The GALE ENCYCLOPEDIA *of* ALTERNATIVE MEDICINE

THIRD EDITION

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LAURIE J. FUNDUKIAN, EDITOR

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Project Editor: Laurie J. Fundukian

Editorial: Donna Batten, Amy Kwolek, Brigham Narins, Jeffrey Wilson

Product Manager: Kate Hanley

Editorial Support Services: Andrea Lopeman

Indexing Services: Factiva, a Dow Jones Company

Rights Acquisition and Management: Robyn V. Young

Composition: Evi Abou El Seoud, Mary Beth Trimper

Manufacturing: Wendy Blurton, Dorothy Maki

Imaging: Lezlie Light

Product Design: Pam Galbreath

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PLEASE READ—IMPORTANT INFORMATION

The Gale Encyclopedia of Alternative Medicine is a medical reference product designed to inform and educate readers about a wide variety of complementary therapies and herbal remedies and treatments for prevalent conditions and diseases. Gale believes the product to be comprehensive, but not necessarily definitive. It is intended to supplement, not replace, consultation with a physician or other healthcare practitioner. While Gale has made substantial efforts to provide information that is accurate, comprehensive, and up-to-date, Gale makes no representations or warranties of any kind, including without limitation, warranties of merchantability or fitness for a particular purpose, nor does it guarantee the accuracy, comprehensiveness, or timeliness of the information contained in this product. Readers should be aware that the universe of complementary medical knowledge is constantly growing and changing, and that differences of medical opinion exist among authorities. They are also advised to seek professional diagnosis and treatment for any medical condition, and to discuss information obtained from this book with their healthcare provider.

INTRODUCTION

The Gale Encyclopedia of Alternative Medicine (GEAM) is a one-stop source for alternative medical information that covers complementary therapies, herbs and remedies, and common medical diseases and conditions. It avoids medical jargon when possible, making it easier for the layperson to use. *The Gale Encyclopedia of Alternative Medicine* presents authoritative, balanced information and is more comprehensive than single-volume family medical guides.

Scope

More than 800 full-length articles are included in *The Gale Encyclopedia of Alternative Medicine*. Many prominent figures are highlighted as sidebar biographies that accompany the therapy entries. Articles follow a standardized format that provides information at a glance. Rubrics include:

Therapies

- Origins
- Benefits
- Description
- Preparations
- Precautions
- Side effects
- Research and general acceptance
- Resources
- Key terms

Herbs/remedies

- General use
- Preparations
- Precautions
- Side effects
- Interactions
- Resources
- Key terms

Diseases/conditions

- Definition
- Description
- Causes and symptoms
- Diagnosis
- Treatment
- Allopathic treatment
- Expected results
- Prevention
- Resources
- Key terms

Inclusion criteria

A preliminary list of therapies, herbs, remedies, diseases, and conditions was compiled from a wide variety of sources, including professional medical guides and textbooks, as well as consumer guides and encyclopedias. The advisory board, made up of three medical and alternative healthcare experts, evaluated the topics and made suggestions for inclusion. Final selection of topics to include was made by the medical advisors in conjunction with Gale editors.

About the Contributors

The essays were compiled by experienced medical writers, including alternative healthcare practitioners and educators, pharmacists, nurses, and other complementary healthcare professionals. *GEAM* medical advisors reviewed more than 95% of the completed essays to insure that they are appropriate, up-to-date, and medically accurate.

How to Use this Book

The Gale Encyclopedia of Alternative Medicine has been designed with ready reference in mind:

- Straight **alphabetical arrangement** allows users to locate information quickly.
- Bold faced terms function as *print hyperlinks* that point the reader to related entries in the encyclopedia.
- A list of **key terms** is provided where appropriate to define unfamiliar words or concepts used within the context of the essay. Additional terms may be found in the **glossary**.
- **Cross-references** placed throughout the encyclopedia direct readers to where information on subjects without their own entries can be found. Synonyms are also cross-referenced.
- A **Resources section** directs users to sources of further complementary medical information.
- An appendix of alternative medical organizations is arranged by type of therapy and includes valuable **contact information**.
- A comprehensive **general index** allows users to easily target detailed aspects of any topic, including Latin names.

Graphics

The Gale Encyclopedia of Alternative Medicine is enhanced with more than 400 images, including photos, tables, and customized line drawings.

ADVISORS

An advisory board made up of prominent individuals from complementary medical communities provided invaluable assistance in the formulation of this encyclopedia. They defined the scope of coverage and reviewed individual entries for accuracy and accessibility. We would therefore like to express our appreciation to them:

Mirka Knaster, PhD
author, editor, consultant in Eastern and Western body-mind disciplines and spiritual traditions
Oakland, CA

Diana Quinn, ND
Naturopathic Women's Healthcare, Ann Arbor, MI
Ann Arbor, MI

Suzanna M. Zick, ND, MPH
University of Michigan Department of Family Medicine
Ann Arbor, MI

CONTRIBUTORS

Margaret Alic, PhD
Medical Writer
Eastsound, WA

Greg Annussek
Medical Writer
American Society of Journalists and Authors
New York, NY

Barbara Boughton
Health and Medical Writer
El Cerrito, CA

Ruth Ann Prag Carter
Freelance Writer
Farmington Hills, MI

Linda Chrisman
Massage Therapist and Educator
Medical Writer
Oakland, CA

Rhonda Cloos, RN
Medical writer and Nurse
Austin, TX

Gloria Cooksey, CNE
Medical Writer
Sacramento, CA

Amy Cooper, MA, MSI
Medical Writer
Vermillion, SD

Angela Costello
Medical Writer
Northfield, OH

Sharon Crawford
Writer, Editor, Researcher
American Medical Writers Association
Periodical Writers Association of Canada and the Editors' Association of Canada
Toronto, ONT Canada

Sandra Bain Cushman
Massage Therapist
Alexander Technique Practitioner and Educator
Charlottesville, VA

Helen Davidson
Medical Writer
Portland, OR

Tish Davidson, MA
Medical Writer
Fremont, CA

Lori DeMilto, MJ
Medical Writer
Sicklerville, NJ

Doug Dupler, MA
Medical Writer
Boulder, CO

Paula Ford-Martin, PhD
Medical Writer
Warwick, RI

Rebecca J. Frey, PhD
Medical Writer
New Haven, CT

Lisa Frick
Medical Writer
Columbia, MO

Kathleen Goss
Medical Writer
Darwin, CA

Elliot Greene, MA
Former President, American Massage Therapy Association
Massage Therapist
Silver Spring, MD

Peter Gregutt
Medical Writer
Asheville, NC

Clare Hanrahan
Medical Writer
Asheville, NC

David Helwig
Medical Writer
London, ONT Canada

Beth A. Kapes
Medical Writer, Editor
Bay Village, OH

Katherine Kim
Medical Writer
Oakland, CA

Erika Lenz
Medical Writer
Lafayette, CO

Lorraine Lica, PhD
Medical Writer
San Diego, CA

Whitney Lowe, LMT
Massage Therapy Educator
Orthopedic Massage Education & Research Institute
Bend, OR

Mary McNulty
Freelance Writer
St.Charles, IL

Leslie Mertz
Medical Writer, Biologist
Kalkaska, MI

Katherine E. Nelson, ND
Naturopathic Physician
Naples, FL

David E. Newton, Ed.D.
Medical Writer
Ashland, OR

Teresa Odle
Medical Writer
Ute Park, NM

Jodi Ohlsen Read
Medical Writer
Carver, MN

Carole Osborne-Sheets
Massage Therapist and Educator
Medical Writer
Poway, CA

Lee Ann Paradise
Medical Writer
Lubbock, TX

Patience Paradox
Medical Writer
Bainbridge Island, WA

Belinda Rowland, PhD
Medical Writer
Voorheesville, NY

Joan M. Schonbeck, RN
Medical Writer
Marlborough, MA

Gabriele Schubert, MS
Medical Writer
San Diego, CA

Kim Sharp, M Ln
Medical Writer
Houston, TX

Kathy Shepard Stolley, PhD
Medical Writer
Virginia Beach, VA

Judith Sims, MS
Science Writer
Logan, UT

Patricia Skinner
Medical Writer
Amman, Jordan

Genevieve Slomski, PhD
Medical Writer
New Britain, CT

Jane E. Spear
Medical Writer
Canton, OH

Liz Swain
Medical Writer
San Diego, CA

Judith Turner, DVM
Medical Writer
Sandy, UT

Samuel Uretsky, PharmD
Medical Writer
Wantagh, NY

Ken R. Wells
Science Writer
Laguna Hills, CA

Angela Woodward
Science Writer
Madison, WI

Kathleen Wright, RN
Medical Writer
Delmar, DE

Jennifer L. Wurges
Medical Writer
Rochester Hills, MI

A

Abdominal pain *see* **Stomachaches**

Abscess

Definition

An abscess is a place of accumulation of the creamy white, yellow, or greenish fluid, known as pus, surrounded by reddened tissue. It is the result of the body's inflammatory response to a foreign body or a bacterial, viral, parasitic, or fungal infection. An abscess usually dries out and resolves when it is drained of pus. The most common parts of the body affected by abscesses are the face, armpits, arms and legs, rectum, sebaceous glands (oil glands), and the breast during lactation.

Description

Most abscesses are septic, which means they are the result of an infection. Abscesses occur when white blood cells (WBCs) gather in response to an infection. They produce oxidants (for example, superoxide radical) and enzymes to digest the invading bacteria, viruses, parasites, or fungi. The infective agents are then broken down by the WBCs into small pieces that can be transported through the bloodstream and eliminated from the body. Unfortunately, the enzymes may also digest part of the body's tissues along with the infective agents. The resulting liquid of this digestion is pus, which contains the remains of the infective agents, tissue, white blood cells, and enzymes.

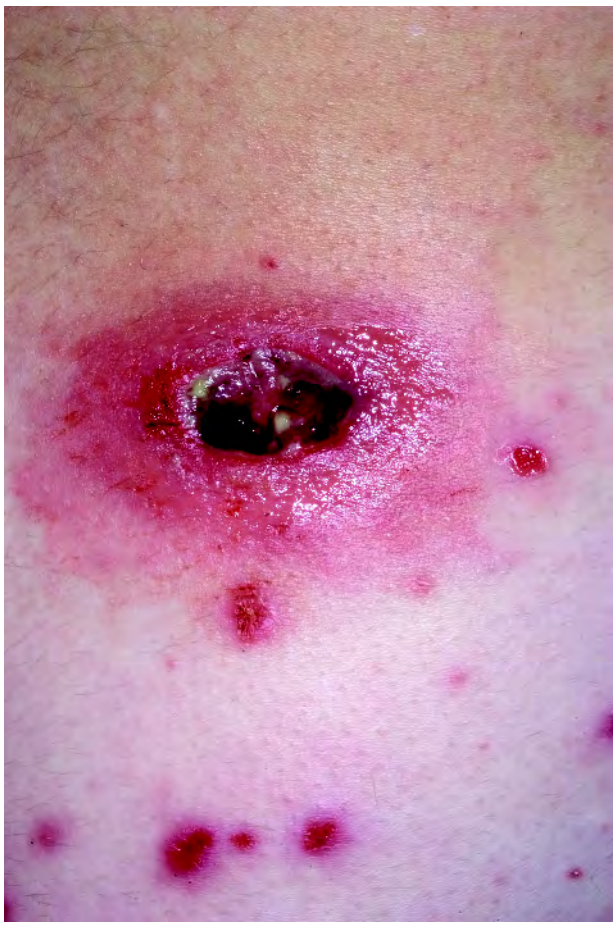
A sterile abscess is one that is not produced by an infection. It is caused by irritants, such as foreign bodies or injected drugs, and medications that have not been totally absorbed. Sterile abscesses quite often heal into hardened scar tissue.

Common types of abscesses

- Boils and carbuncles. Sebaceous glands and superficial skin are the places usually infected.
- Dental abscess. An abscess that develops along the root of a tooth.
- Pilonidal abscess. People who have a birth defect involving a tiny opening in the skin just above the anus may have fecal bacteria enter this opening, causing an infection and a subsequent abscess.
- Retropharyngeal, parapharyngeal, peritonsillar abscess. As a result of throat infections like strep throat and tonsillitis, bacteria invade the deeper tissues of the throat and cause a parapharyngeal or peritonsillar abscess. A retropharyngeal abscess is a result of something usually blood-borne, and not from a direct spread of tonsillitis. These abscesses can compromise swallowing and even breathing.
- Lung abscess. During or after pneumonia, an abscess can develop as a complication.
- Liver abscess. Bacteria, parasites, or amoeba from the intestines can spread through the blood to the liver and cause abscesses.
- Psoas abscess. An abscess can develop in the psoas muscles, when an infection spreads from the appendix, the large intestine, or the fallopian tubes.
- Butin abscess. Any blood-borne organism feeding off bacteria that stimulate pus production (pyogenic organisms). Can cause abscesses in possibly many sites.

Causes and symptoms

Many different agents cause abscesses. The most common are the pyogenic, or pus-forming bacteria, such as *Staphylococcus aureus,* which is nearly always the cause of abscesses directly under the skin. Abscesses are usually caused by organisms that normally inhabit



Methicillin resistant *Staphylococcus aureus* skin abscess.
(© Scott Camazine / Alamy)

nearby structures or that infect them. For example, abscesses around the anus may be caused by any of the numerous bacteria found within the large intestine. Brain abscesses and liver abscesses are caused by the bacteria, amoeba, and fungi that are able to travel there through circulation.

Symptoms of an abscess are the general signs of inflammation. Symptoms that identify superficial abscesses include heat, redness, swelling, and **pain** over the affected area. Abscesses in other places may produce only generalized symptoms, such as **fever** and discomfort. A sterile abscess may present as painful lump deep under the site of an injection. A severe infection may bring on fever, **fatigue**, weight loss, and **chills**. Recurrent abscesses may indicate undiscovered **allergies** or decreased immune functioning.

Diagnosis

A general physical examination and a detailed patient history are used to diagnose an abscess. Recent or chronic disease or dysfunction in an organ suggests it may be the site of an abscess. Pain and tenderness on physical examination are common findings. There may also be a leakage of pus from a sinus tract connected to an abscess deep in the body tissue.

Treatment

Bentonite clay packs with a small amount of **goldenseal** powder (*Hydrastis canandensis*) can be placed on the site of a superficial abscess and used to draw out the infection. **Tea tree oil** (*Melaleuca* spp.) and **garlic** (*Allium sativa*) directly applied to abscesses may also help to clear them.

Applications of a hot compress to the skin over the abscess will hasten the draining or the reabsorption of the abscess. Contrast **hydrotherapy**, using alternating hot and cold compresses, can also be used. Additionally, localized warm/hot soaks three to five times daily frequently brings an abscess to heal.

Homeopathic remedies that can be taken to help diminish abscess formation include **belladonna**, **silica**, Hepar sulphuris, and **calendula**. Also, **acupuncture** may be recommended to help treat pain caused by an abscess. In addition, vitamins A and C, beta-carotene, **zinc**, liquid chlorophyll, and garlic are useful as supportive daily nutrients to help clear up abscesses.

Allopathic treatment

Often, the pus of an abscess must be drained by a physician. Ordinarily, the body will handle the remaining infection. Sometimes antibiotics are prescribed. The doctor may often put a piece of cloth or rubber, called a drain, in the cavity of the abscess to prevent it from closing until all the pus has drained.

Expected results

Once the abscess is properly drained, it should clear up in a few days. Any underlying diseases will determine the overall outcome of the condition. Recurrent abscesses, especially those on the skin, return due to either defective/altered immunity, or staph overgrowth, where there is high bacterial colonization on the skin. The patient should consult a physician for treatment with which to wash the skin areas, and treatment to eradicate colonization.

If the abscess ruptures into neighboring areas or if the infectious agent spills into the bloodstream, serious consequences are likely. Abscesses in and around the nasal sinuses, face, ears, and scalp may spread the infection into the brain. Abscesses in the abdominal cavity, such as in the liver, may rupture into that cavity. **Blood poisoning**, or septicemia, is an infection

KEY TERMS

Bentonite clay—A green clay of aluminum silicate containing magnesium and trace minerals. The clay has the ability to attract and hold to its surface agents of infection from a wound.

Enzyme—A protein that can increase the rate of chemical reactions.

Sinus tract—A channel connecting a body part with the skin outside.

that has spilled into the bloodstream and then spreads throughout the body. These are emergency situations where the patient needs to be seen by a physician as soon as possible.

It is important to take note that abscesses in the hand may be more serious than they might appear. Due to the intricate structure and the overriding importance of the hand, any hand infection must be treated promptly and competently.

Prevention

Infections that are treated early with heat, if superficial, or antibiotics, if deeper, will often resolve without the formation of an abscess. It is even better to avoid infections altogether by promptly cleaning and irrigating open injuries, particularly **bites** and puncture **wounds**.

Resources

BOOKS

Bennett, J. Claude, and Fred Plum, ed. *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders Co., 1996. (Lee Goldman and Dennis Ausiello, ed. *Cecil Medicine*. [2008]. 23rd ed.)

Duke, James A., et al. *The Green Pharmacy*. Pennsylvania: Rodale, 1997.

Isselbacher, Kurt, et al, ed. *Harrison's Principles of Internal Medicine*. New York: McGraw Hill, 1997. (Anthony S. Fauci . . . [et al.] [2008]. 17th ed.)

Tierney, Jr., Lawrence M., et al, ed. *Current Medical Diagnosis and Treatment*. Connecticut: Appleton & Lange, 1996.

OTHER

AlternativeMedicine.com. http://www.alternativemedicine.com (December 28, 2000).

Patience Paradox

Absinthe *see* **Wormwood**

Aches and pains *see* **Pain**

Acidophilus

Description

Lactobacillus acidophilus, commonly referred to simply as acidophilus, is a friendly inhabitant of the gastrointestinal (GI) tract. It, as well as some related strains of bacteria, is known as a probiotic. Probiotic organisms secrete enzymes that support healthy digestion. They keep the flora of the intestines and vagina balanced and compete with some pathogenic organisms. When the probiotic population of the body is severely decreased, as can occur with treatment by many antibiotics, yeasts and harmful bacteria may take over and cause illness. Normal and healthy amounts of acidophilus can also be decreased by chronic **diarrhea**, **stress**, **infections**, and poor diet.

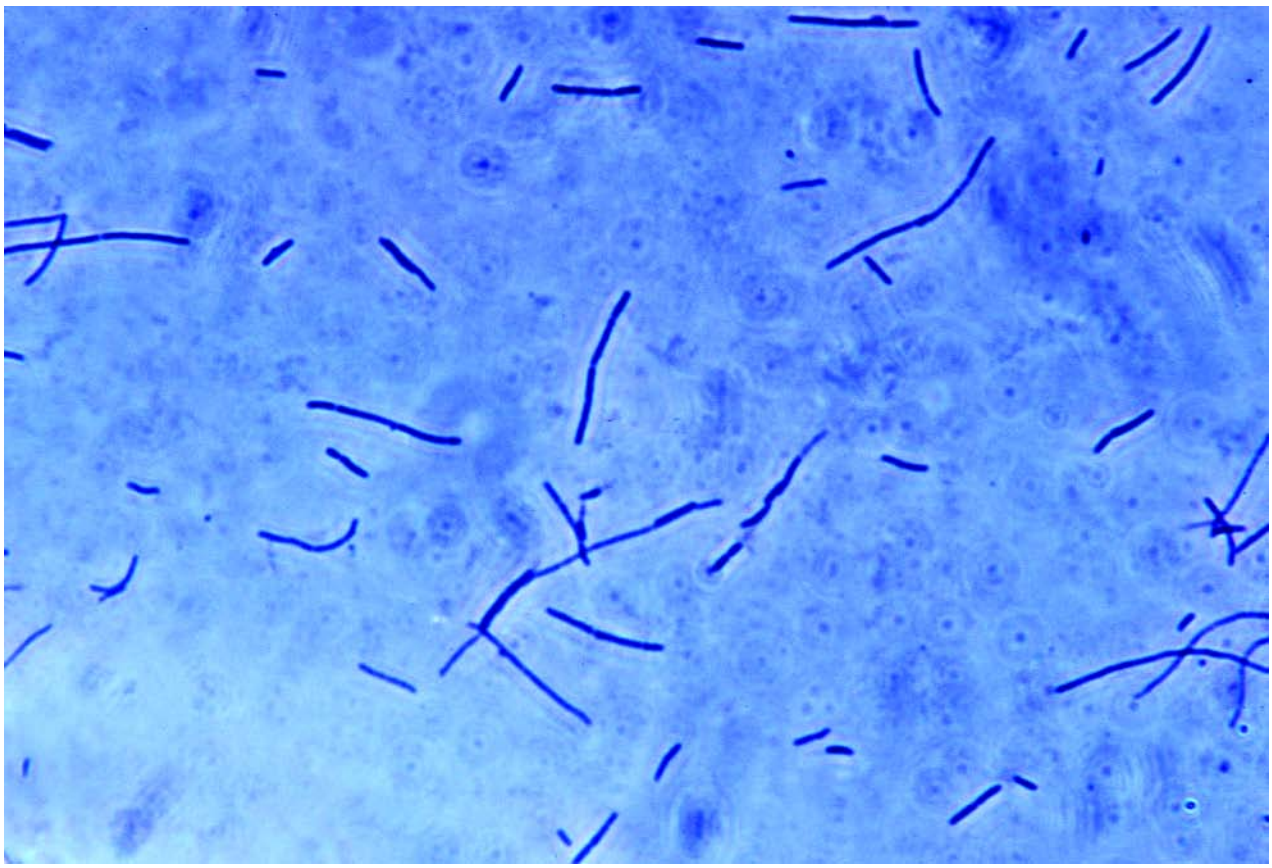
The species of *Lactobacilli* that inhabit the GI tract cause an increase of acidity. The bacteria do this by producing lactic acid from milk sugar (lactose). The increased acidity may promote the absorption of **calcium**, as well as of some other minerals. Lowered pH also discourages the growth of many pathogenic species of bacteria and yeasts. The hydrogen peroxide produced by the acidophilus helps to suppress pathogens.

Acidophilus may function in the production of some of the B vitamins, such as **niacin**, **pyridoxine**, **biotin**, and **folic acid**.

General use

Yeast infections

Acidophilus may be used to reduce susceptibility to vaginal yeast infections, which are quite common. Symptoms including **itching**, burning, inflammation, and discharge occur due to an overgrowth of the yeast *Candida albicans*, which is part of the normal vaginal flora. Some women are more prone to yeast infections than others. Antibiotics destroy the normal probiotic flora, and may lead to yeast infections. High sugar levels are another predisposing factor. Diabetics, who tend to have high blood sugar, and persons who consume a processed diet that is high in sugar have more frequent problems with yeast as well. The hormonal states created by **pregnancy** or the use of oral contraceptives also contribute to yeast infections. IUD users can have an increased rate of infection. In rare cases, *Candida* is sexually transmitted and both partners may require treatment in order to control repeated overgrowth. Anyone who has **AIDS** or any other condition causing immunosuppression has increased susceptibility to *Candida* and other types of



Photomicrograph of *Lactobacillus acidophilus*. This bacterium is considered to be beneficial to health and is part of the normal flora of the gastrointestinal and genitourinary tracts. It is found in yogurt and other dairy products. *(PHOTOTAKE Inc. / Alamy)*

infections. Acidophilus is one of the organisms that competes with *Candida* and decreases its population. Many studies have shown that oral and topical use (by douching) of acidophilus are effective to prevent and treat this condition.

Systemic candidiasis, or yeast hypersensitivity syndrome, is a condition that is not recognized by many allopaths. It is acknowledged by some practitioners of alternative and complementary medicine as a problem with broad-ranging consequences. This theory holds that some people have an allergic reaction to the yeast and/or its toxins, and that they can experience serious symptoms when the organism multiplies in the body to an abnormal degree. **Fatigue**, diarrhea, **constipation**, muscle **pain**, thrush, itching, mood changes, endocrine dysfunction, headaches, and tingling or numbness of the extremities are some of the symptoms that are reportedly associated with systemic candidiasis. A weak immune system may be more prone to allowing yeast to multiply, and large numbers of yeast can act to further suppress the immune function. Acidophilus, in combination with such nutritional supplements as **essential fatty acids**, is often recommended for the prevention and treatment of this syndrome.

Gastrointestinal disorders

Irritable bowel syndrome (IBS) is a functional disturbance of the lower intestine that can cause bloating, cramping, abdominal pain, diarrhea, constipation, and painful bowel movements. This condition is also known as spastic colon. One small study of the use of acidophilus to treat IBS showed more improvement in the treated group than in those who took a placebo. This evidence is not conclusive evidence, but in view of the safety of the treatment and the scarcity of effective alternatives, acidophilus may be worth trying.

Traveler's diarrhea is sometimes suffered by people who consume contaminated food or water in other countries. Some evidence shows that regular use of acidophilus and other **probiotics** may prevent this condition. Two clinical studies published in 2007 reported that probiotics, including acidophilus, can

be effective in treating IBS and in preventing and treating mild to moderate ulcerative **colitis** (UC), an inflammation of the walls of the bowel accompanied by the formation of ulcers. The condition can result in permanent bowel damage. One of the studies also showed probiotics appear to be useful in preventing and treating pouchitis, an acute infection in part of the intestines of patients who have undergone an ileostomy (removal of a pouch at the end of the small intestine) and restorative complete colectomy (removal of all four parts of the colon). Both studies concluded there is no evidence to suggest probiotics are effective in treating Crohn's disease, an immune system disorder that effects the small intestine that sometimes spreads to the colon.

High cholesterol levels

Recent evidence suggests that consuming *Lactobacillus acidophilus L1* can be effective in lowering blood **cholesterol**. The February 1999 issue of the *Journal of the American College of Nutrition* reports on two studies done at the University of Kentucky. Subjects who consumed the yogurt containing *L. acidophilus L1* had cholesterol levels drop by 2.4% in one study and 3.2% in the other. Although the percentages are small, the effect on the risk of **heart disease** could be significant.

Immune response

A study published in the December 1998 issue of the *Brazilian Journal of Medical and Biological Research* found that acidophilus induced a nonspecific immune response in experimental mice. Acidophilus is sometimes recommended as an immune booster for people, although as of 2008 the effect has not yet been documented in humans.

Other uses

Acidophilus may possibly be helpful in the treatment of **canker sores**, **feverblisters**, **hives**, and adolescent **acne**. Its use has also been suggested as a preventative for colon **cancer**. Some evidence suggests that acidophilus may reduce the risk of developing an allergic reaction, including **asthma**, **hay fever**, and skin reactions, such as **eczema**. In fact, some early evidence suggests that if mothers who have at least one relative with asthma, or some other allergy-related illness, take this probiotic while pregnant and breastfeeding, their babies may be less likely to develop asthma. Clinical studies also have shown acidophilus can help treat respiratory (lung) infections, including sinusitis, **bronchitis**, and **pneumonia**, according to the University of Maryland Medical Center.

KEY TERMS

Candidiasis—Any of a variety of infections caused by fungi of the genus *Candida*.

Complete colectomy—The surgical removal of all four parts of the colon.

Crohn's disease—An immune system disorder that effects the small intestine that sometimes spreads to the colon.

Ileostomy—The removal of a pouch at the end of the small intestine.

Irritable bowel syndrome—A functional disturbance of the lower intestine that can cause bloating, cramping, abdominal pain, diarrhea, constipation, and painful bowel movements.

Pouchitis—An acute infection in part of the intestines of patients who have undergone an ileostomy and a complete colectomy.

Probiotic—Any strain of bacteria that lives in the human gut and is considered a "friendly" bacterium. Probiotics secrete enzymes that help to keep the digestive system balanced, and compete with some pathogenic organisms. Acidophilus is one of the best-known probiotics.

Traveler's diarrhea—Diarrhea caused by ingesting local bacteria to which one's digestive system has not yet adapted.

Ulcerative colitis—An inflammation of the walls of the bowel accompanied by the formation of ulcers. The condition can result in permanent bowel damage.

Preparations

Acidophilus is taken by mouth. It is available as powder, liquid, tablets, or capsules, and is also present in some types of milk, kefir, yogurt, and some cheeses. Frozen yogurt does not contain live probiotics. Check product labels to see whether live organisms are present. The bacteria are killed by pasteurization. Probiotic products are most potent when kept refrigerated. The potency of a given preparation is usually expressed as the number of organisms per capsule. A usual dose of acidophilus is 1–10 billion organisms, divided into three doses per day.

Precautions

People who are lactose-intolerant may not tolerate acidophilus.

Side effects

The initial use of acidophilus may cause an increase in intestinal **gas**, which decreases with continued use of the product.

Interactions

Taking acidophilus in conjunction with some antibiotics, including ampicillin (Amcill, Ampicin) and amoxicillin (Amoxil, Novamoxin), can prevent the diarrhea that is sometimes caused by their use. One clinical study suggests that acidophilus speeds up the metabolism of sulfasalazine, a medication used to treat ulcerative colitis. The significance of this information is unknown, according to the University of Maryland Medical Center.

Resources

BOOKS

Huffnagle, Gary B., and Sarah Wernick. *The Probiotics Revolution: The Definitive Guide to Safe, Natural Health Solutions Using Probiotic and Prebiotic Foods and Sup plements*. New York: Bantam, 2007.

Taylor, John R., and Deborah Mitchell. *The Wonder of Probiotics: A 30 Day Plan to Boost Energy, Enhance Weight Loss, Heal GI Problems, Prevent Disease, and Slow Aging*. New York: St. Martin's Griffin, 2007.

PERIODICALS

Gaby, Alan R. "*Lactobacillus acidophilus* Douche for Bac terial Vaginosis." *Townsend Letter: The Examiner of Alternative Medicine* (October 2007): 50.

Gionchetti, Paolo P., et al. "Antibiotics and Probiotics in Treatment of Inflammatory Bowel Disease." *World Journal of Gastroenterology* (June 2006): 3306 3313.

Hedin, C., et al. "Evidence for the Use of Probiotics and Prebiotics in Inflammatory Bowel Disease: A Review of Clinical Trials." *Proceedings of the Nutrition Society* (August 2007): 307 315.

Moon, Kenneth T. "Does *Lactobacillus acidophilus* Prevent Traveler's Diarrhea?" *American Family Physician* (March 15, 2007): 916.

ORGANIZATIONS

Agriculture and Agri Foods Canada. Sir John Carling Building, 930 Carling Ave., Ottawa, ON K1A 0C7 Canada. (613) 759 1000. http://www.agr.gc.ca.

Food and Drug Administration. 5600 Fishers Lane, Rock ville, MD 20857. (888) 463 6332. http://www.fda.gov.

Nutrition Society. 10 Cambridge Court, 210 Shepherds Bush Road, London W6 7NJ Great Britain. (44) 020 7602 0228. http://www.nutsoc.org.uk.

Judith Turner
Ken R. Wells

Acne

Definition

Acne is a common inflammatory skin disease characterized by pimples on the face, chest, and back. It occurs when the pores of the skin become clogged with oil, dead skin cells, and/or bacteria.

Description

Acne vulgaris, the medical term for common acne, is the most common skin disease. It affects nearly 17 million people in the United States. While acne can occur at any age, it usually begins at puberty and worsens during adolescence. Nearly 85% of people develop acne some time between the ages of 12 and 25 years old. Up to 20% of women develop mild acne. It is also found in some newborns.

The sebaceous glands lie just beneath the skin's surface. They produce sebum, an oily secretion that helps to preserve the flexibility of the hair and moisturizes the skin. These glands and the hair follicles within which they are found are called sebaceous follicles. These follicles open onto the skin through pores that allow the sebum to reach the hair shaft and the skin. In certain situations, the glands excrete excess sebum that cannot be cleared from the pores efficiently. This excess happens, for instance, at puberty when increased levels of the androgen hormones cause overproduction of sebum. In addition, cells lining the follicle are shed too quickly and begin to clump together. The excess sebum combines with the dead cells and forms a plug, or comedo (also called comedones), which is not usually seen, that blocks the pore. When the follicle begins to bulge and show up as a small whitish bump mostly under the skin, it is called a whitehead. If the comedo opens up, the top surface of the plug darkens, and it is referred to as a blackhead.

Infection results when a plugged follicle is invaded by *Propionibacterium acnes,* a bacterium that normally lives on the skin, and possibly other microorganisms. The bacterium produces chemicals and enzymes that bring on inflammation. Pimples are the result of infected blackheads or whiteheads that rupture, releasing sebum, bacteria, dead skin, and white blood cells onto the surrounding tissues. Inflamed pimples near the skin's surface are called papules; they are red and raised and may be quite tender to the touch. The papules may become filled with pus and are then called pustules. If the follicle continues to enlarge rather than rupture, it forms a closed sac, called a cyst, which can be felt as a lump under the skin. Large hard swellings

deep within the skin are called nodules. Both nodules and cysts may cause **pain** and scarring.

Causes and symptoms

The exact cause of acne is mostly unknown. One exception is the occurrence of acne in women as a result of excess male hormone production, which is diagnosed by excessive growth of hair, especially in places not usual on a female, called hirsuitism; irregular menstrual cycles; and premenstrual flare-ups of acne. A 2001 study demonstrated that menstrual cycle does affect acne. Surprisingly, the study revealed that 53% of women over age 33 experienced a higher premenstrual acne rate than women under age 20.

Many alternative practitioners assert that acne is often related to a condition of toxicity in the intestines or liver. This condition may be due to the presence of bacteria such as *Clostridia spp*. and *Yersinia enterocolitica,* a result of a low-fiber diet; a lack of friendly gut flora such as *Lactobacillus spp*.; an intestinal overgrowth of *Candida albicans*; and food **allergies**.

The interaction between the body's hormones, skin protein, skin secretions, and bacteria determines the course of acne. Several other factors have also been shown to affect the condition:

- Age. Teenagers are more likely than any other age group to develop acne.
- Gender. Boys have more severe acne and develop it more often than girls.
- Disease. Hormonal disorders can complicate acne in girls.
- Heredity. Individuals with a family history of acne have greater susceptibility to the condition.
- Hormonal changes. Acne can flare up before menstruation, during pregnancy, and menopause.
- Diet. Although they are not the primary cause of acne, certain foods may bring on flare-ups or make the condition worse.
- Drugs. Acne can be a side effect of using antibiotics, oral contraceptives, and anabolic steroids.
- Personal hygiene. Use of abrasive soaps, hard scrubbing of the face, or handling pimples will often make them worse.
- Cosmetics. Oil-based makeup and hair sprays worsen acne.
- Environment. Exposure to oils and greases, polluted air, and sweating in hot weather can all aggravate acne.
- Stress. Emotional stress may contribute to acne.
- Friction. Continual pressure or rubbing on the skin by such objects as bicycle helmets, backpacks, or tight clothing can worsen acne.

The most common sites of acne are the face, chest, shoulders, and back, since these are the parts of the body where the most sebaceous follicles are found. In teenagers, acne is often found on the forehead, nose, and chin. As people age, the condition tends to appear towards the outer part of the face. Adult women may have acne on their chins and around their mouths. The elderly often develop whiteheads and blackheads on the upper cheeks and skin around the eyes. Inflamed lesions may cause redness, pain, tenderness, **itching**, or swelling in affected areas.

Diagnosis

Acne has a characteristic appearance and is, therefore, not difficult to diagnose. A complete medical history should be taken, including questions about skin care, diet, factors that improve or worsen the condition, medication use, and prior treatment. Physical examination includes the face, upper neck, chest, shoulders, back, and other affected areas. Under good lighting, the doctor can determine what types and how many blemishes are present, whether they are inflamed, whether they are deep or superficial, and whether there is scarring or skin discoloration. Blood tests are done when the patient appears to have hormonal or other medical problems. Stool tests can be helpful in determining whether there is a bacterial or yeast overgrowth contributing to the condition. Food allergy testing should also be considered.

Treatment

Alternative treatments for acne focus on proper cleansing to keep the skin oil-free; intermittent **fasting**; eating a good diet; an **elimination diet** in which the individual avoids alcohol, dairy products, **smoking**, **caffeine**, sugar, processed foods, and foods high in **iodine**, a mineral which appears to contribute to acne.

Supplementation with herbs that are blood cleansers or blood purifiers is recommended. These herbs strengthen the action of the liver and the kidneys, helping with **detoxification** and excretion. **Dandelion** root tincture (*Taraxacum officinale*) is recommended. Other recommended products include **burdock root** (*Arctium lappa*), also known as gobo, which can be purchased fresh at health food grocers or in Asian markets. It can be used either raw or cooked in salads, stir-fries, or other vegetable dishes. Burdock root tincture can also be used. **Red clover** (*Trifolium pratense*) makes a pleasant tea that can be consumed throughout

the day. **Milk thistle** seed (*Silybum marianum*) can either be taken in tincture form or the seeds can be ground up and eaten in combination with hot cereal, granola, or other foods.

Other herbs useful in the treatment of acne include *Echinacea spp*. and **goldenseal** (*Hydrastis canadensis*). Goldenseal is particularly helpful in clearing up underlying conditions of intestinal toxicity. Herbal remedies used in **traditional Chinese medicine** (TCM) for acne include cnidium seed (*Cnidium monnieri*), and **honeysuckle** flower (*Lonicera japonica*). Supplementation nutrients, such as **essential fatty acids** (EFAs), **vitamin B complex**, **zinc**, **vitamin A** or beta-carotene, and **chromium** are also recommended.

Bowel toxicity may contribute to acne flare-ups and should be addressed. *Lactobacillus acidophilus* and *Lactobacillus bulgaricus* should be taken in yogurt or in capsules to maintain a healthy balance of intestinal flora. Goldenseal can be used to kill toxic bacteria. Allergic foods should be identified and removed from the diet. Dietary fiber, such as oat and wheat bran, beans, fruits and vegetables and their skins, and **psyllium** seed, should be increased in the diet. The fiber absorbs toxins and carries them through the colon to be excreted.

In addition, individuals with acne may want to participate in **movement therapy**, such as **yoga** or **t'ai chi**, or begin an **exercise** regimen. The person may also consider stress reduction or **meditation**.

Allopathic treatment

Acne treatment consists of reducing sebum and keratin production, encouraging the shedding of dead skin cells to help unclog the pores and killing or limiting bacteria. Treatment choice depends upon whether the acne is mild, moderate, or severe. Complicated cases are referred to a dermatologist or an endocrinologist, who treats diseases of the glands and the hormones. Counseling may be necessary to clear up misconceptions about the condition and to offer support regarding the negative effect of acne on the physical appearance.

Topical drugs

Treatment for mild acne consists of reducing the formation of new comedones with over-the-counter acne medications containing benzoyl peroxide (e.g., Clearasil, Fostex), salicylic acid (Stridex), **sulfur** (Therac lotion), or resorcinol (Acnomel cream). Treatment with stronger medications requires a doctor's supervision. Such medications include comedolytics, which are agents that loosen hard plugs and open pores. Adapalene (Differin), the vitamin A acid tretinoin (Retin-A), and concentrated versions of salicylic acid, resorcinol, and sulfur are in this group. Topical antibiotics, such as erythromycin, clindamycin (Cleocin-T), and meclocycline (Meclan), may be added to the treatment regimen. Drugs that act as both comedolytics and antibiotics, such as benzoyl peroxide, azelaic acid (Azelex), or benzoyl peroxide plus erythromycin (Benzamycin), are also used.

After washing with a mild soap, the acne medications are applied alone or in combination, once or twice a day over the entire affected area of skin. It may take many months to years to control the condition with these medications. Possible side effects include mild redness, peeling, irritation, dryness, and an increased sensitivity to sunlight that requires use of a sunscreen.

Oral drugs

When acne is severe and the lesions are deep, oral antibiotics may be taken daily to reduce the spread of bacteria. Tetracycline is the medication most often used. Minocycline, however, may be preferable because it has fewer side effects. Erythromycin and doxycycline are also used, and they also have side effects, including **dizziness**, photosensitivity, gastrointestinal problems, and darkening of the skin. Other possible side effects include allergic reactions, yeast **infections**, dizziness, tooth discoloration, and folliculitis. It is necessary for antibiotics to be used for up to three months to clear up the condition.

Isotretinoin (Accutane) can be used in cases of very severe acne or if antibiotic therapy proves unsuccessful. It may clear up resistant cysts and nodules in up to 90% of people and prevent scarring. Some do require a second course of treatment before this happens, however. Although the medication can be quite helpful, women who might become pregnant should use it with care. Isotretinoin can cause birth defects up to a month after it has stopped being used. Therefore, strict attention is paid to **pregnancy** tests and contraceptive requirements for women of child-bearing age who take this medication.

The course of treatment with isotretinoin lasts about four to five months. If dosage is kept low, a longer course of therapy is needed. Isotretinoin is a strong medication. Side effects are very common, mostly dryness of the eyes, genital mucosa, and lips. Other effects may include increases in **cholesterol**, triglycerides, and abnormal liver enzymes. Blood

tests taken each month should be monitored during the course of treatment to ensure that the medication is not causing serious harm.

Anti-androgens, drugs that inhibit androgen production, are used to treat women who are unresponsive to other therapies. Oral contraceptives such as norgestimate/ethinyl estradiol (Ortho-Tri-Cyclen) have been shown to improve acne. In late 2001, a clinical trial demonstrated that ultra low-dose birth control pills (Alesse) prove as effective in treating acne as do pills with higher doses of estrogen. Improvement may take up to four months.

Other drugs, such as spironolactone and corticosteroids, may be used to reduce hormone activity in the adrenal glands, reducing production of sebum. This is the treatment of choice for an extremely severe, but rare type of acne called acne fulminans, found mostly in adolescent males. Acne conglobata, a more common form of severe inflammation, is characterized by numerous, deep, inflammatory nodules that heal with scarring. It is treated with oral isotretinoin and corticosteroids.

Other types of treatment

Several surgical or medical treatments are available to alleviate acne or the resulting scars:

- Comedone extraction. The comedo is removed from the pore with a special tool.
- Chemical peels. Glycolic acid is applied to peel off the top layer of skin to reduce scarring.
- Dermabrasion. The affected skin is frozen with a chemical spray and removed by brushing or planing.
- Punch grafting. Deep scars are excised and the area repaired with small skin grafts.
- Intralesional injection. Corticosteroids are injected directly into inflamed pimples.
- Collagen injection. Shallow scars are elevated by collagen protein injections.
- Laser treatments. Two types of laser treatments are used in treating acne scars. Laser-treated skin heals in three to 10 days, depending on the treatment chosen.

Expected results

Most dermatologists use a combination of therapies to treat acne, depending on the individual. Results of specific treatments vary. Acne is not a serious health threat. The most troubling aspects of this condition are the negative cosmetic effects and potential for permanent scarring. Some people, especially teenagers, become emotionally upset about their condition, and this psychological aspect may contribute to social or other emotional problems.

Acne is not considered curable, although it can be controlled by proper treatment, with improvement possibly taking many months. Acne tends to reappear when treatment stops, but it often spontaneously improves over time. Inflammatory acne may leave scars that require further treatment.

KEY TERMS

Androgens—Male sex hormones that are linked with the development of acne.

Comedo—A hard plug composed of sebum and dead skin cells.

Follicles—Structures where pimples form. They are found within the skin and house the oil glands and hair.

Isotretinoin—A drug that decreases sebum production and dries up acne pimples.

Sebum—An oily skin moisturizer produced by sebaceous glands.

Prevention

There are no sure ways to prevent acne, but the following steps may be taken to minimize flare-ups:

- Gentle washing of affected areas once or twice every day.
- Avoidance of abrasive cleansers.
- Limited use of makeup and moisturizers; with avoidance of oil-based brands altogether.
- Frequent shampooing of oily hair which should be worn up, away from the face.
- A healthy, well-balanced diet that emphasizes fresh fruits and vegetables. Foods that seem to trigger flare-ups should be avoided.
- Gentle washing of the face, twice daily, with a soap compounded of sulfur, *Calendula officinalis,* or other substances that are useful against acne.
- Avoidance of handling affected areas excessively. Pimples should not be squeezed or prodded, as this may contribute to scarring, as well as spreading the acne lesions.
- Control over emotional stress.

Resources

BOOKS

Gabriel, Julie. *Clear Skin: Organic Action Plan for Acne*. Lincoln, NE: iUniverse Books, 2007.

Logan, Alan C., and Valori Treloar. *The Clear Skin Diet: A Nutritional Plan for Getting Rid of and Avoiding Acne*. Nashville, TN: Cumberland House, 2007.

Webster, Guy F., and Anthony V. Rawlings, eds. *Acne and Its Therapy*. London: Informa Healthcare, 2007.

PERIODICALS

Ganceviciene, Ruta, and Christos C. Zouboulis. "Isotreti noin: State of the Art Treatment for Acne Vulgaris." *Expert Review of Dermatology* (November 2007): 693 706.

Haedersdal, M., K. Togsverd Bo, and H. C. Wulf. "Evidence based Review of Lasers, Light Sources, and Photody namic Therapy in the Treatment of Acne Vulgaris." *Journal of the European Academy of Dermatology & Venereology* (March 2008): 267 278.

Kumar, Anil, et al. "Treatment of Acne with Special Emphasis on Herbal Remedies." *Expert Review of Dermatology* (February 2008): 111 122.

Simonart, T., M. Dramaix, and V. De Maertelaer. "Efficacy of Tetracyclines in the Treatment of Acne Vulgaris: A Review." *British Journal of Dermatology* (February 2008): 208 216.

OTHER

Harper, Julie C. "Acne Vulgaris." eMedicine. http://www.emedicine.com/DERM/topic2.htm. (February 8, 2008).

Merck Manual. "Acne Vulgaris." http://www.merck.com/mmpe/sec10/ch111/ch111b.html. (February 8, 2008).

Patience Paradox
David Edward Newton, Ed.D.

Acne rosacea *see* **Rosacea**

Aconite

Description

Aconite is the common name for any of 100 or more related species in the *Aconitum* genus. Two of the species, *Aconitum napellus* and *Aconitum carmichaeli* are used medicinally. The more popular remedy, *Aconitum napellus*, is a plant that grows in mountainous regions of Central Asia, Russia, Europe, and Great Britain. This perennial plant from the Ranunculaceae family grows to a height of 3 ft (1 m) and has dark green, glossy leaves and dark blue flowers.

Winter aconite. *(ImageState / Alamy)*

Other names for aconite are wolf's bane, monkshood, blue rocket, and friar's cap. Wolf's bane is a direct translation of the Greek word *Lycotonum*. The Greeks left the plant as poisonous bait for wolves or moistened arrows with the juice of the herb in order to kill wolves. The plant was nicknamed monkshood and friar's cap because of the shape of the flowers.

The plant in its fresh form is highly poisonous. The poison comes from the toxic alkaloid aconitine. Aconitine is found in the whole plant but is concentrated mainly in the root. Symptoms of poisoning include tingling; numbness of the tongue and mouth; **nausea** and **vomiting**; labored breathing; a weak and irregular pulse; and cold, clammy skin. Even the smallest amounts of aconitine inside the mouth cause burning, tingling, and numbness. As little as 2 mg of aconitine can cause death in four hours, which may be one reason why aconite is often chosen by people attempting suicide by poison. The Australian government has declared all species of aconite unfit for human consumption.

General use

Western herbology

Herbalists have used aconite as a medicine for hundreds of years. However, in ancient times the herb was known more for its power to kill rather than heal; it was often used in ancient Rome to commit murders.

The herb acts as a diuretic (a substance that promotes urination) and diaphoretic (a substance that causes sweating). Tinctures are taken internally to slow fevers, **pneumonia**, **laryngitis**, and acute **tonsillitis**. Liniments or ointments made from the herb are applied externally to relieve the **pain** of **neuralgia** and rheumatism.

Traditional Chinese medicine

Aconitum carmichaeli is used in **traditional Chinese medicine**. It is called Fu Zi (sometimes Fu Tzu) in Mandarin; in other parts of China and in Hong Kong, it is known as *chuan wou tou*. This herb is used to treat rheumatism, **bruises**, arthritis, acute hypothermia, **diarrhea**, and **impotence**. The herb has a sweet, spicy taste.

The main function of Fu Zi is to warm the interior of the body. It also works to restore collapsed yang, warm kidney fire, warm the kidney and spleen, drive out the cold, warm the meridians, and relieve pain. Fu Zi is also used by traditional Chinese herbalists in conditions marked by deficient kidney and spleen yang or in conditions with early morning diarrhea or lack of appetite.

Aconitum carmichaeli also contains the toxic alkaloid aconitine. After cooking the herb, the alkaloid is converted to aconine, which is not as toxic.

This herb is poisonous. When it is properly prepared as recommended by a Chinese medicine practitioner, there are rarely any adverse effects. Chinese pharmacies do not sell raw, untreated aconite, as the plant should be dried and then brewed for long periods of time. However, cases of aconite poisoning have been reported in Asian countries, including some that ended in the patient's death from heart arrhythmias. It appears that most of these cases were due either to the herbalist's prescribing a larger dose of aconite than was needed, or to the patient's attempting to prepare the remedy at home.

Homeopathy

Homeopaths prescribe aconite for conditions that come on suddenly as a result of grief, fear, anger, shock, or exposure to cold, dry wind. It is also recommended for people troubled by suicidal thoughts. The remedy is short-acting and is indicated at the onset of acute conditions such as **croup**, colds, **cough**, **bronchitis**, eye and ear **infections**, headaches, and rheumatism. This remedy is one of the best substances for treating **measles**, arthritis, and pneumonia when all of the symptoms are present. Aconite is also useful at the beginning of a **fever**, in early stages of inflammation, and following shock caused by an injury or surgery.

Preparations

Aconite is available as a homeopathic remedy or in dried bulk form, as an ointment or liniment, and as a tincture. Pharmacies, health food stores, and Chinese herbal stores carry the various preparations. They are also available as prescribed by a herbalist, homeopathic doctor, or Chinese medicine practitioner.

The whole plant is used in Western herbal medicine. The leaves and flowers are cut when the flowers are in blossom in June. The roots are collected after the stem has died off, usually in August. The root is dried before use while the leaves, stems, and flowers are used fresh.

The homeopathic preparation of aconite is created in the following manner. When the flowers are in full bloom, the whole plant—but not the root—is collected and pounded to a pulp. The juice from the pulp is pressed and mixed with alcohol. The mixture is then strained and diluted. The final homeopathic remedy is created after the diluted mixture is repeatedly succussed (pounded against a hard surface to break down and mix the substance). The remedy is available at health-food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

In traditional Chinese medicine, the aconite root is generally used in small amounts in combination with other herbs.

Precautions

If symptoms do not improve after the recommended time period, individuals should consult their homeopath or other healthcare practitioner.

Do not exceed the recommended dosage.

Use *Aconitum carmichaeli* only under supervision of a Chinese medical practitioner.

Aconite is poisonous and should not be consumed in its raw state. Persons who gather wild plants to eat should be very careful in identifying what they are gathering. Cases have been reported of aconite poisoning in people who thought they were gathering mountain **chicory**.

KEY TERMS

Aconitine—A toxic alkaloid contained in aconite. As little as 2 mg taken internally may be fatal.

Antidote—A medication or remedy given to counteract the effects of a poison.

Diaphoretic—A substance that causes sweating.

Diuretic—A substance that promotes urination.

Succussion—A process integral to the creation of a homeopathic remedy in which a solution is repeatedly struck against a firm surface. This process is performed to thoroughly mix the substance and magnify its healing properties.

Toxicology—The branch of medical pharmacology dealing with the detection, effects, and antidotes of poisons.

Women who are pregnant, trying to get pregnant, or who are breastfeeding should not use *Aconitum carmichaeli*.

Side effects

Symptoms of poisoning by the fresh aconite plant include tingling, numbness of the tongue and mouth, nausea, vomiting, labored breathing, a weak and irregular pulse, and cold, clammy skin. In cases of severe poisoning, aconite can produce extreme symptoms that include severe pain, convulsions, paralysis, confusion, seizures, and heart failure. The only established treatment for aconite poisoning is supportive; that is, there is no antidote.

Most liniments or lotions made with aconite for external use contain a 1.3% concentration of the herb. Use of these preparations must be limited to unbroken skin, as aconite can be absorbed through the skin and cause toxic symptoms. If a skin reaction occurs, use of the liniment must be discontinued immediately.

Interactions

When taking any homeopathic remedy, individuals should not use **peppermint** products, coffee, or alcohol. These products make the remedy ineffective.

Aconitum carmichaeli should not be used by individuals with a deficiency of yin, or coolness, or with signs of heat such as fever, redness, and agitation.

Resources

BOOKS

Gomella, Leonard G., et al. *Clinician's Pocket Drug Reference*. New York: McGraw Hill, 2008.

PERIODICALS

Fujita, Yuji, et al. "Five Cases of Aconite Poisoning: Toxicokinetics of Aconitines." *Journal of Analytical Toxicology* (April 2007): 132 137.

ORGANIZATIONS

American Academy of Clinical Toxicology, 777 East Park Dr., PO Box 8820, Harrisburg, PA, 17105, (717) 558 7750, http://www.clintox.org/.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http://nationalcenterforhomeopathy.org/.

Jennifer Wurges
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Acquired Immunodeficiency syndrome *see* **AIDS**

Acupressure

Definition

Acupressure is a form of touch therapy that uses the principles of **acupuncture** and Chinese medicine. In acupressure, the same points on the body are used as in acupuncture, but they are stimulated with finger pressure instead of with the insertion of needles. Acupressure is used to relieve a variety of symptoms and **pain**.

Acupressure massage. *(© Will & Deni McIntyre/Photo Researchers, Inc. Reproduced by permission.)*

Origins

Centuries ago Chinese medicine developed acupuncture, acupressure, herbal remedies, diet, **exercise**, lifestyle changes, and other remedies as part of its healing methods. Many of these historical forms of Oriental medicine are used in the West in the twenty-first century. Acupuncture, acupressure, **shiatsu**, and Chinese herbal medicine have their roots in Chinese medicine. One legend has it that acupuncture and acupressure evolved as early Chinese healers studied the puncture **wounds** of Chinese warriors, noting that certain points on the body created interesting results when stimulated. The oldest known text specifically on acupuncture points, the *Systematic Classic of Acupuncture*, dates to about 282 A.D. Acupressure is the non-invasive form of acupuncture, a result of Chinese physicians having determined that stimulating points on the body with massage and pressure could be effective for treating certain problems.

Outside of Asian American communities, Chinese medicine remained virtually unknown in the United States until the 1970s, when Richard Nixon became the first U.S. president to visit China. On Nixon's trip, journalists were amazed to observe major operations being performed on patients without the use of anesthetics. Instead, fully conscious patients were being operated on, with only acupuncture needles inserted into them to control pain. At that time, a famous columnist for the *New York Times*, James Reston, had to undergo surgery and elected to use acupuncture for anesthesia. Later, he wrote some convincing stories on its effectiveness. Despite being neglected by mainstream medicine and the American Medical Association (AMA), acupuncture and Chinese medicine became an option for alternative medicine practitioners in the United States. In the early 2000s, millions of patients can attest to its effectiveness, and there are nearly 9,000 practitioners dispersed across all 50 states.

Acupressure is used by Chinese medicine practitioners and acupuncturists, as well as by massage therapists. Many massage schools in the United States include acupressure techniques as part of their bodywork programs. Shiatsu massage is very closely related to acupressure, involving the same points on the body and the same general principles, although it was developed over centuries in Japan rather than in China. **Reflexology** is a form of bodywork based on acupressure concepts. Jin Shin Do is a bodywork technique with an increasing number of practitioners in the United States that combines acupressure and shiatsu principles with **qigong**, Reichian theory, and **meditation**.

Benefits

Acupressure massage performed by a therapist can be very effective both as prevention and as a treatment for many health conditions, including headaches, general aches and pains, colds and flu, arthritis, **allergies**, **asthma**, nervous tension, menstrual cramps, sinus problems, **sprains**, **tennis elbow**, and toothaches, among others. Unlike acupuncture, which requires a visit to a professional, acupressure can be performed by a layperson. Acupressure techniques are fairly easy to learn and have been used to provide quick, cost-free, and effective relief from many symptoms. Acupressure points can also be stimulated to increase energy and feelings of well-being, reduce **stress**, stimulate the immune system, and alleviate **sexual dysfunction**.

Description

Acupressure and Chinese medicine

Chinese medicine views the body as a small part of the universe, subject to laws and principles of harmony and balance. Moreover, Chinese medicine does not make as sharp a distinction as Western medicine does between mind and body. The Chinese system asserts that emotions and mental states are every bit as influential on disease as purely physical mechanisms; it considers factors such as work, environment, and relationships as fundamental to health. Chinese medicine also uses very different symbols and ideas to discuss the body and health. While Western medicine typically describes health as mainly physical processes composed of chemical processes, the Chinese use ideas of yin and yang, chi, and the organ system to describe health and the body.

Everything in the universe has properties of yin and yang. Yin is associated with cold, female, passive, downward, inward, dark, wet. Yang can be described as hot, male, active, upward, outward, light, dry, and so on. Nothing is either completely yin or yang. These two principles always interact and affect each other, although the body and its organs can become imbalanced by having either too much or too little of either.

Chi (pronounced *chee*, also spelled *qi* or *ki* in Japanese shiatsu) is the fundamental life energy. It is found in food, air, water, and sunlight, and it travels through the body in channels called *meridians*. There are 12 major meridians in the body that transport chi, corresponding to the 12 main organs categorized by Chinese medicine.

Disease is viewed as an imbalance of the organs and chi in the body. Chinese medicine has developed

intricate systems regarding how organs are related to physical and mental symptoms, and it has devised corresponding treatments using the meridian and pressure point networks that are classified and numbered. The goal of acupressure, and acupuncture, is to stimulate and unblock the circulation of chi, by activating very specific points, called pressure points or *acupoints*. Acupressure seeks to stimulate the points on the chi meridians that pass close to the skin, as these are easiest to unblock and manipulate with finger pressure.

Acupressure can be used as part of a Chinese physician's prescription, as a session of **massage therapy**, or as a self-treatment for common aches and illnesses. A Chinese medicine practitioner examines a patient very thoroughly, looking at physical, mental, and emotional activity, taking the pulse usually at the wrists, examining the tongue and complexion, and observing the patient's demeanor and attitude, to get a complete diagnosis of which organs and meridian points are out of balance. When the imbalance is located, the physician recommends specific pressure points for acupuncture or acupressure. If acupressure is recommended, the patient might opt for a series of treatments from a massage therapist.

In massage therapy, acupressurists evaluate a patient's symptoms and overall health, but a massage therapist's diagnostic training is not as extensive as that of a Chinese physician. In a massage therapy treatment, a person usually lies on a table or mat, with thin clothing on. The acupressurist gently feels and palpates the abdomen and other parts of the body to determine energy imbalances. Then, the therapist works with different meridians throughout the body, depending on which organs are imbalanced in the abdomen. The therapist uses different types of finger movements and pressure on different acupoints, depending on whether the chi needs to be increased or dispersed at different points. The therapist observes and guides the energy flow through the patient's body throughout the session. Sometimes, special herbs (*Artemesia vulgaris* or moxa) may be placed on a point to warm it, a process called *moxibustion*. A session of acupressure is generally a very pleasant experience, and some people experience great benefit immediately. For more chronic conditions, several sessions may be necessary to relieve and improve conditions.

As of 2008 the cost of acupressure massage was typically from $30 to $70 per hour session. A visit to a Chinese medicine physician or acupuncturist can be more expensive, comparable to a visit to an allopathic physician if the practitioner is a certified medical doctor (MD). Insurance reimbursement varies widely, and consumers should be inquire as to whether their policies cover alternative treatment, acupuncture, or massage therapy.

Self-treatment

Acupressure is easy to learn, and there are many good books that illustrate the position of acupoints and meridians on the body. The procedure can also be conducted anywhere, and it is a good form of treatment for spouses and partners to give to each other and for parents to perform on children for minor conditions. As effective as acupressure may be, it should not be used to the exclusion of allopathic methods that provide more reliable relief or cure for certain diseases and disorders.

While giving self-treatment or performing acupressure on another, a mental attitude of calmness and attention is important, as one person's energy can be used to help another's. Loose, thin clothing is recommended. There are three general techniques for stimulating a pressure point.

- Tonifying is meant to strengthen weak chi and is done by pressing the thumb or finger into an acupoint with a firm, steady pressure, holding it for up to two minutes.
- Dispersing is meant to move stagnant or blocked chi, and the finger or thumb is moved in a circular motion or slightly in and out of the point for two minutes.
- Calming the chi in a pressure point utilizes the palm to cover the point and gently stroke the area for about two minutes.

There are many pressure points that are easily found and memorized to treat common ailments from headaches to colds.

- For headaches, toothaches, sinus problems, and pain in the upper body, the "LI4" point is recommended. It is located in the web between the thumb and index finger, on the back of the hand. Using the thumb and index finger of the other hand, a person applies a pinching pressure until the point is felt and holds it for two minutes. Pregnant women should never press this point.
- To calm the nerves and stimulate digestion, a person finds the "CV12" point that is four thumb widths above the navel in the center of the abdomen. Calm the point with the palm, using gentle stroking for several minutes.
- To stimulate the immune system, a person finds the "TH5" point on the back of the forearm two thumb widths above the wrist. The dispersing technique, or circular pressure with the thumb or finger, is used for two minutes on each arm.

- For headaches, sinus congestion, and tension, a person locate the "GB20" points at the base of the skull in the back of the head, just behind the bones in back of the ears and then disperses these points for two minutes with the fingers or thumbs. The individual can also find the "yintang" point, which is in the middle of the forehead between the eyebrows and disperse it with gentle pressure for two minutes to clear the mind and to relieve headaches.

Precautions

Acupressure is a safe technique, but it is not meant to replace professional health care. A physician should always be consulted when there are doubts about medical conditions. If a condition is chronic, a professional should be consulted; purely symptomatic treatment can exacerbate chronic conditions. Acupressure should not be applied to open wounds or to places that are swollen or inflamed. Areas of scar tissue, **blisters**, **boils**, **rashes**, or **varicose veins** should be avoided. Finally, certain acupressure points should not be stimulated on people with high or low blood pressure and on pregnant women.

Research and general acceptance

In general, Chinese medicine has been slow to gain acceptance in the West, mainly because it rests on ideas quite unlike the Western scientific model. For instance, Western scientists have trouble with the idea of chi, the invisible energy of the body, and the idea that pressing on certain points can alleviate certain conditions seems incredible.

Western scientists, in trying to account for the action of acupressure, have theorized that chi is actually part of the neuroendocrine system of the body. Celebrated orthopedic surgeon Robert O. Becker, who was twice nominated for the Nobel Prize, wrote a book on the subject called *Cross Currents: The Promise of Electromedicine; The Perils of Electropollution*. By using precise electrical measuring devices, Becker and his colleagues showed that the body has a complex web of electromagnetic energy and that traditional acupressure meridians and points contained amounts of energy that non-acupressure points did not.

The mechanisms of acupuncture and acupressure remain difficult to document in terms of the biochemical processes involved. Numerous testimonials are the primary evidence supporting the effectiveness of acupressure and acupuncture. However, in the 2000s a body of research was growing that verified the effectiveness in acupressure and acupuncture techniques in treating many problems and in controlling pain.

KEY TERMS

Acupoint—A pressure point stimulated in acupressure.

Chi—Basic life energy.

Meridian—A channel through which chi travels in the body.

Moxibustion—An acupuncture technique that involves burning of the herb moxa or mugwort.

Shiatsu—Japanese form of acupressure massage.

Yin/yang—Universal characteristics used to describe aspects of the natural world.

Training and certification

There are two methods for becoming trained in the skill of acupressure. The first is training in traditional acupuncture and Chinese medicine, for which there are many schools and certifying bodies around the United States. The majority of acupressure practitioners are trained as certified massage therapists, either as acupressure or shiatsu specialists.

Resources

BOOKS

Kolster, Bernard C., and Astrid Waskowiak. *The Acupressure Atlas*. Rochester, VT: Healing Arts Press, 2007.

Vora, Devendra. *Health in Your Hands: Acupressure and Other Natural Therapies,* 2nd ed. New Delhi: Navneet, 2007.

Wright, Janet. *Reflexology and Acupressure*. London: Hamlyn Press, 2008.

PERIODICALS

Agarwal, A., et al. "Acupressure for Prevention of Pre operative Anxiety: A Prospective, Randomised, Pla cebo Controlled Study." *Anaesthesia* (October 2005): 978 981.

Jamigorn, Mattawan, and Vorapong Phupong. "Acupres sure and Vitamin B6 to Relieve Nausea and Vomiting in Pregnancy: A Randomized Study." *Archives of Gyne cology and Obstetrics* (September 2007): 245 249.

"Non epidural Pain Relief." *The Informed Choice Initiative (Women's Edition)* (April 2007): 91 98.

Zhou, Wei, and John C. Longhurst. "Review of Trials Examining the Use of Acupuncture to Treat Hyper tension." *Future Cardiology* (May 2006): 287 292.

ORGANIZATIONS

Acupressure Institute, 1533 Shattuck Ave., Berkeley, CA, 94709, (800) 442 2232, www.acupressure.com.

American Massage Therapy Association, 500 Davis St., Evanston, IL, 60201, (877) 905 2700, www.amtamassage.org.

American Organization for Bodywork Therapies of Asia, 1010 Haddonfield Berlin Rd., Suite 408, Voorhees, NJ, 08043, (856) 782 1616, http://www.aobta.org/.

Jin Shin Do Foundation for Bodymind Acupressure, PO Box 416, Idyllwild, CA, 92549, (951) 659 5707, http://www.jinshindo.org/.

Douglas Dupler
David Edward Newton, Ed.D.

Acupuncture

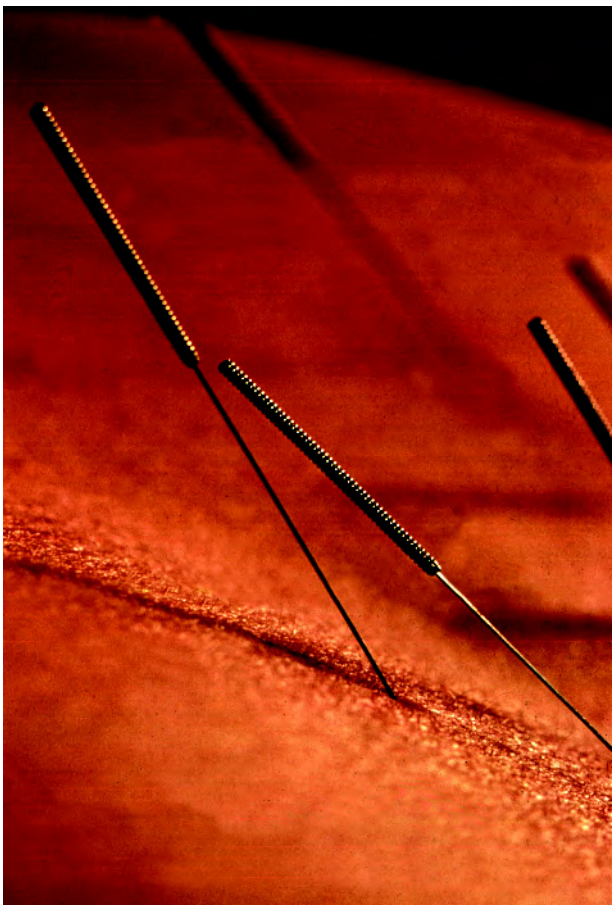
Definition

Acupuncture is one of the main forms of treatment in **traditional Chinese medicine**. It involves the use of sharp, thin needles that are inserted in the body at specific points. This process is believed to adjust and alter the body's energy flow into healthier patterns and is used to treat a wide variety of illnesses and health conditions.

Origins

The original text of Chinese medicine is the *Nei Ching, The Yellow Emperor's Classic of Internal Medicine*, which is estimated to be at least 2,500 years old. Thousands of books followed on the subject of Chinese healing, and its basic philosophies spread long ago to other Asian civilizations. Nearly all of the forms of Oriental medicine which are used in the West in the 2000s, including acupuncture, **shiatsu**, **acupressure** massage, and macrobiotics, are part of or have their roots in Chinese medicine. Legend has it that acupuncture developed when early Chinese physicians observed unpredicted effects of puncture **wounds** in Chinese warriors. The oldest known text on acupuncture, the *Systematic Classic of Acupuncture*, dates back to 282 A.D. Although acupuncture is its best known technique, Chinese medicine traditionally uses herbal remedies, dietary therapy, lifestyle changes, and other means to treat patients.

In the early 1900s, only a few Western physicians who had visited China knew about and used acupuncture. But outside of Asian American communities it remained virtually unknown until the 1970s, when Richard Nixon became the first U.S. president to visit China. On Nixon's trip, journalists were amazed to observe major operations being performed on patients without the use of anesthetics. Instead, fully conscious patients were being operated on with only acupuncture needles inserted into them to control **pain**. During that time, a famous columnist for the *New York Times*, James Reston, had to undergo surgery and elected to use acupuncture instead of pain medication, and he wrote some convincing stories on its effectiveness.



Acupuncture needles in skin. *(© Photo Researchers, Inc. Reproduced by permission.)*

As of 2008 acupuncture was practiced in all U.S. 50 states by more than 9,000 practitioners, with about 4,000 medical doctors (MDs) including it in their practices. Acupuncture has shown notable success in treating many conditions, and more than 15 million Americans have used it as a therapy. Acupuncture, however, remains largely unsupported by the medical establishment. The American Medical Association has been resistant to encouraging research, as the practice is based on concepts markedly unlike the Western scientific model.

Several forms of acupuncture are being used as of 2008 in the United States. Japanese acupuncture uses extremely thin needles and does not incorporate herbal medicine in its practice. Auricular acupuncture uses acupuncture points only on the ear, which are believed to stimulate and balance internal organs. In France, where acupuncture is very popular and more widely accepted by the medical establishment, neurologist Paul Nogier developed a system of acupuncture based on neuroendocrine theory rather than on traditional Chinese concepts, which has gained some use in the United States.

Benefits

The World Health Organization (WHO) recommends acupuncture as an effective treatment for over forty medical problems, including **allergies**; respiratory conditions; gastrointestinal disorders; gynecological problems; nervous conditions; and disorders of the eyes, nose and throat; and childhood illnesses; among others. Acupuncture has been used in the treatment of **alcoholism** and **substance abuse**. In 2002, a center in Maine received a unique grant to study acupuncture treatment for substance abuse. Although recognizing that acupuncture had been used before for helping those with abuse problems, this study sought to show that ear acupuncture's effects on **relaxation** response helped those abusing drugs and alcohol better deal with the **anxiety** and life circumstances thought to lead them to substance abuse.

Acupuncture is an effective and low-cost treatment for headaches and chronic pain, associated with problems like back injuries and arthritis. It has also been used to supplement invasive Western treatments such as chemotherapy and surgery. Acupuncture is generally more effective when used as prevention or before a health condition becomes acute, but it has been used to help patients suffering from **cancer** and **AIDS**. In 2002, the National Institutes of Health announced that pain from certain musculoskeletal conditions such as **fibromyalgia** could be helped by acupuncture. Acupuncture has limited value in treating conditions or traumas that require surgery or emergency care (such as for broken bones).

Description

Basic ideas of Chinese medicine

Chinese medicine views the body as a small part of the universe and subject to universal laws and principles of harmony and balance. Chinese medicine does not draw a sharp line, as Western medicine does, between mind and body. The Chinese system believes that emotions and mental states are every bit as influential on disease as purely physical mechanisms and considers factors such as work, environment, lifestyle, and relationships as fundamental to the overall picture of a patient's health. Chinese medicine also uses very different symbols and ideas to discuss the body and health. While Western medicine typically describes health in terms of measurable physical processes made up of chemical reactions, the Chinese use the ideas of yin and yang, chi, the organ system, and the five elements to describe health and the body. To understand the ideas behind acupuncture, it is worthwhile to introduce some of these basic terms.

YIN AND YANG. According to Chinese philosophy, the universe and the body can be described by two separate but complementary principles, that of yin and yang. For example, in temperature, yin is cold and yang is hot. In gender, yin is female and yang is male. In activity, yin is passive and yang is active. In light, yin is dark and yang is bright. In direction yin is inward and downward and yang is outward and up, and so on. Nothing is ever completely yin or yang, but a combination of the two. These two principles are always interacting, opposing, and influencing each other. The goal of Chinese medicine is not to eliminate either yin or yang, but to allow the two to balance each other and exist harmoniously together. For instance, if a person suffers from symptoms of high blood pressure, the Chinese system would say that the heart organ might have too much yang and would recommend methods either to reduce the yang or to increase the yin of the heart, depending on the other symptoms and organs in the body. Thus, acupuncture therapies seek to either increase or reduce yang or increase or reduce yin in particular regions of the body.

CHI. Another fundamental concept of Chinese medicine is that of chi (pronounced *chee*, also spelled *qi*). Chi is the fundamental life energy of the universe. It is invisible and is found in the environment in air, water, food, and sunlight. In the body, it is the invisible vital force that creates and animates life. Humans are all born with inherited amounts of chi, and they also get acquired chi from the food they eat and the air they breathe. The level and quality of a person's chi also depends on the state of physical, mental, and emotional balance. Chi travels through the body along channels called *meridians*.

THE ORGAN SYSTEM. In the Chinese system, there are twelve main organs: the lung, large intestine, stomach, spleen, heart, small intestine, urinary bladder, kidney, liver, gallbladder, pericardium, and the "triple warmer," which represents the entire torso region. Each organ has chi energy associated with it, and

each organ interacts with particular emotions on the mental level. As there are twelve organs, there are twelve types of chi that can move through the body, and these move through twelve main channels or meridians. Chinese doctors connect symptoms to organs. That is, symptoms are caused by yin/yang imbalances in one or more organs or by an unhealthy flow of chi to or from one organ to another. Each organ has a different profile of symptoms it can manifest.

THE FIVE ELEMENTS. Another basis of Chinese theory is that the world and body are made up of five main elements: wood, fire, earth, metal, and water. These elements are all interconnected, and each element either generates or controls another element. For instance, water controls fire, and earth generates metal. Each organ is associated with one of the five elements. The Chinese system uses elements and organs to describe and treat conditions. For instance, the kidney is associated with water, and the heart is associated with fire, and the two organs are related as water and fire are related. If the kidney is weak, then there might be a corresponding fire problem in the heart, so treatment might be made by acupuncture or herbs to cool the heart system and/or increase energy in the kidney system.

The Chinese have developed an intricate system that describes how organs and elements are related to physical and mental symptoms, and the above example is a simple one. Although this system sounds suspect to Western scientists, some interesting parallels have been observed. For instance, Western medicine has observed that with severe heart problems, kidney failure often follows, but it still does not know exactly why. In Chinese medicine, this connection between the two organs has long been established.

MEDICAL PROBLEMS AND ACUPUNCTURE. In Chinese medicine, disease as seen as imbalances in the organ system or chi meridians, and the goal of any remedy or treatment is to assist the body in reestablishing its innate harmony. Disease can be caused by internal factors such as emotions, external factors such as the environment and weather, and other factors such as injuries, trauma, diet, and germs. However, infection is seen not as primarily a problem with germs and viruses but as a weakness in the energy of the body that is allowing a sickness to occur. In Chinese medicine, no two illnesses are ever the same, as each body has its own characteristics of symptoms and balance. Acupuncture is used to open or adjust the flow of chi throughout the organ system, which will strengthen the body and prompt it to heal itself.

A VISIT TO THE ACUPUNCTURIST. Typically, an acupuncturist first gets a thorough idea of a patient's medical history and symptoms, both physical and emotional, using a questionnaire and interview. Then the acupuncturist examines the patient to find further symptoms, looking closely at the tongue, the pulse at various points in the body, the complexion, general behavior, and other signs like coughs or pains. From this examination, the practitioner is able to determine patterns of symptoms that indicate which organs and areas are imbalanced. Depending on the problem, the acupuncturist inserts needles to manipulate chi on one or more of the twelve organ meridians. On these twelve meridians, there are nearly 2,000 points that can be used in acupuncture, with around 200 points being most frequently used by traditional acupuncturists. During an individual treatment, one to 20 needles may be used, depending on which meridian points are chosen.

Acupuncture needles are sterilized, and acupuncture is a very safe procedure. The depth of insertion of needles varies, depending on which chi channels are being treated. Some points barely go beyond superficial layers of skin, while some acupuncture points require a depth of 1–3 in (3–8 cm) of needle. The needles generally do not cause pain. Patients sometimes report pinching sensations and often pleasant sensations, as the body experiences healing. Depending on the problem, the acupuncturist might spin or move the needles, or even pass a slight electrical current through some of them. **Moxibustion** may sometimes be used. Moxibustion is a process in which an herbal mixture (moxa or **mugwort**) is either burned like incense on the acupuncture point or on the end of the needle, a process believed to stimulate chi in a particular way. Also, acupuncturists sometimes use *cupping*, during which small suction cups are placed on meridian points to stimulate them.

How long the needles are inserted also varies. Some patients require only a quick in and out insertion to clear problems and provide *tonification* (strengthening of health), while some other conditions might require needles inserted up to an hour or more. The average visit to an acupuncturist takes about 30 minutes. The number of visits to the acupuncturist varies, with some conditions improved in one or two sessions and others requiring a series of six or more visits over the course of weeks or months.

Costs for acupuncture vary, depending on whether the practitioner is a medical physician. Initial visits with non-MD acupuncturists can cost $50–$100, with follow-up visits usually costing less. Insurance reimbursement varies widely, depending on the company

and state. Regulations tend to change frequently. Some states authorize Medicaid to cover acupuncture for certain conditions, and some states have mandated that general coverage pay for acupuncture. Consumers should be aware of the provisions for acupuncture in their individual policies.

Precautions

Acupuncture is generally a safe procedure. If individuals are in doubt about a medical condition, more than one physician should be consulted. Also, individuals should feel comfortable and confident that their acupuncturist is knowledgeable and properly trained.

Research and general acceptance

Mainstream medicine has been slow to accept acupuncture. Although more medical doctors are using the technique, the American Medical Association does not recognize it as a specialty. The reason for this position is that the mechanism of acupuncture is difficult to understand or measure scientifically, such as the invisible energy of chi in the body. Western medicine, admitting that acupuncture works in many cases, has theorized that the energy meridians are actually part of the nervous system and that acupuncture relieves pain by releasing endorphins, or natural pain killers, into the bloodstream. Despite the ambiguity in the biochemistry involved, acupuncture continues to show effectiveness in clinical tests, from reducing pain to alleviating the symptoms of chronic illnesses, and in the 2000s research in acupuncture was growing. The Office of Alternative Medicine of the National Institute of Health funded research in the use of acupuncture on a number of conditions, including **depression**, attention-deficit disorder, arthritis, and **post-traumatic stress disorder**.

Training and certification

Medical acupuncture has evolved in the United States in an atmosphere that focuses on traditional Western methods, such as surgical techniques and pain management, and not as part of Chinese medicine overall. Medical acupuncture is performed by an MD or an osteopathic physician (DO). As of 2008, 23 states allowed only this type of acupuncture. Practitioners get their training as part of conventional medical school programs. Since any MD can legally perform acupuncture, the *American Academy of Medical Acupuncture* (AAMA) was chartered in 1987 to support the education and correct practice of physician-trained acupuncturists. Its members must be either MDs or DOs who have completed proper study of acupuncture techniques.

KEY TERMS

Acupressure—A form of massage using acupuncture points.

Auricular acupuncture—Acupuncture using only points found on the ears.

Chi—Basic life energy.

Meridian—A channel through which chi travels in the body.

Moxibustion—Acupuncture technique that involves burning the herb moxa or mugwort.

Tonification—Acupuncture technique for strengthening the body.

Yin/Yang—Universal characteristics used to describe aspects of the natural world.

Resources

BOOKS

Filshie, Jacqueline. *Introduction to Medical Acupuncture*. Oxford, England: Churchill Livingstone, 2008.

Focks, Claudia. *Atlas of Acupuncture*. Oxford, England: Churchill Livingstone, 2008.

Landgren, Kajsa. *Ear Acupuncture: A Practical Guide*. Oxford, England: Churchill Livingstone, 2008.

Maciocia, Giovanni. *The Practice of Chinese Medicine: The Treatment of Diseases with Acupuncture and Chinese Herbs*. Oxford, England: Churchill Livingstone, 2008.

PERIODICALS

Hollifield M., et al. "Acupuncture for Post traumatic Stress Disorder: A Randomized Controlled Pilot Trial." *Journal of Nervous and Mental Diseases* (June 2007): 504 513.

Mayhew, E., and E. Ernst. "Acupuncture for Fibromyalgia: A Systematic Review of Randomized Clinical Trials." *Rheumatology* (May 2007): 801 804.

Paterson, Charlotte. "Patients' Experiences of Western style Acupuncture: The Influence of Acupuncture 'Dose', Self care Strategies and Integration." *Journal of Health Services Research and Policy* (April 2007): 39 45.

Tillisch, Kirsten. "Complementary and Alternative Medi cine for Gastrointestinal Disorders." *Clinical Medicine, Journal of the Royal College of Physicians* (June 2007): 224 227.

ORGANIZATIONS

American Academy of Medical Acupuncture, 4929 Wilshire Blvd., Suite 428, Los Angeles, CA, 90010, (323) 937 5514, http://www.medicalacupuncture.org/.

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaom.org/.

National Certification Commission for Acupuncture and Oriental Medicine, 76 South Laura St., Suite 1290, Jacksonville, FL, 32202, (904) 598 1005, http://www.nccaom.org/.

Douglas Dupler
Teresa G. Odle
David Edward Newton, Ed.D.

Acute homeopathic remedies *see* **Homeopathy, acute prescribing**

ADD *see* **Attention-deficit hyperactivity disorder**

Addiction *see* **Alcoholism; Substance abuse and dependence**

Ademetionine

Description

Ademetionine, also known as SAMe (pronounced "sammy"), is a specific form of the amino acid **methionine** (S-adenosyl-methionine). The body manufactures it, and it is found in most tissues of the body. Ademetionine is essential for the formation of **glutathione**, a water-soluble peptide that helps the body fight free radicals. SAMe also helps the liver to process fats (protecting against a fatty liver) and is believed to play a role in protecting the body from **heart disease**.

SAMe is a methyl donor, which means that it provides other molecules with methyl groups that are critical to their metabolism. In general, ademetionine raises the level of functioning of other **amino acids** in the body. Severe deficiencies of SAMe can cause problems with other important body functions, such as secretion of important hormones such as **melatonin**, which plays a key role in regulating sleep and circadian rhythms.

It is believed to increase levels of serotonin and dopamine, and a synthetic version of SAMe may be useful in treating some conditions, including **osteoarthritis** and **depression**.

General use

The synthetic formula of ademetionine was discovered in Italy in 1953 and was researched over the following decades. In the 1970s, Italian researchers investigating its properties as a treatment for **schizophrenia** discovered that it also had antidepressant properties. Ademetionine became a useful treatment during the 1990s, when scientists found a way to stabilize it for research purposes. After that technological development, ademetionine could be sold as a medical supplement.

SAMe has been used to treat depression, osteoarthritis, schizophrenia, liver disease, **peripheral neuropathy**, and other illnesses. As of February 2008, considerable research had been conducted on the use of ademetionine for treating osteoarthritis.

Osteoarthritis

Numerous studies indicated that people diagnosed with osteoarthritis experienced less **pain** while taking ademetionine. SAMe appeared as effective as non-steroidal anti-inflammatory drugs (NSAIDs) and produced fewer side effects, according to organizations, including the Mayo Clinic. However, additional research was needed to verify the findings from those studies. In addition, long-term effects of SAMe use were not known in 2008.

Depression

SAMe has been studied for decades, but research as of 2008 was rated as inconclusive because of factors such as the small number of participants in studies and the absence of a placebo group in some studies. For example, *BMC Psychiatry* in 2004 described an eight-week American study of 20 people diagnosed with HIV/AIDS and major depressive disorder. The people took ademetionine and a "rapid effect" was observed after the first week. "Progressive decreases in depression symptom rating scores" were noted during the subsequent weeks of the study.

Fibromyalgia

Ademetionine may be useful in treating **fibromyalgia**, which is characterized by persistent muscle pain and depression. However, some research involved injections of SAMe. While those studies indicated ademetionine was effective, the body reacts differently to injections than it does to remedies taken orally.

Other conditions

Ademetionine has been suggested for the treatment of conditions, including pain relief, migraine, **Alzheimer's disease**, **Parkinson's disease**, liver function, and peripheral neuropathy. The supplement had not been fully researched as of February 2008 in terms of safety and effectiveness for these and other

conditions. Scientifically accepted testing of a large human population should provide answers and clear up inconsistencies in earlier studies. For example, some studies indicated that SAMe would not interfere with the effectiveness of levodopa, the drug most often prescribed for Parkinson's disease. There were no long-term studies on the possible interactions between levodopa and ademetionine.

KEY TERMS

Fibromyalgia—Chronic muscular or nerve pain that has no obvious cause.

Peripheral neuropathy—Damage to the nerve endings of the hands and feet, often as a result of diabetes.

Preparations

Ademetionine is available in preparations for oral, intravenous, and intramuscular administration. The dosage varies with condition, and with the strength and form of the supplement. Treatment with ademetionine should always be monitored by a qualified practitioner. This is particularly important when ademetionine is administered by injection. In February 2008, use of injectable SAMe was more prevalent in Europe than in the United States.

Osteoarthritis patients may be advised to take from 600 mg to 1,200 mg daily. That amount would be divided into three dosages per day. The injected dosage is 400 mg.

For depression, the daily oral dosage ranges from 400 mg to 1,600 mg. The higher strength was used in ademetionine studies. The injected dosage is 200 mg to 400 mg.

People with fibromyalgia could take 200 mg of ademetionine twice daily, increasing to 600 mg doses.

The daily dosages for migraine and liver conditions are 200 mg. For liver function, 200 mg of ademetionine can be taken twice daily, gradually raising the dosage to 400 mg three times daily. Patients with peripheral neuropathy have been given dosages as high as 1,600 mg.

Precautions

The United States Food and Drug Administration does not regulate supplements such as ademetionine, which means that supplements have not proven to be safe or effective. The safety of ademetionine for use by children, pregnant women, and nursing mothers has not been established. In addition, ingredients are not standardized to comply with federal regulations.

SAMe is not suitable for patients with **bipolar disorder**, as it may amplify the manic phase of the condition.

People should consult their doctor or practitioner before taking SAMe. This is especially important for people with pre-existing conditions such as those previously mentioned.

One possible drawback to ademetionine treatment is its cost. One company in 2008 offered a bottle containing 30 200-mg tablets for about $40. Another vendor sold 30 400-mg tablets for that price. Since daily dosages vary by condition, it could cost up to $100 or more for a month's supply of ademetionine. In addition, SAMe is not likely to be covered by medical insurance.

Side effects

Side effects of ademetionine could include gastrointestinal conditions such as **nausea**, **vomiting**, **constipation**, and **diarrhea**. Other side effects include increased thirst, **heartburn**, skin rash, **anxiety**, **dizziness**, headaches, **insomnia**, and sweating.

In patients who are deficient in the B vitamins, notably B_6 and B_{12}, there is a danger that SAMe may break down to form homocysteine, an amino acid that has been linked to heart disease and **stroke**. If the patient's levels of B vitamins are maintained, then, the body will be able to convert the homocysteine back into methionine and glutathione. As a result, use of SAMe will supposedly not increase the risk of heart disease.

Interactions

Ademetionine should not be used in conjunction with prescription medications such as anti-depressants and MAO inhibitors.

Resources

BOOKS

Mayo Clinic Book of Alternative Medicine. New York: Time Inc. Home Entertainment, 2007.

PERIODICALS

Medina, J., and R. Moreno Otero. "Pathophysiological Basis for Antioxidant Therapy in Chronic Liver Dis ease." *Medscape Drugs Journal* 65, no. 17 (2005): 2445 2461.

Shippy, R. A., D. Mende, K. Jones, L. Cergnu, and S. E. Karpiak. "S Adenosylmethionine (SAM e) for the Treatment of Depression in People Living with HIV/AIDS." *BMC Psychiatry* 4 (2004): 38.

Werneke, U., T. Turner, and S. Priebe. "Complementary Medicines in Psychiatry: Review of Effectiveness and Safety." *British Journal of Psychiatry: The Journal of Mental Science* 188 (June 2006): 587.

ORGANIZATIONS

American Holistic Medicine Association, One Eagle Valley Court, Suite 201, Broadview Heights, OH, 44147, (440) 838 1010, http://www.holisticmedicine.org/index.html.

National Center for Complementary and Alternative Medicine; National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Patricia Skinner
Teresa G. Odle
Liz Swain

ADHD *see* **Attention-deficit hyperactivity disorder**

Adie's pupil

Definition

Adie's pupil is a neurological condition that affects the eye and the autonomic nervous system. It is characterized by anisocoria, an inequality in the size of the pupils of the eyes. The pupil of one eye is larger than normal, and it constricts slowly in bright light, a condition known as tonic pupil. The condition may progress to the other eye. Other symptoms of this condition may include the loss of some deep tendon reflexes.

Adie's pupil is also referred to as Holmes-Adie syndrome. Adie's pupil primarily affects young women. It is considered a benign condition with no known cure.

Description

Adie's pupil is thought to be a result of damage to neurons in the ciliary ganglion, the part of the brain that controls eye movement, according to the National Institute of Neurological Disorders and **Stroke** (NINDS). Accommodation, or the adjustment of the eye for distance, is affected. The condition also affects pupillary dilation and contraction, the ability of the eye's iris to open or close in response to ambient light.

The condition also produces damage to the spinal ganglion, the part of the brain related to the autonomic nervous system, which affects deep tendon reflexes such as the knee and ankle jerk reflexes.

Some people may experience tonic pupil along with the loss of deep tendon reflexes and excessive sweating. When these three symptoms are experienced, the condition is generally known as Ross's syndrome, according to NINDS. However, the condition may be diagnosed as a variant of Holmes-Adie syndrome.

Eye function and Adie's pupil

The eyes are a complex anatomical and neurological unit. The outer surface of each eye is protected by a cornea, a normally clear cover that initiates the bending of light rays into the eye. Behind the cornea lies the colorful iris, a membrane containing two muscles capable of contracting and dilating. Behind the iris is the lens. Under the influence of the ciliary body, the lens further bends and directs the incoming light back to the retina. There it is received and transferred through the optic nerve at the back of the eye to the visual center of the brain (the visual cortex) at the back of the head.

The visual cortex sends instruction to the eye based on whether the object of vision is near or far and whether the surrounding light is bright or dim. This instruction goes back to the muscles of the eye—the ciliary body—through the ciliary ganglion. This results in a reshaping of the lens (accommodation) and an opening or closing of the pupil (pupillary reaction) as needed to order to focus more sharply.

Under normal circumstances, brightness and accommodation for near vision result in contracture of the ciliary body and the pupil. Darkness and accommodation for distance normally results in a **relaxation** of the ciliary body and dilation of the pupil. For a person with Adie's pupil, however, nerve signals arriving at the ciliary body of one eye are weaker than to the other eye.

The affected eye muscle is unable to contract, dilate, or focus with the same strength and speed as the unaffected eye. In normal daylight, the pupil of the affected eye is larger than that on the unaffected eye. In a quickly darkened room, the pupil of the affected eye is smaller. Furthermore, the nerve from the ciliary ganglion to the ciliary body has 30 fibers dedicated to changing the shape of the lens and only one fiber dedicated to dilating the iris. As a result, a person with Adie's pupil is even less able to dilate the pupil than to focus. Some research suggests that as the

person ages, the ability to dilate gradually lessens to the point that the eye may have a smaller (constricted) pupil almost all the time.

Numerous names

Adie's pupil has been known by many names. These names include: Adie's Tonic Pupil, Tonic Pupil syndrome, Holmes-Adie syndrome and Adie-Holmes syndrome; Psuedotabes, Papillotonic Psuedotabes, and Psuedotabes pupillotonica; Kehrer-Adie syndrome, Markus' syndrome Weill's syndrome, Weill-Reys syndrome, and Weill-Reys-Adie syndrome; Psuedo-Argyll Robertson Pupil, Psuedo-Argyll Robertson syndrome, and Nonluetic Argyll-Robertson Pupil; Myotonic Pupil and Myotonic Pupillary Reaction; and Saenger's syndrome.

These numerous names derive from the lengthy history of the study of this condition. Many designations indicate the name of the person researching the condition. In 1813, London ophthalmologist James Ware described some common symptoms of Adie's pupil. Until 1914, some in the medical community thought the condition was caused by **syphilis**.

William John Adie was among the doctors who studied the condition. His contribution to the research came in 1931 when he maintained the condition was caused by the nervous system. Although Adie was referring to the findings of other doctors during the 1920s, the condition became associated with him. It was first referred to as Adie's syndrome in 1934 by the French neurologist, Jean-Alexandre Barré.

Medical theories

As of February 2008, viral and bacterial **infections** were thought to be the causes of Adie's pupil. Some other theories have been suggested but not proven. One doctor noted that the Adie's pupil affected women between 20 and 40 years of age more than it did men of all ages. The doctor speculated that the condition was related to an autoimmune disorder, especially when the individual lived a stressful lifestyle and other related family members were diagnosed with neurological diseases or disorders.

Heredity is rarely the cause of Adie's pupil, according to the NINDS. NINDS and other institutes of the National Institutes of Health (NIH) conducted research into Holmes-Adie syndrome (HAS) at NIH laboratories. NIH grants also supported research through grants to medical institutions. Research at all locations focused primarily on methods of preventing, treating, and curing conditions such as Adie's pupil.

Causes and symptoms

Adie's pupil is thought to be caused by an infection that damages the neurons in the brain, according to NINDS. A viral or bacterial infection is thought to be the cause of inflammation that damages neurons in the ciliary ganglion and the spinal ganglion.

Symptoms of Adie's pupil

Adie's pupil generally begins gradually in one eye and often progresses to the other eye, according to NINDS. The condition may initially cause the loss of deep tendon reflexes on one side of the body and then progress to the other side. People may sweat excessively, sometimes sweating on just one side of the body.

Adie's pupil has symptoms that may appear in conjunction with other nervous-symptom conditions such as migraine, according to NINDS.

Diagnosis

The diagnosis of Adie's pupil may include a physical examination to rule out other causes. In most cases, a professional in an optometrist's or ophthalmologist's office examines the person. The exam usually includes a test of the eye's reaction to a diluted amount of pilocarpine drops. The drops are an alkaloid substance from the jaborandi tree; they cause the otherwise slow-to-constrict pupil to constrict intensely. In a normal eye, the diluted drops would not cause the pupil to constrict.

In addition, the eyes may be examined with a slit lamp, an intensely bright lamp shielded by a shade with a slit. The diagnosis may be based on observing the pupil's reaction to light and dark conations.

Treatment

Allopathic treatment is necessary for Adie's pupil. Not much is known about this condition so treatments that strengthen or protect the nervous system might be helpful. These include taking the B-complex of vitamins. The complex or group consists of nutrients that are useful to the nervous system and eye health. Stress-reducing activities such as **yoga** or massage may be helpful.

KEY TERMS

Accommodation—The adjustment made through a change in shape of the lens allowing for vision of objects near and far.

Aqueous humor—A clear fluid in the posterior and anterior chambers of the eye that moves from back to front and exits the eye through a small canal into the venous system.

Knee and ankle jerk reflexes—Normal reflexes elicited usually by testing with a reflex hammer and demonstrating, by being present, a healthy and intact nervous system.

Pupillary reaction—The normal change in the size of the pupil due to the amount of ambient light. Under normal circumstances, both pupils respond simultaneously and equally.

Tonic pupil—A pupil that is slow to change.

Allopathic treatment

A doctor may prescribe prescription reading glasses to help correct the vision in the affected eye. In addition, the person may find it helpful to wear sunglasses or tinted indoor glasses.

The doctor may recommend that the patient apply pilocarpine drops to the eye three times a day. These drops constrict the pupil, making it smaller.

Prognosis

Adie's pupil is not a disabling or life-threatening condition, according to NINDS. Although some symptoms in the eyes may worsen, the use of glasses and eyedrops will help correct vision problems. However, the loss of the deep tendon reflexes is permanent.

Prevention

No preventative measures have yet been identified.

Resources

BOOKS

Galloway, Winfried, M. K. Amoaku, Peter H. Galloway, and Andrew C. Browning. *Common Eye Diseases and Their Management*. Berlin: Springer Science + Business Media, 2005.

OTHER

"Adie's syndrome." Who Named It. http://www.whonamedit.com/synd.cfm/1837.html. (February 1, 2008).

"Adie's tonic pupil." *Merck Manuals Online Medical Library Basic and Clinical Science Course Excerpt*. November 2005. http://one.aao.org/CE/EducationalContent/snippet.aspx?F bcsccontent\bcscsection5\bcsc2007section5_2007 08 13_050829\thepatientwithpupillaryabnormalities\bcsc05100034.xml. (March 1, 2008).

Holistic Online.com. http://holisticonline.com. (March 1, 2008).

"Holmes Adie's syndrome Information Page." *National Institute of Neurological Disorders and Stroke*. February 13, 2007. http://www.ninds.nih.gov/disorders/holmes_adie/holmes_adie.htm. (March 1, 2008).

ORGANIZATIONS

American Academy of Ophthalmology, PO Box 7424, San Francisco, CA, 94120 7424, (415) 561 8500, http://www.aao.org.

American Optometrist Association, 243 N. Lindbergh Blvd., St. Louis, MO, 63141, (800) 365 2219, http://www.aoa.org.

National Institute of Neurological Disorders and Stroke. NIH Neurological Institute, PO Box 5801, Bethesda, MD, 20824, (800) 352 9424, http://www.ninds.nih.gov.

Katherine E. Nelson, N.D.
Liz Swain

African medicine *see* **Traditional African medicine**

African pygeum

Description

African pygeum (*Prunus africana*), also known as pygeum africanum, pygeum, and African plum tree, is an evergreen tree native to higher elevations of southern Africa. A 150 ft (46 m) tall member of the Rose family (*Rosacea*), pygeum has been found to be useful in treating prostate problems, particularly benign prostatic hypertrophy (BPH), a condition affecting many men.

The tree's bark contains an oil with many active ingredients; waxes, fatty acids, and other less familiar compounds. Pygeum's principal biological activity is traced to a "phytosterol" compound known as beta-sitosterol. Phyto (plant) sterols are structurally similar to, but much less efficiently absorbed from the diet than, **cholesterol**. The biological strength of phytosterols, however, is similar to that of hormones; therefore, a very small amount seems sufficient to initiate a

response. Pygeum's phytosterols are anti-inflammatory. Pygeum also reduces **edema** (the swelling caused by an excess of fluids), reduces levels of the hormone prolactin, lowers and inhibits cholesterol activity within the prostate. Prolactin, whose levels are increased by drinking beer, stimulates testosterone uptake by the prostate, reportedly increasing levels of a metabolite responsible for prostatic cell increases, dihydrotestosterone (di-hydro-testosterone), (DHT). Cholesterol is reported to increase the influence of DHT. BPH imlies two prostate changes: increased size and increase tissue density. These changes cause symptoms of frequent urge to urinate small volumes, reduced prostatic secretions, reduced bladder emptying. Incomplete bladder emptying increases risk of bladder **infections**, edema and inflammation, and possibly, prostatic **cancer**. Blood sugar levels and immune function have also been found to improve.

In summary, african pygeum's medicinal actions include:

- anti-inflammation
- reducing edema of the prostate
- inhibit cellular increase
- improving the natural flow of prostatic secretions
- lowering cholesterol
- regulating insulin activity, thereby affecting blood sugar levels
- regulating the immune system

Although pygeum's use is relatively new to the United States, it has been imported from Africa to Europe since the 1700s, and is still used today as a major treatment for BPH. Europeans learned of this plant's usefulness in treating what was then known as "old man's disease". It continues to be *widely popular* in Europe as a remedy for BPH, especially in France where the use of African pygeum for BPH is reported to be about 80%.

General use

Pygeum is primarily used to treat BPH, a condition which affects men as early as their 40s, but increasingly with age: 30% of 50 year olds; 50% of 60 year olds; and nearly 80% of men 70 and older. It has been found to be of use in the related condition of chronic prostatitis, with and without prostate related **sexual dysfunction**, and **infertility** due to reduced prostatic secretions. Due to actions as an immune system "up regulator" and anti-inflammatory, pygeum is also being studied for use with other treatments for **hepatitis** C and HIV.

According to one source, in a double blind placebo controlled study involving 263 men on a dose of 100 mg per day of African pygeum extract for 60 days, the following improvements versus controls were observed:

- 31% decrease in "nocturia," or night-time frequency
- 24.5% decrease in "residual urine," the amount of urine left in the bladder after urination
- 17.2% increase in urine flow
- 50% increase in overall relief and feeling of wellbeing

Two-thirds of the group using Pygeum reported feeling satisfaction. This was twice the improvement reported by the control group on placebo.

In a study on chronic prostatitis, 60% of men with urinary tract infections and nearly 80% of men without infections reported improvements using 100 mg of pygeum extract for five to seven weeks. In the treatment of sexual dysfunction due to chronic prostatitis, a dose of 200 mg for 60 days, with or without an antibiotic, produced improvements in urination and sexual function. The few small and relatively short clinical trials of pygeum in the treatment of hepatitis C and HIV + infections have been statistically significant; further trials are under way in South Africa.

Preparations

Since the 1960s, in Europe, the most commonly used form is the standardized herbal extract. The process is highly technical and, for pygeum, is designed to target extraction of the active oils using a sequence of laboratory extraction procedures. Standardization is the process whereby the targeted active ingredients are quantified and concentrated to a consistent therapeutic dose. The widely modern use of the extract form of African pygeum instead of the whole plant may derive from the discovery that the plant's activity is primarily due to its alcohol soluble phytosterols. A month's supply in capsules at a daily dosage of 100 mg, standardized to contain approximately 14% of the active beta-sitosterol ingredient, costs between $40 and $50. In some preparations, synergistic ingredients such as **amino acids**, other herbs, and vitamins or minerals, may be included. Studies cited used dosages of 100 mg daily; however, one study compared and found two dosages of 50 mg versus one dose of 100 mg per day had the same therapeutic effect.

Precautions

Precautions include recommendations to seek the guidance of a healthcare professional, and

not to self treat. Pygeum may cause a hormonal shift, and is not recommended for children. Pygeum may require several weeks to months to make a noticeable difference; studies noted reported benefits at ranges of five to eight weeks. One source reported pygeum relieves symptoms but does not reduce prostatic size. Another study specifically stated that the active components of pygeum have symptom reversal and prevention characteristics.

Side effects

Pygeum appears to be relatively safe and non-toxic. One report noted rare occurrences of **diarrhea**, **dizziness**, disturbed vision, gastric **pain** and **constipation**. One study reported satisfactory safety profiles after 12 months of using 100 mg daily in 174 subjects. In animal studies it was reported that dogs and rats given amounts equivalent to more than 500 times the therapeutic dose showed no adverse effects, and amounts equivalent to 50 times the therapeutic dose had no effect on fertility. *In vivo* and *in vitro* studies showed no carcinogenic effects, In fact, pygeum's constituents have been found to be anti-carcinogenic. The National Institute of Health (NIH), in 2002, established a grant for a randomized controlled clinical study involving 3,100 men, in order to learn more about the medical potential of this alternative therapy, due to increased BPH diagnoses as the population ages.

Interactions

Synergistic supplements may facilitate benefits. One report advised dietary adjustments to enhance beneficial result. Dietary recommendations to improve prostatic health included avoiding the irritants of coffee and tobacco; eating pumpkin seeds for their **zinc** and Omega 3 anti-inflammatory content; increasing other dietary sources of Omega 3s, including the cold water fishes salmon, sardines, and mackerel; taking **antioxidants** and a good multivitamin; and the synergistic herb **saw palmetto** (*Serenoa repens*), said to be more effective than the pharmaceutical for BPH, Proscar, at inhibiting the conversion of testosterone to its metabolite DHT, implicated in prostatic cell increases. Vitamins E (400 IU) and B_6 (50–100 mg) were suggested to synergistically reduce prolactin levels. It was also noted that 200 mcg of **selenium** daily reduce the risk of **prostate cancer**.

No unfavorable interactions were noted. Any lifestyle habit that aggravates prostate health, for example, a high cholesterol, high fat, high red meat, low fiber diet, frequent and high intake of beer, and lack of **exercise** may decrease the effectiveness of pygeum or other medications indicated for prostate health. Because pygeum has been found to upregulate immunity, its use may be contra-indicated where immune system upregulation is undesirable. No unfavorable herb-drug interactions have been noted.

KEY TERMS

Benign prostatic hypertrophy (BPH)—A condition in many men affecting the prostate, wherein increased number and size of cells produces many urinary related symptoms.

Beta-sitosterol—A plant lipid with considerable biological activity; even in very amounts it is found to be anti-inflammatory and to have positive effects in treating BPH.

Dihydrotestosterone (DHT)—A testosterone metabolite implicated in the increase in size and number of prostatic cells.

Double blind placebo controlled study—A study in which neither the patient nor the drug administrator knows who is receiving the trial drug and who the placebo.

Metabolite—A by-product of the physical and chemical change process known as metabolism.

Prolactin—A hormone found in lactating women, and in men. Levels are increased by drinking beer.

Prostatic secretions—Normal secretions of the prostate gland intended to nourish and protect sperm, improving fertility.

Standardized herbal extract—An herbal product created by using water or alcohol to dissolve and concentrate the active ingredients, which are then quantified for medicinal pharmacological effect.

Synergistic—Describes an association that improves the effectiveness of members of the association.

Testosterone—The primary male reproductive hormone. Uptake into prostatic tissues is stimulated by prolactin; its DHT metabolite stimulates prostatic cell increases.

Resources

BOOKS

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. D.K. Publishing. 1996. (*Natural health encyclopedia of herbal medicine*. [2000] 2nd Ed.)

PERIODICALS

Brown, Don. "The Male Dilemma: Relief For Prostate Problems." *Total Health* 12 June 1990.

Miller, N.D., Alan L. "Benign Prostatic Hyperplasia, Nutritional and Botanical Therapeutic Options." *Alternative Medicine Review* 1.1. (2001).

Patrick, N.D., Lyn. "Hepatits C: Epidemiology and Review of Complementary/Alternative Medicine Treatments." *Alternative Medicine Review*. (2001).

"Pygeum africanum (*Prunus Africana*) (African plum tree)." *Alternative Medicine Review* 7.1. February 2002.

"The National Institutes of Health is Proceeding on a Study to Determine if the Dietary Supplement Ingredients . . . Saw Palmetto and Pygeum." *Food Chemical News* 43.52. February 11, 2002.

OTHER

Iyker, Robert. "Men's Health: Straight Talk On Your Health and Life." *Natural Health* April 1999. http://www.findarticles.com.

Katy Nelson, N.D.

Agastache

Description

Agastache is a genus of plants found almost worldwide. Different species are used in several native cultures for healing. The best known of these is *Agastache rugosa*, also called the giant **hyssop**, wrinkled giant hyssop, Korean mint, or in Chinese *huo xiang*.

Agastache rugosa is a perennial or biennial plant that grows to a height of 4 ft (1.2 m). It is native to China but has spread to Japan, Korea, Laos, and Russia. It grows wild on sunny hillsides and along roads, but it can be cultivated in backyard gardens. The highly aromatic leaves and purple or red flowers are used for healing.

Several other species of agastache found in other parts of the world are used in healing. These include *A. nepetoides* (yellow giant hyssop), *A. foeniculum* (**anise** hyssop), and *A. mexicana*. Leaf and flower color vary considerably among the different species. Many species of agastache also are grown commercially in the United States for landscaping. In southern China and Taiwan, *Pogostemon cablin*, a relative of *Pogostemon patchouli*, the Indian plant that produces patchouli oil, is used interchangeably with *A. rugosa*.

Agastache. *(Plantography / Alamy)*

General use

A. rugosa is used extensively in Chinese herbalism. Its first recorded use dates from about 500 A.D. It is associated with the lungs, spleen, and stomach and is classified as having a warm nature and an acrid and aromatic taste. Traditionally, agastache has been associated the treatment of several different sets of symptoms. It has long been used to treat stomach flu, stomachache, **nausea**, **vomiting**, **diarrhea**, abdominal bloating, and abdominal **pain**. It is combined with *Scutellaria* (**skullcap**) to treat **morning sickness** in pregnant women. It is also a component of formulas that improve digestive balance by aiding the absorption of nutrients and intestinal function.

In Chinese herbalism, *A. rugosa* is also used to treat summer flu or summer colds with accompanying low **fever**, feelings of fullness in the chest, and **headache**. It is also used to treat dark urine and a feeling of heaviness in the arms and legs. A lotion containing *A. rugosa* is applied externally to treat **fungal infections**.

Other cultures independently have discovered similar uses for other species of agastache. *A. mexicana* is grown in Mexico and used to treat gastrointestinal upsets, nervous disorders, and cardiovascular ailments. The leaves of *A. nepetoides* are used by Native Americans to treat skin **rashes** caused by poison ivy. *A. foeniculum* leaves have a strong **licorice** taste (accounting for its English name, anise hyssop). These leaves can be brewed in a tea to treat coughs, fever, and colds.

Rigorous scientific testing of the healing claims made for agastache is scarce. Most of the work that

KEY TERMS

Biennial—Biennial plants take two years to complete their life cycle and produce fruit and flowers only in the second year.

Qi—Qi is the Chinese term for the vital life force that permeates the body. According to traditional Chinese medicine, qi collects in channels in the body and can be moved and redirected through treatments and therapies.

done on this herb involves test-tube studies or animal testing.

Preparations

Agastache can be prepared alone as a tea, incorporated into a lotion, or prepared as a pill. The leaves are strongly aromatic but lose this quality with prolonged boiling (over 15 minutes). Therefore, agastache is added last in formulas that must be boiled.

The best known formulas using agastache are agastache formula and *Huo Xiang Zheng Qi Wan*, or agastache qi-correcting formula. Agastache formula is used to harmonize the stomach. It is given as treatment for gastrointestinal upsets with **chills**, fever, and diarrhea.

Huo Xiang Zheng Qi Wan regulates qi and treats seasonal gastric disorders, especially those occurring during hot, humid weather. This formula is commercially available in both tablet and liquid form. Other cultures prepare agastache either as a tea to be drunk or use the leaves externally.

Precautions

Agastache has a long history of use with no substantial reported problems.

Side effects

No side effects have been reported with the use of agastache.

Interactions

Agastache is often used in conjunction with other herbs with no reported interactions. Since agastache has been used almost exclusively in Chinese medicine, there are no studies of its interactions with Western pharmaceuticals.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

OTHER

"Agastache rugosa." *Plants for a Future,* June 2004. http://www.pfaf.org/database/plants.php?Agastache+rugosa.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

Tish Davidson, A. M.

Aging

Definition

Starting at what is commonly called middle age, operations of the human body become more vulnerable to daily wear and tear. There is a general decline in physical, and possibly mental, functioning. In the Western countries, the length of life often extends into the 70s. However, the upward limit of the life span can be as high as 120 years. During the latter half of life, an individual is more prone to problems with the various functions of the body, and to a number of chronic or fatal diseases. The cardiovascular, digestive, excretory, nervous, reproductive, and urinary systems are particularly affected. The most common diseases of aging include Alzheimer's, arthritis, **cancer**, diabetes, **depression**, and **heart disease**.

Description

Human beings reach a peak of growth and development during their mid 20s. Aging is the normal transition time after that flurry of activity. Although there are quite a few age-related changes that tax the body, disability is not necessarily a part of aging. Health and lifestyle factors, together with the genetic makeup of the individual, determine the response to these changes. Body functions that are most often affected by age include:

- Hearing, which declines especially in relation to the highest pitched tones.
- The proportion of fat to muscle, which may increase by as much as 30%. Typically, the total padding of body fat directly under the skin thins out and accumulates around the stomach. The ability to excrete fats is impaired, and therefore the storage of fats increases, including cholesterol and fat-soluble nutrients.
- The amount of water in the body, which decreases, reducing the body's ability to absorb water-soluble nutrients. Also, there is less saliva and other lubricating fluids.
- Liver and kidney activities, which become less efficient, thus affecting the elimination of wastes.
- The ease of digestion, which is decreased, resulting in a reduction in stomach acid production.
- Muscle strength and coordination, which lessens, with an accompanying loss of mobility, agility, and flexibility.
- Sexual hormones and sexual function, which both decline.
- Sensations of taste and smell, which decrease.
- Cardiovascular and respiratory systems, with changes leading to decreased oxygen and nutrients throughout the body.
- Nervous system, which experiences changes that result in less efficient nerve impulse transmission, reflexes that are not as sharp, and diminished memory and learning.
- Bone strength and density, which decrease.
- Hormone levels, which gradually decline. The thyroid and sexual hormones are particularly affected.
- Visual abilities, which decline. Age-related changes may lead to diseases such as macular degeneration.
- A compromised ability to produce vitamin D from sunlight.
- Protein formation, which is reduced, leading to shrinkage in muscle mass and decreased bone formation, possibly contributing to osteoporosis.

Causes and symptoms

There are several theories on why the aging body loses functioning. It may be that several factors work together or that one particular factor is the culprit in a given individual. These theories include:

- Programmed senescence, or aging clock, theory. The aging of the cells for each individual is programmed into the genes, and there is a preset number of possible rejuvenations in the life of a given cell. When cells die at a rate faster than they are replaced, organs do not function properly, and they become unable to maintain the functions necessary for life.
- Genetic theory. Human cells maintain their own seed of destruction at the chromosome level.
- Connective tissue, or cross-linking theory. Changes in the makeup of the connective tissue alter the stability of body structures, causing a loss of elasticity and functioning, and leading to symptoms of aging.
- Free-radical theory. The most commonly held theory of aging, is based on the fact that ongoing chemical reactions of the cells produce free radicals. In the presence of oxygen, these free radicals cause the cells of the body to break down. As time goes on, more cells die or lose the ability to function, and the body ceases to function as a whole.
- Immunological theory. There are changes in the immune system as it begins to wear out, and the body is more prone to infections and tissue damage, which may ultimately cause death. Also, as the system breaks down, the body is more apt to have autoimmune reactions, in which the body's own cells are mistaken for foreign material and are destroyed or damaged by the immune system.

Diagnosis

Many problems can arise due to age-related changes in the body. Although there is no individual test to measure these changes, a thorough physical exam and a basic blood screening and blood chemistry panel can point to areas in need of further attention. When older people become ill, the first signs of disease are often nonspecific. Further exams should be conducted if any of the following occur:

- diminished, or lack of, desire for food
- increased confusion
- failure to thrive
- urinary incontinence
- dizziness
- weight loss
- falling

Treatment

Nutritional supplements

Consumption of a high-quality multivitamin is recommended. Common nutritional deficiencies connected with aging include B vitamins, **vitamin A** and **vitamin C**, **folic acid**, **calcium**, **magnesium**, **zinc**, **iron**, **chromium**, and trace minerals. Since stomach acids may be decreased, powdered multivitamin formula in gelatin capsules are suggested, as this form is the

easiest to digest. Such formulas may also contain enzymes for further help with digestion.

Antioxidants can help neutralize damage caused by free radical actions, which are thought to contribute to problems of aging. They are also helpful in preventing and treating cancer, and in treating **cataracts** and **glaucoma**. Supplements that serve as antioxidants include:

- Vitamin E, 400–1,000 IUs daily. Protects cell membranes against damage. It shows promise in preventing heart disease, and Alzheimer's and Parkinson's diseases.
- Selenium, 50 mg taken twice daily. Research suggests that selenium may play a role in reducing cancer risk.
- Beta-carotene, 25,000–40,000 IUs daily. May help in treating cancer, colds and flu, arthritis, and immune support.
- Vitamin C, 1,000–2,000 mg per day. It may cause diarrhea in large doses. The dosage should be decreased if this occurs.

Other supplements that are helpful in treating age-related problems include:

- B_{12}/B-complex vitamins. Studies show that B_{12} may help reduce mental symptoms, such as confusion, memory loss, and depression.
- Coenzyme Q_{10} may be helpful in treating heart disease. Up to 75% of cardiac patients have been found to lack this heart enzyme.

Hormones

The following hormone supplements may be taken to prevent or treat various age-related problems. However, caution should be taken before beginning treatment, and the patient should consult his or her health care professional prior to hormone use.

DHEA improves brain functioning and serves as a building block for many other important hormones. It may be helpful in restoring hormone levels that have declined, building muscle mass, strengthening bones, and maintaining a healthy heart.

Melatonin may be helpful for **insomnia**. It has also been used to help fight viruses and bacterial **infections**, reduce the risk of heart disease, improve sexual function, and to protect against cancer.

Human growth hormone (hGH) has been shown to regulate blood sugar levels and to stimulate bone, cartilage, and muscle growth while reducing fat.

Herbs

Garlic (*Allium sativa*) is helpful in preventing heart disease, and improving the tone and texture of skin. Garlic stimulates liver and digestive system functions, and also helps manage heart disease and high blood pressure.

Siberian ginseng (*Eleutherococcus senticosus*) supports the adrenal glands and immune functions. It is believed to be helpful in treating problems related to **stress**. Siberian ginseng also increases mental and physical performance, and may be useful in treating **memory loss**, chronic **fatigue**, and immune dysfunction.

Ginkgo biloba works particularly well on the brain and nervous system. It is effective in reducing the symptoms of such conditions as **Alzheimer's disease**, depression, visual disorders, and problems of blood circulation. It may also help treat heart disease, strokes, **dementia**, Raynaud's disease, head injuries, leg cramps, **macular degeneration**, **tinnitus**, **impotence** due to poor blood flow, and diabetes-related nerve damage.

Proanthocyanidins, or PCO, (brand name Pycnogenol), are derived from grape seeds and skin, as well as pine tree bark. They may help prevent cancer and poor vision.

Green tea has powerful antioxidant qualities, and has been used for centuries as a natural medicine in China, Japan, and other Asian cultures. In alternative medicine, it aids in treating cancer, **rheumatoid arthritis**, high **cholesterol**, heart disease, infection, and impaired immune function. Several scientific studies have shown that antioxidant benefits are obtained by drinking two cups of green tea each day.

In **Ayurvedic medicine**, aging is described as a process of increased vata, in which there is a tendency to become thinner, drier, more nervous, more restless, and more fearful, while experiencing declines in both sleep and appetite. Bananas, almonds, avocados, and coconuts are some of the foods used in correcting such conditions. One of the main herbs used to treat these problems is **gotu kola** (*Centella asiatica*). It is taken to revitalize the nervous system and brain cells, and to fortify the immune system. Gotu kola is also used to treat memory loss, **anxiety**, and insomnia.

In Chinese medicine, most symptoms of aging are regarded as signs of a yin deficiency. Moistening foods are recommended, and include barley soup, tofu, mung beans, **wheat germ**, **spirulina**, potatoes, black sesame seeds, walnuts, and flax seeds. Jing tonics may also be used. These include deer antler, dodder seeds, processed rehmannia, longevity soup, mussels, and chicken.

Allopathic treatment

For the most part, doctors prescribe medications to control the symptoms and diseases of aging. In the United States, about two-thirds of people age 65 and over take medications for various conditions. More women than men use these medications. The most common drugs used by the elderly are painkillers, diuretics or water pills, sedatives, cardiac medications, antibiotics, and mental health remedies.

Estrogen replacement therapy (ERT) is commonly prescribed to alleviate the symptoms of aging in postmenopausal women. It is often used in conjunction with progesterone. These drugs help keep bones strong, reduce the risk of heart disease, restore vaginal lubrication, and improve skin elasticity. Evidence suggests that they may also help maintain mental functions.

Expected results

Aging is unavoidable, but major physical impairment is not. People can lead healthy, disability-free lives throughout their later years. A well-established support system of family, friends, and health care providers, along with a focus on good **nutrition** and lifestyle habits, and effective stress management, can prevent disease and lessen the impact of chronic conditions.

Prevention

Preventive health practices such as healthy diet, daily **exercise**, stress management, and control of lifestyle habits, such as **smoking** and drinking, can lengthen the life span and improve the quality of life as people age. Exercise can improve appetite, bone health, emotional and mental outlook, digestion, and circulation.

Drinking plenty of fluids aids in maintaining healthy skin, good digestion, and proper elimination of wastes. Up to eight glasses of water should be consumed daily, along with plenty of herbal teas, diluted fruit and vegetable juices, and fresh fruits and vegetables that have a high water content.

Because of a decrease in the sense of taste, older people often increase their salt intake, which can contribute to high blood pressure and nutrient loss. Use of sugar is also increased. Seaweeds and small amounts of honey can be used as replacements.

Alcohol, nicotine, and **caffeine** all have potential damaging effects, and consumption should be limited or completely eliminated.

KEY TERMS

Alzheimer's disease—A condition causing a decline in brain function that interferes with the ability to reason and to perform daily activities.

Antioxidants—Substances that counteract the damaging effects of oxidation in the body's tissues.

Senescence—Aging.

Vata—One of the three main constitutional types found under Ayurvedic principles. Keeping one's particular constitution in balance is considered important in maintaining health.

A diet high in fiber and low in fat is recommended. Processed foods should be replaced by such complex carbohydrates as whole grains. If chewing becomes a problem, there should be an increased intake of protein drinks, freshly juiced fruits and vegetables, and creamed cereals.

Resources

BOOKS

Cox, Harold. *Aging*. New York, NY: McGraw Hill College Division, 2004.

Giampapa, Vincent, et al. *The Anti Aging Solution: 5 Simple Steps to Looking and Feeling Young*. Hoboken, NJ: John Wiley & Sons, 2004.

Landis, Robyn, with Karta Purkh Singh Khalsa. *Herbal Defense: Positioning Yourself to Triumph Over Illness and Aging* New York, NY: Warner Books, 1997.

Panno, Joseph. *Aging: Theories and Potential Therapies* New York, NY: Facts on File, Inc., 2004.

Weil, Andrew M.D. *Healthy Aging* New York, NY: Knopf, 2004.

PERIODICALS

"Chemopreventive Effects of Green Tea Said to Delay Aging of Skin." *Cancer Weekly* (April 13, 2004): 10.

"Discovery Claims to Link DNA Test to Reversing Signs of Aging." *Drug Week* (February 27, 2004): 122.

"Fitness Can Improve Thinking Among Aging." *Obesity, Fitness & Wellness Week* (March 13, 2004): 16.

"Hormonal Activity Plays Role in Body Composition Changes with Aging." *Obesity, Fitness & Wellness Week* (March 20, 2004): 3.

Lofshult, Diane. "Aging Trends for 2004." *IDEA Health & Fitness Source* (March 2004): 14.

"Research Reports on Key Antioxidant to Slow Aging." *Drug Week* (April 2, 2004): 194.

ORGANIZATIONS

The Anti Aging Institute. 843 William Hilton Parkway, Hilton Head, SC 29928. (912) 238 3383. http://www.anti aging.org.

The Rosenthal Center for Complementary and Alternative Medicine Research in Aging and Women's Health. Columbia University, College of Physicians and Surgeons, 630 W. 168th St., New York, NY 10032. http://www.rosenthal.hs.columbia.edu.

OTHER

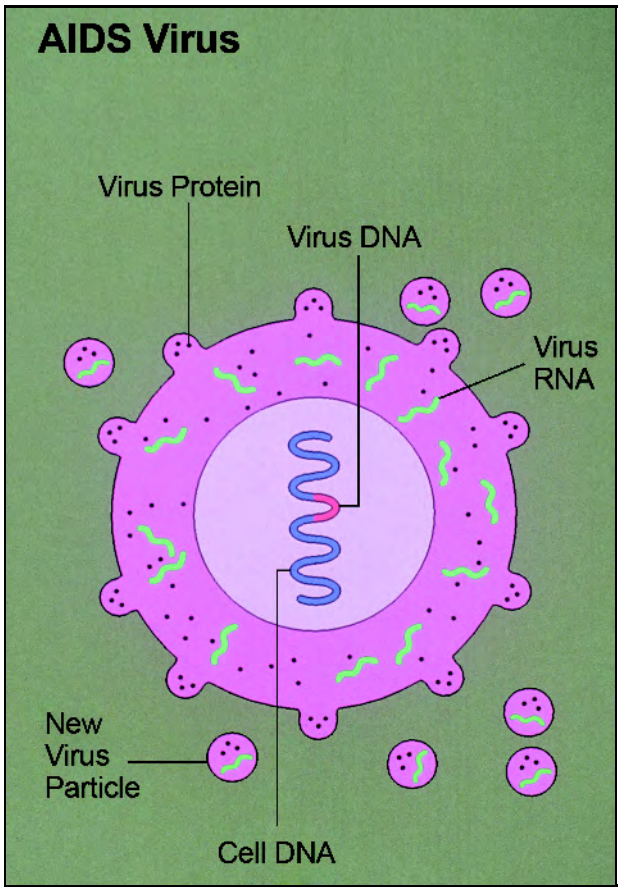
National Institute on Aging Senior Health Web site. http://www.nihseniorhealth.gov.

Patience Paradox
Ken Wells

AIDS

Definition

Acquired immune deficiency syndrome (AIDS) is an infectious disease caused by the human immunodeficiency virus (HIV). It was first recognized in the United States in 1981. AIDS is the advanced form of infection with the HIV virus, which may not cause disease for a long period after the initial exposure (latency). Infection with HIV weakens the immune system, which makes infected people susceptible to infection and **cancer**.



The AIDS virus. *(National Institutes of Health, U.S. Department of Health and Human Services)*

Estimated number of adults and children living with AIDS/HIV worldwide as of 2005

Regions	Estimate
Caribbean	330,000
East Asia	680,000
Eastern Europe & Central Asia	1,500,000
Latin America	1,600,000
North Africa & Middle East	440,000
North America	1,300,000
Oceania	78,000
South & Southeast Asia	7,600,000
Sub-Saharan Africa	24,500,000
Western & Central Europe	720,000
Global Total	38,748,000

(Illustration by Corey Light. Cengage Learning, Gale)

Description

AIDS is considered one of the most devastating public health problems in recent history. In 2003, the Centers for Disease Control and Prevention (CDC) estimated that one million persons in the United States were HIV-positive, and 223,000 are living with AIDS. Of these patients, 45% are gay or bisexual men, 22% are heterosexual intravenous drug users, and 26% are women. In addition, approximately 100–200 children are born each year with HIV infection. In 2002, the CDC reported 42,136 new AIDS diagnoses in the United States, a 2.2% increase from the previous year. AIDS cases rose among gay and bisexual men (7.1% in 25 states that report regularly). The disease also seems to be rising among older Americans. From

2001 to 2005, the number of cases in Americans age 50 years or older rose from 17% to 24%.

The World Health Organization (WHO) estimates that 18 million adults and 1.5 million children worldwide were infected with HIV as of 1995 with the potential to produce about 4.5 million cases of AIDS. Most of these cases were in the developing countries of Asia and Africa. In 2003, WHO cautioned that if treatment was not delivered soon to nearly 6 million people with AIDS in developing countries, there could be 45 million cases by HIV by 2010.

Risk factors

AIDS can be transmitted in several ways. The risk factors for HIV transmission vary according to category:

- Sexual contact. Persons at greatest risk are those who do not practice safe sex, are not monogamous, participate in anal intercourse, and have sex with a partner with symptoms of advanced HIV infection and/or other sexually transmitted diseases (STDs). In the United States and Europe, most cases of sexually transmitted HIV infection have resulted from homosexual contact, whereas in Africa, the disease is spread primarily through sexual intercourse among heterosexuals.
- Transmission in pregnancy. High-risk mothers include women married to bisexual men or men who have an abnormal blood condition called hemophilia and require blood transfusions, intravenous drug users, and women living in neighborhoods with a high rate of HIV infection among heterosexuals. The chances of transmitting the disease to the child are higher in women in advanced stages of the disease. Breast feeding increases the risk of transmission by 10–20% and is not recommended. The use of zidovudine (ZDV) during pregnancy and delivery can decrease the risk of transmission to the baby.
- Exposure to contaminated blood or blood products. Following the introduction of blood product screening in the mid-1980s, the incidence of HIV transmission in blood transfusions dropped to 1 in 100,000.
- Needle sticks among health care professionals. In the early 2000s, studies indicated that the risk of HIV transmission by a needle stick was about 1 in 250. This rate can be decreased if the injured worker is given AZT or triple therapy (HAART), the standard at the time.

HIV is not transmitted by handshakes or other casual non-sexual contact, coughing or **sneezing**, or by bloodsucking insects such as mosquitoes.

AIDS in women

AIDS in women is a serious public health concern. Women exposed to HIV infection through heterosexual contact are the most rapidly growing risk group in the United States. The percentage of AIDS cases diagnosed in women rose from 7% in 1985 to 18% in 1996. For unknown reasons, women with AIDS do not live as long as men with AIDS.

AIDS in children

Because AIDS can be transmitted from an infected mother to her child during **pregnancy**, during the birth process, or through breast milk, all infants born to HIV-positive mothers are at risk. In 1997, it was estimated that 84% of HIV-positive women are of childbearing age; 41% of them are drug abusers. Between 15–30% of children born to HIV-positive women will be infected with the virus.

AIDS is one of the 10 leading causes of death in children between one and four years of age worldwide. The interval between exposure to HIV and the development of AIDS is shorter in children than in adults. Infants infected with HIV have a 20–30% chance of developing AIDS within a year and dying before age three. In the remainder, AIDS progresses more slowly; the average child patient survives to seven years of age. Some survive into early adolescence.

Causes and symptoms

Because HIV destroys immune system cells, AIDS is a disease that can affect any of the body's major organ systems. HIV attacks the body through three disease processes: immunodeficiency, autoimmunity, and nervous system dysfunction.

Immunodeficiency describes the condition in which the body's immune response is damaged, weakened, or is not functioning properly. In AIDS, immunodeficiency results from the way that the virus binds to a protein called CD4, which is found on certain white blood cells, including helper T cells, macrophages, and monocytes. Once HIV attaches to an immune system cell, it can replicate within the cell and kill the cell. In addition to killing some lymphocytes directly, the AIDS virus disrupts the functioning of other CD4 cells. Because the immune system cells are destroyed, **infections** and cancers that take advantage of a person's weakened immune system (opportunistic) can develop.

Autoimmunity is a condition in which the body's immune system produces antibodies that work against its own cells. Antibodies are specific proteins produced

in response to exposure to a specific, usually foreign, protein or particle called an antigen. In this case, the body produces antibodies that bind to blood platelets that are necessary for proper blood clotting and tissue repair. Once bound, the antibodies mark the platelets for removal from the body, and they are filtered out by the spleen. Some AIDS patients develop a disorder, called immune-related thrombocytopenia purpura (ITP), in which the number of blood platelets drops to abnormally low levels.

The course of AIDS generally progresses through three stages, although not all patients follow this progression precisely.

Acute retroviral syndrome

Acute retroviral syndrome is a group of symptoms that can resemble **mononucleosis** and that may be the first sign of HIV infection in 50–70% of all patients and 45–90% of women. The symptoms may include **fever**, **fatigue**, muscle aches, loss of appetite, digestive disturbances, weight loss, skin **rashes**, **headache**, and chronically swollen lymph nodes (lymphadenopathy). Approximately 25–33% of patients experience a form of **meningitis** during this phase, in which the membranes that cover the brain and spinal cord become inflamed. Acute retroviral syndrome develops between one and six weeks after infection and lasts two to four weeks, sometimes up to six weeks. Blood tests during this period indicate the presence of virus (viremia) and the appearance of the viral p24 antigen in the blood.

Latency period

After the HIV virus enters a patient's lymph nodes during the acute retroviral syndrome stage, the disease becomes latent for as many as 10 years or more before symptoms of advanced disease develop. During latency, the virus continues to replicate in the lymph nodes, where it may cause one or more of the following conditions.

PERSISTENT GENERALIZED LYMPHADENOPATHY (PGL). Persistent generalized lymphadenopathy, or PGL, is a condition in which HIV continues to produce chronic painless swellings in the lymph nodes during the latency period. The lymph nodes most frequently affected by PGL are those in the areas of the neck, jaw, groin, and armpits. PGL affects between 50–70% of patients during latency.

CONSTITUTIONAL SYMPTOMS. Many patients develop low-grade fevers, chronic fatigue, and general weakness. HIV also may cause a combination of food malabsorption, loss of appetite, and increased metabolism that contribute to the so-called AIDS wasting or wasting syndrome.

OTHER ORGAN SYSTEMS. At any time during the course of HIV infection, patients may develop a **yeast infection** in the mouth called thrush, open sores or ulcers, or other infections of the mouth; **diarrhea** and other gastrointestinal symptoms that cause malnutrition and weight loss; diseases of the lungs and kidneys; and degeneration of the nerve fibers in the arms and legs. HIV infection of the nervous system leads to general loss of strength, loss of reflexes, and feelings of numbness or burning sensations in the feet or lower legs.

Late-stage AIDS

Late-stage AIDS usually is marked by a sharp decline in the number of CD4+ lymphocytes (a type of white blood cell), followed by a rise in the frequency of opportunistic infections and cancers. Doctors monitor the number and proportion of CD4+ lymphocytes in the patient's blood in order to assess the progression of the disease and the effectiveness of different medications. About 10% of infected individuals never progress to this overt stage of the disease.

OPPORTUNISTIC INFECTIONS. Once the patient's CD4+ lymphocyte count falls below 200 cells/mm^3, he/she is at risk for opportunistic infections. The infectious organisms may include:

- Fungi. Fungal infections include a yeast infection of the mouth (candidiasis or thrush) and cryptococcal meningitis.
- Protozoa. The most common parasitic disease associated with AIDS is *Pneumocystis carinii* pneumonia (PCP). About 70–80% of AIDS patients have at least one episode of PCP prior to death. PCP is the immediate cause of death in 15–20% of AIDS patients. It is an important measure of a patient's prognosis. Toxoplasmosis is another common infection in AIDS patients that is caused by a protozoan. Other diseases in this category include amebiasis and cryptosporidiosis.
- Mycobacteria. AIDS patients may develop tuberculosis or MAC infections. MAC infections are caused by *Mycobacterium avium-intracellulare* and occur in about 40% of AIDS patients.
- Bacteria. AIDS patients are likely to develop bacterial infections of the skin and digestive tract.
- Viruses. AIDS patients are highly vulnerable to cytomegalovirus (CMV), herpes simplex virus (HSV), varicella zoster virus (VZV), and Epstein-Barr virus (EBV) infections. Another virus, JC virus, causes progressive destruction of brain tissue in the brain

stem, cerebrum, and cerebellum (multifocal leukoencephalopathy or PML), which is regarded as an AIDS-defining illness by the CDC.

AIDS DEMENTIA COMPLEX AND NEUROLOGIC COMPLICATIONS. AIDS **dementia** complex is a late complication of the disease. It is unclear whether it is caused by the direct effects of the virus on the brain or by intermediate causes. AIDS dementia complex is marked by loss of reasoning ability, loss of memory, inability to concentrate, apathy and loss of initiative, and unsteadiness or weakness in walking. Some patients also develop seizures.

MUSCULOSKELETAL COMPLICATIONS. Patients in late-stage AIDS may develop inflammations of the muscles, particularly in the hip area, and may have arthritis-like pains in the joints.

ORAL SYMPTOMS. Patients may develop a condition called hairy leukoplakia of the tongue. This condition also is regarded by the CDC as an indicator of AIDS. Hairy leukoplakia is a white area of diseased tissue on the tongue that may be flat or slightly raised. It is caused by the Epstein-Barr virus.

AIDS-RELATED CANCERS. Patients with late-stage AIDS may develop **Kaposi's sarcoma** (KS), a skin tumor that primarily affects homosexual men. KS is the most common AIDS-related malignancy. It is characterized by reddish-purple blotches or patches (brownish in African Americans) on the skin or in the mouth. About 40% of patients with KS develop symptoms in the digestive tract or lungs. KS appears to be caused by a herpes virus.

The second most common form of cancer in AIDS patients is a tumor of the lymphatic system (lymphoma). AIDS-related lymphomas often affect the central nervous system and develop very aggressively.

Invasive cancer of the cervix is an important diagnostic marker of AIDS in women.

Diagnosis

Because HIV infection produces such a wide range of symptoms, the CDC has drawn up a list of 34 conditions regarded as defining AIDS. The physician uses the CDC list to decide whether the patient falls into one of these three groups:

- definitive diagnoses with or without laboratory evidence of HIV infection
- definitive diagnoses with laboratory evidence of HIV infection
- presumptive diagnoses with laboratory evidence of HIV infection

Physical findings

Almost all symptoms of AIDS can occur with other diseases. The general physical examination may range from normal findings to symptoms that are closely associated with AIDS. These symptoms are hairy leukoplakia of the tongue and Kaposi's sarcoma. During the examination, the doctor looks for the overall pattern of symptoms rather than any one finding.

Laboratory tests for HIV infection

BLOOD TESTS (SEROLOGY). The first blood test for AIDS was developed in 1985. Patients who are being tested for HIV infection usually are given an enzyme-linked immunosorbent assay (ELISA) test for the presence of HIV antibody in their blood. Positive ELISA results then are tested with a Western blot or immunofluorescence (IFA) assay for confirmation. The combination of the ELISA and Western blot tests is more than 99.9% accurate in detecting HIV infection within four to eight weeks following exposure. The polymerase chain reaction (PCR) test can be used to detect the presence of viral nucleic acids in the very small number of HIV patients who have false-negative results on the ELISA and Western blot tests. In 2003, a one-step test that was quicker and cheaper was shown to be effective for detecting HIV in the physician office setting. However, further research was ongoing as to its effectiveness in replacing other tests as a first check for HIV.

OTHER LABORATORY TESTS. In addition to diagnostic blood tests, there are other blood tests that are used to track the course of AIDS. These include blood counts, viral load tests, p24 antigen assays, and measurements of β_2-microglobulin (β_2M).

Doctors use a wide variety of tests to diagnose the presence of opportunistic infections, cancers, or other disease conditions in AIDS patients. Tissue biopsies, samples of cerebrospinal fluid, and sophisticated imaging techniques, such as magnetic resonance imaging (MRI) and computed tomography scans (CT) are used to diagnose AIDS-related cancers, some opportunistic infections, damage to the central nervous system, and wasting of the muscles. Urine and stool samples are used to diagnose infections caused by parasites. AIDS patients are also given blood tests for **syphilis** and other sexually transmitted diseases.

Diagnosis in children

Diagnostic blood testing in children older than 18 months is similar to adult testing, with ELISA screening confirmed by Western blot. Younger infants can

be diagnosed by direct culture of the HIV virus, PCR testing, and p24 antigen testing.

In terms of symptoms, children are less likely than adults to have an early acute syndrome. They are, however, likely to have delayed growth, a history of frequent illness, recurrent ear infections, a low blood cell count, failure to gain weight, and unexplained fevers. Children with AIDS are more likely to develop bacterial infections, inflammation of the lungs, and AIDS-related brain disorders than are HIV-positive adults.

Treatment

AIDS patients turn to alternative medicine when conventional treatments are ineffective and to supplement conventional treatment, reduce disease symptoms, counteract drug effects, and improve quality of life. Because alternative medicines may interact with conventional medicines, it is important for patients to inform their doctors of all treatments being used.

A report released in 2003 showed trends in increased use of alternative medicine among HIV-positive individuals. The types of therapies they used most were **relaxation** techniques, massage, **chiropractic** care, self-help groups, commercial **diets**, and **acupuncture**.

Supplements

- Lauric oils (coconut oil) are used by the body to make monolaurin, which inactivates HIV.
- Selenium deficiency increases the risk of death due to AIDS-related illness. One study found that 250 micrograms of selenomethionin daily for one year showed no improvement in CD4 cell counts or disease symptoms. Greater than 1,000 micrograms daily is toxic.
- Vitamin C has antioxidant and antiretroviral activities. One study found that treatment caused a trend to decrease viral load.
- DHEA (dehydroepiandrosterone) is commonly used by AIDS patients to counteract wasting. One study found that DHEA had no effect on lymphocytes or p24 antigen levels. However, a 2002 study found that it was associated with a significant increase in measures that indicate mental health improvement.
- Vitamin A deficiency is associated with increased mortality. One study of pregnant women with AIDS found that 5,000 IU of vitamin A daily led to stabilized viral load as compared to a placebo group. Another study found that 60 mg of vitamin A had no effect on CD4 cells or viral load. Vitamin A has been associated with faster disease progression. Excessive vitamin A during pregnancy can cause birth defects.
- Beta-carotene supplementation for AIDS is controversial as studies have shown both beneficial and detrimental effects. Beta-carotene supplementation has led to elevation in white blood cell counts and changes in the CD4 cell count. Some studies have found that beta-carotene supplementation led to an increase in deaths due to cancer and heart disease.

Naturopathic doctors often recommend the following supplements for AIDS:

- beta-carotene, 150,000 IU daily
- vitamin C, 2000 mg three times daily
- vitamin E, 400 IU twice daily
- cod liver oil, 1 tablespoon daily
- multivitamin, as directed
- coenzyme Q10, 50–60 mg twice daily

Herbals and Chinese medicine

One small study of the effectiveness of Chinese herbal treatment in AIDS showed promise. AIDS patients took a tablet that contained 31 herbs that was based on the formulas Enhance and Clear Heat. Disease symptoms were reduced in the herbal treatment group as compared to the placebo group.

Herbals used in treating AIDS include:

- Maitake mushroom extract. Recommended dose is 10 drops twice daily.
- Licorice (*Glycyrrhiza glabra*) solid extract. Recommended dose is one-quarter to one-half teaspoon twice daily.
- Boxwood extract (SPV-30) has antiviral activity. Recommended dose is one capsule three times daily.
- Garlic concentrate (Allicin) helped reduce bowel movements, stabilized or increased body weight, or cured *Cryptosporidium parvum* infection in affected AIDS patients. However, a 2002 National Institutes of Health study cautioned that garlic supplements could reduce levels of a protease inhibitor that is used to treat AIDS patients, so patients should discuss using garlic supplements with their physicians.
- Tea tree oil (*Malaleuca*) improves or cures infection of the mouth by the yeast *Candida*. Tea tree oil is available as soap, dental floss, toothpick, and mouthwash.
- Marijuana is used to treat wasting. Studies have found that patients who use marijuana had increased food intake and weight gain. The active ingredient

delta-9-tetrahydrocannabinol is licensed for treating AIDS wasting.

Psychotherapy and stress reduction

Many therapies that are directed at improving mental state can have a direct impact on disease severity and quality of life. The effectiveness of many have been proven in clinical studies. These include:

- massage
- laughter/humor
- stress management training
- visualization
- cognitive therapy
- aerobic exercise
- prayer

One study from the New York Institute of Technology claims to have demonstrated that mind power can alter the rate of replication of HIV under laboratory conditions. A more interesting study from the Department of Epidemiology of the University of Washington, published in 2007, reported that people who had engaged in any form of psychological or spiritual treatment for a period of six months to one year had better clinical outcomes, including survival, as compared with other patients.

Other treatments for AIDS include **homeopathy**, naturopathy, acupuncture, and chiropractic.

Allopathic treatment

Treatment for AIDS covers four categories:

Antiretroviral treatment

In the early 2000s researchers developed drugs that suppress HIV replication. The drugs are used in combination with one another and fall into four classes:

- Nucleoside reverse transcriptase inhibitors. These drugs work by interfering with the action of HIV reverse transcriptase, thus ending the virus replication process. These drugs include zidovudine (sometimes called Zidovudine or AZT, trade name Retrovir), didanosine (ddi, Videx), emtricitabine (FTC, Emtriva), zalcitabine (ddC, Hivid), stavudine (d4T, Zerit), abacavir (Ziagen), tenofovir (df, Viread), and lamivudine (3TC, Epivir).
- Protease inhibitors. Protease inhibitors are effective against HIV strains that have developed resistance to nucleoside analogues and often are used in combination with them. These compounds include saquinavir (Fortovase), ritonavir (Norvir), indinavir (Crixivan), amprenavir (Agenerase), lopinavir plus ritonavir (Reyataz), and nelfinavir (Viracept).
- Non-nucleoside reverse transcriptase inhibitors, a newer class of antiretroviral agents. Three are available: nevirapine (Viramune), efavirenz (Sustiva), and delavirdine (Rescriptor).
- Fusion inhibitors. These drugs are less common, expensive, and difficult to use. They block infection early by preventing HIV from fusing with and entering a human cell. This class includes only one compound: Enfuvirtide (Fuzeon).

Treatment guidelines for these agents are in constant change as new medications are developed and introduced. In mid-2003, the U.S. Department of Health and Human Services revised its guidelines for the use of these agents to help clinicians select the best combinations. The new guidelines offer a list of suggested combination regimens classified as either "preferred" or "alternative".

Treatment of opportunistic infections and malignancies

Most AIDS patients require complex long-term treatment with medications for infectious diseases. This treatment often is complicated by the development of resistance in the disease organisms. AIDS-related malignancies in the central nervous system usually are treated with radiation therapy. Cancers elsewhere in the body are treated with chemotherapy.

Prophylactic treatment for opportunistic infections

Prophylactic treatment is treatment that is given to prevent disease. AIDS patients with a history of *Pneumocystis* **pneumonia**; with CD4+ counts below 200 cells/mm^3 or 1% of lymphocytes; weight loss; or thrush are likely to benefit from prophylactic medications. The three drugs given are trimethoprim-sulfamethoxazole, dapsone, or pentamidine in aerosol form.

STIMULATION OF BLOOD CELL PRODUCTION. Because many patients with AIDS have abnormally low levels of both red and white blood cells, they may be given medications to stimulate blood cell production. Epoetin alfa (erythropoietin) may be given to anemic patients. Patients with low white blood cell counts may be given filgrastim or sargramostim.

Treatment in women

Treatment of pregnant women with HIV is particularly important because antiretroviral therapy has been shown to reduce transmission to the infant by 65%

KEY TERMS

Acute retroviral syndrome—A group of symptoms resembling mononucleosis that often are the first sign of HIV infection.

AIDS dementia complex—A type of brain dysfunction caused by HIV infection that causes difficulty thinking, confusion, and loss of muscular coordination.

Antibody—A specific protein produced by the immune system in response to a specific foreign protein or particle called an antigen.

Antigen—Any substance that stimulates the body to produce antibody.

Autoimmunity—A condition in which the body's immune system produces antibodies in response to its own tissues or blood components instead of to foreign particles or microorganisms.

CD4—A type of protein molecule in human blood. The HIV virus infects cells with CD4 surface proteins and, as a result, depletes the number of T cells, B cells, natural killer cells, and monocytes in the patient's blood.

Hairy leukoplakia of the tongue—A white area of diseased tissue on the tongue that may be flat or slightly raised. Caused by the Epstein-Barr virus, it is an important diagnostic sign of AIDS.

Hemophilia—Hereditary blood clotting disorders occurring almost exclusively in males.

Human immunodeficiency virus (HIV)—A transmissible retrovirus that causes AIDS in humans. Two forms of HIV are recognized: HIV-1, which causes most cases of AIDS in Europe, North and South America, and most parts of Africa; and HIV-2, which is chiefly found in West African patients.

Immunodeficient—A condition in which the body's immune response is damaged, weakened, or is not functioning properly.

Kaposi's sarcoma—A cancer of the connective tissue that produces painless purplish red (in people with light skin) or brown (in people with dark skin) blotches on the skin. It is a major diagnostic marker of AIDS.

Latent period—Also called incubation period, the time between infection with a disease-causing agent and the development of disease.

Lymphocyte—A type of white blood cell that is important in the formation of antibodies and that can be used to monitor the health of AIDS patients.

Lymphoma—A cancerous tumor in the lymphatic system that is associated with a poor prognosis in AIDS patients.

Macrophage—A large white blood cell, found primarily in the bloodstream and connective tissue, that helps the body fight off infections by ingesting the disease-causing organism.

Monocyte—A large white blood cell that is formed in the bone marrow and spleen.

Mycobacterium avium (MAC) infection—A type of opportunistic infection that occurs in about 40% of AIDS patients and is regarded as an AIDS-defining disease.

Opportunistic infection—An infection by organisms that usually do not cause infection in people whose immune systems are working normally.

Persistent generalized lymphadenopathy (PGL)—A condition in which HIV continues to produce chronic painless swellings in the lymph nodes during the latency period.

***Pneumocystis carinii* pneumonia (PCP)**—An opportunistic infection caused by a fungus that is a major cause of death in patients with late-stage AIDS.

Progressive multifocal leukoencephalopathy (PML)—A disease caused by a virus that destroys white matter in localized areas of the brain. It is regarded as an AIDS-defining illness.

Protozoan—A single-celled, usually microscopic organism that has a nucleus and is, therefore, different from bacteria.

Retrovirus—A virus that contains a unique enzyme called reverse transcriptase that allows it to replicate within new host cells.

T cells—Lymphocytes that originate in the thymus gland. CD4 lymphocytes are a subset of T lymphocytes.

Thrush—A yeast infection of the mouth characterized by white patches on the inside of the mouth and cheeks.

Viremia—The measurable presence of virus in the bloodstream that is a characteristic of acute retroviral syndrome.

Wasting syndrome—A progressive loss of weight and muscle tissue caused by the AIDS virus.

Expected results

There is no cure for AIDS. Treatment stresses aggressive combination drug therapy when possible. The use of multi-drug therapies has significantly reduced the number of U.S. deaths resulting from AIDS. The potential exists to prolong life indefinitely using these and other drug therapies to boost the immune system, keep the virus from replicating, and ward off opportunistic infections and malignancies.

Prognosis after the latency period depends on the patient's specific symptoms and the organ systems affected by the disease. Patients with AIDS-related lymphomas of the central nervous system often die within two to three months of diagnosis; those with systemic lymphomas may survive eight to ten months. In the United States, the successful treatment of AIDS patients with highly active anti-retroviral therapy (HAART) has actually led to a growing number of people living with HIV. About 25,000 infected people per year are added to the list of HIV-infected Americans.

HAART and other treatment works to prolong AIDS patients' lives and has led to some improvement in quality of life too. One study shows that HAART therapy substantially reduces risk of AIDS-related pneumonia (PCP), although PCP still remains the most common AIDS-defining illness among opportunistic infections. Other studies show that these protease inhibitors may result in high **cholesterol** and put AIDS patients at eventual risk for **heart disease**. More research must be done, since long-term effects of HAART treatment are still underway. Most clinicians would say the benefits outweigh the risks anyway.

Prevention

As of 2008, there was no vaccine effective against AIDS. Several vaccines to prevent initial HIV infection and disease progression are being tested. In 2002, reports indicated a new "library" vaccine showed potential. The vaccine is composed of up to 32 HIV gene fragments that can induce a number of immune responses. Also in 2002, the British government worked with five African countries in a trial to find an effective gel that would protect women against HIV during sex. The study leaders believed if they could find a lotion that could be applied before intercourse that would help prevent HIV transmission, they would give women the ability to better protect themselves from HIV. In 2003, the first human test of a vaccine against the most common subtype of HIV was undertaken.

Precautions to take to prevent the spread of AIDS include:

- Practicing safe sex and being monogamous. Besides avoiding the risk of HIV infection, condoms are successful in preventing other sexually transmitted diseases and unwanted pregnancies.
- Avoiding needle sharing among intravenous drug users.
- Donating blood before undergoing surgery. Although blood and blood products are carefully monitored, those individuals who are planning to undergo major surgery may wish to donate blood ahead of time to prevent a risk of infection from a blood transfusion.
- Wearing protective gear. Healthcare professionals should wear gloves and masks when handling body fluids and avoid needle-stick injuries.
- Getting tested. Individuals who suspect that they may have become infected should get tested. If treated aggressively and early, the development of AIDS can sometimes be postponed indefinitely. If HIV infection is confirmed, it also is vital to inform sexual partners.

Resources

BOOKS

PERIODICALS

Fitzpatrick, A. L., L. J. Standish, J. Berger, J. G. Kim, C. Calabrese, and N. Polissar. "Survival in HIV 1 positve Adults Practicing Psychological or Spiritual Activities for One Year." *Alternative Therapy Health Medicine* (September/October 2007): 18 20, 22 24.

Xu J; He B. "The Effect of Mind Power on HIV 1: A Pilot Study." *Alternative Therapy Health Medicine* (Septem ber/October 2007): 40 42.

ORGANIZATIONS

American Foundation for AIDS Research, 120 Wall St., 13th Fl., New York, NY, 1005 3908, (212) 806 1600., http:// www.amfar.org/cgi bin/iowa/fdoc.html?record 13.

Gay Men's Health Crisis, 119 W. Twenty fourth St., New York, NY, 10011 0022, (212) 367 1000, http:// www.gmhc.org/donate.html.

National AIDS Hot Line, (800) 342 AIDS (English), (800) 344 SIDA (Spanish), (800) AIDS TTY (hearing impaired).

Belinda Rowland
Teresa G. Odle

Alcoholism

Definition

Alcoholism is the layman's term for alcohol dependence and alcohol abuse. According to the *Diagnostic and Statistical Manual of Mental Disorders*, published by the American Psychiatric Association and commonly called DSM–IV, the essential feature of **substance abuse** (in this instance, alcohol abuse) is maladaptive use of the substance with recurrent and significant adverse consequences related to its repeated use. Dependence is a physical addiction with psychological, social, and genetic components. Despite damage to health, finances, reputations, and relationships, the alcohol dependent person continues to drink unless successful intervention occurs. Abuse is distinguished from dependence by the individual's retaining some control over the use of alcohol. Nevertheless both conditions result in many of the same consequences over time, and abuse increases risk of dependence.

Alcohol abuse and alcohol dependence are often associated with abuse of, or dependence on, other substances, including nicotine, **marijuana**, cocaine, heroin, amphetamines, sedatives, and anxiolytics (anti-anxiety drugs). Alcoholism is more common in males than in females, with an estimated male-to-female ratio as high as five-to-one. A U.S. study conducted between 1990 and 1991, using DSM standards, found that 14% of the adult population (ages 15–54) had, at some time, met the criteria for alcohol dependence; and 7% had been alcohol-dependent in the past year. An earlier, similar study showed that about 5% of Americans qualified for a diagnosis of alcohol abuse at some point during their life. In 2006, the Substance Abuse and Mental Health Services Administration reported that 18.2 million Americans over the age of 12 met the criteria for alcohol abuse or dependence in the preceding year. Although it is difficult to develop accurate statistics worldwide, experts know that the incidence of what is called alcoholism has been steadily rising around the globe for several years.

Description

The effects of alcoholism are quite far-reaching. Alcoholism affects every body system, causing a wide range of drinking-related health problems, including lower testosterone, shrinking gonads, erectile dysfunction, interference with reproductive fertility, weak bones, memory disorders, difficulty with balance and walking, liver disease (including **cirrhosis** and **hepatitis**), high blood pressure, weakness of muscles (including the heart), disturbances of heart rhythm, **anemia**, clotting disorders, weak immunity to **infections**, inflammation and irritation of the entire gastrointestinal system, acute and chronic problems with the pancreas, low blood sugar, high blood fat content, and poor **nutrition**.

The mental health implications of alcoholism include marital and other relationship difficulties, **depression**, unemployment, poor performance at

Alcohol concentration and effect relationship

BAC (%)	Effects
0.01-0.029	Mood elevation; slight muscle relaxation; average individual appears normal
0.03-0.06	Relaxation and warmth; increased reaction time; decreased fine muscle coordination; talkativeness; mild euphoria, decreased inhibition
0.06-0.10	Impaired balance, speech, vision, depth perception, hearing, and muscle coordination; euphoria and extroversion
0.11-0.19	Gross impairment of physical and mental control and reaction time; staggering; slurred speech
0.20-0.30	Severly intoxicated; very little control of mind or body, memory blackout
0.40-0.50	Unconscious; deep coma; death from respiratory depression

(Illustration by Corey Light. Cengage Learning, Gale)

school or work, spouse and child abuse, and general family dysfunction. Alcoholism causes or contributes to a variety of severe social problems, such as homelessness, murder, suicide, injury, and violent crime. Alcohol is a contributing factor in half of all deaths from motor vehicle accidents. In fact, 50% of the 100,000 deaths that occur each year due to the effects of alcohol are due to injuries of some sort. By some estimates, alcohol-related problems cost the United States over $150 billion yearly in lost productivity and alcohol-related medical expense.

Causes and symptoms

A physical dependence on alcohol develops insidiously, over time. The body is a magnificent adaptor; therefore, with persistent use, many adaptations occur physically and psychologically, resulting in both a higher tolerance to and increased need for alcohol. The physical adaptation to alcohol involves changing levels and altered balances of neurotransmitters, chemicals in the brain that not only affect physical abilities such as muscle coordination, but also an individual's mood. The abuse of alcohol is associated with a desire to feel better and to avoid feeling poorly. Initially a stimulant, it eventually acts as a central nervous system (CNS) depressant and is used in a majority of societies or cultures in the world as an accepted part of dealing with life events, except where religious opposition bans, discourages, or prohibits its use, as in most Muslim communities. It is included in celebrations and, ironically, its use is perceived as an appropriate response to sadness and loss, such as at wakes.

No single known factor causes some people to be alcohol-dependent and others not. Some genetic studies have demonstrated that close biological relatives of an alcoholic are four times as likely to become alcoholics themselves. Furthermore, this risk holds true even for children who were adopted away from their biological families at birth and raised in non-alcoholic homes, without knowledge of their biological family's difficulties with alcohol. Factors that increase the risk of experiencing problems with alcohol include: being male; being the child of an alcoholic parent or parents; having an extended family history and being of Irish (Celtic), Scandinavian, German, Polish, Russian, or Native American ancestry; beginning drinking as a teenager; and being depressed or highly anxious. Further research may determine if genetic factors are accountable, in part, for differences in alcohol metabolism and increase the risk of an individual's becoming an alcoholic. Other factors contributing to the development of alcoholism include high levels of **stress** and turmoil or **pain**, and having drinking friends, drinking partners, and enablers—people who facilitate a drinker's habits and denial mechanisms. Ample advertising that makes drinking appear to be sexy or the basis of a good time also contributes. For example, numerous televised sporting events are sponsored heavily by alcohol-related companies.

One of the classic symptoms of alcoholism is denial of a problem with alcohol. An addicted person, under the influence of the addictive substance, is physically and psychologically motivated to perpetuate the addiction. Therefore, intervention often starts when loved ones, recognizing the signs and symptoms, bring attention to the problem and call for help. Occasionally, an intervention requires a whole family unit and outside assistance.

Signs and symptoms of alcohol dependence and abuse may include the following:

- not remembering conversations or commitments
- losing interest in activities that were once pleasurable
- ritualized drinking, before, with, and after dinner and being upset if the pattern is interrupted
- becoming irritable as the so-called happy hour approaches, especially if alcohol is not available
- drinking alone or secretly
- hiding alcohol in unusual places
- ordering doubles, drinking quickly, and drinking to intentionally become drunk
- focusing attention on the source of one's next drink
- unstable relationships, financial, legal, and employment difficulties

Physical symptoms of alcoholism can be divided into two major categories: symptoms of acute alcohol use and symptoms of long-term alcohol use.

Immediate (acute) effects of alcohol use

Although the initial reaction to alcohol may be stimulatory, ultimately alcohol exerts a depressive, uninhibiting effect on the brain. The blood-brain barrier does not prevent alcohol from entering the brain, so the brain alcohol level quickly becomes equivalent to the blood alcohol level. Alcohol's depressive effects result in impaired thinking, feeling, and judgment; short term **memory loss**; muscle weakness; difficulty in walking; poor balance; slurred speech; and generally poor coordination (accounting for the increased likelihood of injury and alcohol-related injury statistics). At higher alcohol levels, a person's breathing and heart rate slows. **Vomiting** may occur, with a high risk of vomitus aspiration (inhaling vomit into the lungs), and may result in further complications, including

pneumonia. Still higher alcohol levels may result in coma and death.

Effects of long-term (chronic) alcoholism

Alcohol is considered a lethal poison, requiring continuous **detoxification** by the liver. As drinking continues and alcohol overwhelms the liver's ability to detoxify, long-term consequences to health occur, affecting virtually every organ system of the body.

NERVOUS SYSTEM. Experts estimate that 30–40% of all men in their teens and twenties have experienced alcoholic blackout (loss of consciousness) as a result of drinking a large quantity of alcohol. In an alcoholic blackout, all memory of time and behavior surrounding the episode of drinking is lost. Alcohol causes sleep disturbances, thus affecting overall sleep quality. Numbness and tingling may occur in the arms and legs. Two conditions that may occur either together or separately are Wernicke's and Korsakoff's syndromes. Both are due to the depleted **thiamine** levels found in alcoholics. Wernicke's syndrome results in disordered eye movements, very poor balance, and difficulty walking, whereas Korsakoff's syndrome severely affects one's memory, preventing new learning from taking place.

GASTROINTESTINAL SYSTEM. Alcohol causes a loosening of the muscular ring (the cardiac sphincter) that prevents the stomach's contents from reentering the esophagus. As a result, acid from the stomach flows upward into the esophagus, burning those tissues and causing pain and bleeding, or gastro-esophageal reflux disease (GERD). Inflammation of the stomach can also result in bleeding and pain as well as a decreased desire to eat. A major cause of severe, uncontrollable bleeding (hemorrhage) in an alcoholic is the development in the esophagus of enlarged (dilated) blood vessels, which are called esophageal varices (**varicose veins** of the esophagus). These varices actually develop in response to the toxic effect of alcohol on the liver and are extremely prone to bursting and hemorrhage.

A malnourished state arises from the loss of appetite for food—due to caloric substitution of alcohol and its effects on blood sugar levels—and interference with the absorption of nutrients throughout the intestinal tract. Inflammation of the pancreas (**pancreatitis**) is a serious and painful problem in alcoholics that disrupts carbohydrate and fat digestion and increases the risk of **insulin resistance**, weight gain, hyperlipidemia, diabetes, and pancreatic **cancer**. **Diarrhea** is also a common symptom of chronic alcohol use, due to alcohol's effect on the pancreas.

LIVER. Because alcohol is broken down (metabolized) within the liver, that organ is severely affected by constant levels of alcohol. Alcohol interferes with the large number of important chemical processes that occur in the liver. As alcohol converts to blood sugar, which in turn converts to blood fat, the liver begins to enlarge, filling with fat, a condition called fatty liver. Cirrhosis, a potentially deadly complication, develops when fibrous tissue, while trying to support the extra burden placed on the liver by the accumulation of fat and liver cell weakness, interferes with the liver's normal structure and function. The liver may also become inflamed, a condition called hepatitis, producing **jaundice**, **fatigue**, and elevated liver enzymes indicative of liver cell death and destruction. Because of the liver's important role in digestion, metabolism, and immunity, damage to the liver takes a serious toll throughout the body.

BLOOD. Alcohol can cause changes to any of the types of blood cells. Red blood cells become abnormally large. White blood cells (important for fighting infections) decrease in number, resulting in a weakened immune system. This condition places alcoholics at increased risk for infections and is thought to account in part for an alcoholic's increased risk of cancer (ten times greater than normal). Platelets and blood clotting factors are affected, causing an increased risk of bleeding and hemorrhage, especially when coupled with vascular weaknesses, varices, or aneurism.

HEART AND CIRCULATORY SYSTEM. Small amounts of alcohol cause a drop in blood pressure, but increased use begins to raise blood pressure dangerously. Increased blood pressure negatively affects the kidneys. While some studies demonstrate that one to two alcoholic drinks per night improves **heart disease** risk values, higher amounts and chronic intake produce high levels of circulating fats, which increases the risk of heart disease. Heavy drinking results in an enlarged heart, coronary arterial disease (CAD), peripheral vascular disease, weakening of the heart muscle, abnormal heart rhythms, a risk of **blood clots** forming within the chambers of the heart, and a greatly increased risk of **stroke**. Strokes result when a blood clot from the heart enters the circulatory system, goes to the brain, and blocks a blood vessel. Stroke may also result from a hemorrhage within the brain, as weakened vessel walls give way and platelet deficient blood pours through.

REPRODUCTIVE SYSTEM. Heavy drinking has a negative effect on fertility in both men and women, decreasing testicular and ovarian size, interfering with sperm and egg production and viability, disrupting menstrual cycles, and reducing libido. When **pregnancy**

is achieved reduced quality of sperm and egg may significantly and permanently affect the quality of life, pre-, peri-, and postnatally, of the child. A child born to a woman who abuses alcohol is at risk of being born with fetal alcohol syndrome, which causes distinctive cranial and facial defects, including a smaller head size, shortening of the eyelids, and a lowered IQ. Developmental disabilities, heart defects, and behavioral problems are also more likely.

Diagnosis

The DSM-IV divides substance abuse into specific criteria that can be of aid in diagnosing a substance abuse problem. These criteria are paraphrased here to relate to alcoholism. At least one of the following must have manifested itself within a 12-month period to qualify for a diagnosis of alcohol abuse:

- Recurrent alcohol use that results in failure to fulfill major role obligations at work, school, or home. Specific examples are repeated absences from work or poor work performance related to alcohol use; alcohol-related absences, suspensions, or expulsions from school; and neglect of children or household.
- Recurrent alcohol use in situations in which it is physically hazardous. Specific examples are driving an automobile and operating a machine while impaired by alcohol use.
- Recurrent alcohol-related legal problems, such as arrests for alcohol-related disorderly conduct.
- Continued alcohol use despite having persistent and recurring social or interpersonal problems caused or exacerbated by the effects of the alcohol. Examples include arguments with a spouse about the consequences of intoxication and alcohol-related physical fights.

A diagnosis of alcohol dependence requires habitual, long-term tolerance for and heavy consumption of alcohol as well as the development of symptoms of withdrawal when the amount of alcohol in the system is substantially lowered or completely stopped. Once a pattern of compulsive alcohol use has developed, alcohol-dependent people may devote large portions of their time to the procurement and drinking of alcohol.

A significant number of illnesses categorized in DSM-IV as *alcohol-induced disorders* has come into being as a result of alcohol abuse and dependence, illustrating the negative impacts of alcoholism on physical and mental health. Among the psychiatric diagnoses that are included in alcohol-induced disorders are:

- dementia
- amnestic disorder
- psychotic disorder
- mood disorder
- anxiety disorder
- sexual dysfunction
- sleep disorder

As previously mentioned, due to the strong element of denial and a need, usually, for intervention, diagnosis is often brought about because family members call an alcoholic's difficulties to the attention of a physician. A physician may become suspicious when a patient has repeated injuries or begins to experience medical problems that are related to the use of alcohol. In fact, some estimates suggest that about 20% of a physician's patients are alcoholics, a percentage that is higher than the general population and lower than the increased risk to health posed by alcoholism. In other words, alcohol-related illness may prompt alcoholics to see medical counsel, but their illness may not be recognized as alcohol-related until the disease toll is quite advanced.

Questionnaires that try to determine what aspects of a person's life may be affected by use of alcohol can be an effective diagnostic aid. Determining the exact quantity of alcohol that individuals drink is much less important than determining how their drinking affects health, relationships, jobs, educational goals, and family life. In fact, because the metabolism of alcohol (how the body breaks down and processes alcohol) is so individual, the quantity of alcohol consumed is not part of the criteria list for diagnosing either alcohol dependence or alcohol abuse.

One very simple tool for beginning the diagnosis of alcoholism is called the CAGE questionnaire. It consists of four questions, with the first letter of each key word spelling out the word CAGE:

- Have you ever tried to Cut down on your drinking?
- Have you ever been Annoyed by anyone's comments about your drinking?
- Have you ever felt Guilty about your drinking?
- Do you ever need an Eye-opener (a morning drink of alcohol) to start the day?

Other, longer lists of questions may help determine the severity and effects of a person's alcohol use. A thorough physical examination may reveal the physical signs suggestive of alcoholism, such as an enlarged liver, a visible network of enlarged veins just under the skin around the navel (called *caput medusae* or herniated umbilicus), fluid in the abdomen (ascites), yellowish tone to the skin (jaundice), decreased testicular size or gynecomastia (breast enlargement in men), **osteoporosis**, physical deterioration, loss of teeth, evidence of old injuries, and poor

nutritional status. Diagnostic testing may include cardiovascular, CNS, GI, general chemistry, and liver function tests (LFTs) that reveal poor stress test performance, arterial disease, congestive heart failure, palsy, loss of coordination, reflux disease or history of stomach ulcer, **irritable bowel syndrome**, an increased red blood cell size and anemia, abnormal white blood cells (cells responsible for fighting infection) counts or characteristics, abnormal platelets (particles responsible for clotting), and increased liver enzymes. Given the genetic risk factors for alcoholism, determinations of familiar alcoholism related illness and death may be additive.

Treatment

Alternative treatments can be a helpful adjunct for the alcoholic patient once the medical danger of withdrawal has passed. Because many alcoholics have very stressful lives (because of, or leading to, the alcoholism), many of the treatments for alcoholism involve dealing with and relieving stress. These include massage, **meditation**, and **hypnotherapy**. A list from the Mayo Clinic also includes **acupuncture** (may reduce craving, **anxiety**, depression, **tremor**, fatigue, and the symptoms of withdrawal), **biofeedback** (monitoring of internal systems for stress reduction), **behavioral therapy**, motivational enhancement therapy (problem acknowledgment), and aversion therapy (may involve simultaneous use of medications the cause **nausea** or vomiting with relapse).

Nutritionally oriented practitioners may be consulted to address the malnutrition associated with long-term alcohol use. Careful and remedial attention toward a healthier diet and lifestyle, including use of nutritional supplements, such as vitamins A, B complex, and C; certain fatty acids; **amino acids**; **zinc**; **magnesium**; and selenium—supplements that support antioxidant, detoxifying, restorative and corrective deficiencies—may further enhance recovery and lessen the likelihood of relapse.

Herbal treatments include **milk thistle** (*Silybum marianum*), which is thought to protect the liver against damage. Other herbs are thought to be helpful for the patient suffering through withdrawal. Some of these include the antidepressive attributes of **lavender** (*Lavandula officinalis*); the calming and restorative nerve tonifying effects of **skullcap** (*Scutellaria lateriflora*), **chamomile** (*Matricaria recutita*), and **valerian** (*Valeriana officinalis*); the stimulating and GI helpful effects of **peppermint** (*Mentha piperita*); and the bladder aid, **yarrow** (*Achillea millefolium*).

Allopathic treatment

Allopathic treatment of alcoholism has two parts. The first phase is the treatment of acute effects of alcoholism, called detoxification. The second phase involves learning how to live with the disease of alcoholism.

Withdrawal

Detoxification, or withdrawal, involves helping individuals to rid their bodies of alcohol as well as the harmful physical effects of the alcohol. Because their bodies have become accustomed to alcohol, individuals need care and monitoring during withdrawal. Withdrawal is an individual experience, depending on the severity of the alcoholism as measured by the quantity of alcohol ingested daily and the length of time individuals have been drinking (the adaptation factor). Withdrawal symptoms can range from mild to life threatening. Mild withdrawal symptoms include nausea, achiness, diarrhea, difficulty sleeping, excessive sweating, anxiety, and trembling. This phase may last from three to seven days. More severe effects of withdrawal may include hallucinations (in which individuals see, hear, or feel something that is not real), seizures, an unbearable craving for more alcohol, confusion, **fever**, fast heart rate, high blood pressure, and delirium (a fluctuating level of consciousness). Patients at highest risk for the most severe symptoms of withdrawal (referred to as delirium tremens or DTs) are those with other medical problems, such as malnutrition, liver disease, or Wernicke's syndrome. Delirium tremens usually begins about three to five days after the patient's last drink and may last a number of days. Withdrawal usually progresses from the more mild symptoms to the more severe ones.

Patients going through only mild withdrawal, monitored carefully to make sure that more severe symptoms do not develop, may not require medication; however, fluids are encouraged to facilitate detoxifying the person's system. Patients suffering more severe effects of withdrawal may need to be given sedative medications, benzodiazepines such as Valium or Librium, to relieve discomfort and to avoid the potentially life-threatening complications of high blood pressure, fast heart rate, and seizures. Because of the patient's nausea, fluids may need to be given intravenously (through a vein), along with some necessary sugars and salts (electrolyte pushes). It is crucial that thiamine be included in the fluids because it is usually quite low in alcoholic patients, and deficiency of thiamine is responsible for the Wernicke and Korsakoff syndromes. In-patient treatment is usually

short-term (three to seven days), though longer rehabilitation programs lasting weeks or even months are sometimes needed. Any treatment is usually followed by longer-term outpatient treatment.

Recovery

After the physical problems associated with alcohol withdrawal have been treated, the more difficult task begins: helping individuals recognize the nature and severity of their illness. This is done on both an inpatient and outpatient basis. Alcoholism is a disease of denial; as members of Alcoholics Anonymous (AA) put it, it is "the only disease that keeps telling you that you do not have a disease." Alcoholics can be made aware of their condition through what is called an intervention, a meeting with family and/or significant people who describe for the alcoholic the symptoms of alcoholism that they have witnessed and how these symptoms have affected them. This is important because alcoholics who are actively drinking are often not aware of what they do, nor do they remember later what they have done. (Interventions are sometimes done before the problem becomes serious enough to require detoxification from alcohol.) Essential to recovery is the awareness of powerlessness over the disease, acceptance of having the disease, and abstinence from the substance that perpetuates the disease.

There is no cure for alcoholism. Sessions led by peers, such as AA meetings, are often part of inpatient hospital treatment. AA meetings, in which recovering alcoholics meet regularly and provide support for each other's recovery, are considered among the best methods of preventing a return to drinking (relapse). The AA program is based on a twelve-step program, involving recognizing the destructive power that alcohol has held over the alcoholic's life, looking to a Higher Power for help in overcoming the problem, reflecting on the ways in which the use of alcohol has hurt others, and if possible, making amends to those people. The final step involves carrying the message of hope and recovery to other sick and suffering alcoholics. The Serenity Prayer becomes an ally: "God grant me the strength to accept the things I cannot change, the courage to change the things I can change, and the wisdom to know the difference."

The best programs incorporate the alcoholic's family or loved ones in the therapy because loved ones have undoubtedly been severely affected by the drinking. Many therapists believe that families, in an effort to deal with the alcoholic's drinking problem, develop patterns of behavior that unwittingly support or enable the patient's drinking. This situation is referred to as co-dependency. The twelve-step programs of Al Anon and Adult Children of Alcoholics can be successful in helping the families or loved ones of alcoholics.

There are also medications that may help an alcoholic avoid returning to drinking. These have been used with variable success. Disulfiram (Antabuse) is a drug that, when mixed with alcohol, causes a very unpleasant reaction which includes nausea and vomiting, diarrhea, and trembling. Naltrexone (a drug that blocks a narcotic high and may reduce the urge to drink) and acamprosate seem to be helpful in limiting the effects of a relapse. Naltrexone, found to produce liver damaging side effects, may be an option used only as a last resort. None of these medications have been found to be helpful unless individuals are also willing to work hard to change their behavior.

Expected results

There is no cure for alcoholism. Recovery from alcoholism is a lifelong process. In fact, people who have suffered from alcoholism are encouraged to refer to themselves ever after as recovering alcoholics, never as recovered alcoholics. Alcoholism can only be arrested—by abstaining from the drug, alcohol. The potential for relapse (returning to illness) is always there, and it must be acknowledged and respected. Statistics suggest that among middle-class alcoholics in stable financial and family situations who have undergone treatment, 60% or more can successfully stop drinking for at least a year, and many for a lifetime.

Prevention

Prevention is primarily related to education and early intervention. In a culture in which alcohol is so widely accepted and used, education about the dangers of this drug is vitally important, even in early childhood. Since alcohol is one of the easiest and cheapest drugs to obtain and one commonly used by teens, the first instance of intoxication (drunkenness) with alcohol usually occurs during the teenage years. It is particularly important that teenagers who are at high risk for alcoholism be made aware of this danger. Those at high risk include those with a family history of alcoholism, an early or frequent use of alcohol, a tendency to drink to drunkenness, alcohol use that interferes with schoolwork, a poor family environment, or a history of domestic violence. Peers are often the best people to provide this education, and groups such as SADD (Students Against Drunk Driving, a Marlborough, Massachusetts-based organization), appear effective.

KEY TERMS

Blood-brain barrier—A membrane that lines the blood vessels in the brain and prevents many damaging substances from reaching the brain. Certain small molecules are able to cross the barrier, including water, oxygen, carbon dioxide, and alcohol.

Dependence—A state in which a person requires a steady amount of a particular drug in order to avoid experiencing symptoms of withdrawal.

Detoxification—The phase of treatment during which patients stop drinking and are monitored and cared for while they experience withdrawal from alcohol.

Relapse—A return to a disease state after recovery appeared to be occurring. In alcoholism, relapse refers to a patient beginning to drink alcohol again after a period of abstenance.

Tolerance—A phenomenon whereby a drug user becomes physically accustomed to a particular quantity of alcohol (or dosage of a drug) and requires ever-increasing quantities in order to obtain the same effects.

Withdrawal—Those signs and symptoms experienced by individuals who have become physically dependent on a drug, experienced upon decreasing the drug's dosage or discontinuing its use.

Courts and schools sometimes provide education through local substance abuse programs, as well. Setting a good example, developing and practicing communication skills with youngsters, and having frank discussions about the consequences of drinking, are all encouraged as ways to prevent alcoholism-related problems. Developing alternative coping skills to life's problems is also essential, as is encouraging an objective perspective on the pervasive advertising that deceptively promotes alcohol's health-reducing glamour.

Resources

BOOKS

Baye, Douglas R. *New Research on Alcoholism*. Hauppauge, NY: Nova Science, 2007.

Maltzman, Irving M. *Alcoholism: Its Treatments and Mis treatments*. Singapore: World Scientific, 2008.

Prentiss, Chris. *The Alcoholism and Addiction Cure: A Holistic Approach to Total Recovery*. Malibu, CA: Power Press, 2007.

Wyborny, Sheila. *Alcoholism*. Farmington Hills, MI: Lucent Books, 2007.

PERIODICALS

Amodeo, Maryann, et al. "Coping with Stressful Events: Influence of Parental Alcoholism and Race in a Com munity Sample of Women." *Health and Social Work* (November 2007): 247 257.

Cherpitel, Cheryl. "Alcohol and Injuries: A Review of International Emergency Room Studies Since 1995." *Drug and Alcohol Review* (March 2007): 201 214.

Knop, J., et al. "Paternal Alcoholism Predicts the Occur rence but Not the Remission of Alcoholic Drinking: A 40 year Follow up." *Acta Psychiatrica Scandinavica* (November 2007): 386 393.

Lawrence, Andrew. "Therapeutics for Alcoholism: What's the Future?" *Drug and Alcohol Review* (January 2007): 3 8.

OTHER

"Alcoholism." *MayoClinic.com*. http://www.mayoclinic.com/print/alcoholism/DS00340/DSECTION all& METHOD print (February 9, 2008).

"Alcoholism." *Medline Plus*. National Library of Medicine. http://www.nlm.nih.gov/medlineplus/alcoholism.html (February 9, 2008).

Thompson, Warren. "Alcoholism." *eMedicine*. http://www.emedicine.com/med/topic98.htm (February 9, 2008).

ORGANIZATIONS

Alcoholics Anonymous, AA World Services, Inc, PO Box 459, New York, NY, 10163, (212) 870 3400, http://www.alcoholics anonymous.org/.

Substance Abuse & Mental Health Services Administration, 1 Choke Cherry Road, Rockville, MD, 20857, http://www.samhsa.gov/.

Katherine E. Nelson, N.D.
David Edward Newton, Ed.D.

Alexander technique

Definition

The Alexander technique is a somatic method for improving physical and mental functioning. Excessive tension, which Frederick Alexander, the originator, recognized as both physical and mental, restricts movement and creates pressure in the joints, the spine, the breathing mechanism, and other organs. The goal of the technique is to restore freedom and expression to the body and clear thinking to the mind.

Origins

Frederick Matthias Alexander was born in 1869 in Tasmania, Australia. He became an actor and Shakespearean reciter, and early in his career he began to

suffer from strain on his vocal chords. He sought medical attention for chronic hoarseness, but after treatment with a recommended prescription and extensive periods of rest, his problem persisted.

Alexander realized that his hoarseness began about an hour into a dramatic performance and reasoned that it was something he did in the process of reciting that caused him to lose his voice. Returning to his medical doctor, Alexander told him of his observation. When the doctor admitted that he did not know what Alexander was doing to injure his vocal chords, Alexander decided to try and find out for himself.

Thus began a decade of self-observation and discovery. Using as many as three mirrors to observe himself in the act of reciting, normal speaking, and later standing, walking, and sitting, Alexander managed to improve his coordination and to overcome his vocal problems. One of his most startling discoveries was that in order to change the way he used his body he had to change the way he was thinking, redirecting his thoughts in such a way that he did not produce unnecessary tension when he attempted speech or movement. After making this discovery at the end of the nineteenth century, Alexander became a pioneer in body-mind medicine.

At first, performers and dancers sought guidance from Alexander to overcome physical complaints and to improve the expression and spontaneity of their performances. Soon a great number of people sought help from his teaching for a variety of physical and mental disorders.

Benefits

Because the Alexander technique helps students improve overall functioning, both mental and physical, it offers a wide range of benefits. Nikolaas Tinbergen, in his 1973 Nobel lecture, hailed the "striking improvements in such diverse things as high blood pressure, breathing, depth of sleep, overall cheerfulness and mental alertness, resilience against outside pressures, and the refined skill of playing a musical instrument." He went on to quote a list of other conditions helped by the Alexander technique: "rheumatism, including various forms of arthritis, then respiratory troubles, and even potentially lethal **asthma**; following in their wake, circulation defects, which may lead to high blood pressure and also to some dangerous heart conditions; gastrointestinal disorders of many types, various gynecological conditions, sexual failures, migraines and depressive states."

Literature in the 1980s and 1990s went on to include improvements in back **pain**, chronic pain, postural problems, repetitive strain injury, benefits during **pregnancy** and **childbirth**, help in applying physical therapy and rehabilitative exercises, improvements in strain caused by computer use, improvements in the posture and performance of school children, and improvements in vocal and dramatic performance among the benefits offered by the technique.

Description

The Alexander technique is primarily taught one-on-one in private lessons. Introductory workshops or workshops for special applications of the technique (e.g., workshops for musicians) are also common. Private lessons range from a half-hour to an hour in length, and are taught in a series. The number of lessons varies according to the severity of the student's difficulties with coordination or to the extent of the student's interest in pursuing the improvements made possible by continued study. The cost of lessons ranges from $40-80 per hour. Insurance coverage is not widely available, but discounts are available for participants in some complementary care insurance plans. Pre-tax Flexible Spending Accounts for health care cover Alexander technique lessons if they are prescribed by a physician.

In lessons, teachers guide students through simple movements (while students are dressed in comfortable clothing) and use their hands to help students identify and stop destructive patterns of tension. Tensing arises from mental processes as well as physical, so discussions of personal reactions or behavior are likely to arise in the course of a lesson.

The technique helps students move with ease and improved coordination. At the beginning of a movement (the lessons are a series of movements), most people pull back their heads, raise their shoulders toward their ears, over-arch their lower backs, tighten their legs, and otherwise produce excessive tension in their bodies. Alexander referred to this as misuse of the body.

At any point in a movement, proper use can be established. If the neck muscles are not over-tensed, the head will carry slightly forward of the spine, simply because it is heavier in the front. When the head is out of balance in the forward direction, it sets off a series of stretch reflexes in the extensor muscles of the back. It is skillful use of these reflexes, along with reflex activity in the feet and legs, the arms and hands, the breathing mechanism, and other parts of the body, that lessons in the technique aim to develop.

Alexander found that optimal functioning of the body was very hard to maintain, even for the short

FREDERICK MATTHIAS ALEXANDER (1869–1955)

Frederick Matthias (F.M.) Alexander was born in Aus tralia where he began a career as a young actor. While leading the theater life, he developed chronic laryngitis. While tragic for a stage career, his lingering ailment would lead to his discovery of the Alexander Technique, which would ultimately help people around the world rid their bodies of tension and stress.

At the age of 19, Alexander became frustrated with a medical practitioner's inability to treat his hoarseness and was determined to find the cause of his malady. Although lacking any medical training, Alexander began to metic ulously observe his manner of coordination while speaking and reciting with the use of strategically placed mirrors. After following this method of study for 10 years, Alexander concluded that modern society was causing individuals to severely misuse the human system of locomotion, thus resulting in the dysfunction of other sys tems of the body. His experiments and technique laid the groundwork in the early 1900s for good habits of coordi nation and the proper use of the neuromuscular system.

Alexander left Australia for London in 1904. The pop ularity of the Alexander Technique led him to work with intellectuals such as George Bernard Shaw and Aldous Huxley. Alexander also taught extensively throughout the United States.

The Alexander Technique is taught in 26 countries, and there are nine affiliated societies overseeing a profes sion of approximately 2,000 teachers of the technique. Alexander's technique continues to have a profound impact on the training of musicians, actors, and dancers from around the world.

period of time it took to complete a single movement. People, especially adults, have very strong tension habits associated with movement. Chronic misuse of the muscles is common. It may be caused by slouching in front of televisions or video monitors, too much sitting or driving and too little walking, or by tension associated with past traumas and injuries. Stiffening the neck after a whiplash injury or favoring a broken or sprained leg long after it has healed are examples of habitual tension caused by injury.

The first thing a teacher of the Alexander technique does is to increase a student's sensory awareness of this excessive habitual tension, particularly that in the neck and spine. Next the student is taught to inhibit the tension. If the student prepares to sit down, for example, he will tense his muscles in his habitual way. If he is asked to put aside the intention to sit and instead to free his neck and allow less constriction in his muscles, he can begin to change his tense habitual response to sitting.

By leaving the head resting on the spine in its natural free balance, by keeping eyes open and focused, not held in a tense stare, by allowing the shoulders to release, the knees to unlock and the back to lengthen and widen, a student greatly reduces strain. In Alexander lessons students learn to direct themselves this way in activity and become skilled in fluid, coordinated movement.

Side effects

The focus of the Alexander technique is educational. Teachers use their hands simply to gently guide students in movement. Therefore, both contraindications and potential physiological side effects are kept to a minimum. No forceful treatment of soft tissue or bony structure is attempted, so damage to tissues, even in the case of errors in teaching, is unlikely.

As students' sensory awareness develops in the course of Alexander lessons, they become more acutely aware of chronic tension patterns. As students learn to release excessive tension in their muscles and to sustain this release in daily activity, they may experience tightness or soreness in the connective tissue. This is caused by the connective tissue adapting to the lengthened and released muscles and the expanded range of movement in the joints.

Occasionally students may get light-headed during a lesson as contracted muscles release and effect the circulatory or respiratory functioning.

Forceful contraction of muscles and rigid postures often indicate suppression of emotion. As muscles release during or after an Alexander lesson, students may experience strong surges of emotion or sudden changes in mood. In some cases, somatic memories surface, bringing to consciousness past injury or trauma. This can cause extreme **anxiety**, and referrals may be made by the teacher for counseling.

Research and general acceptance

Alexander became well known among the intellectual, artistic, and medical communities in London, England during the first half of the twentieth century. Among Alexander's supporters were John Dewey,

KEY TERMS

Direction—Bringing about the free balance of the head on the spine and the resulting release of the erector muscles of the back and legs which establish improved coordination.

Habit—Referring to the particular set of physical and mental tensions present in any individual.

Inhibition—Referring to the moment in an Alexander lesson when the student refrains from beginning a movement in order to avoid tensing of the muscles.

Sensory awareness—Bringing attention to the sensations of tension and/or release in the muscles.

Aldous Huxley, Bernard Shaw, and renowned scientists Raymond Dart, G.E. Coghill, Charles Sherrington, and Nikolaas Tinbergen.

Researchers continue to study the effects and applications of the technique in the fields of education, preventive medicine, and rehabilitation. The Alexander technique has proven an effective treatment for reducing **stress**, for improving posture and performance in schoolchildren, for relieving chronic pain, and for improving psychological functioning. The technique has been found to be as effective as beta-blocker medications in controlling stress responses in professional musicians, to enhance respiratory function in normal adults, and to mediate the effects of **scoliosis** in adolescents and adults.

Training and certification

Before his death in 1955, Alexander formed the Society for Teachers of the Alexander Technique (STAT) in London, England. The Society is responsible for upholding the standards for teachers of the technique. In the late 1980s, due to rapid growth of the Alexander teaching profession, STAT authorized replication of its certification body in many countries worldwide.

The American Society for the Alexander Technique (AmSAT) oversees the profession in the United States. Teachers are board certified according to STAT standards. They must receive 1,600 hours of training over three years at an AmSAT approved training program. Alexander Technique International (ATI), a second organization for teachers in the United States, has varied standards for teacher certification.

Resources

BOOKS

Caplan, Deborah. *Back Trouble A New Approach to Prevention and Recovery Based on the Alexander Technique*. Triad Communications: 1987.

Dimon, Theodore. *THE UNDIVIDED SELF: Alexander Technique and the Control of Stress*. North Atlantic Books: 1999.

Jones, Frank Pierce. *Freedom To Change The Development and Science of the Alexander Technique*. Mouritz: 1997, imported (First published 1976 as *Body Awareness in Action*.)

PERIODICALS

Stern, Judith C. "The Alexander Technique: An Approach to Pain Control." *Lifeline* (Summer 1992).

Tinbergen, Nikolaas. "Ethology and Stress Diseases." *England Science* 185: (1974) 20 27.

OTHER

Alexander Technique Resource Guide. (includes list of teachers) AmSAT Books, (800) 473 0620 or (413) 584 2359.

Nielsen, Michael. "A Study of Stress Amongst Professional Musicians." *STAT Books* London, 1994.

Reiser, Samuel. "Stress Reduction and Optimal Psychological Functioning." Lecture given at Sixth International Montreaus Congress on Stress, 1994.

ORGANIZATIONS

Alexander Technique International, 1692 Massachusetts Ave., 3rd Floor, Cambridge, MA, 02138, (888) 668 8996, 617 497 2615, ati usa@ati net.com, www.ati net.com.

American Society for the Alexander Technique, P.O. Box 60008, Florence, MA, 01062, (413) 584 2359, (800) 473 0620, 413 584 3097, info@amsat.ws, www.alexandertech.org.

Sandra Bain Cushman

Alfalfa

Description

Alfalfa is the plant *Medicago sativa*. There are many subspecies. It is a perennial plant growing up to 30 in (0.75 m) in height in a wide range of soil conditions. Its small flowers range from yellow to purple. Alfalfa is probably native to the area around the Mediterranean Sea, but it is extensively cultivated as fodder for livestock in all temperate climates.

Alfalfa is a member of the legume family. It has the ability to make nutrients available to other plants both through its very long, deep (6–16 ft [2–5 m]) root

Alfalfa. *(© Arco Images / Alamy)*

system, and because it hosts beneficial nitrogen-fixing bacteria. For these reasons it is often grown as a soil improver or "green manure." The medicinal parts of alfalfa are the whole plant and the seeds. It is used both in Western and **traditional Chinese medicine**. In Chinese it is called *zi mu*. Other names for alfalfa include buffalo grass, buffalo herb, Chilean clover, purple medick, purple medicle, and lucerne.

General use

Alfalfa has been used for thousands of years in many parts of the world as a source of food for people and livestock and as a medicinal herb. It is probably more useful as a source of easily accessible nutrients than as a medicinal herb. Alfalfa is an excellent source of most vitamins, including vitamins A, D, E, and K. **Vitamin K** is critical in blood clotting, so alfalfa may have some use in improving clotting. It also contains trace minerals such as **calcium**, **magnesium**, **iron**, phosphorous, and **potassium**. Alfalfa is also higher in protein than many other plant foods. This abundance of nutrients has made alfalfa a popular tonic for convalescents when brewed into tea.

In addition to using the seeds and leaves as food, alfalfa has a long history of folk use in Europe as a diuretic or "water pill." It is also said that alfalfa can lower **cholesterol**. Alfalfa is used as to treat arthritis, diabetes, digestive problems, weight loss, ulcers, kidney and bladder problems, prostate conditions, **asthma**, and **hay fever**. Alfalfa is also said to be estrogenic (estrogen-like).

Alfalfa is not native to the United States and did not arrive until around 1850. However, once introduced, it spread rapidly and was adapted by Native Americans as a food source for both humans and animals. The seeds were often ground and used as a flour to make mush. The leaves were eaten as vegetable. The main medical use for alfalfa in the United States was as a nutritious tea or tonic.

In China, alfalfa and a closely related species tooth-bur clover, *Medicago hispida* or *nan mu xu* have been used since the sixth century. Alfalfa is a minor herb in traditional Chinese medicine. It is considered to be bitter in taste and have a neutral nature. Traditional Chinese healers use alfalfa leaves to cleanse the digestive system and to rid the bladder of stones.

The root of alfalfa is used in Chinese medicine to reduce **fever**, improve urine flow, and treat **jaundice**, **kidney stones**, and **night blindness**. Contrary to the Western belief that alfalfa will aid in weight gain, Chinese herbalists believe that extended use of alfalfa will cause weight loss.

Alfalfa contains hundreds of biologically active compounds, making it difficult to analyze and to ascribe healing properties to any particular component. In addition to the nutrients mentioned alfalfa contains two to three percent saponin glycosides. In test tube and animal studies, saponin glycosides have been shown to lower cholesterol, but there is no evidence that this cholesterol-lowering effect occurs in humans. In addition, saponin glycosides are known to cause red blood cells to break open (hemolysis) and to interfere with the body's utilization of **vitamin E**.

No modern scientific evidence exists that alfalfa increases urine output, effectively treats diabetes, aids kidney or bladder disorders, improves arthritis, reduces ulcers, or treats respiratory problems. Similarly, there is no scientific evidence that alfalfa either stimulates the appetite or promotes weight loss. There is no evidence that alfalfa has any estrogenic effect on **menstruation**. There is evidence, however, that although for most people alfalfa is harmless, for some people it can be dangerous to use.

Preparations

Although alfalfa is available as fresh or dried leaf, it is most often taken as a capsule of powdered alfalfa or as a tablet. When dried leaves are used, steeping one ounce of dried leaves in one pint of water for up to 20 minutes makes a tea. Two cups of this tea are drunk daily.

In traditional Chinese medicine, juice squeezed from fresh alfalfa is used to treat kidney and bladder stones. To treat fluid retention, alfalfa leaves are added to a soup along with bean curd and lard.

KEY TERMS

Diuretic—Any substance that increases the production of urine.

Estrogenic—Having properties that mimic the functions of the female hormone, estrogen.

Precautions

Although alfalfa is harmless to most people when taken in the recommended quantities, people with the autoimmune disease **systemic lupus erythematosus** (SLE) should not take any form of alfalfa. In a well-documented study, people with latent SLE reactivated their symptoms by using alfalfa. In another study, monkeys fed alfalfa sprouts and seeds developed new cases of SLE. People with other autoimmune diseases should stay away from alfalfa as a precautionary measure. In addition, some allergic reactions have been reported to alfalfa tablets contaminated with other substances.

Side effects

No side effects are reported in healthy people using alfalfa in the recommended doses.

Interactions

There are no studies of the interactions of alfalfa and traditional pharmaceuticals.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. London: Dorling Kindersley, 1996. (*Natural health encyclopedia of herbal medicine*. [2000] 2nd Ed.)

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1999.

Tish Davidson

Alisma

Description

Alisma, a member of the plant family Alismataceae, is a herb commonly used in **traditional Chinese medicine** (TCM). The medicinal part of the plant is the dried root of *Alisma plantago-aquatica*. Alisma is also called mad-dog weed, water **plantain**, American water plantain, or northern water plantain. It belongs to a different species from the edible plantain or cooking banana of the Caribbean or the plantain that produces **psyllium** seed. The Chinese name for alisma is *ze xie*.

Alisma natans *(© The Natural History Museum / Alamy)*

Alisma is a perennial plant that grows aggressively in shallow water and boggy spots in parts of Europe, North America, and northern China. Its leaves take different shapes depending on whether the leaves grow above or in the water. The plant rarely reaches a height of more than 30 in (0.9 m). There are several subspecies of *Alisma plantago* found throughout the world, but their medicinal uses are the same.

General use

Alisma has been used for centuries in China. It is also used in North America and Europe. In the categories used by traditional Chinese medicine, which classifies herbs according to energy level (hot, warm,

cool, or cold) as well as taste, alisma is said to have a cold nature and a sweet, bland taste. It is used primarily to treat conditions of damp heat associated with the kidney, bladder, and urinary tract.

Alisma is a diuretic and is used to rid the body of excess water. It has mild and safe tonic qualities that especially affect the kidney and bladder. It is often combined with other herbs in general tonic formulas. It is used to treat **kidney stones**, pelvic **infections**, nephritis, and other urinary tract infections, as well as yellowish discharges from the vagina. Alisma is believed to have an antibacterial action that helps control infection. In China, alisma is used to help rid the body of phlegm, to reduce feelings of abdominal bloating, and to treat diabetes. The herb is also widely used in Japan.

Outside of China, alisma leaves are sometimes used medicinally. They can be applied externally to **bruises** and swellings, or taken internally to treat kidney and urinary tract inflammations. The roots are used for kidney and urinary tract disorders, as well as to lower blood pressure and to treat severe **diarrhea**. A minor homeopathic remedy can also be made from the root.

Modern scientific research shows that alisma does act as a mild diuretic. In several studies done in Japan, alisma extracts were shown to reduce artificially induced swelling in the paws of rats. Studies using human subjects have not been done, but test tube and animal studies do seem to indicate that there is a scientific basis for some of the traditional uses of alisma. There is also some indication that alisma does have a mild antibacterial effect, but again, evidence in humans is anecdotal and by observation rather than by controlled trials.

Preparations

Alisma roots are harvested before the plant blooms and is dried for future use. Fresh root is toxic. Heating or drying deactivates the poisonous compounds in the root. If the leaves are used, they must be boiled for a long time before using. Fresh leaves are also poisonous.

Alisma is an ingredient in many common Chinese preparations to improve kidney balance and general health. These include rehmannia eight and rehmannia six combination, lycium chrysanthemum and rehmannia combination, rehmannia and schizandra, rehmannia and **cornus**, rehmannia and magnetitum formula, immortal long life pill, **gentiana**, and hoeln five. An extract of alisma root is commercially available. Some herbalists indicate that a large dose is necessary for alisma to be completely effective when treating infections, or that it should be combined with other anti-infective herbs.

KEY TERMS

Diuretic—A medication or substance that increases the production of urine.

Precautions

Fresh alisma roots and leaves are poisonous. Dried roots or cooked leaves are safe, even in fairly large doses. However, the **kidney infections** that alisma is used to treat can be serious. Anyone who suspects that they have a kidney infection should see a medical practitioner.

Side effects

Some Chinese herbalists indicate that long-term use of alisma can irritate the intestines.

Interactions

In China and Japan, alisma is often taken together with antibiotics for kidney infections without any negative interactions. Since alisma is primarily an Asian herb, there is no body of information on how it might interact with most Western pharmaceuticals.

Resources

BOOKS

Molony, David. *Complete Guide to Chinese Herbal Medi cine*. New York: Berkeley Books, 1998.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1999.

Teegarden, Ron. *Radiant Health: The Ancient Wisdom of the Chinese Tonic Herbs*. New York: Warner Books, 1998.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine (AAAOM), P.O. Box 162340, Sacramento, CA, 95816, (916) 443 4770, (866) 455 7999, (916) 443 4766, www.aaaomonline.org.

Tish Davidson

Allergic rhinitis *see* **Hay fever**

Allergies

Definition

Allergies are abnormal reactions of the immune system that occur in response to otherwise harmless substances.

Description

Allergies are among the most common medical disorders. The American Academy of Allergy, **Asthma**, and Immunology estimates that more than 50 million Americans, or more than one in every six people, have some form of allergy, with similar proportions throughout much of the rest of the world. Allergy is the single largest reason for school absence and is a major source of lost productivity in the workplace.

An allergy is a type of immune reaction. Normally, the immune system responds to foreign bodies, such as pollen or bacteria, by producing specific proteins called antibodies that are capable of binding to identifying molecules (antigens) on the foreign body. This reaction between antibody and antigen sets off a series of reactions designed to protect the body from infection. Harmless, everyday substances can also trigger this same series of reactions. This condition is known as an allergic response, and the offending substance is called an allergen.

Allergens enter the body through four main routes: the airways, the skin, the gastrointestinal tract, and the circulatory system. The following list describes these pathways and their physiological effects:

- Airborne allergens cause the sneezing, runny nose, and itchy, bloodshot eyes of hay fever (allergic rhinitis). Airborne allergens can also affect the lining of the lungs, causing asthma, or conjunctiva of the eyes, causing conjunctivitis (pink eye).
- Allergens in food can cause itching and swelling of the lips and throat, cramps, and diarrhea. When absorbed into the bloodstream, they may cause hives or more severe reactions, involving recurrent, non-inflammatory swelling of the skin, mucous membranes, organs, and brain (angioedema). Some food allergens may cause anaphylaxis, a potentially life-threatening condition marked by tissue swelling, airway constriction, and drop in blood pressure.
- In contact with the skin, allergens can cause reddening, itching, and blistering, called contact dermatitis. Skin reactions can also occur from allergens introduced through the airways or gastrointestinal tract. This type of reaction is known as atopic dermatitis.
- Injection of allergens, from insect bites and stings or drug administration, can introduce allergens directly into the circulation, where they may cause system-wide responses (including anaphylaxis), as well as the local responses like swelling and irritation at the injection site.

People with allergies are not equally sensitive to all allergens. Allergies may get worse over time. For example, childhood ragweed allergy may progress to year-round dust and pollen allergy. A person may also lose allergic sensitivity. Infant or childhood atopic **dermatitis**, for example, disappears in almost all people. More commonly, what seems to be loss of sensitivity is instead a reduced exposure to allergens or an increased tolerance for the same level of symptoms.

Causes and symptoms

Causes

Immunologists separate allergic reactions into two main types: immediate hypersensitivity reactions, which are mainly mast cell-mediated and occur within minutes of contact with allergen, and delayed hypersensitivity reactions, mediated by T cells (a type of white blood cells) and occurring hours to days after exposure.

In the upper airways and eyes, immediate hypersensitivity reactions cause the runny nose and itchy, bloodshot eyes typical of allergic **rhinitis**. In the gastrointestinal tract, these reactions lead to swelling and irritation of the intestinal lining, which causes the cramping and **diarrhea** typical of food allergy. Allergens that enter the circulation may cause **hives**, angioedema, anaphylaxis, or atopic dermatitis.

Allergens on the skin usually cause delayed hypersensitivity reaction. Roving T cells contact the allergen, setting in motion a more prolonged immune response. This type of allergic response may develop over several days following contact with the allergen, and symptoms may persist for a week or more.

THE ROLE OF INHERITANCE. While allergy to specific allergens is not inherited, the likelihood of developing some type of allergy seems to have a genetic factor, at least for many people. If neither parent has allergies, the chances of a child's developing an allergy is approximately 10–20%; if one parent has allergies, it is 30–50%; and if both have allergies, it is 40–75%.

COMMON ALLERGENS. The most common airborne allergens are the following:

- plant pollens
- animal fur and dander

- body parts from house mites (microscopic creatures found in all houses)
- house dust
- mold spores
- cigarette smoke
- solvents
- cleaners

Common food allergens include the following:

- nuts, especially peanuts, walnuts, and Brazil nuts
- fish, mollusks, and shellfish
- eggs
- wheat
- milk
- food additives and preservatives

Common causes of **contact dermatitis** include the following:

- poison ivy, poison oak, and poison sumac
- nickel or nickel alloys
- latex

Insects and other arthropods whose **bites** or **stings** typically cause allergy include the following:

- bees, wasps, and hornets
- mosquitoes
- fleas
- scabies

Symptoms

Symptoms depend on the specific type of allergic reaction. Allergic rhinitis is characterized by an itchy, runny nose often with a scratchy or irritated throat due to post-nasal drip. Inflammation of the thin membrane covering the eye (allergic **conjunctivitis**) causes redness, irritation, and increased tearing in the eyes. Asthma causes **wheezing**, coughing, and shortness of breath. Symptoms of food allergies depend on the tissues most sensitive to the allergen and whether it is spread systemically by the circulatory system. Gastrointestinal symptoms may include swelling and tingling in the lips, tongue, palate or throat; **nausea**; cramping; diarrhea; and **gas**. Contact dermatitis is marked by reddened, itchy, weepy skin **blisters**.

Whole body or systemic reactions may occur from any type of allergen but are more common following ingestion or injection of an allergen. Skin reactions include the raised, reddened, and itchy patches called hives. A deeper and more extensive skin reaction, involving more extensive fluid collection, is called angioedema. Anaphylaxis, another reaction, is marked by difficulty breathing, blood pressure drop, widespread tissue swelling, heart rhythm abnormalities, lightheadedness, and in some cases, loss of consciousness.

Diagnosis

Allergies can often be diagnosed by a careful medical history, matching the onset of symptoms to the exposure to possible allergens. Allergy tests can be used to identify potential allergens. These tests usually begin with prick tests or patch tests, which expose the skin to small amounts of allergen to observe the response. Reaction will occur on the skin even if the allergen is normally encountered in food or in the airways. Radioallergosorbent testing (RAST) measures the level of reactive antibodies in the blood. Provocation tests, most commonly done with airborne allergens, present the allergen directly through the route normally involved. Food allergen provocation tests require abstinence from the suspect allergen for two weeks or more, followed by ingestion of a measured amount. Provocation tests are not used if anaphylaxis is a concern due to the patient's medical history.

Treatment

Allergic rhinitis

The following treatments can help to relieve the symptoms of airborne allergies:

- Stinging nettle (*Urtica dioica*) has antihistamine and anti-inflammatory properties. The common dose is 300 mg four times daily.
- Grape (*Vitis vinifera*) seed extract has antihistamine and anti-inflammatory properties. The usual dose is 50 mg three times daily.
- Ephedra (*Ephedra sinicia*), also called ma huang, has anti-inflammatory activity and has proven effective in treating allergies. However, ephedra should not be used, as it can raise blood pressure, cause rapid heartbeat, and interfere with adrenal gland function. Because of severe health risks posed by ephedra, the supplement was banned from sale in the United States in April 2004. After a series of lawsuits, the U. S. Court of Appeals for the Tenth District upheld this ban on August 17, 2006. As of July 2007, the supplement can no longer be legally sold in the United States.
- Licorice (*Glycyrrhiza glabra*) has cortisone-like, anti-inflammatory activity, stimulating the adrenals and relieving allergy symptoms. It can be taken as a tea or in 100–300 mg capsules. Long-term use can result in sodium retention or potassium loss.

- Chinese skullcap (*Scutellaria baicalensis*) has bronchodilator activity, is an anti-inflammatory, and prevents allergic reactions. It is taken in combination with other herbs.
- Ginkgo (*Ginkgo biloba*) seeds are used in Chinese medicine for relief from wheezing and coughing.
- Echinacea (*Echinacea* species) may have anti-inflammatory activity and boost the immune system.
- Khellin (*Ammi visnaga*) has bronchodilator activity.
- Cramp (*Viburnum opulus*) bark has bronchodilator activity.
- Traditional Chinese medicine treats allergic rhinitis with various herbs. The patent combination medicines Bu Zhong Yi Qi Wan (Tonify the Middle and Augment the Qi) and Yu Ping Feng San (Jade Windscreen) are used for preventing allergies, and Bi Yan Pian (Rhinitis Infusion) is often prescribed for symptoms affecting the nose.
- The homeopathic remedies *Rhus toxicodendron*, *Apis mellifica*, and *Nux vomica* have decongestant activities. They are taken internally.
- Vitamin C has antihistamine and decongestant activities.
- Vitamins A and E are antioxidants and help to promote normal functioning of the immune system.
- Coenzyme Q10 may help to promote normal functioning of the immune system.
- Zinc may boost the immune system.
- N-acetylcysteine may have decongestant activity.
- Acupuncture has been shown to be as effective as antihistamine drugs in treating allergic rhinitis. It is also used to help prevent allergic reactions by strengthening the immune system.

Skin reactions

A variety of herbal remedies, either applied topically or taken internally, can assist in the treatment of contact dermatitis. A poultice made of jewelweed (*Impatiens* species) or **chickweed** (*Stellaria media*) can soothe the skin. A cream or wash containing **calendula** (*Calendula officinalis*), a natural antiseptic and anti-inflammatory agent, can help heal rash. Chinese herbal remedies have been effective in treating atopic dermatitis. The following are homeopathic remedies to be taken internally:

- Apis (*Apis mellifica*) for hives that feel better with cold application and bee stings
- Poison ivy (*Rhus toxicodendron*) for hives that feel better with hot applications and for poison ivy, oak, or sumac rashes
- Stinging nettle (*Urtica urens*) for hives
- Marsh tea (*Ledum*) for itching insect bites
- Croton (*Croton tiglium*) oil for poison ivy, oak, or sumac rashes

Food allergies

Food allergy may be managed by oral desensitization. Children with allergy to milk, eggs, fish, or apples who follow an oral desensitization procedure may develop resistance to the allergenic food. Oral desensitization exposes the patient to allergens in controlled, but increasing, doses. Control subjects, who had avoided the allergenic food during the study, were still sensitive.

Allopathic treatment

A large number of prescription and over-the-counter drugs are available for treatment of immediate hypersensitivity reactions. Most of these drugs work by decreasing the ability of histamine to provoke symptoms. Other drugs counteract the effects of histamine by stimulating other systems or reducing immune responses in general.

ANTIHISTAMINES. Antihistamines block the histamine receptors on nasal tissue, decreasing the effect of histamine released by mast cells. They may be used after symptoms appear, though they seem to prove more effective when used preventively. A wide variety of antihistamines are available.

DECONGESTANTS. Decongestants constrict blood vessels to counteract the effects of histamine. Nasal sprays and oral systemic preparations are available. Decongestants are stimulants and may cause increased heart rate and blood pressure, headaches, and agitation. Use of nasal sprays for longer than several days can cause loss of effectiveness and produce rebound congestion, in which nasal passages become more severely swollen than before treatment.

TOPICAL CORTICOSTEROIDS. Topical corticosteroids reduce mucous membrane and skin inflammation and are available by prescription. Allergies tend to become worse as the season progresses and topical corticosteroids are especially effective at reducing this seasonal sensitization. As a result, they are best started before allergy season begins. Studies have shown that steroid nasal sprays work better for seasonal allergies on an as-needed basis than do antihistamines. Side effects are usually mild but may include headaches, **nosebleeds**, and unpleasant taste sensations.

MAST CELL STABILIZERS. Cromolyn **sodium** (Nasalcrom) prevents the release of mast cell granules, thereby preventing the release of histamine and other

chemicals contained in them. Cromolyn sodium is available as a nasal spray and aerosol (a suspension of particles in gas).

BRONCHODILATORS. Because allergic reactions involving the lungs cause the airways or bronchial tubes to narrow, bronchodilators, which cause the smooth muscle lining the airways to open, can be very effective. Bronchodilators include adrenaline, albuterol, and theophylline. Other drugs, including steroids, are used to prevent and control asthma attacks.

Immunotherapy

Immunotherapy, also known as desensitization or allergy shots, alters the balance of antibody types in the body. Injections involve gradually increasing amounts of allergen, over several weeks or months, with periodic boosters. Full benefits may take up to several years to achieve and are not seen at all in about one in five patients. Individuals receiving all shots will be monitored closely following each shot because of the small risk of anaphylaxis, a condition that can result in difficulty breathing and a sharp drop in blood pressure.

New treatments

Researchers have developed a number of treatments for allergies that employ new approaches to the problem. One class of new medications is the antileukotrienes (also known as leukotriene modifiers). Some members of this class are montelukast (Singulair), zafirlukast (Accolate), and zileuton (Zyflo). These drugs block the action of a group of compounds known as the leukotrienes, which contribute to the development of inflammatory reactions. A second category of new drugs is the IgE modifiers, which interfere with the action of mast cells in producing allergic reactions. The first IgE modifier to be approved for use in the United States by the Food and Drug Administration (FDA) was omalizumab (Xolair), approved in 2003. A third class of antiallergic medications is a group of immunomodulatory medications, topical ointments that interfere with cell mechanisms producing inflammatory responses. Examples of immunomodulatory medications are pimecrolimus (Elidel cream) and tacrolimus (Protopic ointment).

Treatment of contact dermatitis

Calamine lotion applied to affected skin can reduce irritation somewhat. Topical corticosteroid creams are more effective, though overuse may lead to dry and scaly skin.

KEY TERMS

Allergen—A substance that provokes an allergic response.

Allergic rhinitis—Inflammation of the mucous membranes of the nose and eyes in response to an allergen.

Anaphylaxis—Increased sensitivity caused by previous exposure to an allergen that can result in blood vessel dilation and smooth muscle contraction. Anaphylaxis can result in sharp blood pressure drops and difficulty breathing.

Angioedema—Severe non-inflammatory swelling of the skin, organs, and brain that can also be accompanied by fever and muscle pain.

Antibody—A specific protein produced by the immune system in response to a specific foreign particle called an antigen.

Antigen—A foreign particle to which the body reacts by making antibodies.

Asthma—A lung condition in which the airways become narrow due to smooth muscle contraction, causing wheezing, coughing, and shortness of breath.

Atopic dermatitis—Infection of the skin as a result of exposure to airborne or food allergens.

Conjunctivitis—Inflammation of the thin lining of the eye called the conjunctiva.

Contact dermatitis—Inflammation of the skin as a result of contact with a substance.

Histamine—A chemical released by mast cells that activates pain receptors and causes cells to become leaky.

Mast cells—A type of immune system cell that is found in the lining of the nasal passages and eyelids and participates in the allergic response by releasing histamine.

T cells—White blood cells that stimulate cells to create and release antibodies.

Treatment of anaphylaxis

The emergency condition of anaphylaxis is treated with injection of adrenaline, also known as epinephrine. People who are prone to anaphylaxis because of food or insect allergies often carry an Epi-pen containing adrenaline in a hypodermic needle. Prompt injection can prevent a more serious reaction from developing.

Expected results

Allergies can improve over time, although they often worsen. While anaphylaxis and severe asthma are life-threatening, other allergic reactions are not. Learning to recognize and avoid allergy-provoking situations allows most people with allergies to lead normal lives.

Prevention

By determining which allergens are causing the reactions, most people can learn to avoid allergic reactions from food, drugs, and contact allergens. Airborne allergens are more difficult to avoid, although keeping dust and animal dander from collecting in the house may limit exposure. **Vitamin C** may prevent allergy symptoms. Cromolyn sodium can be used for allergy prevention.

Resources

BOOKS

Gensler, Tracy Olgeaty. *Probiotic and Prebiotic Recipes for Health: 100 Recipes that Battle Colitis, Candidiasis, Food Allergies, and Other Digestive Disorders*. Beverly, MA: Fair Winds Press, 2008.

Kay, A. Barry, et al., eds. *Allergy and Allergic Diseases,* 2 vols. New York: Wiley Blackwell, 2008.

Lockey, Richard F., and Dennis K. Ledford, eds. *Allergens and Allergen Immunotherapy,* 4th ed. London: Informa Healthcare, 2008.

Sutton, Amy L. *Allergies Sourcebook*. Detroit, MI: Omni graphics, 2007.

PERIODICALS

Björkstén, Bengt, et al. "Worldwide Time Trends for Symptoms of Rhinitis and Conjunctivitis: Phase III of the International Study of Asthma and Allergies in Childhood." *Pediatric Allergy and Immunology* (March 2008): 110 124.

Finegold, Ira. "Immunotherapy: When to Initiate Treat ment in Children." *Allergy and Asthma Proceedings* (November/December 2007): 698 705.

Hamelmann, E., et al. "Primary Prevention of Allergy: Avoiding Risk or Providing Protection?" *Clinical & Experimental Allergy* (February 2008): 233 245.

Noimark, Lee, and Helen E. Cox. "Nutritional Problems Related to Food Allergy in Childhood." *Pediatric Allergy and Immunology* (March 2008): 188 195.

Pourpak, Zahra, Mohammad R. Fazlollahi, and Fatemeh Fattahi. "Understanding Adverse Drug Reactions and Drug Allergies: Principles, Diagnosis, and Treatment Aspects." *Recent Patents on Inflammation & Allergy Drug Discovery* (January 2008): 24 46.

OTHER

Gallagher, Patricia E. "American Academy of Allergy, Asthma, and Immunology Patient and Consumer Center." *Journal of Consumer Health on the Internet* June 2007. http://www.aaaai.org/patients.stm (March 1, 2008).

Belinda Rowland
Teresa Norris
David Edward Newton, Ed.D.

Allergy elimination diet *see* **Elimination diet**

Allium cepa

Description

Allium cepa is the common onion. Although it is usually thought of as a vegetable, *A. cepa* also has a long history of medicinal use.

Onions are perennials that are cultivated for food worldwide. There are many varieties. Most onion bulbs are white, yellow, or red. The green stems and leaves are hollow and can reach 3 ft (1 m) in height. The plants bear small flowers that are usually white or purple. The fleshy bulb that grows below the ground is used medicinally as well as for food. Onions are members of the lily family.

General use

Onion has been used as a food source for almost as long as humans have been keeping written records. Their usefulness has been discovered independently by many cultures on several continents. Onions are mentioned in ancient Egyptian writings and were known in

Onion plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

ancient Greece. In medieval Europe, they were used unsuccessfully to ward off plague.

In North America, Native Americans used onion to treat insect **stings** and relieve colds. It is also used in **traditional Chinese medicine**. Homeopaths make a tincture of onion to treat a variety of conditions, including cold, **cough**, **diarrhea**, facial paralysis, **hay fever**, hernia, **laryngitis**, **pneumonia**, and trauma.

Over the centuries, onion has been used for healing both internally and externally. Internally, onion has been recommended to treat colds, cough, **bronchitis**, **whooping cough**, **asthma**, and other respiratory problems. It is believed to help loosen congestion in the lungs and expand the airways.

Onion is also used internally to relieve excess **gas** and calm an upset stomach. A mixture of rue (*Ruta graveolens*) and onion is used to rid the digestive system of parasites. Onion is also thought to stimulate the appetite.

Onion is believed to have a positive effect on the circulatory system. It has been used as a diuretic to reduce swelling. It is also thought to help reduce arteriosclerosis by lowering blood **cholesterol** levels and preventing the formation of **blood clots**. Onion has been used to treat diabetes and is reputed to lower blood sugar levels.

Externally, fresh onion juice is used to prevent bacterial and **fungal infections**. It can be applied to **wounds** and stings on the skin, used to remove **warts**, used to stimulate hair growth, and even used to reduce unwanted skin blemishes. Warm onion juice dropped in the ear is said to help relieve **earache**. Baked onion is used to draw pus from abscesses.

Modern scientific research supports many of the traditional uses for onion. Onion contains thiosulphinate, a compound that is effective in killing many common bacteria, including *Salmonella typhi*, *Pseudomonas aeriginosa,* and *Escherichia coli.* This finding supports the folk use of onion to treat wounds and skin **infections** and possibly its use for an upset stomach.

Even more supportive are small clinical studies on humans that show that both fresh onions and commercial onion extracts actually lower blood cholesterol levels, lower blood pressure, and help prevent the formation of blood clots. Although these studies have been done on only a small number of people, they are consistently supported by additional data from animal and test-tube studies. In addition, many of these properties have been found in **garlic** (*A. sativum*) which is a close relative to onion.

In 1990, scientists detected the presence of a compound in onion that partially blocks the development of inflammation. In addition, laboratory animals were protected against induced asthma with fresh onion juice. Humans with asthma have also shown reduced allergy-induced constriction of the airways when given an extract of onion. These findings support the traditional folk administration of onion to treat asthma and respiratory complaints.

Onion has also been shown to contain **antioxidants**, which are compounds that protect the body against free radicals. Free radicals are highly reactive molecules that destabilize other molecules and are associated with a number of degenerative diseases.

The German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, has approved onion as an antibacterial agent. Although many studies are promising, more information is needed before this endorsement is extended to other uses of onion. In general, however, it appears that onion is a healthful vegetable that may confer many medical benefits.

Cancer

Onion may also be helpful in reducing the risk for a number of cancers, according to a study by Swiss and Italian researchers published in the November 2006 issue of *American Journal of Clinical Nutrition*. The meta-study looked at a number of previous studies of garlic and onion use among approximately 25,000 people in Italy and Switzerland. In people who ate 15–22 portions of onions and garlic per week, the reduced risk of various types of **cancer** was: oral and pharynx, 84%; esophageal, 88%; colorectal, 56%; laryngeal, 83%; breast, 25%; ovarian, 73%; prostate, 71%; and kidney, 38%.

Preparations

A common vegetable, onion can be served cooked or raw. For medicinal purposes, onion is available for internal use as a capsule or tablet containing dehydrated onion or onion extract. One study of the antioxidant activity of onion juice indicates that it is not affected by heating or boiling. For external use, the juice of fresh onion is used. A common dose is 1/4–1 cup of raw onions daily or one teaspoon of juice three times a day. In folk medicine, a cough syrup is made of raw onion liquid and honey.

Precautions

No special precautions are needed when taking onion medicinally.

KEY TERMS

Antioxidant—An enzyme or other organic substance that is capable of counteracting the damaging effects of oxidation in living tissue. Onion has been found to contain antioxidants.

Diuretic—Any substance that increases the production of urine.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Side effects

Although no allergic reactions to the bulb of the onion are reported, some people develop an allergic rash after handling the leaves of the plant. In addition, windblown particles of onion leaves and skin have been shown to irritate the eyes of farm workers employed to harvest onions.

Interactions

There are no studies of the interaction of onion and conventional pharmaceuticals. However, given the long and widespread use of onion as a vegetable, serious interactions appear unlikely.

Resources

BOOKS

Balch, Phyllis A. *Prescription for Nutritional Healing*, 4th ed. New York: Avery Publishing Group, 2007.

ICON Health Publications. *Onions A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet Resources*. San Diego, CA: ICON Health Publications, 2005.

PERIODICALS

"Compound Found in Onions Linked to Lower Blood Pressure." *Tufts University Health & Nutrition Letter* (January 2008): 6.

Cruz Correa, Marcia, et al. "Combination Treatment with Curcumin and Quercetin of Adenomas in Familial Adenomatous Polyposis." *Clinical Gastroenterology and Hepatology* (August 2006): 1035 1038.

Galeone, Carlotta, et al. "Onion and Garlic Use and Human Cancer." *American Journal of Clinical Nutrition* (November 2006): 1027 1032.

"Onions and Garlic Could Help Ward Off Cancer." *Tufts University Health & Nutrition Letter* (February 2007): 8.

Wilson, Emily A., and Barbara Demmig Adams. "Antioxidant, Anti Inflammatory, and Antimicrobial Properties of Garlic and Onions." *Nutrition & Food Science* (May/June 2007): 178 183.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Australian Homeopathic Association, 6 Cavan Ave., Renown Park, SA, 5008, Australia, (61) 8 8346 3961, http://www.homeopathyoz.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Medicine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Tish Davidson
Ken R. Wells

Allium sativa see **Garlic**

Aloe

Definition

Aloe is a genus of flowering succulent plants that includes about four hundred species. Probably the best known and most medically useful member of the genus is *Aloe vera*. The term *aloe* is commonly used to refer to the specific species *Aloe vera*.

Aloe leaves. *(© blickwinkel / Alamy)*

Description

Appearance

Although it has the appearance of a cactus the aloe is a member of the lily family (Liliaceae). It is indigenous to eastern and southern Africa but has been spread throughout many of the warmer regions of the world and is also popularly grown indoors. The plant has yellow flowers and triangular, fleshy leaves with serrated edges that arise from a central base and may grow to nearly 2 ft (0.6 m) long. Each leaf is composed of three layers. A clear gel, which is the part of the plant used for topical application, is contained within the cells of the generous inner portion. Anthraquinones, which exert a marked laxative effect, are contained in the bitter yellow sap of the middle leaf layer. The fibrous outer part of the leaf serves a protective function.

History

In use for thousands of years, *Aloe vera* is mentioned in records as far back as 1750 B.C. Use of the plant is thought to have originated in Egypt or the Middle East. It was reputedly used in Egyptian embalming procedures, as drawings of *Aloe vera* have been found on burial walls in the region. Legend has it that *Aloe vera* was one of Cleopatra's secrets for keeping her skin soft. Pliny and Dioscorides of ancient Greece wrote of the healing effects of this plant. Additionally, Alexander the Great is said to have acquired Madagascar so that he could use the *Aloe vera* growing there to treat soldiers' **wounds**. The plant has served as a remedy in the Indian practice of **Ayurvedic medicine**.

In the United States, *Aloe vera* was in use by the early 1800s, but primarily as a laxative. A turning point occurred in the mid-1930s, when a woman with chronic and severe **dermatitis** resulting from x-ray treatments was healed by an application of *Aloe vera* leaf gel. Success with this patient encouraged trials with other individuals suffering from radiation **burns**. Evidence of the effectiveness remained anecdotal until 1953, when two American physicians, C. C. Lushbaugh and D. B. Hale, produced a convincing study, using *Aloe vera* to treat beta radiation lesions in rats. Subsequent experimental protocols were carried out using animals, but there was little human research data to describe the degree of effectiveness of *Aloe vera* treatment. Some evidence suggests that it is especially helpful in the elderly and other people with impaired health or failing immune systems.

Biologic components

Aloe vera contains a wealth of substances that are biologically active. The laxative, and in large doses, purgative, effects of *Aloe vera* latex are attributable to a group of chemicals known as the anthraquinones. Aloin, barbaloin, aloe-emodin, and aloectic acid are a few of the anthraquinones contained in the latex layer. Another component was discovered in *Aloe vera*, the biologically active polysaccharide known as acetylated mannose, or acemannan. This substance was shown to be a highly effective immune stimulant, with activity against the viruses causing the flu, **measles**, and early stages of **AIDS**. It has been used effectively against some veterinary cancers, most notably sarcoma, and was investigated as an agent to be used in treating **cancer** in humans. As of 2008, acemannan had been approved for treatment of certain types of cancers in cats and dogs, but it had not yet been approved for use with humans. Acemannan is one of many saccharides contained in *Aloe vera*. Some of the others are arabinose, cellulose, galactose, mannose, and xylose. Prostaglandins, a third important set of compounds, are thought to play a major role in wound healing. *Aloe vera* also contains fatty acids, enzymes, **amino acids**, vitamins, minerals, and other substances. The interaction of all these components produces a favorable environment for wound healing.

General use

Few botanicals are as well known or as highly thought of as the *Aloe vera* plant. Throughout recorded history, it has been used to keep skin beautiful and restore it to health. A frequent moisturizing ingredient in cosmetics and hair care products, it also promotes healing of burns and superficial wounds but should not be used on deep or surgical wounds or punctures. Topical application has been successful in treatment of **sunburn**, **frostbite**, **radiation injuries**, some types of dermatitis, **psoriasis**, **cuts**, insect **stings**, poison ivy, ulcerations, abrasions, and other dermatologic problems. Healing is promoted by the anti-inflammatory components, including several glycoproteins and salicylates, and substances that stimulate growth of skin and connective tissue. *Aloe vera* contains a number of vitamins and minerals that are necessary to healing, including **vitamin C**, **vitamin E**, and **zinc**. It also exerts antifungal and antibacterial effects and thus helps to prevent wound **infections**. One study showed it to have a little more activity than the antiseptic silver sulfadiazine against a number of common bacteria that can infect the skin. It has moisturizing and **pain** relieving properties for the skin lesions, in addition to healing effects.

Aloe vera gel products may also be used internally. They should not contain the laxative chemicals found in the latex layer. There is some evidence that *Aloe vera* juice has a beneficial effect on peptic ulcers, perhaps inhibiting the causative bacteria, *Helicobacter pylori*. It appears to have a soothing effect on the ulcer and interferes with the release of hydrochloric acid by the stomach. **Colitis** and other conditions of the intestinal tract may also respond favorably to the internal use of gel products. *Aloe vera* has been shown to exert a stabilizing effect on blood sugar in studies done on mice, indicating a possible place for it in the treatment of diabetes. One study suggested that giving *Aloe vera* extract orally to patients with **asthma** who are not dependent on steroids could improve symptoms. A healthcare provider should be consulted about these uses. Other suggested, but insufficiently proven, indications for oral *Aloe vera* gel include prevention of **kidney stones** and relief of arthritis pain.

Aloe vera products derived from the latex layer are taken orally for the laxative effect. They can cause painful contractions of the bowel if taken in high doses. Milder measures are recommended first.

The concentration of the immune stimulant acemannan is variable in the natural plant, as well as gel and juice products, but it is also available in a purified, standardized, pharmaceutical grade form. An injectable type is used in veterinary medicine to treat fibrosarcoma and feline **leukemia**, a condition caused by a virus in the same family as AIDS.

Preparations

Commercial products

Choosing effective *Aloe vera* products can be challenging. Once a leaf is cut, enzymes start to break down some of the long chain sugars which make *Aloe vera* gel an effective healing product, so it is important for the plant to have been properly handled and stabilized. Consumers should ask for help in selecting a reputable company as a product source. When shopping for a product to use for topical healing, people should look for *Aloe vera* to be one of the first products listed to ensure that it is not too dilute to be efficacious. Commercial, stabilized gel products may not work as well as the fresh gel, but cold processing is thought to best retain the beneficial properties. The FDA does not regulate labeling of *Aloe vera* products.

Aloe vera juice is most often the form of the gel that is used internally. At least half of the juice should be *Aloe vera* gel. If laxative properties are not desired, users need to be sure that the juice does not contain latex. A product that is made from the whole leaf does not necessarily contain anthraquinones from the latex layer, as those are water-soluble and can be separated out during processing. Capsules and tinctures of the gel are available. Oral forms of the latex extract are generally capsules, as the extract is extremely bitter.

Growing aloe at home

For common topical use, keeping an *Aloe vera* plant at home is one of the easiest ways to get fresh concentrated gel. It is easy to cultivate, requiring only good drainage, mild temperatures, and occasional watering. The plant needs to be brought indoors if outside temperatures are less than 40°F (4°C). It will tolerate either full or partial sunlight but will require more frequent watering in full sun. It should be watered only when the soil is dry. Getting the gel requires breaking off a leaf and cutting it lengthwise to expose the inner layer. The gel can be scooped out and applied generously to the area needing treatment. Leftover gel needs to be discarded because it degenerates quickly. The inner portion of the leaf may also be applied directly to a skin injury and bound to it.

Precautions

Aloe vera gel is generally safe for topical use, but it is best to apply it to a small area first to test for possible allergic reaction. Stinging and generalized dermatitis may result in individuals who are sensitive to it. The vast majority of the warnings apply only to products containing anthraquinones, such as aloin and barbaloin (as well as the numerous others), which are found in the latex layer of the plant. *Aloe vera* latex should not be used internally by children or by women who are pregnant or lactating. This product can cause abortion or stimulate **menstruation**. It may pass into breastmilk. People who have abnormal kidney function, **heart disease**, or gastrointestinal diseases are best advised to avoid any product containing *Aloe vera* latex or anthraquinones. Prolonged, internal use in high doses may produce tolerance so that more is required to obtain the laxative effect. Any *Aloe vera* product intended for internal use is supposed to contain only the gel portion and can become contaminated by the anthraquinones of the latex layer. For this reason, people who have a contraindication for using *Aloe vera* latex should use caution when taking an *Aloe vera* gel product internally.

KEY TERMS

Aloe concentrate—Aloe gel from which the water has been removed.

Aloe gel—Thick, undiluted substance from the central portion of the aloe leaf.

Aloe juice—A product for oral use, which is composed of at least 50% aloe gel.

Aloe latex—Bitter yellow sap from the middle leaf layer.

Anthraquinone—A group of chemicals contained in the latex of the aloe plant and having strong laxative properties.

Hyperglycemia—High blood sugar.

Side effects

Internal use of *Aloe vera* latex may turn the urine red and abdominal pain or cramps may occur when products containing anthraquinones are consumed.

Interactions

Chronic internal use of products containing *Aloe vera* latex may increase the likelihood of **potassium** loss when used concomitantly with diuretics or corticosteroids. It may possibly compound the risk of toxicity when used with cardiac glycosides (both prescription and herbal types) and antiarrhythmic drugs. Absorption of other oral medications can be decreased. *Aloe vera* latex should not be used with other laxative herbs, which may also lead to excessive potassium loss.

Internal use of *Aloe vera* gel can cause changes in blood sugar, so diabetics should monitor blood glucose levels during use, particularly if insulin or other pharmaceuticals are being used to control hyperglycemia.

Topical *Aloe vera* may enhance the effect of topical corticosteroids and allow for a reduction in the amount of the steroid being used.

Resources

BOOKS

Davis, W. Marvin. *Consumer's Guide to Dietary Supplements and Alternative Medicines: Servings of Hope*. New York: Pharmaceutical Products Press, 2006.

Judith Turner
David Edward Newton, Ed.D.

Alopecia *see* **Hair loss**

Alpha-hydroxy

Description

Alpha-hydroxy is a chemical compound derived from fruit and milk sugars. Alpha-hydroxy acids (AHAs) are used in topical skin care products to exfoliate, or slough away, dead skin cells and promote collagen growth. They may be useful in promoting smoother, even-toned skin and may reduce the appearance of wrinkles and fine lines in some individuals. Products containing AHA may be used to treat **acne**, age spots, and other irregular skin pigmentations.

AHAs are available in a number of different synthetic and natural formulations. Lactic AHA is derived from milk products, while glycolic AHA is derived from sugarcane. Other AHA compounds include citric acid derived from citrus fruit, malic acid derived from apples, and tartaric acid derived from grapes.

General use

AHAs work by removing dead cells at the surface of the skin. In higher concentrations, alpha hydroxy promotes collagen production, which may reduce the appearance of fine lines and wrinkles in the skin. The acids penetrate deep into the skin, where they actually begin to damage skin cells. This skin damage triggers the production of collagen, a fibrous protein and a building block of tissue and skin, as the body attempts to repair the cell damage.

AHA may be an ingredient in over-the-counter products such as creams, lotions, and moisturizers that are marketed for their supposed anti-aging properties. Among the uses of products containing AHA are to smooth fine lines and surface wrinkles, unblock or open pores, improve overall skin appearance and conditions, including acne and oily skin. Over-the counter products generally have an AHA concentration of 10% or less.

AHA may also be used in chemical peels used to treat skin conditions such as wrinkles, acne, scarring, and oily skin. The concentration of AHA products used by trained cosmetologists may run between 20% and 30%, while those used by doctors may range from 50% to 70%.

Preparations

AHA preparations are available in over-the-counter and prescription products, including gel, lotion, toner, and cream formulations. The United States

Food and Drug Administration (FDA) regulates these products as cosmetics, so the products do not undergo the rigorous testing for safety and effectiveness that is required for drugs. However, the FDA does become involved when it appears that cosmetics may contain ingredients that are harmful to people.

During the 1990s, the FDA received approximately 100 reports from people who said that use of AHA products caused side effects ranging from mild irritation and stinging to blistering and **burns**. These reports led the FDA in 1996 to issue a report, "Effects of Alpha Hydroxy Acid on Skin." The report concluded that additional research was needed.

A report linking AHA usage to increased sensitivity to the sun's ultraviolet (UV) rays was sponsored by the Cosmetic, Toiletry, and Fragrance Association. In December 1996, the association's cosmetic ingredient review panel reported on AHA studies that had started in 1994. The panel stated that over-the-counter products containing AHAs were safe when the alpha-hydroxy concentration was 10% or less. However, the safety depended on the product having a formulation of pH of 3.5 or greater. A lower pH number designates more acidity, which could increase the skin's sensitivity to the sun. On products with a lower pH, the product directions should include daily use of sun protection every day.

Furthermore, the report stated that salon products were safe if the AHA concentrations were less than or equal to 30%. However, safety was based on a pH level of 3.0 or higher.

The FDA's Office of Women's Health sponsored two studies in 2000 that affirmed the connection between AHA and increased sensitivity to the sun. However, that sensitivity diminished soon after a person stopped using products with AHA. In 2002, the FDA required that manufacturers label products containing AHAs with a warning that the acids may increase the risk of **sunburn**.

Selecting AHA products

The manufacturer is not required to list the strength of AHA on the package labeling. However, product ingredients must be listed sequentially in the order of highest concentration, so products that list AHA compounds second or third are usually more beneficial than those who list them in the middle and toward the end of the ingredient list.

Depending on their skin type, certain individuals may find some carrier formulas (i.e., cream, gel, lotion, toner) more effective than others. Those with dry skin may find moisturizing AHA creams and lotions more effective, while individuals with oily skin may prefer a less oily toner or gel.

Individuals who are considering using AHA products for the first time may want to start with a low AHA concentration. It is important to perform a skin-patch test to check for skin sensitivity to the substance. A small, dime-sized drop of the AHA product should be applied to a small patch of skin inside the elbow or wrist. The skin patch should be monitored for 24 hours to ensure no excessive unusual redness, swelling, blistering, or rash occurs. If a reaction does occur, the test may be repeated with an AHA product with a lower alpha-hydroxy acid concentration. Individuals who experience a severe reaction to a skin patch test of AHA are advised not to use the product. A dermatologist or other healthcare professional may be able to recommend a suitable alternative.

Individuals who are prescribed AHA formulations by a healthcare professional should follow their doctor's directions for use of the product.

Precautions

People should carefully read the labels of products containing AHA products that conform to the Cosmetic Ingredient Review guidelines of 10% or less AHA with a 3.5 or higher pH level.

AHA products increase sun sensitivity. Individuals using AHA products should use a sunscreen with an SPF (sun protection factor) of at least 15 to protect against burning. Sunscreen should be applied no less than 15 minutes after the AHA formula is applied to prevent neutralizing the acids. Shading the face with a wide-brimmed hat may also be useful.

Exfoliative products should be used with care, as over-exfoliation can cause damage to the skin. AHA products should not be combined with other exfoliative products such as facial scrubs, buff pads, or loofahs. In addition, individuals should only use one AHA product at a time.

Higher concentration prescription AHA products have a great likelihood of producing side effects, so individuals taking them should contact their healthcare provider immediately if they experience burning, redness, or any other reaction to the product.

Individuals who experience adverse reactions to AHA treatments should report them to both the manufacturer of the product and to the FDA's Office of Consumer Affairs. A patient's dermatologist or healthcare provider may also make this report anonymously for the patient. Although these products do not require FDA approval for market release, the

KEY TERMS

Exfoliate—To shed skin; in skin care, the process of removing dead skin cells.

pH—Potential of hydrogen; a neutral pH is 7. Levels below 7 are considered acidic, and those above 7 are alkaline.

FDA is responsible for monitoring their safety and may initiate a product recall or removal for a specific brand or formulation if enough adverse effects occur to make these steps necessary.

AHA chemical peels and other high concentration AHA treatments should only be administered by a licensed cosmetologist, licensed dermatologist, or other qualified healthcare professional.

Side effects

The major side effect of using products containing alpha-hydroxy acids is increased sensitivity to the sun's UV rays. This heightened sensitivity may increase the risk of sunburn. People may also experience mild skin irritation. In some cases, products with AHA may cause burning, a rash, or redness. Because of these reactions, it is very important for people to read the directions and warnings on the package before using a product. The person should do a skin-patch test and then use the product sparingly until it is known whether it causes side effects.

Interactions

As of 2008, there were no known interactions between alpha-hydroxy acid products and other medications and substances when these were administered in recommended strengths. However, because over-the-counter AHA products are considered cosmetics and not pharmaceuticals, existing research on possible interactions had thus far been minimal.

Alpha-hydroxy products may enhance the effects of other products or medications with similar therapeutic properties.

Resources

BOOKS

Baumann, Leslie. *The Skin Type Solution*. New York: Bantam Books, 2006.

Day, Doris J., and with Sondra Forsyth. *Forget the Facelift*. New York: Avery (Penguin Group), 2005.

PERIODICALS

Kurtzweil, Paula. "Alpha Hydroxy Acids." FDA Consumer. 32, No. 2 (March/April 1998): 30 6.

Dugas, Barbara. "Choosing the Right Peel for Your Patient." *Plastic Surgical Nursing*. (April/June 2007): 80 84.

OTHER

Mayo Clinic Staff. "Wrinkle Creams: Your Guide To Younger Looking Skin." (October 12, 2006). http://www.mayoclinic.com/health/wrinkle creams/SN00010 (March 2, 2008).

ORGANIZATIONS

Cosmetic Ingredient Review, 1101 Seventeenth St. N.W., Suite 412, Washington D.C., 20036 4702, (202) 331 0651, http://www.cir safety.org.

U.S. Food and Drug Administration, 5600 Fishers Lane, Rockville, MD, 20857, (888) 463 6332, http://www.fda.gov.

Paula Ford-Martin
Liz Swain

ALS, Amyotrophic lateral sclerosis *see* **Lou Gehrig's disease**

Alternate nostril breathing *see* **Breath therapy**

Althea occicinal see **Marsh mallow**

Alzheimer's disease

Definition

Alzheimer's disease (AD), the most common form of **dementia**, is a neurologic disease characterized by loss of mental ability severe enough to interfere with normal activities of daily living, lasting at least six months, and not present from birth. AD usually occurs in old age and is marked by a decline in cognitive functions such as remembering, reasoning, and planning.

Description

A person with AD usually has a gradual decline in mental functions, often beginning with slight **memory loss**, followed by losses in the ability to maintain employment, to plan and execute familiar tasks of daily living, and to reason and **exercise** judgment. Communication ability, mood, and personality are also affected. Most people who have AD die within eight years of their diagnosis, although that interval may be as short as one year or as long as 20 years. As of 2008, AD was the eighth leading cause of death in adults in the United States.

In 2007, the Alzheimer's Association estimated that about five million Americans have AD. The National Institute on Aging predicted that that number would grow to as many as 14 million by the middle of the twenty-first century as the population as a whole ages. While a small number of people in their 40s and 50s develop the disease (called early-onset AD), AD affects the elderly predominantly. AD affects about 3% of all people between ages 65 and 74, about 19% of those between 75 and 84, and about 47% of those over 85. Slightly more women than men develop AD, but this may be because women tend to live longer, leaving a higher proportion of women in the most affected age groups.

The cost of caring for a person with AD is considerable and has been estimated at approximately $174,000 per person over the course of the disease. Most people with AD are cared for at home; the cost of extended nursing home care adds substantially to this estimate.

Causes and symptoms

The cause or causes of AD are unknown. Some strong leads have been found through research, and these have also given some theoretical support to several new experimental treatments.

AD affects brain cells, mostly those in brain regions responsible for learning, reasoning, and memory. Autopsies of persons with AD show that these regions of the brain become clogged with two abnormal structures—neurofibrillary tangles and senile plaques. Neurofibrillary tangles are twisted masses of protein fibers inside nerve cells, or neurons. Senile plaques are composed of parts of neurons surrounding a group of brain proteins called beta-amyloid deposits. While it is not clear exactly how these structures cause problems, some researchers believe that their formation is in fact responsible for the mental changes of AD, presumably by interfering with the normal communication between neurons in the brain.

What triggers the formation of plaques and tangles is unknown, although there are several possible candidates. Inflammation of the brain may play a role in their development and use of nonsteroidal anti-inflammatory drugs (NSAIDs) seems to reduce the risk of developing AD. Restriction of blood flow may be part of the problem, perhaps accounting for the beneficial effects of estrogen that increases blood flow in the brain, among its other effects. Highly reactive molecular fragments called free radicals damage cells of all kinds, especially brain cells, which have smaller supplies of protective **antioxidants** thought to protect against free radical damage.

Several genes have been implicated in AD, including the gene for amyloid precursor protein (APP), responsible for producing amyloid. Mutations in this gene are linked to some cases of the relatively uncommon early-onset forms of AD. In 2007, a research team at Harvard University reviewed more than 900 studies on the genetic basis of Alzheimer's. They found ten genes that appear to be implicated in the disease, nine of which they called "minor players." After the study was completed, the Harvard scientists announced that fifteen additional Alzheimer's-related genes had been discovered. Research continued in the 2000s on other genes that may be involved in the development of Alzheimer's, the role they may play, and possible interactions among them.

A potentially important genetic link was discovered in the early 1990s on chromosome 19. A gene on this chromosome, called apoE, codes for a protein involved in transporting lipids into neurons. ApoE occurs in at least three forms—apoE2, apoE3, and apoE4. Each person inherits one apoE from each parent and, therefore, can either have one copy of two different forms, or two copies of one. Compared to those without ApoE4, people with one copy are about three times as likely to develop late-onset AD, and those with two copies are almost four times as likely to do so. Despite this important link, not everyone with apoE4 develops AD, and people without it can still have the disease. Why apoE4 increases the chances of developing AD was not known as of 2008.

Several risk factors increase a person's likelihood of developing AD. The most significant one is age; older people develop AD at much higher rates than younger ones. Another risk factor is having a family history of AD, Down syndrome, or **Parkinson's disease**. People who have had head trauma or **hypothyroidism** may manifest the symptoms of AD more quickly. No other medical conditions have been linked to an increased risk for AD.

Many environmental factors have been suspected of contributing to AD, but population studies had not borne out these links as of 2008. Among these hypothesized factors are pollutants in drinking water, aluminum from commercial products, and metal dental fillings. As of early 2008, none of these factors had been shown to cause AD or increase its likelihood. Further research might yet turn up links to other environmental culprits, although no firm candidates had been identified.

The symptoms of AD begin gradually, usually with short-term memory loss. Occasional memory lapses are common to everyone and do not by themselves signify any change in cognitive function. The person with AD may begin with only the routine sort of memory lapse—forgetting where the car keys are—but progress to more profound or disturbing losses, such as forgetting that one can even drive a car. Becoming lost or disoriented on a walk around the neighborhood becomes more likely as the disease progresses. Individuals with AD may forget the names of family members or forget what was said at the beginning of a sentence by the time they hear the end.

As AD progresses, other symptoms appear, including inability to perform routine tasks, loss of judgment, and personality or behavior changes. Some patients have trouble sleeping and may suffer from confusion or agitation in the evening (called sunsetting). In some cases, people with AD repeat the same ideas, movements, words, or thoughts, a behavior known as perseveration. Some patients may exhibit inappropriate sexual behaviors. In the final stages of the disease, people may have severe problems with eating, communicating, and controlling their bladder and bowel functions.

The Alzheimer's Association developed a list of 10 warning signs of AD. A person with several of these symptoms should see a physician for a thorough evaluation:

- memory loss that affects job skills
- difficulty performing familiar tasks
- problems with language
- disorientation of time and place
- poor or decreased judgment
- problems with abstract thinking
- misplacing belongings
- changes in mood or behavior
- changes in personality
- loss of initiative

Other types of dementia, including some that are reversible, can cause similar symptoms. It is important for the person with these symptoms to be evaluated by a professional who can weigh the possibility that his or her symptoms may have another cause. Approximately 20% of those originally suspected of having AD turn out to have some other disorder; about half of these cases are treatable.

Diagnosis

Diagnosis of AD is complex and may require office visits to several different specialists over several months before a diagnosis can be made. While a confident provisional diagnosis may be made in most cases after thorough testing, AD cannot be definitively diagnosed until autopsy examination of the brain for senile plaques and neurofibrillary tangles.

The diagnosis of AD begins with a thorough physical examination and complete medical history. Except in the disease's earliest stages, accurate history from family members or caregivers is essential. Since there are both prescription and over-the-counter drugs that can cause the same mental changes as AD, a careful review of the patient's drug, medicine, and alcohol use is important. AD-like symptoms can also be provoked by other medical conditions, including tumors, infection, and dementia caused by mild strokes (multi-infarct dementia). These possibilities must be ruled out as well through appropriate blood and urine tests, brain magnetic resonance imaging (MRI) or computed tomography scans (CT), tests of the brain's electrical activity (electroencephalographs or EEGs), or other tests.

Positron emission tomography (PET) scans can also help predict individuals who might develop memory impairment. Although PET scanning is a relatively expensive technology, it has become more readily available. Several types of oral and written tests are used to aid in the AD diagnosis and to follow its progression, including tests of mental status, functional abilities, memory, and concentration. Still, the neurologic exam is normal in most patients in early stages.

One of the most important parts of the diagnostic process is to evaluate the patient for **depression** and delirium, since each of these can be present with AD or may be mistaken for it. (Delirium involves a decreased consciousness or awareness of one's environment.) Depression and memory loss are both common in the elderly, and the combination of the two can often be mistaken for AD. Depression can be treated with drugs, although some antidepressants can worsen dementia if it is present, further complicating both diagnosis and treatment.

A genetic test for the ApoE4 gene is available but it is not used for diagnosis because possessing even two copies does not ensure that a person will develop AD.

Treatment

The mainstay of treatment for individuals with AD continues to be the establishment of daily

routines and good nursing care, providing both physical and emotional support for patients. Modifications of the home to increase safety and security are often necessary. Caregivers also need support. Regular medical care by a practitioner with a non-defeatist attitude toward AD is important so that illnesses can be diagnosed and treated properly.

People with AD are also often depressed or anxious and may suffer from sleeplessness, poor **nutrition**, and general poor health. Each of these conditions is treatable to some degree. It is important for persons with AD to eat well and continue to exercise. Professional advice from a nutritionist may be useful to provide healthy, easy-to-prepare meals. Finger foods may be preferable to those requiring utensils to be eaten. Regular exercise (supervised for safety if necessary) promotes overall health. A calm, structured environment with simple tools that support orientation (like calendars and clocks) may reduce **anxiety** and increase safety.

Diet and supplements

DIET. The incidence of AD is lower in countries whose citizens have a diet that is lower in fats and calories. There have been a few reports that a diet rich with fish improves mental function in patients with AD or dementia. AD patients treated with **essential fatty acids** showed greater improvement in mood and mental function than patients on placebo. Because of its disease-preventing properties, red wine in moderation may be beneficial to AD patients.

VITAMIN E. Studies have shown that AD patients have lower blood levels of **vitamin E** than age-matched control subjects. A large, two-year study of moderately affected AD patients found that taking 2,000 IU of vitamin E daily significantly delayed disease progression as compared to patients taking placebo. This delay was equivalent to that seen with patients taking the drug selegiline. Vitamin E is also thought to delay AD onset. High levels of vitamin E put the patient at higher risk for bleeding disorders.

THIAMINE (VITAMIN B_1). Several small studies to determine the effectiveness of **thiamine** (vitamin B_1) on AD have been carried out. Daily doses of 3 g for two to three months have improved mental function and AD assessment scores. Other studies have shown that thiamine had no effect on AD patients. Side effects include **nausea** and **indigestion**.

COBALAMIN (VITAMIN B_{12}). Although results are conflicting, some studies have found that AD patients have lower levels of cobalamin (**vitamin B_{12}**) than others. Some studies have shown that cobalamin supplementation improves memory and mental function in AD patients whereas other studies have found no effect.

ACETYL L-CARNITINE. Acetyl L-carnitine is similar in structure to the neurotransmitter acetyl-choline. Studies have shown that 2 g or 3 g of acetyl L-carnitine daily slows the progression of AD, especially in patients who developed the disease before age 66. Patients who developed disease after 66 years of age worsened with treatment. Side effects include increased appetite, **body odor**, and rash.

DHEA. **DHEA** (dehydroepiandrosterone) is a steroid hormone. There may be a link between decreasing levels of DHEA in the elderly and development of AD. Studies on the effect, if any, of DHEA on AD were needed as of 2008. Side effects include **acne**, hair growth, irritability, **insomnia**, **headache**, and menstrual irregularity.

MELATONIN. **Melatonin** is a hormone that helps to regulate mood and sleep cycles. The effect of melatonin treatment on AD is unknown, but it may be beneficial in regulating sleep cycles. The usual dose is 3 mg taken one to two hours before bedtime. Side effects are drowsiness, confusion, headache, decreased sex drive, and decreased body temperature.

Herbals and Chinese medicine

GINKGO. Ginkgo, the extract from the *Ginkgo biloba* tree is the most commonly used herbal treatment for AD. Several studies have been performed to test the effectiveness of ginkgo for treating AD. The dose range studied were 120–160 mg daily divided into three doses. Although results were mixed, the evidence suggested that ginkgo may be an effective treatment for patients with mild to moderate AD. Side effects are not common but include headache, allergic skin reaction, and gastrointestinal disturbance. Ginkgo also decreases blood coagulation. Individuals with coagulation or platelet disorders should use extreme caution and consult a physician before using ginkgo.

PHYTOESTROGENS. Phytoestrogens may be beneficial in the treatment of AD based on the findings that women with AD who are on hormone replacement therapy have improved mental function and mood. Estrogens may prevent AD, therefore, phytoestrogens may have the same effect. Phytoestrogens are found mainly in soy products.

CLUBMOSS. Huperzine A is a compound isolated from clubmoss (*Huperzia serrata*). Studies have shown that taking 0.1–0.4 mg daily improves mental function in AD patients. Side effects are nausea, **muscle cramps**, **vomiting**, and **diarrhea**.

Therapies

Music therapy has been shown to be effective in treating the depression, agitation, wandering, feelings of isolation, and memory loss associated with AD. AD patients have benefited from listening to favorite music or participating in musical activity. Participation in a music therapy group was more effective at improving memory and decreasing agitation than being part of a verbal (talking) group.

A wide variety of other therapies have been beneficial in the treatment of the psychological symptoms of AD. These include:

- Light therapy in the evening to improve sleep cycle disturbances.
- Supportive therapy through touch, compliments, and displays of affection.
- Sensory stimulation through massage and aromatherapy.
- Socio-environmental therapies using activities fitted to previous interests, favorite foods, and pleasant surroundings.
- Cognitive therapy to reduce negative perceptions and learn coping strategies.
- Insight-oriented psychotherapy to address the patients' awareness of their disease.
- Dance therapy.
- Validation therapy.
- Reminiscence therapy.
- Reality-oriented therapy.

Nursing care and safety

The nursing care required for a person with AD is easy to learn. Caregivers usually need to spend increasing amounts of time grooming patients as the disease progresses. Patients may require assisted feeding early on to make sure that they are taking in enough nutrients. Later on, as movement and swallowing become difficult, a feeding tube may be placed into the stomach through the abdominal wall. A feeding tube requires more attention but is generally easy to care for if patients are not resistant to its use. Incontinence becomes a difficult problem to deal with at home and is a principal reason for pursuing nursing home care. In the early stages, limiting fluid intake and increasing the frequency of toileting can help. Careful attention to hygiene is important to prevent skin irritation and infection from soiled clothing.

In all cases, persons diagnosed with AD should not be allowed to drive because of the increased potential for accidents and the increased likelihood of wandering very far from home while disoriented. In the home, simple measures such as grab bars in the bathroom, bedrails on the bed, and easily negotiable passageways can greatly increase safety. Electrical appliances should be unplugged and put away when not in use. Matches, lighters, knives, or weapons should be stored safely out of reach. The hot water heater temperature may be set lower to prevent accidental scalding. A list of emergency numbers, including the poison control center and the hospital emergency room, should be posted by the phone.

Care for the caregiver

Family members or others caring for a person with AD have an extremely difficult and stressful job that becomes harder as the disease progresses. It is common for caregivers to develop feelings of anger, resentment, guilt, and hopelessness, in addition to the sorrow they feel for their loved one and for themselves. Depression is an extremely common consequence. Becoming a member of an AD caregivers' support group can be one of the most important measures a family member can take, not only for themselves, but for the person with AD as well. The location and contact numbers for AD caregiver support groups are available from the Alzheimer's Association. They may also be available through a local social service agency, the patient's physician, or pharmaceutical companies that manufacture the drugs used to treat AD. Medical treatment for depression may be an important adjunct to group support.

Outside help, nursing homes, and governmental assistance

Most families eventually need outside help to relieve some of the burden of around-the-clock care for individuals with AD. Personal care assistants, either volunteer or paid, may be available through local social service agencies. Adult daycare facilities are increasingly common. Meal delivery, shopping assistance, or respite care may be available as well. Many families consider nursing home care when AD advances to the late-stage.

Several federal government programs may ease the cost of caring for persons with AD, including Social Security Disability, Medicare, and Supplemental Security Income. Each of these programs may provide some assistance for care, medication, or other costs, but none of them pays for nursing home care indefinitely. Medicaid is a state-funded program that may provide for some or all of the cost of nursing home care, although there are important restrictions. Details of the benefits and eligibility requirements of

these programs are available through the local Social Security or Medicaid office or from local social service agencies.

Allopathic treatment

As of early 2008, the U.S. Food and Drug Administration (FDA) had approved five drugs for use with Alzheimer's disease: memantine (Namenda), galantamine (Razadyne), rivastigmine (Exelon), donepezil (Aricept), and tacrine (Cognex). In most cases, the drugs prevent the breakdown of acetylcholine in the brain, thereby increasing the efficiency with which neurons communicate with each other. These drugs can modestly increase cognition and improve the ability to perform normal activities of daily living. Side effects accompany the use of each drug, the most common of which are diarrhea, nausea, and vomiting. Tacrine has an additional side effect of some concern, promoting an increase in the liver enzyme alanine aminotransferase (ALT). Patients taking tacrine must have a weekly blood test to monitor their ALT levels.

Estrogen, a female sex hormone, has been widely prescribed for post-menopausal women to prevent **osteoporosis**. Several preliminary studies have shown that women taking estrogen have lower rates of AD, and those who develop AD have a slower progression and less severe symptoms.

Preliminary studies suggested a reduced risk for developing AD in older people who regularly use nonsteroidal anti-inflammatory drugs (NSAIDs), including aspirin, ibuprofen (Advil), and naproxen (Aleve), although not acetaminophen. A 2001 study reported that those subjects who used NSAIDs for at least two years were up to 80% less likely to develop Alzheimer's. Later studies have not confirmed this original finding, however, and there was as of 2008 no good reason to recommend the use of NSAIDs in the treatment of AD.

Selegiline, a drug used in the treatment of Parkinson's disease, appears to slow the development of AD. Selegiline is thought to act as an antioxidant, preventing free radical damage. However, it also acts as a stimulant, making it difficult to determine whether the delay in onset of AD symptoms is due to protection from free radicals or to the general elevation of brain activity from the stimulant effect.

Psychiatric symptoms, such as depression, anxiety, hallucinations (seeing or hearing things that aren't there), and delusions (false beliefs) may be treated with drugs if necessary.

KEY TERMS

Acetylcholine—One of the substances in the body that transmits nerve impulses.

Dementia—Impaired intellectual function that interferes with normal social and work activities.

Neurofibrillary tangle—Twisted masses of protein inside nerve cells that develop in the brains of people with AD.

Neuron—A nerve cell.

Senile plaque—Structures composed of parts of neurons surrounding brain proteins called beta-amyloid deposits and found in the brains of people with AD.

Expected results

While Alzheimer's disease may not be the direct cause of death, the generally poorer health of a person with AD increases the risk of life-threatening infection, including **pneumonia**. In addition, other diseases common in old age (**cancer**, **stroke**, and **heart disease**) may lead to more severe consequences in a person with AD. On average, people with AD live eight years past their diagnosis, with a range from 1–20 years.

Prevention

As of 2008, there was no sure way to prevent Alzheimer's disease, although it was hoped that some of the drug treatments discussed may eventually be proven to reduce the risk of developing the disease. The most likely candidates were estrogen, phytoestrogens, NSAIDs, vitamin E, and selegiline. In 2001, researchers found preliminary indications that onset of Alzheimer's might be tied to **cholesterol** levels. Later studies showed, however, that cholesterol-lowering drugs had no effect on the onset or development of Alzheimer's.

Resources

BOOKS

Calo oy, Starr, and Bob Calo oy. *Caregiving Tips A Z, Alzheimer's & Other Dementias*. Fremont, CA: Orchard Publications, 2008.

Chan, A. P. *Alzheimer's Disease Research Trends*. Hauppauge, NY: Nova Science, 2008.

Doraiswamy, P. Murali, Lisa Gwyther, and Tina Adler. *The Alzheimer's Action Plan: The Experts' Guide to the Best Diagnosis and Treatment for Memory Problems*. New York: St. Martin's Press, 2008.

Lerner, Adrienne. *Alzheimer's Disease*. Farmington Hills, MI: Greenhaven Press, 2008.
McCann Beranger, Judith. *A Caregiver's Guide to Alz heimer's & Related Diseases*. New York: Bunim & Bannigan, 2008.

PERIODICALS

Gruneir, Andrea, et al. "Is Dementia Special Care Really Special? A New Look at an Old Question." *Journal of the American Geriatrics Society* (February 2008): 199 205.
Ji, Hong fang, and Hong yu Zhang. "Multipotent Natural Agents to Combat Alzheimer's Disease: Functional Spectrum and Structural Features." *Acta Pharmaco logica Sinica* (February 2008): 143 151.
Kontush, Anatol, and Svetlana Schekatolina. "An Update on Using Vitamin E in Alzheimer's Disease." *Expert Opinion on Drug Discovery* (February 2008): 261 271.
Muñoz Torrero, Diego, and Pelayo Camps. "Huprines for Alzheimer's Disease Drug Development." *Expert Opinion on Drug Discovery* (January 2008): 65 81.
"Statin Use Does Not Prevent the Occurrence of Alz heimer's Disease." *Inpharma* (January 26, 2008): 18.

ORGANIZATIONS

Alzheimer's Association, 225 N. Michigan Ave., 17th Floor, Chicago, IL, 60601 7633, (800) 272 3900, http:// www.alz.org/.
National Institute of Aging, Alzheimer's Education and Referral Center, PO Box 8250, Silver Spring, MD, 20907, (800) 438 4380, http://www.nia.nih.gov/ alzheimers.

Belinda Rowland
Teresa Norris
David Edward Newton, Ed.D.

Amblyopia *see* **Lazy eye**

Amenorrhea

Definition

Amenorrhea is the absence of menses during the reproductive years.

Description

Amenorrhea is defined as the absence of menses during the childbearing years. It can be physiologic during transitional times such as puberty, **pregnancy** and postpartum, or **menopause**. In other situations the absence of menses in women of childbearing age is considered abnormal and worthy of evaluation. The causes of amenorrhea can be determined by a thorough workup with a licensed heath practitioner, tailoring treatment to the cause of the problem.

Demographics

Amenorrhea is classified as either primary or secondary depending on the time in a woman's life when it occurs. Primary amenorrhea is the absence of menses in a woman who has never menstruated by 16 ½ years of age. This type of amenorrhea is uncommon; the incidence is less than 0.1% of American women. Secondary amenorrhea is defined as an absence of menses for 6–12 months in a woman who has previously menstruated. Approximately 1.8–3% of women in the United States experience amenorrhea at some point in their childbearing years, and it may affect as many as 20% of women seeking treatment for **infertility**.

The age of menarche, or a woman's first menstrual period, occurs on average by 12.3 years. Based on Tanner's stages of puberty for females, menarche typically occurs 2.3 years after breast development begins. When a young woman has not begun menstruating by 16 years of age, but she is progressing through early stages of puberty, it is likely that menarche is simply delayed, but an endocrine evaluation is warranted. If secondary sex characteristics such as breast and pubic hair development have not begun by age 14, primary amenorrhea should be considered and assessed for.

The onset of menses may be delayed for a variety of reasons. Delayed menarche can be caused by low body weight. Girls with the eating disorders **anorexia nervosa** or bulimia often experience delayed menses due to malnutrition. Vigorous **exercise** regimens in the pre–pubertal girl can also cause delayed menarche. These situations can contribute to both primary and secondary amenorrhea.

Causes and symptoms

The most common cause of primary amenorrhea is chromosomal defects that result in normal female external genitalia, but produce alterations in either breast or uterine development. Some examples of these genetic abnormalities are Turner's syndrome, Mullerian anomalies, and Testicular Feminization.

The majority of cases of secondary amenorrhea are due to disorders of the hypothalamus, followed by pituitary disorders and ovarian problems. Least common are cases caused by uterine disorders, which often result from intrauterine adhesions (IUAs) that occur after surgical procedures.

The hypothalamus secretes a hormone that is integral to the normal menstrual cycle, Gonadotropin–releasing hormone (GnRH). This hormone is part of a complex feedback mechanism with estrogen and progesterone. Hypothalamic function may be altered due to a lesion or mass in the hypothalamus or central nervous system, resulting in low circulating levels of GnRH. **Stress**, strenuous exercise and significant weight loss all provoke a drop in GnRH and subsequent decline in estrogen levels resulting in amenorrhea. Amenorrhea due to extreme dieting and exercise is a warning sign for anorexia nervosa. In patients with eating disorders, menses typically resumes with a gain in body weight. Stress–induced amenorrhea is often self–limiting, and is diagnosed by exclusion of a pituitary problem.

The pituitary gland secretes two hormones, leutinizing hormone (LH) and follicle–stimulating hormone (FSH). In a healthy menstrual cycle, FSH stimulates maturation of an egg, or ovum, in the ovary. This occurs at the beginning, or follicular phase, of the cycle. During the follicular phase, ovarian production of estrogen rises and peaks, dropping off just before ovulation. Ovulation is the release of the fully mature ovum, and is prompted by a spike in LH, which also rises, peaks and drops off. In the second half of the menstrual cycle, known as the luteal phase, progesterone is secreted by a gland formed from the sac in the ovary that once held the ripening ovum, now called the corpus luteum. Progesterone is the dominant hormone of the luteal phase of the menstrual cycle, accompanied by a gradual rise in estrogen as the cycle prepares to begin again.

Disorders of the pituitary gland leading to amenorrhea include tumors, most commonly benign tumors known as adenomas. These tumors tend to produce hormones that disrupt the menstrual cycle, such as prolactin, adrenocorticotropic hormone (ACTH) or thyroid–stimulating hormone (TSH). Of these, prolactin–secreting tumors are the most common. Prolactin inhibits GnRH and thus disrupts cyclic menses. A common symptom of elevated prolactin is galactorrhea, or milky discharge from the nipples. Because thyroid function closely affects female hormones and the menstrual cycle, thyroid function should be assessed by measuring TSH. Additional abnormalities of the pituitary gland are Sheehan syndrome, which often presents in the postpartum period with an inability to lactate, and Empty Sella Syndrome, an abnormality of the pituitary gland which can be congenital or a result of radiation or surgery.

The ovaries cyclically produce the hormones estrogen and progesterone. Disorders of the ovary can be genetic chromosomal defects resulting in primary amenorrhea, such as Turner's syndrome, Mosaicism and Swyer syndrome. A common cause of secondary amenorrhea is premature ovarian failure, in which women enter menopause under 40 years of age. Premature ovarian failure is also a cause of primary amenorrhea in 10–28% of cases. The cause of premature ovarian failure is usually unknown, although it may have a genetic basis or be due to autoimmune disease. In 10–20% of cases ovarian function resumes. In cases where radiation, chemotherapy or surgical intervention has taken place, ovarian function typically does not resume.

A common ovarian cause of amenorrhea is Polycystic Ovarian Syndrome (PCOS). PCOS, also known as Stein–Leventhal syndrome, is a collection of symptoms which often includes menstrual irregularity, excess growth of facial or chest hair, and **obesity**. Women with PCOS may have irregular, anovulatory cycles and multiple follicular cysts on their ovaries. **Insulin resistance** may also be present, marked by elevated blood glucose and insulin. Masculinization may occur due to elevated testosterone produced by the ovaries.

Diagnosis

Because successful management of amenorrhea requires an accurate diagnosis of the origin of imbalance, a full workup is called for. Amenorrhea, either primary or secondary, is evaluated by the following strategy. First, laboratory analysis of TSH and prolactin are done to rule out **hypothyroidism** or hyperprolactinemia. If prolactin is elevated, an MRI may be indicated to rule out a pituitary adenoma or other pituitary tumor.

If TSH and prolactin levels are normal, the next step in diagnosis is a progesterone challenge. This diagnostic procedure involves the administration of oral or injected progesterone, which should prompt uterine bleeding within two–seven days. This is done to mimic the luteal phase of the menstrual cycle, where a rise and drop in progesterone is followed by **menstruation**. The presence of estrogen in the follicular phase builds the lining of uterus, and the effect of progesterone in the luteal phase is to slough off that lining, prompting menstrual bleeding. If bleeding occurs after a progesterone challenge, a diagnosis can be made of anovulation.

If withdrawal bleeding does not occur, there may be an anatomical abnormality affecting the uterus or vagina, or a low–estrogen state in which the uterus is not building up an endometrial lining. At this point

oral estrogen is administered for 21 days, followed by five days of oral progesterone to provoke menstruation. Alternatively, one cycle of oral contraceptive pills may be used. If no withdrawal bleed occurs, an anatomical problem may be the origin of the amenorrhea. If a withdrawal bleed does occur, further workup is still indicated.

Additional tests include FSH and LH levels. Elevated levels suggest premature ovarian failure, as the ovaries are not responding to high levels of stimulating hormones. Normal or low levels of FSH and LH require further assessment of the pituitary gland via imaging techniques.

Treatment

Holistic approaches to treatment of amenorrhea are tailored to address the cause of the imbalance. After appropriate diagnostic measures are taken to identify the cause, a holistic treatment plan will account for the whole person by addressing **nutrition**, exercise, sleep and stress management in addition to therapies to balance the menstrual cycle.

Stress management is an important component to holistic treatment for amenorrhea. Techniques for reducing stress, such as **meditation**, **guided imagery** or deep breathing exercises can be helpful. Gentle stretching exercises like **yoga**, chi gong or tai chi are beneficial for the nervous system. Aerobic exercise for 30 minutes several times per week is essential for cardiovascular and overall health, but vigorous exercise should be avoided in women who are underweight or experiencing exercise–induced amenorrhea. Stress can also be reduced by maintaining a regular sleep routine, as adequate sleep is essential for endocrine health.

Nutrition concerns

Clinical nutrition for amenorrhea is aimed at restoring balance to overall health. For example, for underweight women the goal is to increase calories, dietary protein and high–quality fats. Eating disorders should be evaluated for and treated with appropriate psychiatric intervention. Women experiencing amenorrhea who are overweight with an elevated body mass index may benefit from a diet low in refined carbohydrates and high in fiber and lean proteins to help reduce weight and manage insulin resistance. In all cases, an emphasis on whole foods, complex carbohydrates, legumes, nuts and seeds is ideal. Increasing cold–water fish is beneficial for the essential fatty acid content. Soy foods, which are weakly estrogenic, are helpful in situations where estrogen is low. Optimizing digestion will benefit overall health, as will incorporating routine in mealtimes.

Therapy

Botanical medicine can be of great help in restoring balance to the menstrual cycle by regulating sex hormones.

- Black Cohosh (*Cimicifuga racemosa*)—Black Cohosh is not a phytoestrogen. It is useful in premature ovarian failure to diminish early symptoms of perimenopause and to reestablish regular menstrual cycles.
- Blue Cohosh (*Caulophyllum thalictroides*)—Blue Cohosh is a uterine stimulant that can stimulate the onset of menses in secondary amenorrhea where there is no underlying pathology. It acts as a progesterone precursor and is helpful in anovulatory cycles with low progesterone in the luteal phase.
- Chastetree Berry (*Vitex agnus cactus*)—Chastetree is indicated for several different causes of amenorrhea. Its action on the hypothalamus and pituitary glands results in an elevation in LH and drop in FSH, causing in an increase in luteal phase progesterone. Chastetree berry can also suppress elevated prolactin levels due to stress. Therefore, Chastetree berry is useful for amenorrhea due to anovulation, such as in PCOS, and in cases of elevated prolactin when no pituitary adenoma is present.
- Dong Quai (*Angelica sinensis*)—Dong Quai is a phytoestrogenic herb that is useful for amenorrhea due to low estrogen or premature ovarian failure.
- Rhodiola (*Rhodiola rosea*)—Rhodiola is an adaptogenic herb that supports the adrenal glands. For this reason it is useful as part of a stress management treatment plan. It also has balancing effects of the nervous system.
- Wild Yam (*Dioscorrhea spp.*)—Wild Yam is a progesterone precursor and is useful for anovulatory cycles with low progesterone in the luteal phase. Wild yam is also the base for many over the counter progesterone creams, as well as being the source material for bioidentical hormone therapy.

Prognosis

Prior to initiating treatment with natural remedies for amenorrhea, a thorough workup to determine the cause is needed. It is advisable to consult with a knowledgeable provider for evaluation and management and treatment.

KEY TERMS

Anovulation—The absence of ovulation in the menstrual cycle.

Hypothalamus—The hypothalamus is a portion of the diencephalon in the brain. It regulates many functions of the autonomic nervous system as well as communicates with the endocrine system via the pituitary gland.

Menarche—Onset of menses, occurring on average at age 12.

Ovulation—The release of a fully mature ovum from the ovary as part of a normal menstrual cycle.

Phytoestrogen—Phytoestrogens are compounds found in many plants and have mild estrogenic and anti estrogenic activity. They are known as hormone modulators for their ability to regulate either excess or deficient estrogen states.

Pituitary gland—Often referred to as the "master gland," the pituitary is an endocrine gland that secretes several hormones that regulate growth, reproduction and metabolic proceses.

Tanner's stages—Stages of physical development in childhood, adolescence and adulthood. They were first described by Drs. Marshall and Tanner in 1969, and are also referred to as pubertal stages 1 through 5.

Prevention

Maintaining a healthy weight and a nutritious diet are important for overall health and can prevent some types of amenorrhea. Stress management, moderate exercise and good sleep habits encourage regular menses.

Resources

BOOKS

Gordon, John David, M.D. and Leon Speroff M.D. *Hand book for Clinical Gynecologic Endocrinology and Infer tility*, pp. 211 239. Philadelphia, PA: Lippincott, 2002.

Hudson, Tori, N.D. *Women's Encyclopedia of Natural Medicine: Alternative Therapies and Integrative Medi cine*, pp. 15 27. Los Angeles, CA: Keats Publishing, 1999.

Mills, Simon, and Kerry Bone. *Principles and Practice of Phytotherapy: Modern Herbal Medicine*. London, England: Churchill Livingstone, 2000.

Sherman, John A., N.D. *The Complete Botanical Prescriber*. 1993.

Stenchever, Morton, A., M.D., William Droegemueller, M.D., Arthur L. Herbst, M.D., Daniel R. Mishell, Jr., M.D. *Comprehensive Gynecology*, pp. 1099 1119. St. Louis, MO: Elsevier, 2001.

PERIODICALS

Kelly, G. S. "Rhodiola: A Possible Plant Adaptogen." *Alternative Medicine Review* 6, no. 3 (2001): 293 302.

Roemheld Hamm B. "Chasteberry." *American Family Physician* 78 no. 5 (September 2005): 821 824.

Diana Christoff Quinn, ND

American elm *see* **Slippery elm**

American skullcap *see* **Skullcap**

Amino acids

Description

Amino acids are a group of nitrogen-containing organic compounds composing the structure of proteins. They are essential to human metabolism and to making the human body function properly for good health. All proteins are made of some combination of 20 amino acids. These 20 amino acids are classified into essential and non-essential amino acids. In this context essential means that the human body is unable to synthesize these compounds. It is essential, therefore, that they be included in one's daily diet. Authorities disagree to some extent as to how amino acids should be classified, at least partly because of the needs of specialized populations (such as those who have deficiency diseases such as phenylketonuria, PKU). The amino acids most commonly listed as essential are histidine, isoleucine, leucine, **lysine**, **methionine**, phenylalanine, threonine, tryptophan, and valine. Five other amino acids are sometimes listed as conditionally essential because they may be essential under special circumstances. For example, **arginine** can be synthesized by adults, but not by children. Other conditionally essential amino acids are cysteine, glycine, **glutamine**, and tyrosine. The non-essential amino acids that can be synthesized by the human body are alanine, asparagine, aspartic acid, glutamic acid, proline, and serine.

The major source for essential amino acids in the human diet is protein from plant and animals sources. Good protein sources include dairy products, meats, fish, poultry, nuts, legumes, and eggs. Those sources are considered more complete than vegetable protein,

such as beans, peas, and grains, also considered a good—even if not complete—source of amino acids.

Amino acids became popular as dietary supplements by the end of the twentieth century for various uses, including fitness training, weight loss, and certain chronic diseases. Some proponents of **holistic medicine** believe that amino acid supplements taken in the proper dosage can aid in fighting **depression**, **allergies**, **heart disease**, gastrointestinal problems, high **cholesterol**, muscle weakness, blood sugar problems, arthritis, **insomnia**, bipolar illness, **epilepsy**, **chronic fatigue syndrome**, **autism**, **attention-deficit hyperactivity disorder** (ADHD), and mental exhaustion.

Description

Amino acid therapy as a supplemental aid to a healthy diet joined the fitness craze in the United States by the end of the 1990s. Brenda Adderly in *Better Nutrition,* in September of 1999, stated: "The creation of new protein from amino acids and the breaking down of existing protein into amino acids are ongoing processes." After people **exercise** a lot, amino acides create new protein in order to replace muscle cells. Understanding the balance of amino acids in the body can be often the first clue to understanding why a person has many ailments, ranging from depression to upset stomach to **obesity**. Deficiencies in the proper balance of amino acids is likely to occur in those with poor **diets**. Because **stress**, age, infection, and various other factors, including the amount of exercise a person does, can also affect the levels of amino acids, people with healthy, nutritious diets could also find that they have deficiencies. Unfortunately, amino acid deficiencies are difficult to estimate as there are not recommended daily allowances for them.

Essential amino acids

The amino acids, which are derived only from food and that the body cannot manufacture, perform various functions, as follows:

- Tryptophan is considered a natural relaxant. This amino acid helps alleviate insomnia, helps in the treatment of migraine headaches, helps reduce the risk of artery and heart spasms, and works with lysine to reduce cholesterol levels.
- Lysine aids in proper absorption of calcium; helps form collagen for bone cartilage and connective tissues; and aids in production of antibodies, hormones, and enzymes. Research has indicated it also might be effective against herpes by creating a balance of nutrients that slows the growth of the herpes virus. A deficiency could result in fatigue, lack of concentration, irritability, bloodshot eyes, retarded growth, hair loss, anemia, and reproductive problems.
- Methionine provides the primary source of sulfur that can prevent disorders of the hair, skin, and nails; lowers cholesterol by increasing the liver's production of lecithin; reduces liver fat; protectes kidneys; and promots hair growth.
- Phenylalanine serves the brain by producing norepinephrine, the chemical responsible for transmitting the signals between the nerve cells and the brain; it maintains alertness, reduces hunger pains, acts as an antidepressant, and improves memory.
- Threonine makes up a substantial portion of the collagen, elastin, and enamel protein; serves the liver by preventing buildup; aids the digestive and intestinal tracts to function better; and acts as a trigger for metabolism.
- Valine promotes mental energy, helps with muscle coordination, and serves as a natural tranquilizer.
- Leucine works with isoleucine to provide for the manufacture of essential biochemical processes in the body that are used for energy, increasing the stimulants to the upper brain for greater mental alertness.

Roles of certain non-essential amino acids

- Glycine facilitates the release of oxygen for the cell-making process and plays a key role in manufacturing of hormones and health of immune system.
- Serine is a source of glucose storage by the liver and muscles, provides antibodies for immune system, and synthesizes fatty acid sheath around nerve fibers.
- Glutamic acid is nature's brain food because it increases mental prowess, helps speed the healing of ulcers, and aids in combating fatigue.

Creatine in the spotlight

One of the most discussed amino acid supplements available on the market is **creatine** monohydrate. Creatine differs from other amino acids discussed in this entry because it is not used in the production of proteins. The body produces small amounts of creatine in the kidneys, liver, and pancreas. Most diets that include red meat or fish also include a few grams of creatine. It is stored in muscle cells and is used in activities, such as weight lifting and sprinting, providing the necessary thrust of energy for such activities. The natural supply of creatine produced by the body is quickly depleted. After

approximately 10 seconds, when muscle **fatigue** becomes apparent, the daily production is used.

Timothy Gower, writing for *Esquire* in February of 1998, stated: "Scientists identified creatine 160-odd years ago, but only in the 1980s did they figure out that muscle cells can be 'loaded' with up to 30% more of the compound than they normally carry. Since then, several studies have shown that weight lifters primed on the supplement tire less easily, allowing them to work out longer." Gower also noted that creatine users find that the weight they add on is fat-free, whether that is lean tissue or some is water weight, no one had yet determined, since muscle cells do fill with water during creatine loading. Additionally, while it can add to the burst of the energy a sprinter needs to perform well, creatine does not do anything for the marathon runner going for several hours.

Though creatine has been commercially available since 1993, its long-term effects remain unknown. One 2002 study showed that creatine use improved rehabilitation for injured athletes and another that using the supplement increased risk of injury. It should be noted that some 20–30% of people researched showed no improvement using creatine. One report indicated that creatine could be beneficial for some people in spurring metabolism, burning calories, and helping in weight loss. Those reports were inconclusive as of 2008. In 2008, the National Center for Complementary and Alternative Medicine (NCCAM) reported that initial trials showed that creatine may be effective in treating Huntington's disease. NCCAM reportedly intended to fund further studies on this use of the supplement.

General use

Amino acid supplements to a healthy diet are used for various purposes. The most common uses include: sustaining strength in weight training to build muscles; improving heart and circulatory problems or diseases, particularly in older people; treating chronic fatigue syndrome; treating depression and **anxiety**; treating eating disorders, such as bulimia and/or anorexia, along with overeating; increasing memory; and building up and sustaining the body's immune system in fighting bacteria and viruses. It is important to note that, while the necessity and role of all amino acids was verified in the maintenance of optimum health, research was not extensive enough to provide indisputable verification of the touted benefits of such supplements over the long term.

Nonetheless, some members of the scientific medical community seem to confirm what amino acid proponents have long believed to be true. Rainer Hambrecht and colleagues from the University of Leipzig (Germany) tested the amino acid l-arginine on 38 heart-failure patients. Knowing that the human body converted it into nitric oxide, a chemical that relaxes blood vessels, the researchers gave one group 8 g of it daily for four weeks; another group simply did forearm exercises; and a third group combined the supplement with the exercise. The people who took the supplement alone increased their blood-vessel dilation by a factor of four, as did the exercise group. Those who took both the supplement and performed the exercise increased it by six. Studies on arginine in 2002 found that the supplement may help reduce risk of postoperative **infections**. Further, arginine may enhance women's sexual function. Later studies on the effectiveness of arginine for the treatment of heart disease had variable results. The United States Food and Drug Administration (FDA) prohibited the manufacturers of arginine from claiming that their product is effective in treating heart disease.

Supplements are recommended by alternative medical practitioners particularly for those who are not getting a proper diet, especially vegetarians who might not be getting a balance of complete protein, as well as athletes, anyone under severe stress, and anyone whose alcohol intake level is moderate to high.

Preparations

Supplements of various amino acids are available primarily in capsule, tablet, or powder form. A common way of taking amino acids is in a multiple amino acid gel cap. These contain sources of protein from gelatin, soy, and whey. The market for supplements in wholesale, retail, and Internet sales have been estimated to reach into the millions of dollars, with literally hundreds available. In the 2000s, Internet sales were fast-growing particularly with the use of such supplements as creatine powder publicized by well-known Olympic stars and professional athletes. Daily usage of creatine as evident from research indicated that usage should be leveled at 5 g of powder in a glass of orange juice and could be taken up to four times a day during peak athletic training. Maintenance dosages were recommended at 5 g once a day.

KEY TERMS

Essential amino acids—Amino acids that cannot be produced by the human body and that must, therefore, be included in daily diet.

Non-essential amino acids—Amino acids that are produced in the human body.

Side effects

Because amino acids are naturally produced substances both in the human body and in the diet protein derived from animal and dairy products, as well as being present in food combinations such as beans and rice, such supplements are not regulated by the United States Food and Drug Administration (FDA), nor are there any specified daily requirements, and they also do not show up in either drug or urine tests. Amino acid supplements might be classified as having no affect at all. Long-term effects had not been identified as of 2008.

Interactions

Interactions of amino acids with drugs has not been sufficiently studied to determine yet if any adverse effects result from using amino acids with medications.

Resources

BOOKS

Cynober, Luc A. *Metabolic and Therapeutic Aspects of Amino Acids in Clinical Nutrition,* 2nd ed. London: Taylor & Francis, 2007.

DiPasquale, Mauro G. *Amino Acids and Proteins for the Athlete: The Anabolic Edge,* 2nd ed. Boca Raton, FL: CRC Press, 2007.

Losso, Jack N., Kenji Sato, and Giuseppe Mazza, eds. *Functional Proteins, Peptides and Amino Acids.* Boca Raton, FL: CRC Press, 2008.

Sahyun, Melville. *Proteins and Amino Acids in Nutrition.* Toronto: Richardson Press, 2007.

PERIODICALS

Brosnan, J. T., and M. E. Brosnan. "The Sulfur containing Amino Acids: An Overview." *Journal of Nutrition* (June 2006): 1636S 1640S.

Kreider, R. B. "Effects of Creatine Supplementation on Performance and Training Adaptations." *Molecular and Cellular Biochemistry* (February 2003): 89 94.

Maughan, Ron, Doug King, and Trevor Lea. "Dietary Supplements." *Journal of Sports Sciences* (January 2004): 95 113.

Nicolis, Curis E., et al. "Almost All about Citrulline in Mammals." *Amino Acids* (November 2005): 177 205.

Jane Spehar
Teresa G. Odle
David Edward Newton, Ed.D.

Amyotrophic lateral sclerosis *see* **Lou Gehrig's disease**

An-mo *see* **Chinese massage**

Andrographis

Definition

Andrographis, a genus of plant belonging to the family Acanthaceae, is native to India and Sri Lanka. Its best known and most widely used exemplar is the species *Andrographis paniculata*.

Description

Andrographis paniculata is a flowering perennial that grows wild in thickets throughout south Asia, although it is also cultivated. In summer and autumn, clusters of small white flowers appear. The plant is harvested for commercial and medicinal use when flowers begin to bloom. It is traditionally valued as an herbal remedy in China, where it grows in the Guangdong, Guangxi, Fujian, Yunnan, Sichuan, Jiangsu, and Jianxi provinces.

In Mandarin, andrographis is called *chuan xin lian, Yi jian xi* and *Lan he lian*, which translate directly as "thread-the-heart lotus." The Cantonese term is *chyun sam ling*, and the Japanese call it *senshinren*. English common names include green chiretta, heart-thread lotus leaf, and kariyat. Its pharmaceutical names, used to distinguish it as a medicine, are *Herba Andrographitis Paniculatae* or, alternately, *Folium Andrographis*.

General use

Practitioners of Chinese medicine believe that andrographis affects the large intestine, lung, stomach, bladder, and liver meridians, or energy pathways in the body. It is thought to dispel heat (such as that associated with **fever** or infection) and is used primarily as a broad-spectrum antibiotic and immunostimulant for a variety of bacterial, viral, and parasitic conditions, including **influenza**, intestinal **infections**, **hepatitis**, **pneumonia**, and infected **wounds**. Andrographis's

medicinal properties are considered very bitter, astringent, cold, dry, and stimulating.

Andrographis is considered most effective for conditions associated with fever, inflammation, and the formation of pus. It clears heat and relieves what is known as fire toxicity manifested as sores and carbuncles on the skin. It is also applied topically for snakebite and **eczema**. Under the supervision of a qualified practitioner, it is used as a uterine stimulant and abortive, to bring on miscarriage or treat prolonged **pregnancy** or retained placenta.

Andrographis can also be used as an inexpensive substitute for another Chinese herb, **coptis** (*huang lian*).

Much research on andrographis has been conducted in China and has focused on pharmacological investigation. Studies there indicate that andrographis cultivated in the plains of Shanghai has significant immune stimulating and anti-infective qualities. In vitro, it inhibits the growth of *Diplococcus pneumoniae* and other bacteria and delays the deterioration of embryonic renal cells caused by a virus. Scientific studies on the safety and efficacy of andrographis in the United States have been inconclusive. A review published in 2008 by Natural Standard, an international collaborative that studies the effectiveness of complementary and alternative medicines, concluded that research on the use of andrographis in the treatment of familial Mediterranean fever, influenza, and upper respiratory tract infection was inadequate to make recommendations on the herb's use.

Major chemical ingredients include andrographan, andrographolide, neoandrographolide, paniculide A, 14-deoxy-11-oxyandrographolide, and beta-sitosterol.

Preparations

Andrographis is not generally available in U.S. health food stores, but it can be found at most Chinese pharmacies and Asian groceries.

The standard dose ranges from 10–15 g as a decoction (strong tea) or 2–5 ml as a tincture. Powder doses range from 0.6 to 1.2 g. Because the herb is extremely bitter, it is recommended that powder be taken in capsule form.

Practitioners of Chinese medicine commonly combine andrographis in patent formulas along with other Chinese herbs. The following are the major herbs with which it is combined and the symptoms for which the combinations are prescribed.

- Pericarpium Citri Reticulatae (*Citrus reticulata, Chen pi*) for cough associated with lung heat.
- Herba et Radix Houttuyniae Cordatae (*Houttuynia cordata, yu xing cao*) and Semen Benincasae Hispidae (*Benincasa hispida, dong gua ren cao*) for lung abscess.
- Flos Lonicerae Japonicae (*Lonicera japonica, jin yin hua*) and Radix Platycodonis Grandiflori (*Platycodon grandiflorum, jie geng*) for early stages of a disease with fever and sore throat.
- Herba Portulacae Oleraceae (*Portulacca oleracea, ma chi xian*) for dysentery.
- Radix et folium Polygoni Cuspidati (*Polygonum cuspidatum, hu zhang*) and Rhizoma Imperatae Cylindricae (*Imperata cylindrical* var. *major, bai mao gen*) for hot, painful urinary dysfunction.

Natural Standard noted that scientific research on the effectiveness of combination treatments was also incomplete and inconclusive.

Precautions

According to tradition, andrographis is never used in cases of deficient, cold intestinal conditions. When used long-term or in large doses, this bitter and cold herb may damage stomach qi, causing gastric distress and loss of appetite.

Andrographis is also capable of producing a miscarriage, and thus should be avoided by pregnant women unless otherwise directed by a knowledgeable practitioner.

Side effects

Gastric distress and loss of appetite have been noted when the herb is taken in large doses. The 2008 Natural Standards review indicated that andrographis is generally safe to use, although a number of unpleasant side effects may occur, including **headache**, **dizziness**, confusion, **nausea**, **diarrhea**, chest and abdominal discomfort, and increased risk of bleeding.

Interactions

Interactions with pharmaceutical drugs and herbs have not been well studied. The 2008 Natural Standards report suggested that interactions may occur with anticoagulant drugs, such as warfarin; antiplatelet drugs, such as clopidogrel; blood pressure medications; some nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen; and some drugs used for the treatment of diabetes. The report also suggested obtaining professional advice if one is also taking a variety of herbs such as ginkgo, **horse chestnut** seed extract, **black cohosh**, **hawthorn**, or **bitter melon**.

KEY TERMS

Cold—In Chinese pathology, the term defines a condition that has insufficient warmth, either objective (hypothermia) or subjective (feeling cold).

Decoction—A strong tea brewed for 20 30 minutes.

Heat—In Chinese pathology, the term defines a condition that has excessive heat, either objective (fever, infection) or subjective (feeling hot).

Meridians—Energetic pathways inside the body through which *Qi* flows; also called channels.

Patent formulas—Chinese herbal formulas that were patented centuries ago and are believed to be proven over centuries of use and study.

Qi—A Chinese medical term, pronounced *chee,* denoting active physiological energy.

Tincture—A solution of medicinal substance in alcohol, usually more or less diluted; herb tinctures are made by infusing the alcohol with plant material.

Resources

BOOKS

Leung, Ping Chung, Harry Hong Sang Fong, and Charlie Changli Xue, eds. *Current Review of Chinese Medicine: Quality Control of Herbs And Herbal Material*. Singa pore: World Scientific, 2006.

Liu, Chongyun. *Chinese Herbal Medicine: Modern Applica tions of Traditional Formulas*. London: Taylor & Fran cis, 2007.

PERIODICALS

Mkrtchyan A., et al. "A Phase I Clinical Study of Androg raphis Paniculata Fixed Combination Kan Jang Versus Ginseng and Valerian on the Semen Quality of Healthy Male Subjects." *Phytomedicine* (June 2005): 403 409.

Erika Lenz
David Edward Newton, Ed.D.

Androstenedione

Description

Androstenedione is a hormone that occurs naturally in the body, and is one of those responsible for male characteristics. It is a metabolite of **DHEA**, and as such, a direct precursor to the male hormone testosterone. It is found in some plant matter, notably pollen, and in the gonads of all mammals.

General use

Supplementation with androstenedione increases blood levels of testosterone, which among other things, will lead to an increase in strength and muscle mass. As such, it is mainly of interest to athletes and bodybuilders, for whom it has the added benefits of increasing energy levels, improving levels of nitrogen retention and shortening muscle recovery time. Androstenedione is safer than anabolic steroids because it has a far gentler effect on the body, and potential effects are milder and more transient.

Androstenedione is also taken to improve well being, and to raise levels of mental alertness. In addition, it is thought to have a positive effect on sexual performance. As androstenedione also aids in the conversion of fatty tissue to muscle, it could conceivably be considered an aid to weight loss.

The German patent for androstenedione states that 50 mg administered orally raised testosterone levels from 140%–183% above normal, which although impressive, is considerably less than the increase associated with administration of anabolic steroids. Also, it is a precursor, in that the body retains some control over production of testosterone.

Preparations

When taken orally, androstenedione is metabolized by a single enzyme into testosterone. Athletes generally take between 50 mg–300 mg daily, according to how much time is spent exercising and how much physical improvement is required. Dosage is usually sublingual in the form of a spray or capsules. The spray is felt to be far more effective, due to imperfect absorption through the digestive route.

Levels of testosterone in the blood will begin to rise approximately 15 minutes after administration of androstenedione supplements. They will remain so for about three hours, with testosterone levels peaking roughly 1–1.5 hours after administration.

Precautions

There is no reliable research to prove the claims by supplement companies that androstenedione is useful. Trials that have been conducted are limited in size and scope, and generally do not satisfy the criteria set for medical trials. Some experts warn that as a result of the short time

that androstenedione stays in the system, it is unlikely to have any significant bodybuilding effects.

Androstenedione is not suitable for pregnant or lactating women, and should not be taken at all by children. When taken by women, this supplement may cause hirsuitism and virilization. Caution should be exercised when males under the age of 25 years take androstenedione.

Those supplementing with androstenedione on a regular basis are advised to have "cool down" periods when the product is not taken. This can either be a couple of days a week, or one week per month.

Androstenedione is unsuitable for use by men with **prostate cancer** or elevated PSA. It may also stimulate prostate replication, enlarging the prostrate (benign prostate hypertrophy or **cancer**). Many experts are skeptical of the claims made by supplement companies, because they say that natural bodily checks and balances will work against this supplement to ensure that muscle mass and strength do not exceed normal levels for the individual. Taking androstenedione at times other than periods of physical exertion is not recommended, because of the possible effect on mood.

Because of the complex interaction of hormones within the body, it is strongly advised that anyone contemplating supplementing with androstenedione consult a qualified practitioner.

Whereas anabolic steroids are illegal, androstenedione is considered a dietary supplement, and as such is not governed by the same regulations.

As a result of trials conducted by them, the American Medical Association issued a statement to the effect that androstenedione does not raise serum testosterone levels, and in addition, it may have undesirable side effects.

Side effects

Possible effects on the personality of this type of hormone should be considered, as high levels of male hormones have been known to trigger aggressive behavior in some cases, particularly when high doses of the supplement are involved.

It is also possible that long-term use of androstenedione, which is not in accordance with medical recommendations, may eventually have a negative effect on natural levels of testosterone, due to compensation on the part of the pituitary gland. This means that, in the long term, it is possible that supplementation with androstenedione may cause a reduction in levels of testosterone.

The androgen effect of androstenedione may cause males to develop loss of head hair. Other side effects that have been associated with androstenedione administration include blurred vision, development of breast-like tissue, and the development of **acne**.

KEY TERMS

Anabolic steroids—Synthetic male hormones.

DHEA—Dehydroepiandrosterone, which is basically a male hormone.

Hirsuitism—The growth of excess hair on the bodies of women, usually due to a hormone imbalance.

PSA—Prostatic Specific Antigen, elevated levels of which are a precondition to the development of cancer of the prostate gland.

Sublingual—Taken underneath the tongue.

Transient—Of short duration.

Virilization—The development of male characteristics in women.

Interactions

This supplement should not be taken in conjunction with other bodybuilding substances, particularly anabolic steroids, unless under the direction of a physician. Lysophosphatidyl **choline**, when taken in conjunction with androstenedione, may enhance absorption.

In addition, manufacturers recommend **saw palmetto** to be taken in conjunction with androstenedione as it can help reduce associated **hair loss**, and is useful in controlling **prostate enlargement**.

Resources

OTHER

Betterbodz (1995 2000). http://www.betterbodz.com/androstenedione.html/ (December 28, 2000).

Nutritionalsupplements.com (1998 2000). http://www.nutritionalsupplements.com/andro5.html/ (December 28, 2000).

Patricia Skinner

Anemarrhena

Description

Anemarrhena (*Anemarrhena asphodeloides* or *Zhi-Mu*) is a rare herb that grows wild in Japan, Korea, and the northern part of China. It has a 2,000-year

history of use, and written records of its use date from 200 A.D. It is an attractive-looking plant that belongs to the lily family. At the top of three-foot spikes, it has small, fragrant, white six-petal flowers that bloom at night. The medicinal parts are the rhizomes (roots) and the stems. Rhizomes that are large, hard, and round with pale-yellowish color inside are best for medicinal use.

General use

Traditional Chinese medicine classifies this herb as cold (or yin) and bitter. Yin and yang are the two opposite energies that complement one another. Yin conditions are described as cold, damp, and deficient, while yang is characterized by heat, dry, and excess. Anemarrhena is used to treat heat disorders, which are caused by excessive yang or insufficient yin functions. When there is excessive heat, dryness often follows. For example, fever—an excessive internal heat symptom—is followed by thirst, which is a sign of dryness. Traditional Chinese medicine uses bitter and cold herbs such as anemarrhena to clear the internal heat and provide moisture to the lungs and the kidneys.

Because anemarrhena brings moisture and coolness, it has been said to bring relief to excessive internal heat and dryness symptoms such as **fever**, thirst, irritability, racing pulse, **cough**, bleeding gums, night sweat, **insomnia**, and **hot flashes**. Anemarrhena has been used in herbal combinations such as *Zhi Bai Di Huang Wan* to relieve symptoms such as coughing, ulcers of the mouth, kidney dysfunction, urinary tract infection, insomnia, restlessness, **genital herpes**, and sterility.

Chronic bronchitis

Anemarrhena has been used to eradicate **infections** caused by *Staphylococcus aureus*, the bacterial strain that often causes lung infections. Anemarrhena has also been used to treat **bronchitis** and exacerbating symptoms of chronic bronchitis such as chronic coughing.

Tuberculosis

Anemarrhena is also used to treat **tuberculosis**. However, animal research did not support its use.

Urinary tract infections

Anemarrhena has been used to treat cystitis, an infection of the bladder. It may be effective against *Escherichia coli* (known as *E.coli*), which is a common cause of cystitis in women. If it is proven to be effective, it would be useful against urinary tract infections caused by this bacterial strain.

Other infections

As of 2008 little information was available concerning the use of anemarrhena in other types of infections. However, anemarrhena may have antibacterial activity that is useful against *Salmonella typhi* and *Vibrio cholera*, the bacteria that cause salmonella **food poisoning** and cholera, two common infections of the bowels. Anemarrhena may also be effective against **fungal infections**.

Oliguria

Anemarrhena provides moisture to dry internal organs. Therefore, it is used as a diuretic to improve kidney function.

Ulcers of the mouth and/or bleeding gums

Anemarrhena is thought to restore moisture in these oral conditions that exhibit excessive dryness and inflammation.

Diabetes

Because Chinese herbalists believe that yin deficiency is the underlying cause of diabetes, they often use anemarrhena to treat this disease. Animal studies indicated that anemarrhena contains two pharmacologic agents, mangiferin and mangiferin-7-0-beta glucoside, which appear to increase the effectiveness of insulin and can lower blood glucose levels. In studies, anemarrhena had the greatest effect in mild to moderate diabetic conditions. However, it did not affect glucose levels in nondiabetic conditions. Anemarrhena may be combined with Shi Gao (Gypsum) for additional hypoglycemic effects.

Chemotherapy and radiation side effects

Anemarrhena is thought to be effective in relieving severe adverse reactions associated with conventional chemotherapy and radiation treatments in **cancer** patients. According to traditional Chinese medicine, x rays used in radiation treatment and drugs used in chemotherapy are considered "heat toxins." These agents are very toxic so that they can kill tumor cells. But they are also toxic to the body, causing excessive build-up of heat inside the lungs and damaging the kidneys.

Menopausal symptoms

Another use of anemarrhena is to treat menopausal symptoms such as insomnia, hot flashes, and irregular periods.

High blood pressure

Anemarrhena is often used in combination with phellodendron and rehmannia to treat high blood pressure conditions in patients with symptoms of liver-fire deficiency. These symptoms are **dizziness**, **headache**, ringing in the ears, back **pain**, insomnia, palpitations, dry eyes, and night sweat. Studies of laboratory animals prior to 2000 indicated that this herb was effective in lowering blood pressure.

Preparations

The usual dosage of anamarrhena is 6–12 g per day. It is available as a single ingredient or in combinations in the following forms:

- Powder or pills. These are generally taken with warm water on an empty stomach.
- Decoction. A method often used in traditional Chinese medicine to make an herbal preparation at home. Herbs, usually in combination, are simply boiled down to a concentrated broth or tea to be taken internally.

Precautions

The United States Food and Drug Administration does not regulate herbal remedies such as anemarrhena, which means that the remedies have not been proven to be safe or effective. The safety of anemarrhena has not been established for use by children, pregnant women, and nursing mothers. In addition, ingredients are not standardized to comply with federal regulations.

As of 2008, research claims into the effectiveness of anemarrhena were primarily based on the testing of laboratory animals. The lack of clinical testing on humans raises questions about how anemarrhena would interact with other medications and herbs. In addition, the lack of detailed information about product ingredients drew cautions from organizations, including the American Cancer Society. When the California Department of Health tested Chinese herbal remedies, results showed close to 33% contained prescription drugs or were contaminated with toxic metals such as mercury, arsenic, and lead, according to the society.

Medical precautions

Before beginning any herbal treatment, people should consult a physician or health practitioner. It is especially important for people with conditions such as diabetes to consult with a doctor. Anemarrhena should not be regarded as a substitute for other medications, including insulin.

Anemarrhena should not be used when a person has **diarrhea**, chronic loose bowel movements, or hypotension (low blood pressure). Anemarrhena at very high dosages could cause severe drops in blood pressure levels.

KEY TERMS

Diuretic—A substance that increases the formation and excretion of urine.

Energy—Includes nonmaterial (such as Qi) as well as material (such as blood) vital forces that create and sustain life.

Fire—An extremely high internal heat condition characterized by severe dehydration, red eyes, red face, constipation, insomnia, and agitation. Fire often affects Lungs, Liver, and Stomach.

Hypoglycemia—Low blood sugar.

Oliguria—A condition in which the kidneys produce small amounts of urine.

Side effects

Taking large dosages of anemarrhena could cause diarrhea, intestinal **colic**, and **gastroenteritis**.

Interactions

Anemarrhena has been known to interact with the following:

- Iron supplements or multivitamin, multimineral supplements containing iron. Patients should take iron supplements at least two hours before or two hours after the herb.
- Iron pots or pans. Patients should not use iron cooking utensils to make decoctions as they may alter the chemistry of the herb.

Resources

BOOKS

Mayo Clinic Book of Alternative Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines, (PDR for Herbal Medicines). Boston: Thomson Healthcare, 2005.

OTHER

"Chinese Herbal Medicine." *American Cancer Society,* June 26, 2007. http://www.cancer.org/docroot/ETO/content/ETO_5_3x_Chinese_Herbal_Medicine.asp. (February 11, 2008).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaom.org.

American Botanical Council, 6200 Manor Rd., Austin, TX, 78723, (512) 926 4900, http://abc.herbalgram.org.

American Diabetes Association, 1701 N. Beauregard St., Alexandria, VA, 22311, (800) 342 2383, http://www.diabetes.org.

American Herbal Products Association, 8484 Georgia Ave., Suite 370, Silver Springs, MD, 20910, (301) 588 1171, http://www.ahpa.org.

Herb Research Foundation, 4140 Fifteenth St., Boulder, CO, 80304, (303) 449 2265, http://www.herbs.org.

National Center for Complementary and Alternative Medicine, National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Mai Tran
Liz Swain

Anemia

Definition

Anemia is a condition characterized by abnormally low levels of healthy red blood cells or hemoglobin.

Description

The tissues of the human body need a regular supply of oxygen to stay healthy. Red blood cells, which contain hemoglobin that allows them to deliver oxygen throughout the body, live for only about 120 days. When they die, the **iron** they contain is returned to the bone marrow and used to create new red blood cells. Anemia can develop when heavy bleeding causes significant iron loss. It also occurs when something happens to slow down the production of red blood cells or to increase the rate at which they are destroyed.

Anemia can be mild, moderate, or severe enough to lead to life-threatening complications. Over 400 different types of anemia have been identified. Many of them are rare. More common anemia types include:

- iron deficiency anemia
- folic acid deficiency anemia
- vitamin B_{12} deficiency anemia
- vitamin C deficiency anemia
- autoimmune hemolytic anemia
- hemolytic anemia
- sickle cell anemia
- aplastic anemia
- anemia of chronic disease

Causes and symptoms

Anemia is caused by bleeding, decreased red blood cell production, or increased red blood cell destruction. Poor diet can contribute to vitamin deficiency and iron deficiency anemia, in which an inadequate supply of red blood cells is produced. Hereditary disorders and certain diseases can cause increased blood cell destruction. However, excessive bleeding is the most common cause of anemia, and the speed with which blood loss occurs has a significant effect on the severity of symptoms. Chronic blood loss may be caused by the following conditions:

- heavy menstrual flow
- hemorrhoids
- nosebleeds
- cancer
- gastrointestinal tumors
- diverticulosis
- polyposis
- stomach ulcers
- long-term alcohol abuse

Acute blood loss is usually the result of the following:

- childbirth
- injury
- ruptured blood vessel
- surgery

Iron deficiency anemia

Iron deficiency anemia is the most common form of anemia around the world. In the United States, iron deficiency anemia affects about 240,000 toddlers between one and two years of age and 3.3 million women of childbearing age. This condition is less common in older children and in adults over 50, and it rarely occurs in teenage boys and young men.

Iron deficiency anemia has a gradual onset. The deficiency begins when the body loses more iron than it gains from food and other sources. Because depleted iron stores cannot meet the red blood cells' needs, fewer red blood cells develop. In this early stage of anemia, the red blood cells look normal, but they are reduced in number. Then the body tries to compensate for the iron deficiency by producing more red blood cells, which are characteristically smaller than normal.

Weakness, **fatigue**, and a run-down feeling may be signs of mild anemia. Other signs include skin that is pasty or sallow, or lack of color in the creases of the palm, gums, nail beds, or lining of the eyelids. Someone who is weak, tires easily, is often out of breath, and feels faint or dizzy may be severely anemic. Other symptoms of anemia are:

- angina pectoris (chest pain)
- headache
- inability to concentrate and/or memory loss
- inflammation of the mouth (stomatitis) or tongue (glossitis)
- insomnia
- irregular heartbeat
- loss of appetite
- nails that are dry, brittle, or ridged
- rapid breathing
- sores in the mouth, throat, or rectum
- sweating
- swelling of the hands and feet
- thirst
- tinnitus (ringing in the ears)
- unexplained bleeding or bruising
- pica (a craving to chew ice, paint, or dirt)

Folic acid deficiency anemia

Folic acid deficiency anemia is the most common type of megaloblastic anemia, in which red blood cells are bigger than normal. It is caused by a deficiency of folic acid, a vitamin that the body needs to produce normal cells.

Folic acid anemia is especially common in infants and teenagers. Although this condition usually results from a dietary deficiency, it is sometimes due to an inability to absorb enough folic acid from foods such as the following:

- eggs
- fish
- green vegetables
- meat
- milk and cheese
- mushrooms
- yeast

Smoking raises the risk of developing this condition by interfering with the absorption of **vitamin C**, which the body needs to absorb folic acid. Folic acid anemia can be a complication of **pregnancy**, when a woman's body needs eight times more folic acid than it does otherwise.

Vitamin B_{12} deficiency anemia

Less common in the United States than folic acid anemia, **vitamin B_{12}** deficiency anemia is another type of megaloblastic anemia that develops when the body does not absorb enough of this nutrient. Necessary for the creation of red blood cells, B_{12} is found in meat and vegetables.

Large amounts of B_{12} are stored in the body, so this condition may not become apparent until as long as four years after B_{12} absorption slows down or stops. The resulting drop in red blood cell production can cause the following problems:

- loss of muscle control
- loss of sensation in the legs, hands, and feet
- soreness or burning of the tongue
- weight loss
- yellow-blue color blindness

The most common form of B_{12} deficiency is pernicious anemia. Since most people who eat meat or eggs get enough B_{12} in their **diets**, a deficiency of this vitamin usually means that the body is not absorbing it properly. This condition can occur among people who have had intestinal surgery or those who do not produce adequate amounts of intrinsic factor, a chemical secreted by the stomach lining that combines with B_{12} to help its absorption in the small intestine. Symptoms of pernicious anemia include problems with movement or balance, a slick tongue, tingling in the hands and feet, confusion, **depression**, and **memory loss**. Pernicious anemia can also damage the spinal cord. A doctor should be notified whenever symptoms of this condition occur.

Pernicious anemia usually strikes people 50–60 years of age. Eating disorders or an unbalanced diet increases the risk of developing pernicious anemia. So do **diabetes mellitus**, **gastritis**, stomach **cancer**, stomach surgery, thyroid disease, and family history of pernicious anemia.

Vitamin C deficiency anemia

A rare disorder that causes the bone marrow to manufacture abnormally small red blood cells, vitamin C deficiency anemia results from a severe, long-standing dietary deficiency.

Hemolytic anemia

Some people are born with hemolytic anemia. Some acquire this condition, in which infection or antibodies destroy red blood cells more rapidly than bone marrow can replace them.

Hemolytic anemia can cause enlargement of the spleen and accelerate the destruction of red blood cells (hemolysis). Other complications of hemolytic anemia may include **pain**, shock, **gallstones**, and other serious health problems.

Thalassemias

An inherited form of hemolytic anemia, thalassemia stems from the body's inability to manufacture as much normal hemoglobin as it needs. There are two categories of thalassemia, depending on which of the amino acid chains is affected. (Hemoglobin is composed of four chains of amino acids.) In alpha-thalassemia, there is an imbalance in the production of the alpha chain of **amino acids**; in beta-thalassemia, there is an imbalance in the beta chain. Alpha-thalassemia most commonly affects blacks (25% have at least one gene); beta-thalassemia most commonly affects people of Mediterranean and Southeast Asian ancestry.

Characterized by production of red blood cells that are unusually small and fragile, thalassemia affects only people who inherit the gene for it from each parent (autosomal recessive inheritance).

Autoimmune hemolytic anemia

Warm antibody hemolytic anemia is the most common type of this disorder. This condition occurs when the body produces autoantibodies that coat red blood cells. The coated cells are destroyed by the spleen, liver, or bone marrow.

Warm antibody hemolytic anemia is more common in women than men. About one-third of patients who have warm antibody hemolytic anemia also have lymphoma, **leukemia**, lupus, or connective tissue disease.

In cold antibody hemolytic anemia, the body attacks red blood cells at or below normal body temperature. The acute form of this condition frequently develops in people who have had **pneumonia**, **mononucleosis**, or other acute **infections**. It tends to be mild and short-lived and disappears without treatment.

Chronic cold antibody hemolytic anemia is most common in women and most often affects those who are over 40 and have arthritis. This condition usually lasts for a lifetime, generally causing few symptoms. However, exposure to cold temperatures can accelerate red blood cell destruction, causing fatigue, joint aches, and discoloration of the arms and hands.

Sickle cell anemia

Sickle cell anemia is a chronic, incurable condition that causes the body to produce defective hemoglobin, which forces red blood cells to assume an abnormal crescent shape. Unlike normal oval cells, fragile sickle cells cannot hold enough hemoglobin to nourish body tissues. The deformed shape makes it hard for sickle cells to pass through narrow blood vessels. When capillaries become obstructed, a life-threatening condition called sickle cell crisis is likely to occur.

Sickle cell anemia is hereditary. It almost always affects people of African or Mediterranean descent. A child who inherits the sickle cell gene from each parent will have the disease, but a child who inherits the gene from only one parent will carry the sickle cell trait but will not have the disease.

Aplastic anemia

Sometimes curable by bone marrow transplant, but potentially fatal, aplastic anemia is characterized by decreased production of red and white blood cells and platelets (disc-shaped cells that allow the blood to clot). This disorder may be inherited or acquired as a result of recent severe illness, long-term exposure to industrial chemicals, or use of anticancer drugs and certain other medications.

Anemia of chronic disease

Cancer, chronic infection or inflammation, and kidney and liver disease often cause mild or moderate anemia. Chronic liver failure generally produces the most severe symptoms.

Diagnosis

Personal and family health history may suggest the presence of certain types of anemia. Laboratory tests that measure the percentage of red blood cells or the amount of hemoglobin in the blood are used to confirm diagnosis and determine which type of anemia is responsible for a patient's symptoms. X rays and examinations of bone marrow may be used to identify the source of bleeding.

Treatment

Individuals who have anemia caused by poor **nutrition** should modify their diet to include more vitamins, minerals, and iron. Foods such as lean red meats, dried beans and fruits, liver, poultry, and enriched breads and cereals are all good sources of iron. In addition, eating foods rich in vitamin C such as citrus fruits and juices can promote the absorption of iron.

Patients diagnosed with iron-deficiency anemia should undergo a thorough physical examination and medical history to determine the cause of the anemia, particularly if chronic or acute blood loss is suspected. The cause of a specific anemia will determine the type of treatment recommended.

Anemia due to nutritional deficiencies can usually be treated at home with iron supplements or self administered injections of vitamin B_{12}. People with folic acid anemia should take oral folic acid replacements. Vitamin C deficiency anemia can be cured by taking daily supplements of vitamin C.

Many therapies for iron-deficiency anemia focus on adding iron-rich foods to the diet or on techniques to improve circulation and digestion. Iron supplementation, especially with iron citrate (less likely to cause **constipation**), can be given in combination with herbs that are rich in iron. Some examples of iron-rich herbs are **dandelion** (*Taraxacum officinale*), **parsley** (*Petroselinum crispum*), and **nettle** (*Urtica dioica*). The homeopathic remedy ferrum phosphoricum (iron sulfate) can also be helpful.

An iron-rich herbal tonic can also be made using the following recipe:

- Soak one-half ounce of yellow dock root and one-half ounce dandelion root in 1 qt of boiled water for 4–8 hours.
- Simmer until the amount of liquid is reduced to 1 cup.
- Remove from heat and add one-half cup black strap molasses, mixing well.
- Store in refrigerator; take one-quarter cup daily.

Other herbal remedies known to promote digestion are prescribed to treat iron-deficiency anemia. Gentian (*Gentiana lutea*) is widely used in Europe to treat anemia and other nutritionally based disorders. The bitter qualities of gentian help stimulate the digestive system, making iron and other nutrients more available for absorption. This bitter herb can be brewed into tea or purchased as an alcoholic extract (tincture).

Other herbs recommended to promote digestion include:

- anise (*Pimpinella anisum*)
- caraway (*Carum carvi*)
- cumin (*Cuminum cyminum*)
- linden (*Tilia* spp.)
- licorice (*Glycyrrhiza glabra*)

Traditional Chinese treatments for anemia include:

- Acupuncture to stimulate a weakened spleen.
- Asian ginseng (*Panax ginseng*) to restore energy.
- Dong quai (*Angelica sinensis*) to control heavy menstrual bleeding.
- A mixture of dong quai and Chinese foxglove (*Rehmannia glutinosa*) to clear a sallow complexion.
- Astragalus (*Astragalus membranaceus*) to treat pallor and dizziness.

Allopathic treatment

Surgery may be necessary to treat anemia caused by excessive loss of blood. Transfusions of red blood cells may be used to accelerate production of red blood cells.

Medication or surgery may also be necessary to control heavy menstrual flow, repair a bleeding ulcer, or remove polyps (growths or nodules) from the bowels.

Patients with thalassemia usually do not require treatment. However, people with a severe form may require periodic hospitalization for blood transfusions and/or bone marrow transplantation.

Sickle cell anemia

Treatment for sickle cell anemia involves regular eye examinations, immunizations for pneumonia and infectious diseases, and prompt treatment for sickle cell crises and infections of any kind. **Psychotherapy** or counseling may help patients deal with the emotional impact of this condition.

Vitamin B_{12} deficiency anemia

A life-long regimen of B_{12} shots is necessary to control symptoms of pernicious anemia. The patient may be advised to limit physical activity until treatment restores strength and balance.

Aplastic anemia

People who have aplastic anemia are especially susceptible to infection. Treatment for aplastic anemia may involve blood transfusions and bone marrow transplant to replace malfunctioning cells with healthy ones.

Anemia of chronic disease

There is no specific treatment for anemia associated with chronic disease, but treating the underlying illness may alleviate this condition. This type of anemia rarely becomes severe. If it does, transfusions or hormone treatments to stimulate red blood cell production may be prescribed.

Hemolytic anemia

There is no specific treatment for cold-antibody hemolytic anemia. About one-third of patients with warm-antibody hemolytic anemia respond well to large doses of intravenous and oral corticosteroids, which are gradually discontinued as the patient's condition improves. Patients with this condition who do not respond to medical therapy must have the spleen surgically removed. This operation controls anemia in about half of the patients on whom it is performed. Immune-system suppressants are prescribed for patients whose surgery is not successful.

Expected results

Folic acid and iron deficiency anemia

It usually takes three to six weeks to correct folic acid or iron deficiency anemia. Patients should continue taking supplements for another six months to replenish iron reserves and should have periodic blood tests to make sure the bleeding has stopped and the anemia has not recurred.

Pernicious anemia

Although pernicious anemia is considered incurable, regular B_{12} shots alleviate symptoms and reverse complications. Some symptoms disappear almost as soon as treatment begins.

Aplastic anemia

Aplastic anemia can sometimes be cured by a bone marrow transplant. If the condition is due to immunosuppressive drugs, symptoms may disappear after the drugs are discontinued.

Sickle cell anemia

Although sickle cell anemia cannot be cured, effective treatments enable patients with this disease to enjoy longer, more productive lives.

Thalassemia

People with mild thalassemia (alpha thalassemia trait or beta thalassemia minor) lead normal lives and do not require treatment. Those with severe thalassemia may require bone marrow transplantation. Genetic therapy is being investigated and is expected to become available.

Hemolytic anemia

Acquired hemolytic anemia can generally be cured when the cause is removed.

KEY TERMS

Aplastic—Exhibiting incomplete or faulty development.

Diabetes mellitus—A disorder of carbohydrate metabolism brought on by a combination of hereditary and environmental factors.

Hemoglobin—An iron-containing pigment of red blood cells composed of four amino acid chains (alpha, beta, delta, gamma) that delivers oxygen from the lungs to the tissues of the body.

Megaloblast—A large erythroblast (a red marrow cell that synthesizes hemoglobin).

Prevention

Inherited anemia cannot be prevented. Genetic counseling can help parents cope with questions and concerns about passing on disease-causing genes to their children.

Avoiding excessive use of alcohol, eating a balanced diet that contains plenty of iron-rich foods, and taking a daily multivitamin can help prevent anemia.

Methods of preventing specific types of anemia include:

- Avoiding lengthy exposure to industrial chemicals and drugs known to cause aplastic anemia.
- Not taking medication that has triggered hemolytic anemia and not eating foods that have caused hemolysis (breakdown of red blood cells).
- Receiving regular B_{12} shots to prevent pernicious anemia resulting from gastritis or stomach surgery.

Resources

BOOKS

Bridges, Kenneth. *Anemias and Other Red Cell Disorders*. New York: McGraw Hill Professional, 2007.

Platt, Allan, and Alan Sacerdote. *Hope and Destiny: A Patient's and Parent's Guide to Sickle Cell Anemia*. Munster, IN: Hilton, 2006.

Weiss, Gunter, Victor R. Gordeuk, and Chaim Hershko, eds. *Anemia of Chronic Disease*. London: Informa Healthcare, 2005.

PERIODICALS

D'Arena, Giovanni, et al. "Rituximab for Warm type Idio pathic Autoimmune Hemolytic Anemia: A Retrospec tive Study of 11 Adult Patients." *European Journal of Haematology* (July 2007): 53 58.

Huma, Nuzahat, et al. "Food Fortification Strategy Preventing Iron Deficiency Anemia: A Review."

Critical Reviews in Food Science and Nutrition (March 2007): 259 265.

Killip, Shersten, John M. Bennett, and Mara D. Chambers. "Iron Deficiency Anemia." *American Family Physician* (March 1, 2007): 671 678.

Paula Ford-Martin
David Edward Newton, Ed.D.

Angelica

Description

Angelica is a genus of plants in the **parsley** family used in both Western healing and **traditional Chinese medicine** (TCM). The most common angelica used in Western healing is the European species, *Angelica archangelica*. Occasionally the North American species, *A. atropurpurea*, is used in the same way as *A. archangelica*. Other names for Western Angelica are European angelica, garden angelica, purple angelica, Alexander's archangel, masterwort, wild angelica, and wild celery.

Western angelica grows to a height of about 4.5 ft (1.5 m) in dappled sun. It has white to yellow flowers and very large three-part leaves. The root is long and fibrous and may be poisonous if used fresh. The plant has a strong, tangy odor and taste.

At least 10 different species of angelica are used in TCM. The most frequently used species is *A. sinensis*, which in Chinese is called *dong quai* (alternate spellings are *dang gui*, *tang kwei*, and *tang gui*). Other Chinese species include *A. pubescens*, called in Chinese *du huo*, and *A. dahurica*, called in Chinese *bai zhi*. The descriptions of the medicinal uses of Chinese angelica in this article refer only to *A. sinensis* or *dong quai*.

Chinese angelica is a perennial that grows to a height of 3 ft (1 m) in moist, fertile soil at high altitudes in China, Korea, and Japan. It has a purple stem and umbrella-like clusters of flowers. The root is used medicinally and as a spice.

The species of angelica used in Western healing have different properties than those used in Eastern medicine. Any properties or benefits ascribed to Western angelica do not necessarily apply to Chinese angelica or vice versa.

General use

Western angelica

Western angelica, or *A. archangelica*, is said to have been named after an angel who revealed the herb to a European monk as a curative. It has a long history of folk use in Europe, Russia, and among Native American tribes.

The leaves of angelica are prepared as a tincture or tea and used to treat coughs, colds, **bronchitis**, and other respiratory complaints. They are considered gentler in action than preparations made from the root. The root is the most medically active part of the plant. It is used as an appetite stimulant and to treat problems of the digestive system and liver. It is said to relieve abdominal bloating and **gas**, **indigestion**, and **heartburn**.

Angelica will induce sweating and is used to treat conditions such as arthritis and rheumatism. In addition, it is used as a diuretic. Externally, angelica is applied as an ointment to treat lice and some skin disorders.

In addition to medicinal use, an essential oil derived from the plant is used in making perfumes and as a food flavoring. Oil from the seeds imparts the distinctive flavor to the Benedictine liqueur. Sometimes candied leaves and stalks are used as sweets.

Despite its widespread folk use, angelica can present some serious health hazards. The root is poisonous when fresh and must be dried thoroughly before use. All members of the genus contain compounds called furocoumarins that can cause a person exposed to the sun or other source of ultraviolet rays to develop severe **sunburn** and/or rash (photodermatitis). In addition, in animal studies furocoumarins have been found to cause **cancer** and cell damage even without exposure to light. The essential oil contains safrole, the cancer-causing substance that caused the United States Food and Drug Administration (FDA) to ban the herb **sassafras**.

Despite these health concerns, the German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, has approved preparations containing angelica root as a treatment for bloating and as an appetite stimulant.

Chinese angelica

Chinese angelica, or *dong quai*, is considered in TCM to have a warm nature and a sweet, acrid, and bitter taste. The main use of angelica in TCM is to

regulate the female reproductive organs and treat irregularities of the menstrual cycle, especially deficient bleeding (amenorhhea). Chinese herbalists also use this herb to treat irregular periods, menstrual cramps, and **infertility**. The root is one component of Four Things Soup, a widely used woman's tonic in China. Because of its use as a tonic for women, *dong quai* is sometimes called "women's ginseng."

Dong quai is one of the most commonly used herbs in China and is one of the traditional Chinese herbs that is increasingly familiar in the West. In addition to treating women's complaints, Chinese angelica is used in general blood tonics to improve conditions such as **anemia**. Because angelica is considered to be a warming herb, it is also used to aid circulation and digestion. Other uses are to treat kidney complaints, **headache**, **constipation**, rheumatism, high blood pressure, and ulcers.

Dong quai contains several active compounds called coumarins. These compounds are well documented as agents that dilate (open up) the blood vessels, stimulate the central nervous system, and help control spasms. It is likely that these compounds do act on the uterus, supporting the use of *dong quai* for some women's problems.

Animal and test-tube studies indicated that *dong quai* may combat **allergies** by altering the immune system response. Other animal studies suggest that the herb is a mild diuretic. Interest in *dong quai* has increased in the twenty-first century and more test tube and animal research is being done on the herb. There are reports that the herb may have estrogen-like properties that would account for its effect on the female reproductive system. As of 2008, laboratory and animal studies of this effect have produced mixed results.

Preparations

Angelica root is harvested in the fall, then dried for future use. The leaves of Western angelica can be made into a tea (1 teaspoon powdered leaves to one cup of boiling water steeped up to 20 minutes), a tincture, or a cream for external use. The root can be made into a tincture or a decoction. The essential oil can be combined with other oils for external use as a massage oil for arthritis.

Dong quai is used in many common Chinese formulas and as a component of many medicinal soups. Because it is most often used with other herbs, dosage varies.

KEY TERMS

Decoction—Decoctions are made by boiling an herb, then straining the solid material out for the resulting liquid.

Diuretic—A diuretic is any substance that increases the production of urine.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Precautions

Pregnant women should not take angelica because of its effects on the reproductive system. It is not known whether angelica passes into breast milk, so breastfeeding women should also avoid the herb. Safe use in children has not been established.

People who are taking blood thinners such as warfarin (Coumadin) should discuss taking any preparations containing angelica with their doctor. The herb appears to have anticlotting effects and may, when taken with other blood-thinning agents, cause excessive bleeding.

Individuals who are allergic to plants in the same family as angelica, including **anise**, caraway, carrot, celery, dill, and parsley, may experience an allergic reaction to *dong quai*.

Women who have or have had estrogen-sensitive cancers should avoid *dong quai* until more research is done on its estrogen-like properties.

Dong quai, like Western angelica, contains compounds that can cause a person exposed to the sun or other source of ultraviolet rays to develop severe sunburn and/or rash. These problems become more severe when using the concentrated essential oil or purified forms of the herb. The essential oil also contains safrole, a known carcinogen.

Side effects

In addition to increasing the risk of photodermatitis, angelica is considered to be a mild laxative and may cause **diarrhea**.

Interactions

Angelica may interact with blood-thinning pharmaceuticals in a way that causes excessive bleeding. Other interactions with Western pharmaceuticals have not been documented. Given the history of its long use in TCM, it appears unlikely that there are any significant interactions with other commonly used Chinese herbs.

Resources

BOOKS

Bensky, Dan, et al. *Chinese Herbal Medicine: Materia Medica,* 3rd ed. Seattle, WA: Eastland Press, 2004.

Blumenthal, Mark, ed. *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medi cines*. Boston: Integrative Medicine Communications, 1998.

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

OTHER

"*Angelica sinensis*." *Plants for a Future*. [cited February 19, 2008]. http://www.pfaf.org/database/plants.php?Angelica + sinensis.

"Dong quai (Angelica sinensis [Oliv.] Diels), Chinese angelica." *Mayo Clinic*. September 1, 2006 [cited Feb ruary 19, 2008]. http://www.mayocli nic.com/health/dong quai/NS_patient Dongquai.

"Dong Quai (Angelica sinensis) Oral." *MedicineNet.com*. March 2, 2005 [cited February 19, 2008]. http://www.medicinenet.com/dong_quai_angelica_sinensis oral/article.htm.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

Tish Davidson, A. M.

Angelica archangelica see **Angelica root**

Angelica sinensis see **Dong quai**

Angina

Definition

Angina is **pain**, discomfort, or pressure in the chest that is caused by **ischemia**, an insufficient supply of oxygen-rich blood to the heart muscle. It is sometimes also characterized by a feeling of choking, suffocation, or crushing heaviness. This condition is also called angina pectoris.

Description

Often described as a muscle spasm and choking sensation, angina primarily is chest (thoracic) pain caused by insufficient oxygen to the heart muscle. An episode of angina is not an actual **heart attack**, but rather pain that results when the heart muscle temporarily receives too little blood. This temporary condition may be the result of demanding activities such as **exercise** and does not necessarily indicate that the heart muscle is experiencing permanent damage. In fact, episodes of angina seldom cause permanent damage to heart muscle. An estimated 9.1 million Americans suffer from angina with 500,000 new cases of stable angina diagnosed each year, according to the American Heart Association. In the United Kingdom, about 1.8 million people have angina.

There are five types of angina.

Stable angina

Stable angina is a common disorder caused by the narrowing of the arteries (a condition called **atherosclerosis**) that supply oxygen-rich blood to the heart muscle. In the case of stable angina, the coronary arteries can provide the heart muscle (myocardium) adequate blood during rest but not during periods of exercise, **stress**, or excitement. The resulting pain is relieved by resting or by administering nitroglycerin, a medication that relaxes the heart muscle, opens up the coronary blood vessels, and lowers the blood pressure—all of which reduce the heart's need for oxygen. Patients with stable angina have an increased risk of heart attack (myocardial infarction).

Unstable angina

Unstable angina has symptoms of unexpectant chest pain that occur while the person is at rest. The pain progressively worsens and is more severe than in stable angina. It is an intermediate condition between stable angina and a heart attack. People who experience unstable angina need to seek immediate medical attention.

Variant angina

Variant angina is relatively uncommon and occurs independently of atherosclerosis, which may incidentally be present. Variant angina occurs at rest and is not related to excessive work by the heart muscle. Research indicates that variant angina is caused by coronary

artery muscle spasm that does not last long enough and/or is not intense enough to cause an actual heart attack. It is more common in women than men.

Microvascular angina

People with microvascular angina experience chest pain but have no apparent coronary artery blockages. Doctors have found that the pain results from the poor function of tiny blood vessels that nourish the heart as well as the arms and legs. Microvascular angina can be treated with some of the same medications used for stable angina. It is more common in people with diabetes.

Atypical angina

Atypical angina is caused by a sudden narrowing or tightening of an artery that supplies blood to the heart. Symptoms include a vague feeling of discomfort in the chest rather than pain, shortness of breath, **fatigue**, **nausea**, **indigestion**, and back or **neck pain**. It is more common in women than men and in people with diabetes.

Causes and symptoms

Angina is usually caused by an underlying obstruction to the coronary artery due to atherosclerosis. In some cases, it is caused by spasm that occurs naturally or as a result of ingesting cocaine. In rare cases, angina is caused by a coronary embolism or by a disease other than atherosclerosis that places demands on the heart.

Most episodes of angina are brought on by physical exertion, when the heart needs more oxygen than is available from the blood nourishing the heart. Emotional stress, extreme temperatures, heavy meals, cigarette **smoking**, and alcohol can also cause or contribute to an episode of angina.

Angina causes a pressing pain or sensation of heaviness, usually in the chest area under the breast bone (sternum). It is occasionally experienced in the shoulder, arm, neck, or jaw regions. In most cases, the symptoms are relieved within a few minutes by resting or by taking prescribed angina medications.

Diagnosis

Physicians can usually diagnose angina based on the patient's symptoms and the precipitating factors. However, other diagnostic testing is often required to confirm or rule out angina or to determine the severity of the underlying **heart disease**.

Electrocardiogram (ECG)

An electrocardiogram is a test that records electrical impulses from the heart. The resulting graph of electrical activity can show if the heart muscle is not functioning properly as a result of a lack of oxygen. Electrocardiograms are also useful in investigating other possible abnormal features of the heart, such as arrhythmia (irregular heartbeat).

Stress test

For many individuals with angina, the results of an electrocardiogram while at rest will not show any abnormalities. Because the symptoms of angina occur during stress, the heart's function may need to be evaluated under the physical stress of exercise. The stress test records information from the electrocardiogram before, during, and after exercise in search of stress-related abnormalities. Blood pressure is also measured during the stress test and symptoms are noted. In some cases a more involved and complex stress test (for example, thallium scanning) is used to picture the blood flow in the heart muscle during the most intense exercise and after rest.

Angiogram

The angiogram, which is a series of x rays of the coronary artery, has been noted as the most accurate diagnostic test to indicate the presence and extent of coronary disease. In this procedure, a long, thin, flexible tube (catheter) is inserted into an artery located in the forearm or groin. This catheter is passed further through the artery into one of the two major coronary arteries. A dye is injected through the catheter to make the heart, arteries, and blood flow clearer on the x ray. A fluoroscopic film, or series of "moving" x rays, shows the blood flowing through the coronary arteries. This examination reveals any narrowing that can decrease blood flow to the heart muscle and cause symptoms of angina.

Treatment

Controlling existing factors that place the individual at risk is the first step in addressing artery disease that causes angina. These risk factors include cigarette smoking, high blood pressure, high **cholesterol** levels, and **obesity**.

Once the angina has subsided, the cause should be determined and treated. Atherosclerosis, a major associated cause, requires diet and lifestyle adjustments, primarily including regular exercise, reduction of dietary sugar and saturated fats, and increase of dietary fiber.

In the 1990s and 2000s, several specific cholesterol-lowering treatments gained public attention and interest. One popular treatment is ingesting **garlic** (*Allium sativum*). Some studies have shown that garlic can reduce total cholesterol by about 10% and LDL (bad) cholesterol by 15%, and can raise HDL (good) cholesterol by 10%. Other studies have not shown significant benefit. Although its effect on cholesterol is not as great as the effect achieved by medications, garlic may help in relatively mild cases of high cholesterol, without causing the side effects associated with cholesterol-reducing drugs. In 2007, scientists in the United States reported they had discovered why garlic benefits heart health. Researchers found that consuming garlic can boost blood flow by increasing the levels of hydrogen sulphide in the bloodstream, which lowers blood pressure and decreases cholesterol levels, two risk factors for angina.

Several studies have found that red yeast extract can significantly reduce cholesterol when it is taken in conjunction with a low-fat diet. Red yeast extract, available in the United States under the trade name Cholestin, has been used in Chinese medicine to treat heart maladies for hundreds of years. The effectiveness of the extract depends on the patient's cholesterol level and medical history, so individuals should consult with their healthcare professionals before taking the supplement. Additional natural remedies that may help lower cholesterol include oats (*Avena sativa*), **alfalfa** (*Medicago sativa*), **fenugreek** (*Trigonella foenum-graecum*), **Korean ginseng** (*Panax ginseng*), **myrrh** (*Commiphora molmol*), and **turmeric** (*Curcuma longa*).

Yarrow (*Achillea millefolium*), linden (*Tilia europaea*), and **hawthorn** (*Crataegus spp.*) are sometimes recommended for controlling high blood pressure, a risk factor for heart disease. In particular, hawthorn extract appears to benefit the **aging** heart. A 2001 report of a European study reported that patients using hawthorn extract showed improvements in exercise tolerance, fatigue levels, and shortness of breath.

A Chinese herbal medical formula has been used for at least several centuries to treat angina. The formula, called *xue fu zhu yu tang*, contains the following herbs: tao ren (*semen persicae*), hong hua (*flos carthami*), dang gui (*radix angelicae sinensis*), sheng di huang (uncooked *radix rehmanniae*), chuan xiong (*rhizoma chuanxiong*), chi shao (*radix rubra paeoniae*), niu xi (*radix achyranthis bidentatae*), jie geng (*radix platycodi*), chai hu (*radix bupleuri*), zhi ke (*fructus aurantii*), and gan cao (*radix glycyrrhizae*). In a 2006 study, Chinese researchers concluded that the formula was effective in relieving angina pain and had no reported adverse side effects. The formula is sold over the counter in the United States and a one-month supply costs about $40.

Tea (*Camellia sinensis*)—especially green tea—is high in **antioxidants**, and studies have shown that it may help prevent atherosclerosis. Other antioxidants, including **vitamin A** (**beta carotene**), **vitamin C**, **vitamin E**, and **selenium**, can also limit the damage to the walls of blood vessels by oxidation, which may be lead to the formation of atherosclerotic plaque.

Vitamin and mineral supplements that reduce, reverse, or protect against coronary artery disease include **chromium**, **calcium**, and **magnesium**, B-complex vitamins, L-carnitine, and **zinc**. **Yoga** and other bodywork, massage, **aromatherapy**, and **music therapy** may also help reduce angina symptoms by promoting **relaxation** and stress reduction.

Traditional Chinese medicine may recommend herbal remedies (such as a ginseng and **aconite** combination), massage, **acupuncture**, and dietary modification. Exercise and a healthy diet, including cold-water fish as a source of **essential fatty acids**, are important components of a regimen to prevent angina and heart disease.

Allopathic treatment

Angina is often controlled by medication, most commonly with nitroglycerin. This drug relieves symptoms of angina by increasing the diameter of the blood vessels that carry blood to the heart muscle. Nitroglycerin is taken whenever discomfort occurs or is expected. It may be taken sublingually, by placing the tablet under the tongue. Or it may be administered transdermally, by placing a medicated patch directly on the skin.

In addition, beta-blockers or calcium channel blockers may be prescribed to decrease the heart's rate and workload. In late 2001, a study reported that the drug Nicorandil had become the first to demonstrate a reduction in risk of angina and to improve symptoms in patients with chronic stable angina. Guidelines released late in 2000 promoted use of clopidogrel to help prevent recurring events. A study group that used clopidogrel and aspirin showed a significant decrease in cardiovascular death, nonfatal heart attack, and **stroke** compared to patients in a control group that received a placebo and aspirin. In 2006, the U.S. Food and Drug Administration (FDA) approved the prescription drug ranolazine (Ranexa) as a second-line treatment of angina. It is recommended for patients with chronic stable angina who do not respond well to other drugs. It was the first new

drug in 20 years to be approved by the FDA to treat angina. Further clinical studies of the drug were underway as of late 2007 to determine its effectiveness and safety as a first-line treatment for stable and unstable angina.

When conservative treatments are not effective in reducing angina pain and the risk of heart attack remains high, physicians may recommend angioplasty or surgery. In coronary artery bypass surgery, a blood vessel (often a long vein surgically removed from the leg) is grafted onto the blocked artery to bypass the blocked portion. This newly formed pathway allows blood to flow adequately to the heart muscle.

Another procedure used to improve blood flow to the heart is percutaneous tranluminal coronary angioplasty, usually called coronary or balloon angioplasty. In this procedure, the physician inserts a catheter with a tiny balloon at the end into a forearm or groin artery. The catheter is then threaded up into the coronary arteries, and the balloon is inflated to open the vessel in narrowed sections. Other techniques to open clogged arteries are under development and in limited use, including the use of lasers, stents, and other surgical devices.

A newer but less used treatment for angina is called enhanced external counterpulsation (EECP). The treatment increases blood flow to the heart by wrapping long inflatable cuffs (similar to those used to measure blood pressure) around the calves, thighs, and buttocks of patients. The cuffs inflate and deflate with each heartbeat, pushing blood up the legs towards the heart. EECP is recommended for people with chronic stable angina who are not helped by taking nitrates and who do not qualify for surgery. EECP is a non-surgical procedure that is typically done in an outpatient center. The treatment is given one to two hours a day, five days a week, for seven weeks. A number of studies have reported that EECP treatment is safe, effective, and has no adverse side effects. The treatment costs $8,000 to $10,000 in the United States and is covered by some insurance plans and covered under certain conditions by Medicare.

Expected results

The prognosis for a patient with angina depends on the general health of the individual as well as on the origin, type, and severity of the condition. Individuals can improve their prognosis by seeking prompt medical attention and learning the pattern of their angina, such as what causes the attacks, what they feel like, how long episodes usually last, and whether medication relieves the attacks. Medical help should be sought immediately if patterns of the symptoms change significantly or if symptoms resemble those of a heart attack.

KEY TERMS

Atherosclerosis—Progressive narrowing and hardening of the arteries caused by the buildup of plaque on the artery walls, which results in restricted blood flow.

Enhanced external counterpulsation (EECP)—A noninvasive angina treatment that increases blood flow to the heart.

Ischemia—Decreased blood supply to an organ or body part, often resulting in pain.

Myocardial infarction—A blockage of a coronary artery that cuts off the blood supply to part of the heart. In most cases, the blockage is caused by fatty deposits.

Myocardium—The thick middle layer of the heart that forms the bulk of the heart wall and contracts as the organ beats.

Prevention

In most cases, the best prevention involves changing habits to avoid bringing on attacks of angina. A heart-healthy lifestyle includes eating right, exercising regularly, maintaining an appropriate weight, not smoking, drinking in moderation, controlling **hypertension**, and managing stress. Most healthcare professionals can provide valuable advice on proper diet, weight control, smoking cessation, and maintaining healthy blood cholesterol levels and blood pressure.

Resources

BOOKS

Braverman, Debra. *Heal Your Heart with EECP: The Only Noninvasive Way to Overcome Heart Disease*. San Francisco: Celestial Arts, 2005.

Chermin, Dennis. *The Complete Homeopathic Resource for Common Illnesses*. Berkeley, CA: North Atlantic Books, 2006.

Icon Health Publications. *The Official Patient's Sourcebook on Angina: A Directory for the Internet Age*. San Diego: Icon Health Publications, 2005.

Maciocia, Giovanni. *The Practice of Chinese Medicine: The Treatment of Diseases With Acupuncture and Chinese Herbs*. Burlington, MA: Churchill Livingstone (Elsevier), 2007.

PERIODICALS

Flaws, Bob. "The Chinese Medical Treatment for Coronary Heart Disease Angina." *Townsend Letter: The Exam iner of Alternative Medicine* (July 2007): 158 159.

Gupta, Nelly Edmondson, et al. "Stents vs. Medications to Treat Heart Disease: Once Hailed as a Breakthrough in the Care of Angina, Stents Are in the Crosshairs of Skeptics. Two Cardiologists Sort Through the Contro versy." *Clinical Advisor* (November 2007): 52(3).
Havranek, Edward. "Enhanced External Counterpulsation (EECP)." *Clinical Reference Systems* (May 31, 2007): N/A.
Koren, Michael J., et al. "Long Term Safety of a Novel Antianginal Agent in Patients with Severe Chronic Stable Angina." *Journal of the American College of Cardiology* (March 13, 2007): 1027(8).
Moon, Mary Ann. "CABG Relieves Angina Better than PCI." *Family Practice News* (November 1, 2007): 12(2).
Warburton, Louise. "Clinical: How to Diagnose and Treat Angina The Basics." *GP* (September 14, 2007): 26.

ORGANIZATIONS

American Heart Association, 7320 Greenville Ave., Dallas, TX, 75231, (800) 242 8721, http://www.americanheart.org.
American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.
Heart and Stroke Foundation of Canada, 222 Queen St., Suite 1402, Ottawa, ON, K1P 5V9, Canada, (613) 569 4361, http://www.heartandstroke.ca.
Heart Association of Australia, 80 William St., Level 3, Sydney, NSW 2011, Australia, (11) 61 2 300 36 2787, http://www.heartfoundation.org.au.
Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON , M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.
National Heart, Lung, and Blood Institute, PO Box 30105, Bethesda, MD, 20824 0105, (301) 592 8573, http://www.nhlbi.nih.gov.

Paula Ford-Martin
Ken R. Wells

Animal-assisted therapy *see* **Pet therapy**

Anise

Description

Anise, *Pimpinella anisum*, is a slow-growing annual herb of the **parsley** family (Apiaceae, formerly Umbelliferae). It is related to other plants prized for their aromatic fruits, commonly called seeds, such as dill, cumin, caraway, and **fennel**. It is cultivated chiefly for its licorice-flavored fruits, called aniseed. Although it has a **licorice** flavor, anise is not related to the European plant whose roots are the source of true licorice. It has been used as a medicinal and fragrant plant since ancient times.

Anise hyssop (*Pimpinella anisum*). *(© Arco Images, Inc. / Alamy)*

The plant reaches from 1 to 3 ft (0.3 to 1 m) in height when cultivated, and has finely-divided feather-like bright green leaflets. The name *Pimpinella* (from the Latin *dipinella*) refers to the pinnately divided form of the leaves. The plant bears white to yellowish-white flowers in compound umbels (umbrella-like clusters). When ripe, the fruits are 0.125 in (3 mm) long and oval-shaped with grayish-green coloring.

While the entire plant is fragrant and tastes strongly of anise, it is the aniseed fruit that has been highly valued since antiquity. Seed maturation usually occurs one month after pollination, when the oil content in the dried fruit is about 2.5%. Steam distillation of the crushed aniseed yields from 2.5 to 3.5% of a fragrant, syrupy, essential, or volatile, oil, of which anethole, present at about 90%, is the principal aromatic constituent. Other chemical constituents of the fruit are creosol, alpha-pinene, dianethole, and photoanethole.

In addition to its medicinal properties, anise is widely used for flavoring curries, breads, soups, cakes, candies, desserts, nonalcoholic beverages, and liqueurs such as anisette. The essential oil is valuable in perfumes and soaps and has been used in toothpastes, mouthwashes, and skin creams.

Anise is endemic to the Middle East and Mediterranean regions, including Egypt, Greece, Crete, and Turkey. It was cultivated and used by ancient Egyptians, and used in ancient Greece and Rome, when it was cultivated in Tuscany. Its use and cultivation spread to central Europe in the Middle Ages, and today it is cultivated on a commercial scale in warm areas such as southern Europe, Asia, India, North Africa, Mexico, and Central and South America.

General use

The medicinal properties of anise come from the chemicals that are present in the fruits. The anethole in anise helps to relieve **gas** and settle an upset stomach. The use of anise to season foods, especially meat and vegetable dishes, in many parts of the world may have originated as a digestive aid. The Romans ate aniseed cake at the end of rich meals to prevent **indigestion**. The chemicals creosol and alpha-pinene act as expectorants, loosening mucus and making it easier to cough up. The estrogenic action of anise is from the chemicals dianethole and photoanethole, which act in a way similar to estrogen. The anise fruits and the essential oil of anise contain these chemicals and can be used medicinally. Aniseed can also be used to make an herbal tea which can help relieve physical complaints.

As a medicinal plant, anise has been used as an antibacterial, an antimicrobial, an antiseptic, an antispasmodic, a breath freshener, a carminative, a diaphoretic, a digestive aid, a diuretic, an expectorant, a mild estrogenic, a mild muscle relaxant, a parasiticide, a stimulant, and a stomachic.

Anise may be helpful in the following conditions:

- Anemia. Anise promotes digestion, which may help improve anemia due to inefficient absorption of iron.
- Asthma. Essential oil of anise may be inhaled through the nose to help ease breathing and relieve nasal congestion.
- Bad breath. It can be used in mouthwash or tea to sweeten breath.
- Bronchitis. Aniseed may be used as an expectorant and essential oil of anise may be inhaled through the nose to help ease breathing.
- Catarrh. Drinking aniseed tea soothes mucous membranes.
- Cold. Aniseed can be used as an expectorant and drinking aniseed tea soothes the throat.
- Colic. Drinking anise tea or using essential oil can alleviate gas.
- **Cough**. Can be used as an expectorant, especially for hard, dry coughs where expectoration is difficult.
- Croup. Aniseed can be used to alleviate a persistent cough in a child.
- Emphysema. Essential oil of anise may be inhaled through the nose to help ease breathing and relieve nasal congestion and tea with aniseed will soothe mucous membranes.
- Gas and gas pains. Drinking aniseed tea helps relieve gas, gas pains, and flatulence.
- Menopause. Aniseed tea can help alleviate menopausal symptoms.
- Morning sickness. Tea made from anise can help alleviate morning sickness during pregnancy.
- Nursing. Aniseed tea can help a nursing mother's milk come in.
- Sore throat. Drinking aniseed tea alleviates pain of sore throat.

Preparations

Aniseeds may be added to foods when cooking to flavor and aid digestion, or may be taken whole in doses of 1-3 tsp of dried anise seeds per day.

For tea, one tsp of crushed aniseeds can be steeped in a cup of hot water, then combined with fennel and caraway to help relieve gas and gas pains. To help relieve a cough, **coltsfoot**, **marsh mallow**, **hyssop**, and licorice can be added to the tea. Infants should only receive 1 tsp of boiled, prepared tea.

Preparations of essential oil of anise can be used for inhalation. The essential oil may be taken orally at a dose of 0.01 oz (0.3 g) per day. In addition, the liqueur anisette, which contains anise essential oil, may be administered in hot water to help relieve problems in the bronchial tubes, such as **bronchitis** and spasmodic **asthma**. One to three drops of essential oil administered on sugar may help relieve **colic**.

Precautions

Persons allergic to anise or anethole, its main ingredient, should avoid using aniseed or its essential oil. It is also possible to develop an allergic sensitivity to anise. Care should be taken to monitor the quantity of aniseed oil given to infants. A 2002 report noted an infant brought to the emergency department with seizures as a result of multiple doses of aniseed oil tea.

KEY TERMS

Anemia—Condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume.

Antiseptic—A substance that checks the growth or action of microorganisms especially in or on living tissue.

Antispasmodic—A substance capable of preventing or relieving spasms or convulsions.

Carminative—A substance that expels gas from the alimentary canal to relieve colic or griping.

Catarrh—Inflammation of a mucous membrane, especially of the nose and air passages.

Diaphoretic—A substance that increases perspiration.

Diuretic—A substance that increases the flow of urine.

Estrogenic—A substance that promotes estrus, the state in which a woman is capable of conceiving.

Expectorant—A substance that promotes the discharge or expulsion of mucus.

Parasiticide—A substance destructive to parasites.

Stomachic—A stimulant or tonic for the stomach.

Side effects

Although anise is generally considered safe, the side effects of its estrogenic property have not been fully studied. Anise oil may induce **nausea**, **vomiting**, seizures, and pulmonary **edema** if it is ingested in sufficient quantities. Also, contact of the skin with the concentrated oil can cause irritation.

It is important to note that Japanese Star Anise is *not* the same herb—it is poisonous.

Interactions

No interactions have been reported.

Resources

BOOKS

Foster, Gertrude B. and Rosemary F. Louden. *Park's Success with Herbs*. Greenwood, SC: G. W. Park Seed Co., 1980.

Grieve, M. *A Modern Herbal: The Medicinal, Culinary, Cosmetic and Economic Properties, Cultivation and Folk lore of Herbs, Grasses, Fungi, Shrubs, & Trees with All Their Modern Scientific Uses*. New York: Harcourt, Brace and Co., 1931.

Reader's Digest Editors. *Magic and Medicine of Plants*. Pleasantville, NY: Reader's Digest Association, 1986.

Simon, James E., Alena F. Chadwick and Lyle E. Craker. *Herbs: An Indexed Bibliography, 1971 1980: The Scientific Literature on Selected Herbs, and Aromatic and Medicinal Plants of the Temperate Zone*. Hamden, CT.: Archon Books, 1984.

PERIODICALS

Tuckler, V., et al. "Seizure in an Infant from Aniseed Oil Toxicity." *Clinical Toxicology* (August 2002): 689.

OTHER

Herb Society of America. http://www.herbsociety.org/factsheets/anise.pdf/ (July 12, 2000).

One Planet. http://www.oneplanetnatural.com/anise.htm/ (July 12, 2000).

"*Pimpinella anisum*." http://webmd.lycos.com/content/article/1677.57580/ (July 12, 2000).

"Herbs." Department of Horticulture, Pennsylvania State University. http://garden.cas.psu.edu/vegcrops/herbs/Pimpinellaanisum.html/ (July 12, 2000).

Melissa C. McDade
Teresa G. Odle

Ankylosing spondylitis

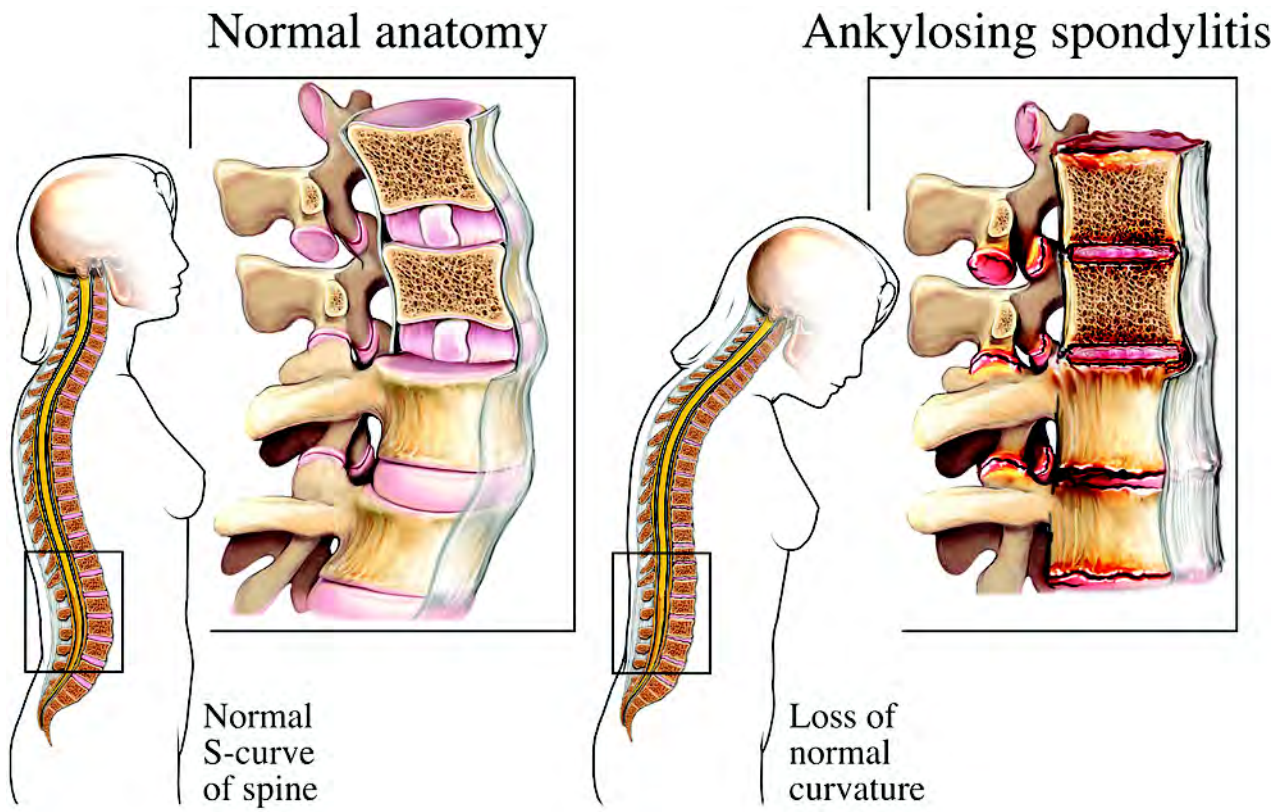
Definition

Ankylosing spondylitis (AS) is a systemic disorder that involves inflammation of the joints in the spine. AS is the primary disease in a group of conditions known as *seronegative spondylarthropathies*. It is also known as rheumatoid spondylitis or Marie-Strümpell disease (among other names). AS is an autoimmune disease, as are most forms of arthritis. By definition, other joints, in addition to the spine, can be affected, including the shoulders, hips, knees, and feet. Tissues in the eye can also be affected.

Description

A form of arthritis, AS is characterized by chronic inflammation, causing **pain** and stiffness of the back, progressing to the chest and neck. Eventually, the whole back may become curved and inflexible if the bones fuse, which is known as "bamboo spine." Other conditions associated with AS include reactive arthritis, psoriatic arthritis, spondylitis of **inflammatory bowel disease**, and undifferentiated spondyarthropathy. AS may involve multiple organs, such as the following:

- eye (causing an inflammation of the iris, or iritis)
- heart (causing aortic valve disease)



Ankylosing spondylitis (AS) is a systemic disorder that involves inflammation of the joints in the spine. *(© Nucleus Medical Art, Inc. / Alamy)*

- lungs
- skin (causing a scaly skin condition, or psoriasis)
- gastrointestinal tract (causing inflammation within the small intestine, called ileitis, or inflammation of the large intestine, called colitis)

Less than 1% of the population has AS; however, 20% of people with AS have a relative with the disorder.

Causes and symptoms

Genetics, in the form of a gene named HLA-B27, can play an important role in the disease, but the precise cause of AS remains unknown. According to information from the Spondylitis Association of America, HLA-B27 is a perfectly normal gene found in 8% of the general population. Generally speaking, no more than 2% of people born with this gene will eventually get spondylitis. The gene itself does not cause spondylitis, but people with HLA-B27 are more susceptible to getting spondylitis. As of 2008, 31 alleles (subtypes) of HLA-B27 had been identified. They are designated as HLA-B*2701 to HLA-B*2727. The most common subtypes in the United States are B*2705 and B*2702. The frequency of various HLA-B27 alleles among populations in various parts of the world differs dramatically. For example, the frequency of allele *2704 varies from 80–100% in most of East Asia, but the allele is virtually absent from Europe and Africa. The way in which HLA-B27 interacts with certain other proteins seems to be very important in the genesis of AS, but further research is necessary to determine exactly how this process takes place.

Symptoms of AS include the following:

- low back and hip pain and stiffness
- duration of symptoms longer than three months
- difficulty expanding the chest
- early morning stiffness improved by a warm shower or light exercise
- pain in the neck, shoulders, knees, and ankles
- low-grade fever
- fatigue
- weight loss

AS occurs most often in males between 16 and 35 years of age. Initial symptoms are uncommon after the age of 30, although the diagnosis may not be established until after that age. The incidence of AS in African Americans is about half that among Caucasians.

Some naturopathic healers link the cause of AS to its autoimmune origins in food **allergies** and abnormal bowel function, sometimes referred to as leaky gut syndrome. According to this theory, food allergies combine with the leaky gut and cause increased circulation of gut-derived antigens into other areas of the body. In response to this condition, the body produces antibody-antigen complexes characteristic of **rheumatoid arthritis** to battle these gut-derived foreign antigens, producing the symptoms of AS.

Diagnosis

Doctors usually diagnose ankylosing spondylitis disease simply by observable symptoms of pain and stiffness. Doctors also review spinal and pelvic x rays since involvement of the hip and pelvic joints is common and may be the first abnormality seen on the x ray. Doctors might also order a blood test to determine the presence of HLA-B27 antigen if the x rays have not clearly determined the diagnosis. If the gene is present, it could facilitate the accuracy of the possible AS diagnosis. When a diagnosis is made, patients may be referred to a rheumatologist, a doctor who specializes in treating arthritis. Patients may also be referred to an orthopedic surgeon, a doctor who can surgically correct joint or bone disorders.

Treatment

To reduce inflammation, various herbal remedies, including **white willow** (*Salix alba*), **yarrow** (*Achillea millefolium*), and **lobelia** (*Lobelia inflata*), may be helpful. **Acupuncture**, performed by a trained professional, has helped some patients manage their pain. Homeopathic practitioners may prescribe such remedies as *Bryonia* and *Rhus toxicodendron* for pain relief.

A key alternative treatment for AS is **massage therapy**. Reported benefits include a decrease in pain, increase in circulation, lymph flow improvement, and increase in range of motion. The major benefit of this therapy could be that it provides further motivation for a regular **exercise** program, considered the most beneficial of all treatments for AS.

Diets of various regimens have been offered that include supplements of fatty acids and **antioxidants**, as with other arthritis diets. Naturopaths and some medical doctors have theorized that certain foods should be eliminated from the diet in order to alleviate symptoms. Possible problem foods include wheat, corn, milk and other dairy products, beef, tomatoes, potatoes, and peppers. Tobacco has also been thought to aggravate the condition. Various reports have indicated that a diet high in fiber and fresh fruits and vegetables—minus those listed above—and low in sugar, meat, refined carbohydrates, and animal fats might help in the treatment of the symptoms of AS, particularly with pain or swelling.

Allopathic treatment

Nonsteroidal anti-inflammatory drugs (NSAIDs), such as naproxen (Naprosyn) or indomethacin (Indocin) are used to relieve pain and stiffness. In severe cases, sulfasalazine (Azulfidine), another drug to reduce inflammation, or methotrexate (Rheumatrex), an immune-suppressing drug, are recommended. In cases in which chronic therapy is needed, potential drug side effects must be taken into consideration. Corticosteroid drugs are effective in relieving symptoms but are usually reserved for severe cases that do not improve when NSAIDs are used. To avoid potential side effects, treatment with corticosteroids is usually limited to a short amount of time with a gradual weaning from the drug.

Two other drugs for use with AS work by a somewhat different mechanism than do NSAIDs and corticosteroids. Infliximab (Remicade) is a chimeric (made from both human and mouse components) monoclonal antibody that interferes with the inflammatory response characteristic of the disease. Etanercept (Enbrel) is a recombinant human soluble tumor necrosis factor-alpha (TNFa) receptor fusion protein that functions in a manner similar to that of infliximab, reducing inflammation caused by autoimmune responses in the body. Another TNF blocker, adalimumab (Humira), was approved by the FDA in August 2006 to be used for AS.

Physical therapists prescribe exercises to prevent a stooped posture and breathing problems when the spine starts to fuse and ribs are affected. Back braces may be used to prevent continued deformity of the spine and ribs. Only in severe cases of deformity is surgery performed to straighten and realign the spine or to replace knee, shoulder, or hip joints. Because it is a major and complicated procedure, with a potential for complications, this surgery is recommended cautiously even in severe cases.

KEY TERMS

Ankylosing—A process by which joint bones fuse, stiffen, and/or become rigid.

HLA-B27—An antigen or protein marker on cells that may indicate the possibility of ankylosing spondylitis.

Immune suppressing—Any substance or event that reduces the activity of the immune system.

Inflammation—A reaction of tissues to disease or injury, often associated with pain and swelling.

Spondylitis—An inflammation of the spine.

Expected results

There is no cure for AS, and the course of the disease is unpredictable. Generally, AS progresses for about 10 years, then levels off. Most patients can lead normal lives with treatment to control symptoms. Claims that homeopathic remedies have cured them had not been verified as of 2008.

Prevention

There is no known way to prevent AS. With advances in gene therapy, the possibility exists for further determination of the factor that HLA-B27 gene plays in its manifestation and what role it could play in preventing it for future generations.

Resources

BOOKS

Parker, Philip M. *Ankylosing Spondylitis: A Bibliography and Dictionary for Physicians, Patients, and Genome Researchers*. San Diego: ICON Group International, 2007.

Van Royen, Barend J., and Ben A. C. Dijkmans, eds. *Ankylosing Spondylitis: Diagnosis and Management*. London: Informa Healthcare, 2006.

Weisman, Michael H., John D. Reveille, and Desiree van der Heijde. *Ankylosing Spondylitis and the Spondyloarthropathies*. St. Louis, MO: Mosby/Elsevier, 2006.

PERIODICALS

Cakar, Engin, et al. "Sexual Problems in Male Ankylosing Spondylitis Patients: Relationship with Functionality, Disease Activity, Quality of Life, and Emotional Status." *Clinical Rheumatology* (October 2007): 1607 1613.

Hoy, Sheridan, and Lesley J. Scott. "Etanercept: A Review of Its Use in the Management of Ankylosing Spondylitis and Psoriatic Arthritis." *Drugs* 67, no. 17 (2007): 2609 2633.

Konttinen, Liisa, et al. "Anti TNF Therapy in the Treatment of Ankylosing Spondylitis: The Finnish Experience." *Clinical Rheumatology* (October 2007): 1693 1700.

Royen, Barend, et al. "ASKyphoplan: A Program for Deformity Planning in Ankylosing Spondylitis." *European Spine Journal* (September 2007): 1445 1449.

OTHER

"Ankylosing Spondylitis." Merck. http://www.merck.com/mmhe/sec05/ch067/ch067e.html. (February 10, 2008).

Peh, Wilfred C. G. "Ankylosing Spondylitis." *eMedicine*. http://www.emedicine.com/RADIO/topic41.htm. (February 10, 2008).

ORGANIZATIONS

Arthritis Foundation, PO. Box 7669, Atlanta, GA, 30357 0669, (800) 283 7800, http://www.arthritis.org.

National Institute of Arthritis and Musculoskeletal and Skin Diseases, Information Office, Bldg. 31, Room 4C 02, 31 Center Drive, MSC 2350, Bethesda, MD, 20892 2350, (301) 496 8190, www.niams.nih.gov/.

Spondylitis Association of America, PO Box 5872, Sherman Oaks, CA, 91413, (800) 777 8189, http://www.spondylitis.org/.

Jane Spear
Teresa G. Odle
David Edward Newton, Ed.D.

Anorexia nervosa

Definition

Anorexia nervosa is an eating disorder characterized by unrealistic fear of weight gain, self-starvation, and conspicuous distortion of body image. The name comes from two Latin words that together mean "nervous inability to eat." The disorder is sometimes referred to simply as anorexia. In females who have begun to menstruate, anorexia nervosa is usually marked by **amenorrhea**, or missing at least three menstrual periods in a row. The fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*, 1994) defines two subtypes of anorexia nervosa: a restricting type, characterized by strict dieting and **exercise** without binge eating, and a binge-eating/purging type, marked by episodes of compulsive eating with or without self-induced **vomiting** and the use of laxatives or enemas. *DSM-IV* defines a binge as a time-limited (usually under two hours) episode of compulsive eating in which the individual

Symptoms of anorexia nervosa

Resistance to maintaining body weight at or above a minimally normal weight for age and height

Intense fear of gaining weight or becoming fat, even though underweight

Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight

Infrequent or absent menstrual periods (in females who have reached puberty)

(Illustration by Corey Light. Cengage Learning, Gale)

consumes a significantly larger amount of food than most people would eat in similar circumstances.

Description

Anorexia nervosa was not officially classified as a psychiatric disorder until the third edition of *DSM* in 1980. It is, however, a growing problem among adolescent females and its incidence in the United States has doubled since 1970. The rise in the number of reported cases reflects a genuine increase in the number of persons affected by the disorder, not simply earlier or more accurate diagnosis. Estimates of the incidence of anorexia range between 0.5–1% of Caucasian female adolescents. Over 90% of patients diagnosed with the disorder as of 1998 were female. It was originally thought that only 5% of anorexics are male, but that estimate was being revised upward as of 2008. The peak age range for onset of the disorder is 14–18 years, although there are patients who develop anorexia as late as their 40s. In the 1970s and 1980s, anorexia was regarded as a disorder of upper- and middle-class women, but that generalization also changed. Subsequent studies indicated that anorexia is increasingly common among women of all races and social classes in the United States.

Anorexia nervosa is a serious public health problem not only because of its rising incidence, but also because it has one of the highest mortality rates of any psychiatric disorder. Moreover, the disorder may cause serious long-term health complications, including congestive heart failure, sudden death, growth retardation, dental problems, **constipation**, stomach rupture, swelling of the salivary glands, loss of kidney function, **osteoporosis**, **anemia**, and other abnormalities of the blood.

Causes and symptoms

Anorexia is a disorder that results from the interaction of cultural and interpersonal as well as biological factors. While the precise cause of the disease is not known, it has been linked to the following factors.

Social influences

The rising incidence of anorexia is thought to reflect the idealization of thinness as a badge of upper-class status as well as of female beauty. In addition, the increase in cases of anorexia includes so-called copycat behavior, with some patients developing the disorder from imitating other girls.

The onset of anorexia in adolescence is attributed to a developmental crisis caused by girls' changing bodies coupled with cultural overemphasis on women's appearance. The increasing influence of the mass media in spreading and reinforcing gender stereotypes has also been noted.

Occupational goals

The risk of developing anorexia is higher among adolescents preparing for careers that require attention to weight and/or appearance. These high-risk groups include dancers, fashion models, professional athletes (including gymnasts, skaters, long-distance runners, and jockeys), and actresses.

Genetic and biological influences

Women whose biological mothers or sisters have the disorder appear to be at increased risk.

Psychological factors

A number of theories have been advanced to explain the psychological aspects of the disorder. No single explanation covers all cases. Anorexia nervosa has been interpreted as connected to the following:

- A rejection of female sexual maturity. This rejection is variously interpreted as a desire to remain a child or as a desire to resemble men as closely as possible.
- A reaction to sexual abuse or assault.
- A desire to appear as fragile and non-threatening as possible. This hypothesis reflects the idea that female passivity and weakness are attractive to men.

- Overemphasis on control, autonomy, and independence. Some anorexics come from achievement-oriented families that stress physical fitness and dieting. Many anorexics are perfectionists and obsessive about schoolwork and other matters in addition to weight control.
- Evidence of family dysfunction. In some families, a daughter's eating disorder serves as a distraction from marital discord or other family tensions.
- Inability to interpret the body's hunger signals accurately due to early experiences of inappropriate feeding.

Male anorexics

Although anorexia nervosa is still considered a disorder that affects women primarily, its incidence in the male population is rising. Less is known about the causes of anorexia in males, but some risk factors are the same as for females. These factors include certain occupational goals and increasing media emphasis on appearance in men.

Diagnosis

Diagnosis of anorexia nervosa is complicated by a number of factors. One is that the disorder varies somewhat in severity from patient to patient. A second factor is denial, which is regarded as an early sign of the disorder. Most anorexics deny that they are ill and are usually brought to treatment by a family member.

Anorexia is usually diagnosed by pediatricians or family practitioners. Anorexics develop emaciated bodies, dry or yellowish skin, and abnormally low blood pressure. There is usually a history of amenorrhea (failure to menstruate) in females and sometimes of abdominal **pain**, constipation, or lack of energy. The patient may feel chilly or have developed lanugo, a growth of downy body hair. If the patient has been vomiting, she may have eroded tooth enamel or Russell's sign (scars on the back of the hand). The second step in diagnosis is measurement of the patient's weight loss. *DSM-IV* specifies a weight loss tending toward a body weight 15% below normal, with some allowance for body build and weight history.

The doctor rules out other physical conditions that can cause weight loss or vomiting after eating, including metabolic disorders, brain tumors (especially hypothalamus and pituitary gland lesions), diseases of the digestive tract, and a condition called superior mesenteric artery syndrome. Persons with this condition sometimes vomit after meals because the blood supply to the intestine is blocked. The doctor usually orders blood tests, an electrocardiogram, urinalysis, and bone densitometry (bone density test) in order to exclude other diseases and to assess the patient's nutritional status.

The doctor also needs to distinguish between anorexia and other psychiatric disorders, including **depression**, **schizophrenia**, social phobia, **obsessive-compulsive disorder**, and body dysmorphic disorder. Two diagnostic tests that are often used are the Eating Attitudes Test (EAT) and the Eating Disorder Inventory (EDI).

Treatment

Alternative treatments should serve as complementary to a conventional treatment program. Alternative therapies for anorexia nervosa include diet and **nutrition**, herbal therapy, **hydrotherapy**, **aromatherapy**, Ayurveda, and **mind/body medicine**.

Nutritional therapy

A naturopath or nutritionist may recommend the following:

- Avoiding sweets or baked goods.
- Following a nutritious and well-balanced diet (when patients resume eating normally).
- Daily multivitamin and mineral supplements.
- Zinc supplements. Zinc is an important mineral needed by the body for normal hormonal activity and enzymatic function.

Herbal therapy

The following herbs may help reduce **anxiety** and depression which are often associated with this disorder:

- chamomile (*Matricaria recutita*)
- lemon balm (*Melissa officinalis*)
- linden (*Tilia* spp.) flowers

Aromatherapy

Essential oils of herbs such as bergamot, basil, **chamomile**, clary **sage**, and **lavender** may help stimulate appetite, relax the body, and fight depression. They can be diffused into the air, inhaled, massaged, or put in bath water.

Relaxation techniques

Relaxation techniques such as **yoga**, **meditation**, and **t'ai chi** can relax the body and release **stress**, anxiety and depression.

Hypnotherapy

Hypnotherapy may help resolve unconscious issues that contribute to anorexic behavior.

Other alternative treatments

Other alternative treatments that may be helpful include hydrotherapy, magnetic field therapy, **acupuncture**, **biofeedback**, Ayurveda and Chinese herbal medicine.

Allopathic treatment

Treatment of anorexia nervosa includes both short-term and long-term measures and requires assessment by dietitians and psychiatrists as well as medical specialists. Therapy is often complicated by the patient's resistance or failure to carry out treatment plan.

Hospital treatment

Hospitalization is recommended for anorexics with any of the following characteristics:

- weight of 40% or more below normal or weight loss over a three-month period of more than 30 pounds
- severely disturbed metabolism
- severe binging and purging
- signs of psychosis
- severe depression or risk of suicide
- family in crisis

Hospital treatment includes individual and group therapy as well as refeeding and monitoring of the patient's physical condition. Treatment usually requires two to four months in the hospital. In extreme cases, hospitalized patients may be force-fed through a tube inserted in the nose (nasogastric tube) or by overfeeding (hyperalimentation techniques).

Outpatient treatment

Anorexics who are not severely malnourished can be treated by outpatient **psychotherapy**. The types of treatment recommended are supportive rather than insight-oriented and include behavioral approaches as well as individual or group therapy. Family therapy is often recommended when the patient's eating disorder is closely tied to family dysfunction. Self-help groups are often useful in helping anorexics find social support and encouragement. Psychotherapy with anorexics is a slow and difficult process; about 50% of patients continue to have serious psychiatric problems after their weight has stabilized.

KEY TERMS

Amenorrhea—Absence of menstruation in a female who has begun to have menstrual periods.

Binge eating—A pattern of eating marked by episodes of rapid consumption of large amounts of food, usually food that is high in calories.

Body dysmorphic disorder—A psychiatric disorder marked by preoccupation with an imagined physical defect.

Hyperalimentation—A method of refeeding anorexics by infusing liquid nutrients and electrolytes directly into central veins through a catheter.

Lanugo—A soft, downy body hair that develops on the chest and arms of anorexic women.

Purging—The use of vomiting, diuretics, or laxatives to clear the stomach and intestines after a binge.

Russell's sign—Scraped or raw areas on the patient's knuckles, caused by self-induced vomiting.

Superior mesenteric artery syndrome—A condition in which a person vomits after meals due to blockage of the blood supply to the intestine.

Medications

Anorexics have been treated with a variety of medications, including antidepressants, anti-anxiety drugs, selective serotonin reuptake inhibitors, and lithium carbonate. The effectiveness of medications in treatment regimens continues to be debated. However, at least one study showed that the antidepressant Prozac helped the patient maintain weight gained while in the hospital.

Expected results

Figures for long-term recovery vary from study to study, but the most reliable estimates are that 40–60% of anorexics make a good physical and social recovery, and 75% gain weight. The long-term mortality rate for anorexia is estimated at around 10%, although some studies give a lower figure of 3–4%. The most frequent causes of death associated with anorexia are starvation, electrolyte imbalance, heart failure, and suicide.

Prevention

Short of major long-term changes in the larger society, the best strategy for prevention of anorexia is the cultivation of healthy attitudes toward food, weight control, and beauty or body image within families.

Resources

BOOKS

Buckroyd, Julia, and Sharon Rother, eds. *Psychological Responses to Eating Disorders and Obesity: Recent and Innovative Work*. New York: Wiley Interscience, 2008.

Dosil, Joaquin. *Eating Disorders in Athletes*. New York: Wiley Interscience, 2008.

Lucas, Alexander R. *Demystifying Anorexia Nervosa: An Optimistic Guide to Understanding and Healing*. New York: Oxford University Press, 2008.

Schulherr, Susan. *Eating Disorders for Dummies*. Indianap olis, IN: For Dummies, 2008.

PERIODICALS

Barabasz, Marianne. "Efficacy of Hypnotherapy in the Treatment of Eating Disorders." *International Journal of Clinical and Experimental Hypnosis* (July 2007): 318 335.

Fedyszyn, Izabela Ewa, and Gavin Brent Sullivan. "Ethical Re evaluation of Contemporary Treatments for Anorexia Nervosa: Is an Aspirational Stance Possible in Practice?" *Australian Psychologist* (September 2007): 198 211.

Maguire, Sarah, et al. "Staging Anorexia Nervosa: Con ceptualizing Illness Severity." *Early Intervention in Psychiatry* (February 2008): 3 10.

Nilsson, Karin, et al. "Causes of Adolescent Onset Anorexia Nervosa: Patient Perspectives." *Eating Disorders* (March 2007): 125 133.

OTHER

"Anorexia Nervosa." *MedicineNet.com*. http://www.medicine net.com/anorexia_nervosa/article.htm. (February 10, 2008).

"Anorexia Nervosa." *womenshealth.gov*. http://www.4wo men.gov/faq/easyread/anorexia etr.htm. (February 10, 2008).

Levey, Robert. "Anorexia Nervosa." *eMedicine*. http://www. emedicine.com/med/topic144.htm. (February 10, 2008).

ORGANIZATIONS

National Association of Anorexia Nervosa and Associated Disorders, PO Box 7, Highland Park, IL, 60035, (847) 433 3996, http://www.anad.org/.

National Eating Disorders Association, 603 Stewart St., Suite 803, Seattle, WA, 98101, (800) 931 2237, http:// www.nationaleatingdisorders.org/.

Mai Tran
David Edward Newton, Ed.D.

Anthroposophical medicine

Definition

Anthroposophical medicine (AM), or anthroposophically extended medicine, is a system of healing based on the spiritual science that was developed by Rudolph Steiner.

Origins

Rudolph Steiner (1861-1925) was an Austrian philosopher and teacher who founded anthroposophy (*anthropos* meaning human and *sophy* meaning wisdom), which is a worldwide spiritual movement that seeks to apply a scientific approach to spiritual perception. Steiner believed that everyone has spiritual powers that can be activated by exercises in mental concentration and **meditation**. During his lifetime, he was an active teacher, attracting many followers to his spiritual ideas. Steiner founded several schools, wrote nearly 30 books, and gave more than 6,000 lectures around the world on subjects including education, medicine, agriculture, social issues, science and art. His ideas have remained influential. The Waldorf school system, which he began, educates thousands of young people each year. Many health food stores carry products produced by Steiner's system of agriculture called biodynamic farming, which considers the health and purity of the soil, water, and air to be of central importance.

Anthroposophical medicine is based on Steiner's concept that spiritual awareness is the foundation of individual health and of the health of society. Steiner believed that many of the oldest systems of healing, such as **traditional Chinese medicine**, **Ayurvedic medicine**, and **Tibetan medicine**, were based on a spiritual perception of the world that modern science has lost. Steiner wanted medicine to get back in touch with **spirituality**, and at the same time keep and use wisely the gains that science and technology have made. Thus, conventional medicine needed to be extended beyond physical science to include a holistic spiritual science.

Steiner formally began application of his philosophy in a series of 20 lectures in the early spring of 1920 to the medical community of a town in Switzerland. It was the first such course for physicians and medical students. He and Dutch medical doctor Ita Wegman co-authored a foundational work for physicians wanting to expand their practice according to anthroposophic principles.

Anthroposophical medicine is still in its early stages. Steiner believed that it would take many years for his medical ideas to be fully applied. There are thousands of anthroposophical doctors and researchers practicing in Europe, where the main school was founded. In America, practitioners can be found in several large cities, but the overall number of anthroposophical physicians is very small.

Benefits

Anthroposophical medicine can be used to treat any health condition. It is particularly recommended for preventive care, **infections**, inflammatory conditions such as arthritis, and the treatment of **cancer** and chronic degenerative diseases associated with **aging**. It is also recommended for pediatric (child) care, with its avoidance of toxic drugs, and is beneficial for children's conditions such as **attention-deficit hyperactivity disorder** (ADHD) and developmental problems.

Description

The anthroposophical concept of the body

Anthroposophical physicians have a different view of the body and health than the conventional scientific model. Human beings are made up of four levels (four-foldness) of being. The first level is the physical body. The second level is the life or *etheric* body, which corresponds to the Chinese idea of *chi* and the Ayurvedic idea of *prana*. The third level is the soul, or astral body, and the fourth level is the spirit. AM doctors believe that all levels of being influence a patient's health.

The physical body is made up of a three-fold system, including the "sense-nerve" system, which comprises the head and nervous system, supporting the mind and the thinking process. Second is the "metabolic-limb" system, which includes the digestive system for elimination, energetic metabolism, and voluntary movement processes, all supporting aspects of human behavior that express the will. Finally, the rhythmic system, which includes the heart and lungs in the chest, is responsible for balancing the head and digestive systems. According to AM, these systems tend to oppose each other in functioning and characteristics, similar to the Chinese concept of yin and yang. For instance, the digestive system is associated with heat and helps to dissolve elements in the body, while the head system is associated with cooling and helps in the formation of elements in the body. Illness is caused when the systems of the body become out of balance. AM involves a broad understanding of the three bodily systems, and the illnesses associated with each system and its imbalance. This model provides practitioners a means for therapeutic insight now recognized as mind-body relationships in health and disease.

In AM, illness is considered a significant event in a person's life, and not just a chance occurrence. One role of the doctor is to understand, and help the patient understand, the significance of the illness on all levels of being. Conventional medicine tends to suppress illness, using drugs to block the symptoms. AM doctors believe that true healing must first bring an illness out in order to heal it, and that healing requires change and development in the patient on several levels.

AM also asserts, as did the early healer Paracelsus, that every illness has a cure that can be found in nature. Paracelsus is the pseudonym for a Swiss-born alchemist and physician who lived from 1493-1541. Nature and the human body are made up of the plant, animal, and mineral kingdoms, and thus AM doctors use medicines that are made from plants, animals (usually in the form of organ extracts), and minerals. AM remedies are usually given in homeopathic doses, which are very diluted, non-toxic solutions.

Treatment by an anthroposophical physician

All anthroposophical physicians are conventionally trained M.D.s, as Steiner believed that conventional training was a necessary first step. However, a visit to an anthroposophical physician may be different than a visit to a regular doctor. Anthroposophical doctors tend to spend much more time with their patients, particularly during the initial visit. Every patient is considered unique, and AM doctors use the first visit to get a broad understanding of patients and their medical histories. To diagnose illnesses, AM doctors may use modern diagnostic tools, but also rely on intuition and an understanding of the patient. Part of training of AM doctors involves improving their powers of perception in order to understand illnesses. Diagnosis is considered a very important process; Steiner believed that if the diagnosis of a problem is done correctly, then the therapeutic (healing) work is much easier. After a problem is thoroughly diagnosed, treatment will be recommended. AM doctors attempt to treat a patient on all four levels of being. For the physical body, remedies will be prescribed. There are hundreds of uniquely formulated medications, similar to homeopathies, as well as botanical medicines. AM doctors try to minimize the use of antibiotics, drugs, and vaccinations.

Anthroposophical medicine also uses allied therapies, which are additional therapies that Steiner recommended to heal patients on other levels than the physical. These include **massage therapy** and a **movement therapy** called *eurythmy*. Eurythmy is a system of movements designed to help patients give expression to inner spiritual movements. **Psychotherapy** may also be recommended to help heal some conditions. AM doctors may apply allied therapies themselves, or refer patients to other healers. The length of treatment

with AM depends on the patient and condition. The cost of treatment varies with the practitioner, and is comparable to treatment by conventional M.D.s. AM medications are less expensive than conventional drugs. Because AM practitioners are trained medical doctors, insurance policies often cover their fees, although consumers should be aware of their policy restrictions.

Preparations

AM doctors may give new patients packages of materials before treatment, which include thorough questionnaires and explanations of AM. Anthroposophical physicians encourage patients to prepare for treatment by becoming willing to take responsibility for their condition and health, and to change their behaviors and lifestyles in the interest of healing.

Side effects

AM medications are safe and non-toxic. During treatment, some patients may experience what doctors call "healing crises." During these, patients may temporarily experience a worsening of symptoms as part of the healing process, including **fever**, headaches, **nausea**, weakness, muscle soreness, and other symptoms.

Research and general acceptance

Active research in AM is being regularly conducted in Europe, mainly in Germany, Holland, Switzerland, and France. Several research organizations performing patient-centered research have shown promising results with the AM cure for cancer, which utilizes the herbal remedy **mistletoe** extract, and for other conditions. Other research has shown that AM is less expensive than conventional medical treatment, with 50% fewer illness days than when treated by conventional practitioners. Current research studies appear in the quarterly *Journal of Anthroposophical Medicine*, as well as in European publications.

Training and certification

Currently, there is no course for the certification of AM practitioners, although every AM doctor is required to obtain training as a certified M.D. Afterwards, physicians may specialize in AM by taking a series of courses or by interning with specialists. The Physicians Association for Anthroposophic Medicine (PAAM) is the largest association in North America. The organization for non-M.D. health professionals interested in anthroposophical medicine is *Artemesia, The Association for Anthroposophical Renewal of Healing*.

KEY TERMS

Ayurvedic medicine—System of healing originating in ancient India.

Chi—Universal life energy as defined by traditional Chinese medicine. Also known as qi.

Homeopathy—System of healing using minute, diluted doses of remedies that would otherwise produce symptoms of the treated disease. Prepared from plant, animal, mineral and human sources, they are tailored for individualized treatment.

Yin and yang—Two opposite and complimentary characteristics used to describe the universe and phenomena, defined by traditional Chinese medicine.

Resources

BOOKS

Bott, Victor. *Anthroposophical Medicine*. Hudson, New York: Anthroposophic Press, 1985.

Steiner, Rudolph. *Introducing Anthroposophic Medicine*. Hudson, New York: Anthroposophical Press, 1998.

ORGANIZATIONS

Anthroposophic Press (Steiner Books), P.O. Box 749, Great Barrington, MA, 01230, (413) 528 8233, www.steinerbooks.org.

Artemesia, The Association for Anthroposophical Renewal of Healing, 1923 Geddes Avenue, Ann Arbor, MI, 48104, (734) 930 9462

Gilpin Street Holistic Center. Dr. Philip Incao, M.D, 1624 Gilpin Street, Denver, CO, 80218, (303) 321 2100

Physicians Association for Anthroposophic Medicine (PAAM), 1923 Geddes Avenue, Ann Arbor, MI, 48104, (734) 930 9462

Douglas Dupler

Anti-inflammatory diets

Definition

There is no one anti-inflammatory diet, rather, there are **diets** designed around foods believed to decrease inflammation and that shun foods that aggravate the inflammatory processes. Many anti-inflammatory diets are based around whole grains, legumes, nuts, seeds, fresh vegetables and fruits, wild fish and seafood, grass-fed lean turkey and chicken which are thought to aid in the bodies healing of inflammation. They exclude foods that are thought

to trigger inflammation such as refined grains, wheat, corn, full-fat dairy, red meat, **caffeine**, alcohol, peanuts, sugar, saturated and trans-saturated fats.

The common foundation of anti-inflammatory diets is the belief that low grades of inflammation are the precursor and/or antagonizer to many chronic diseases. Once removed, the body can begin healing itself.

Origins

The philosophical genesis of anti-inflammatory diets dates back to the original healers throughout history who have worked with foods, herbs, teas and other natural remedies to assist the body's own healing energy.

Beginning in the 1970s investigators began exploring physiological mechanisms of **fever**, weight loss, and acute phase responses to acute and chronic infection. Research results from these studies began to change the mainstream attitudes about disease pathogenesis. Accumulating evidence linked proteins, produced by macrophages and other immune cells, not pathogens, as formerly believed, to the cause of tissue damage and disease syndromes in experimental animals. Thus, the medical profession began looking into original treatments for chronic diseases. Then in the 1980s, research showed that proteins, newly named cytokines, and hormone-like substances, named prostaglandins and leukotrienes, revealed that they possessed pleiotropic biological activities that were either beneficial or injurious to the bodiesí tissues.

From this research emerged the cytokine theory of disease; the concept that cytokines produced by the immune system can cause the signs, symptoms, and damaging after effects of chronic diseases. Change did not occur until the measurement of C-reactive protein (CRP), a marker of inflammation circulating in the blood, was proposed as a method to identify persons at risk of chronic diseases. As pioneering research began to show that higher levels of C-reactive protein was linked to **heart disease**, conventional thought among the medical profession began. Originally discovered by W. S. Tillett and T. Francis Jr. in 1930, C-reactive protein was discovered as a substance in the serum of patients diagnosed with acute inflammation that reacted with the C-polysaccharide of pneumoccocus.

A growing consensus among medical professionals is that inflammation is believed to play a role in the pathogenesis of chronic diseases such as heart disease, **stroke**, diabetes, and colon **cancer** to name a few. Mainstream thinking is beginning to accept that treating the underlying cause may ameliorate cardiovascular disease, metabolic syndrome, **hypertension**, diabetes, and hyperlipidemia, inflammation caused by visceral adipose tissue.

KEY TERMS

Anti-oxidant—A chemical compound or substance that inhibits oxidation. A substance, such as vitamin E, vitamin C, or beta-carotene.

Chronic disease—An illness or medical condition that lasts over a long period of time and sometimes causes a long-term change in the body.

C-reactive protein (CRP)— A marker of inflammation circulating in the blood has been proposed as a method to identify persons at risk of these diseases.

Flavonoid—Refers to compounds found in fruits, vegetables, and certain beverages that have diverse beneficial biochemical and antioxidant effects.

Inflammation—Swelling, redness, heat, and pain produced in an area of the body as a reaction to injury or infection.

Description

Inflammation

Inflammation is a localized reaction of tissue to injury, whether caused by bacteria or viral infection, trauma, chemicals, heat or other phenomenon that causes irritation. The irritant causes the tissues within the body to release multiple substances that cause changes within the tissues. This complex response is called inflammation. Inflammation is characterized by such symptoms as (1) vasodilatation of the local blood vessels resulting in excess local blood flow, (2) increases in the permeability of the capillaries with leakage of large quantities of fluid into the interstitial spaces, (3) clotting of the fluid in the interstitial spaces due to excess amounts of fibrinogen and other proteins leaking from the capillaries, (4) relocation of granulocytes and monocytes into the tissue in large quantities, and (5) swelling of the tissue cells.

The common substances released from the tissues that result in inflammation are histamine, bradykinin, serotonin, prostaglandins, multiple hormonal substances called lymphokines that are released by sensitized T-cells and various other reaction products of other systems within the body. Many of these substances activate the macrophage system, which are sent out

to dispose of the damaged tissue but also which further injure the still-living tissue and cells.

Conditions with chronic inflammation

Inflammation has been associated as a component of, but not limited to, arthritis, heart disease, diabetes, strokes, **asthma**, **allergies**, irritable bowel disease, **Celiac disease** or other digestive system diseases, **obesity**, chronic **stress**, **sleep disorders** such as **sleep apnea**, Alzheimerís disease, high blood pressure, elevated lipids such as triglycerides and **cholesterol**.

Medical anti-inflammatory treatments

General anti-inflammatory medical treatments include **relaxation**, moderate **exercise** such as walking, weight maintenance or loss, and medications designed to reduce the inflammation and control the **pain** if present.

These medications may include: ibuprofen or aspirin, Non Steroidal Anti-Inflammatory Drugs (NSAIDs), or steroid medications. The NSAIDs are widely used as the initial form of therapy. Unfortunately, long-term use of these medications can irritate the stomach and lead to ulcers. In some cases they can lead to kidney, as well as other medical problems.

Function

Diet and chronic inflammation

Registered dietitians, and naturopathic physicians often prescribe diets to lessen the inflammatory symptoms of diseases. Although these diets have not been compared to other treatments in many formal research settings to date, it is thought that anti-inflammatory diets result in a reduced amount of inflammation and a healthier response by the immune system.

Adding foods that reduce inflammation is thought to improve symptoms of chronic diseases and help decrease risk for chronic diseases. These foods help in supplying the nutrients that are needed to decrease inflammation. One example is **omega-3 fatty acids**. The human body uses these fats to manufacture prostaglandins, chemicals that play an important role in inflammation and a healthy immune response. Another beneficial component of **fish oil** that plays an important role is eicosapentaenoic acid (EPA), an essential fatty acid derived from omega-3 fatty acids. EPA promotes the production of certain forms of prostaglandins having anti-inflammatory properties by reducing inflammation and decreasing the production of inflammatory substances.

Foods that reduce chronic inflammation

Whole grains

Whole grains or foods made from them, whether cracked, crushed, rolled, extruded, and/or cooked, contain the essential parts and nutrients of the entire grain seed. Research has shown that diets high in whole grain products are associated with decreased concentrations of inflammatory markers and increased adiponectin levels. The protective effects of a diet high in whole grains on systemic inflammation may be explained, in part, by reduction in overproduction of oxidative stress that results in inflammation.

A whole grain will include the following parts of the grain kernel–the bran, germ and endosperm. Such whole grains are amaranth, barley, bulgur, wild rice, millet, oats, quinoa, rye, spelt, wheat berries, buckwheat, and whole wheat.

Legumes

Diets high in legumes are inversely related to plasma concentrations of C-reactive protein (CRP). Among the many varieties of legumes are; pinto beans, lentils, kidney beans, borlotti beans, mung beans, soybeans, cannelloni beans, garbanzo or chickpeas, adzuki beans, fava beans, and black beans.

Nuts, seeds

Nuts and seeds are rich in unsaturated fat and other nutrients that may reduce inflammation. Frequent nut consumption is associated with lower levels of inflammatory markers. This may explain why there is a lower risk of cardiovascular disease and type 2 diabetes with frequent nut and seed consumption. With the exception of peanuts, be sure to add in walnuts, flax seeds and pumpkin seeds. Nuts and seeds are best eaten when unsalted and raw.

Fresh vegetables

Green leafy vegetables, and brightly colored vegetables provide beta-carotene; **vitamin C** and other **antioxidants** have been shown to reduce cell damage and to have anti-inflammatory effects. Aim for three or more servings per day.

Fresh fruits

Flavonoids found in fresh fruits among other substances are thought to increase the antioxidant effects of vitamin C. Research has shown that fruits have an anti-inflammatory effect. Aim for two or more servings daily. Be sure to include berries in your weekly choices of fruits such as blueberries, blackberries, and strawberries.

Wild fish and seafood

Oily fish such as herring, mackerel, salmon and trout are an excellent source of omega-3 fatty acids, as are shellfish such as mussels and clams. Including fish or seafood high in omega-3 fatty acids at least three times a week is recommended.

Lean poultry

Protein is used in the body to repair and manufacture cells, make antibodies, enzymes and hormones. Lean protein has been associated with lower levels of inflammatory biomarkers.

When choosing poultry, choose grass-fed animals, which tend to have a higher amount of **essential fatty acids**. Select poultry with limited amounts of, or free of, preservatives, **sodium**, nitrates or coloring. Also, in an ideal diet, only 10-12% of daily calories should come from protein. On average, an adult needs 0.36 grams of protein per pound of body weight.

Soy products

Anti-inflammatory properties of the isoflavones, a micronutrient component of soy, have been reported in several experimental models and disease conditions. Data suggests the possibility of beneficial effects of isoflavone-rich soy foods when added to the diet. Soy products include; soybeans, **edema** me, tofu, tempeh, soymilk, as well as many other products made from soybeans.

Oils

Expeller pressed Canola oil and Extra Virgin Olive oil are types of oils that have been linked to reduced inflammation. Other oils thought to aid in reducing inflammation include rice bran, grape seed, evening primrose and walnut oil. It is suggested to use these oils in moderation when cooking, baking and flavoring of foods. Also, when purchasing oils, make sure they are pure oils rather than blended oils. Blended oil usually contains less healthful oils.

Water in the form of fresh drinking water free of toxic chemicals

Water is an essential substance for every function of the body. It is a medium for chemical processes; a solvent for body wastes and dilutes their toxicity and aids in their excretion. Water aids in ingestion, absorption and transport of vital nutrients that have anti-inflammatory effects. Water is also needed for basic cell functioning, repairing of body tissues and is the base of all blood and fluid secretions.

Herbs and spices

A greater amount of research is emerging on the antioxidant properties of herbs and spices and their use in the management of chronic inflammation. Herbs and spices can be used in recipes to partially or wholly replace less desirable ingredients such as salt, sugar and added saturated fat, know for their inflammatory effects, thus reducing the damaging properties of these foods.

Precautions

Foods that irritate inflammation

Best referred to in research articles as "the western dietary pattern", it credits a diet that is high in refined grains, red meat, butter, processed meats, high-fat dairy, sweets and desserts, pizza, potato, eggs, hydrogenated fats, and soft drinks. This pattern of eating is positively related to an increase in circulating blood CRP levels and higher risks for chronic diseases, obesity and cancers. These foods, termed "pro-inflammatory" may increase inflammation, thus increasing a persons risk for chronic diseases as well as exacerbate symptoms from these chronic conditions.

There is some support for the belief that food sensitivities or allergens to foods may be a trigger for inflammation. Often hard to detect with common blood tests, some people have seen alleviation of symptoms of chronic diseases, such as arthritis, when the aggravating foods are removed from their diet. Common allergic foods are milk and dairy, wheat, corn, eggs, beef, yeast and soy.

Other pro-inflammatory foods have been shown to have substances that activate or support the inflammatory process. Unhealthy trans fats and saturated fats used in preparing and processing certain foods are linked to increased inflammation. Processed meats such as lunchmeats, hot dogs and sausages contain chemicals such as nitrites that are associated with increased inflammation and chronic disease.

Saturated fats naturally found in meats, dairy products and eggs contain fatty acids called arachidonic acid. While some arachidonic acid is essential for health, excess arachidonic acid in the diet has been shown to worsen inflammation.

Research supports that diets high in sugar produce acute oxidative stress within the cells, associating it with inflammation. Elimination of high sugar foods such as sodas, soft drinks, pastries, presweetened cereals and candy has been shown to be beneficial. As well as switching from refined grains to whole grains.

Benefits

The effects of the anti-inflammatory diet are unobtrusive. There is a series of research articles that demonstrate a benefit in reduction of chronic diseases such as cardiovascular disease, neurodegenerative diseases, and cancers when following a dietary pattern associated with the anti-inflammatory diet. But the benefits go beyond disease prevention. Studies have shown an alleviation of symptoms associated with chronic diseases. As well, a person may decrease or discontinue their dosage of medications prescribed to control symptoms related to inflammatory conditions, and reduce the side affects associated with anti-inflammatory agents.

It has also been documented that people who followed the anti-inflammatory diet stated they experienced loss of weight, had an elevation of energy, and reported better mental and emotional health.

Risks

The risks associated with following the anti-inflammatory diet are limited and not supported by research. The general concern associated with following any diet without the consent of a primary physician would apply. Anyone attempting to follow the anti-inflammatory diet should discuss it with their primary care physician and get a referral to see a registered dietitian, educated in the diet for maximal benefit and decreased risk of following a diet that eliminates certain foods from the dietary pattern to ensure proper intake of all macro- and micronutrients.

Research and general acceptance

There is no one anti-inflammatory diet but rather there are foods that are thought to increase the inflammatory process and ones that are beneficial to the inflammatory processed within the body. Because of this, many medical professionals and other health providers may not support the concept of a diet that decreases the anti-inflammatory response within the body.

There is substantial evidence supported through research that shows the beneficial effects on the body in reducing markers of inflammation such as CPH and reduction in chronic disease and its symptoms. Most medical professionals have an easier time accepting the **Mediterranean diet,** which includes many of the foods found in the anti-inflammatory diet, and is the closest termed dietary eating pattern to the anti-inflammatory diet.

Megan C.M. Porter, RD, LD

Antioxidants

Description

Antioxidants are a broad group of compounds that destroy single oxygen molecules, also called free radicals, in the body, thereby protecting against oxidative damage to cells. They are essential to good health and are found naturally in a wide variety of foods and plants, including many fruits and vegetables. Many antioxidants, either singly or in combination, are also available as over-the-counter nutritional supplements in tablet or capsule form. The most commonly used antioxidants are **vitamin C**, **vitamin E**, and **beta carotene**. Others include **grape seed extract**, **vitamin A**, **selenium**, and coenzyme Q10. It is unknown whether supplemental antioxidants provide the same benefits as those occurring naturally in foods.

General use

In brief, antioxidants destroy free radicals in the body. Free radicals are byproducts of oxygen metabolism that can damage cells and are among the causes of many degenerative diseases, especially diseases associated with **aging**. They are also associated with the aging process itself. As a person ages, cell damage accumulates, and supplementing the diet with extra antioxidant-rich foods can help slow the oxidative damage done to cells. Scientific studies validate the role of antioxidants in preventing many diseases. Although studies have shown lower rates of **cancer** and **heart disease** in people who eat a recommended amount of fruits and vegetables, recent clinical studies have shown that supplementation of diet with antioxidant vitamin therapy does not lower risk of cardiovascular disease or certain other diseases.

Many herbs and medicinal plants are good natural sources of antioxidants. These include carrots, tomatoes, yams, leafy greens, blueberries, blackberries, cherries, **ginkgo biloba**, **garlic**, and **green tea**, to name a few. A diet rich in vitamin C, vitamin E, and

Health benefits of antioxidants and their food sources

Antioxidant	Health benefits	Food sources
Selenium	Helps maintain healthy hair and nails, enhances immunity, works with vitamin E to protect cells from damage. Reduces the risk of cancer, particularly lung, prostate, and colorectal.	Garlic, seeds, Brazil nuts, meat, eggs, poultry, seafood, whole grains. The amount in plant sources varies according to the content of the soil.
Beta-carotene	Keeps skin healthy, helps prevent night blindness and infections, promotes growth and bone development.	Red, yellow-orange, and leafy green vegetables and fruits, including carrots, apricots, cantaloupe, peppers, tomatoes, spinach, broccoli, sweet potatoes, and pumpkin.
Vitamin E	Acts as the protector of essential fats in cell membranes and red blood cells. Reduces risk of cancer, heart disease, and other age-associated diseases.	Peanut butter, nuts, seeds, vegetable oils and margarine, wheat germ, avocado, whole grains, salad dressings.
Vitamin C	Destroys free radicals inside and outside cells. Helps in the formation of connective tissue, the healing of wounds, and iron absorption, and also helps to prevent bruising and keep gums healthy. May reduce risk of cataracts, heart disease, and cancer.	Peppers, tomatoes, citrus fruits and juices, berries, broccoli, spinach, cabbage, potatoes, mango, papaya.
Vitamin A	Protects cell membranes and fatty tissue, helps repair damage caused by air pollutants, and boosts the immune system. Helps bones and teeth develop and promotes vision.	Liver, eggs, and fortified dairy products.

(Illustration by GGS Information Services. Cengage Learning, Gale)

beta carotene may help reduce the risk of some cancers, heart disease, **cataracts**, and strokes.

A number of studies were released in 2007 that reported conflicting information on the effectiveness of antioxidants in fighting and preventing disease and their anti-aging properties. In early 2007, the *Journal of the American Medical Association (JAMA)* published an analysis of 68 studies of antioxidant supplements by researchers in Denmark that reported the antioxidants vitamins A, E, and beta carotene did not increase lifespan and, in some cases, shortened it. Some researchers in the United States questioned the accuracy of the study, saying it was flawed because it looked at all causes of death, including murder and auto accidents, even though there clearly is no relationship between taking antioxidant supplements and these types of deaths. Also, U.S. researchers said the studies used in the analysis were not uniform in their length of time or in the dosages taken of the antioxidants. The dosages that were used in the study were extremely high, further tainting the conclusion, some U.S. researchers said.

Two other studies released in 2007 also reported bad news on antioxidants. One of the studies, called the Women's Antioxidant and Cardiovascular Study, reported that taking vitamins C, E, or beta carotene—either alone or in combination—did not protect women from cardiovascular risks, such as **heart attack** and **stroke**. The long-term study of more than 8,000 women was conducted by researchers at Brigham and Women's Hospital in Boston. The second study, conducted by researchers at the University of Paris, reported that taking antioxidant supplements increased the risk of skin cancers in women but not in men. The long-term study of more than 13,000 French men and women involved the antioxidants vitamins C, E, and beta carotene, along with selenium and **zinc**.

Further large-scale clinical studies underway in the United States as of 2007 may shed more light on the antioxidant debate, especially in regards to the anti-cancer benefits of antioxidants. One of these is the Physicians' Health Study-II, which began in 1997 and was scheduled to end in December 2007. As of January 2008, results from the study were still being analyzed and had not been released. The study involved vitamins C, E, and beta carotene, and a multivitamin. It looked at the effects of these antioxidants—together, alone, and in combinations—on preventing cardiovascular disease, cancer in general, **prostate cancer**, colon cancer, aging-related eye disease, and early cognitive decline. Another study is the Selenium and Vitamin E Cancer Prevention Trial (SELECT), a clinical trial to see if either or both of these antioxidants can prevent prostate cancer. More than 35,000 men in the United States, Canada, and Puerto Rico, participated in the study, which began in 2001 and was scheduled to end in 2011. This study was funded by the National Cancer Institute, a branch of the National Institutes of Health.

Vitamin A

A study by the University of Arizona found that vitamin A has a protective affect against many types of cancer, according to Dr. Michael Colgan in his book, *The New Nutrition*. Vitamin A is a fat-soluble antioxidant found in animal products but can be made by the body from its precursor, beta carotene. Foods rich in vitamin A are liver, eggs, and fortified dairy products. Vitamin A helps bones and teeth develop and promotes vision. As an antioxidant, it protects cell membranes and fatty tissue, helps repair damage caused by air pollutants, and boosts the immune system. A deficiency of this vitamin can result in dry skin, brittle hair, vision problems, blindness, and increased susceptibility to respiratory **infections**.

Vitamin C

Probably the most widely used of all vitamin supplements, vitamin C is a powerful antioxidant that has a myriad of functions and helps strengthen the immune system. It became famous in the 1970s when Nobel Prize-winning scientist Linus Pauling advocated daily mega doses (8–10 grams) of vitamin C to prevent and ease the symptoms of the **common cold**. Many clinical studies show vitamin C is superior to over-the-counter medicines in reducing the symptoms, duration, and severity of colds. As an antioxidant, vitamin C may help fight cardiovascular disease by protecting the linings of arteries from oxidative damage. As of 2007, debate continued on the vitamin's effects on heart disease. One study revealed that Vitamins C and E helped reduce arteriosclerosis (hardening of the arteries) following heart transplants. Yet another study demonstrated that vitamin therapy had no effect on preventing heart disease. There is some evidence and research that vitamin C can help prevent cancer. Studies have shown it is also beneficial in protecting the body against the effects of **smoking** and air pollutants and generally boosts the immune system.

Vitamin E

Vitamin E is a potent antioxidant by itself, but its effectiveness is magnified when taken with other antioxidants, especially vitamin C, selenium, and beta carotene. Some scientific evidence indicates that vitamin E helps promote cardiovascular health. Past studies have demonstrated higher vitamin E intake is associated with decreased incidence of heart disease in both men and women. In fact, the combination of vitamin C and E can slow progression of cardiovascular disease following heart transplant. In 2002, researchers stated that the vitamin combination might also be useful in other organ transplants. In addition, Harvard Medical School reported in the same year that vitamin E might play a role in helping people live longer, citing its role in strengthening the immune system.

Carotenoids

This class of antioxidants, including beta carotene, **lutein**, and **lycopene**, are found in a variety of fruits and vegetables such as carrots, pumpkins, kale,

spinach, tomatoes, and pink grapefruit. Research evidence suggests **carotenoids** lower the risk of heart disease and some types of cancer and strengthen the immune system. Lycopene, which is concentrated in the prostate gland, is believed to protect the prostate from cancer. Lutein is thought to prevent **macular degeneration**, a major cause of blindness or stop its progression. Beta carotene increases the lungs' defense system in smokers or those exposed to other air-borne pollutants. It also has been used as an immune system stimulator in people with **AIDS**. In 2002, a report revealed that more than 90% of ophthalmologists and optometrists surveyed believe that lutein helps prevent eye disease.

Bioflavonoids

Bioflavonoids are a group of about 5,000 compounds that act as antioxidants. They occur in fruits, vegetables, green tea, soy products, herbs, and spices. A combination of bioflavonoids has a synergistic effect when taken with vitamin C. They have been shown to be beneficial in treating a variety of conditions, including **allergies**, arthritis, diabetes, **hypertension**, and viral infections. One group of bioflavonoids found to be a powerful antioxidant is oligomeric proanthocyanidins (OPCs), also known generically as pycnogenol. Extremely high concentrations of OPCs are found in maritime pine bark (*Pinus maritima*) extract, grape seed extract, and grape and peanut skins. Due primarily to its much lower cost, grape seed extract is the most commonly used OPC. Procyanidins, a group of compounds found in the extract, are thought to increase the effectiveness of other antioxidants, especially vitamin C and vitamin E, by helping them regenerate after neutralizing free radicals in the blood and tissue.

Other antioxidants

The other widely used antioxidants are selenium, zinc, coenzyme Q10, and certain **amino acids**. Selenium, especially when teamed with vitamin E, may help protect against lung, colon, prostate, and rectum cancers. The antioxidant benefits of coenzyme Q10 may include slowing the aging process, boosting the immune system, and preventing oxidative damage to the brain. Some people suggest its use to treat a variety of cardiovascular diseases. Amino acids that have strong antioxidant effects include alpha lipoic acid, cysteine, **glutathione**, and N-acetyl cysteine (NAC).

Preparations

Bottled antioxidant formulae are available in a single pill or as part of a multivitamin. The usual dosages of antioxidants taken individually can vary widely. The United States Department of Agriculture (USDA) has established recommended daily allowances, but these may be conservative amounts for preventing diseases. For instance, the USDA recommendation for vitamin C is 60 mg a day, but natural health practitioners commonly recommend 500 mg a day or more. The dosage may also depend on whether it is being taken to treat or prevent a specific condition. With that in mind, the common daily dosages for specific antioxidants are: vitamin A, 5,000-15,000 IU; beta carotene, 15,000-25,000 IU; vitamin C, 250-1,500 mg; vitamin E, 30-400 IU; selenium, 50-400 micrograms; bioflavonoids, 100-500 mg; grape seed extract, 150-200 mg; coenzyme Q10, 90-150 mg; alpha lipoic acid, 20-50 mg or 300-600 mg for elevated blood sugar levels; glutathione, 100 mg; N-acetyl cysteine, 600 mg, and zinc, 40–60 mg.

Precautions

Various precautions are available regarding the use of antioxidants:

- Vitamin C: May interfere with some laboratory tests, including urinary sugar spilling for diabetics.
- Vitamin A: Can be toxic in high doses of more than 15,000 IU per day or chronic doses for months and may cause birth defects if taken in high doses during pregnancy. In 2002, one study showed that consistent vitamin A intake could increase the risk of hip fractures in postmenopausal women, but the study was not representative of all women, and more study on the upper limits of safe vitamin A consumption for women in their 40s and 50s is needed.
- Vitamin E: Dangerous in very high doses.
- Carotenoids: No known precautions are indicated for normal doses.
- Bioflavonoids: No known precautions are indicated for normal doses.
- Selenium: No precautions indicated at normal doses, but a physician should be consulted before taking daily doses of more than 200 micrograms.
- Coenzyme Q10: No known precautions are indicated for normal dosage.
- Amino acids: There are no known precautions indicated for alpha lipoic acid, cysteine, glutathione, or NAC.

Side effects

Side effects for consuming antioxidants are as follows:

- Vitamin C: Individual tolerances vary. High doses may cause cramps, diarrhea, ulcer flare-ups, kidney stones, and gout in some people.
- Vitamin A: High doses can lead to headaches, nausea, hair loss, and skin lesions; may cause bone disease in people with chronic kidney failure.
- Vitamin E: Usually no adverse side effects in doses of up to 400 mg a day, high doses may elevate blood pressure and lead to blood-clotting problems.
- Carotenoids: No known side effects occur with normal dosage.
- Bioflavonoids: No known negative side effects in normal doses.
- Selenium: No reported adverse side effects with normal dosage of 200 micrograms, higher doses may cause dizziness and nausea.
- Coenzyme Q10: No adverse side effects have been reported.
- Amino acids: There are no known side effects associated with normal doses of alpha lipoic acid, cysteine, glutathione, or NAC.

Interactions

Information on interactions is available, some of which is as follows:

- Vitamin C: No known common adverse interactions with other drugs.
- Vitamin A: Women taking birth control pills should consult with their doctors before taking extra vitamin A.
- Vitamin E: Should not be used by persons taking anti-coagulation drugs.
- Carotenoids: No known negative interactions with other drugs.
- Bioflavonoids: No known adverse interactions with other drugs.
- Coenzyme Q10: No negative drug interactions yet reported.
- Amino acids: There are no adverse reactions yet reported between alpha lipoic acid, cysteine, glutathione, or NAC and other medications.

KEY TERMS

Atherosclerosis—A buildup of fatty substances in the inside of arteries, resulting in the restriction of blood flow and hardening of the vessels.

Macular degeneration—An eye disease resulting in a loss of central vision in both eyes while peripheral vision is preserved.

Oxidation—The loss of electrons from a molecule by their bonding to an oxygen molecule, rendering the donor molecule positive in charge and the recipient oxygen negative in charge (free radical).

Sinusitis—An inflammation or infection in the sinus cavities in the head.

Resources

BOOKS

Bruning, Nancy Pauling. *The Real Vitamin and Mineral Book: The Definitive Guide to Designing Your Personal Supplement Program,* 4th ed. New York: Avery, 2007.

Jeep, Robin, et al. *The Super Antioxidant Diet and Nutrition Guide: A Health Plan for the Body, Mind, and Spirit*. Charlottesville, VA: Hampton Roads, 2008.

Milbury, Paul E., and Alice C. Richer. *Understanding the Antioxidant Controversy: Scrutinizing the "Fountain of Youth."* Westport, CT: Praeger, 2007.

Panglossi, Harold V., ed. *Antioxidants: New Research*. Haupauge, NY: Nova Science, 2006.

Presman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals,* 3rd ed. New York: Alpha (Penguin Group), 2007.

PERIODICALS

Antinoro, Linda. "Antioxidant Allies Abound: Where to Look, Surprising Food Sources." *Environmental Nutrition* (March 2006): 1.

"Antioxidant Supplements Now What? Despite Controversial Analysis Linking Some Antioxidants to Increased Mortality, Experts Still See Possible Preventive Benefits." *Tufts University Health & Nutrition Letter* (June 2007): 4(2).

Brunk, Doug. "Antioxidants Do Not Protect Women Against Heart Risks." *Family Practice News* (September 15, 2007): 17.

Challem, Jack. "Vitamin Basics: To Maintain Optimal Health, It's Often Worthwhile to Venture Beyond What You Get in a Multivitamin. These Are Our Top 10 Picks for Individual Vitamin Supplements." *Better Nutrition* (August 2007): 14(3).

Gable, Christine. "R.O.Y.G.B.I.V.: Eat Your Colors: Color Yourself Healthy with a Rainbow Inspired Menu that Provides a Balance of Vitamins, Minerals, and Antioxidants." *Better Nutrition* (September 2007): 62 64.

Gottesman, Nancy. "Vitamin Wars The Latest." *O, The Oprah Magazine* (September 2007): 211 213.
Mechcatie, Elizabeth. "Antioxidants May Raise Women's Skin Cancer Risk." *Skin & Allergy News* (October 2007): 4.

ORGANIZATIONS

American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL, 60606, (800) 877 1600, http://www.eatright.org.
American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.
Canadian Cancer Society, 10 Alcorn Ave., Suite 200, Toronto, ON, M4V 3B1, Canada, (416) 961 7223, http://www.cancer.ca.
Dieticians of Canada, 480 University Ave., Suite 604, Toronto, ON, M5G 1V2, Canada, (416) 596 0857, http://www.dieticians.ca.
National Cancer Institute, 6116 Executive Blvd., Room 3036A, Bethesda, MD, 20892, (800) 422 6237, http://www.cancer.gov.
Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, http://www.ods.od.nih.gov.

Ken R. Wells

Anxiety

Definition

Anxiety is a bodily response to a perceived threat or danger. It is triggered by a combination of biochemical changes in the body, the patient's personal history and memory, and the social situation.

It is important to distinguish between anxiety as a feeling or experience and an anxiety disorder as a psychiatric diagnosis. A person may feel anxious without having an anxiety disorder. Also, a person facing a clear and present danger or experiencing a realistic fear is not usually considered to be in a state of anxiety. In addition, anxiety frequently occurs as a symptom in other categories of psychiatric disturbance.

Description

Anxiety is related to fear, but it is not the same emotion. Fear is a direct, focused response to a specific event or object of which an individual is consciously aware. Most people feel fear if someone points a loaded gun at them or if they see a tornado forming on the horizon. They also recognize that they are afraid. Anxiety, by contrast, is often unfocused, vague, and hard to link to a specific cause.

Sometimes anxiety experienced in the present may stem from an event or person that produced **pain** and fear in the past. In this experience, the anxious individual may not be consciously aware of the original source of the feeling. Anxiety has an aspect of remoteness that makes it hard for people to compare their experiences. Whereas fear is the typical and logical response to physically dangerous situations, anxiety is often triggered by objects or events that are unique and specific to an individual and may seem illogical triggers from other persons' perspectives. An individual may be anxious because of a unique meaning or memory being stimulated by present circumstances rather than because of some immediate danger.

According to the Anxiety Disorders Association of America, anxiety disorders affect 40 million adults in the United States (more than 18% of the population), and are the most common mental illness.

Causes and symptoms

Anxiety is characterized into four categories, each with associated symptoms:

- Somatic. These physical symptoms include headaches, dizziness or lightheadedness, nausea and/or vomiting, diarrhea, tingling, pale complexion, sweating, numbness, difficulty in breathing, and sensations of tightness in the chest, neck, shoulders, or hands. These symptoms are produced by the hormonal, muscular, and cardiovascular reactions involved in the fight-or-flight reaction.
- Behavioral. These symptoms include pacing, trembling, general restlessness, hyperventilation, pressured speech, hand wringing, and finger tapping.
- Cognitive. These symptoms include recurrent or obsessive thoughts, feelings of doom, morbid or fear-inducing thoughts or ideas, and confusion or inability to concentrate.
- Emotional. These symptoms include feelings of tension or nervousness, of being hyper or keyed up, and having a sense of unreality, panic, or terror.

Anxiety can have a number of different causes. It is a multidimensional response to stimuli in the person's environment or a response to an internal stimulus (e.g., a hypochondriac's reaction to stomach rumbling) resulting from a combination of general biological and individual psychological processes.

Physical triggers

In some cases, anxiety is produced by physical responses to **stress** or by certain disease processes or medications.

THE AUTONOMIC NERVOUS SYSTEM (ANS). The nervous system of human beings is hard-wired to respond to dangers or threats. These responses are not subject to conscious control and are the same in humans as in lower animals. They represent an evolutionary adaptation to animal predators and other dangers to which all animals, including primitive humans, had to cope.

The most familiar reaction of this type is the fight-or-flight reaction to a life-threatening situation. When people have fight-or-flight reactions, the level of stress hormones in their blood rises. They become more alert and attentive, their eyes dilate, their heartbeat rate increases, their breathing rate increases, and their digestion slows down, making more energy available to the muscles.

This emergency reaction is regulated by a part of the nervous system called the autonomic nervous system, or ANS. The ANS is regulated by the hypothalamus, a specialized part of the brainstem that is among a group of structures called the limbic system. The limbic system controls human emotions through its connections to glands and muscles; it also connects to the ANS and higher brain centers, such as parts of the cerebral cortex.

One problem with this arrangement is that the limbic system cannot tell the difference between a real physical threat and an anxiety-producing thought or idea. The hypothalamus may trigger the release of stress hormones from the pituitary gland even when there is no external danger.

A second problem is caused by the biochemical side effects of too many false alarms in the ANS. When individuals respond to a real danger, their body relieves itself of the stress hormones by facing up to the danger or fleeing from it. In modern life, however, people often have fight-or-flight reactions in situations in which they can neither run away nor lash out physically. As a result, their bodies have to absorb all the biochemical changes of hyperarousal rather than release them. These biochemical changes can produce anxious feelings as well as muscle tension and other physical symptoms of anxiety.

DISEASES AND DISORDERS. Anxiety can be a symptom of certain medical conditions. For example, anxiety is a symptom of certain endocrine disorders that are characterized by overactivity or underactivity of the thyroid gland. Cushing's syndrome, in which the adrenal cortex overproduces cortisol, is one such disorder. Other medical conditions that can produce anxiety are respiratory distress syndrome, mitral valve prolapse, porphyria, and chest pain caused by inadequate blood supply to the heart (**angina** pectoris).

MEDICATIONS AND SUBSTANCE USE. Numerous medications may cause anxiety-like symptoms as a side effect. They include birth control pills, some thyroid or **asthma** drugs, some psychotropic agents, corticosteroids, antihypertensive drugs, nonsteroidal anti-inflammatory drugs (such as flurbiprofen and ibuprofen), and local anesthetics. **Caffeine** can also cause anxiety-like symptoms when consumed in sufficient quantity.

Withdrawal from certain prescription drugs—primarily beta-blockers and corticosteroids—can cause anxiety. Withdrawal from drugs of abuse, including LSD, cocaine, alcohol, and opiates, can also cause anxiety.

Childhood development and anxiety

Researchers in early childhood development regard anxiety in adult life as a residue of childhood memories of dependency. Humans learn during the first year of life that they are not self-sufficient and that their basic survival depends on others. It is thought that this early experience of helplessness underlies the most common anxieties of adult life, including fear of powerlessness and fear of not being loved. Thus, adults can be made anxious by symbolic threats to their sense of competence or significant relationships, even though they are no longer helpless children.

Symbolization

The psychoanalytic model gives a lot of weight to the symbolic aspect of human anxiety; examples include phobic disorders, obsessions, compulsions, and other forms of anxiety that are highly individualized. Because humans mature slowly, children and adolescents have many opportunities to connect their negative experiences to specific objects or events that can trigger anxious feelings in later life. For example, a person who was frightened as a child by a tall man wearing glasses may feel panicky years later, without consciously knowing why, by something that echoes that person or experience.

Freud thought that anxiety results from a person's internal conflicts. According to his theory, people feel anxious when they feel torn between moral restrictions

and desires or urges toward certain actions. In some cases, the person's anxiety may attach itself to an object that represents the inner conflict. For example, someone who feels anxious around money may be pulled between a desire to steal and the belief that stealing is wrong. Money becomes a symbol for the inner conflict between doing what is considered right and doing what one wants.

Phobias

Phobias are a special type of anxiety reaction in which individuals concentrate their anxiety on a specific object or situation and then tries to avoid it. In most cases, the fear is out of proportion to its cause. According to the Anxiety Disorders Association of America, 19 million American adults, representing nearly 9% of the population, have specific phobias. Some phobias—agoraphobia (fear of open spaces), claustrophobia (fear of small or confined spaces), and social phobia, for example—are shared by large numbers of people. Others are less common or are unique to individuals.

Social and environmental stressors

Because humans are social creatures, anxiety often has a social dimension. People frequently report feelings of high anxiety when they anticipate or fear the loss of social approval or love. Social phobia is a specific anxiety disorder that is marked by high levels of anxiety or fear of embarrassment in social situations.

Another social stressor is prejudice. People who belong to groups that are targets of bias have a higher risk of developing anxiety disorders. Some experts think, for example, that the higher rates of phobias and **panic disorder** among women reflects their greater social and economic vulnerability.

Several controversial studies indicate that the increase in violent or upsetting pictures and stories in news reports and entertainment may raise people's anxiety levels. Stress and anxiety management programs often recommend that patients cut down their exposure to upsetting stimuli.

Environmental or occupational factors can also cause anxiety. People who must live or work around sudden or loud noises, bright or flashing lights, chemical vapors, or similar nuisances that they cannot avoid or control may develop heightened anxiety levels.

Diagnosis

Diagnosing anxiety is difficult and complex because of the variety of possible causes and because each person's symptoms arise from highly individualized experiences. When an anxious patient is examined, the healthcare practitioner will first rule out physical conditions and diseases that have anxiety as a symptom. The doctor will then take the patient's history to see if prescription drugs, alcohol or drug abuse, caffeine, work environment, or other external stressors could be triggering the anxiety. In many cases, the most important source of diagnostic information is the patient's psychological and social history. The doctor may administer several brief psychological tests, including the Hamilton Anxiety Scale and the Anxiety Disorders Interview Schedule (ADIS).

Treatment

Meditation and mindfulness training can benefit patients with phobias and panic disorder. **Hydrotherapy**, **massage therapy**, and **aromatherapy** are useful to some anxious patients because these treatments can promote general **relaxation** of the nervous system. **Essential oils** of **lavender**, **chamomile**, neroli, sweet marjoram, and ylang-ylang are commonly recommended by aromatherapists for stress relief and anxiety reduction.

Relaxation training, which is sometimes called anxiety management training, includes breathing exercises and similar techniques intended to help the patient prevent hyperventilation and relieve the muscle tension associated with the fight-or-flight reaction. **Yoga**, aikido, tai chi, and **dance therapy** help patients work with the physical, as well as the emotional, tensions that either promote anxiety or result from the anxiety.

Homeopathy and **traditional Chinese medicine** (TCM) approach anxiety as a symptom of a holistic imbalance. Homeopathic practitioners select a remedy based on other associated symptoms and the patient's general constitution. Homeopathic remedies for anxiety include **ignatia**, **gelsemium**, **aconite**, **pulsatilla**, **arsenicum album**, and coffea cruda. These remedies should be prescribed by a homeopathic healthcare professional.

Chinese medicine regards anxiety as a disruption of *qi*, or energy flow, inside the patient's body. **Acupuncture** and/or herbal therapy are standard remedies for rebalancing the entire system. Reishi (*Ganoderma lucidum* or Ling-Zhi) is a medicinal mushroom prescribed in TCM to reduce anxiety and **insomnia**. However, because reishi can interact with other prescription drugs and is not recommended for patients with certain medical conditions, individuals

should consult their healthcare practitioner before taking the remedy. Other TCM herbal remedies for anxiety include the **cordyceps** mushroom (also known as caterpillar fungus) and Chinese **green tea**. In addition, numerous TCM formulas combine multiple herbs for use as an anxiety treatment, depending on the individual problem.

Herbalists or holistic healthcare providers may also prescribe herbs known as *adaptogens* to treat anxiety. These herbs are thought to promote adaptability to stress, and they include Siberian ginseng (*Eleutherococcus senticosus*), ginseng (*Panax ginseng*), wild yam (*Dioscorea villosa*), borage (*Borago officinalis*), **licorice** (*Glycyrrhiza glabra*), chamomile (*Chamaemelum nobile*), **milk thistle** (*Silybum marianum*), and nettles (*Urtica dioica*). Tonics of **skullcap** (*Scutellaria lateriafolia*), and oats (*Avena sativa*) may also be recommended to ease anxiety.

A 2002 preliminary study found that St. John's wort could be an effective treatment for generalized anxiety. Patients taking 900 mg a day and higher doses responded well in early trials. However, further research was needed, particularly at doses higher than 900 mg per day. The Ayurvedic herb **gotu kola**, long used by practitioners of India's holistic medical system to enhance memory and relieve **varicose veins**, may also help patients with anxiety by working against the startle response. In addition, kava extract (also known as kava-kava) has been suggested as a potential treatment for generalized anxiety.

Allopathic treatment

Because anxiety often has more than one cause and patients experience it in highly individual ways, its treatment often requires more than one type of therapy. In some cases, several types of treatment may need to be tried before the best combination is discovered. It usually takes about six to eight weeks to evaluate the effectiveness of a treatment regimen.

Medications

Medications are often prescribed to relieve the physical and psychological symptoms of anxiety. Most medications work by counteracting the biochemical and muscular changes involved in the fight-or-flight reaction. Some work directly on the brain chemicals that are thought to underlie the anxiety.

ANXIOLYTICS. Anxiolytics are sometimes called tranquilizers. Benzodiazepines work by relaxing the skeletal muscles and calming the limbic system. They include such drugs as alprazolam (Xanax) and diazepam (Valium). Barbiturates, once commonly used, carry a high risk of addiction and abuse and are rarely used in clinical practice. Benzodiazepines are potentially habit-forming and may cause withdrawal symptoms, but they are far less likely than barbiturates to cause physical dependency.

Two other types of anxiolytic medications are meprobamate (Equanil), which is rarely used as of 2008, and buspirone (BuSpar), a later type of anxiolytic that appears to work by increasing the efficiency of the body's own emotion-regulating brain chemicals. Unlike barbiturates and benzodiazepines, buspirone does not cause dependence problems, does not interact with alcohol, and does not affect the patient's ability to drive or operate machinery. It does, however, carry some side effects, and it is not effective against certain types of anxiety, such as panic disorder.

ANTIDEPRESSANTS AND BETA-BLOCKERS. The treatment of choice for **obsessive-compulsive disorder**, panic type anxiety, and other anxiety disorders is a group of antidepressants known as selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine hydrochloride (Prozac) and paroxetine hydrochloride (Paxil). When anxiety occurs in tandem with depressive symptoms, tricyclic antidepressants such as imipramine (Tofranil) or monoamine oxidase inhibitors (MAOIs) such as phenelzine (Nardil) are sometimes prescribed.

Beta-blockers are medications that work by blocking the body's reaction to the stress hormones that are released during the fight-or-flight reaction. They include drugs such as propranolol (Inderal) or atenolol (Tenormin). Beta-blockers are sometimes given to patients with post-traumatic anxiety symptoms or social phobic anxiety.

Psychotherapy

Many patients with anxiety are given some form of **psychotherapy** along with medication. Many patients benefit from insight-oriented therapies, which are designed to help them uncover unconscious conflicts and defense mechanisms in order to understand how their symptoms developed.

Cognitive-behavioral therapy (CBT) also works well with anxious patients. In CBT, individuals are taught to identify thoughts and situations that stimulate their anxiety and to view them more realistically. In the behavioral part of the program, individuals are exposed to the anxiety-provoking object, situation, or internal stimulus (e.g., a rapid heart beat) in gradual stages until they are desensitized to it.

KEY TERMS

Anxiolytic—A type of medication that helps to relieve anxiety.

Aromatherapy—The therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological wellbeing.

Autonomic nervous system (ANS)—The part of the nervous system that supplies nerve endings in the blood vessels, heart, intestines, glands, and smooth muscles; it also governs their involuntary functioning. The autonomic nervous system is responsible for the biochemical changes involved in experiences of anxiety.

Endocrine gland—A ductless gland, such as the pituitary, thyroid, or adrenal gland, that secretes its products directly into the blood or lymph.

Hyperarousal—A state or condition of muscular and emotional tension produced by hormones released during the fight-or-flight reaction.

Hypothalamus—A portion of the brain that regulates the autonomic nervous system, the release of hormones from the pituitary gland, sleep cycles, and body temperature.

Limbic system—A group of structures in the brain that includes the hypothalamus, amygdala, and hippocampus. The limbic system plays an important part in regulation of human moods and emotions.

Phobia—In psychoanalytic theory, a psychological defense against anxiety in which the patient displaces anxious feelings onto an external object, activity, or situation.

Expected results

According to the Anxiety Disorders Association of America, nearly half of those people who experience persistent anxiety do not seek treatment. Among those people who do, the prognosis for resolving anxiety depends on the specific disorder and a wide variety of factors, including the patient's age, general health, living situation, belief system, social support network, and responses to different medications and forms of therapy.

Resources

BOOKS

Bourne, Edmund J. *The Anxiety & Phobia Workbook,* 4th ed. Oakland, CA: New Harbinger, 2005.

Challem, Jack, and Melvyn Werbach. *The Food Mood Solution: All Natural Ways to Banish Anxiety, Depression, Anger, Stress, Overeating, and Alcohol and Drug Problems and Feel Good Again,* rep. ed. Hoboken, NJ: Wiley, 2008.

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (512) 926 4900, http://abc.herbalgram.org/site/PageServer.

Anxiety Disorders Association of America, 8730 Georgia Ave., Suite 600, Silver Spring, MD, 20910, (240) 485 1001, http://www.adaa.org.

Paula Ford-Martin
Leslie Mertz, Ph.D.

Apis

Description

Not all products used in alternative healing come from plants. *Apis mellifica* is the venom of the common honeybee or a tincture made from the whole bee. Various species of honeybees found throughout the world are used for this remedy in homeopathic medicine. The remedy made from them is usually called apis. Other folk medicine traditions use additional bee-related substances in healing such as honey, beeswax, pollen, **royal jelly**, and propolis.

General use

Homeopathic medicine operates on the principle that "like heals like." This means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow

Honey bee, *Apis mellifera.* *(© WildPictures / Alamy)*

another homeopathic law, the Law of Infinitesimals. In opposition to traditional medicine, the Law of Infinitesimals states that the *lower* a dose of curative, the more effective it is. To make a homeopathic remedy, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

In homeopathic terminology, the effectiveness of remedies is "proved" by experimentation and reports by famous homeopathic practitioners. Around 1900, both bee venom and tincture from the entire insect were proved as a remedy by the Central New York State Homeopathic Society.

In homeopathic medicine, apis is used as a remedy for many symptoms similar to those of bee **stings**. These include:

- inflammation with a burning sensation
- stinging pain
- itchy skin
- swollen and sensitive skin
- red, flushed, hot face
- hive-like welts on the skin

Homeopathic practitioners use apis when stinging or burning inflammations appear in all parts of the body, not just on the skin. A homeopath could use apis for sore throats, **mumps**, urinary tract **infections**, and other conditions where there is a stinging or burning sensation.

Symptoms treated by apis usually appear quite rapidly. There is often some swelling (**edema**) along with the stinging sensation. Many people who need apis complain of swollen eyelids, as if they had an eye infection. In keeping with the symptom of edema, often little urine is produced although there may be a strong urge to urinate. Despite this, the patient has little thirst or desire to drink.

Often the patient who will be given apis appears flushed or has a rough rash. The rash may appear, then disappear. The skin will be sensitive to the touch and alternately hot and dry, then sweaty. Patients may also feel nauseated, experience **heartburn**, or have tightness throughout their chest or abdomen that feels as if they will burst if they **cough** or strain.

Certain mental and emotional symptoms also appear in the patient that needs treatment with apis. Sadness, weeping, and **depression** can occur. Apis is often used after a person experiences a strong emotional reaction such as jealousy, fear, rage, or anger.

In homeopathic medicine, the fact that certain symptoms get better or worse under different conditions is used as a diagnostic tool to indicate what remedy will be most effective. Symptoms that benefit from treatment with apis get worse by applying warmth or drinking warm liquids. They also get worse from touch or pressure, or when the person is in a closed, heated room. The symptoms are often worse on the right side, after sleeping and also worsen in the late afternoon. Symptoms improve with the application of cold and exposure to fresh air.

Homeopathy also ascribes certain personality types to certain remedies. The apis personality is said to be fidgety, restless, and unpredictable. People with the apis personality may have wildly inappropriate reactions to emotional situations. They want company, but reject affection, and sometimes insist that they do not need medical attention when they clearly are unwell. People who need apis often have bouts of unprovoked jealousy and unprovoked tears. They may fear ill health and death greatly.

Preparations

There are two homeopathic dilution scales, the decimal (x) scale with a dilution factor of 1:10 and the centesimal (c) scale with a dilution factor of 1:100. Once the mixture is diluted, shaken, strained, then rediluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Homeopathic apis venom is available commercially in tablets in many different strengths. Dosage depends on the symptoms being treated. Homeopathic tincture of whole honeybee is also available in a variety of strengths.

Homeopathic and orthodox medical practitioners agree that by the time the initial remedy solution is diluted to strengths used in homeopathic healing, it is likely that very few molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called "potentization" that has not yet been explained by mainstream scientists.

Precautions

No particular precautions have been noted for using apis. However, people who are allergic or sensitive to bee venom should be cautious. They may react adversely to certain potencies of homeopathic apis.

Side effects

When taken in the recommended dilute form, no side effects from apis have been reported.

KEY TERMS

Edema—Puffiness caused by water retention.

Propolis—A sticky resin made by honeybees to seal the holes in their hives.

Royal jelly—Special substance secreted by bees to feed the young queen bees.

Tincture—An extract prepared by soaking the remedy in alcohol.

Concentrated quantities of the bee venom can cause allergic reactions in susceptible people.

Interactions

Studies on interactions between apis and conventional pharmaceuticals have not been done. No interactions have been reported.

Resources

BOOKS

Chernin, Dennis. *The Complete Homeopathic Resource for Common Illnesses*. Berkeley, CA: North Atlantic Books, 2006.

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. 3rd ed. rev. New York: Tarcher, 2004.

Wolf, C. W. *Apis Mellifica; or, the Poison of the Honeybee, Considered as a Therapeutic Agent*. Originally published Philadelphia: W. Radde, 1858. Reprinted Ann Arbor, MI: Scholarly Publishing Office, University of Michi gan Library, 2005.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Poto mac, MD 20859. (301) 340 1960. http://www.amfoun dation.org.

American Institute of Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314. (888) 445 9988. http://homeopathyusa.org.

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790. http:// www.homeopathic.org/contact.htm.

OTHER

"Apis Mellifica." *ABC Homeopathy*. [cited February 19, 2008]. http://abchomeopathy.com/r.php/Apis.

"British Homeopathic Library." *Hom Inform*. [cited February 19, 2008]. http://www.hom inform.org.

Tish Davidson, A. M.

Apitherapy

Definition

Apitherapy involves the therapeutic use of honeybee products, including **bee pollen**, honey, propolis, **royal jelly**, beeswax, and venom, to treat a variety of ailments. The most well-known and well-practiced facet of apitherapy is Bee Venom Therapy (BVT), which involves the medicinal use of bee **stings**. The venom is thought to reduce inflammation and boost the body's immune system. When most people refer to apitherapy, they are referring to BVT.

Origins

The medicinal use of bees goes back to ancient times. Chinese texts dating back 2,000 years mention it, and Hippocrates wrote about it. The Egyptians were said to treat diseases with an ointment made from bees, and Greek physician and writer Galen (129—c. 199), wrote about bee treatments. In 1888, Phillip Terc, an Austrian physician, published a paper on one of the first clinical studies involving bee stings titled *Report About a Peculiar Connection Between the Beestings and Rheumatism*. Thereafter, its use expanded throughout Europe and the United States. It spread as a type of folk remedy popularized by anecdotal accounts, but as the 21st century approached, the medical community began investigating the therapy, studying its use on a pharmacological level. Though clinical studies had begun by 2000, most people using the therapy were either doing it themselves or with the help of lay practitioners. Physicians were beginning to use the therapy but mostly with an injectable form of the venom.

Benefits

The American Apitherapy Society says it has anecdotal evidence showing bee venom is effective in the treatment of:

- immune system problems, such as arthritis and **multiple sclerosis** (MS)
- cardiovascular disease, such as hypertension, arrhythmias, atherosclerosis, and varicose veins
- endocrine disorders, such as premenstrual syndrome, menstrual cramps, irregular periods, and decreased blood glucose levels
- infections, like herpes simplex 1 and 2, warts, mastitis, and laryngitis
- psychological disturbances, such as depression or mood swings

The most well-known facet of apitherapy is Bee Venom Therapy (BVT), which involves the medicinal use of bee stings. The venom is thought to reduce inflammation and boost the body's immune system. *(louise murray / Alamy)*

- rheumatologic disturbances, such as rheumatoid arthritis, osteoarthritis, juvenile rheumatoid arthritis, bursitis and "tennis elbow"
- skin conditions, such as eczema, psoriasis, corns, warts and topical ulcers

Apitherapy is thought of as a last-resort treatment but may be beneficial to those who cannot be helped by traditional therapies and medicines. MS patients have reported increased stability, along with less **fatigue** and muscle spasm, after trying the therapy. Patients with **rheumatoid arthritis** and **osteoarthritis** have said **pain** and swelling have decreased following the stings. It has also been said to shrink the size of rheumatoid nodules. For those who have not achieved relief with other treatments, apitherapy may help.

Description

Honey bee venom contains more than 40 active substances, many of which have physiological effects. The most abundant compound is an anti-inflammatory agent called melittin. This substance causes the body to produce cortisol, which is an agent of the body's own healing process. As an anti-inflammatory, melittin is 100 times more potent than hydrocortisol. It is noted in Paul L. Cerrato's *RN* article that experiments have shown that melittin can slow the body's inflammatory response. That is why the venom may be helpful in treating inflammatory conditions such as rheumatoid arthritis.

Other compounds that may have pharmacological effects include apamin, which works to enhance nerve transmission; adolapin, which is an anti-inflammatory and an analgesic; and other neurotransmitters like norepinephrine and dopamine and seratonin, which figure in **depression**.

The most prevalent use of BVT is for immune system and inflammatory disorders. One of the most promising uses may be relieving the symptoms of treatment-resistant MS. More than 1,300 people with MS have sent testimonials to the American Apitherapy Society in support of the treatment saying the therapy helped relieve fatigue and muscle spasm, as well as to restore stability.

Most people receiving the therapy do it themselves or with the help of a lay practitioner. The cost of learning the therapy and the cost for the bees is generally not covered by insurance. The therapy may be covered, however, if prescribed and administered by a physician who uses an injectable form.

To receive treatment, a bee is taken from a jar or hive with a pair of tweezers and held on the body part to be stung. The stinger should be left in for 10 to 15 minutes. The number of stings delivered in a session and the frequency of the sessions varies, depending on the patient's tolerance and the nature of the problem. To treat tendonitis, a patient might need only two to five therapy sessions involving only two to three stings per session. Treating a more chronic problem like arthritis can take several stings per session two to three times per week for up to three months. Treating MS is a prolonged effort. Those who have used it say the therapy must happen two to three times per week for six months in order to start working.

On average, doctors who use the therapy delivered injections one to two times per week. The number of injections varied widely, from one to 30 per session, depending on the ailment being treated.

Physicians who use the therapy do not use live bees. Instead, they obtain venom in an injectable form and inject it under the skin.

Obviously, the more stings or injections to be administered, the more time the therapy will take per session.

Preparations

Before the therapy is begun, a doctor will inject the patient with a weak form of the venom to test for allergic reaction. The doctor will have a syringe of epinephrine nearby in case a reaction does occur. If the patient is allergic to the venom, the therapy cannot be administered.

Lay practitioners and beekeepers who deliver live stings test patients with an initial sting to the knee or forearm and observe the patient to see if they are allergic. The test sting should only be administered if the practitioner has a bee-sting kit containing epinephrine nearby. If a person is allergic, a reaction will generally occur in 15 to 20 minutes. Up to 2% of the population may be allergic to insect venom.

Ice may be used to numb the area where the stings will occur. It can also be used afterward to soothe the pain.

Precautions

Venom therapy should not be used by those with severe **allergies**, **tuberculosis**, **syphilis**, **gonorrhea**, and transient insulin-dependent diabetes.

Side effects

Pain, **itching**, and swelling are common at the injection or sting site. Patients should also be cautioned that severe anaphylactic allergic reactions can lead to respiratory problems, cardiac collapse, and death. Some may develop nodular masses or ulcers at sting sites.

It seems, however, that major complications are rare. Christopher M. H. Kim, director of the Monmouth Pain Institute in Red Bank, New Jersey, says he has given more than 34,000 injections to 174 patients over the past 15 years and has yet to see any major complications. The venom Kim injects is equivalent to one to ten bee stings. The most common side effect reported by his patients is itching, reported by 80% of his patients after the first session. After 12 sessions, however, only 40% still experienced itching. Of his patients, 29.7% reported swelling; 6.4% reported **headache**; and 5.6% reported flushing.

Research and general acceptance

Due to a growing body of anecdotal evidence to support the use of BVT, formal clinical studies were launched in August 2000. The National Multiple Sclerosis Society funded a study on apitherapy at Georgetown University Medical Center in Washington, D.C. The study evaluated the safety of apitherapy as a treatment for patients with progressive MS. According to the study, although no serious allergic reactions were observed, only two of the nine subjects showed objective improvement and larger studies are necessary to prove effectiveness of the treatment.

During the course of the study, Joseph A. Bellanti, who directed the study, changed his view of the therapy. "In the beginning I thought it was rather strange, but after some investigation, I saw that there are definite immunologic changes after bee venom therapy, and the use of venom began to seem less farfetched."

Over the years, researchers have experimented with the therapy on animals and have found that bee venom can keep arthritis at bay in rodents. A study in which researchers induced a condition similar to rheumatoid arthritis in rats found that

KEY TERMS

Cardiovascular—Refers to the heart and blood vessels as a unified system.

Multiple sclerosis—A chronic, debilitating disease that affects the central nervous system causing a loss of muscular coordination, speech defects, and the like.

Propolis—A brownish, waxy substance that bees collect from the buds of certain trees and use to glue their hives together.

Tendonitis—Refers to an inflammation of the tendons, the fibrous connective tissue that attaches muscle to bone.

daily injections of bee venom suppressed the disease.

Harvard Medical School professor John Mills, who works with arthritis patients, has seen patients achieve short-term relief through the sting therapy, though he does not condone its use. He believes the same response could be achieved through drug therapy without the allergic risk the venom poses to some.

While animal studies, preliminary results of clinical trials, and anecdotal evidence suggest BVT may have therapeutic effects, until clinical trials on humans are completed, there is no way to know if the treatment works. The **placebo effect** may also be responsible for some degree of benefit patients achieve.

Training and certification

Some physicians practice BVT, but the majority of those seeking treatment rely on lay practitioners, bee keepers, themselves, or a partner, who is taught to use the bees.

Those seeking treatment can contact the American Apitherapy Society to find a local practitioner.

Resources

PERIODICALS

Castro, Henry J., et al. "A Phase I Study of the Safety of Honeybee Venom Extract as a Possible Treatment for Patients with Progressive Forms of Multiple Sclerosis." *Allergy and Asthma Proceedings* 26, 6 (November December 2005): 470 476.

Cerrato, Paul L. "A Therapeutic Bee Sting?" *RN* 61, 8 (August 1998): 57 58.

D'Epiro, Nancy Walsh. "Bee Venom for Multiple Sclero sis." *Patient Care* 33, 14 (September 15, 1999): 27 31.

Granstrom, Chris. "Stinging Away the Pain." *Country Journal* 23, 5 (September/October 1996): 22 25.

Somerfield, Stanley D. "Bee Venom and Arthritis: Magic, Myth or Medicine?" *New Zealand Medical Journal* 99, 800 (April 1986): 281 283.

OTHER

"Bee Venom Therapy." Spectrum Medical Arts. http:// www2.shore.net/ spectrum/apitherapy.html (July 13, 2000).

ORGANIZATIONS

American Apitherapy Society, 500 Arthur Street, Centerport, NY, 11721, (631) 470 9446, info@apitherapy.org, http:// www.apitherapy.org.

Lisa Frick

Apple cider vinegar

Description

The word vinegar traces back to the French word *vinaigre*, which means sour wine. Apple cider vinegar is created by fermenting cider and other alcoholic liquids. Cider is made by pressing apples into a liquid. Sweet cider is unfermented and nonalcoholic. Hard cider is fermented. When converted into vinegar, the liquid has a strong odor and contains acetic acid. Vinegar is used as a condiment, preservative, and as a folk remedy for numerous conditions.

General use

Vinegar's medicinal uses date back to ancient times. Hippocrates, known as the father of medicine, reportedly used vinegar as an antiseptic.

In the nineteenth century, vinegar became associated with weight loss. The British poet Lord Byron developed a unique diet in 1820. The 194-pound poet scaled down to less than 130 pounds by eating food covered with vinegar. While Byron did not recommend a specific type of vinegar, a twentieth-century American doctor advocated apple cider vinegar as the key to improved health.

Supplement for good health and weight loss

The 1959 bestselling book by DeForest Clinton Jarvis, *Folk Medicine: A Vermont Doctor's Guide to Good Health,* recommended that people consume apple cider vinegar for numerous health conditions. Jarvis based his findings on observing the outcome

when cows received vinegar in their food. Jarvis said that adding vinegar to a cow's diet resulted in the birth of a healthy, intelligent, "well-furred" calf.

Jarvis applied his observation to people. He claimed that a pregnant woman who added vinegar and honey to her well-balanced diet would give birth to a baby with thick hair and strong fingernails. Jarvis claimed there was "no limit" to the ailments that could be treated with apple cider vinegar.

While *Time* magazine criticized the remedy as "pseudo science" and "pseudo medicine," the public was not as skeptical. Jarvis's book remained on the bestseller list for months. People paid $2.95 for a 182-page book that advised them to drink vinegar undiluted or with water. However, Jarvis maintained that combining apple cider vinegar with honey produced the best results. A mixture consisting of half vinegar and half honey became known as honegar.

Apple cider vinegar became popular as a weight-loss aid during the 1970s and again in the 1990s. People drank diluted apple cider vinegar before meals because of the liquid's supposed ability to reduce the appetite and burn calories.

By the close of the twentieth century and into the twenty-first, apple cider vinegar in the form of liquid, tablets, and capsules was recommended as a weight-loss aid and a remedy for numerous conditions ranging from arthritis and **asthma** to sore throats and muscles.

Preparation

Apple cider vinegar has long been associated with weight loss, and the condiment may be used as an ingredient for a low-fat salad dressing. Additionally, vinegar was historically a folk remedy for coughs and **sunburn** and a complementary treatment for conditions such as diabetes and high blood pressure. For some conditions, supporters claim that the beneficial effects come from pectin, a water carbohydrate found in ripe fruit.

Some remedies use liquid vinegar; some specify a particular dose. When the dosage is not specified, people should follow the directions on the package or the advice of their physician or health practitioner.

Apple cider vinegar diet

Taking apple cider vinegar before meals is supposed to curb a person's appetite, help the body to burn fat more quickly, and boost metabolism. **Diets** using vinegar specify dosages ranging from 1 to 3 tsp (5 ml to 15 ml) of apple cider vinegar before meals. Some plans recommend diluting the vinegar in water. The dosage of apple cider vinegar tablets and capsules varies with the strength of the supplement. For some plans, the dosage is 1 to 2 tablets taken before meals.

Many apple cider vinegar weight-loss plans recommend that the dieter **exercise** and eat sensibly. Some diets recommend that people select nutritional food and watch the amount of food consumed. However, people will lose weight without taking apple cider vinegar if they eat sensibly and exercise, according to the American Dietetic Association and other organizations that are skeptical of the benefits of vinegar consumption for weight loss.

Vinegar as a home remedy

Vinegar, in varieties including apple cider, has been recommended for a range of aches and pains. Some treatments are centuries-old home remedies; others are uses recommended by the manufacturers of apple cider vinegar supplement. Conditions and treatments include:

- Sore muscles and cramped legs and feet may be soothed with a compress consisting of a cloth soaked in vinegar. The compress is placed on the aching area for about 15 minutes.
- Headaches may be helped with a compress soaked in a solution that is half vinegar and half water.
- Sunburns can be treated with applications of vinegar compresses.
- Pain from stiff joints may be relieved by ingesting apple cider vinegar in liquid or tablet form. Another remedy is to pour some vinegar in a bath and then soak in it.
- Arthritis pain is said to be helped by a dosage of apple cider vinegar ingested four times daily.
- A sore throat may be soothed by gargling with a solution consisting of 1 tsp apple cider mixed in a glass of water.
- Colds and congestion may be treated by misting a room with 1/4 cup (150 ml) of vinegar in a vaporizer.
- Asthma is supposedly relieved by taking a dosage of apple cider vinegar by mouth or applying a vinegar-soaked cloth to the inside of wrists.

Diabetes and high blood pressure

Apple cider vinegar has also been marketed as a possible remedy for diabetes and high blood pressure. However, research on the effectiveness of this remedy was based on small studies. Lower blood sugar levels

were reported in a 2007 study of 11 people diagnosed with Type II diabetes who used 2 T (30 ml) of apple cider vinegar each evening. Furthermore, vinegar reduced the blood pressure in studies involving rats.

As of 2008, larger studies of humans were needed to determine whether apple cider vinegar could help with the treatment of diabetes and high blood pressure.

Precautions

Apple cider vinegar is highly acidic. If not diluted with water or another liquid, vinegar can harm tooth enamel, the mouth, and the esophagus. There is also a risk that it can irritate or burn skin.

Furthermore, apple cider vinegar tablets are classified as supplements and are not evaluated by the U.S. Food and Drug Administration for safety and effectiveness.

In 2005, the University of Arkansas Department of Human Environmental Science tested eight brands of apple cider vinegar tablets after receiving a report that someone taking apple cider vinegar supplements suffered damage to the esophagus. The department's testing covered factors such as pH, which designates acidity and the component acid content. The testing revealed that the supplement size and pH content varied in the eight brands. Furthermore, the researchers noted that doubts remained about whether the brands contained any apple cider vinegar.

People should consult with their doctor or health practitioner before beginning a program that involves regular use of apple cider vinegar. This is especially important for pregnant women, nursing mothers, and people with pre-existing conditions such as diabetes.

Side effects

Possible side effects of apple cider vinegar could result from the acidity in vinegar. The high acid content could cause burning in the mouth and throat, **indigestion**, or **nausea**. Furthermore, a person could experience an allergic reaction. Symptoms of that include difficulty breathing, a rash, and **itching**.

Interactions

When used as a remedy, dosages of apple cider vinegar may potentially react with medications such as insulin and diuretics. The combination could produce complications such as low blood **potassium** levels.

Resources

PERIODICALS

"Bestseller Revisited." *Time* December 18, 1959. http://www.time.com/time/magazine/article/0,9171,811634 1,00.html.

Hill, L., L. H. Woodruff, J. C. Foote, M. Barreto Alcoba. "Esophageal Injury by Apple Cider Vinegar Tablets and Subsequent Evaluation Of Products." *Journal of the American Dietetic Association* (July 2005): 1141 4.

OTHER

WebMD. "Apple Cider Vinegar." December 4, 2007. http://www.webmd.com/diet/apple cider vinegar.

ORGANIZATIONS

American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.

National Center for Complementary and Alternative Medicine/National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Liz Swain

Applied kinesiology

Definition

Applied kinesiology (AK) is the study of muscles and the relationship of muscle strength to health. It incorporates a system of manual muscle testing and therapy. AK is based on the theory that an organ dysfunction is accompanied by a specific muscle weakness. Diseases are diagnosed through muscle-testing procedures and then treated. AK is not the same as kinesiology, or biomechanics, which is the scientific study of movement.

Origins

AK is based on principles of functional neurology, anatomy, physiology, biomechanics, and biochemistry as well as principles from Chinese medicine, **acupuncture**, and massage. It was developed from traditional kinesiology in 1964 by George G. Goodheart, a chiropractor from Detroit, Michigan. He observed that each large muscle relates to a body organ. A weakness in a muscle may mean that there is a problem in the associated organ. Goodheart found that by treating the muscle and making it strong again, he was able to improve the function of the organ as well. For example, if a particular nutritional supplement was given to a patient, and the muscle tested

strong, it was the correct supplement for the patient. If the muscle remained weak, it was not. Other methods of treatment can be evaluated in a similar manner. Goodheart also found that painful nodules (small bumps) may be associated with a weak muscle. By deeply massaging the muscle, he was able to improve its strength. Goodheart's findings in 1964 led to the origin and insertion treatment, the first method developed in AK. Other diagnostic and therapeutic procedures were developed for various reflexes described by other chiropractors and doctors. Goodheart incorporated acupuncture meridian therapy into AK after reading the writings of Felix Mann, M.D.

Goodheart considered AK to be a therapeutic tool that incorporates feedback from the body. He said that "applied kinesiology is based on the fact that the body language never lies." He felt that the body's muscles were indicators of disharmony. Once muscle weakness has been ascertained, the problem may be solved in a variety of ways. If a practitioner approaches the problem correctly, he believed, making the proper and adequate diagnosis and treatment, the outcome is satisfactory both to the doctor and to the patient.

Goodheart died March 5, 2008. In addition to pioneering the field of Applied Kinesiology, Goodheart was appointed to the U.S. Olympic Sports Medicine Committee for the 1980 Lake Placid Games.

Benefits

AK is not designed for crisis medicine. For example, an AK practitioner cannot cure **cancer**, arthritis, diabetes, **heart disease**, or **infections**. This therapy is designed to be a part of a holistic approach to preventive medicine. The goals of AK are to (1) restore normal nerve function, (2) achieve normal endocrine, immune, digestive, and other internal organ functions, (3) intervene early in degenerative processes to prevent or delay pathological conditions, and to (4) restore postural balance, correct gait (walking) impairment, and improve range of motion.

Description

According to AK, each muscle in the body relates to a specific meridian or energy pathway (acupuncture lines) in the body. These meridians also relate to organs or glands, allowing the muscles to provide information about organ or gland function and energy. The five areas of diagnosis and therapy for the applied kinesiologist are (1) the nervous system, (2) the lymphatic system, (3) the vascular (blood vessel) system, (4) the cerebrospinal system, and (5) the meridian system.

The first part of AK is muscle testing, which is used to help diagnose what part of the body is functioning abnormally. Muscle testing involves putting the body into a position that requires a certain muscle to remain contracted, and then applying pressure against the muscle. The testing does not measure strength but is meant to reveal stresses and imbalances in the body through the tension in the muscle. The test evaluates the ability of a controlling system (like the nervous system) to adapt the muscle to meet the changing pressure of the examiner's test. AK practitioners also examine structural factors such as posture, gait, and range of motion. Some chiropractors use AK to help them evaluate the success of spinal adjustment. A leg muscle is tested for strength or weakness to determine whether the adjustments made are appropriate.

According to AK, common internal causes of muscle weakness include:

- dysfunction of nerve supply (nerve interference between spine and muscles)
- impairment of lymphatic drainage
- reduction of blood supply
- abnormal pressure in cerebral fluid affecting nerve-to-muscle relationships
- blockage of an acupuncture meridian
- imbalance of chemicals
- dysfunction of organs or glands
- excesses or deficiencies in nutrition

Physiological reactions to chemicals, including those associated with **nutrition** and **allergies**, may also be evaluated using AK. The AK protocol for testing chemical compounds is to place the substance on the patient's tongue so that he tastes the material, and the normal chemical reactions of ingestion begin. In some cases, the substances are inhaled through the nose. The AK practitioner then tests the associated muscle-organ pattern to determine where or if there is a strength or weakness. The patient does not need to swallow the substance for a change in strength or weakness to be identified. David S. Walther, a diplomate of the International College of Applied Kinesiology, has indicated that "it is possible that the central nervous system, recognizing the compound being ingested, relays information to the organs and glands preparing for use of the compound. If the compound is

recognized as beneficial, the energy pattern is immediately enhanced, influencing not only the organ or gland, but also the associated muscle."

AK has been used as a diagnostic health tool for a variety of conditions.

Bone health

- neck/low back pain and sciatica
- whiplash
- frozen shoulder

Joint health

- carpal tunnel syndrome
- arthritis (including rheumatoid arthritis)
- sports injuries

Muscle health

- tennis elbow
- heel spurs
- wound healing
- intermittent claudication (pain on walking)
- restless legs
- cramps

Vascular system health

- aching varicose veins
- palpitations
- high blood pressure

Nervous system health

- migraine and other headaches
- trigeminal neuralgia and other face pains
- Bell's palsy
- anxiety
- depression
- fears
- addictions (like smoking)
- claustrophobia
- Meniere's disorder
- neuralgia (severe, throbbing pain)
- travel sickness
- fatigue
- phantom limb pain
- paralysis of leg or arm after a stroke

Respiratory system health

- hay fever
- rhinitis (inflammed nasal passages)
- asthma
- bronchitis
- emphysema (lung disease)

Urinary system health

- cystitis (bladder inflammation), especially in the elderly
- early prostate enlargement
- non-specific urethritis (inflammation of tube from the bladder)
- bedwetting

Reproductive organ health

- menstrual pains
- irregular or excessive menstrual activity
- pelvic pains and endometriosis
- menopausal flushes
- painful, nodular breasts
- preparation for childbirth
- vaginal pain
- post herpetic (shingles) pain
- impotence and infertility

Skin health

- pain after operations
- painful, prominent scars
- wrinkles or bagginess of face
- acne
- psoriasis and eczema (skin diseases)
- boils
- excessive perspiration
- hemorrhoids
- canker sores
- itching

Immune system health

- recurring tonsillitis (inflammed tonsils)
- persisting weakness after a severe illness

Sensory organ health

- tinnitus (ringing ears)
- tired eyes
- retinitis pigmentosa and pterygium retinitis (diseases of the retina)

Digestive system health

- constipation
- colitis or other bowel inflammations
- ulcers
- diarrhea
- obesity

GEORGE GOODHEART (1918–2008)

Dr. George Goodheart was born in Detroit, Michigan, in 1918 and became a second generation doctor of chiro practic. He graduated from the National College of Chiro practic in 1939 and is recognized as the founder and developer of applied kinesiology. After he joined the U.S. Air Force as an aviation cadet in World War II, he received a promotion to major at the age of 22. He was the youngest ever to attain that rank. He served in active duty from 1941 1946 and continued as a member of the Air Force Reserve until the mid 1950s.

Goodheart held numerous positions of distinction during his career, including director of the National Chi ropractic Mutual Insurance Company and director for the International College of Applied Kinesiology U.S.A. He also lectured and taught throughout the United States, Japan, Europe, and Australia; and he was the official doctor of chiropractic for the Lake Placed Winter Olympic Games in 1980. He contributes to a variety of trade publications on a regular basis.

In 1998 Goodheart received a Lifetime Achievement Award from the International College of Kinesiology. Ear lier, in 1987 he was honored with the Leonardo da Vinci Award from the Institute for the Achievement of Human Potential, and he was cited for his research by Logan and Palmer Colleges of Chiropractic. He represented the State of Michigan as a delegate to the American Chiropractic Association and was a fellow at the International College of Chiropractic.

The second part of AK involves the treatment phase. Goodheart and other practitioners of AK have adapted many treatment methods for the problems that are diagnosed with muscle testing. Examples of treatment methods include special **diets**, dietary supplements, **chiropractic** manipulation, osteopathic cranial techniques, acupuncture/meridian therapies, **acupressure**, deep muscle massage, and nervous system coordination procedures. For example, an AK practitioner might treat **asthma** by looking for weaknesses in specific lower back and leg muscles that share a connection with the adrenal glands. The practitioner will strengthen these muscles and help the adrenal gland produce bronchodilators, chemicals that relax or open air passages in the lungs.

The practice of kinesiology requires that it be used in conjunction with other standard diagnostic methods by professionals trained in clinical diagnosis. Most practitioners of AK are chiropractors, but naturopaths, medical doctors, dentists, osteopaths, nutritionists, physical therapists, massage therapists, podiatrists, psychiatrists, and nurse practitioners are also involved. In 2003, 37.6% of 2,574 full-time chiropractors in the United States who responded to a survey by the National Board of Chiropractic Examiners (NBCE) said they used AK in their practice. Previous NBCE surveys indicated that around 31% of chiropractors in Canada, 60% in Australia, and 72% in New Zealand use AK.

Most practitioners of AK utilize a holistic approach and evaluate a person from a triad-based health perspective. Generally, chiropractors approach health and healing from a structural basis, medical doctors generally from a chemical basis, and psychiatrists and psychologists from a mental or emotional basis. Applied kinesiologists attempt to work with all three areas of health, and in some cases, include a spiritual dimension.

The use of AK is often included in insurance coverage if the policy covers chiropractor benefits. The cost of the AK examination is similar to the costs of other chiropractic practices.

Preparations

Since AK is a non-invasive diagnostic tool, there are no preparations required.

Precautions

AK should only by used by trained professionals with the necessary expertise to perform specific and accurate tests. The AK examination should be combined with a standard physical diagnosis, which often includes laboratory tests, x rays, health and dietary history, and other special tests. An AK examination should enhance a standard diagnosis, not replace it. The total diagnostic work-up should be used to determine the final diagnosis.

The use of manual muscle testing to evaluate nutrition is particularly a problem if it is done by a lay nutrition sales person as a tool to sell his/her product. The person should have the educational background to evaluate nutritional needs as well as

have a high level of knowledge in the use of proper muscle testing techniques.

Side effects

If AK is performed by a trained practitioner with the appropriate educational background, side effects from the muscle-testing procedures should be minimal.

Research and general acceptance

AK is a tool that is used by many health care professionals, and especially by chiropractors. A literature review published in 1999 by researchers from the School of Medicine at the University of North Carolina at Chapel Hill and the Foundation for Allied Conservative Therapies Research in Chapel Hill stated that, although AK appears to be a promising methodology, there is a lack of research results relevant to clinical practice and outcomes of AK care. They found this lack of results surprising, since cost, satisfaction, utilization, and changes in symptoms are the important results of clinical practice. In addition, they determined that some studies that were supposed to be an evaluation of AK procedures did not actually use clinical practices and principles of AK. However, from studies adhering to AK principles and employing standardized training by well-trained practitioners, they did state there was some evidence that AK is an objectively verifiable phenomenon. They suggested that "future studies of AK should focus on outcomes of care, including symptoms, function, costs, and safety. Only well-designed studies that account for the individual nature of AK diagnosis and treatment and preserve the proper clinical context of AK treatment will be informative. Understanding the individual components of the process of AK treatment remains important. Studies addressing validation of isolated AK procedures need to meet the methodological challenges of studying appropriate subjects that reflects the current recognized practice and understanding of AK. Further evaluation of the basic physiologic phenomena involved and correlation of AK manual muscle test results will also advance understanding of this diagnostic and therapeutic system."

Training and certification

In 1976, a group of doctors who were practicing AK founded the International College of Applied Kinesiology (ICAK). The purpose of the ICAK is to promote teaching and research of AK. The college does not have physical buildings. Instead, it is an organization to bring together those in the health field with common interests and goals and to provide education in the use of AK. The organization has chapters representing Belgium, Luxembourg, and the Netherlands (BeNeLux), Germany, France, Italy, Germany, Scandanavia, United Kingdom, Canada, Australia and Asia (Australasia), and the United States.

AK is performed by a healthcare professional who has basic education in his or her field of practice. To become an applied kinesiologist, the healthcare professional must study the principles in a basic course, which includes 100 hours of classroom study taught by a diplomate of the ICAK. At the end of this course, students take a basic proficiency test. To obtain certification by the board of ICAK, the professional must complete 300 hours of continuing classes, pass a diplomate test (a comprehensive written and practical test), and present two research papers to the general membership of ICAK.

Resources

BOOKS

Holdway, Anne. *Kinesiology: Muscle Testing and Energy Balancing for Health and Well Being*. Rockport, MA: Element, 1997.

Valentine, Tom, Carol Valentine, and D.P. Hetrick. *Applied Kinesiology*. Rochester, VT: Healing Arts Press, 1989.

ORGANIZATIONS

International College of Applied Kinesiology, 6405 Metcalf Ave., Suite 503, Shawnee Mission, KS, 66202, 913 384 5336, http://www.icakusa.com and http://www.icak.com.

Judith Sims

Apricot seed

Description

Apricot seed is the small kernel enclosed within the wood-like pit at the center of the apricot fruit. The apricot tree carries the botanical name *Prunus armeniaca*. It is a drupe, meaning stone-fruit, and a close relative of the peach. Both are very similar in appearance and qualities. The apricot is also sometimes called apricock or *Armeniaca vulgaris*. Like the plum, both peaches and apricots are distantly related to the rose and are classified as members of the Rosacaeae family.

Apricots grow on small to medium size trees, which are hardy in most temperate areas. White, multi-petaled blossoms with a slight reddish tinge nearer to the base of the flower emerge onto the bare branches in early spring, before the tree's heart-shaped leaves appear. By late July or early August, the apricot fruit ripens. There are more than 20 varieties of apricot known to botanists.

The name *Prunus armeniaca* is actually a misnomer based upon the long-held belief that apricots initially came from Armenia. It is now known that in reality they originated in the Far East, most likely in the Himalayas and Northern China. It is speculated that the apricot had already migrated to the Middle East before the Old Testament and that the apples described in the Garden of Eden in Genesis were actually apricots. During the reign of King Henry VIII in the 1500s, apricots were brought to England from Italy.

Though smaller than the peach, apricots have the same russet-tinted, golden, velvet appearing exterior and deeper golden-orange flesh inside. The innermost layers form the large, woody compressed stone, or pit, that contains at its very center, the kernel, or seed. When pressed, nearly half of this kernel gives forth an oil very chemically similar to the oil found in sweet almond and peach kernels. This oil contains olein, glyceride of **linoleic acid**, and a transparent, crystalline chemical compound, amygdalin, or laetrile. This compound is also known as vitamin B_{17}. The oil is chemically indistinguishable from oil of bitter almond. Although the oil from apricot seeds usually breaks down into a toxic substance capable of causing death within the human body, there are varieties of apricot seed that are reported to be edible.

General use

Because the oil from the apricot seed is far less expensive than oil of almond, confectioners use it in place of bitter almond oil for flavoring sweets and as a culinary seasoning. A liqueur manufactured in France is made from apricot seed and is called *Eau de Noyaux*. Apricot oil is also used extensively in the manufacture of cosmetics, often being fraudulently added to almond oil. It has skin softening properties and is often used in making soaps, hand creams, cold cream, and perfume preparations.

Chinese Medicine practitioners use apricot seed as a treatment in respiratory diseases, including **bronchitis** and **emphysema**. It is believed to act as an **cough** suppressant and expectorant and, because of the oil, also used as a laxative.

There has been considerable controversy regarding apricot seed, and specifically amygdalin, one of its components. Since the 1920s, in many countries around the globe it has been recognized as a possible **cancer** preventative and malignant cell growth inhibitor. In San Francisco biochemist Ernst Krebs's article *The Nitrilosides (Vitamin B_{17})-Their Nature, Occurrence and Metabolic Significance (Antineoplastic Vitamin B_{17})*, theorized that amygdalin, with diet and vitamins, could inhibit cancerous growths. In the years since, it has been used in many countries as a cancer treatment, thought to be especially beneficial in the treatment of smoking-related tumors such as **lung cancer**. Several studies done in the United States throughout the 1970s and early 1980s demonstrated that amygdalin did not kill cancer cells. Review of patients' records where there had been reported cures or remarkable size reduction in tumors did not provide credible evidence of amygdalin ability to treat cancer effectively. There has been significant documentation that amygdalin breaks down into cyanide, a potent poison, in the human body, and when taken in sufficiently high doses, can actually bring on death due to its toxicity.

Preparations

Apricot seed is not sold in American health food stores due to its classification as an unapproved drug by the U.S. Food and Drug Administration (FDA). However, it is available in other countries, including Mexico, and in Chinese pharmacies and Asian markets. It is sold both as the whole kernel or seed, or in decoctions including cough syrups. Chinese practitioners usually combine apricot seed with other herbs, including white mulberry leaf or **ophiopogon**, a tuber grown in Asia. A paste made of apricot seed and sugar has been shown, in some Chinese medical trials, to relieve chronic bronchitis.

Precautions

The amygdalin in apricot seed breaks down within the body into a form of the deadly poison cyanide, or prussic acid. There has been considerable debate concerning its level of toxicity to human beings. Following an Oklahoma judicial decision legalizing the importation of amygdalin in 1986, clinical trials were begun by the FDA and National Cancer Institute in 1987. Amygdalin was used, along with the diet, enzymes, and vitamins suggested by pro-amygdalin factions. The report from this study concludes: "No substantive benefit was observed in terms of cure, improvement, or stabilization of the cancer." They further reported that "the hazards of amygdalin therapy were

KEY TERMS

Expectorant—An agent that facilitates the removal of the secretions of the bronchopulmonary mucous membrane.

Unapproved drug—The FDA is responsible for ensuring that biological products are safe and effective and in compliance with the law and FDA regulations. Biological products are licensed under the provisions of Section 351 of the Public Health Service Act (42USC)(PHS Act).

evidenced in several patients by symptoms of cyanide toxicity or by blood cyanide levels approaching lethal range. Amygdalin is a toxic drug that is not effective as a cancer treatment." It has been reported that ten apricot seeds can kill a child.

Side effects

Chinese practitioners caution using apricot seed if the person being treated has **diarrhea**. **Headache** and **nausea** have been reported following ingestion of small amounts. The most serious side effect of apricot seed is potential cyanide poisoning. When large doses of cyanide are ingested, death is almost instantaneous. Toxicity from smaller doses is manifested by **vomiting**, diarrhea, mental confusion, vertigo, headache, extreme dyspnea, and violent respirations, slow pulse, weakness, glassy or protruding eyes, dilated pupils, and a characteristic (peach blossoms, bitter almond) odor to the breath.

Interactions

Practitioners of Chinese medicine advise that apricot seed should not be given in combination with the herbs **astragalus**, **skullcap**, or **kudzu** root.

Resources

BOOKS

Carper, Jean. *The Food Pharmacy*. Bantam Books, 1988.

Grieve, M. and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultivation and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes & Noble Publishing, 1992.

Holvey, David N., MD. *Merck Manual*. Sharp & Dohme Research Laboratories, 1972.

Taber, Clarence Wilbur. *Taber's Cyclopedic Medical Dictionary*. F.A. Davis Co.

PERIODICALS

Krebs, Ernst T., Jr. "The Nitrilosides (Vitamin B 17) Their Nature, Occurence and Metabolic Significance Anti neoplastic Vitamin B 17)." *Journal of Applied Nutrition* 1970.

ORGANIZATIONS

U.S. Food and Drug Administration, HFI 40, Rockville, MD, 2085, 1 888 463 6332, webmail@oc.fda.gov, http://www.fda.gov/bbs/topics/ANSWERS/ANS00309.htm.

Joan Schonbeck

Arbor Vitae *see* **Thuja**

Arginine

Description

Arginine is one of the **amino acids** produced in the human body by the digestion, or hydrolysis of proteins. Arginine can also be produced synthetically. Adult humans produce all the arginine they need from the food they eat. For this reason, arginine is usually called a nonessential amino acid. The term nonessential means that it is not necessary to add the amino acid to a person's diet because the body produces all that is needed. Infants, however, are unable to make arginine. Arginine must be added to their diet artificially. For this reason, arginine is also called a semi-essential amino acid. Arginine consists in two forms, called L-arginine and D-arginine. Molecules of the two compounds are mirror images of each other. Although they look very similar, they have different biological properties. The form of arginine most commonly encountered is L-arginine.

General use

Arginine has a number of important functions in the human body. For example, it removes potentially toxic ammonia from the body. Ammonia is formed when proteins are metabolized (broken down). It is then converted to arginine and other compounds for removal from the body by way of the excretory system. Arginine is also involved in cell division, facilitating operation of the immune system, promoting the production of white blood cells, making possible the release of hormones, and taking part in the manufacture of new proteins in the body. Arginine is also a major source of nitric oxide, a compound with a number of important functions in the body. Nitric oxide is

a vasodilator, a substance that increases the size of blood vessels, allowing blood to flow more freely through the body. The connection between arginine and nitric oxide was explained by American researchers Robert F. Furchgott, Louis J. Ignarro, and Ferid Murad, who received the 1998 Nobel Prize in physiology or medicine for their studies. This research inspired more than a thousand additional studies on arginine and its relationship to nitric oxide and a variety of biological functions.

Arginine is a popular nutritional supplement because of its many biological properties:

- improves immune response to bacteria, viruses, and tumor cells
- promotes wound healing by repairing tissues
- plays a crucial role in the regeneration of liver
- responsible for release of growth hormones
- promotes muscle growth
- improves cardiovascular functioning

Arginine is used as a supplement in the treatment of heart patients with arterial **heart disease**, as an intravenous supplement to patients with liver dysfunction, and as a supplement for easing exercise-related pains due to the heart muscle not getting enough blood to circulate to the muscles in the calves. A 2000 study by researchers at the University of Leipzig in Germany confirmed the value of arginine in treating patients with chronic heart failure (CHF). The study showed that patients who took arginine had improved blood flow and reduced effects from CHF, whereas those who took arginine and exercised did even better. Supplements that combine arginine with other amino acids, such as ornithine and **lysine**, are purported to assist in muscle-building exercises by minimizing body fat and maximizing muscle tone. Results vary among those who have taken these supplements. Arginine is also present in multi-amino acids capsules that are taken as a dietary supplement.

New information released in 2002 showed that treatment with arginine improved immune function in HIV patients and proved safe for these patients when used short-term on patients. Other research found that arginine supplements worked as an effective anticoagulant, but unlike aspirin and other anticoagulants, could prevent clotting without increasing **stroke** risk. Other research in the 2000s showed arginine's effectiveness in fighting **cancer** and protecting and detoxifying the liver, improving male fertility, and promoting healing.

Preparations

Arginine supplements as an alternative medicine therapy are normally taken in either tablet or capsule form. In naturopathic treatment of liver dysfunction, the supplement is added intravenously as a powder diluted in liquid. Discoveries reported in 2000 indicated that in the treatment of arterial heart disease, the ingestion of arginine tablets or capsules of 6–9 g a day is helpful in dilating blood vessels to ease circulation and prevent the buildup of **cholesterol**.

Precautions

Long-term effects of arginine supplements had not been determined as of 2008. Consultation with a physician regarding individual needs is always advised. Individuals who attempt to treat their own heart ailments or intend to guard against any potential difficulty should seek advice of a physician. Arginine does not show any positive results in treatment of men with damaged valves or enlarged heart tissue.

Arginine has been suspected in the formation of cold sores. Some practitioners suggest that consuming foods high in arginine, such as nuts, grains, and chocolates, can promote cold sores. Reducing intake of foods high in arginine and increasing intake of lysine (another amino acid) can reduce or even eliminate the **cold sore** problem.

Side effects

The use of supplemental arginine should be monitored for use with specific problems. Overdose can result in unforeseen complications, whereas regular use might or might not help ease everyday problems, such as **relaxation** of muscles not due to the specific heart ailment of arterial disease. People who should not take arginine supplements are those predisposed to herpes outbreaks; cancer patients, due to possible increase in cell replication of cancerous cells; those with low blood pressure; and individuals with certain liver or kidney problems. Those taking blood thinners are advised to seek medical advice before taking the supplement. Pregnant women are also cautioned against taking the supplements due to the unknown effect it could have on both mother and fetus.

Interactions

Long-term studies are ongoing. While no adverse reactions of ordinary supplements of 6–9 g a day has been documented, caution is urged. Because amino acids are not drugs, their use is not regulated by the U.S. Food and Drug Administration (FDA). One

KEY TERMS

Hyperkalimia—Excessive amount of potassium in the blood that serves as an indicator of the possible serious complications in bodily functions.

study in April 1999 in *HealthInform: Essential Information on Alternative Health Care* reported that nutritional supplements of arginine with **omega-3 fatty acids** for outpatients with HIV showed no particular benefits in immunity.

Resources

PERIODICALS

Boeger, Rainer H., and E.S. Ron. "L Arginine Improves Vascular Function by Overcoming the Deleterious Effects of ADMA, a Novel Cardiovascular Risk Fac tor." *Alternative Medicine Review* (March 2005): 14 23.

Facchinetti, Fabio, et al. "L arginine Supplementation in Patients with Gestational Hypertension." *Hypertension in Pregnancy* (January 2007): 121 130.

Schulman, Steven P. "L Arginine Therapy in Acute Myo cardial Infarction." *JAMA* (January 2006): 58 64.

Wilson, Andrew M., et al. "L Arginine Supplementation in Peripheral Arterial Disease." *Circulation* (July 2007): 188 195.

Jane Spehar
Teresa G. Odle
David Edward Newton, Ed.D.

Arka

Description

Arka is a perennial herb that is in the milkweed family Asclepediaceae (sometimes listed in the subfamily Asclepiadoideae of the family Apocynaceae. It comes in two primary forms—rakta arka (*Calotropis procera*) and sweta arka (*Calotropis gigantea*)—and a number of other less widely used forms. *Calotropis procera* and *Calotropis gigantea* are probably native to India or the Indian subcontinent, although they have spread throughout many areas of Southeast Asia and into Africa. The plants grow in open, often dry areas, including current and past farm fields, and along roadsides. They are often considered weeds and are very widespread. Arka is known by other names, such as yercum, wara, mudar, and mandara, among many others. It is used in Ayurvedic traditional medicine in India and other folk/traditional remedies.

Plants in the genus *Calotropis* grow in tropical and subtropical Africa and Asia. *Calotropis gigantea* is also known as the crown flower, gigantic swallow wort, giant milkweed, or madar. It is a shrub that grows 8 to 10 ft (2.4–3 m) tall. Its flowers each have five petals of white to light-purple that curl downward from a crown-shaped center. It was introduced to Hawaii and elsewhere. *Calotropis procera* is also known as swallow-wort, apple of Sodom, roostertree, and French cotton. Its flower petals are frequently white toward the center and tipped in shades of pink or lavender. This shrubby plant grows 3 to 6 ft (1 to 2 m) tall. In North America, this plant occurs in California, Hawaii, and Puerto Rico.

Various parts of these two plants, and sometimes the entire plants, have been used in traditional/folk medicine to treat a wide range of ailments, including loss of appetite, respiratory difficulties and disorders, digestive problems, dysentery, **jaundice**, enlarged spleen, leprosy, migraine headaches, poisoning, rheumatism, **syphilis**, eye and ear diseases, **boils**, parasite infestation, chronic **hiccups**, scrofula (a type of **tuberculosis** on the neck) and other skin diseases, snake **bites**, scorpion **stings**, and the bone disorder known as caries. Arka has also been used to promote wound healing.

General use

Alternative medicine practitioners use arka in several ways. They use the dried whole plant as an expectorant to expel mucus and other material from the respiratory system, as a depurative or blood-purification agent, and as an anthelmintic, which combats parasitic **worms**. The dried root bark is used in the same ways as the dried whole plant and also to induce **vomiting**, to reduce **fever**, and as a laxative. Practitioners may prescribe powdered root to treat **asthma**, **bronchitis**, and dyspepsia (**indigestion**). The flowers of the plant are used to aid digestion and as an astringent, and the leaves are used to ease swellings and to reduce fever and also to treat paralysis and joint **pain**. The milky sap is used as an anti-inflammatory to treat various maladies.

Numerous studies of arka have been conducted, much of them since the 1980s. In 1988, for example, researchers examined an extract from the flower of *Calotropis procera* for its anti-inflammatory, fever-reducing (antipyretic), pain-relieving (analgesic), and microbe-fighting activities in rats. They found that it reduced inflammation-caused swelling by 37%, fever

by 40%, and significantly decreased the growth of bacteria. Their study found weak analgesic effects, but a later study found that the root yielded a significant pain-relieving response when tested on rats. In 1994, researchers tested the milky sap, or latex, of the plant on rats. They mixed the dried latex in water and found that it significantly reduced inflammation. A study of the pain-relieving properties of latex solution in mice was conducted in 2000, and researchers found that it produced better results than did aspirin. They added, however, that the latex is toxic when taken internally.

Arka has also been shown to assist in wound-healing. Research showed substantial healing in **wounds** to guinea pigs when the animals were treated with a topical application of a solution of *Calotropis procera* latex. When compared with control animals after seven days, the researchers found that the wounds were smaller and the tissue had regenerated faster in the treated guinea pigs. In addition, various studies have shown that arka has antibacterial properties.

A study in 2001 showed that the dry latex of *Calotropis procera* is effective in treating **diarrhea**. In this study, the researchers tested the latex on rats and found that it not only eased existing diarrhea, but also prevented it. In addition, studies have shown that it can fight parasite infection. A study in 2005 demonstrated that powdered flowers of *Calotropis procera* were effective in fighting gastrointestinal nematodes found in sheep.

Studies have also considered arka and diabetes. According to a study published in 2005, dry latex of *Calotropis procera* was effective. The researchers reported, "The efficacy of [dry latex] as an antioxidant and as an anti-diabetic agent was comparable to the standard anti-diabetic drug, glibenclamide."

In addition to its antibacterial, anti-inflammatory, and other properties, arka has been shown to be effective as a sedative, as well as an anticonvulsant and an anti-anxiety agent. An extract made from the roots of *Calotropis gigantea* reduced pain, convulsions, and **anxiety** in rats, and also acted as a sedative.

Arka has an indirect health benefit, too. A study published in 2000 demonstrated that an extract of *Calotropis procera* was effective in killing the larvae of mosquitoes, which transmit numerous illnesses particularly in tropical regions. The researchers tested 16 different plant extracts and found that the extract of *Calotropis procera* latex was one of the most effective. This property, combined with the easy collection of the plant in certain regions of the world that have mosquito-borne health problems, could make the latex a practical insecticide.

KEY TERMS

Phytoalexin—A compound made by some plants to fight various microbes, such as bacteria, viruses, and fungi.

Phytochemical—A plant chemical.

Preparations

Arka is available commercially as tinctures, pills and pellets, liquid solutions, granules, and ointments. In India and many other areas where it is used medicinally, the plants are widespread and sometimes collected by the patient or the herbalist. Dosage recommendations vary greatly depending on the condition and the preparation.

Precautions

Arka is toxic when taken internally. It should be used only under the close supervision of a qualified health-care professional. Anyone using arka products should inform their doctor.

Side effects

Plants in the milkweed family (or subfamily) contain compounds called cardiac glycosides, which are poisonous. In fact, some individuals have orally taken *Calotropis* to commit suicide or to initiate abortion. Extreme care should be taken when using arka, and patients should discuss the use of arka products with their doctor before using them. Topical applications may cause skin irritation.

Interactions

Some people have a reaction to the milky sap of various milkweed plants. In fact, a case study published in 2002 reported that arka appeared to be the cause of **blisters**, lesions, and ulcers at one patient. According to the report, a 79-year-old patient came to the doctor with blisters on his abdomen and back, lesions on his lips, and ulcers in his mouth after taking a regimen of burned *Calotropis procera* leaves to treat joint pain. After developing the symptoms, the patient continued the treatment on the advice of his doctor, but the symptoms worsened and he finally stopped the *Calotropis procera* treatment. After trying several remedies without success, the patient reported to the hospital where he received additional care and finally recovered.

Resources

BOOKS

Gruenwald, Joerg, Thomas Brendler, and Christof Jaenicke, eds. *PDR for Herbal Medicines,* 4th ed. London: Thomson Healthcare, 2007.

Karalliedde, Lakshman, Rita Fitzpatrick, and Debbie Shaw. *Traditional Herbal Medicines: A Guide to Their Safer Use*. London: Hammersmith Press, 2007.

Mars, Brigitte. *The Desktop Guide to Herbal Medicine: The Ultimate Multidisciplinary Reference to the Amazing Realm of Healing Plants, in a Quick study, One stop Guide*. Laguna Beach, CA: Basic Health Publications, 2007.

PERIODICALS

Ahmed, K. K. Mueen, A. C. Rana, and V. K. Dixit. "*Calotropis* Species (Ascelpediaceae) A Comprehensive Review." *Pharmacognosy Magazine* 1, no. 2 (April/June 2005): 48 52. http://www.phcog.net/phcogmag/review_template.pdf (March 28, 2008).

Argal, Ameeta, and Anupam Kumar Pathak. "CNS activity of *Calotropis gigantea* roots." *Journal of Ethnopharmacology* 106, no. 1 (June 15, 2006): 142 145.

Iqbal, Zafar, Muhammad Lateef, Abdul Jabbar, Ghulam Muhammad, and Muhammad Nisar Khan. "Anthelmintic Activity of *Calotropis procera* (Ait.) Ait. F. Flowers in Sheep." *Journal of Ethnopharmacology* 102, no. 2 (November 14, 2005): 256 261.

Roy, S., R. Sehgal, B. M. Padhy, and V. L. Kumar. "Anti oxidant and Protective Effect of Latex of *Calotropis procera* against Alloxan induced Diabetes in Rats." *Journal of Ethnopharmacology* 102, no. 3 (December 1, 2005): 470 473.

OTHER

"*Calotropis gigantea* (*L.*) R.BR." Medicinal Plants of Con servation Concern. http://envis.frlht.org. [cited March 28, 2008].

"*Calotropis procera* R.BR." Medicinal Plants of Conserva tion Concern. http://envis.frlht.org. (April 12, 2008).

Leslie Mertz, Ph.D.

Arnica

Description

Arnica (*Arnica montana L.*), known also as leopardsbane, wolfsbane, and European arnica, is a member of the Compositae (Asteraceae) family. This attractive herb is native to the mountains of Siberia

Arnica, a Rocky Mountain wild flower. *(Image copyright Kris Butler, 2008. Used under license from Shutterstock.com.)*

and central Europe, where the leaves were smoked as a substitute for tobacco. This practice led to a common name for the herb: mountain tobacco. There are several North American species of arnica, including *A. fulgens*, *A. sororia*, and *A. cordifolia*. Arnica thrives in the northern mountains of the United States and Canada, in high pastures and woodlands.

Arnica grows from a cylindrical, hairy rhizome with a creeping underground stem. First year leaves are downy and grow in a flat rosette at the base of the stem. In the second year, arnica sends up a round, hairy stem with smaller, sessile leaves growing in one to three opposite pairs. This central stem may branch into three or more stems each with a terminal composite blossom. Arnica's aromatic, daisy-like flowers have 10–14 bright yellow rays, each with three notches at the end. Flower rays are irregularly bent back. The central disk is composed of tubular florets. Arnica blooms from June to August. The flowerheads, when crushed and sniffed, may cause **sneezing**, resulting in another of arnica's common names: sneezewort.

History

Arnica has a history of folk medicine use in many locations, including North America, Germany, and Russian. The herb has been used in folk remedies since the 16th century. A North American indigenous tribe, the Cataulsa, prepared a tea from arnica roots to ease back pains. The German writer Goethe credited arnica with saving his life by bringing down a persistent high **fever**. Arnica preparations are used extensively in Russia. Folk use there includes external treatment of **wounds**, black eye, **sprains**, and contusions. Arnica has been used in Russian folk medicine to treat uterine hemorrhage, myocarditis, arteriosclerosis, **angina** pectoris, cardiac insufficiency, and in numerous other unproven applications.

General use

Arnica flowers, fresh or dried, are used medicinally. Many herbalists consider arnica to be a specific remedy for **bruises**, sprains, and sore muscles. The herb is known by some as "tumbler's cure all," reflecting this common medicinal use. A compress soaked in an arnica infusion may relieve the inflammation of **phlebitis**. A few drops of arnica tincture added to warm water in a foot bath will relieve **fatigue** and soothe sore feet. A hair rinse prepared with arnica extract has been used to treat alopecia neurotica, an **anxiety** condition leading to **hair loss**. The very dilute homeopathic preparation ingested following a shock or muscle/soft tissue trauma is said to be beneficial. The homeopathic preparation is also used to relieve vertigo, hoarseness, and seasickness. Studies have determined that arnica has properties that act as an immunostimulant. The extract of arnica has been shown to stimulate the action of white blood cells in animal studies, increasing resistance to bacterial **infections**, such as salmonella.

German studies have isolated sesquiterpenoid lactones, including helenalin and dihydrohelenalin, in arnica. These compounds were found to possess the pharmacologic properties responsible for arnica's anti-inflammatory and analgesic effects. Arnica contains sesquiterpene lactones, flavonoid glycosides, alkaloid, volatile oil, tannin, and isomeric alcohol, including arnidio and foradiol.

Arnica is approved for external use as an anti-inflammatory, analgesic, and antiseptic by the German Commission E, an advisory panel on herbal medicines. There are over one hundred medicinal preparations using arnica extracts commercially available in Germany. In the United States, arnica is widely used in topical application for bruises, aches, sprains, and inflammations. Arnica was listed in the *U.S. Pharmacopeia* from the early 1800s until 1960.

Preparations

Arnica is available commercially in the form of liniments and massage oil for external application, and in very dilute homeopathic preparations considered safe for internal use.

Harvest fully open arnica blossoms throughout the flowering season. Pick the flower heads on a sunny day after the morning dew has evaporated. Spread the blossoms on a paper-lined tray to dry in a bright and airy room away from direct sun. Temperature in the drying room should be at least 70°F (21.1°C). When the blossoms are completely dry, store in a dark glass container with an air-tight lid. The dried herb will maintain medicinal potency for 12–18 months. Clearly label the container with the name of the herb and the date and place harvested.

Tincture: Combine four ounces of fresh or dried arnica flowers with one pint of brandy, gin, or vodka in a glass container. The alcohol should be enough to cover the flowers. The ratio should be close to 50/50 alcohol to water. Stir and cover. Place the mixture in a dark cupboard for three to five weeks. Shake the mixture several times each day. Strain and store in a tightly capped, clearly labeled, dark glass bottle. Tinctures, properly prepared and stored, will retain medicinal potency for two years or more. Arnica tincture

should not be ingested without supervision of a qualified herbalist or physician.

Ointment: Simmer one ounce of dried and powdered arnica flowers with one ounce of olive oil for several hours on very low heat. Combine this medicinal oil with melted beeswax to desired consistency. Pour into dark glass jars while still warm. Seal with tightly fitting lids when cool and label appropriately.

Infusion: Place two to three teaspoons of chopped, fresh arnica blossoms in a warmed glass container. Bring two cups of fresh, nonchlorinated water to the boiling point, add it to the herbs. Cover. Simmer for about 10 minutes. Strain. The prepared tea will store for about two days in the refrigerator. The infusion may be used to bathe unbroken skin surfaces and to provide relief for rheumatic **pain**, chillbains, bruises, and sprains. Because of the toxicity of arnica, it is best to avoid internal use without qualified medical supervision.

Precautions

Arnica is deadly in large quantities. Do not ingest the herb or the essential oil. Do not use the undiluted essential oil externally. The extremely dilute homeopathic preparation of arnica is considered safe for internal use in proper therapeutic dosages. Overdose of arnica extract has resulted in poisoning, with toxic symptoms such as **vomiting**, **diarrhea**, and hemorrhage, even death. Use externally with caution, and only in dilute preparations. Only the homeopathic tincture can be safely ingested. Discontinue if a skin rash results, and do not use on broken skin. Research has confirmed that alcoholic extracts of arnica have a toxic action on the heart, and can cause an increase in blood pressure.

Side effects

Arnica contains a compound known as helenalin, an allergen that may cause **contact dermatitis** in some persons. If a rash develops discontinue use of the herbal preparation. Prolonged external use of arnica extract in high concentrations can result in blistering, skin ulcers, and surface necroses.

Interactions

None reported.

Resources

BOOKS

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. Lynn Sonberg Book Associates, 1996.

Hoffmann, David. *The New Holistic Herbal*. 2d ed. Massachusetts: Element, 1986.

Kowalchik, Claire, and William H. Hylton. *Rodale's Illustrated Encyclopedia of Herbs*. Pennsylvania: Rodale Press, 1987.

Lust, John. *The Herb Book*. New York: Bantam Books, 1974.

Magic And Medicine of Plants. The Reader's Digest Association, Inc. 1986.

Meyer, Joseph E. *The Herbalist*. Clarence Meyer, 1973.

Palaise, Jean. *Grandmother's Secrets, Her Green Guide to Health From Plants*. NY: G.P. Putnam's Sons, 1974.

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

Phillips, Roger, and Nicky Foy. *The Random House Book of Herbs*. New York: Random House, Inc., 1990.

Thomson, M.D., William A. R. *Medicines From The Earth, A Guide to Healing Plants*. San Francisco: Harper & Row, 1978.

Tyler, Varro E., Ph.D. *Herbs Of Choice, The Therapeutic Use of Phytomedicinals*. New York: The Haworth Press, Inc., 1994.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

OTHER

Grieve, Mrs. M. "A Modern Herbal, Arnica." http://botanical.com/botanical/mgmh/a/arnic058.html.

Hoffmann, David L. "Herbal Materia Medica, Hyssop." http://www.healthy.net.

Clare Hanrahan

Aromatherapy

Definition

Aromatherapy is the therapeutic use of plant-derived, aromatic **essential oils** to promote physical and psychological well-being. It is sometimes used in combination with massage and other therapeutic techniques as part of a holistic treatment approach.

Origins

Aromatic plants have been employed for their healing, preservative, and pleasurable qualities throughout recorded history in both the East and West. As early as 1500 B.C. the ancient Egyptians used waters, oils, incense, resins, and ointments scented with botanicals for their religious ceremonies.

There is evidence that the Chinese may have recognized the benefits of herbal and aromatic remedies much earlier than this. The oldest known herbal text,

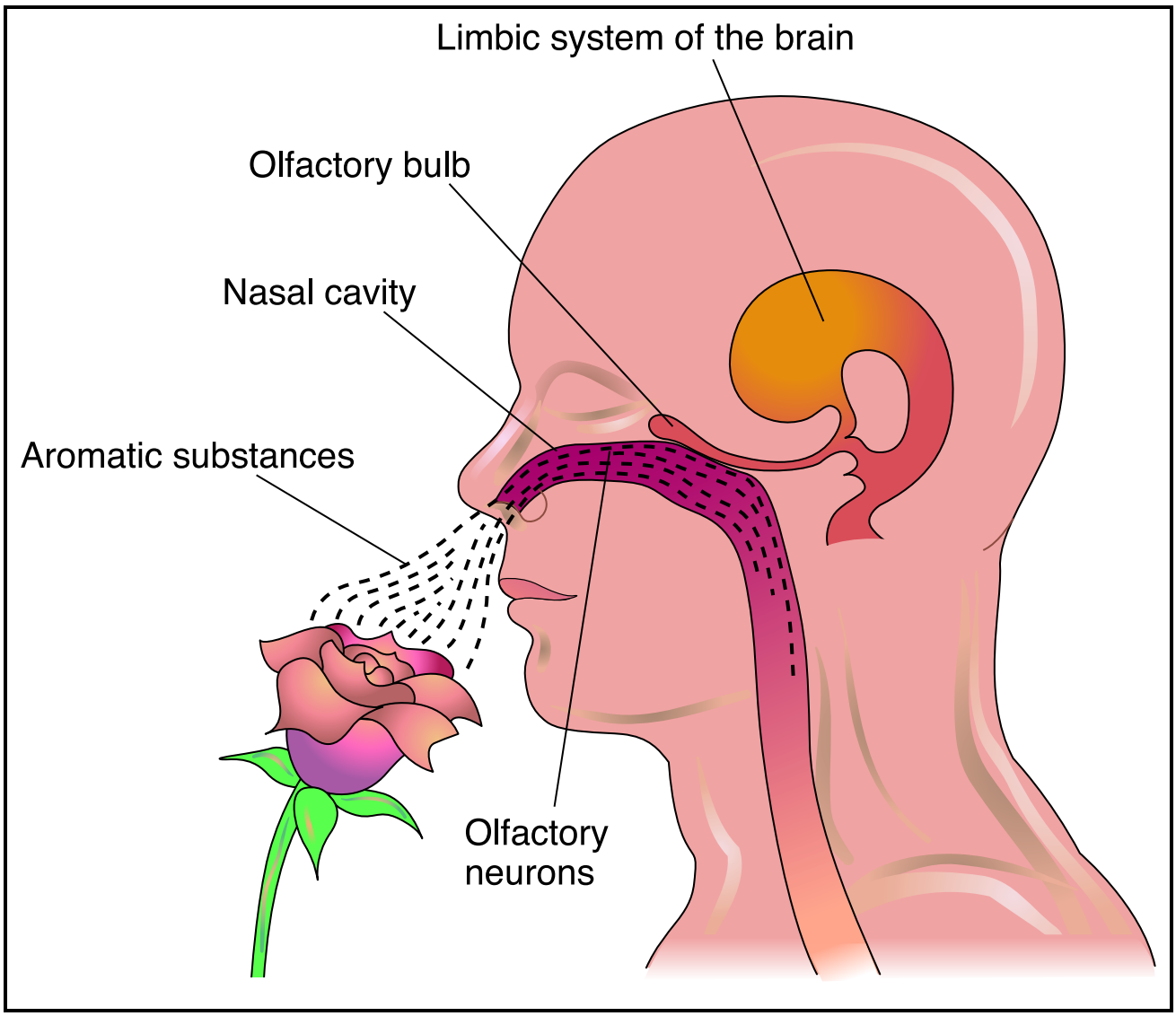
Aromatherapy oils

Name	Description	Conditions treated
Bay laurel	Antiseptic, diuretic, sedative, etc.	Digestive problems, bronchitis, common cold, influenza, and scabies and lice. CAUTION: Don't use if pregnant
Clary sage	Relaxant, anti-convulsive, anti-inflammatory, and antiseptic	Menstrual and menopausal symptoms, burns, eczema, muscle pain and tension, and anxiety. CAUTION: Don't use if pregnant.
Chamomile	Sedative, anti-inflammatory, anti-spasmodic, antiseptic, and pain reliever	Hay fever, burns, acne, arthritis, digestive problems, menstrual and menopausal symptoms, insomnia, and anxiety.
Eucalyptus	Antiseptic, antibacterial, astringent, expectorant, analgesic, and stimulant	Boils, breakouts, cough, common cold, influenza, and sinusitis. CAUTION: Not to be taken orally.
Lavender	Analgesic, antiseptic, calming/soothing, and carminative	Headache, depression, insomnia, stress, sprains, and nausea.
Peppermint	Pain reliever, carminative, anti-inflammatory, anti-spasmodic, analgesic	Indigestion, nausea, headache, motion sickness, muscle pain, ulcerative conditions of the bowels, and tension.
Rosemary	Antiseptic, circulatory and nervine stimulant, diuretic, carminative, anti-spasmodic, and emmenagogue	Indigestion, gas, bronchitis, fluid retention, influenza, and headache. CAUTION: Don't use if pregnant or have epilepsy or hypertension.
Tarragon	Diuretic, laxative, anti-spasmodic, and stimulant	Menstrual and menopausal symptoms, gas, and indigestion. CAUTION: Don't use if pregnant.
Tea tree	Antiseptic and soothing	Common cold, bronchitis, abscesses, acne, vaginitis, and burns.
Thyme	Stimulant, antiseptic, anti-microbial anti-spasmodic, carminative, astringent, expectorant, and anthelmintic	Cough, laryngitis, tonsillitis, coughs, diarrhea, gas, and intestinal worms. CAUTION: Don't use if pregnant or have hypertension.

(Illustration by Corey Light. Cengage Learning, Gale)

Shen Nung's *Pen Ts'ao* (c. 2700-3000 B.C.) catalogs over 200 botanicals. Ayurveda, a practice of traditional Indian medicine that dates back more than 2,500 years, also used aromatic herbs for treatment.

The Romans were well known for their use of fragrances. They bathed with botanicals and integrated them into their state and religious rituals. So did the Greeks, with a growing awareness of the medicinal properties of herbs. Greek physician and surgeon Pedanios Dioscorides, whose renown herbal text *De Materia Medica* (60 A.D.) was the standard textbook for Western medicine for 1,500 years, wrote extensively on the medicinal value of botanical aromatics. The *Medica* contained detailed information on some 500 plants and 4,740 separate medicinal uses for them, including an entire section on aromatics.



As a holistic therapy, aromatherapy is believed to benefit both the mind and body. Here, the aromatic substances from a flower stimulates the olfactory bulb and neurons. The desired emotional response (such as relaxation) is activated from the limbic system of the brain. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

Written records of herbal distillation are found as early as the first century A.D., and around 1000 A.D., the noted Arab physician and naturalist Avicenna described the distillation of rose oil from rose petals, and the medicinal properties of essential oils in his writings. However, it wasn't until 1937, when French chemist René-Maurice Gattefossé published *Aromatherapie: Les Huiles essentielles, hormones végé tales*, that aromatherapie, or aromatherapy, was introduced in Europe as a medical discipline. Gattefossé, who was employed by a French perfumeur, discovered the healing properties of **lavender** oil quite by accident when he suffered a severe burn while working and used the closest available liquid, lavender oil, to soak it.

In the late 20th century, French physician Jean Valnet used botanical aromatics as a front line treatment for wounded soldiers in World War II. He wrote about his use of essential oils and their healing and antiseptic properties, in his 1964 book *Aromatherapie, traitement des maladies par les essences des plantes*, which popularized the use of essential oils for medical and psychiatric treatment throughout France. Later, French biochemist Mauguerite Maury popularized the cosmetic benefits of essential oils, and in 1977 Robert Tisserand wrote the first English language book on the subject, *The Art of Aromatherapy*, which introduced massage as an adjunct treatment to aromatherapy and sparked its popularity in the United Kingdom.

Benefits

Aromatherapy offers diverse physical and psychological benefits, depending on the essential oil or oil combination and method of application used. Some common medicinal properties of essential oils used in aromatherapy include: analgesic, antimicrobial, antiseptic, anti-inflammatory, astringent, sedative, antispasmodic, expectorant, diuretic, and sedative. Essential oils are used to treat a wide range of symptoms and conditions, including, but not limited to, gastrointestinal discomfort, skin conditions, menstrual **pain** and irregularities, stress-related conditions, mood disorders, circulatory problems, respiratory **infections**, and **wounds**.

Description

In aromatherapy, essential oils are carefully selected for their medicinal properties. As essential oils are absorbed into the bloodstream through application to the skin or inhalation, their active components trigger certain pharmalogical effects (e.g., pain relief).

In addition to physical benefits, aromatherapy has strong psychological benefits. The volatility of an oil, or the speed at which it evaporates in open air, is thought to be linked to its specific psychological effect. As a rule of thumb, oils that evaporate quickly are considered emotionally uplifting, while slowly-evaporating oils are thought to have a calming effect.

Essential oils commonly used in aromatherapy treatment include:

- Roman chamomile (*Chamaemelum nobilis*). An anti-inflammatory and analgesic. Useful in treating otitis media (earache), skin conditions, menstrual pains, and depression.
- Clary sage (*Salvia sclarea*). This natural astringent is not only used to treat oily hair and skin, but is also said to be useful in regulating the menstrual cycle, improving mood, and controlling high blood pressure. Clary sage should not be used by pregnant women.
- Lavender (*Lavandula officinalis*). A popular aromatherapy oil that mixes well with most essential oils, lavender has a wide range of medicinal and cosmetic applications, including treatment of insect bites, burns, respiratory infections, intestinal discomfort, nausea, migraine, insomnia, depression, and stress.
- Myrtle (*Myrtus communis*). Myrtle is a fungicide, disinfectant, and antibacterial. It is often used in steam aromatherapy treatments to alleviate the symptoms of whooping cough, bronchitis, and other respiratory infections.
- Neroli (bitter orange), (*Citrus aurantium*). Citrus oil extracted from bitter orange flower and peel and used to treat sore throat, insomnia, and stress and anxiety-related conditions.
- Sweet orange (*Citrus sinensis*). An essential oil used to treat stomach complaints and known for its reported ability to lift the mood while relieving stress.
- Peppermint (*Mentha piperita*). Relaxes and soothes the stomach muscles and gastrointestinal tract. Peppermint's actions as an anti-inflammatory, antiseptic, and antimicrobial also make it an effective skin treatment, and useful in fighting cold and flu symptoms. In addition, research in 2002 found that peppermint scent helped athletes run faster and perform more push–ups than control subjects with odorless strips under their noses.
- Rosemary (*Rosmarinus officinalis*). Stimulating essential oil used to treat muscular and rheumatic complaints, as well as low blood pressure, gastrointestinal problems, and headaches. Recently. Brain scans have shown that fragrance of rosemary increases blood circulation in the brain.
- Tea tree (*Melaleuca alternifolia*). Has bactericidal, virucidal, fungicidal, and anti-inflammatory properties that make it a good choice for fighting infection. Recommended for treating sore throat and respiratory infections, vaginal and bladder infections, wounds, and a variety of skin conditions.
- Ylang ylang (*Cananga odorata*). A sedative essential oil sometimes used to treat hypertension and tachycardia.

Essential oils contain active agents that can have potent physical effects. While some basic aromatherapy home treatments can be self-administered, medical aromatherapy should always be performed under the guidance of an aromatherapist, herbalist, massage therapist, nurse, or physician.

Inhalation

The most basic method of administering aromatherapy is direct or indirect inhalation of essential oils. Several drops of an essential oil can be applied to a tissue or handkerchief and gently inhaled. A small amount of essential oil can also be added to a bowl of hot water and used as a steam treatment. This technique is recommended when aromatherapy is used to treat respiratory and/or skin conditions. Aromatherapy steam devices are also available commercially. A warm bath containing essential oils can have the same effect as steam aromatherapy, with the added

benefit of promoting **relaxation**. When used in a bath, water should be lukewarm rather than hot to slow the evaporation of the oil.

Essential oil diffusers, vaporizers, and light bulb rings can be used to disperse essential oils over a large area. These devices can be particularly effective in aromatherapy that uses essential oils to promote a healthier home environment. For example, **eucalyptus** and **tea tree oil** are known for their antiseptic qualities and are frequently used to disinfect sickrooms, and citronella and geranium can be useful in repelling insects.

Direct application

Because of their potency, essential oils are diluted in a carrier oil or lotion before being applied to the skin to prevent an allergic skin reaction. The carrier oil can be a vegetable or olive based one, such as **wheat germ** or avocado. Light oils, such as safflower, sweet almond, grapeseed, hazelnut, **apricot seed**, or peach kernel, may be absorbed more easily by the skin. Standard dilutions of essential oils in carrier oils range from 2–10%. However, some oils can be used at higher concentrations, and others should be diluted further for safe and effective use. The type of carrier oil used and the therapeutic use of the application may also influence how the essential oil is mixed. Individuals should seek guidance from a healthcare professional and/or aromatherapist when diluting essential oils.

Massage is a common therapeutic technique used in conjunction with aromatherapy to both relax the body and thoroughly administer the essential oil treatment. Essential oils can also be used in hot or cold compresses and soaks to treat muscle aches and pains (e.g., lavender and **ginger**). As a **sore throat** remedy, antiseptic and soothing essential oils (e.g., tea tree and **sage**) can be thoroughly mixed with water and used as a gargle or mouthwash.

Internal use

Some essential oils can be administered internally in tincture, infusion, or suppository form to treat certain symptoms or conditions; however, this treatment should never be self-administered. Essential oils should only be taken internally under the supervision of a qualified healthcare professional.

As non-prescription botanical preparations, the essential oils used in aromatherapy are typically not paid for by health insurance. The self-administered nature of the therapy controls costs to some degree. Aromatherapy treatment sessions from a professional aromatherapist are not covered by health insurance in most cases, although aromatherapy performed in conjunction with physical therapy, nursing, therapeutic massage, or other covered medical services may be covered. Individuals should check with their insurance provider to find out about their specific coverage.

The adage "You get what you pay for" usually applies when purchasing essential oils, as bargain oils are often adulterated, diluted, or synthetic. Pure essential oils can be expensive; and the cost of an oil will vary depending on its quality and availability.

Preparations

The method of extracting an essential oil varies by plant type. Common methods include water or steam distillation and cold pressing. Quality essential oils should be unadulterated and extracted from pure botanicals. Many aromatherapy oils on the market are synthetic and/or diluted, contain solvents, or are extracted from botanicals grown with pesticides or herbicides. To ensure best results, essential oils should be made from pure organic botanicals and labeled by their full botanical name. Oils should always be stored in dark bottles out of direct light.

Before using essential oils on the skin, individuals should perform a skin patch test by applying a small amount of the diluted oil behind the wrist and covering it with a bandage or cloth for up to 12 hours. If redness or irritation occurs, the oil should be diluted further and a second skin test performed, or it should be avoided altogether. Individuals should never apply undiluted essential oils to the skin unless advised to do so by a trained healthcare professional.

Precautions

Individuals should only take essential oils internally under the guidance and close supervision of a health care professional. Some oils, such as eucalyptus, **wormwood**, and sage, should never be taken internally. Many essential oils are highly toxic and should not be used at all in aromatherapy. These include (but are not limited to) bitter almond, **pennyroyal**, mustard, **sassafras**, rue, and **mugwort**.

Citrus-based essential oils, including bitter and sweet orange, lime, lemon, grapefruit, and tangerine, are phototoxic, and exposure to direct sunlight should be avoided for at least four hours after their application.

Other essential oils, such as cinnamon leaf, black pepper, **juniper**, lemon, white camphor, eucalyptus blue gum, ginger, **peppermint**, pine needle, and **thyme** can be extremely irritating to the skin if applied in high enough concentration or without a carrier oil or lotion. Caution should always be exercised when

applying essential oils topically. Individuals should never apply undiluted essential oils to the skin unless directed to do so by a trained healthcare professional and/or aromatherapist.

Individuals taking homeopathic remedies should avoid black pepper, camphor, eucalyptus, and peppermint essential oils. These oils may act as a remedy antidote to the homeopathic treatment.

Children should only receive aromatherapy treatment under the guidance of a trained aromatherapist or healthcare professional. Some essential oils may not be appropriate for treating children, or may require additional dilution before use on children.

Certain essential oils should not be used by pregnant or nursing women or by people with specific illnesses or physical conditions. Individuals suffering from any chronic or acute health condition should inform their healthcare provider before starting treatment with any essential oil.

Asthmatic individuals should not use steam inhalation for aromatherapy, as it can aggravate their condition.

Essential oils are flammable, and should be kept away from heat sources.

Side effects

Side effects vary by the type of essential oil used. Citrus-based essential oils can cause heightened sensitivity to sunlight. Essential oils may also cause **contact dermatitis**, an allergic reaction characterized by redness and irritation. Anyone experiencing an allergic reaction to an essential oil should discontinue its use and contact their healthcare professional for further guidance. Individuals should do a small skin patch test with new essential oils before using them extensively.

Research and general acceptance

The antiseptic and bactericidal qualities of some essential oils (such as tea tree and peppermint) and their value in fighting infection has been detailed extensively in both ancient and modern medical literature.

Recent research in mainstream medical literature has also shown that aromatherapy has a positive psychological impact on patients. Several clinical studies involving both post-operative and chronically ill subjects showed that massage with essential oils can be helpful in improving emotional well-being, and consequently, promoting the healing process.

Today, the use of holistic aromatherapy is widely accepted in Europe, particularly in Great Britain, where it is commonly used in conjunction with massage as both a psychological and physiological healing tool. In the United States, where aromatherapy is often misunderstood as solely a cosmetic treatment, the mainstream medical community has been slower to accept its use.

KEY TERMS

Antiseptic—Inhibits the growth of microorganisms.

Bactericidal—An agent that destroys bacteria (e.g., *Staphylococci aureus, Streptococci pneumoniae, Escherichia coli, Salmonella enteritidis*).

Carrier oil—An oil used to dilute essential oils for use in massage and other skin care applications.

Contact dermatitis—Skin irritation as a result of contact with a foreign substance.

Essential oil—A volatile oil extracted from the leaves, fruit, flowers, roots, or other components of a plant and used in aromatherapy, perfumes, and foods and beverages.

Holistic—A practice of medicine that focuses on the whole patient, and addresses the social, emotional, and spiritual needs of a patient as well as their physical treatment.

Phototoxic—Causes a harmful skin reaction when exposed to sunlight.

Remedy antidote—Certain foods, beverages, prescription medications, aromatic compounds, and other environmental elements that counteract the efficacy of homeopathic remedies.

Steam distillation—A process of extracting essential oils from plant products through a heating and evaporation process.

Volatile—Something that vaporizes or evaporates quickly when exposed to air.

Training and certification

Certification or licensing is currently not required to become an aromatherapist in the United States; however, many states require that healthcare professionals who practice the "hands-on" therapies often used in conjunction with aromatherapy (e.g., massage) to be licensed. There are state-licensed educational institutions that offer certificates and/or diplomas in aromatherapy training. Individuals interested in aromatherapy treatment from a professional aromatherapist may be able to obtain a referral from one of these institutions, or from their current healthcare provider.

Resources

BOOKS

Lawless, Julia. *The Complete Illustrated Guide To Aroma therapy*. Rockport, MA: Element Books Ltd, 1997.

Schnaubelt, Kurt. *Medical Aromatherapy: Healing With Essential Oils*. Berkeley, CA: Frog Ltd, 1999.

PERIODICALS

Claps, Frank. "Training Scents: You May be Able to Sniff Your Way to Better Workouts With Tricks from the Aromatherapist's Bag." *Men's Fitness* (May 2002): 34.

Stanten, Michele, and Selene Yeager. "Smell this for Instant Energy: the Easiest Way to Boost your Workouts. (Fitness News)." *Prevention* (April 2002): 76.

ORGANIZATIONS

National Association of Holistic Aromatherapy, 836 Hanley Industrial Court, St. Louis, MO, 63144, , 888 ASK NAHA, http://www.naha.org.

Paula Ford-Martin
Teresa G. Odle

Arrowroot

Description

Growing to a height of up to 6 ft (2 m), arrowroot is a tropical perennial with clusters of long, thin stems and small, cream-colored flowers that grow in pairs. Once revered by the ancient Mayans and other inhabitants of Central America as an antidote for poison-tipped arrows, the herb is mainly used today to soothe the stomach and alleviate **diarrhea**. It has also been popular for centuries in the culinary arts and is still used in many American kitchens as a thickening agent. While arrowroot is native to Central America and widely cultivated in the West Indies, it can also be found growing in many tropical regions of the world, including Southeast Asia, South Africa, Australia, and in Florida in the United States. The Latin genus *Maranta* was derived from the name of an Italian doctor, Bartommeo Maranto.

Arrowroot, which belongs to the Marantaceae plant family, is widely considered an easily digested and nutritious starch. The herb is extracted from the fleshy roots, called rhizomes, of the arrowroot plant through an elaborate process of washing, peeling, soaking, and drying in the sun. The end product is a fine, white powder with the same appearance and texture as cornstarch. Arrowroot is valued by herbalists primarily for its demulcent and antidiarrheal properties. Exactly how it produces its therapeutic effects is not known. The chemical composition of the herb has not been thoroughly investigated.

While only *Maranta arundinacea* is considered true arrowroot, the common name for the herb is often applied to a variety of starches. These include other species of *Maranta*, such as *Maranta ramosissima*, *Maranta allouya*, *Maranta nobilis*, as well as Brazilian arrowroot (*Manihot utilissima* or *Manihot palmate*), Tahitian arrowroot (*Tacca oceanica*), and East Indian arrowroot (*Curcuma augustifolia*). While some of these starches may be chemically similar to true arrowroot, it is not clear if they produce the same medicinal effects. Consumers interested in trying arrowroot are advised to choose *Maranta arundinacea*, which is sometimes referred to as West Indian arrowroot or simply Maranta.

Research is still required to determine if arrowroot can produce significant health benefits safely and effectively. The proper dosage of the herb has also yet to be determined.

General use

While not approved by the United States Food and Drug Administration (FDA), arrowroot is thought to have several beneficial effects. However, there is little scientific evidence to support these claims. The herb is primarily used to soothe an uneasy stomach and alleviate diarrhea or **nausea** and **vomiting**. Since it contains **calcium** and carbohydrates as well as other nutrients, arrowroot is also used as an easily digested source of **nutrition** for infants, people recovering from illnesses (especially those with bowel problems), and those on restricted diets. The herb is considered easier on the stomach than other forms of starch.

Because arrowroot has not been studied extensively in people or animals, its effectiveness is based mainly on its reputation as a folk remedy. Despite the lack of scientific evidence, some practitioners of alternative medicine consider it useful for certain conditions. Alternative physicians praise the stomach-soothing powers of arrowroot as well as its nutritional value. Another prominent herbalist recommends arrowroot for preventing athlete's foot. Putting the dried powder inside socks and shoes can help to combat the moisture that contributes to the growth of foot fungus. However, arrowroot is not known to have antifungal properties.

Arrowroot was popular in the past as an antidote for arrow poison. It also had a reputation as a

treatment for scorpion and spider **bites** as well as **gangrene**. However, there is no scientific evidence to support these uses. In cases of poisoning, the local poison control center or an emergency care center should be contacted immediately.

Aside from its medicinal uses, arrowroot is still used in cooking. Much like cornstarch, arrowroot is used as a thickener for sauces, soups, and confections.

Preparations

The optimum daily dosage of arrowroot has not been established with any certainty. Consumers should follow the package directions for proper use or consult a doctor experienced in the use of alternative remedies. Arrowroot powder, which is basically flavorless, is often mixed with juice or other beverages before ingestion.

Precautions

Arrowroot is not known to be harmful when taken in recommended dosages. However, it is important to remember that the long-term effects of taking the herb (in any amount) have not been investigated. Due to the lack of sufficient medical research, arrowroot should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

People who experience vomiting or severe/prolonged diarrhea may be prone to dehydration. They should drink plenty of water (six to eight glasses a day) in order to maintain a proper fluid balance. A doctor should be consulted if the vomiting or diarrhea lasts longer than three days or is accompanied by other symptoms such as **pain** or fever.

Side effects

When taken in recommended dosages, arrowroot is not associated with any significant side effects.

Interactions

Arrowroot is not known to interact adversely with any drug or dietary supplement. It has been combined with milk, lemon and other fruit juices, sugar, and wine without apparent harm.

To avoid **constipation**, consumers should not take arrowroot with other medications or dietary supplements used to alleviate diarrhea.

KEY TERMS

Calcium—A mineral necessary for strong bones and the proper functioning of organs and muscles.

Demulcent—A gelatinous or oily substance that has a protective or soothing influence on irritated mucous membranes.

Gangrene—Localized tissue death caused by lack of blood.

Rhizome—A relatively long and thick plant root that can be distinguished from normal roots by the presence of buds, nodes, or other characteristics.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines*. New Jersey: Medical Economics, 1998.

PERIODICALS

Rolston D. D., P. Mathew, and V. I. Mathan. "Food Based Solutions Are a Viable Alternative to Glucose Electrolyte Solutions for Oral Hydration in Acute Diarrhoea Studies in a Rat Model of Secretory Diarrhoea." *Transactions of the Royal Society of Tropical Medicine and Hygiene* 84, no. 1 (1990): 156 159.

OTHER

Botanical.com. http://www.botanical.com

ORGANIZATIONS

American Botanical Council, P.O. Box 144345, Austin, TX, 78714 4345.

Greg Annussek

Arsenicum album

Description

Arsenicum album is a homeopathic remedy derived from the metallic element arsenic. Traces of arsenic are found in vegetables and animals. In its crude form, arsenic is poisonous. Gradual accumulations may result in digestive disturbances, **nausea**, **vomiting**, **diarrhea**, dehydration, coma, shock, convulsions, paralysis, and death.

Common names for arsenicum album include arsenic trioxide, white arsenic, white oxide of metallic arsenic, and arsenius acid. Arsenic is indestructible,

KEY TERMS

Polychrest—A homeopathic remedy that is used to treat many ailments.

Pustular—Resembling a blister and usually containing pus.

even by fire, and remains in bone ash after cremation. It has been used to create pigmentation for wallpaper, carpet, and paints. Arsenic has also been used to produce medicines and pesticides.

Arsenic was used as a remedy for certain types of cattle disease as far back as the eighth century. In the seventeenth century, arsenic was applied topically to treat malignant ulcers and skin diseases in humans. Taken internally, it was used to treat fevers. When frequent and repeated doses of arsenic resulted in poisoning and death, arsenic was pronounced unsafe for use. However, housewives and practitioners still used arsenic and were often successful in their treatments. Eventually arsenic use was reinstated. Weak compounds of arsenic were often used to increase strength and endurance, remedy **anemia**, and improve the skin and fur of animals. An ointment made from arsenic was used to treat cancerous growths and tumors.

General use

Arsenicum album is one of the most frequently used homeopathic remedies and is one of the most well-proven remedies. A polychrest with a wide field of action, arsenicum album has the power to affect all parts of the human body.

Arsenicum album is used to treat serious acute ailments, chronic diseases, and acute colds, **bronchitis**, and fevers. Homeopaths prescribe this remedy to treat **asthma**, **anxiety** disorders, panic attacks, skin **infections**, **boils**, **burns** with **blisters**, cystitis, eye inflammations, **chickenpox**, colds, coughs, **indigestion**, **Crohn's disease**, herpes simplex, flu, **insomnia**, **measles**, **mumps**, sore throats, **allergies** and **hay fever**, **food poisoning**, and fevers. Arsenicum album has also been used to treat malarial and septic infections, **alcoholism**, **syphilis**, lupus, and **cancer** (when applied in the early stages of the disease).

Arsenicum album illnesses can be brought about by the use of quinine, tobacco, or alcohol, or from the suppression of skin eruptions, sweat, or mucous membrane discharges.

Common characteristics

People requiring arsenicum album generally fit a particular profile. They are anxious, restless, weak, pale, emaciated, faint, chilled, and catch colds easily. Their eyes are sunken and glassy; their face is yellowish or ashy pale, and mouth, lips, and tongue are parched and dry. They desire liquids in small, frequent amounts. The forehead, face, chest, knees, hands, and feet are often cold, so patients crave warmth. They may suffer from burning, pressing pains throughout the entire body. These pains are aggravated by cold and reduced by heat. Weakness is sudden and is reduced by lying down, although the other symptoms are worsened by it.

Other physical characteristics of this remedy include burning, offensive, and watery discharges; palpitations; profuse, sour sweat; and a red-tipped tongue. There is a tendency to bleed easily and from any place, and vomiting of blood and bleeding from lungs, throat, and mucous membranes are not uncommon.

The mental and emotional symptoms of the patient profile also include anxiety, nervousness, suspicion, impulsiveness, irritability, sadness, hopelessness, and **depression**. People requiring this remedy are often difficult patients. They are critical and argumentative, easily offended, easily startled, insecure, forgetful, sensitive to **pain**, and often suffer from delusions or hallucinations. They think their ailment is more serious than it is and despair of ever getting well, often fearing that they are going to die. They desire company and are afraid of being alone. Patients may be unable to sleep due to their restlessness and anxiety or from physical discomforts such as **fever** or **cough**. When they do sleep, they may have anxious dreams or nightmares. Even though they are extremely weak, arsenicum album patients are clean and tidy, partially to relieve their restlessness.

The symptoms are aggravated by a change in temperature, wet weather, cold food and drink, and by the slightest exertion. They are worse after midnight, upon waking, with alcohol use, and during **menstruation**. Symptoms are improved by heat, hot beverages, the warmth of the bed, fresh air, and lying down.

Arsenicum album is a useful remedy for mental disorders with symptoms of melancholy, irritation, intense anxiety, and restlessness. The patient may be prone to violent fits of anger or rage or have an impulse to commit murder. It also can have a positive effect on alcoholism and can improve diarrhea, weakness, stomach irritation, and emaciation.

Specific indications

Arsenicum album can be used for the following conditions:

- Throbbing, frontal headaches. These are accompanied by a flushed or hot face, heat or burning inside the head, and a feeling that the head will explode. These headaches occur with regularity and are reduced by cool air or cold applications.
- Herpetic or eczematous skin eruptions. These are moist, scabby, pustular, itching, or burning.
- Hot, burning fevers. These sometimes alternate with chills. Fevers are worse at night, particularly after midnight.
- Sore throat. It is accompanied by burning pain that is worse from swallowing or cold drinks and is reduced with hot drinks.
- Hacking coughs. These are frequently dry at night and are relieved by hot drinks. They are worsened by the cold, by fresh air, when lying down, at night (particularly after midnight), and during a fever.
- Chronic nasal congestion. This is often accompanied by bleeding, constant sneezing, chills, fatigue, restlessness, anxiety at night, troublesome dreams, and crusts in the back of the nose.

Preparations

The homeopathic remedy is prepared by separating arsenic from **iron**, cobalt, and nickel when the minerals are baked at high temperatures. The powder is then ground and diluted with milk sugar.

Arsenicum album is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or healthcare practitioner should be consulted.

Consumers are advised not to exceed the recommended dose.

Side effects

There are no side effects currently reported.

Interactions

When taking any homeopathic remedy, consumers should not use **peppermint** products, coffee, or alcohol. These products may cause the remedy to be ineffective.

Resources

BOOKS

Cummings, Stephen, M.D., and Ullman, Dana, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Art therapy

Definition

Art therapy, sometimes called creative arts therapy or expressive arts therapy, encourages people to express and understand emotions through artistic expression and through the creative process.

Origins

Humans have expressed themselves with symbols throughout history. Masks, ritual pottery, costumes, other objects used in rituals, cave drawings, Egyptian hieroglyphics, and Celtic art and symbols are all visual records of self-expression and communication through art. Art has also been associated spiritual power, and artistic forms such as the Hindu and Buddhist mandala and Native American sand painting are considered powerful healing tools.

In the late nineteenth century, French psychiatrists Ambrose Tardieu and Paul-Max Simon both published studies on the similar characteristics of and symbolism in the artwork of the mentally ill. Tardieu and Simon viewed art therapy as an effective diagnostic tool to identify specific types of mental illness or traumatic events. Later, psychologists would use this diagnostic aspect to develop psychological drawing tests (the Draw-A-Man test, the Draw-A-Person Questionnaire [DAP.Q]) and projective personality tests involving visual symbol recognition (e.g., the Rorschach Inkblot Test, the Thematic Apperception Test [TAT], and the Holtzman Inkblot Test [HIT]).

The growing popularity of milieu therapies at psychiatric institutions in the twentieth century was an important factor in the development of art therapy in the United States. Milieu therapies (or **environmental therapy**) focus on putting the patient in a controlled therapeutic social setting that provides the

KEY TERMS

Catharsis—Therapeutic discharge of emotional tension by recalling past events.

Mandala—A design, usually circular, that appears in religion and art. In Buddhism and Hinduism, the mandala has religious ritual purposes and serves as a yantra (a geometric emblem or instrument of contemplation).

Organic illness—A physically, biologically based illness.

patient with opportunities to gain self-confidence and interact with peers in a positive way. Activities that encourage self-discovery and empowerment such as art, music, dance, and writing are important components of this approach.

Educator and therapist Margaret Naumburg was a follower of both Freud and Jung, and incorporated art into **psychotherapy** as a means for her patients to visualize and recognize the unconscious. She founded the Walden School in 1915, where she used students' artworks in psychological counseling. She published extensively on the subject and taught seminars on the technique at New York University in the 1950s. Today, she is considered the founder of art therapy in the United States.

In the 1930s, Karl, William, and Charles Menninger introduced an art therapy program at their Kansas-based psychiatric hospital, the Menninger Clinic. The Menninger Clinic employed a number of artists in residence in the following years, and the facility was also considered a leader in the art therapy movement through the 1950s and 60s. Other noted art therapy pioneers who emerged in the 50s and 60s include Edith Kramer, Hanna Yaxa Kwiatkowska (National Institute of Mental Health), and Janie Rhyne.

Benefits

Art therapy provides the client-artist with critical insight into emotions, thoughts, and feelings. Key benefits of the art therapy process include:

- Self-discovery. At its most successful, art therapy triggers an emotional catharsis.
- Personal fulfillment. The creation of a tangible reward can build confidence and nurture feelings of self-worth. Personal fulfillment comes from both the creative and the analytical components of the artistic process.
- Empowerment. Art therapy can help people visually express emotions and fears that they cannot express through conventional means, and can give them some sense of control over these feelings.
- Relaxation and stress relief. Chronic stress can be harmful to both mind and body. Stress can weaken and damage the immune system, can cause insomnia and depression, and can trigger circulatory problems (like high blood pressure and irregular heartbeats). When used alone or in combination with other relaxation techniques such as guided imagery, art therapy can effectively relieve stress.
- Symptom relief and physical rehabilitation. Art therapy can also help patients cope with pain. This therapy can promote physiological healing when patients identify and work through anger, resentment, and other emotional stressors. It is often prescribed to accompany pain control therapy for chronically and terminally ill patients.

Description

Art therapy, sometimes called expressive art or art psychology, encourages self-discovery and emotional growth. It is a two part process, involving both the creation of art and the discovery of its meaning. Rooted in Freud and Jung's theories of the subconscious and unconscious, art therapy is based on the assumption that visual symbols and images are the most accessible and natural form of communication to the human experience. Patients are encouraged to visualize, and then create, the thoughts and emotions that they cannot talk about. The resulting artwork is then reviewed and its meaning interpreted by the patient.

The "analysis" of the artwork produced in art therapy typically allows patients to gain some level of insight into their feelings and lets them to work through these issues in a constructive manner. Art therapy is typically practiced with individual, group, or family psychotherapy (talk therapy). While a therapist may provide critical guidance for these activities, a key feature of effective art therapy is that the patient/artist, not the therapist, directs the interpretation of the artwork.

Art therapy can be a particularly useful treatment tool for children, who frequently have limited language skills. By drawing or using other visual means to express troublesome feelings, younger patients can begin to address these issues, even if they cannot identify or label these emotions with

words. Art therapy is also valuable for adolescents and adults who are unable or unwilling to talk about thoughts and feelings.

Beyond its use in mental health treatment, art therapy is also used with traditional medicine to treat organic diseases and conditions. The connection between mental and physical health is well documented, and art therapy can promote healing by relieving **stress** and allowing the patient to develop coping skills.

Art therapy has traditionally centered on visual mediums, like paintings, sculptures, and drawings. Some mental healthcare providers have now broadened the definition to include music, film, dance, writing, and other types of artistic expression.

Art therapy is often one part of a psychiatric inpatient or outpatient treatment program, and can take place in individual or group therapy sessions. Group art therapy sessions often take place in hospital, clinic, shelter, and community program settings. These group therapy sessions can have the added benefits of positive social interaction, empathy, and support from peers. The client-artist can learn that others have similar concerns and issues.

Preparations

Before starting art therapy, the therapist may have an introductory session with the client-artist to discuss art therapy techniques and give the client the opportunity to ask questions about the process. The client-artist's comfort with the artistic process is critical to successful art therapy.

The therapist ensures that appropriate materials and space are available for the client-artist, as well as an adequate amount of time for the session. If the individual artist is exploring art as therapy without the guidance of a trained therapist, adequate materials, space, and time are still important factors in a successful creative experience.

The supplies used in art therapy are limited only by the artist's (and/or therapist's) imagination. Some of the materials often used include paper, canvas, poster board, assorted paints, inks, markers, pencils, charcoals, chalks, fabrics, string, adhesives, clay, wood, glazes, wire, bendable metals, and natural items (like shells, leaves, etc.). Providing artists with a variety of materials in assorted colors and textures can enhance their interest in the process and may result in a richer, more diverse exploration of their emotions in the resulting artwork. Appropriate tools such as scissors, brushes, erasers, easels, supply trays, glue guns, smocks or aprons, and cleaning materials are also essential.

An appropriate workspace should be available for the creation of art. Ideally, this should be a bright, quiet, comfortable place, with large tables, counters, or other suitable surfaces. The space can be as simple as a kitchen or office table, or as fancy as a specialized artist's studio.

The artist should have adequate time to become comfortable with and explore the creative process. This is especially true for people who do not consider themselves "artists" and may be uncomfortable with the concept. If performed in a therapy group or one-on-one session, the art therapist should be available to answer general questions about materials and/or the creative process. However, the therapist should be careful not to influence the creation or interpretation of the work.

Precautions

Art materials and techniques should match the age and ability of the client. People with impairments, such as traumatic brain injury or an organic neurological condition, may have difficulties with the self-discovery portion of the art therapy process depending on their level of functioning. However, they may still benefit from art therapy through the sensory stimulation it provides and the pleasure they get from artistic creation.

While art is accessible to all (with or without a therapist to guide the process), it may be difficult to tap the full potential of the interpretive part of art therapy without a therapist to guide the process. When art therapy is chosen as a therapeutic tool to cope with a physical condition, it should be treated as a supplemental therapy and not as a substitute for conventional medical treatments.

Research and general acceptance

A wide body of literature supports the use of art therapy in a mental health capacity. And as the mind-body connection between psychological well-being and physical health is further documented by studies in the field, art therapy gains greater acceptance by mainstream medicine as a therapeutic technique for organic illness.

Training and certification

Both undergraduate and graduate art therapy programs are offered at many accredited universities across the United States. Typical art therapy

programs combine courses in art and psychology. The majority of these programs meet or exceed standards set by the American Art Therapy Association (AATA).

The Art Therapy Credentials Board (ATCB), a voluntary organization, grants the designation ATR (Art Therapist Registered) to professionals who have completed an approved master's level program of study in art therapy (as described by the AATA) and have accumulated at least 1,000 hours of additional supervised clinical experience. Board certification is also available through the ATCB for art therapists who have met the ATR requirements and have passed a certification exam (ATR-BC). Art therapists with the ATR-BC designation must complete continuing education credits to maintain their certification.

Registration and/or certification is a recognition of professional expertise, not a legal qualification or requirement to practice. Professional licensing requirements for art therapists vary by state. However, if the therapy is intended as a companion treatment to psychological counseling or other mental health treatment, state licensing requirements typically apply. Where licensing is a prerequisite to practice, a combination of education and clinical experience, a written test, and continuing education are required to maintain the license.

Resources

BOOKS

Fausek, Diane. *A Practical Guide to Art Therapy*. Bing hamton, New York: Haworth Press, 1997.

Ganim, Barbara. *Art and Healing: Using expressive art to heal your body, mind, and spirit*. New York: Three Riv ers Press, 1999.

Malchiodi, Cathy A. *The Art Therapy Sourcebook*. Los Angeles: Lowell House, 1998.

McNiff, Shaun. *Art as Medicine: Creating a Therapy of the Imagination*. Boston: Shambhala, 1992.

ORGANIZATIONS

American Art Therapy Association.1202 Allanson Rd., Mundelein, IL 60060 3808. 888 290 0878 or 847 949 6064. Fax: 847 566 4580. E mail: arttherapy@ntr.net *www.arttherapy.org*.

Paula Ford-Martin

Arthritis *see* **Osteoarthritis; Rheumatoid arthritis**

Artichoke

Definition

The artichoke is a perennial plant with purple flowers. Although the artichoke is regarded as a vegetable, the edible portion of the plant is actually the unopened flower bud. Artichoke leaves and roots have been used as remedies to treat conditions ranging from **irritable bowel syndrome** to the prevention of hangovers caused by the consumption of alcohol.

Description

Cynara scolymus is the botanical name for the artichoke, a thistle plant that produces one of the oldest known foods. According to mythology, the Greek god Zeus fell in love with a beautiful woman named Cynara. Zeus transformed her into a goddess and took Cynara to live with him. Cynara did not like her new home and wanted to return to Earth. That angered Zeus. The god sent her home, but Zeus transformed Cynara into the world's first artichoke plant.

The artichoke, a member of the daisy (*Asteraceae*) family, is native to Mediterranean countries in southern Europe, northern Africa, and the Canary Islands. Ancient people recognized the value of the artichoke as both a food and a remedy. Greeks and Romans regarded the artichoke as a delicacy and a treatment for digestive troubles. They also viewed the artichoke as an aphrodisiac, an aid used to enhance romantic feelings and sex drive. Greeks thought that taking artichoke was a remedy for women who wanted to give birth to sons.

There are more than 50 artichoke varieties. These varieties do not include the Jerusalem artichoke, which is a tuber.

The only artichoke grown in the United States is the green globe. Spanish settlers brought the artichoke to the New World during the 1880s, and 80% of green globes are grown in Castroville, California. The town calls itself the "Artichoke Capital of the World." Castroville was among the first to recognize a woman who would become a twentieth century movie goddess. The actress Marilyn Monroe served as the first California Artichoke Queen, a title she received in 1949.

As a food, a medium artichoke contains 25 calories and 3 grams of fiber. It is also a source of **vitamin C**, the B vitamin foliate, and **magnesium**. The leaves contain cynarin, a plant compound that small studies showed may help to lower **cholesterol**.

General use

Considering the legend surrounding the creation of the artichoke, it may not be surprising that the artichoke was considered an aphrodisiac. However, it also served as a folk medicine treatment for a range of other conditions. Over the years, the artichoke was used as a remedy for **anemia**, arthritis and rheumatism, **gallstones**, **gout**, **indigestion**, **itching**, and snakebite.

Contemporary uses of artichoke

Artichoke leaf extract has been used as a remedy for conditions including irritable bowel syndrome, cholesterol management, and hangovers. Other uses include treating indigestion and appetite loss. The artichoke is thought to stimulate bile, the fluid secreted by the liver. By stimulating bile, artichoke leaf extract might provide relief for indigestion.

Artichoke leaf has been approved for some of those conditions in the German Commission E Monographs, a guide to herbal remedies. Those approved uses are the treatment of liver and gallbladder conditions and appetite loss.

In the United States, artichoke leaf is marketed as a dietary supplement because the herbal remedy has not been evaluated by the United States Food and Drug Administration (FDA). The lack of FDA review means that artichoke leaf has not been proven to be safe or effective. Furthermore, ingredients are not standardized to comply with federal regulations.

In 2007, the *American Journal of Health-System Pharmacy* highlighted some of the research into the use of artichoke leaf extract as a remedy for irritable bowel syndrome, cholesterol management, and alcohol-induced hangovers.

IRRITABLE BOWEL SYNDROME. Irritable bowel syndrome is a condition affecting the digestive tract. Symptoms include abdominal bloating, **pain**, and **gas**. In addition, a person may experience **constipation**, **diarrhea**, or both symptoms. Irritable bowel syndrome symptoms may increase during a stressful time or after a person eats.

In a study of 208 people diagnosed with irritable bowel syndrome, the participants were assessed two months before and after treatment with 320 mg or 640 mg of artichoke leaf extract. During the follow-assessment, participants reported a 26.4% decrease in irritable bowel syndrome, according to the *American Journal of Health-System Pharmacy*. The dosage strength did not make a significant difference in the outcome.

The study concluded that artichoke leaf extract may alleviate some symptoms associated with irritable bowel syndrome or dyspepsia (impaired digestion). Furthermore, the *Mayo Clinic Book of Alternative Medicine* noted that a small study "suggests" that artichoke leaf extract could help relieve irritable bowel symptoms.

CHOLESTEROL. Artichoke leaf extract has been marketed as a product that may balance LDL (low-density lipoprotein), which is also known as bad cholesterol. However, studies as of February 2008 had not proven the effectiveness of artichoke on cholesterol management.

HANGOVER. A **hangover** is caused by the body's reaction to alcohol, a substance that is toxic. The amount of alcohol that produces a hangover varies with each person. Hangover symptoms include an intense **headache**, **fatigue**, and dehydration.

Artichoke leaf extract has been marketed as remedy to prevent hangovers. However, the medical community was skeptical about this claim. Small studies showed little proof that artichoke leaf extract was effective at preventing hangovers.

Preparation

Herbal artichoke is available in capsule and extract form. Capsule strength ranges from 170 mg to 320 mg, so people should follow the directions on the product package. The average capsule dosage is 600 mg per day, and the daily artichoke leaf extract dose is about 500 mg per day. People should discuss the dosage with their doctor or health practitioner. This is especially important for women who are pregnant or breastfeeding, and people diagnosed with conditions including diabetes, high blood pressure, liver blockage, and heart or blood vessel disease.

Precautions

Artichoke leaf extract has not been evaluated by the FDA, so its safety and effectiveness have not been established. In addition, ingredients of herbal remedies are not standardized to comply with federal regulations.

Due to the lack of information about the safety of artichoke leaf extract, it should not taken by children under the age of 12, pregnant women, and nursing mothers. In addition, the safety of this remedy has not been determined for people with severe kidney and liver diseases.

Furthermore, people diagnosed with bile-duct obstruction or gallstones should not use artichoke extract as a remedy. The herb could stimulate bile, causing those medical conditions to worsen.

Moreover, artichoke in both herbal form and as a food should be avoided by people who are allergic to daisies, ragweed, chrysanthemums, and marigolds.

Interactions

There are known interactions with artichoke.

Resources

BOOKS

Balch, James, and Mark Stengler. *Prescription for Natural Cures: A Self care Guide for Treating Health Problems with Natural Remedies, Including Diet and Nutrition, Nutritional Supplements, Bodywork, and More*. John Wiley & Sons, 2004.

Mayo Clinic. *Mayo Clinic Book of Alternative Medicine*. Time Inc. Home Entertainment, 2007.

PERIODICALS

Bundy R., AF Walker, RW Middleton, et al. "Artichoke Leaf Extract Reduces Symptoms Of Irritable Bowel Syndrome And Improves Quality Of Life In Otherwise Healthy Volunteers Suffering From Concomitant Dyspepsia: A Subset Analysis." *The Journal Of Alterna tive And Complementary Medicine* 10, no. 4 (2004): 667 669.

Joy, Jamie Foster, Stacy L. Haber. "Clinical Uses Of Arti choke Leaf Extract." *American Journal of Health System Pharmacy*. (September 15, 2007): 1904 1909.

Webb, Denise. "Mysteries of the Artichoke: Fabulous Fla vor, Surprising Nutrition." *Environmental Nutrition*. (September 2005): 8.

OTHER

Heubeck, Elizabeth. "Strategies for a Hangover Free Holi day Season." WebMD Weight Loss Clinic Feature (December 9, 2004). http://www.medicinenet.com/ script/main/art.asp?articlekey 55900 (February 1, 2008).

Holistic Online.com. http://holisticonline.com (Feb. 1, 2008).

ORGANIZATIONS

American Botanical Council, 6200 Manor Rd, Austin, TX, 78723, (512) 926 4900, http://abc.herbalgram.org.

Liz Swain

Ascorbic acid *see* **Vitamin C**

Ashwaganda

Description

Ashwaganda, also spelled ashwagandha, is a member of the pepper family known as *Withania somnifera*. The small evergreen grows in the frost-free drier parts of western India, northern Africa, the Mediterranean, and the Middle East. Ashwaganda grows to a height of 2–3 ft (about 1 m) and has oval leaves, showy yellow flowers, and red, raisin-sized fruits. All parts of the plant, including the root, are used medicinally. Ashwaganda is also called winter cherry, withania, asgandh, and Indian ginseng.

General use

Ashwaganda is a major herb in the Ayurvedic system of health and healing. **Ayurvedic medicine** is a system of individualized healing derived from

Ashwaganda plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

Hinduism that has been practiced in India for more than 2,000 years. It is a complex system that recognizes different human temperaments and body types. Each of these types has different qualities that affect a person's health and natural balance.

In Ayurvedic medicine, disease can result from any of seven major categories of factors: heredity, congenital, internal, external trauma, seasonal, habits, or supernatural factors. Disease can also be caused by misuse of the five senses: sight, touch, taste, hearing, and smell. Diagnoses are made through questioning, observation, examination, and interpretation. Health is restored by evaluating the exact cause of the imbalance causing the disease or condition and then prescribing herbs, exercises, diet changes and/or **meditation** to help restore the natural balance of body, mind, and spirit. Prescriptions are highly individualized, so that the same symptoms may require different remedies in different people.

Ashwaganda is used to treat a great many different conditions in Ayurvedic medicine. Every part of the plant is used: leaves, fruit, flowers, and root. In addition, the young shoots and seeds are used as food and to thicken plant milks in the making of vegan cheeses. The fruit can be used as a substitute for soap, and the leaves are sometimes used as an insect repellent. Although ashwaganda can be taken alone, it is more often combined with other herbs in tonics to enhance its rejuvenating effects.

KEY TERMS

Adaptogen—A substance that acts in nonspecific ways to improve the body's level of functioning and its adaptations to stress.

Decoction—A liquid extract of a herb, made by simmering or boiling the herb in water, then straining out the plant parts.

Poultice—A soft moist mass of cloth, usually containing herbs, applied warm or hot to relieve pain or speed healing in a part of the body.

Psoriasis—A skin disease characterized by dry, scaling, whitish patches.

Scabies—A contagious skin disease caused by a mite and characterized by small, raised, red, very itchy pinprick bumps on the skin.

Tincture—An alcohol-based extract of a herb prepared by soaking plant parts in alcohol or a mixture of alcohol and water.

Tonic—A medicine given to strengthen and invigorate the body. Ashwaganda is frequently used as a tonic.

Vegan—Food products made without any animal products such as meat, milk, or eggs. A vegan diet is a nutrition regimen that excludes all animal products.

Indian ginseng

Ashwaganda is sometimes called the Indian ginseng because its actions and uses are in many ways similar to those of Chinese ginseng, although its cost is much lower. In Hindi, the name of ashwaganda means "horse smell." This unromantic name refers less to the herb's odor than to a horse's strength and health. Ashwaganda is supposed to impart that same horse-like strength to the people who use it.

Ashwaganda is an adaptogen. Adaptogens are substances that non-specifically enhance and regulate the body's ability to withstand **stress** and increase its general performance in ways that help the whole body resist disease. Ashwaganda is celebrated as an adaptogen that will do all of the following:

- boost strength
- increase stamina and relieve fatigue
- enhance sexual energy and rejuvenate the body
- strengthen the immune system
- speed recovery from chronic illness
- strengthen sickly children
- soothe and calm without producing drowsiness
- clarify the mind and improve memory
- slow the aging process

The powdered root of ashwaganda is normally used for whole body tonics that improve general health and well being. For most of these uses, ashwaganda is prepared as part of a *rasayana*, or rejuvenating formula that contains many different herbs. The use of ashwaganda in multi-herb formulas makes it difficult for modern laboratory scientists to assess its specific effects as an adaptogen.

Disease-specific uses

In addition to the whole body effects of ashwaganda, the plant is used for many other specific conditions. Different parts are used for different conditions. Ashwaganda is one of the most frequently used remedies in India. It is taken internally for:

- anemia
- arthritis
- asthma

- bronchitis
- cancer
- chronic fatigue syndrome
- colds
- coughs
- depression
- diarrhea
- fluid retention
- hemorrhoids
- hypertension
- hypoglycemia
- leprosy
- nausea
- rheumatism
- sexually transmitted diseases
- stomach ulcers
- systemic lupus erythematosus
- tuberculosis
- tumors

Ashwaganda can also be made into a poultice for external use, as it is thought to have antibacterial and antifungal properties. It is used to prevent infection in skin **wounds** and to treat skin diseases, including **psoriasis**, ringworm, and **scabies**.

Laboratory studies

University and medical researchers have been studying ashwaganda since at least the early 1960s. Chemical analysis shows that ashwaganda contains compounds thought to have anti-tumor, anti-inflammatory, and anti-fungal properties. Other compounds have been isolated that are associated with ashwaganda's sedative and anti-stress effects.

The most rigorous laboratory tests have been done in test tubes and on rats, mice, and other small laboratory animals. There is no proof that ashwaganda affects humans in the same way that it affects rodents. In animal studies, however, ashwaganda has been shown to have consistent anti-inflammatory, anti-fungal, anti-stress, and sedative effects. In one well-known study, extracts of ashwaganda root were shown to significantly increase the swimming endurance of rats in a test that is considered a classic stress test.

Experimenters have had mixed results in demonstrating anti-tumor and anti-cancer properties of ashwaganda. Many have found that extracts of ashwaganda root slow the growth of tumor cells in test-tube and small-animal experiments, but these results have not yet been reproduced in human subjects. Some researchers report that ashwaganda makes tumors more sensitive to chemotherapy and radiation therapy without increasing side effects caused by these therapies.

Although there is little doubt that ashwaganda contains biologically active compounds that produce some of the healing effects in humans that have been found in test tube and small animal studies, few controlled studies using people have been done. One drawback to arriving at conclusive evidence in humans is that most people take ashwaganda as part of a multi-herb tonic, making it difficult for researchers to attribute specific actions to any one particular component of the formula. Scientific interest in ashwaganda is high, and laboratory studies continue to be performed.

Preparations

Ashwaganda is available in many forms, including powders, decoctions, essential oil, tinctures, and teas made from the root, root bark, and the leaves. Commercially ashwaganda is available as capsules. The usual capsule dosage is 300 mg of powdered root, taken once or twice a day. Tincture dosage is often 2–4 ml (0.5–1 tsp) daily. Ashwaganda tea can be made by boiling the roots for about 15 minutes. Three cups a day is recommended. The fruit is often chewed to assist in convalescence from prolonged illness. These are simply representative doses and uses, since Ayurvedic medicine is highly individualized. The dose recommended depends on both the body type of the person and the nature of his or her illness.

Precautions

Ashwaganda is not recommended for use by pregnant women. Thousands of years of use have shown that this plant is quite safe. On the other hand, laboratory tests indicate that rats given high levels of ashwaganda root extract develop kidney lesions. This effect has not been seen in humans, but using the herb in moderation may be prudent.

Ashwaganda has a sedative effect on the central nervous system. It will enhance the effect of any other central nervous system sedatives (e.g., barbiturates or alcohol) that are taken at the same time. People operating heavy equipment or working in situations that require a high level of alertness should keep this in mind when using ashwaganda.

Side effects

No undesirable side effects have been reported with ashwaganda.

Interactions

There are few, if any, studies of how ashwaganda interacts with traditional Western medicines. It has been used for many years in combination with other Ayurvedic herbs without incident. Ayurvedic practitioners believe that when ashwaganda is combined with other herbs in rejuvenation formulas, it enhances the effects of these other herbs.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. London: Dorling Kindersley, 1996.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: William Morrow and Company, 1999.

ORGANIZATIONS

American School of Ayurvedic Sciences, 2115 112th Avenue NE, Bellevue, WA 98004, (425) 453 8002.

The Ayurvedic Institute, P. O. Box 23445, Albuquerque, NM 87112, (505) 291 9698.

OTHER

Plants for the Future: Withania somnifera aphrodisiaca. http://www.metalab.unc.edu.

Tish Davidson

Asthma

Definition

Asthma is a chronic inflammatory disease of the airways in the lungs. This inflammation periodically causes the airways to narrow, which produces **wheezing** and breathlessness, sometimes to the point where the patient gasps for air. This obstruction of the air flow either stops spontaneously or responds to a wide range of treatments. Continuing inflammation makes asthmatics hyper-responsive to such stimuli as cold air, **exercise**, dust, pollutants in the air, and even **stress** or **anxiety**.

Description

The American Academy of Allergy Asthma and Immunology (AAAAI) estimates that about 20 million Americans have asthma. That number has been rising since 1980. AAAAI also reports that nine million U.S. children under age 18 have been diagnosed with asthma. African Americans, Hispanics, American Indians, and Alaskan natives all have higher rates of asthma than whites or Asians in the United States.

Inhaled allergens most often triggering asthma attacks

- Air pollutants (e.g. tobacco smoke, strong odors, scented products)
- Animal dander
- Cockroach allergens
- Dust mites
- Indoor fungi (molds)
- Occupational allergens such as chemicals, fumes, particles of industrial materials
- Pollen

(Illustration by Corey Light. Cengage Learning, Gale)

Occupations associated with asthma

- Animal handling
- Bakeries
- Cleaning workers
- Health care
- Jewelry making
- Laboratory work
- Manufacturing detergents
- Nickel plating
- Soldering
- Snow crab and egg processing
- Tanneries

SOURCE: Occupational Safety and Health Administration, U.S. Department of Labor

(Illustration by Corey Light. Cengage Learning, Gale)

The changes that take place in the lungs of asthmatics make their airways (the bronchi and the smaller bronchioles) hyper-reactive to many different types of stimuli that do not affect healthy lungs. In an asthma attack, the muscle tissue in the walls of the bronchi goes into spasm, and the cells that line the airways swell and secrete mucus into the air spaces. Both these actions cause the bronchi to narrow, a change that is called bronchoconstriction. As a result, an asthmatic person has to make a much greater effort to breathe.

Cells in the bronchial walls, called mast cells, release certain substances that cause the bronchial muscle to contract and stimulate mucus formation. These substances, which include histamine and a group of chemicals called leukotrienes, also bring white blood cells into the area. Many patients with asthma are prone to react to substances such as pollen, dust, or animal dander. Substances that produce this reaction are called allergens. Many people with asthma do not realize that allergens are triggering their attacks. However, asthma also affects many patients who are not allergic in this way.

Asthma usually begins in childhood or adolescence, but it also may first appear in adult life. While the symptoms may be similar, certain important aspects of asthma are different in children and adults. When asthma begins in childhood, it often does so in a child who is likely, for genetic reasons, to become sensitized to common allergens in the environment. Such a child is known as an atopic person. In 2004, scientists in Helsinki, Finland, identified two new genes that cause atopic asthma. The discovery may lead to earlier prediction of asthma in children and adults. When these children are exposed to dust, animal proteins, fungi, or other potential allergens, they produce a type of antibody that is intended to engulf and destroy the foreign materials, which has the effect of making the airway cells sensitive to particular materials. Further exposure can lead rapidly to an asthmatic response. This condition of atopy is present in at least one-third and as many as one-half of the general population. When an infant or young child wheezes during viral **infections**, the presence of allergy (in the child or a close relative) is a clue that asthma may well continue throughout childhood. A third asthma gene was discovered in 2007 by a group of scientists from London, France, Germany, and the University of Michigan. The presence of the gene increases a person's chance of contracting asthma by at least 60%.

Allergenic materials may also play a role when adults become asthmatic. Asthma can start at any age and in a wide variety of situations. Many adults who are not allergic have such conditions as sinusitis or nasal polyps, or they may be sensitive to aspirin and related drugs. Another major source of adult asthma is exposure at work to animal products, certain forms of plastic, wood dust, metals, and environmental pollution.

Causes and symptoms

In most cases, asthma is caused by inhaling an allergen that sets off the chain of biochemical and tissue changes leading to airway inflammation, bronchoconstriction, and wheezing. Because avoiding (or at least minimizing) exposure is the most effective way of treating asthma, it is vital to identify the allergen or irritant causing symptoms in a particular patient. Once asthma is present, symptoms can be set off or made worse if the patient also has **rhinitis** (inflammation of the lining of the nose) or sinusitis. The reaction called acid reflux, when stomach acid passes back up the esophagus, can make asthma worse. In addition, a viral infection of the respiratory tract can inflame an asthmatic reaction. Aspirin and drugs called beta-blockers, often used to treat high blood pressure, also can worsen the symptoms of asthma. But the most important inhaled allergens giving rise to attacks of asthma are as follows:

- animal dander
- dust mites
- fungi (molds) that grow indoors
- cockroach allergens
- pollen
- occupational exposure to chemicals, fumes, or particles of industrial materials
- tobacco smoke
- air pollutants

In addition, there are three important factors that regularly produce attacks in certain asthmatic patients, and they may sometimes be the sole cause of symptoms. They are:

- cold air suddenly inhaled (cold-induced asthma)
- exercise-induced asthma (in certain children, asthma attacks are caused simply by exercising)
- stress or a high level of anxiety

Wheezing often is obvious, but mild asthmatic attacks may be confirmed when the physician listens to the patient's chest with a stethoscope. Besides wheezing and being short of breath, the patient may **cough** or report a feeling of tightness in the chest. Children may have **itching** on their back or neck at the start of an attack. Wheezing often is loudest when the patient exhales. Some asthmatics are free of

symptoms most of the time but may occasionally be short of breath for a brief time. Others spend much of their days (and nights) coughing and wheezing until properly treated. Crying or even laughing may bring on an attack. Severe episodes often are seen when the patient gets a viral respiratory tract infection or is exposed to a heavy load of an allergen or irritant. Asthmatic attacks may last only a few minutes or can go on for hours or even days. Being short of breath may cause a patient to become very anxious, sit upright, lean forward, and use the muscles of the neck and chest wall to help breathe. The patient may be able to say only a few words at a time before stopping to take a breath. Confusion and a bluish tint to the skin are clues that the oxygen supply is much too low and that emergency treatment is needed. In a severe attack, some of the air sacs in the lung may rupture so that air collects within the chest, which makes it even harder to breathe. The good news is that almost always patients, even with the most severe attacks, recover completely.

Diagnosis

Apart from listening to the patient's chest, the examiner looks for maximum chest expansion during inhalation. Hunched shoulders and contracting neck muscles are other signs of narrowed airways. Nasal polyps or increased amounts of nasal secretions are often noted in asthmatic patients. Skin changes, such as **dermatitis** or **eczema**, are a clue that the patient has allergic problems. Inquiring about a family history of asthma or **allergies** can be a valuable indicator of asthma. A test called spirometry measures how rapidly air is exhaled and how much is retained in the lungs. Repeating the test after the patient inhales a drug that widens the air passages (a bronchodilator) shows whether the narrowing of the airway is reversible, which is a very typical finding in asthma. Often patients use a related instrument, called a peak flow meter, to keep track of asthma severity when at home.

Frequently, it is difficult to determine what is triggering asthma attacks. Allergy skin testing may be used, although an allergic skin response does not always mean that the allergen being tested is causing the asthma. Also, the body's immune system produces an antibody to fight off the allergen, and the amount of antibody can be measured by a blood test. The blood test shows how sensitive the patient is to a particular allergen. If the diagnosis is still in doubt, the patient can inhale a suspect allergen while using a spirometer to detect airway narrowing. Spirometry also can be repeated after a bout of exercise if exercise-induced asthma is a possibility. A chest x-ray helps rule out other disorders.

Treatment

There are many alternative treatments available for asthma that have shown promising results. One strong argument for these treatments is that they try to avoid the drugs that allopathic treatment (combating disease with remedies to produce effects different from those produced by the disease) relies upon, which can be toxic and addictive. Mainstream journals have reported on the toxicity of asthma pharmaceuticals. A 1995 New Zealand study showed that before 1940, death from asthma was very low, but that the death rate promptly increased with the introduction of bronchodilators. The *New England Journal of Medicine* in 1992 reported that albuterol and other asthma drugs cause the lungs to deteriorate when used regularly. A 1989 study in the *Annals of Internal Medicine* showed that respiratory therapists, who are exposed to bronchodilator sprays, develop asthma five times more often than other health professionals, which could imply that the drugs themselves may induce asthma. Theophylline, another popular drug, has been reported to cause personality changes in users. Steroids can also have negative effects on many systems in the body, particularly the hormonal system. Thus, natural and non-toxic methods for treating asthma are the preferred first choice of alternative practitioners, while drugs are used to manage extreme cases and emergencies.

Alternative medicine tends to view asthma as the body's protective reaction to environmental agents and pollutants. As such, the treatment goal is often to restore balance to and strengthen the entire body and provide specific support to the lungs and to the immune and hormonal systems. Asthma sufferers can help by keeping a diary of asthma attacks in order to determine environmental and emotional factors that may be contributing to their condition.

Alternative treatments have minimal side effects, are generally inexpensive, and are convenient forms of self-treatment. They also can be used alongside allopathic treatments to improve their effectiveness and lessen their negative side effects.

Dietary and nutritional therapies

Some alternative practitioners recommend cutting down on or eliminating dairy products from the diet, as these increase mucus secretion in the lungs and are sources of food allergies. Other recommendations include avoiding processed foods, refined starches and

sugars, and foods with artificial additives and sulfites. **Diets** should be high in fresh fruits, vegetables, and whole grains, and low in salt. Asthma sufferers should experiment with their diets to determine if food allergies are playing a role in their asthma. Some studies have shown that a sustained vegan (zero animal foods) diet can be effective for asthma, as it does not contain the animal products that frequently cause food allergies and contain chemical additives. A vegan diet also eliminates a fatty acid called arachidonic acid, which is found in animal products and is believed to contribute to allergic reactions. A 1985 Swedish study showed that 92% of patients with asthma improved significantly after one year on a vegan diet. However, some people feel weaker on a vegan diet. In addition, many people are allergic to vegetables rather than to meat.

People with asthma should drink plenty of water, as water helps to keep the passages of the lungs moist. Onions and **garlic** contain **quercetin**, a flavonoid (a chemical compound/biological response modifier) that inhibits the release of histamine, and should be a part of an asthmatic's diet. Quercetin is also available as a supplement and should be taken with the digestive enzyme **bromelain** to increase its absorption.

As nutritional therapy, vitamins A, C, and E have been touted as important treatments for asthma. Also, the B complex vitamins, particularly B_6 and B_{12}, may be helpful for asthma sufferers, as well as **magnesium**, **selenium**, and an omega-3 fatty acid supplement such as **flaxseed** oil. A good multivitamin supplement also is recommended. In 2004, a study of supplements at Cornell University showed that high levels of beta-carotene and **vitamin C** along with selenium lowered risk of asthma. The same study found that **vitamin E** had no effect.

Herbal remedies

Chinese medicine has traditionally used *ma huang* for asthma attacks. Ma huang contains ephedrine, which is a bronchodilator once used in many drugs. However, the U.S. Food and Drug Administration (FDA) issued a ban on the sale of **ephedra** that took effect in April 2004 because it was shown to raise blood pressure and stress the circulatory system, resulting in heart attacks and strokes for some users. Manufacturers of ephedra raised legal challenges to this decision. When the U. S. Supreme Court refused to hear these challenges in 2007, the ban on ephedra became permanent.

Another herbal product, ginkgo, has been shown to reduce the frequency of asthma attacks, and **licorice** is used in Chinese medicine as a natural decongestant and expectorant. There are many formulas used in **traditional Chinese medicine** to prevent or ease asthma attacks, depending on the specific Chinese diagnosis given by the practitioner. For example, ma huang is used to treat so-called wind-cold respiratory ailments.

Other herbs used for asthma include **lobelia**, also called Indian tobacco; **nettle**, which contains a natural antihistamine; **thyme**; elecampane; **mullein**; **feverfew**; **passionflower**; **saw palmetto**; and Asian ginseng. Coffee and tea have been shown to reduce the severity of asthma attacks because **caffeine** works as a bronchodilator. Tea also contains minute amounts of theophylline, a drug commonly used to treat asthma. Ayurvedic (traditional East Indian) medicine recommends the herb *Tylophora asthmatica*.

Mind/body approaches

Mind/body medicine has demonstrated that psychological factors play a complex role in asthma. Emotional stress can trigger asthma attacks. Mind/body techniques strive to reduce stress and help people with asthma manage the psychological component of their condition. A 1992 study by Dr. Erik Peper at the Institute for Holistic Healing Studies in San Francisco used **biofeedback**, a treatment method that uses monitors to reveal physiological information to patients, to teach **relaxation** and deep breathing methods to 21 asthma patients. Eighty percent of them subsequently reported fewer attacks and emergency room visits. A 1993 study by Kaiser Permanente in Northern California worked with 323 adults with moderate to severe asthma. Half the patients got standard care while the other half participated in support groups. The support group patients had cut their asthma-related doctor visits in half after two years. A 2008 study conducted by Anita Kozyrskyj at the University of Manitoba (and her colleagues) found that children whose mothers were chronically stressed experienced a significantly higher rate of asthma that a control group. Some other mind/body techniques used for asthma include relaxation methods, **meditation**, **hypnotherapy**, mental imaging, **psychotherapy**, and visualization.

Yoga and breathing methods

Studies have shown that **yoga** significantly helps asthma sufferers, with exercises specifically designed to expand the lungs, promote deep breathing, and reduce stress. Pranayama is the yogic science of breathing, which includes hundreds of deep breathing techniques. These breathing exercises should be done

daily as part of any treatment program for asthma, as they are a very effective and inexpensive measure.

Controlled exercise

Many people believe that people with asthma should not exercise. This belief is especially common among parents of children with asthma. In a 2004 study, researchers reported that 20% of children with asthma do not get enough exercise. Many parents believe it is dangerous for their children with asthma to exercise, but physical activity benefits all children, including those with asthma. Parents should work with their children's healthcare providers and any coach or organized sport leader to carefully monitor the children's activities.

Acupuncture

Acupuncture can be an effective treatment for asthma. It is used in traditional Chinese medicine along with dietary changes. **Acupressure** can also be used as a self-treatment for asthma attacks and prevention. The Lung 1 points, used to stimulate breathing, can be easily found on the chest. These are sensitive, often knotted spots on the muscles that run horizontally about an inch below the collarbone, and about two inches from the center of the chest. The points can be pressed in a circular manner with the thumbs, while the head is allowed to hang forward and the patient takes slow, deep breaths. **Reflexology** also uses particular acupressure points on the hands and feet that are believed to stimulate the lungs.

Other treatments

Aromatherapists recommend **eucalyptus**, **lavender**, **rosemary**, and **chamomile** as fragrances that promote free breathing. In Japan, a common treatment for asthma is administering cold baths. This form of **hydrotherapy** has been demonstrated to open constricted air passages. Massage therapies such as **Rolfing** can help asthma sufferers as well, as they strive to open and increase circulation in the chest area. **Homeopathy** uses the remedies *Arsenicum album, Kali carbonicum, Natrum sulphuricum,* and *Aconite*.

Allopathic treatment

Allopaths recommend that asthma patients should be periodically examined and have their lung functions measured by spirometry. The goals are to prevent troublesome symptoms, to maintain lung function as close to normal as possible, and to allow patients to pursue their normal activities, including those requiring exertion. The best drug therapy is that which controls asthmatic symptoms while causing few or no side effects.

Drugs

The chief methylxanthine drug is theophylline. It may exert some anti-inflammatory effect and is especially helpful in controlling nighttime symptoms of asthma. When, for some reason, a patient cannot use an inhaler to maintain long-term control, sustained-release theophylline is a good alternative. The blood levels of the user must be measured periodically, as too high a dose can cause an abnormal heart rhythm or convulsions.

Beta-receptor agonists (drugs that trigger cell response) are bronchodilators. They are the drugs of choice for relieving sudden attacks of asthma and for preventing attacks from being triggered by exercise. Some agonists, such as albuterol, act mainly in lung cells and have little effect on the heart and other organs. These drugs generally start acting within minutes, but their effects last only four to six hours. They may be taken by mouth, inhaled, or injected. In 2004, a new lower concentration of albuterol was approved by the FDA for children ages two to 12.

Steroids are drugs that resemble natural body hormones. They block inflammation and are effective in relieving symptoms of asthma. When steroids are taken by inhalation for a long period, asthma attacks become less frequent as the airways become less sensitive to allergens. Steroids are the strongest medicine for asthma and can control even severe cases over the long term and maintain good lung function. However, steroids can cause numerous side effects, including bleeding from the stomach, loss of **calcium** from bones, **cataracts** in the eye, and a diabetes-like state. Patients using steroids for lengthy periods may also have problems with wound healing, may gain weight, and may suffer mental problems. In children who use steroids, growth may be slowed. Besides being inhaled, steroids may be taken by mouth or injected to rapidly control severe asthma.

Leukotriene modifiers are among a newer type of drug that can be used in place of steroids, for older children or adults who have a mild degree of persistent asthma. They work by counteracting leukotrienes, which are substances released by white blood cells in the lung that cause the air passages to constrict and promote mucus secretion. Other drugs include cromolyn and nedocromil, which are anti-inflammatory drugs that often are used as initial treatments to prevent long-term asthmatic attacks in children. Montelukast **sodium** (Singulair) is a drug taken daily that is

used to help prevent asthma attacks rather than to treat an acute attack. In 2004, the FDA approved an oral granule formula of Singulair for young children.

If a patient's asthma is caused by an allergen that cannot be avoided and it has been difficult to control symptoms by drugs, immunotherapy may be worth trying. In a typical course of immunotherapy, a patient is injected with increasing amounts of the allergen over a period of three to five years, so that the body can build up an effective immune response. There is a risk that this treatment may itself cause the airways to become narrowed and bring on an asthmatic attack. Not all experts are enthusiastic about immunotherapy, although some studies have shown that it reduces asthmatic symptoms caused by exposure to dust mites, ragweed pollen, and cats.

Managing asthmatic attacks

A severe asthma attack should be treated as quickly as possible. It is most important for a patient suffering an acute attack to be given extra oxygen. Rarely, it may be necessary to use a mechanical ventilator to help the patient breathe. A beta-receptor agonist is inhaled repeatedly or continuously. If the patient does not respond promptly and completely, a steroid is given. A course of steroid therapy, given after the attack is over, will make a recurrence less likely.

Long-term allopathic treatment for asthma is based on inhaling a beta-receptor agonist using a special inhaler that meters the dose. Patients must be instructed in proper use of an inhaler to be sure that it will deliver the right amount of drug. Once asthma has been controlled for several weeks or months, it is worth trying to cut down on drug treatment, but this tapering must be done gradually. The last drug added should be the first to be reduced. Patients should be seen every one to six months, depending on the frequency of attacks. Starting treatment at home, rather than in a hospital, makes for minimal delay and helps the patient to gain a sense of control over the disease. All patients should be taught how to monitor their symptoms so that they will know when an attack is starting. Those with moderate or severe asthma should know how to use a flow meter. They also should have a written plan to follow if symptoms suddenly become worse, including how to adjust their medication and when to seek medical help. If more intense treatment is necessary, it should be continued for several days. When deciding whether a patient should be hospitalized, the physician must take into account the patient's past history of acute attacks, severity of symptoms, current medication, and the availability of good support at home.

Expected results

Most patients with asthma respond well when the best treatment or combination of treatments is found, and they are able to lead relatively normal lives. Patients who take responsibility for their condition and experiment with various treatments have good chances of keeping symptoms minimal. Having urgent measures to control asthma attacks and ongoing treatment to prevent attacks are important as well. More than one half of affected children stop having attacks by the time they reach 21 years of age. Many others have less frequent and less severe attacks as they grow older. A small minority of patients will have progressively more trouble breathing. Because they run a risk of going into respiratory failure, they must receive intensive treatment.

Prevention

Prevention is extremely important in the treatment of asthma, which includes eliminating all possible allergens from the environment and diet. Homes and work areas should be as dust and pollutant-free as possible. Areas can be tested for allergens and high-quality air filters can be installed to clean the air. If the patient is sensitive to a family pet, removing the animal or at least keeping it out of the bedroom (with the bedroom door closed) is advised. Keeping the pet away from carpets and upholstered furniture, and removing all feathers also helps. To reduce exposure to dust mites, practitioners recommend removal of wall-to-wall carpeting, keeping the humidity low, and using special pillows and mattress covers. Cutting down on stuffed toys and washing them each week in hot water is advised for children with asthma. If cockroach allergen is causing asthma attacks, controlling the roaches (using traps or boric acid) can help.

It is important not to leave food or garbage exposed. Keeping indoor air clean by vacuuming carpets once or twice a week (with the asthmatic person absent) and avoiding use of humidifiers is advised. Those with asthma should avoid exposure to tobacco smoke and should not exercise outside when air pollution levels are high. When asthma is related to exposure at work, taking all precautions, including wearing a mask and, if necessary, arranging to work in a safer area, is recommended. For chronic sufferers who live in heavily polluted areas, moving to less polluted regions may be a viable alternative.

KEY TERMS

Allergen—A foreign substance that causes the airways to narrow and produces symptoms of asthma when inhaled.

Atopy—A state that makes persons more likely to develop allergic reactions of any type, including the inflammation and airway narrowing typical of asthma.

Bronchodilator—A type of medication that acts to open up bronchial tubes that have constricted in an asthmatic attack.

Hypersensitivity—A condition in which very small amounts of allergen can cause the airways to constrict and bring on an asthmatic attack.

Leukotrienes—Substances that are produced by white blood cells in response to antigens and contribute to inflammatory and asthmatic reactions.

Pranayama—Breathing techniques taught in yoga.

Quercetin—A flavonoid (chemical compound/biological response modifier) found in onions and garlic that may be a useful dietary supplement for asthma patients.

Vegan diet—A vegetarian diet that excludes meat and dairy products.

Resources

BOOKS

Byrne Ralfs, Christine, and Patrick McKeown. *Stop Asthma Naturally: Incorporating the Buteyko Breathing Method* Vancouver, Canada: Buteyko Books, 2007.

Cutler, Ellen W. *Winning the War against Asthma and Allergies* (Rev. ed.). New York: Delmar, 2007.

Kendall, Kent P. *Allergy and Asthma Control Naturally*. West Conshohocken, PA: Infinity Press, 2005.

PERIODICALS

"Clinical Applications of Complementary and Alternative Medicine for Asthma." *Alternative & Complementary Therapies* (October 1, 2007): 235 238.

"Complementary and Alternative Medicine Use in Asthma: Who is Using What?" *Respirology* (July 2006): 373 387.

"How Does Exercise Cause Asthma Attacks?" *Current Opinion in Allergy and Clinical Immunology* (February 2006): 37 42.

"New Protein Discovered at Yale May Play a Role in Severe Asthma." *Expert Review of Molecular Diagnostics* (January 2008): 5 7.

ORGANIZATIONS

Allergy and Asthma Magazine, 702 Marshall St., Suite 611, Redwood City, CA, 94063, (605) 780 0546.

Asthma and Allergy Foundation of America, 1125 Fifteenth St. NW, Suite 502, Washington, DC, 20005, (800) 7ASTHMA, http://www.aafa.org.

Center for Complementary and Alternative Medicine Research in Asthma, Allergy, and Immunology. University of California at Davis, 3150B Meyer Hall, Davis, CA, 95616, (916) 752 6575, http://www camra.ucdavis.edu.

David Newton

Astigmatism

Definition

Astigmatism is visual distortion caused by a misshapen cornea. The cornea acts as a focusing lens for the eye. If the cornea does not have the proper shape, the eye is unable to properly focus an image. Most people have a certain degree of astigmatism. Corrective measures are necessary only in cases in which the distortion is severe.

Description

Light rays entering a normal eye come to a point of focus on the retina through a transparent, dome-shaped layer called the cornea. In astigmatism, an unequal curvature of the cornea causes the light rays to come to focus at more than one point on the retina, and as a result, the person sees a blurred or doubled image. Astigmatism is usually present at birth and may increase during childhood as the eye tissue develops. Usually the degree of astigmatism remains fairly constant throughout adulthood.

Causes and symptoms

It is unknown why some people develop a misshapen cornea. It is possible that astigmatism is an inherited trait. Factors such as **stress**, continual reading in dim lighting, or excessive close-up work may also contribute to the development of astigmatism. It is sometimes caused by pressure from chalazion, a condition that causes the eyelid to swell; from scars on the cornea; or from keratoconus, a condition that involves swelling of the cornea. The main symptom of astigmatism is blurred or distorted vision. Some patients may also experience a history of headaches, eye strain, **fatigue**, and double vision.

Diagnosis

The standard eye examination with a refraction test, given by an optometrist or ophthalmologist, is used to determine the presence of astigmatism. An instrument called a keratometer is used to measure the cornea and calculate the shape of the required corrective lens.

Treatment

The **Bates method** or other type of visual training may be helpful in improving vision and reducing symptoms. Practitioners of alternative medicine may recommend the homeopathic remedies *Ruta graveolens* (from common rue) and *Apis mellifica* (from the honey bee) to relieve eyestrain, one of the main symptoms and possible contributors to astigmatism. They may also suggest **acupuncture** treatment and **traditional Chinese medicine** that have implications for the liver because the liver system is believed to be connected to eye functions. Certain treatments are prescribed to strengthen and correct the skewing of the Liver qi. (*Qi* is the flow of energy in the body. It is sometimes associated with certain organs.)

Allopathic treatment

Astigmatism can be most simply treated with either eyeglasses or contact lenses. The lenses are designed to counteract the shape of the sections of cornea that are causing difficulty. Contact lenses that are used to correct astigmatism are called toric lenses. In the past, only hard contact lenses could treat most cases of astigmatism, but soft contact lenses are now available for all but the most complex prescriptions. The options for keratoconus include soft lenses (for some mild to moderate cases), hard contact lenses, corneal implants, or, in some cases, corneal transplants.

Refractive surgery can be performed to correct the curvature of the cornea. The three most commonly used types are photorefractive keratectomy (PRK), laser-assisted *in situ* keratomileusis (LASIK), and laser-assisted subepithelial keratomileusis (LASEK). In PRK, a laser is used to improve the shape of the cornea by removing micro-thin slices. In LASIK, a flap of the cornea is lifted to reveal the underlying corneal tissue, which is shaved to improve the shape. LASEK is similar to LASIK, but the corneal flap is typically much thinner. LASEK is often recommended for people who are at high risk for eye injury.

KEY TERMS

Chalazion—A condition in which clogging of the meibomiam gland causes a cyst inside the eyelid.

Keratoconus—A progressive condition in which the cornea takes on a cone shape, causing major changes in the eye's refractive power.

Refraction—The turning or bending of light waves as the light passes from one medium or layer to another. In the eye, it means the ability of the eye to bend light so that an image is focused onto the retina.

Refractive surgery—Eye surgery to correct a defect in the eye's ability to focus accurately on an image.

Retina—The substance of the eye, made of nerve tissue. It receives and transmits images to the brain.

These may include individuals who engage in contact sports.

Refractive surgery requires a high level of expertise. Anyone considering it should make sure that the surgeon has a high level of experience in the procedure and should engage in an in-depth discussion of the possible side effects and risks of the procedure. For instance, patients with flatter corneas may experience more light distortion than those with curved corneas.

Expected results

Effects of astigmatism can generally be greatly improved with eyeglasses or contact lenses. Refractive surgery may diminish the need for lenses or make them unnecessary altogether. The major risks of surgery include chronic visual problems, injury to the eye tissue, infection, and over- or under-correction, which would still leave some astigmatism. Complications may require the use of medication or further surgery.

Resources

BOOKS

Gaby, Alan R., and the Healthnotes Medical Team. *The Natural Pharmacy,* 3rd ed. New York: Three Rivers Press, 2006.

Rosenfarb, Andy. *Healing Your Eyes with Chinese Medicine: Acupuncture, Acupressure, & Chinese Herbs*. Berkeley, CA: North Atlantic Books, 2007.

OTHER

"Astigmatism." American Optometric Association. http://www.aoa.org/x4698.xml. (March 25, 2008).

"Astigmatism." Merck Source. August 8, 2006. http://www.mercksource.com/pp/us/cns/cns_hl_adam.jspzQzpgzEzzSzppdocszSzuszSzcnszSzcontentzSzadamzSzencyzSzarticlezSz001015zPzhtm. (March 25, 2008).

Patience Paradox
Teresa G. Odle
Leslie Mertz, Ph.D.

Aston-Patterning

Definition

Aston-Patterning is an integrated system of movement education, bodywork, ergonomic adjustments, and fitness training that recognizes the relationship between the body and mind for well being. It helps people who seek a remedy from acute or chronic **pain** by teaching them to improve postural and movement patterns.

Origins

Aston-Patterning is a process originated by Judith Aston in 1977. After graduating from college with an advanced degree in dance, Aston began working with athletes, dancers, and actors in movement education programs in California. In 1968, she suffered injuries from two automobile accidents. In seeking relief from pain, she met Dr. Ida Rolf, the developer of **Rolfing**. When Aston recovered from her injuries, Rolf asked her to develop a movement education program that would complement the gains achieved with Rolfing. She worked with Rolf in creating this program from 1971 to 1977.

By 1977, Aston and Rolf's interests and views of bodywork had diverged. Aston left Rolf and established her own techniques, which she called Aston-Patterning. She has also developed a special program for older people called the Aston-Patterning Fitness Program for Seniors. Aston-Patterning is a registered trademark of the Aston Paradigm Corporation, of which Judith Aston is president. Aston Enterprises sells a line of patented products to go along with the Aston-Patterning program.

Benefits

Aston-Patterning assists people in finding more efficient and less stressful ways of performing the simple movements of everyday life in order to dissipate tension in the body. This change is achieved through massage, alteration of the environment, and fitness training.

Description

Seeking to solve movement problems, Aston-Patterning helps make the most of each individual's own body type rather than trying to force everyone to conform to an ideal. Unlike Rolfing, it does not strive for linear symmetry. Rather, it works with asymmetry in the human body to develop patterns of alignment and movement that feel right to the individual. Aston also introduced the idea of working in a three-dimensional spinal pattern.

Aston-Patterning sessions have four general components:

- a personal history that helps the practitioner assess the client's needs
- pre-testing, in which the practitioner and the client explore patterns of movement and potential for improvement
- movement education and bodywork, including massage, myofacial release, and arthrokinetics, to help release tension and make new movement patterns easier
- post-testing, when pre-testing movements are repeated, allowing the client to feel the changes that have taken place and integrate them into daily life

Aston-Patterning requires more participation from the client than many bodywork techniques. The massage aspect of Aston-Patterning is designed around a three-dimensional, non-compressive touch that releases patterns of tension in the body. It is gentler than Rolfing. Myokinetics uses touch to release tension in the face and neck. Arthrokinetics addresses tension at bones and joints. This massage is accompanied by education about the establishment of new movement patterns.

In addition to Aston-Patterning sessions, clients are helped to examine their environment for factors, such as seating or sleeping arrangements, that may limit their body function and introduce tension. Finally, they may choose to participate in the Aston fitness training program that includes loosening techniques based on self-massage, toning, stretching, and cardiovascular fitness.

Preparations

Since clients typically work with an Aston-Patterning practitioner for extended periods, it is important that they feel comfortable with their specific

JUDITH ASTON

Judith Aston was born in Long Beach, California. She graduated from University of California at Los Angeles with a B.A. and a M.F.A. in dance. Her interest in movement arose from working as a dancer. In 1963 Aston established her first movement education program for dancers, actors, and athletes at Long Beach City College.

Five years later, while recovering from injuries sustained during two consecutive automobile accidents, Aston met Ida Rolf, the developer of Rolfing. Aston began working for Rolf, teaching a movement education program called Rolf Aston Structural Patterning that emphasized using the body with minimum effort and maximum precision.

In time, Rolf and Aston's views on movement diverged, and the partnership was dissolved in 1977. Aston formed her own company called the Aston Para digm Corporation in Lake Tahoe, California. This com pany provides training and certification for Aston practitioners. She also began exploring how environmen tal conditions affect body movement, foreshadowing the ergonomic movement in the workplace that developed in the 1990s. Over time, Aston has expanded her movement work to include a fitness program for older adults. Today, Judith Aston serves as director of Aston Paradigm Corporation.

practitioner. Certified Aston practitioners recommend that prospective clients make a get-acquainted visit before enrolling in a course of treatment.

Precautions

Aston-Patterning can be quite demanding. People with any of the following diseases or disorders should consult a physician before undertaking a course of Aston-Patterning:

- Heart conditions.
- Diabetes. Because diabetes affects blood circulation, diabetics taking Aston-Patterning should ask the practitioner to avoid massage of the legs and feet.
- Carpal tunnel syndrome. Aston-Patterning may worsen the pain associated with this disorder.
- Respiratory disorders, including asthma and emphysema.
- Osteoporosis. The deep tissue massage in Aston-Patterning may cause hairline fractures in brittle bones.
- Bleeding disorders and other disorders requiring treatment with anticoagulant or corticosteroid medications. Drugs in these categories can make the tissues fragile.
- Disorders requiring medications that affect the sense of balance.
- Post-traumatic stress syndromes. People suffering from acute stress disorder, post-traumatic stress disorder (PTSD), or other emotional disorders related to trauma or abuse should consult a psychotherapist as well as a physician before undertaking any form of bodywork. The physical contact involved in Aston-Patterning may cause flashbacks or bring up emotional and psychological issues.

The Aston-Patterning program can be modified to meet the needs of older adults, those in poor health, or persons with special rehabilitation requirements.

Side effects

Most clients of Aston-Patterning report a diminution of tension, improved ease of movement, and an enhanced feeling of well-being. Some clients, however, do report side effects, the most common being pain and exhaustion. To minimize side effects, clients should give the practitioner as much feedback as possible during sessions.

Research and general acceptance

Aston-Patterning is an outgrowth of Rolfing, which has been shown to be of benefit in a limited number of controlled studies. Little controlled research has been done on either the benefits or limitations of Aston-Patterning; as of 2007, no reports had been published in any peer-reviewed medical, alternative medical, or bodywork journals. Its claims have been neither proven nor disproved, although anecdotally many clients report relief from pain and tension as well as improved body movement. Aston-Patterning is a member of the International Alliance of Healthcare Educators (IAHE), and Judith Aston is a frequent speaker at IAHE conferences. In addition, Aston's postural assessment workbook is used by practitioners in other fields of bodywork and physical therapy.

Training and certification

The Aston Training Center in Incline Village, Nevada, offers courses and certification and promotes a code of ethics among its practitioners. Certification

KEY TERMS

Bodywork—Any healing technique involving hands-on massage or manipulation of the body.

Ergonomics—A branch of applied science that coordinates the physical design and arrangement of furniture, machines, and other features of a living or working environment with the needs and requirements of the individuals in that environment.

Rolfing—Developed by Dr. Ida Rolf (1896 1979), rolfing is a systematic approach to relieving stress patterns and dysfunctions in the body's structure through the manipulation of the highly pliant myofacial (connective) tissue. It assists the body in reorganizing its major segments into vertical alignment.

must be renewed frequently. As of 2008, there were certified Aston-Patterning practitioners in fifteen states, with the largest concentrations in California, Washington, and Massachusetts. Certified Aston-Patterning practitioners also were found in Australia, New Zealand, Canada, and the United Kingdom. Some Aston-Patterning practitioners are cross-certified in **Pilates**.

Resources

BOOKS

Aston, Judith. *Aston Postural Assessment Handbook: Skills for Observing and Evaluating Body Patterns*. San Antonio, TX: Therapy Skill Builders, 1998.

ORGANIZATIONS

Aston Training Center, PO Box 3568, Incline Village, NV, 89450, (775) 831 8228, http://www.astonenterprises.com.

International Alliance of Healthcare Educators (IAHE), 11211 Prosperity Farms Road, D 325, Palm Beach Gardens, FL, 34410, (561) 622 4334, www.iahe.com.

Tish Davidson, A. M.

Astragalus

Description

Astragalus, also called milk vetch root, is the root of the *Astragalus membranaceus* plant, which is a member of the pea family. This perennial grows to a height of 2–4 ft. (5–10 cm). It has white or yellow flowers and leaves with 10–18 pairs of leaflets. The large yellow taproots of four- to seven-year-old plants

Astragalus is a good source of selenium, an antioxidant and immune system stimulant. *(© CuboImages srl / Alamy)*

are used for medicinal purposes. Although there are many varieties in the *Astragalus* family, *Astragalus membranaceus* is the sole medicinal type. The plant is found only in the grasslands and mountains of central and western Asia, principally in China, Taiwan, and Korea. Astragalus is a good source of **selenium**, an antioxidant and immune system stimulant.

General use

Astragalus is called *Huang Qi* in **traditional Chinese medicine** (TCM) and is considered to be an important tonic herb. It is used to strengthen what is called the *wei qi*, or the defensive energy of the body against disease. TCM identifies astragalus as being helpful in conditions involving the Spleen, the Lungs, and the Triple Burner. It is a warming tonic, and it improves the functioning of the qi (the flow of energy in the body), the Spleen, the Blood, and the fluids of the body. Astragalus is recommended for Spleen deficiency symptoms, such as **diarrhea**, **fatigue**, sweating, and lack of appetite. It is used as a tonic for the Lungs and is good for shortness of breath, **asthma**, and chronic lung problems. Astragalus is prescribed for arthritis, diarrhea, and nervous symptoms. It is often given to people who are in a state of generally poor or weakened health.

Astragalus is classified as an adaptogen, an herb that increases the body's endurance and resistance to a wide array of physical, chemical, and biological stressors. Adaptogens help normalize the functioning of various body systems by affecting the action of hormones. Adaptogens are usually beneficial in treating chronic conditions. They have been found to enhance the immune response, reduce inflammation, stabilize blood sugar, and support the hormone systems, particularly the adrenal and pituitary glands. Adaptogens

should be used for an extended period of time—at least six weeks.

Astragalus helps the body function at its best level. It helps the body deal with **stress** and enhances overall immune function. It has been shown to stimulate production and activation of the white blood cells, which fight infection. It is highly recommended for preventing and alleviating colds and flu. Astragalus can be used to cure chronic weaknesses of the lungs. Because it improves blood circulation and heart function, astragalus is useful in treating **heart disease**. It has also been found to prevent or reduce blood clotting. Astragalus can be taken as a tonic for the kidneys. It has a diuretic (urine-producing) effect and so it flushes out the urinary system. It is thus very effective in treating **kidney infections**, proteinuria (too much protein in the urine), chronic prostate problems, and chronic urinary tract problems.

Astragalus is helpful to those taking chemotherapy and radiation treatments. It reduces toxic side effects and enhances therapeutic effects. **Cancer** patients who take astragalus during or after cancer treatments tend to recover more quickly from the ill effects of the treatment, and they generally have better survival rates. This appears to be connected with the strengthening of the immune system. Astragalus also stimulates the adrenal glands, whose functions are suppressed in cancer. The herb improves poor appetite, diarrhea, weakness, wasting, and night sweats. This makes it helpful for cancer patients as well as **AIDS** patients and those with other debilitating diseases.

Astragalus is recommended as a tonic for the elderly. It protects cells from the **aging** process and may diminish other negative effects of aging. For example, it strengthens digestion, stimulates the appetite, and helps improve mental functioning. Astragalus shows promise in the treatment of Alzheimer's disease. By itself or in combinations, it may be useful in treating viral **infections**, **hypoglycemia**, **diabetes mellitus**, chronic ulcers, **insomnia**, **hyperthyroidism**, **chronic fatigue syndrome**, open **wounds**, liver problems, **sexual dysfunction**, fertility problems, and autoimmune diseases.

KEY TERMS

Adrenal glands—Glands atop the kidneys that produce hormones.

Blood—In TCM, it is the fluid that transports physical and emotional nourishment.

Heat condition—A disease whose symptoms include fever, rashes, redness, dehydration, and inflammation.

Lungs—In TCM, the parts of the body associated with breathing, such as the lungs and the skin. It also regulates the movement of water and qi through the body channels.

Qi—In the TCM system, the underlying force that controls the body's movement, resistance to disease, use of nourishment, tissue integrity, and temperature. It circulates through channels, or pathways, called meridians.

Spleen—In TCM, the system of organs that includes the pancreas, large muscles, the lips, the eyelids, the lymph system, and the spleen. It also includes the functions that extract nourishment and convert it into qi and Blood.

Triple Burner—The pathways and relationships between the Spleen, the Lungs and the Kidney.

Preparations

Astragalus is available as a capsule, a tablet, a tincture, as part of an herbal combination, as a prepared tea, and as a sweet dried root that can be eaten or made into tea. Traditionally, several slices of the root are often added to soups and stews. A strong tea can be made by boiling three ounces of astragalus root in three cups of water and letting the mixture steep for at least five minutes. Two or three cups of the unheated tea can be taken over the course of a day. In tincture form, 30–60 drops of astragalus can be taken four times per day. Candied roots can be purchased ready-made or prepared in the home. Preparation involves combining four parts of the dried root with one part honey in water, then simmering until the herb is dried and brownish. In TCM, astragalus ointments are used to heal wounds, particularly those that are slow to heal.

Precautions

Since astragalus is a warming herb, its use should be avoided in heat conditions, such as fevers or agitated states. *Astragalus membranaceus* is the only species of its family to have a medicinal use; other species may be toxic. Therefore, local Western varieties should not be used. Use only the root portion of the plant; other parts of the plant may be poisonous.

Side effects

Sometimes individuals experience a slight stomach upset or allergic reaction to astragalus. However, it is generally a very safe herb, even at high doses.

Interactions

Astragalus increases the effectiveness of other herbs when used in combinations. It is often used with **Siberian ginseng**, *Eleutherococcus senticosus; Echinacea spp.;* **dong quai**, *Angelica sinensis;* and *Lingusticum wallichi.* Astragalus may interfere with the actions of diuretics, phenobarbital, beta-blockers, and anticoagulants (substances that prevent blood clotting). Users of these medications should consult a healthcare provider before using the herb.

Resources

BOOKS

Graedon, Joe, and Teresa Graedon. *The People's Pharmacy Guide to Home and Herbal Remedies*. New York: St. Martin's Press, 1999.

Green, James. *The Male Herbal: Health Care for Men and Boys*. Freedom, Calif.: Crossing Press, 1991.

Hart, Carol, and Magnolia Goh. *Traditional Chinese Medi cine: The A Z Guide to Natural Healing from the Orient*. New York: Dell, 1997.

OTHER

"Astragalus." *Go Symmetry*. http://www.go symmetry.com/astragalus.htm.

"Astragalus." *The Herbalist*. http://www.theherbalist.com/astragal.htm.

"Astragalus." *HerbsHerbals.com*. http://www.herbsherbals.com/astragalus.html.

"Astragalus." *Pro Health International*. http://www.planet.eon.net/~wiggles/astra1galus.htm.

Patience Paradox

Atherosclerosis

Definition

Atherosclerosis is the build up of plaque on the inside of arteries, the blood vessels that carry blood from the heart to the rest of the body. Atherosclerosis is a specific form of arteriosclerosis, which is a general term for hardening of the arteries. The two terms are sometimes used interchangeably.

Description

Atherosclerosis, a progressive condition responsible for most **heart disease**, is a type of hardening of the arteries. It can be caused by normal **aging** processes, by high blood pressure, and by some diseases such as diabetes. Atherosclerosis can begin in the late teens, but it usually takes decades for the signs and symptoms of the disease to be apparent. Some people experience rapidly progressing atherosclerosis in their 30s or later.

An artery is made up of several layers: an inner lining called the endothelium, an elastic membrane that allows the artery to expand and contract, a layer of smooth muscle, and a layer of connective tissue. Atherosclerosis affects the inner lining of an artery. It is characterized by plaque deposits that reduce or block the flow of blood. Plaque is made of fatty substances, **cholesterol**, waste products from the cells, **calcium**, **iron**, and fibrin, a material that helps blood to clot.

As plaque builds up in and around the cells of the artery walls, they accumulate calcium. The innermost layer thickens, the artery's diameter is reduced, and blood flow and oxygen delivery are decreased. Plaque can rupture or crack open, causing the sudden formation of a blood clot, a process called thrombosis. As a result of thrombosis and/or the buildup of plaque, atherosclerosis can cause a **heart attack** if it completely blocks the blood flow in the coronary arteries. It can cause a **stroke** if it completely blocks the carotid arteries of the brain. Atherosclerosis can also occur in the arteries of the neck, kidneys, thighs, and arms, and may lead to kidney failure, **gangrene**, and even death.

Causes and symptoms

Scientists believe that atherosclerosis is caused by the body's response to damage to the artery wall from cholesterol, high blood pressure, and cigarette **smoking**. A person who has all three of these risk factors is eight times as likely to develop atherosclerosis as is a person who has none of the factors. Physical inactivity, damage by oxidants, diabetes, and **obesity** are also risk factors for atherosclerosis. High levels of the amino acid homocysteine and abnormal levels of fats called lipoproteins also raise the risk. Other risk factors include:

- High triglycerides. Most fat in food and in the body takes the form of triglycerides. Blood triglyceride levels above 400 mg/dL have been linked to atherosclerosis.

- Physical inactivity. Lack of exercise increases the risk of atherosclerosis.
- Diabetes mellitus. The risk of developing atherosclerosis is seriously increased for diabetics and can be lowered by keeping diabetes under control. Many diabetics die from heart attacks caused by atherosclerosis.
- Obesity. Excess weight increases the strain on the heart and increases the risk of developing atherosclerosis, even if no other risk factors are present.
- Heredity. People whose parents have coronary artery disease, atherosclerosis, or stroke at an early age are at increased risk.
- Sex. Before age 60, men are more likely to have heart attacks than women.
- Age. Risk is higher in men who are 45 years of age and older and women who are 55 years of age and older.

The symptoms of atherosclerosis differ depending upon the location. They may involve:

- In the coronary (heart) arteries: chest pain, heart attack, and sudden death.
- In the carotid arteries of the brain: sudden dizziness, weakness, loss of speech, and blindness.
- In the femoral arteries of the legs: cramping and fatigue in the calves of the legs when walking.
- In the renal arteries of the kidneys: high blood pressure resistant to treatment.

Diagnosis

Physicians may be able to make a diagnosis of atherosclerosis during a physical examination by listening to the activity of the arteries and the heart with a stethoscope and probing them with the hands. More definitive tests are usually called for, however. These include an electrocardiogram, which shows the heart's activity; **exercise** electrocardiography, more familiarly known as a **stress** test, conducted while the patient exercises on a treadmill or a stationary bike; echocardiography, a type of ultrasound using sound waves to create an image of the heart's chambers and valves; and ultrasonography to assess arteries of the neck and thighs.

Radionuclide angiography and thallium scanning use radioactive material injected into the bloodstream. These tests enable physicians to see the blood flow through the coronary arteries and the heart chambers and to record pictures of the heart. Coronary angiography is the most accurate diagnostic method for atherosclerosis, and it is also the only invasive procedure. A cardiologist inserts a catheter equipped with a viewing device into a blood vessel in the leg or arm and guides it into the heart. A contrast dye makes the heart visible to x rays. Motion pictures are taken of the dye flowing though the arteries, and plaques and blockages are well defined.

Treatment

The most common treatments focus on dietary and lifestyle changes to reduce cholesterol and other problems that contribute to atherosclerosis. Dietary modifications usually incorporate eating foods that are low in saturated fats, cholesterol, sugar, and animal proteins. **Diets** should include foods high in fiber, such as fresh fruits and vegetables, and whole grains. By consuming fruits and vegetables, a person also consumes helpful dietary **antioxidants**, such as **carotenoids** found in vegetable pigments, and bioflavenoids in fruit pigments. Nutritionists also recommend liberal use of onions and **garlic**, as well as fish, especially cold–water fish, such as salmon. Smoking, alcohol, and coffee are to be avoided, and exercise is strongly recommended. Several well-known programs are available, such as those created by Nathan and Robert Pritikin and Dean Ornish. These programs may be helpful in setting up and maintaining dietary and lifestyle programs.

Herbal remedies for atherosclerosis include garlic (*Allium sativum*), **ginger** (*Zingiber officinale*), **hawthorn** (*Crataegus oxycantha*), *Ginkgo biloba*, and **Siberian ginseng** root (*Eleutherococcus senticosus*). Gugulipids, or **myrrh** (*Commiphora molmol*) is highly regarded for its ability to lower cholesterol and triglyceride levels. Other herbs with this ability include **alfalfa** (*Medicago sativum*), **turmeric** (*Curcuma longa*), Korean ginseng (*Panax ginseng*), and **fenugreek** (*Trigonella foenum-graecum*). Atherosclerosis is a complex condition. Therefore, a knowledgeable practitioner of herbal healing should be consulted for recommendations on the right combination of herbs and dosages.

Chelation therapy involves injecting a drug called EDTA and drug taken orally called DMSA, together with nutrients into the bloodstream. These drugs work either by binding to the calcium in plaque and transporting it for excretion, or by acting as an antioxidant, or by both methods. Chelation therapy has shown some success, but it remains a controversial method.

Several disciplines can offer helpful long-term treatment strategies for those with atherosclerosis. A knowledgeable practitioner should be consulted. **Ayurvedic medicine** practitioners combine diet, herbal remedies, **relaxation**, and exercises. A homeopath will prescribe a treatment regimen based on a

complete assessment of the patient. A **traditional Chinese medicine** practitioner may prescribe a combination of herbs such as siler (*Ledebouriellla divaricata*), *Platycodon grandiflorum*, *Polygonum multiflorum,* and *Bupleurum chinense*. **Acupuncture** and massage may be recommended, particularly for the accompanying circulatory problems. A homeopath will prescribe remedies based on an in-depth interview and evaluation.

Stress is known to worsen blood pressure and atherosclerosis, and hasten the progression of the disease. Therapeutic relaxation techniques are, therefore, helpful adjuncts to treatment. Recommended approaches include **yoga**, **meditation**, **guided imagery**, **biofeedback**, and counseling. A 2002 study showed that transcendental meditation, when combined with diet, exercise, and antioxidant food supplements, contributed to nearly a 33% reduction in long-term risk for heart attack and stroke in some patients.

Allopathic treatment

Allopathic treatment includes medications, balloon angioplasty, and coronary artery bypass surgery. Most of the drugs prescribed for atherosclerosis seek to improve conditions that contribute to the disease, such as high cholesterol, **blood clots**, or high blood pressure.

Angioplasty and bypass surgery are invasive procedures that improve blood flow in the coronary arteries. Coronary angioplasty is performed by a cardiologist. It is a procedure in which a catheter tipped with a balloon is threaded from a blood vessel in the thigh into the blocked artery. When the balloon is inflated, it compresses the plaque and enlarges the blood vessel to open the blocked artery. In one–third of patients, the artery narrows again within six months. The procedure may have to be repeated and a wire mesh stent may be placed in the artery to help keep it open. In bypass surgery, a detour is created with grafted or synthetic blood vessels. The blood can then go around the blockage. Other procedures may be used, including catheterization and laser treatments.

Expected results

Atherosclerosis can be successfully treated, but not cured. Studies have shown that atherosclerosis can be delayed, stopped, and even reversed by aggressively lowering cholesterol and changing one's diet.

Prevention

A healthy lifestyle—eating right, regular exercise, maintaining a healthy weight, not smoking, and controlling hypertension—can reduce the risk of developing atherosclerosis, help keep the disease from progressing, and sometimes cause it to regress. A 2002 study presented promising news about the impact of simple exercise on modifying the elasticity of one's arteries. A small group of healthy but sedentary postmenopausal women began walking at a moderate pace for 40 to 45 minutes a day five times a week. By the end of 12 weeks, 48% of the women had restored elasticity to their carotid arteries.

KEY TERMS

Cardiac catheterization—A treatment using a narrow tube to clear out a blocked blood vessel.

Cholesterol—A fat-like substance that is made by the human body and consumed in animal products. Cholesterol is used to form cell membranes, hormones, and vitamin D. High cholesterol levels contribute to the development of atherosclerosis.

Homocysteine—An amino acid involved with protein use in the body. High levels of homocysteine have been implicated in the development of atherosclerosis.

Triglyceride—A simple fat like compound derived from food and found in the blood. Elevated triglyceride levels contribute to the development of atherosclerosis.

Resources

BOOKS

Chilnick, Lawrence D. *Heart Disease: An Essential Guide for the Newly Diagnosed*. Cambridge, Mass.: Da Capo Lifelong Books, 2008.

Kowalski, Robert E. *The Blood Pressure Cure: 8 Weeks to Lower Blood Pressure without Prescription Drugs*. New York: Wiley, 2008.

Sinatra, Stephen T., and James C. Roberts. *Reverse Heart Disease Now: Stop Deadly Cardiovascular Plaque Before It's Too Late*. New York: Wiley, 2008.

PERIODICALS

Expert Panel/Writing Group. "Evidence Based Guidelines for Cardiovascular Disease Prevention in Women." *Circulation* (January 2004): 672 693.

Falk, Erling. "Pathogenesis of Atherosclerosis." *Journal of the American College of Cardiology* (April 2006): C7 C12.

ORGANIZATIONS

American Heart Association, National Center, 7272 Greenville Avenue, Dallas, TX, 75231 4596, http://www.americanheart.org/.

National Heart, Lung, and Blood Institute, P.O. Box 30105, Bethesda, MD, 20824 0105, http://www.nhlbi.nih. gov/.

Patience Paradox
Teresa G. Odle
David Edward Newton, Ed.D.

Athlete's foot

Definition

Athlete's foot is a common fungus infection in which the skin of the feet, especially on the sole and toes, becomes itchy and sore, cracking and peeling away. Athlete's foot, also known as tinea pedis, can be difficult to clear up completely.

Athlete's foot received its common name because the infection is often found among athletes. The fungi that cause the condition flourish best in and around swimming pools, showers, and locker rooms.

Description

Athlete's foot is very common, so common that most people have at least one episode of this fungal infection in their lives. It is found more often in adult males. Symptoms that appear to be athlete's foot in young children are probably caused by some other skin condition.

Causes and symptoms

Athlete's foot is caused by a fungal infection that most commonly affects the skin between the toes. The fungi that cause athlete's foot include *Trichophyton rubrum, T. mentagrophytes,* and *Epidermophyton floccosum*. These fungi live exclusively on dead body tissue, such as hair, the outer layer of skin, and the nails. The fungus grows best in moist, damp, dark places with poor ventilation. The problem is rare in children and those who customarily go barefoot.

Most people carry fungi on their skin. However, these fungi flourish to the point of causing athlete's foot only if conditions are favorable. The fungi multiply on the skin when it is irritated, weakened, or continuously moist. Sweaty feet, tight shoes, synthetic socks that do not absorb moisture well, a warm climate, and not drying the feet well after swimming or bathing all contribute to overgrowth of the fungi. Symptoms include itchy, sore skin on the toes, with scaling, inflammation, and **blisters**. Blisters that break, exposing raw patches of tissue, can cause **pain** and swelling. The infected feet also may have an unpleasant smell. As the infection spreads, **itching** and burning may worsen. In severe cases, the skin cracks and seeps fluid. Sometimes a secondary bacterial infection is also present.

If not treated, athlete's foot can spread to the soles of the feet and toenails. Stubborn toenail **infections**, called tinea unguium, may appear at the same time, with crumbling, scaling, and thickened nails, and nail loss. The infection can spread further if patients scratch and then touch themselves elsewhere (especially in the groin or under the arms). The infection may also spread to other parts of the body via contaminated bed sheets, towels, or clothing. Athlete's foot is more severe and more common in people taking antibiotics, corticosteroids, birth control pills, drugs to suppress immune function, and in people are obese or who are living with **AIDS** or **diabetes mellitus**.

Diagnosis

A dermatologist can diagnose the condition by physical examination and by examining a preparation of skin scrapings under a microscope. Not all foot **rashes** are athlete's foot, which is the reason a physician should diagnose the condition before any remedies are used. In order to properly diagnose the infection, the physician may do a fungal culture. Using nonprescription products on a rash that is not athlete's foot can worsen the rash; therefore, proper diagnosis is important.

Treatment

The infected foot should be kept well ventilated. A foot bath containing cinnamon has been shown to slow down the growth of certain molds and fungi and is said to be very effective in clearing up athlete's foot. Eight to ten broken cinnamon sticks are boiled in four cups of water, simmered for five minutes, and then steeped for 45 minutes. The mixture can then be placed in a basin and used daily to soak the feet.

Herbal remedies used externally to treat athlete's foot include **goldenseal** (*Hydrastis canadensis*), **tea tree oil** (*Melaleuca spp.*), **myrrh** (*Commiphora molmol*), **garlic** (*Allium sativa*), oregano oil (though its smell is quite pungent), and **calendula**. The affected area should be swabbed with an herbal mixture twice daily or the feet should be soaked in a herbal footbath. **Pau d'arco**, also called taheebo or lapacho, can be used for athlete's foot as well. The tea bags can be soaked in water for about 10 minutes and then placed

on the affected areas, or one can make a tincture that is rubbed directly on the toes.

Aromatherapy may be helpful. Several drops of the **essential oils** of tea tree, **peppermint** (*Mentha piperita*), or **chamomile** (*Matricaria recutita*), can be added to the bath water. Chamomile may be applied directly to the toes.

Allopathic treatment

Simple cases of athlete's foot usually respond to antifungal creams or sprays, such as tolnaftate (Aftate or Tinactin), clotrimazole, miconazole nitrate (Micatin products), or Whitfield's tincture made of salicylic acid and benzoic acid. Athlete's foot may be resistant to topical medication and should not be ignored. If the infection is resistant, the doctor may prescribe an oral antifungal drug such as ketoconozole or griseofulvin. Untreated athlete's foot may lead to a secondary bacterial infection in the skin cracks.

Expected results

Athlete's foot usually responds well to treatment, but it is important to complete the recommended treatment, even if the skin appears to be free of fungus; otherwise, the infection may return. Tinea unguium may accompany athlete's foot. It is typically very hard to treat effectively.

Prevention

A healthy diet should be maintained. Foods with a high sugar content should be avoided, including undiluted fruit juice, honey, and maple syrup.

Good personal hygiene and a few simple precautions can help prevent athlete's foot. These include:

- The feet should be washed daily; care should be taken to avoid contact with other parts of the body.
- The feet should be kept dry, especially between toes.
- Tight shoes and shoes made of synthetic material should not be worn.
- The feet need to be kept well ventilated, especially in the summer; bare feet and sandals are recommended.
- Absorbent polypropylene or white cotton socks are recommended; they should be cleaned and changed often.
- Bathing shoes should be worn in public bathing or showering areas.
- A good quality foot powder should be used to keep the feet dry.

KEY TERMS

Corticosteroids—Synthetic hormones that control nutritional processes in the body as well as the function of several organ systems.

- If anyone in the family has athlete's foot, towels, floors, and shower stalls should be washed with hot water and disinfectant after use.

Resources

BOOKS

Copeland, Glenn, and Stan Solomon. *The Good Foot Book*. Alameda, CA: Hunter House, 2005.

Vonhof, John. *Fixing Your Feet: Prevention and Treatments for Athletes*. Berkeley, CA: Wilderness Press, 2006.

ORGANIZATIONS

American Podiatric Medical Association, 9312 Old Georgetown Rd., Bethesda, MD, 20814, (301) 581 9221, http://www.apma.org/.

Patience Paradox
David Edward Newton, Ed.D.

Atkins diet

Definition

The Atkins diet is a high-protein, high-fat, very low-carbohydrate regimen. It emphasizes meat, cheese, and eggs, while discouraging foods such as bread, pasta, fruit, and sugar. It is a form of ketogenic diet.

Origins

Robert C. Atkins (1930–2003), a cardiologist and internist, developed the diet in the early 1970s. It first came to public attention in 1972 with the publication of *Dr. Atkins' Diet Revolution*. It quickly became a bestseller but, unlike most other fad **diets**, remained popular into the early 2000s. The diet started a "low-carb revolution," leading to development of low carbohydrate choices in grocery stores and restaurants around the world. In addition to his original book, Atkins authored a number of other books on his diet theme before his accidental death (from head injuries incurred from a fall) in 2003.

In 1992, Dr. Atkins updated his *Diet Revolution,* and by 2004 *Dr. Atkins' New Diet Revolution* had sold

ROBERT C. ATKINS (1930–2003)

(AP/Wide World Photos. Reproduced by permission.)

Dr. Robert C. Atkins graduated from the University of Michigan in 1951 and received his medical degree from Cornell University Medical School in 1955 with a specialty in cardiology. As an internist and cardiologist he developed the Atkins Diet in the early 1970s. The diet is a ketogenic diet a high protein, high fat, and very low carbohydrate regimen resulting in ketosis. It emphasizes meat, cheese, and eggs, while discouraging foods such as bread, pasta, fruit, and sugar. It first came to public attention in 1972 with the pub lication of *Dr. Atkins' Diet Revolution*. The book quickly became a bestseller but unlike most other fad diet books, this one has remained popular. At last count, it had been reprinted 28 times and sold more than 10 million copies worldwide. Since then, Atkins authored a number of other books on his diet theme, including *Dr. Atkins' New Diet Revolution* (1992), *Dr. Atkins' Quick and Easy New Diet Cookbook* (1997), and *The Vita Nutrient Solution: Nature's Answer to Drugs* (1998).

Atkins saw about 60,000 patients in his more than 30 years of practice. He also appeared on numerous radio and television talk shows, had his own syndicated radio program, *Your Health Choices*, and authored the monthly newsletter *Dr. Atkins' Health Revelations*. Atkins received the World Organization of Alternative Medicine's Recog nition of Achievement Award and was named the National Health Federation's Man of the Year. He was director of the Atkins Center for Complementary Medi cine, which he founded in the early 1980s. The center is located at 152 E. 55th St., New York, NY 10022.

more than 45 million copies and been translated into 25 languages. The new plan was the same, but the maintenance portion of the diet was made a little more liberal. The diet was extremely popular, as were Atkins Nutritionals products, such as vitamin supplements and numerous food items. A later Web-based version called the Atkins Advantage emphasized the products of Atkins Nutritionals and offered additional books, software, and information on a company Web site to support the program's goals and products.

Benefits

The primary benefit of the diet is rapid and substantial weight loss. By restricting carbohydrate intake, the body **burns** more fat stored in the body. Since there are no limits on the amount of calories or quantities of foods allowed on the diet, there is little hunger between meals. According to Atkins, the diet can alleviate symptoms of conditions such as **fatigue**, irritability, headaches, **depression**, and some types of joint and muscle **pain**.

Some dieters have had at least initial success with the diet and have found the liberal rules regarding protein and fats more tasteful and filling than other diets. Advice from the Atkins plan concerning behavioral changes can be helpful, such as shopping the perimeter of the grocery store, where the unprocessed foods are located. In the 1990s and early 2000s, the program attempted to modify some of its advice to more closely fit traditional advice from registered dieticians. For example, more clearly defining the types of fats to emphasize in the diet may help dieters avoid overeating unhealthy fats and increasing their risk for **heart disease**. However, experts have said that the diet still contradicts mainstream views concerning health promotion and disease prevention.

Description

The regimen is a low-carbohydrate, or ketogenic diet, characterized by initial rapid weight loss, usually due to water loss. Drastically reducing the amount of carbohydrate intake causes liver and muscle glycogen loss, which has a strong but temporary diuretic effect. Long-term weight loss is said to occur because with a low amount of carbohydrate intake, the body burns stored fat for energy.

The four-step diet starts with a two-week induction program designed to rebalance an individual's metabolism. Unlimited amounts of fat and protein are allowed but carbohydrate intake is restricted to 15 to 20 grams per day. Foods allowed include butter, oil, meat, poultry, fish, eggs, cheese, and cream. The daily amount of carbohydrates allowed equals about three cups of salad vegetables, such as lettuce, cucumbers, and celery. High fat condiments such as mayonnaise, sour cream, guacamole, and butter are allowed in virtually unlimited quantities. The Atkins theory is that these high fat foods enhance the flavor of meals, making the Atkins diet easier to maintain. Atkins has reminded dieters that while unlimited quantities of fats and proteins are allowed, the advice is not a license to gorge. Dieters are said to feel hungry for the first 48 hours as their bodies adjust to the abrupt reduction in carbohydrates. Weight loss during the induction phase is said to be significant. The phase is recommended to last at least two weeks.

The second stage of the diet is for ongoing weight loss. It allows 15 to 40 grams of carbohydrates a day. When individuals are about 10 pounds from their desired weight, they begin the pre-maintenance phase. They gradually begin to increase carbohydrate intake by 10 grams per week until weight is gained, then drops back to the previous carbohydrate gram level. Examples of vegetables that contain about 10 grams of carbohydrates are 3/4 c. of carrots, 1/2 c. of acorn squash, 1 c. of beets, and 1/4 c. of white potatoes. Legumes and fruit are the next preferred food groups for adding 10 grams daily. One-half apple contains 10 grams of carbohydrates, as does 1/3 c. of kidney beans.

Once the goal weight is reached the maintenance stage begins. This phase generally allows an adult to consume 90 to 120 grams of carbohydrates a day, depending on age, gender, and activity level, but maintaining goal weight is more likely if carbohydrate intake remains at the level discovered in pre-maintenance. The key, according to Atkins, is never letting weight vary by more than three to five pounds before making corrections.

Like many fad diets, the Atkins plan produces and promotes many food products associated with its diet plan. As of 2007, these products included bars, shakes, and candy. So although the plan argues against processed foods and snacking, the company also heavily promotes use of its nutritional products to support weight loss or maintenance.

Preparations

No advance preparation is needed to go on the diet. However, as with most diets, it is important to consult with a physician and to have a physical evaluation before starting a new nutritional regimen. The evaluation should include blood tests to determine levels of **cholesterol**, triglycerides, glucose, insulin, and uric acid. A glucose tolerance test is also recommended.

Precautions

Adherence to the Atkins diet can result in vitamin and mineral deficiencies. In his books, Atkins recommends a wide range of nutritional supplements, including a multi-vitamin. Among his recommendations, Atkins suggests the following daily dosages: 300-600 micrograms (mcg) of **chromium** picolinate, 100-400 milligrams (mg) of pantetheine, 200 mcg of **selenium**, and 450-675 mcg of **biotin**.

The diet is not recommended for lacto-ovo vegetarians, since it cannot be done as successfully without protein derived from animal products. Also, vegans cannot follow this diet, since a vegan diet is too high in carbohydrates, according to Atkins. Instead, he recommends vegetarians with a serious weight problem give up **vegetarianism**, or at least include fish in their diet. In 2003, a physicians group warned that high-protein diets may cause permanent kidney loss in anyone with reduced kidney function. They also can increase people's risk of colon **cancer** and **osteoporosis**.

Side effects

The average carbohydrate intake recommended by the Atkins diet is well below averages generally recommended by other experts. Studies have shown that even though people may lose weight on the Atkins plan, they do not necessarily keep the weight off long-term because the diet does not teach sustainable lifestyle changes.

Followers of the Atkins diet have reported **muscle cramps**, **diarrhea**, general weakness, and **rashes** more frequently than people on low-fat diets. Others have reported **constipation**, bad breath, **headache**, and fatigue. The American Dietetic Association has warned that any diet that severely limits one food group should raise a red flag to dieters.

Beyond the reported side effects and concerns about the diet's long-term effectiveness, some serious problems may arise for Atkins diet followers. One problem that has been documented is called ketoacidosis, which occurs when there is a buildup of the by-products of fat breakdown because the body does not have enough glucose available. The condition can be dangerous, resulting in cell damage, severe illness, and even death. The low amounts of carbohydrates eaten by those on the diet are below those needed to supply the brain and muscles with sugar. Critics of the diet have also long

focused on the risks of unlimited fat intake that the Atkins diet allows. Eating large amounts of saturated fat, even if weight is dropping, can lead to high levels of cholesterol and heart disease. However, this outcome does not inevitably occur. Cholesterol levels tend to decrease in many individuals when they lose weight, even if eating an unbalanced diet. As of 2008, long-term research remained to be done in this area.

People with diabetes who take insulin are at risk of becoming hypoglycemic if they do not eat appropriate carbohydrates. Also, persons who **exercise** regularly may experience low energy levels and muscle fatigue from low carbohydrate intake.

Research and general acceptance

Opinion from the general medical community remains mixed on the Atkins diet but is generally unfavorable. There have been no significant long-term scientific studies on the diet. A number of leading medical and health organizations, including the American Medical Association, American Dietetic Association (ADA), and the American Heart Association oppose it. It is drastically different than the dietary intakes recommended by the U.S. Department of Agriculture and the National Institutes of Health. Much of the opposition comes from the fact that the diet lacks some vitamins and nutrients and is high in fat. In a hearing before the U.S. Congress on February 24, 2000, an ADA representative called the Atkins diet "hazardous" and said it lacked scientific credibility.

In 2004, Jody Gorran, a 53-year-old businessman from Florida, sued the promoters of the Atkins Diet, saying that the plan clogged his arteries and nearly killed him. Gorran claimed that he was seduced by the plan and that by eating the high levels of protein and fats touted by the plan, his cholesterol soared. His lawsuit was backed by the Washington-based advocacy group called Physicians Committee for Responsible Medicine. Gorran sought damages and an injunction preventing the sale of Atkins' books and products without fair and adequate warnings about the dangers of the diet. The lawsuit was dismissed late in 2006 by a judge, but an appeal continued as of 2008.

Atkins' company filed for Chapter 11 bankruptcy protection in July 2005. The company completed its Chapter 11 reorganization by January 2006, having streamlined some operations, and it continued to operate early in 2007, making the Dr. Atkins' diet run more than 35 years long.

Though Dr. Atkins added that numerous studies pointed to the fact that carbohydrates were to blame for weight gain, an explanation for how his diet program worked was never really offered by researchers. Numerous studies continued throughout the 1990s and even after Dr. Atkins' death in 2003. Though some studies showed that people on the Atkins diet often lost weight faster in six months than those on other weight loss programs, the long-term effectiveness and possible harmful effects of the Atkins diet required more study.

KEY TERMS

Biotin—The B complex vitamin found naturally in yeast, liver, and egg yolks.

Carbohydrates—Neutral compounds of carbon, hydrogen, and oxygen found in sugar, starches, and cellulose.

Hypertension—Abnormally high arterial blood pressure, which if left untreated can lead to heart disease and stroke.

Ketogenic diet—A diet that supplies an abnormally high amount of fat and small amounts of carbohydrates and protein.

Ketosis—An abnormal increase in ketones in the body, usually found in people with uncontrolled diabetes mellitus.

Pantetheine—A growth factor substance essential in humans and a constituent of coenzyme A.

Triglycerides—A blood fat lipid that increases the risk for heart disease.

Training and certification

There is no formal training or certification required.

Resources

BOOKS

Atkins, Robert C. *Atkins for Life*. New York: St. Martin's, 2003.

Atkins, Robert C. *Dr. Atkins' New Diet Revolution*. New York: St. Martin's Paperbacks, 2004.

PERIODICALS

"Atkins Diet Vindicated But Long term Success Questionable." *Obesity, Fitness, and Wellness Week* (June 14, 2003): 25.

"Doctor Group Describes Dangers of Atkins Diet." *Obesity, Fitness, and Wellness Week* (August 9, 2003): 33.

OTHER

Atkins Center for Complementary Medicine. 152 E. Fifty fifth St., New York, NY 10022. (212) 758 2110. http://www.atkinscenter.com.

ORGANIZATIONS

Atkins Nutritionals, 1050 Seventeenth St., Suite 100, Den ver, CO, 80265, (800) 6 ATKINS, http://www. atkins.com.

Physicians Committee for Responsible Medicine, 5100 Wis consin Ave. NW, Suite 400, Washington, DC, 20016, (202) 686 2210, http://www.atkinsdietalert.org.

Ken R. Wells
Teresa G. Odle
Helen Davidson

Atopic dermatitis *see* **Eczema**

Atractylodes

Description

Atractylodes is the dried or steam-dried rhizome (rootstalk) of *Atractylodes macrocephala* or *A. ovata*, perennial north Asian herbs in the Compositae family. It grows in mountain valleys, especially in China's Zhejiang province. It may also be cultivated. In autumn, it presents magenta corolla blooms.

In Mandarin, atractylodes is called *Bai Zhu, Bai Shu, Yu Zhu,* and *Dong Zhu*. The Cantonese term is *Paak Sat*, and the Japanese call it *Byakujutsu*. Common names include large-headed atractylodes, white atractylodes, and white shu. Its pharmaceutical name, used to distinguish it as a medicine, is Rhizoma Atractylodis, and it is one of more than 500 plants recognized as official drugs in **traditional Chinese medicine**. Related species, *A. lancea* and *A. chinensis*, both called black or gray atractylodes, are also used medicinally for similar but distinct purposes.

General use

Practitioners of Chinese medicine believe that atractylodes affects the Spleen and Stomach meridians, or energy pathways in the body. Its medicinal properties are considered warm, mildly bitter, and sweet.

Atractylodes is thought to dry dampness, strengthen the Spleen or digestion, and promote diuresis, the formation and excretion of urine. It is used for **diarrhea**, generalized aching, mental **fatigue**, **dizziness**, lack of appetite, **vomiting**, **edema** (accumulation of fluids), and spontaneous sweating. It is also used to prevent miscarriage and to treat restless fetal movement. Other uses include restoring deficient digestion associated with poor absorption, malnutrition, anorexia, metabolic acidosis, hypogylcemia, and rheumatism. It has also been used to treat tumors of the cervix, uterus, breast, and stomach.

KEY TERMS

Cold—In Chinese pathology, the term defines a condition that has insufficient warmth, either objective (hypothermia) or subjective (feeling cold).

Decoction—A strong tea brewed for twenty to thirty minutes.

Heat—In Chinese pathology, the term defines a condition that has excessive heat, either objective (fever, infection) or subjective (feeling hot).

Meridians—Energetic pathways inside the body through which qi flows; also called channels.

Tincture—A solution of medicinal substance in alcohol, usually more or less diluted. Herb tinctures are made by infusing the alcohol with plant material.

Qi—A Chinese medical term denoting active physiological energy.

According to traditional Chinese medicine, both white and black atractylodes may be used for digestive and urinary problems. Black atractylodes is more drying than white. White atractylodes has the additional benefit of being a "Spleen Qi tonic," meaning that it rebuilds metabolic function by increasing **nutrition**, increasing energy, and regulating fluids. White atractylodes is also thought to have restorative, normalizing effects on the digestive system and Liver.

Research on atractylodes has generally been conducted in China and has focused on pharmacological investigation and animal experiments. In-vitro and animal studies show it has significant diuretic, sedative, and hypoglycemic (lowering of blood glucose) effects. Animal studies pinpoint the essential oil as responsible for sedative effects. It also promotes digestion and quells **nausea** and diarrhea.

Major chemical constituents include atractylone, atractylol, butenolide B, acetoxyatractylon, hydroxyatractylon, and **vitamin A**.

Preparations

Atractylodes is not generally available in American health food stores, but it can be found at most Chinese pharmacies and Asian groceries. Good quality atractylodes is large, firm, solid, aromatic, and has a yellowish cross section.

The standard dose is 3–10 g as a decoction (strong tea) or 1–4 ml of tincture. Doses of dried material are 3–12 g.

Atractylodes is commonly prescribed in conjunction with moisture-removing drugs and digestants. Practitioners of Chinese medicine commonly also combine atractylodes with other Chinese herbs. The following are the major herbs with which it is combined and the symptoms for which the combinations are prescribed.

- Radix codonopsis (*Codonopsis pilosula, Dang Shen*) and rhizoma zingiberis (*Zingiber officinalis, Gan Jiang*, dried ginger root) for abdominal pain, distention, vomiting, and diarrhea.
- Fructus Immaturus Citri Aurantii (*Citrus aurantium, Zhi Shi*, unripened bitter orange) for reduced appetite with abdominal distention and fullness due to Spleen deficiency with qi stagnation.
- Gray or black atractylodes (*Atractylodes japonica, Cang Zhu*) for damp-cold painful obstruction or vaginal discharge.
- Sclerotium Poriae Cocos (*Poria cocos; Fu Ling*; tuckahoe, poria, or Indian bread) and Ramulus Cinnamomi Cassiae (*Cinnamomum cassia, Gui Zhi*, cinnamon twig) for congested fluids with distention of the chest and edema due to Spleen deficiency.
- Astragalus (*Astragalus membranaceus, Huang Qi*) and Fructus Tritici (*Triticum aestivum, Fu Xiao Mai*, name wheat grain) for unrelenting spontaneous sweating.
- Ramulus Perillae (*Perilla frutescens, Su Geng*) and Pericarpium Citri Reticulatae (*Citrus reticulata, Chen Pi*, aged tangerine rind) for restless fetus disorder with qi stagnation giving rise to distention and fullness in the chest and abdomen.

Precautions

According to tradition, atractylodes is contraindicated in the presence of deficient heat conditions.

Side effects

None noted.

Interactions

No interactions with pharmaceutical drugs have been noted.

Resources

BOOKS

Bensky, Dan, and Andrew Gamble. *Chinese Herbal Medicine: Materia Medica*. Rev. ed. Seattle: Eastland Press, 1993.

Fan, Warner J W. *A Manual of Chinese Herbal Medicine: Principles and Practice for Easy Reference*. Boston: Shambhala, 1996.

Holmes, Peter. *Jade Remedies: A Chinese Herbal Reference for the West*. Boulder, CO: Snow Lotus Press, 1996.

Hsu, Hong yen, et al. *Oriental Materia Medica: A Concise Guide*. Long Beach, CA: Oriental Healing Arts Institute, 1986.

Erika Lenz

Attention-deficit hyperactivity disorder

Definition

Attention-deficit hyperactivity disorder (ADHD) is a developmental disorder characterized by distractibility, hyperactivity, impulsive behaviors, and the inability to remain focused on tasks or activities.

Description

ADHD, also known as hyperkinetic disorder (HKD) outside the United States, is estimated to affect 3–5% of children, or about 2 million children in the United States. It also affects about 4% of adults. The disorder affects boys more often than girls. Although difficult to assess in infancy and toddlerhood, signs of ADHD may begin to appear as early as age two or three, but the symptom picture changes as adolescence approaches. Many symptoms, particularly hyperactivity, diminish in early adulthood. However, impulsivity and inattention problems remain with up to 50% of individuals with ADHD throughout their adult life.

Children with ADHD have short attention spans and are easily bored and/or frustrated with tasks. Although these individuals may be quite intelligent, their lack of focus frequently results in poor grades and difficulties in school. Children with ADHD act impulsively, taking action first and thinking later. They are constantly moving, running, climbing, squirming, and fidgeting, but often have trouble with gross and fine motor skills. As a result, they may be physically clumsy and awkward. Their clumsiness may extend to the social arena, where they are sometimes shunned due to their impulsive and intrusive behavior. Some critics argue that ADHD is a condition created and diagnosed in the Western world, particular to the environment of highly developed countries, since it is not diagnosed in other cultures. These critics of the ADHD diagnosis believe that medicating a child does

not address the true underlying problem. They also note that there may not be a problem at all because children are naturally active and impulsive.

Causes and symptoms

The causes of ADHD are not known. However, it appears that heredity plays a major role in the development of ADHD. Children with a parent or sibling with ADHD are more likely to develop the disorder. Before birth, children with ADHD may have been exposed to poor maternal **nutrition**, viral **infections**, or maternal **substance abuse**. In early childhood, exposure to lead or other toxins can cause ADHD-like symptoms. Traumatic brain injury or neurological disorders also may trigger ADHD symptoms. An imbalance of certain neurotransmitters (the chemicals in the brain that send messages between nerve cells) is believed to be the mechanism behind ADHD symptoms.

A widely publicized study conducted by Benjamin Feingold in the early 1970s suggested that **allergies** to certain foods and food additives caused the characteristic hyperactivity of children with ADHD. Although some children may have adverse reactions to certain foods that can affect their behavior (for example, a rash might temporarily cause a child to be distracted from other tasks), carefully controlled follow-up studies uncovered no link between food allergies and ADHD. Another popularly held misconception about food and ADHD is that eating sugar causes hyperactive behavior. Again, studies have shown no link between sugar intake and ADHD. It is important to note that a nutritionally balanced diet is important for normal development in all children.

People with ADHD experience a variety of symptoms, including distraction, not paying attention, inconsistency, forgetfulness of even simple tasks, fidgeting, verbal impulsivity, and many other behaviors. It is interesting to note that everyone experiences these symptoms at times, but an individual with ADHD has more of these symptoms more of the time.

Psychologists and other mental health professionals typically use the criteria listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised (DSM-IV-TR)* as a guideline for determining the presence of ADHD. For a diagnosis of ADHD, *DSM-IV-TR* requires the presence of at least six of the following symptoms of inattention or six or more symptoms of hyperactivity and impulsivity combined.

Inattention

- fails to pay close attention to detail or makes careless mistakes in schoolwork or other activities
- has difficulty sustaining attention in tasks or activities
- does not appear to listen when spoken to
- does not follow through on instructions and does not finish tasks
- has difficulty organizing tasks and activities
- avoids or dislikes tasks that require sustained mental effort (such as doing homework)
- is easily distracted
- is forgetful in daily activities

Hyperactivity

- fidgets with hands or feet or squirms in seat
- does not remain seated when expected to do so
- runs or climbs excessively when inappropriate (in adolescents and adults, feelings of restlessness)
- has difficulty playing quietly
- is constantly on the move
- talks excessively

Impulsivity

- blurts out answers before the question has been completed
- has difficulty waiting for his or her turn
- interrupts and/or intrudes on others

DSM-IV-TR also requires that some symptoms develop before age seven and that they significantly impair functioning in two or more settings (e.g., home and school) for at least six months. Children who meet the symptom criteria for inattention, but not for hyperactivity/impulsivity are diagnosed with Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type, commonly called ADD. (Young girls with ADHD may not be diagnosed as frequently because they have mainly this subtype of the disorder.)

Diagnosis

The first step in determining if a child has ADHD is to consult with a pediatrician, a doctor who treats children. The pediatrician can make an initial evaluation of the child's developmental maturity compared to other children in the patient's age group. The doctor also should perform a comprehensive physical examination to rule out any organic causes of ADHD

symptoms, such as an overactive thyroid or vision or hearing problems.

If no organic problem can be found, a psychologist, psychiatrist, neurologist, neuropsychologist, or learning specialist typically is consulted to perform a comprehensive ADHD assessment. A complete medical, family, social, psychiatric, and educational history is compiled from existing medical and school records and from interviews with parents and teachers. Interviews also may be conducted with the child, depending on the individual's age. Along with these interviews, several clinical inventories also may be used, such as the Conners Rating Scales (Teacher's Questionnaire and Parent's Questionnaire), Child Behavior Checklist (CBCL), and the Achenbach Child Behavior Rating Scales. These inventories provide valuable information on the child's behavior in different settings and situations. In addition, the Wender Utah Rating Scale has been adapted for use in diagnosing ADHD in adults.

It is important to note that mental disorders such as **depression** and **anxiety** disorder can cause symptoms similar to ADHD. A complete and comprehensive psychiatric assessment is critical to differentiate ADHD from other possible mood and behavioral disorders. **Bipolar disorder**, for example, may be misdiagnosed as ADHD.

Public schools are required by federal law to offer free ADHD testing upon request. A pediatrician also can provide a referral to a psychologist or pediatric specialist for an ADHD assessment. Parents should check with their insurance plans to see if these services are covered.

Treatment

Many treatments are popular for treating children with ADHD. Behavior modification therapy uses a reward system to reinforce good behavior as well as task completion and can be used both in the classroom and at home. A tangible reward such as a sticker may be given to the child every time he completes a task or behaves in an acceptable manner. A chart system may be used to display the stickers and visually illustrate the child's progress. When a certain number of stickers are collected, the child may trade them in for a bigger reward such as a trip to the zoo or a day at the beach. The reward system stays in place until the good behavior becomes ingrained.

A variation of this technique, cognitive-behavioral therapy, works to decrease impulsive behavior by getting the child to recognize the connection between thoughts and behavior and to change behavior by changing negative thinking patterns.

Individual **psychotherapy** can help children with ADHD build self-esteem, give them a place to discuss their worries and anxieties, and help them gain insight into their behavior and feelings. Family therapy also may be beneficial in helping family members develop coping skills and work through feelings of guilt or anger they may be experiencing.

Children with ADHD perform better within a familiar, consistent, and structured routine with positive reinforcements for good behavior and real consequences for bad. Family, friends, and caretakers should be educated on the special needs and behaviors of the child with ADHD. Communication between parents and teachers is especially critical for ensuring that a child with ADHD has an appropriate learning environment.

A number of alternative treatments exist for ADHD. Although there is a lack of controlled studies to prove their efficacy, a 2005 study found more than two out of three families containing a child with ADHD sought complementary or alternative ADHD treatment at some time. Proponents of these treatments report that they are successful in controlling symptoms in some ADHD patients. Some of the more popular alternative treatments are listed.

- Electroencephalograph (EEG) biofeedback. By measuring brain wave activity and teaching the patient with ADHD which type of brain wave is associated with attention, EEG biofeedback attempts to train patients to generate the desired brain wave activity.
- Dietary therapy. Based in part on the Feingold food allergy diet, dietary therapy focuses on a nutritional plan that is high in protein and complex carbohydrates and free of white sugar and salicylate-containing foods such as strawberries, tomatoes, and grapes.
- Herbal therapy. Herbal therapy uses a variety of natural remedies to address the symptoms of ADHD. Ginkgo (*Gingko biloba*) is used for memory and mental sharpness and chamomile (*Matricaria recutita*) extract is used for calming. The safety of herbal remedies has not been demonstrated in controlled studies. For example, it is known that gingko may affect blood coagulation, but controlled studies have not evaluated the risk of the effect.
- Vitamin and mineral supplements. Vitamin and mineral supplements thought to be effective by some alternative practitioners include calcium, zinc, magnesium,

iron, inositol, trace minerals, and blue-green algae. Also recommended are the combined amino acids GABA, glycine, taurine, L-glutamine, L-phenylalanine, and L-tyrosine.

- Homeopathic medicine. This is probably the most effective alternative therapy for ADD and ADHD because it treats the whole person at a core level. Constitutional homeopathic care is most appropriate and requires consulting with a well-trained homeopath who has experience working with individuals with ADD and ADHD.
- Auricular acupuncture. A small study indicated that this type of acupuncture therapy might be effective in some children, but large well-controlled studies have not been done.

Allopathic treatment

Psychosocial therapy, usually combined with medications, is the treatment approach of choice to alleviate ADHD symptoms. Psychostimulants, such as dextroamphetamine (Dexedrine), pemoline (Cylert), and methylphenidate (Ritalin) commonly are prescribed to control hyperactive and impulsive behavior and increase attention span. They work by stimulating the production of certain neurotransmitters in the brain. Possible side effects of stimulants include nervous tics, irregular heartbeat, loss of appetite, and **insomnia**. The medications usually are well-tolerated and safe in most cases.

In children who do not respond well to stimulant therapy, tricyclic antidepressants such as desipramine (Norpramin, Pertofane) and amitriptyline (Elavil) are frequently recommended. Reported side effects of these drugs include persistent **dry mouth**, sedation, disorientation, and irregular heartbeat (particularly with desipramine). Other medications prescribed for ADHD therapy are buproprion (Wellbutrin), an antidepressant; fluoxetine (Prozac), an antidepressant; and carbamazepine (Tegretol, Atretol), an anticonvulsant drug. Clonidine (Catapres), a medication for high blood pressure, also has been used to control aggression and hyperactivity in some children with ADHD, although it should not be used with Ritalin. A child's response to medication will change with age and maturation, so ADHD symptoms should be monitored closely and prescriptions adjusted accordingly.

In late 2002, the first new drug for treating ADHD released in 30 years was approved by the United States Food and Drug Administration (FDA). The drug atomoxetine (brand name Strattera) was developed by Eli Lilly. Strattera was the first medication for ADHD that was not a stimulant. It was believed that Strattera would improve ADHD symptoms without many of the negative side effects of stimulants. In 2005 the FDA issued a warning that atomoxetine was linked to increased rates of suicidal thoughts in children and teens who take it. Although the observed rate of children with suicidal thoughts was only 4 in 1,000, and no suicides occurred, the FDA recommended increased vigilance among doctors prescribing atomoxetine and required new warning labels on boxes of Strattera.

KEY TERMS

Conduct disorder—A behavioral and emotional disorder of childhood and adolescence. Children with a conduct disorder act inappropriately, infringe on the rights of others, and violate societal norms.

Nervous tic—A repetitive, involuntary action, such as the twitching of a muscle or repeated blinking.

Expected results

Untreated, ADHD negatively affects the social and educational performance of children and can seriously damage their sense of self-esteem. Children with ADHD have impaired relationships with their peers and may be seen as social outcasts. They may be seen as slow learners or troublemakers in the classroom. Siblings and even parents may develop resentful feelings toward the child with ADHD.

Some children with ADHD also develop a conduct disorder problem. For those adolescents who have both ADHD and a conduct disorder, up to 25% go on to develop antisocial personality disorder and the criminal behavior, substance abuse, and high rate of suicide attempts that are symptomatic of it. Children diagnosed with ADHD also are more likely to have a learning disorder, a mood disorder such as depression, or an anxiety disorder.

Approximately 70-80% of patients with ADHD who are treated with stimulant medication experience significant relief from symptoms, at least in the short-term. Approximately half of children with ADHD seem to "outgrow" the disorder in adolescence or early adulthood. The other half retain some or all symptoms of ADHD as adults. With early identification and intervention, careful compliance with a treatment program, and a supportive and nurturing home and school environment, children with ADHD can flourish socially and academically.

Resources

BOOKS

Brynie, Faith Hickman. *ADHD: Attention Deficit Hyper activity Disorder*. Minneapolis, MN: Twenty First Century Books, 2008.

Conners, Keith C. *Attention Deficit Hyperactivity Disorder in Children and Adolescents: The Latest Assessment and Treatment Strategies,* 4th ed. Kansas City, MO: Com pact Clinicals, 2008.

Diagnostic and Statistical Manual of Mental Disorders, 4th ed. Washington, DC: American Psychiatric Press, 2000.

McBurnett, Keith, and Linda Pfiffner, eds. *Attention Deficit Hyperactivity Disorder: Concepts, Controversies, New Directions*. New York: Informa Healthcare, 2008.

PERIODICAL

Chen, Mandy, Carla M. Seipp, and Charlotte Johnston. "Mothers' and Fathers' Attributions and Beliefs in Families of Girls and Boys with Attention Deficit/ Hyperactivity Disorder." *Child Psychiatry and Human Development* 39, no. 1 (March 2008): 85 100.

Dennis, Tanya, et al. "Attention Deficit Hyperactivity Dis order: Parents' and Professionals' Perceptions." *Com munity Practitioner* 81, no. 3 (March 2008): 24 29.

ORGANIZATIONS

Attention Deficit Disorder Association, 15000 Commerce Parkway, Suite C, Mount Laurel, NJ, 08054, (856) 439 9099, www.aad.org.

Kim Sharp
Teresa G. Odle

Aucklandia

Description

Aucklandia, also known as costus or *Mu Xiang*, is the root of the plant *Saussurea costus*. Aucklandia has been used for centuries in Chinese and Indian herbal healing. In modern times, it has been used in Western **aromatherapy**.

Aucklandia comes from a perennial plant that grows to about 6 ft (2 m) in height. It is native to northern India and Pakistan. This plant is also cultivated in other parts of India and in southwest China. The long, tapering root is harvested and dried for uses in healing.

In some regions of Asia, several other species of plant are used interchangeably with *Saussurea costus*. These include *Saussurea lappa* and *Saussurea vladimirus*. Locally, aucklandia is also called kuth, kust, kushta, qust-e-shereen, and patchak.

General use

Aucklandia is used in China and India to treat three main categories of complaints concerning the digestive system, the lungs, and **infections**. Aucklandia is used to treat symptoms such as **nausea**, **vomiting**, **diarrhea**, colon spasms, poor digestion, abdominal **gas**, and stomach **pain**. In laboratory studies, aucklandia has been shown to be an antispasmodic, accounting for its effectiveness against such symptoms as nausea and diarrhea. It is also sometimes used to treat **gallstones** and **jaundice**, although no scientific studies have confirmed its effectiveness for these uses.

Aucklandia is used in many places in Asia to treat **asthma**, **bronchitis**, and uncontrolled **cough**. The antispasmodic component of the root extract causes the airways to relax and open more so that breathing becomes easier. This same property causes it to mildly lower blood pressure by relaxing the artery walls. However, it does not lower blood pressure as effectively as some other herbs.

In India, aucklandia is used primarily as an antiseptic, an insecticide, and a fungicide. It is also said to be effective against yeast infections and some parasites. Some research suggests that aucklandia has antibiotic actions and may be effective against infections such as cholera and typhoid. It appears that the use of aucklandia as an antiseptic has some basis in scientific fact.

Other uses of aucklandia that have not been investigated in regulated scientific studies include using it as a treatment for water retention and lung and liver tumors. In addition to its medicinal uses, aucklandia is a fragrance and fixative in perfumes, shampoo, and hair dye. It is used in the Asian food industry to flavor alcoholic beverages, soft drinks, and sweets.

Preparations

Aucklandia can be prepared as either a distilled extract or as an essential oil. The dried roots are chopped fine and softened in warm water, then distilled with steam. The resulting water-based distillate is then subjected to a solvent extraction to remove the active ingredients. The resulting yellow-brown fluid has a long-lasting woody or musty odor. In Chinese medicine, aucklandia is classified as acrid and bitter.

Aucklandia is used in formulas to treat both digestive and respiratory complaints. The best known of these formulas is *Mu Xiang Shun Qi Wan*. It is used to relieve pain and encourage digestion. *Mu Xiang Shun Qi Wan* is also used to treat chronic **hepatitis**, newly

KEY TERMS

Antispasmodic—A substance that relieves spasm or uncontrolled contraction, usually of the smooth or involuntary muscle of the arteries, intestines, or the airways.

Distillate—The material obtained through the process of distilling (vaporized and condensed to separate out different compounds).

Yin aspects—Yin aspects are the opposite of yang aspects and are represented by qualities such as cold, stillness, darkness, and passiveness.

developed **cirrhosis** of the liver, and abdominal pain. This formula is commercially available as pills, with the recommended dose of eight pills twice a day.

Several other common formulas contain aucklandia. Ginseng and longan formula (*Gui Pi Tang*) is used to treat gastrointestinal upsets and various kinds of physical and emotional **stress**. Rhubarb and scutellaria formula (*Li Dan Pian*) is used to treat gallstones. *Tang Gui* and indigo formula (*Chien Chin Chih Tai Wan*) is used to treat vaginal discharge and vaginal infections, as well as lower body pain.

The oil of aucklandia is more commonly used in India than in China, and it is also used in Western aromatherapy. It is applied externally or inhaled. The oil also is used by the cosmetic and perfume industry, where it blends well with other fragrances such as patchouli and floral fragrances.

Precautions

In Chinese medicine, aucklandia should not be used by people with deficient *yin*, which means people who are dehydrated or have a lot of dryness.

Side effects

When used externally, aucklandia causes skin irritation (**contact dermatitis**) in some sensitive individuals.

Interactions

Aucklandia has been used safely in Asia as a medicinal herb and a food and cosmetic additive for centuries. It is often used in conjunction with other herbs with no reported interactions. Since aucklandia has been used almost exclusively in Asian medicine, there are no available studies of its interactions with Western pharmaceuticals.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

PERIODICALS

Pandey, M. M., S. Rastogi, and A. K. Rasat. "Saussurea costus: Botanical, Chemical, and Pharmacological Review of an Ayurvedic Medicinal Plant." *Journal of Ethnopharmacology* (April 2007): 379 90.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), www.cieer.org.

Tish Davidson, A. M.

Auditory integration training

Definition

Auditory integration training, or AIT, is one specific type of music/auditory therapy based upon the work of French otolaryngologists Dr. Alfred Tomatis and Dr. Guy Berard.

Origins

The premise upon which most auditory integration programs are based is that distortion in how things are heard contributes to commonly seen behavioral or **learning disorders** in children. Some of these disorders include **attention-deficit hyperactivity disorder** (ADHD), **autism**, **dyslexia**, and central auditory processing disorders (CAPD). Training the patient to listen can stimulate central and cortical organization.

Auditory integration is one facet of what audiologists call central auditory processing. The simplest definition of central auditory processing, or CAP, is University of Buffalo Professor of Audiology Jack Katz's, which is: "What we do with what we hear." Central auditory integration is actually the perception of sound, including the ability to attend to sound, to

remember it, retaining it in both the long- and short-term memory, to be able to listen to sound selectively, and to localize it.

Berard developed one of the programs commonly used. Berard's auditory integration training consists of twenty half-hour sessions spent listening to musical sounds via a stereophonic system. The music is random, with filtered frequencies, and the person listens through earphones. These sound waves vibrate and exercise structures in the middle ear. This is normally done in sessions twice a day for 10 days.

Tomatis is also the inventor of the Electronic Ear. This device operates through a series of filters, and reestablishes the dominance of the right ear in hearing. The basis of Tomatis' work is a series of principles that follow:

- The most important purpose of the ear is to adapt sound waves into signals that charge the brain.
- Sound is conducted via both air and bone. It can be considered something that nourishes the nervous system, either stimulating or destimulating it.
- Just as seeing is not the same as looking, hearing is not the same as listening. Hearing is passive. Listening is active.
- A person's ability to listen affects all language development for that person. This process influences every aspect of self-image and social development.
- The capacity to listen can be changed or improved through auditory stimulation using musical and vocal sounds at high frequencies.
- Communication begins in the womb. As early as the beginning of the second trimester, fetuses can hear sounds. These sounds literally cause the brain and nervous system of the baby to develop.

Description

A quartet of CAP defects have been identified that can unfavorably alter how each person processes sound. Among these are:

- Phonetic decoding, a problem that occurs when the brain incorrectly decodes what is being heard. Sounds are unrecognizable, often because the person speaking talks too fast.
- Tolerance-fading memory, a condition with little or poor tolerance for background sounds.
- Auditory integration involves a person's ability to put together things heard with things seen. Characteristically there are long response delays and trouble with phonics, or recognizing the symbols for sounds.
- The fourth problem area, often called auditory organization, overlaps the previous three. It is characterized by disorganization in handling auditory and other information.

Certain audiological tests are carried out to see if the person has a CAP problem, and if so, how severe it is. Other tests give more specific information regarding the nature of the CAP problem. They include:

- Puretone air-conduction threshold testing, which measures peripheral hearing loss. If loss is found, then bone-conduction testing, or evaluation of the vibration of small bones in the inner ear, is also carried out.
- Word discrimination scores (WDS) determines a person's clarity in hearing ideal speech. This is done by presenting 25–50 words at 40 decibels above the person's average sound threshold in each ear. Test scores equal the percentage of words heard correctly.
- Immittance testing is made up of two parts, assessing the status of, and the protective mechanisms of the middle ear.
- Staggered sporadic word (SSW) testing delivers 40 compound words in an overlapping way at 50 decibels above threshold to each ear of the person being tested. This test provides expanded information that makes it possible to break down CAP problems into the four basic types.
- Speech in noise discrimination (SN) testing is similar to Staggered Sporadic Word testing except that other noise is also added and the percentage correct in quiet is compared with that correct when there is added noise.
- Phonemic synthesis (PS) determines serious learning problems. The types of errors made in sounding out written words or associating written letters with the sounds they represent help in determining the type and severity of CAP problems.

Benefits

Upon completion of an auditory integration training program, the person's hearing should be capable of perceiving all frequencies at, or near, the same level. Total improvement from this therapy, in both hearing and behavior, can take up to one year.

Research and general acceptance

Auditory integration training is based upon newly learned information about the brain. Though brain structures and connections are predetermined, probably by heredity, another factor called *plasticity* also comes into play. Learning continues from birth to death. Plasticity is the ability of the brain to actually

ALFRED TOMATIS (1920–2001)

Internationally renowned French otolaryngologist, psychologist, educator and inventor Alfred Tomatis perceived the importance of sound and hearing early in his career. He took his degree as a Doctor of Medicine from the University of Paris and specialized in ear, nose and throat medicine. The son of two opera singers, Tomatis early in his career treated some of his parents' fellow opera singers. From these experiences with the sound of music, he developed the principle that has come to be known as the Tomatis Effect, i.e. that the human voice can only sing what it hears.

Tomatis has been called the Einstein of the ear. It was his research that made the world aware that the ears of an infant in utero are already functioning at four and half months of age. Just as the umbilical cord provides nourishment to the unborn infant's body, Tomatis postulated that the sound of the mother's voice is also a nutrient heard by the fetus. This sound literally charges and stimulates the growth of the brain.

Tomatis took this further, into the realm of language. Tomatis concluded that the need to communicate and to be understood are among our most basic needs. He was a pioneer in perceiving that language problems convert into social problems for people. "Language is what characterizes man and makes him different from other creatures," Tomatis is quoted as saying. The techniques he developed to teach people how to listen effectively are internationally respected tools used in the treatment of autism, attention deficit disorder, and other learning disabilities.

His listening program, the invention of the Electronic Ear, and his work with the therapeutic use of sound and music for the past fifty years have made Tomatis arguably the best known and most successful ear specialist in the world. There are more than two hundred Tomatis Centers worldwide, treating a vast variety of problems related to the ability to hear.

change its structuring and connections through the process of learning.

Problems with auditory processing are viewed as having a wide–reaching ripple effect in society. It is estimated that 30–40% of children starting school have language-learning skills that can be described as poor. CAP difficulties are a factor in several different learning disabilities. They affect not only academic success, but also nearly every aspect of societal difficulties. One example to illustrate this is a 1989 University of Buffalo study where CAP problems were found to be present in a surprising 97% of youth inmates in an upstate New York corrections facility.

Training and certification

Both Tomatis and Berard have certification programs in their therapies.

Resources

BOOKS

Katz, Jack, Ph.D., Wilma Laufer Gabbay, M.S., Deborah S. Ungerleider, M.A., and Lorin Wilde, M.S. *Handbook of Clinical Audiology*. Waverly Press, Inc., 1985.

PERIODICALS

Katz, Jack, Ph.D. "Central Auditory Processing Evaluation." (1996).

Masters, M. Gay. "Speech and Language Management of CAPD." (1996).

Musiek, Frank, Ph.D. "Auditory Training: An Eclectic Approach." *American Journal of Audiology* (1995).

OTHER

Cooper, Rachel. "What is Auditory Integration Training?" http://www.vision3d.com/adhd/ (December 2000).

Dejean, Valerie. *About the Tomatis Method, 1997*. Tomatis Auditory Training Spectrum Center, Bethseda, MD.

Masters, M. Gay, and Jack Stecker Katz, N.A. *Central Auditory Processing Disorders: Characteristic Difficulties*. Miniseminar, 1994.

The Spectrum Center. "Auditory Integration and Alfred Tomatis." http://listeningtraining.com/ (December 2000).

Joan Schonbeck

Aura therapy

Definition

Aura therapy is a healing technique based on reading a person's aura, or vital energy field, and then treating diseases revealed by the aura color or colors. Aura therapy is generally considered a subtype of biofield therapy, which is a form of energy therapy that utilizes energies thought to reside in or emanate from the human body (as distinct from electromagnetic energy therapies). There are several variations of treatment,

Colored bottles used for aura therapy. *(© Anneke Doorenbosch/ Alamy)*

but in general aura therapy emphasizes manipulating the aura energy back into a positive balance.

Origins

The exact origin of aura therapy is unknown, but historical references to it date back about 5,000 years. East Indian, Chinese, Jewish, and Christian faiths all have references to auras as energies that vibrate through physical matter. The energies are seen as colors and represent such states of being emotional, mental, astral, and celestial. Halos have also been considered a kind of aura. Historically, it was believed that the special powers of a psychic, mystic, or clairvoyant were needed to see auras. Today, there are many New Age centers that teach the art of aura reading and therapy.

In the late 1890s, the scientist and inventor Nicola Tesla (1856–1943) became the first person to photograph an aura. Auric photography took a big leap forward in the late 1930s when Semyon and Valentina Kirlian introduced a high-voltage imaging process that became known as **Kirlian photography**. Although there have been challenges to the use of Kirlian photography, the process was designed to photograph aura energy emitted by life forms, including plants, animals, and humans. A newer variation is aura imaging photography, which uses a special camera to take instant photos of a person's aura. The size, shape, and color of the aura can then be analyzed to reveal specific physical, emotional, and mental problems.

Types of aura therapy

Since the early 1970s, several different forms of aura therapy have emerged within the alternative medicine field.

KEY TERMS

Astral—Of or from the stars.

Aura—An energy field that is thought to emanate from the human body and to be visible to people with special psychic or spiritual powers.

Biofield therapies—A subgroup of energy therapies that make use of energy fields (biofields) thought to exist within or emanate from the human body. Biofield therapies include such approaches as aura therapy, Reiki, therapeutic touch, qigong, and polarity balancing.

Bodywork—Any healing technique involving hands-on massage or manipulation of the body.

Clairvoyant—A person who has the power to see within their mind a future event or an event or thing out of their visual range.

Ethereal—Something that is of or from the heavens, usually used in a metaphysical sense.

Tellington touch (Ttouch)—A form of energy therapy that combines aspects of the Feldenkrais method of bodywork with aura therapy.

Therapeutic touch (TT)—An American form of energy therapy based on the ancient tradition of the laying-on of hands. TT is thought to work by removing energy blockages or disturbances from the patient's aura.

Aura color therapy

Aura **color therapy** is more closely related to **light therapy** than to such other forms of aura therapy as **therapeutic touch**. In aura color therapy, the proportions of the colors in a person's aura as well as their clarity or intensity are analyzed and treated. Aura color therapists maintain that the aura of a healthy person will have an undistorted oval shape around the body, with clear lines of light energy and a perfect balance of the seven colors of the rainbow. Muddy colors, bulges or swirls in the energy lines, or an absence of any of the major colors signal energy imbalances. For example, a depressed person will have large amounts of blue and green in the aura with no orange or yellow. A chronically angry person will have too much red and little or no blue.

Color therapy treatment consists of adding extra colors to a dull or depleted aura or using complementary colors to correct a color imbalance in the aura. For example, orange, which is the complementary color of blue, would be used to treat the aura of a

depressed person. Several different techniques may be used to add or balance the colors, the most common being the use of colored lights to irradiate the client's body, or the placement of colored gemstones on the client's body while he or she lies on the floor or on a massage table. In another variation of aura color therapy, the client is advised to wear clothing in colors intended to balance or correct the aura.

Therapeutic touch (TT)

Therapeutic touch, or TT, is a form of energy therapy that was developed in the United States in 1972 by Dora Kunz, a psychic healer, and Dolores Krieger, a professor of nursing at New York University. In TT, the practitioner alters the patient's energy field through a transfer of energy from his or her hands to the patient. When illness occurs, it creates a disturbance or blockage in the aura or vital energy field. The TT practitioner uses her/his hands to discern the blockage or disturbance. Although the technique is called "therapeutic touch," there is generally no touching of the client's physical body, only his or her energetic body or biofield. TT is usually performed on fully clothed patients who are either lying down on a flat surface or sitting up in a chair.

A therapeutic touch session consists of five steps or phases. The first step is a period of **meditation** on the practitioner's part, to become spiritually centered and energized for the task of healing. The second step is assessment or discernment of the energy imbalances in the patient's aura. In this step, the TT practitioner holds his or her hands about 2–3 inches above the patient's body and moves them in long, sweeping strokes from the patient's head downward to the feet. The practitioner may feel a sense of warmth, heaviness, tingling, or similar cues, as they are known in TT. The cues are thought to reveal the location of the energy disturbances or imbalances. In the third step, known as the unruffling process, the practitioner removes the energy disturbances with downward sweeping movements. In the fourth step, the practitioner serves as a channel for the transfer of universal energy to the patient. The fifth step consists of smoothing the patient's energy field and restoring a symmetrical pattern of energy flow. After the treatment, the patient rests for 10–15 minutes.

Tellington touch (Ttouch)

Tellington touch, which is also known as Ttouch, is an interesting instance of an alternative therapy that began in veterinary practice and was later extended to humans. Ttouch was developed in England by Linda Tellington-Jones, a graduate of **Feldenkrais** training. The Feldenkrais method, which is usually considered a bodywork therapy, originated with Dr. Moshe Feldenkrais (1904-1984), a scientist and engineer who was also a judo instructor. The Feldenkrais method is based on redirecting the client's habitual patterns of body movement, but it is unusual among bodywork therapies in its emphasis on new patterns of thinking and imagination as byproducts of the body's reeducation. Tellington-Jones, who was employed as a horse trainer, began using Feldenkrais techniques on horses in 1975. In 1983 she developed the pattern of circular touching motions known as Tellington touch.

In the 1980s, Ttouch expanded from treating behavioral problems in horses to treating cats, dogs, and other household pets. In the 1990s, Ttouch was introduced into nursing school curricula for the treatment of humans. It has been used to treat patients suffering from such chronic conditions as **pain** syndromes, **Alzheimer's disease**, arthritis, and **multiple sclerosis** as well as patients recovering from traumatic injuries or **stroke**. Ttouch is growing in popularity among hospice nurses as an alternative treatment for patients facing death.

In Ttouch, the practitioner touches the client's skin but does not manipulate the underlying muscles or bones. The practitioner imagines the face of a clock on the client's body and places a lightly curved finger at the 6-o'clock position. He or she then pushes the skin clockwise around the face of the clock for one and one-quarter circles, maintaining a constant pressure. The client's body is gently supported with the practitioner's free hand, which is placed opposite the hand making the circle. After each circular touch, the practitioner gently slides the hand down the body and repeats the circle.

Benefits

Aura therapy is generally designed to bring imbalances in the aura back into physical, mental, emotional, and spiritual balance. The benefits can be subtle (like a general feeling of peace and well-being) or dramatic (like experiencing a spiritual transformation or feelings of ecstasy). Changes may be immediate or can occur over several days. Repeated therapy sessions can maintain and deepen the aura energy balance.

Persons who have received therapeutic touch or Tellington touch from nurses frequently mention "comfort" or "humanizing of health care" as important benefits.

Therapeutic touch and Tellington touch appear to benefit patients in intensive care units (ICUs), who frequently develop mild psychiatric disturbances

from being isolated and from the fact that ICU equipment interferes with normal human sensory perception. It is thought that TT and Ttouch help to break down the patient's feelings of isolation and disconnection from other people.

Description

Traditionally, an aura is a protective psychic and spiritual energy field that surrounds the physical body. Energy from an aura is usually not static. It is constantly flowing, flashing, vibrating, expanding, and decreasing. The colors detected usually indicate emotions, such as:

- lavender and purple for spirituality
- red/orange for sexual passion
- white for truth
- rose or pink for love
- red for anger
- yellow for intellect

Slow, deep breaths expand the aura while fast, shallow breaths decrease it. Spaces or gaps in the aura usually signify disease. These gaps often appear near the affected area, such as around the heart to signify **heart disease**. In general, auras have seven levels. Physical and ethereal auras extend up to a foot from the body, imagination and emotional auras extend about two feet, while the mental, archetypal (destiny), and spiritual auras extend about three feet.

There seems to be a general consensus among aura therapists that more than one session is required for optimal balancing. Many suggest three sessions within two or three weeks. The first session focuses on the physical aura, the next on the emotional, and the third on the spiritual. Once the aura levels are in balance, follow-up sessions are encouraged every six months to a year. Aura therapy is not covered by medical insurance. The cost can range from $50 to $100 or more per session.

Preparations

No advance preparation is required. Many aura readers and therapists say the patient should have a genuine desire for better health and happiness. Also, many therapists suggest patients abstain from recreational drugs, alcohol, and sex for several days before the therapy for a better sense of clarity and focus.

Precautions

There are no known precautions associated with aura therapy.

Side effects

No negative side effects associated with aura therapy have been reported, although a small minority of patients treated with TT or Ttouch report feeling uncomfortable with being touched by strangers.

Research and general acceptance

Aura color therapy is considered a New Age treatment and is not generally accepted as valid by the conventional medical community. Skeptics argue that there are no scientific studies documenting the benefits of aura therapy or the existence of a human biofield. Most reports of the benefits of aura color therapy are anecdotal and appear in New Age journals and magazines.

Although therapeutic touch has become a popular alternative/complementary approach in some schools of nursing in the United States and Canada, acceptance by the mainstream medical community varies. Many hospitals permit nurses and staff to perform TT on patients at no extra charge. On the other hand, therapeutic touch became national news in April 1998 when an elementary-school student carried out research for a science project that questioned its claims. Twenty-one TT practitioners with experience ranging from one to 27 years were blindfolded and asked to identify whether the investigator's hand was closer to their right hand or their left. Placement of the investigator's hand was determined by flipping a coin. The TT practitioners were able to identify the correct hand in only 123 (44%) of 280 trials, a figure that could result from random chance alone. Debate about the merits of TT filled the editorial pages of the *Journal of the American Medical Association* for nearly a year after the news reports.

Tellington touch training is offered by some schools of veterinary medicine in the United States, and is also offered in continuing education programs in schools of nursing. It appears to be gaining wider support from the mainstream medical community as a useful technique in calming patients facing unpleasant or painful procedures. One study found that patients awaiting venipuncture who received Ttouch were more relaxed before the procedure and had significantly less discomfort afterward.

Training and certification

No formal training or certification is required to practice aura reading, aura color therapy, TT, or Ttouch. However, a number of alternative medicine and New Age healing schools offer formal training and certification. Therapeutic touch and Tellington touch have their own training and certification programs.

Resources

BOOKS

Bain, Gabriel Hudson. *Auras 101: A Basic Study of Human Auras and the Techniques to See Them*. Flagstaff, AZ: Light Technology Publications, 1998.

Bartlett, Sarah. *Auras and How to See Them*. London, UK: Collins & Brown, 2000.

Chiazzari, Suzy. *The Complete Book of Color: Using Color for Lifestyle, Health, and Well Being*, Part Six: Healing Through the Aura. Boston, MA: Element, 1998.

Krieger, Dolores, Ph.D., R.N. *Accepting Your Power to Heal: The Personal Practice of Therapeutic Touch*. New York: Bear & Company, 1993.

MacFarlane, Muriel. *Heal Your Aura: Finding True Love by Generating A Positive Personal Energy Field*. Secaucus, NJ: Citadel Press, 1999.

Oslie, Pamela. *Life Colors: What the Colors in Your Aura Reveal*. Novato, CA: New World Library, 2000.

Snellgrove, Brian. *The Magic in Your Hands: How to See Auras and Use Them for Diagnosis and Healing*. Essex, UK: C. W. Daniel, 1998.

Tellington Jones, Linda, and Sybil Taylor. *The Tellington Touch: A Breakthrough Technique to Train and Care for Your Favorite Animal*. New York and London, UK: Penguin Books, 1995.

PERIODICALS

Demmer, C., and J. Sauer. "Assessing Complementary Therapy Services in a Hospice Program." *American Journal of Hospice and Palliative Care* 19 (September October 2002): 306 314.

Hewitt, J. "Psychoaffective Disorder in Intensive Care Units: A Review." *Journal of Clinical Nursing* 11 (Sep tember 2002): 575 584.

Rosa, Linda, MSN; Emily Rosa; Larry Sarner; and Stephen Barrett, MD. "A Close Look at Therapeutic Touch." *Journal of the American Medical Association* 279 (April 1, 1998): 1005 11.

"Somesthetic Aura: The Experience of Alice in Wonder land." *The Lancet* (June 27, 1998): 1934.

Wendler, M. Cecilia. "Tellington Touch Before Venipunc ture: An Exploratory Descriptive Study." *Holistic Nursing Practice* 16 (July 2002): 51 64.

ORGANIZATIONS

Feldenkrais Guild of North America. 3611 S.W. Hood Avenue, Suite 100, Portland, OR 97201. (800) 775 2118 or (503) 221 6612. Fax: (503) 221 6616. www. feldenkrais.com.

International Society for the Study of Subtle Energies and Energy Medicine (ISSSEEM). 356 Goldco Circle. Golden, CO 80401. (303) 278 2228. www.vitalenergy. com/ISSSEEM.

National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse. P.O. Box 7923, Gai thersburg, MD 20898. (888) 644 6226. TTY: (866) 464 3615. Fax: (866) 464 3616. www.nccam.nih.gov.

The Nurse Healers Professional Associates International (NH PAI), the Official Organization of Therapeutic Touch. 3760 S. Highland Drive, Salt Lake City, UT 84106. (801) 273 3399. nhpai@therapeutic touch.org. www.therapeutic touch.org.

TTEAM/Ttouch in USA. P. O. Box 3793, Santa Fe, NM 87506. (800) 854 8326. www.tellingtontouch.com.

TTEAM/Ttouch in Canada. Rochdell Road, Vernon, BC V1B 3E8. (250) 545 2336. www.tellingtontouch.com.

OTHER

Auras website. The Healing Channel. http://www.healingchan nel. org/aura.html.

Ken R. Wells
Rebecca J. Frey, PhD

Auriculotherapy

Definition

Auriculotherapy, also called ear **acupuncture**, applies the principles of acupuncture to specific points on the ear. Auriculotherapists believe that healing processes can be promoted by working with these points on the ear, because the ear contains many blood vessels and nerve endings that, when stimulated, influence the organs and bodily functions.

Origins

Acupuncture is one of the world's oldest therapeutic techniques, having its roots in ancient China. Some of the oldest texts of Chinese medicine mention acupuncture points and massage techniques specifically for the ear. For eye problems, silver or gold earrings were sometimes prescribed in ancient times to provide constant healing stimulation at points on the ear, a practice that is still performed in some areas of the world, including parts of Europe. The ancient Egyptians and Greeks believed that working with the ears could influence health. Hippocrates, the Greek father of medicine, mentioned a point on the ear that could be operated on as a birth control measure in men. In Europe in the Middle Ages, doctors

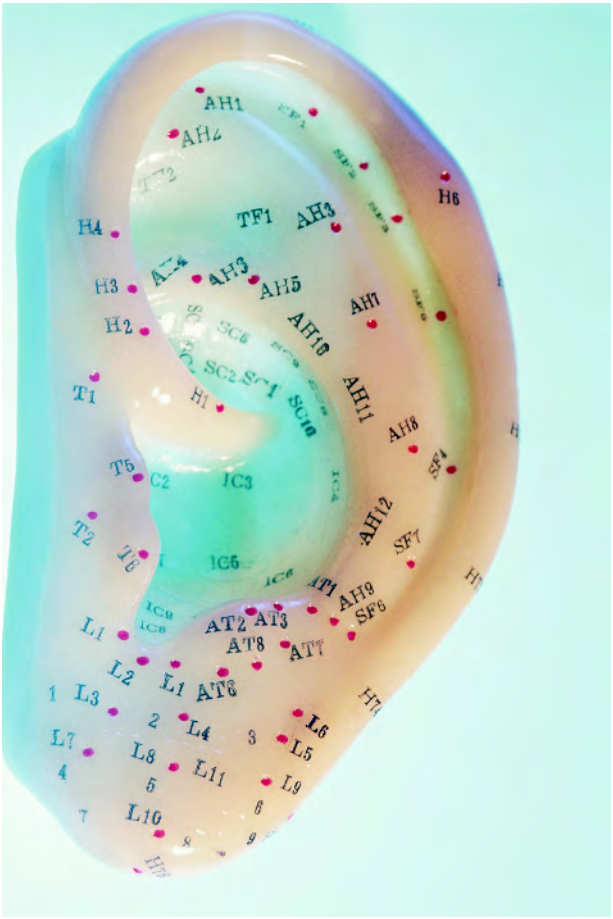


Image of a dummy ear to be used for auriculotherapy. *(© Image Source Limited / Phototake. Reproduced by permission.)*

prescribed surgery on a particular spot on the ear for a condition called **sciatica**, which causes nerve **pain** in the hips and thighs.

In modern times, auriculotherapy has been advanced by Paul Nogier of France. Beginning his work and experiments in the 1950s, Nogier laid out an intricate map of points on the ear that correspond to the organs and processes in the body. Nogier believed that the ear is shaped like an upside down human fetus, and the acupuncture points on the ear correspond to the body parts of the fetus shape, with the earlobe representing the head. Nogier theorized that by stimulating these points on the ear, the corresponding organs and bodily processes would be stimulated by nerve impulses. Nogier also theorized that by measuring electrical impulses on the skin of the ear, problems could be detected in the internal organs, and therefore auriculotherapy could be used to diagnose illnesses. Nogier and many followers, including ear acupuncturists in America and China, conducted

KEY TERMS

Anesthesia—Method of pain control during medical procedures.

Chronic—Referring to illness or condition that is long lasting.

scientific experiments in auriculotherapy, and showed some significant and surprising results in both treatment and diagnosis of conditions. In 2002, a center in Maine received a unique grant to study auriculotherapy for **substance abuse**. Although recognizing that acupuncture had been used before for helping those with abuse, this study sought to show that auriculotherapy's effects on **relaxation** response helped those abusing drugs and alcohol better deal with the **anxiety** and life circumstances thought to lead them to substance abuse.

Benefits

Auriculotherapy is a quick, inexpensive, and noninvasive method of pain control. Ear acupuncture is also used as anesthesia during medical procedures. It is used frequently to help people overcome drug, tobacco, and alcohol addictions, and is used to treat chronic health conditions and diseases.

Description

After an initial exam and interview, auriculotherapists begin treatment by checking the patient's ears closely. Practitioners may palpate (feel) the ears with their hands, and check for any irregularities or painful spots. They may check for spots that are insensitive or numb by using cold or hot needles on the ear. They may also rely on electrical devices that measure skin resistance at points on the ear.

Several techniques may be used during auriculotherapy. Acupuncture needles are typically extremely thin. More than one needle may be used at one time, inserted deeply, or just pricked slightly along the contours of the ear. On some points, needles may be twisted or slanted to create more healing effects. Needles may be left in from a few minutes to half an hour or more.

Auriculotherapists may use *permanent press needles*. These small, tack-shaped needles may be attached to the ear with a narrow band of tape for several days or weeks. They are used for conditions that may require constant stimulation to acupuncture

points on the ear, such as addictions, chronic (long-lasting) **infections**, and other health problems.

Auriculotherapists also practice **electroacupuncture**, which utilizes electrical devices to send small electrical currents into the ear or through the body. Electroacupuncture is used for conditions such as paralysis or nerve damage in the body, drug and alcohol addictions, and chronic pain. Auriculotherapists may also employ *bleeding*, which removes one or two drops of blood at certain points on the ear. Bleeding is used for health problems such as high blood pressure, high **cholesterol**, or **heart disease**.

Auriculotherapy is generally performed once per week on patients for a sequence of several months, although the frequency of treatment depends on the patient and condition. Treatment may last for several months. The initial visit to an acupuncturist is typically the most expensive, costing from $80 to $200. Follow-up visits are less expensive, from $50 to $100 on average. Auriculotherapists may also prescribe herbal and nutritional remedies. Insurance coverage of acupunture fees varies, depending on individual policies.

Preparations

Before treatment, an auriculotherapist may perform a thorough examination and interview the patient to determine health conditions and any precautions or adjustments that must be made. Acupuncturists often rely on **pulse diagnosis** and other diagnostic techniques before and during treatment.

For treatment, the patient should lie in a horizontal position on a comfortable surface in a calm, stress-free environment. After treatment, the patient should be permitted to lie down until feeling capable of leaving the practitioner's office.

Acupuncture needles should be sterilized before use. The ears should be disinfected before acupuncture as well, which is usually done with a cotton ball dipped in rubbing alcohol.

Precautions

Auriculotherapy, like all acupuncture, should not be performed on weak or exhausted patients, nor on those who are very hungry or have just eaten a meal or drunk alcohol. Auriculotherapy should not be performed on pregnant women during the first two trimesters (six months) of **pregnancy**, and afterwards only on very particular points on the ear for pain control. Auriculotherapy is not recommended for children under seven years old, and should be performed with care on the elderly. Ear acupuncture is to be avoided by those with **anemia** (low red blood cell quantity in the blood). Patients with nervous conditions should be thoroughly relaxed and prepared before treatment. For people that find acupuncture disagreeable, ear massage and **acupressure** may be preferable to treatment with needles.

Side effects

Some patients may experience uncomfortable side effects during or after acupuncture. Side effects that may occur after treatment include fainting, **dizziness**, **nausea**, numbness, headaches, sweating, or sharp pains throughout the body. These reactions may be due to anxiety or because acupuncture needles have been inserted too deeply or in the wrong area. Side effects can be alleviated by removing the needles and allowing the patient to lie down under supervision. Some side effects that occur during treatment, such as **hot flashes**, increased pulse, and temporarily increased symptoms, are considered normal and usually disappear quickly.

Training and certification

The American Academy of Medical Acupuncture (AAMA) was chartered in 1987 to support the education and correct practice of physician-trained acupuncturists. Its members must be either MDs or DOs who have completed proper study of acupuncture techniques.

The National Commission for Certification of Acupuncturists (NCCA) conducts certification exams, promotes national standards, and registers members. Most states that license acupuncturists use the NCCA standards as certification.

The American Association of Acupuncture and Oriental Medicine (AAAOM) is the largest organization for practitioners, with more than 1,600 members.

Resources

BOOKS

Fleischman, Dr. Gary. *Acupuncture: Everything You Ever Wanted to Know*. Barrytown, NY: Station Hill, 1998.

Hicks, Angela. *Thorson's Principles of Acupuncture*. New York: HarperCollins, 1997.

Requena, Yves, MD. *Terrains and Pathology in Acupuncture*. Massachusetts: Paradigm, 1986.

PERIODICALS

American Journal of Acupuncture. 1840 41st Ave., Suite 102, P.O. Box 610, Capitola, CA 95010.

Savage, Lorraine. "Grant to Study Acupuncture's Effectiveness on Patients Suffering from Substance Abuse." *Healthcare Review*. (March 19, 2002): 16.

ORGANIZATIONS

American Academy of Medical Acupuncture. 5820 Wilshire Blvd., Suite 500, Los Angeles, CA 90036, (213) 937 5514.

American Association of Acupuncture and Oriental Medicine. 433 Front St., Catasaugua, PA 18032, (610) 266 1433.

National Commission for Certification of Acupuncturists. 1424 16th St. NW, Suite 501, Washington, D.C. 20036, (202) 232 1404.

Douglas Dupler
Teresa G. Odle

Autism

Definition

Autism is a chronic and often severe disorder of brain functioning that begins during childhood. It is marked by problems with social contact, intelligence, and language, coupled with ritualistic or compulsive behavior, sensory integration and processing problems, and abnormal environmental responses.

Description

Autism is a lifelong disorder that interferes with a person's ability to understand what is seen, heard, and touched. This condition can cause profound problems in personal behavior and in a person's ability to relate to others. A person with autism must learn how to communicate normally and how to relate to people, objects, and events. Not all patients have the same degree of impairment. The severity of the condition varies among individuals, ranging from extremely unusual and aggressive behavior to a mild personality disorder or a learning disability.

Autism occurs in as many as one in 1,000 children, and incidence is rapidly increasing. It is found three to four times as often in boys as in girls. The condition occurs around the world in all races and all social backgrounds. Autism usually is evident in the first three years of life, although in some children it is difficult to pinpoint when the problem actually takes hold. Often, the condition may not be diagnosed until

Working with autistic children. *(© Janine Wiedel Photolibrary / Alamy)*

the child enters school. A person with autism can have symptoms ranging from mild to severe.

Two subgroups of autism have been explained by clinicians. Those with essential autism, as defined by diagnostic tests, appear to have higher IQ scores and fewer seizures than those with complex autism, which offers a poorer outcome.

Causes and symptoms

Although the exact causes of autism are unknown, many possibilities have been proposed. Most experts believe that several independent factors contribute to development of autism. The number and combinations of these factors probably differ from person to person. Research points to such precipitating conditions as fetal alcohol syndrome, genetic connections (as with identical twins), brain stem defects, **lead poisoning**, a nervous system defect, **infections**, food and inhalant **allergies**, infant vaccination reactions, and digestive system deficiencies.

Further studies point to major disturbances in the body chemistry of children with autism. Disruption is most often found in fatty acid metabolism, electrolyte balances, problems with digestive functioning, production of red and white blood cells, and the body's balance of minerals. Diseases that may trigger autistic behavior include **rubella** in the pregnant mother; tuberous sclerosis; candiasis infection's fragile X syndrome; encephalitis; cytomegalovirus (CMV), a severe form of a herpes simplex infection; and untreated phenylketonuria.

There also appears to be a strong genetic basis for autism. In October 2001, the National Institutes of Health (NIH) reported that two regions of chromosomes contain genes involved with autism and that two other chromosomes had a weaker relation to autism-related genes. Genetically identical twins are much more likely than fraternal twins to both have autism if one is affected. In a family with one autistic child, the chance of having another child with autism is about one in 20, much higher than in the normal population. Sometimes, relatives of an autistic child have mild behaviors that look very much like autism, such as repetitive behaviors and social or communication problems. Research also has found that some emotional disorders, such as manic **depression**, occur more often in families of a child with autism. At least one group of researchers has also found a link between an abnormal gene and autism. The gene may be just one of at least three to five genes that interact in some way to cause the condition. Scientists suspect that a faulty gene or genes might make a person vulnerable to develop autism in the presence of other factors, such as chemical imbalance, infection, or a lack of oxygen at birth. In general, the genetic basis for autism appears fundamentally important, although still unclear. In a review of research in the area reported in 2007, scientists at Trinity College, in Dublin, Ireland, noted that seven chromosomal regions appear to contain genes that are involved in the development of autism in some way or another. They recommended that future research be focused on these seven areas.

Autism affects the way in which the brain uses or transmits information. Studies have found abnormalities in several parts of the brains of individuals with autism that almost certainly occurred during fetal development. The problem may be centered in the parts of the brain responsible for processing language and information from the senses. Profound problems with social interactions are the most common symptoms of autism. Infants with the disorder will not cuddle, tend to avoid eye contact, and in general do not seem to like or require physical contact or affection. Often, the child will not form attachments to parents or the rest of the family. The child may not speak at all, or will speak very little and may show bizarre patterns of speech, such as endlessly repeating words or phrases. About 10% of those with autism have an exceptional ability in particular areas, such as mathematics, memory, art, or music. Such individuals are known as autistic savants.

Most autistic children appear to be mentally retarded to at least some degree. Bizarre behavior patterns are very common and may include repeated mimicking of the actions of others, complex rituals, screaming fits, rhythmic rocking, arm flapping, finger twiddling, and crying without tears. Many of these children may react to sounds by banging their head or flapping fingers. Some less affected autistic adults who have written books about their childhood experiences report that sounds were often excruciatingly painful to them, forcing them to withdraw from the environment or to try to cope by withdrawing into their own invented world. A common characteristic of individuals with autism is an insistence on routine. There may be strong reactions to changes in food, clothing, and objects or events.

Diagnosis

Autism is diagnosed by obtaining a developmental history of the child and observing and evaluating the child's behavior, communication skills, and social interactions. Because the symptoms of autism are so varied, the condition may go undiagnosed for some time. There is no medical test for autism. The

condition is often missed, especially in mild cases or when additional handicaps are present. Special screening tools help physicians diagnose the condition. Medical tests are sometimes used to rule out other possible causes of autistic symptoms.

Treatment

Early intervention proves critical in managing autism. The American Academy of Pediatrics (AAP) states that many parents have chosen alternative therapies when more traditional therapies do not produce desired results. Among therapies mentioned in the group's report are nutritional supplements, elimination **diets**, immune globulin therapy, and secretin (a hormone) therapy.

There is often a strong nutritional dysfunction involved in autism. A major overhaul of the child's diet should be done, but very gradually. A healthy diet of whole foods with no preservatives or additives, including food dyes, is recommended. Autistic children may have particular difficulty handling certain artificial ingredients, such as the sweetener aspartame, and monosodium glutamate (MSG), as these chemicals may further interfere with already disrupted nerve impulses. Processed foods such as white flour, white sugar, margarine, and hydrogenated fats should be avoided because they may interfere with the stability of blood chemistry.

Many autistic children may be unable to effectively break down the protein in grains such as wheat, barley, and oats called gluten, and the protein in milk called casein. Overgrowths of *Candida albicans* may be present and should be tested for and treated. Testing should also be done for food, chemical, and inhalant allergies. Digestive functioning should be tested and monitored. Extensive testing should be done for blood levels of chemicals in the body, as well. Allergens should be subsequently removed from the diet and environment; further dietary changes should be made to correct chemical imbalances. Possible gut and immune system dysfunction should also be addressed.

Studies have shown that supplementation with megadoses of vitamin B_6 together with **magnesium** improves eye contact, speech, and behavior problems. Vitamin B_6 causes fewer side effects than other medications, but megadoses should be given only under the supervision of a healthcare provider. A B-complex vitamin is probably the best way to give B_6, due to the interdependent functioning of the B vitamins. **Zinc** and **vitamin C** supplementation is also recommended. In addition, dimethylglycine (DMG) has been reported to improve speech in some children with autism in as little as a week's time. Other therapeutic methods that have been shown to be helpful include special **auditory integration training** (AIT) based on the Berard method or the Tomatis method. **Craniosacral therapy** may also improve symptoms of autism by relieving compressions of the skull bones and membranes. Autism is a complex condition. A practitioner who has already worked with cases of autism successfully will be able to offer a comprehensive treatment plan.

Allopathic treatment

Many experts recommend a complex treatment regimen for autism that begins early in life and continues through the teenage years. Behavioral therapies are used in conjunction with medications and special diets. Because the symptoms vary so widely from one person to the next, there is no single approach that works best for every person. Interventions include special training in music, listening, vision, and speech and language. Sensory integration training may be used to normalize sensory functions. Training to change aberrant behaviors should be started as early in the autistic child's life as possible, since early intervention appears to have the most influence on brain development and functioning. A child with autism is able to learn best in a specialized, structured program that emphasizes individualized instruction.

As of 2008, no single medication had proved highly effective for the major features of autism. However, a variety of drugs can control self-injurious, aggressive, and other behaviors. Drugs also can control **epilepsy**, which afflicts up to 20% of people with autism. Types of recommended medication may include stimulants, such as methylphenidate (Ritalin); antidepressants, such as fluroxamine (Luvox); opiate blockers, such as naltrexone (ReVia); antipsychotics; and tranquilizers.

Expected results

Studies show that people with autism can improve significantly with proper treatment. While there is no cure, the negative behaviors of autism can be modified. Earlier generations placed autistic children in institutions; in the 2000s, even severely disabled children can be helped to eventually become more responsive to others. Children with autism usually can learn to better understand and deal with the world around them. Some can even lead nearly mainstream lives.

KEY TERMS

Antidepressant—A type of medication that is used to treat depression; also sometimes used to treat autism.

Asperger syndrome—A condition in which individuals have autistic behavior but normal language skills.

Encephalitis—A rare inflammation of the brain caused by a viral infection, linked to the development of autism.

Fragile X syndrome—A genetic condition related to the X chromosome that affects mental, physical, and sensory development.

Phenylketonuria (PKU)—An enzyme deficiency present at birth that disrupts metabolism and causes brain damage; this rare inherited defect may be linked to the development of autism.

Rubella—Also known as German measles. When a woman contracts rubella during pregnancy, her developing fetus may be damaged. One of the problems that may result is autism.

Tuberous sclerosis—A genetic disease that causes skin problems, seizures, and mental retardation; it may be confused with autism.

Prevention

The mechanisms of autism are poorly understood. As of 2008 there was no known method of prevention for the condition. However, there was much debate as to what part the **measles**, **mumps**, and rubella (MMR) vaccination and the diphtheria, pertussis, and **tetanus** (DPT) vaccination may play in the onset of autism. Some people believe strongly that vaccines may be responsible for a significant number of autism cases. As of 2008, however, virtually no scientific evidence was available to support that hypothesis. Public health authorities were virtually unanimous in their recommendation that all young children have the traditional series of vaccinations for dangerous and potentially fatal diseases.

Resources

BOOKS

Boucher, Jill M. *Autism: Characteristics, Causes, and Basic Issues*. Thousand Oaks, CA: Sage Publications, 2008.

Exkorn, Karen Siff. *The Autism Sourcebook: Everything You Need to Know About Diagnosis, Treatment, Coping, and Healing*. Doughcloyne, Wilton, Cork, Ireland: Collins Press, 2005.

Hall, Laura J. *Autism Spectum Disorders: From Theory to Practice*. Upper Saddle River, NJ: Prentice Hall, 2008.

Jepson, Bryan. *Changing the Course of Autism: A Scientific Approach for Parents and Physicians*. Boulder, CO: Sentient, 2007.

Mackenzie, Heather. *Reaching and Teaching the Child with Autism Spectrum Disorder: Using Learning Preferences and Strengths*. London: Jessica Kingsley, 2008.

PERIODICALS

Knott, Fiona, Aline Wendy Dunlop, and Tommy Mackay. "Living with ASD: How Do Children and Their Parents Assess Their Difficulties with Social Interaction and Understanding?" *Autism* (November 1, 2006): 609 617.

Schmitz, C., and P. Rezaie. "The Neuropathology of Autism: Where Do We Stand?" *Neuropathology & Applied Neurobiology* (February 2008): 4 11.

Wendling, Patricia. "CAM Use High among Autism Patients." *Family Practice News* (February 15, 2005): 43.

Patience Paradox
Teresa Norris
David Edward Newton, Ed.D.

Autoimmune arthritis *see* **Ankylosing spondylitis**

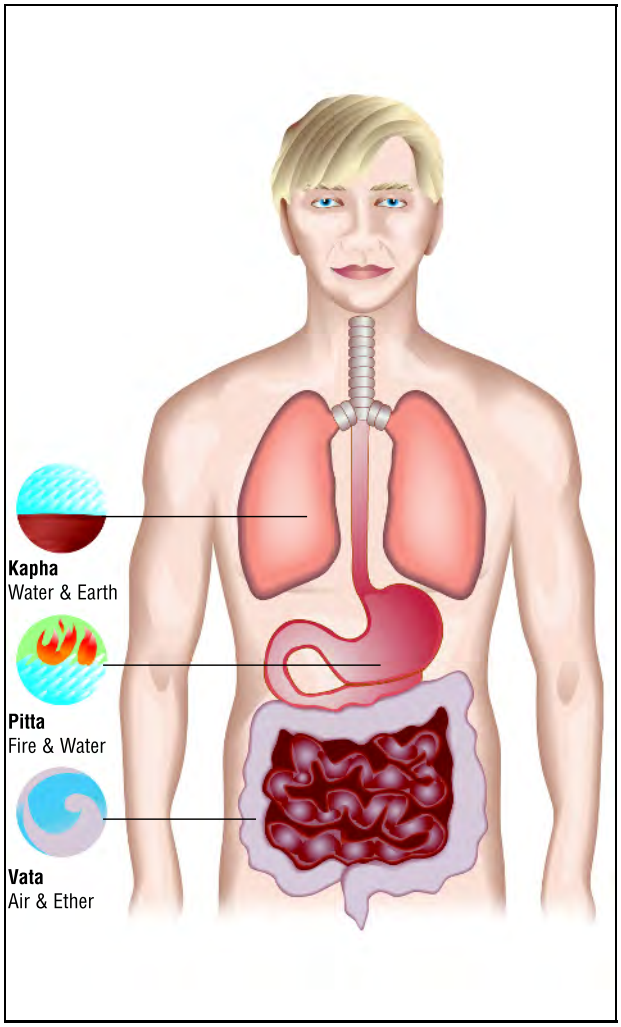
Ayurvedic medicine

Definition

Ayurvedic medicine is a system of healing that originated in ancient India. In Sanskrit, *ayur* means life or living, and *veda* means knowledge, so Ayurveda has been defined as the "knowledge of living" or the "science of longevity." Ayurvedic medicine utilizes diet, **detoxification** and purification techniques, herbal and mineral remedies, **yoga**, breathing exercises, **meditation**, and **massage therapy** as holistic healing methods. Ayurvedic medicine is widely practiced in modern India and has been steadily gaining followers in the West. In this form of medicine, the physician treats the whole person, rather than only focusing on the medical issues that an individual experiences.

Origins

Ayurvedic medicine originated in the early civilizations of India some 3,000–5,000 years ago. It is mentioned in the *Vedas*, the ancient religious and philosophical texts that are the oldest surviving literature in the world, which makes Ayurvedic medicine



The three basic physiological principles or doshas. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

the oldest surviving healing system. According to the texts, Ayurveda was conceived by enlightened wise men as a system of living harmoniously and maintaining the body so that mental and spiritual awareness could be possible. Medical historians believe that Ayurvedic ideas were transported from ancient India to China and were instrumental in the development of Chinese medicine.

Ayurvedic medicine is used by 80% of the population in India. Aided by the efforts of Deepak Chopra and the Maharishi Mahesh Yogi (1918–2008, founder of Transcendental Meditation), it became an increasingly accepted alternative medical treatment in the United States during the 1980s and 1990s. Chopra, who has an MD, has written several bestsellers based on Ayurvedic ideas. He also helped develop the Center for **Mind/Body Medicine** in La Jolla, California, a major Ayurvedic center that trains physicians in Ayurvedic principles, produces herbal remedies, and conducts research and documentation of its healing techniques.

Benefits

According to the original texts, the goal of Ayurveda is prevention as well as promotion of the body's own capacity for maintenance and balance. Ayurvedic treatment is non-invasive and non-toxic, so it can be used safely as an alternative therapy or alongside conventional therapies. Ayurvedic physicians claim that their methods can also help stress-related, metabolic, and chronic conditions. Ayurveda has been used to treat various physical problems, including **acne**, **allergies**, **asthma**, **anxiety**, arthritis, **chronic fatigue syndrome**, colds, **colitis**, **constipation**, **depression**, diabetes, flu, **heart disease**, **hypertension**, immune problems, inflammation, **insomnia**, nervous disorders, **obesity**, skin problems, and ulcers.

Ayurvedic physicians seek to discover the roots of a disease before it gets so advanced that more radical treatments are necessary. Thus, Ayurveda seems to be of limited usefulness in treating severely advanced conditions, traumatic injuries, acute **pain**, and conditions and injuries requiring invasive surgery. Ayurvedic techniques have also been used alongside chemotherapy and surgery to assist patients in recovery and healing.

Description

To understand Ayurvedic treatment, it is necessary to have an idea how the Ayurvedic system views the body. The basic life force in the body is *prana*, which is also found in the elements and is similar to the Chinese notion of *chi*. As Swami Vishnudevananda, a yogi and expert, put it, "Prana is in the air, but is not the oxygen, nor any of its chemical constituents. It is in food, water, and in the sunlight, yet it is not vitamin, heat, or light-rays. Food, water, air, etc., are only the media through which the prana is carried."

In Ayurveda, there are five basic elements that contain prana: earth, water, fire, air, and ether. These elements interact and are further organized in the human body as three main categories or basic physiological principles that govern all bodily functions known as the *doshas*. The three doshas are *vata, pitta,* and *kapha*. Each person has a unique blend of the three doshas, known as the person's *prakriti*, which is why Ayurvedic treatment is always individualized. In Ayurveda, disease is viewed as a state of imbalance

Ayurvedic body types (DOSHAS)

	Vata	Pitta	Kapha
Physical characteristics	Thin	Average build	Large build
	Prominent features	Fair, thin hair	Wavy, thick hair
	Cool, dry skin	Warm, moist skin	Pale, cool, oily skin
	Susceptible to constipation, and skin, neurological and mental diseases	Ulcers, heartburn, hemmorrhoids, heart disease, and arthritis	Obesity, allergies, and sinus problems/asthma, gallbladder problems, and diabetes
	Cramps	Acne	High cholesterol
Emotional characteristics	Moody	Intense	Relaxed
	Vivacious	Quick tempered	Not easily angered
	Imaginative	Intelligent	Affectionate
	Enthusiastic	Loving	Tolerant
	Intuitive	Articulate	Compassionate
Behavioral characteristics	Unscheduled sleep and meal times	Orderly	Slow, graceful
	Nervous disorders	Structured sleep and meal times	Long sleeper and slow eater
	Anxiety	Perfectionist	Procrastination
Dominant Elements	Space and air	Fire and water	Earth and water

(Illustration by Corey Light. Cengage Learning, Gale)

in one or more of a person's doshas, and an Ayurvedic physician strives to adjust and balance the doshas, using a variety of techniques.

The vata dosha is associated with air and ether, and in the body it promotes movement and lightness. Vata people are generally thin and light physically, dry-skinned, and very energetic and mentally restless. When vata is out of balance, there are often nervous problems, hyperactivity, sleeplessness, lower back pains, and headaches.

Pitta is associated with fire and water. In the body, it is responsible for metabolism and digestion. Pitta characteristics are medium-built bodies, fair skin, strong digestion, and good mental concentration. Pitta imbalances show up as anger and aggression and stress-related conditions such as **gastritis**, ulcers, liver problems, and hypertension.

The kapha dosha is associated with water and earth. People characterized as kapha are generally large or heavy with more oily complexions. They tend to be slow, calm, and peaceful. Kapha disorders manifest emotionally as greed and possessiveness, and physically as obesity, **fatigue**, **bronchitis**, and sinus problems.

Diagnosis

In Ayurvedic medicine, disease is always seen as an imbalance in the dosha system, so the diagnostic process strives to determine which doshas are underactive or overactive in a body. Diagnosis is often taken over a course of days in order for the Ayurvedic physician to accurately determine what parts of the body are being affected. To diagnose problems, Ayurvedic physicians often use long questionnaires and interviews to determine a person's dosha patterns and physical and psychological histories. Ayurvedic physicians also intricately observe the pulse, tongue, face, lips, eyes, and fingernails for abnormalities or patterns that they believe can indicate deeper problems in the internal

DEEPAK CHOPRA (1946–)

(Photo Researchers)

Deepak Chopra was born in India and studied medicine at the All India Institute of Medical Science. He left his home for the United States in 1970 and completed residencies in internal medicine and endocrinology. He went on to teaching posts at major medical institutions Tufts University and Boston University schools of medicine while establishing a very successful private practice. By the time he was thirty five, Chopra had become chief of staff at New England Memorial Hospital.

Disturbed by Western medicine's reliance on medication, he began a search for alternatives and discovered one in the teachings of the Maharishi Mahesh Yogi, an Indian spiritualist who had gained a cult following in the late sixties teaching Transcendental Meditation (TM). Chopra began practicing TM fervently and eventually met the Maharishi. In 1985 Chopra established the Ayurvedic Health Center for Stress Management and Behavioral Medicine in Lancaster, Massachusetts, where he began his practice of integrating the best aspects of Eastern and Western medicine.

In 1993, he published *Creating Affluence: Wealth Consciousness in the Field of All Possibilities*, and the enormously successful best seller, *Ageless Body, Timeless Mind*. In the latter he presents his most radical thesis: that aging is not the inevitable deterioration of organs and mind that we have been traditionally taught to think of it as. It is a process that can be influenced, slowed down, and even reversed with the correct kinds of therapies, almost all of which are self administered or self taught. He teaches that applying a regimen of nutritional balance, meditation, and emotional clarity characterized by such factors as learning to easily and quickly express anger, for instance, can lead to increased lifespans of up to 120 years.

systems. Some Ayurvedic physicians also use laboratory tests to assist in diagnosis.

Treatment

Ayurvedic treatment seeks to re-establish balance and harmony in the body's systems. Usually the first method of treatment involves some sort of detoxification and cleansing of the body, in the belief that accumulated toxins must be removed before any other methods of treatment will be effective. Methods of detoxification include therapeutic **vomiting**, laxatives, medicated enemas, **fasting**, and cleansing of the sinuses. Many Ayurvedic clinics combine all of these cleansing methods into intensive sessions known as *panchakarma*. **Panchakarma** methods can take several days or even weeks, and they are more than elimination therapies. They also include herbalized oil massage and herbalized heat treatments. After individuals undergo purification, Ayurvedic physicians use herbal and mineral remedies to balance the body. Ayurvedic medicine contains a vast knowledge of herbs and their uses for specific health problems.

Ayurvedic medicine also emphasizes how people live their lives from day to day, asserting that proper lifestyles and routines accentuate balance, rest, diet, and prevention. Ayurveda recommends yoga as a form of **exercise** to build strength and health, and it also advises massage therapy and self-massage as ways of increasing circulation and reducing **stress**. Yogic breathing techniques and meditation are also part of a healthy Ayurvedic regimen for reducing stress and improving mental energy.

Of all treatments, though, diet is one of the most basic and widely used therapies in the Ayurvedic system. An Ayurvedic diet is a very well planned and individualized regimen. According to Ayurveda, there are six basic tastes: sweet, sour, salty, pungent, bitter, and astringent. Certain tastes and foods can either calm or aggravate a particular dosha. For instance, sweet, sour, and salty decrease vata problems

and increase kapha. Sour, salty, and pungent can increase pitta. After an Ayurvedic physician determines a person's dosha profile, he or she will recommend a specific diet to correct imbalances and increase health. The Ayurvedic diet emphasizes primarily vegetarian foods of high quality and freshness, tailored to the season and time of day. Cooling foods are eaten in the summer and heating ones in the winter, always within a person's dosha requirements. In daily routine, the heaviest meal of the day is lunch, and dinner is eaten well before bedtime to allow for complete digestion. Also, eating meals in a calm manner with proper chewing and state of mind is important, as is combining foods properly and avoiding overeating.

Cost

Costs of Ayurvedic treatments vary, with initial consultations running from $40 to over $100, with follow-up visits costing less. In the United States, a half-hour consultation may range from to $25 to $50. Herbal treatments may cost from $10 to $50 per month and are often available from health food or bulk herb stores. Some clinics offer panchakarma, the intensive Ayurvedic detoxification treatment, which can include overnight stays for up to several weeks. The prices for these programs vary significantly, depending on the services and length of stay. Insurance reimbursement may depend on whether the primary physician is a licensed medical doctor.

Preparations

Ayurveda is a mind/body system of health that contains some ideas foreign to the Western scientific model. Those people considering Ayurveda should approach it with an open mind and willingness to experiment. Also, because Ayurveda is a whole-body system of healing and health, patience and discipline are helpful, as some conditions and diseases are believed to be brought on by years of bad health habits and require time and effort to correct. Finally, the Ayurvedic philosophy affirms that all individuals have the ability to heal themselves, so those considering Ayurveda should be prepared to bring responsibility and participation into the treatment.

Precautions

An Ayurvedic practitioner should be consulted by individuals who want to use herbal preparations. Care should be taken to ensure that a trained practitioner prepares individualized remedies. In 2002, a New York City hospital emergency department cautioned other hospitals when they encountered a case of a patient who came in with severe abdominal pain, occasional vomiting, and eventually seizures. The patient had suffered severe lead toxicity from an ayurvedic compound. In 2004, the Centers for Disease Control and Prevention received 12 reports of **lead poisoning**, which were associated with the use of Ayurvedic treatments. The reports came from consumers in California, Massachusetts, New Hampshire, New York, and Texas.

Side effects

During Ayurvedic detoxification programs, some people report fatigue, muscle soreness, and general sickness. As Ayurveda seeks to release mental stresses and psychological problems from the patient, some people can experience mental disturbances and depression during treatment, and psychological counseling may be part of a sound program.

Research and general acceptance

Because Ayurveda had been outside the Western scientific system for years, research in the United States dates only from the last part of the twentieth century. Another difficulty in documentation arises because Ayurvedic treatment is strictly individualized; two people with the same disease but different dosha patterns are likely to be treated differently. Much more scientific research was conducted in India during the last third of the twentieth century.

Outside India, many groups tried to market the Ayurvedic remedies by duplicating processes and formulas and calling them their own. The Indian government appointed a task force in January 2000 to develop traditional medicines and to prevent piracy of traditional Indian medical knowledge. The task force developed a digital library with international and Indian languages describing about 35,000 Ayurvedic herbal processes and formulas. The library became available in early 2003 on the Internet.

Some Ayurvedic herbal mixtures have been proven to have high antioxidant properties, much stronger than vitamins A, C, and E, and some have also been shown in laboratory tests to reduce or eliminate tumors in mice and to inhibit **cancer** growth in human lung tumor cells. In a 1987 study at MIT, an Ayurvedic herbal remedy was shown to significantly reduce colon cancer in rats. Another study was performed in the Netherlands with Maharishi Ayur-Ved products. A group of patients with chronic illnesses, including asthma, chronic bronchitis, hypertension, **eczema**, **psoriasis**, constipation, **rheumatoid arthritis**, headaches, and non-insulin dependent **diabetes mellitus**, were given Ayurvedic treatment. Strong results were

KEY TERMS

Dosha—One of three constitutional types (vata, pitta, or kapha) identified in Ayurvedic medicine.

Meditation—Technique focusing and concentration in order to calm the mind and body.

Panchakarma—Intensive Ayurvedic cleansing and detoxification program.

Prakriti—An individual's unique dosha pattern.

Prana—Basic life energy found in the elements.

Yoga—System of body and breathing exercises.

observed, with nearly 80% of the patients improving and some chronic conditions being completely cured.

Other studies have shown that Ayurvedic therapies can significantly lower **cholesterol** and blood pressure in stress-related problems. Diabetes, acne, and allergies have also been successfully treated with Ayurvedic remedies. Ayurvedic products have been shown to increase short-term memory and reduce headaches. Also, Ayurvedic remedies have been used successfully to support the healing process of patients undergoing chemotherapy, as these remedies have been demonstrated to increase immune system activity. The herb **gotu kola** has been reported to relieve anxiety and enhance memory.

Training and certification

In the United States, as of 2008, there was no standardized program for the certification of Ayurvedic practitioners. Many practitioners have primary degrees, either as medical doctors, homeopaths, or naturopathic physicians, with additional training in Ayurveda. Others train at an Ayurvedic medical school or college in India. A number of Ayurvedic organizations have worked toward developing licensing standards. Those seeking Ayurvedic treatment should inquire about the Ayurvedic training that a practitioner has completed.

Resources

PERIODICALS

"A Closer Look at Ayurvedic Medicine." *Focus on Complementary and Alternative Medicine* 12, no. 4 (Fall 2005/Winter 2006).

ORGANIZATIONS

American Institute of Vedic Studies. PO Box 8357, Santa Fe, NM 87504. (505) 983 9385. http://www.vedanet.com/.

Ayurvedic and Naturopathic Medical Clinic. 10025 NE Fourth St., Bellevue, WA 98004. (206) 453 8022. http://www.ayurvedicscience.com/.

Ayurveda Holistic Center. Bayville, Long Island, NY. (516) 759 7731. http://www.Ayurvedahc.com.

Ayurvedic Institute. 11311 Menaul, NE Albuquerque, NM 87112. (505) 291 9698. http://www.Ayurveda.com.

Bastyr University of Natural Health Sciences. 144 NE Fifty fourth St., Seattle, WA 98105. (206) 523 9585. http://www.bastyr.edu/.

Center for Mind/Body Medicine. PO Box 1048, La Jolla, CA 92038. (619) 794 2425. http://www.cmbm.org/.

Centers for Disease Control and Prevention. 1600 Clifton Rd., Atlanta, GA 30333. (404) 498 1515; (800) 311 3435. http://www.cdc.gov.

National Institute of Ayurvedic Medicine. 375 Fifth Ave., New York, NY 10016. (212) 685 8600. http://www.niam.com.

Rocky Mountain Institute of Yoga and Ayurveda. PO Box 1091, Boulder, CO 80306. (303) 443 6923. http://www.rmiya.org/index.php/.

OTHER

"Inside Ayurveda: An Independent Journal of Ayurvedic Health Care." PO Box 3021, Quincy, CA 95971. http://www.insideayurveda.com.

Douglas Dupler
Rhonda Cloos, RN

B

Bach flower essences

Description

Bach Flower Essences are specially prepared flower concentrates, containing the healing energy of plants. They are prescribed according to a patient's emotional disposition, as determined by the health practitioner or patients themselves. Bach Flower Essences are more homeopathic than herbal in the way they work, effecting energy levels rather than chemical balances in human and animal bodies. The theory is that they capture the flowers' healing energy, and they are said to overcome negative emotions and so relieve blockages in the flow of human energy that can cause illness. This theory also applies to pets.

The theory behind Bach Flower Essences was originated in the 1920s by British physician and bacteriologist, Edward Bach (1886–1936). Bach noticed that patients with physical complaints often suffered from **anxiety** or some kind of negative emotion. He concluded that determining a patient's emotional disposition and then prescribing an appropriate flower essence could treat the physical illness. Bach was a licensed medical doctor, but he also practiced **homeopathy**.

Following his own serious illness in 1917, Bach began a search for a new and simple system of medicine that would treat the whole person. In 1930, he gave up his medical practice in London and went to Wales and the English countryside to devote his life to his research. At this point, he stopped dispensing the mixtures of homeopathy and allopathic medicine that he had been using. Instead, he began investigating the healing properties of plant essences and discovered that he possessed an intuition for judging the properties of each flower. Through this research, including experimenting with each essence on himself, he developed the system of treatment that bears his name and is also the foundation for all other flower-remedy systems. In 1932 he discovered the first of his flower essences. In the years before his death in 1936, he discovered the remaining 37 essences that came to make up his system of remedies.

The system consists of 38 flower essences, each for a different emotional disposition. The basic theory is that if the remedy for the correct emotion is chosen, the physical illness resulting from that emotional state can then be treated. Bach also developed a combination formula, called **Rescue Remedy**, that contains five of the essences—cherry plum, clematis, impatiens, rock rose, and star of Bethlehem—and is recommended for treating any kind of physical or emotional shock.

Bach Flower Essences cost about $15 per 20 ml vial. There is no set time limit for treatment, which may take days, weeks, or in some cases months. The essences are not generally covered by medical insurance, including Medicare Part D drug plans.

General use

The 38 Bach Flower Essences are divided into seven emotional groups: fear, uncertainty, insufficient interest in present circumstances, despondency and despair, over-sensitivity to the influences or ideas of others, over-care for the welfare of others, and loneliness. The flower essences associated with each group and the specific emotion they are used to treat are as follows:

Fear

- Red rose: Used to treat terror or fright and in situations in which a person feels frozen and unable to move or to think clearly.
- Mimulus: Helps to treat identifiable fears and phobias, such as the fear of spiders or snakes, the fear of being alone, losing a job, or becoming sick. It also alleviates the anxiety of speaking about a fear to others and helps relieve shyness.
- Cherry plum: A remedy for people who fear losing control of their thoughts or actions, and of enacting

Bach Flower Essences are specially prepared flower concentrates, containing the healing energy of plants. *(Cordelia Molloy / Photo Researchers, Inc.)*

choices that are bad for them or that they believe are wrong. It also helps people to trust in themselves and to take actions that they believe are best for them.

- Aspen: Helps alleviate undefined, vague, or unexplainable fears.
- Red chestnut: Helps a person not feel anxious for others, especially loved ones.

Uncertainty

- Cerato: Helps individuals trust their own judgment when making a decision.
- Scleranthus: Helps a person to make a choice when faced with several different options.
- Gentian: Relieves feelings of discouragement and depression when something goes wrong or when one is faced with delays or difficulties.
- Gorse: Alleviates feelings of hopelessness and a sense that nothing more can be done about a situation.
- Hornbeam: Helps indiviudals believe they have the mental or physical strength to deal with the problems of everyday life.
- Wild oat: Helps individuals choose a direction when they reach a crossroad in their lives.

Insufficient interest in current circumstances

- Clematis: A relief for people who feel absorbed, impractical, indifferent, or withdrawn into fantasies, and helps to foster clarity and creativity.
- Honeysuckle: Offers help to people who are homesick, living in the past, or nostalgic.
- Wild rose: Alleviates apathy and resignation, and helps people take a more active interest in their lives.
- Olive: A remedy for exhaustion, which also helps users regain energy, vitality, and an interest in life.
- White chestnut: A help for people who are worried, preoccupied, or who want to get rid of unwanted thoughts.
- Mustard: A relief for sadness and depression caused by unknown reasons.
- Chestnut bud: An aid for people who repeatedly make the same mistake.

Loneliness

- Water violet: Helps people attain a warmer relationship with others and relieves feelings of aloofness.
- Impatiens: A remedy for impatience, irritability, and impulsiveness, and lowers stress and allows people to have empathy and understanding.
- Heather: An aid for people who feel self-centered, egotistical, or self-absorbed, which helps users find companionship and talk about their problems with others.

Over-sensitivity to influences and ideas

- Agrimony: Helps people to communicate their true feelings, and helps people who are normally cheerful but who get upset by arguments.
- Centaury: Helps people who are submissive and weak-willed and makes it easier to say no to others.
- Walnut: Helps to free people from old ties, during times of major life changes, and helps people who have difficulty accepting change.
- Holly: A relief for people who feel anger, jealousy, envy, hatred, and suspicion.

Despondency or despair

- Larch: Helps people regain self-esteem and confidence.
- Pine: Helps relieve feelings of guilt and self-blame. Also helps people who are never satisfied with their efforts and results.
- Elm: Offers relief to people who feel overwhelmed or inadequate and those who are depressed and exhausted.
- Sweet chestnut: Helps people when they feel anguish, despair, or hopelessness.
- Star of Bethlehem: A remedy for grief and distress, such as getting bad news, losing a loved one, or coping with a serious accident.
- Willow: Helps relieve feelings of self-pity and bitterness.
- Oak: A relief for people who are obstinate, inflexible, and overachievers.

- Crab apple: Helps people who feel ashamed and dislike themselves without cause, also known as the cleansing essence.

Over-care for the welfare of others

- Chicory: Helps people to be less critical, opinionated, controlling, or argumentative.
- Vervain: A remedy for people who are overbearing, fanatical, or have an overactive mind.
- Vine: An aid for those who are arrogant, ruthless, and inflexible.
- Beech: Helps people who are critical, intolerant, and negative.
- Rock water: Helps when a person is obsessive, repressive, or perfectionistic.

Preparations

The Bach Flower Essences are made from spring water infused with wild flowers, either by steeping in the sun for two to four hours or by boiling. They are produced by hand at a facility in England and contain 27% grape brandy as a preservative.

The 38 Bach Flower Essences can be taken individually or in any combination. The most common form of the essences is liquid concentrates although there is a combination in cream form, called Rescue Remedy. The liquid essences come in 20 ml (two-third of an ounce) dropper bottles. The recommended dosage is four drops four times a day until relief from the ailment is achieved. The drops can be taken directly into the mouth, placed in a glass of water, or applied on the skin behind the ears or on the inside of the wrists. To use a combination of essences, a small treatment bottle, usually one ounce or 30 ml, is filled with fresh spring water, leaving enough room for the appropriate number of drops. Dr. Bach recommended using two drops of each desired essence, with a maximum of six or seven essences in a single treatment bottle. One teaspoon of brandy, **apple cider vinegar**, or vegetable glycerin can be added as a preservative, if desired.

Precautions

Bach Flower Essences are highly diluted and have not been shown to be addictive, toxic, or cause adverse health effects when taken in normal dosages. Recovering alcoholics and people who avoid alcohol should not take Bach Flower Essences as they contain brandy.

The American **Cancer** Society (ACS) is one of several organizations that maintains there is no available scientific evidence to support claims that flower essences are effective in treating cancer or any other disease. The ACS cites a 2005 Israeli study that reported flower essences were ineffective in treating children with attention deficit hyperactivity disorder. The ACS also points to a 2001 German study that states both flower essences and a placebo were effective in reducing **stress** anxiety in children. This showed that a treatment can be effective if people simply think or are told it will be effective, something called the **placebo effect**, according to the ACS.

KEY TERMS

Allopathic—Conventional medical treatment of disease symptoms that uses substances or techniques to oppose or suppress the symptoms.

Essence—The basic constituent of a plant that determines its characteristics.

Homeopathic—An alternative or complementary disease treatment system in which a patient is given minute doses of natural substances that in larger doses would produce symptoms of the disease itself.

Placebo—Something prescribed for patients that contains no medicine, but is given for the positive psychological effect it may have because the patients believe that they are receiving treatment.

Side effects

Few, if any, adverse side effects have been reported by people using Bach Flower Essences.

Interactions

People taking the antibiotic metronidazole (Flagyl) or antialcoholic medications such as disulfiram (Antabuse) should avoid taking Bach Flower Essences since the essences contain brandy and can cause **nausea** and **vomiting**. Bach Flower Essences have not been tested to determine if they interact with medicines, foods, herbs, spices, and dietary supplements.

Resources

BOOKS

Bach, Edward. *The Essential Writings of Dr. Edward Bach: The Twelve Healers and Heal Thyself*. London: Ran dom House UK, 2005.

Bradford, Nikki. *Heal Yourself with Flowers and Other Essences*. London: Quadrille, 2007.

Pallasdowney, Rhonda. *The Healing Power of Flowers: Bridging Herbalism, Homeopathy, Flower Essences, and the Human Energy System*. Orem, UT: Woodland, 2007.

Salmon, Philip, and Anna Jeoffroy. *Dr. Bach's Flower Remedies: Tapping into the Positive Emotional Qualities of the Chakras*. Berkeley, CA: North Atlantic Books, 2007.

PERIODICALS

"Independent Nurse: Clinical Complementary Medicine Flower Remedies." *GP* (October 21, 2005): 20.

Howard, Judy. "Do Bach Flower Remedies Have a Role to Play in Pain Control?" *Complementary Therapies in Clinical Practice* (August 2007): 174(10).

Pintov, S., et al. "Bach Flower Remedies Used for Attention Deficit Hyperactivity Disorder in Children A Prospective Double Blind Controlled Study." *European Journal of Paediatric Neurology* (October 27, 2005): 395 398.

Wedam, Norene F. "Biological Liquid Crystals: A Scientific Explanation of Bach Flower Essences." *Townsend Letter: The Examiner of Alternative Medicine* (July 2006): 91(3).

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Dr. Edward Bach Centre, Mount Vernon, Bakers Lane, Brightwell cum SotwellOxon, OX10 0PZ , U.K, (44) 01491 834678, http://www.bachcentre.com.

Flower Essence Society, PO Box 459, Nevada City, CA, 95959, (800) 736 9222, http://www.flowersociety. org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Medicine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Ken R. Wells

Bach flower remedies *see* **Flower remedies**

Back pain *see* **Low back pain**

Bad breath *see* **Halitosis**

Bai gou *see* **Ginkgo biloba**

Bai thu *see* **Atractylodes (white)**

Balding *see* **Hair loss**

Balm of Gilead

Description

Balm of Gilead (*Cammiphora opobalsamum*, known as *Populus candicans* in the United States) is a substance used in perfumes that is derived from the resinous juices of the balsam poplar tree. The tree is a member of the Bursera family. The variety that is native to the continents of Africa and Asia is a small tree of 10–12 ft (3-3.6 m)in height. The cultivated North American variety can grow to heights of 100 ft (30 m).

The herb's name derives from the ancient region of Gilead in Palestine, known for the great healing powers of its balm. Balm of Gilead is mentioned several times in the Bible (e.g., Jeremiah 8:22). The writings of Pliny the Elder indicate that the tree was brought to Rome in the first century A.D. The historian Josephus recorded that the Queen of Sheba made a gift of balm of Gilead to King Solomon.

KEY TERMS

Coltsfoot—A common weed, *Russilago farfara*, used to treat chest complaints.

Elecampane—A perennial herb with large yellow flowers used primarily as a digestive stimulant.

Resin—A sticky substance used for medicinal purposes and in the manufacture of varnishes, obtained from the bark of certain trees.

Salicylic acid—A crystalline substance that is the active ingredient in aspirin.

General use

In addition to being used in the composition of perfumes, balm of Gilead is used to soothe ailments of the mucous membranes. It is taken internally to ease coughs and respiratory **infections**. The balm is also said to relieve **laryngitis** and sore throats. It can also be combined with **coltsfoot** to make a **cough** suppressant.

Preparations

The resin of the balsam poplar tree is collected when it seeps out of the tree during the summer months. Seepage increases when humidity levels are high. Slits may be made in the tree's bark to collect the resin more rapidly. The bark and leaf buds are also collected.

For the internal treatment of chest congestion, balm of Gilead is made into a tincture or a syrup. To make a syrup, the balm is combined with equal parts of elecampane, wild **cherry bark** and one-half part of **licorice** mixed with honey. The syrup can be taken by tablespoons as needed.

For external treatment of **bruises**, swellings and minor skin irritations, the balm is combined with lard or oil and applied as needed. The bark, which contains traces of salicylic acid, can be combined with willow and **rosemary** and used as a analgesic to relieve fevers, muscle aches and arthritic **pain**.

Precautions

The sale and use of herbs as medicines, including balm of Gilead, are not regulated by government agencies. Therefore, consumers should **exercise** caution in purchasing and using herbs in this manner. Consultation with a physician or pharmacist is always recommended.

Side effects

In general, balm of Gilead is safe to use in small amounts for coughs and other minor health problems. Some people, however, may have allergic reactions to the resin. In addition, patients with kidney and liver disease, as well as pregnant and nursing women, should avoid the internal use of balm of Gilead.

Interactions

Balm of Gilead has no known interactions with standard pharmaceutical preparations.

Resources

BOOKS

Elias, Jason, and Shelagh Ryan Masline. *Healing Herbal Remedies*. New York: Dell, 1995.

Tierra, Michael. *The Way of Herbs*. New York: Pocket Books, 1990.

OTHER

Grieve, M. "Balsam of Gilead." http://www.botanical.com/ (December 2000).

Mary McNulty

Balneology *see* **Hydrotherapy**

Ban xia *see* **Pinellia**

Barberry

Description

Barberry, Latin name *Berberis vulgaris*, is native to Europe, where it is commonly used as an ornamental shrub. It is also commonly grown in North America. Its close relative, *Berberis aquifolium*, is a native of North America, and is also known as Oregon grape. Native Americans originally taught settlers its value as a medicinal herb. Two other species of the plant,

Barberry plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

Nepalese and Indian barberry, are native to those areas and possess similar qualities.

Barberry is a perennial herb that is usually around 8 ft (2.4 m) tall, but can grow up to 10 ft (3 m) high. It bears yellow flowers, red or black berries, and small rounded fleshy leaves. It flourishes in dry sandy soil, and prefers a sunny location. Research has established that the active alkaloids in barberry belong to the isoquinoline family. They are berberine, berbamine, oxyacanthine, bervulcine, columbamine, isotetrandrine, jatrorrhizine, magnoflorine, and vulvracine. Other components include resin, tannin, and chelidonic acid, among others.

General use

Barberry and other berberine-containing plants have been used throughout history for their medicinal properties. Chinese medicine has records of such use dating back over 3,000 years. In addition to the fact that these plants have been tried and tested over time, recent research has indeed confirmed what herbalists have been teaching for millennia—berberine has remarkable properties.

The berries of the barberry plant are traditionally used to make jams and jellies, and the plant is used to make a dye. However, its culinary use is only minor compared to its importance as a member of the herbal *Materia Medica*.

The medicinal actions of barberry are traditionally classified as being cholagogue, hepatic, antiemetic, bitter and laxative. Its main active constituent, berberine, has recently been the subject of much research (it is the active constituent of a number of valuable herbs, barberry and **goldenseal** being two important examples), and has been proven effective against a variety of ailments.

Barberry is chiefly valued as an efficient liver cleanser, due to its ability to correct liver function and promote the flow of bile. It is good for **heartburn**, stomach upsets, including **gastritis**, ulcers and ulcerative bowel conditions, and is an effective appetite stimulant. It has also been recommended for renal **colic** and the treatment of renal calculi, where it is claimed to allay burning and soreness.

The herb has significant antibacterial, antiviral and antifungal properties, and has even demonstrated antiprotozoal properties, so it is an extremely valuable weapon against infection and **fever**. It is recommended for use against **diarrhea**, whether of non-specific type, such as **gastroenteritis**, or from an identified source such as cholera. It is also capable of inhibiting the growth of *Giardia lamblia, Trichomonas vaginalis* and *Entamoeba histolytica*. In fact, barberry is capable of similar action to Metronidazole, a common antiprotozoal medication, but has the advantage of no side effects.

KEY TERMS

Antiemetic—Prevents or alleviates nausea or vomiting.

Bitter—Reduces toxins, fights infection and fever, and acts as a mild tonic.

Cholagogue—Stimulates the flow of bile from the liver to the intestines.

Decoction—A strong infusion of a herb in water, usually denoting that it is left to stand for longer than an infusion.

Hepatic—Promotes the well being of the liver.

Leishmaniasis—A disease of the tropics transmitted by sandflies.

Laxative—Promotes evacuation of the bowels.

Materia medica—A list of drugs or herbs used medicinally.

Protozoa—Single-celled organisms, many of them intestinal parasites.

Ventricular—Pertaining to the two lower chambers of the heart.

Berberine, the active constituent of barberry, inhibits *Candida* and other fungal growth, but does not affect beneficial bacteria such as *Acidophilus* and *Bifidus*. Barberry is particularly useful for skin **infections**, for which it is often taken internally, and has even been found effective against **psoriasis**.

It is often used against bronchial infections, as it is capable of breaking down and dispersing mucous accumulations, and controlling further secretions. It is an effective sedative, is capable of lowering blood pressure, and is an effective uterine stimulant. Barberry is also taken for **gallstones** and inflammation of the gallbladder. It has the ability to correct an enlarged spleen.

Barberry is useful for correcting menstrual irregularities, correcting **anemia**, as a treatment for **vaginitis**, and even as a tonic for a **hangover**. It is a suitable medication for gouty constitutions. It is recommended for strengthening the patient during convalescence, as it acts as an immune stimulant.

Barberry can be used to treat **malaria** and even Leishmaniasis, which is a protozoal infection. Nicholas Culpeper praised the barberry plant highly, and stated that the berries are just as useful as the bark. He

recommended their use for the cure of ringworm, in addition to the ailments already mentioned.

Because it is capable of increasing blood supply, barberry may be of use to those suffering from ventricular heart defects. Berberine is used in China to treat white blood cell **depression** caused by chemotherapy or radiation treatments.

Preparations

The bark of the roots or stems are the parts used medicinally.

The dried herb may be taken in a decoction, for which place one teaspoonful of the herb in a cup of water and bring to the boil. Leave for about fifteen minutes and drink. This may be taken three time daily. The decoction may also be used as a gargle in cases of **sore throat**.

If a tincture is being used, 1–2 ml may be taken three times daily.

Herbalists recommend that in cases of gallbladder disease, barberry combined with fringe tree bark and black root are an effective treatment.

For an effective liver cleanse, herbalists recommend a combination of one part barberry, one part wild yam, one part **dandelion**, and one half part **licorice** root, simmered in one pint of water for ten minutes, then strained through a coffee filter.

The bark is sometimes made into a poultice for the treatment of skin lesions, and a compress is useful for swollen eye lids and **conjunctivitis**.

Precautions

Barberry root should not be taken by pregnant women because of its stimulant effect on the uterus. Those with **heart disease** or chronic respiratory problems should only take barberry after consultation with a herbalist, naturopath, or medical specialist.

The cultivation of barberry is restricted in some areas, as it hosts and promotes stem rust, a scourge to cereal crops.

If in any doubt, it is always best to consult an herbal practitioner regarding dosage of herbs.

Side effects

Berberine (an active ingredient of barberry), has been found to affect normal bilirubin in infants, so in theory, it may have an adverse effect on **jaundice**.

Strong extracts may cause stomach upsets, so use of barberry for a period of more than two consecutive weeks is not recommended.

Barberry, if taken to excess may cause nose bleeds, lethargy, kidney irritation, skin and eye inflammation, in addition to headaches and low blood sugar.

Interactions

Barberry, or any herb containing berberine, has been found to interact with Sumycin, Helidac (Tetracycline), Vibramycin, Helidac (Tetracycline), Doxycycline, and Achromycin, causing them to be less effective, and to affect their absorption.

Resources

BOOKS

Culpeper, Nicholas. *Culpeper's Complete Herbal*. London: Bloomsbury Books, 1992.

Duke, James A. *The Green Pharmacy*. New York: St. Martin's Paperbacks, 1998.

Grieve, M. *A Modern Herbal*. London: Tiger Books International, 1992.

OTHER

Hoffman, David L. "Barberry." Health World Online. http://www.healthy.net/asp.

Birdsall, Timothy and Gregory Kelly. "Berberine: Therapeutic Potential of an Alkaloid found in several Medicinal plants." In *Alternative Medicine Review* [online database] Vol. 2, no. 2 (March 1997) http://www.thorne.com/altmedrev/fulltext/berb.html.

Patricia Skinner

Barley grass

Description

Barley grass is the leaf portion of the barley plant (*Hordeum vulgare*), which remains after the seeds have been removed. As a grass, it is also known as a *distichon*, meaning that it grows in two separate ranks, or rows. The rows of barley grass are parallel to the central axis, forming a loose sheath over the stem, which is sometimes called the *culm*. This stem is hollow and jointed, and the seeds are ellipitical and furrowed. The barley plant, an annual that requires reseeding each year, reaches a height of up to 3 ft (about 1 m). The plant has an extensive history in human and animal **nutrition**. As a nutritional supplement, it is preferable to use young barley plants that have not yet developed seeds.

Barley growing in a field in California. *(© inga spence / Alamy)*

General use

The barley plant appears to have been used by the ancient Egyptians, Romans, and Vikings. It is believed that Columbus brought it to the Americas in 1493. Barley seeds have been used in both human nutrition and medicine. When the seeds are boiled, they release a thick substance that soothes sore throats. Barley seeds are used for the preparation of malt extract, which has a high sugar content that makes it suitable as a flavoring agent in pharmaceutical preparations.

Marketers make a number of claims regarding barley grass, including:

- It is the only vegetation on earth that can supply sole nutritional support from birth to old age.
- Barley grass juice contains nutrients such as vitamins C and E, which are much more potent together than when taken separately.
- Barley grass is high in calcium, iron, all essential amino acids, vitamin C, the flavonoids, vitamin B_{12}, and a number of enzymes and minerals.
- Barley grass can be used to treat disorders of the stomach and duodenum; pancreatitis; and as an anti-inflammatory agent.
- Barley grass contains superoxide dismutase (SOD), a powerful antioxidant enzyme that protects the cells against toxic free radicals.

Although not substantiated, one source has claimed that barley grass is good for the following conditions:

- skin diseases
- hepatitis
- asthma
- anemia
- diabetes
- arthritis
- obesity

Barley grass contains vitamins, particularly B vitamins, as well minerals such as **potassium**, **calcium**, **iron**, **phosphorus**, and **magnesium**. Enzymes contained in the plant include SOD and nitrogen reductase. The latter reduces nitrogen—an element commonly found in protein—in a biological process. Although barley grass contains enzymes, the health benefits of these substances remain unclear. Enzymes are proteins, which are normally broken down into their component chemicals during digestion. However, the enzymes found in raw foods remain technologically unprotected from normal digestive processes. The medical literature is not consistent on whether any SOD is actually absorbed intact through the digestive tract. In fact, the percentage absorbed may be very small. Techniques are being developed to encapsulate enzymes into other molecules. This will allow the enzymes to be absorbed intact, so that they will remain active following digestion.

Barley grass and other cereal grasses may or may not be useful sources of natural vitamins and minerals. Evidence may be insufficient to justify claims that these products improve physical health or cure disease. Barley grass has not been reviewed by the United States Food and Drug Administration (FDA) or the German Commission E. Nutrient concentration in barley grass products varies with the conditions under which the plant is grown. Like other natural supplements, commercial barley grass is not standardized; therefore, different crops contain varying amounts of nutrients. Young barley grass plants appear to contain higher concentrations of nutrients than older plants.

One well-publicized Chinese study reported that barley grass was beneficial in lowering **cholesterol**

KEY TERMS

Amino acid—An organic compound containing an amino group (NH_2), a carboxylic acid group (COOH), and various side groups. Amino acids are bound together to form proteins.

Diabetes type 2—A form of diabetes mellitus that usually occurs in adults. The pancreas produces insulin, but the muscle cells are resistant to the effects of the insulin. This was formerly called maturity (or adult) onset diabetes.

Enzyme—A protein, produced by a living organism, that functions as an organic catalyst (a chemical that increases the speed of a reaction without being involved in the reaction itself).

Vitamin—Any of various organic carbon-containing substances that are essential in minute amounts for normal growth and activity of the body, and are obtained naturally from plant and animal foods.

levels in patients with type 2 diabetes. This may be due to the plant's antioxidant abilities. Similar results were achieved by other researchers who studied the antioxidant effects of red wine and tomato juice.

Other health claims made for barley grass remain unconfirmed. For example, chlorophyll, the pigment found in barley grass and all green plants, may have some antibacterial effects. Chlorophyll reportedly inhibits the growth of **cancer** cells under laboratory conditions, but its value in human health is unknown.

Similarly, the claim that barley grass can provide full nutrition is subject to dispute. One researcher found that people on a vegan diet that included barley grass were likely to show reduced levels of **vitamin B_{12}**, and to require supplementation with this essential nutrient.

Preparations

Barley grass is available in capsule, powder, and tablet formulations. Capsules are sold in strengths of 470 mg, 475 mg, and 500 mg. Tablets are available in 350 mg and 500 mg strengths.

Precautions

Barley grass may sometimes be rich in **vitamin K**, which interferes with the action of anticoagulants such as Coumadin (the brand name for warfarin, a drug used to treat and prevent **blood clots**). Other than an allergic reaction, there are no known adverse effects attributed to barley grass.

Side effects

There are no known side effects attributed to barley grass.

Interactions

No drug interactions have been associated with barley grass, with the exception of samples that are high in vitamin K (interferes with Coumidin).

Resources

BOOKS

Lust J. *The Herb Book*. New York, NY: Bantam Books, 1984.

Reynolds J., ed. *Martindale The Extra Pharmacopoeia*. 30th ed. London: The Pharmaceutical Press, 1993.

Seibold, R. *Cereal Grass, Nature's Greatest Health Gift*. New Canaan, CT: Keats Publishing Inc., 1991.

PERIODICALS

Donaldson, M.S. "Metabolic Vitamin B_{12} Status on a Mostly Raw Vegan Diet with Follow up Using Tablets, Nutritional Yeast, or Probiotic Supplements." *Annals of Nutrition and Metabolism* 44 (2000): 229 34.

Gowri, J. W., M. S. Turner, J. Nichols, et al. "Lipoprotein Oxidation for Individuals with Type 2 Diabetes Melli tus." *Journal of the American College of Nutrition* 18 (October 1999): 451 61.

Yu, Y. M., Chang, W. C., Chang, C. T., et al. "Effects of Young Barley Leaf Extract and Antioxidative Vitamins on LDL Oxidation and Free Radical Scavenging Activities in Type 2 Diabetes." *Diabetes Metab*. (April 28, 2002): 107 14.

OTHER

Alberta Barley Commission. #200, 3601A 21 Street N.E. Calgary, Alberta T2E 6T5 CANADA. (403) 291 9111. (800) 265 9111. Fax: (403) 291 0190. http://www.albertabarley.com/kids/about.shtml.

Green Green Grass.com. 7925 A N Oracle Rd #281 Tucson, AZ 85704. (888) 773 9808. info@greengreengrass. com. http://www.greengreengrass.com/barleygreen_premium.html.

Herbal Information Center. 3507 Marsala Ct. Punta Gorda, FL 33950 http://www.kcweb.com/herb/barley.htm.

Samuel Uretsky, Pharm.D.

Bates method

Definition

The Bates method, popularized in the early twentieth century by ophthalmologist William Horatio Bates, involves the use of therapeutic eye exercises.

Bates claims these exercises will correct vision problems, thus alleviating the need for glasses or contact lenses. Patients practice eye exercises aimed at strengthening and training their eye muscles in an effort to overcome such problems as farsightedness (**hyperopia**), nearsightedness (**myopia**), and **astigmatism**.

Origins

The method was devised by Bates, who was born in 1860 in Newark, New Jersey. In 1885, he received his medical degree and began practicing in New York City. Over the years, he began to notice that eye conditions like myopia, which is caused by a refractive error, could become better or worse for no apparent reason. Based on this observation, he began to question a basic tenet of traditional ophthalmology, which held that once a person had a refractive error like myopia, the only way to correct it was by wearing glasses.

While traditional ophthalmologists believed that the lens was responsible for the eye's focus, Bates maintained that it was the muscles around the eye that caused the eye to focus. Thus, traditional ophthalmologists blamed problems like nearsightedness on a failure of the lens to properly focus, while Bates believed it was due to a dysfunction of the muscles surrounding the eyeball. Bates had come to this conclusion after performing eye surgery on cataract patients and finding that some of them could still see distance without glasses even though he had removed the lens from their eyes; therefore, he determined that the lens did not play a role in refractive errors such as myopia.

At this point, Bates broke from his counterparts and began focusing his attention on the muscles surrounding the eye. He came to view eye problems as a result of poor evolution, believing that the eye had not kept up with human progress and had not evolved to allow reading. He also blamed problems on artificial light, which kept the eyes working longer hours each day than they were intended to. Bates developed a series of eye exercises to retrain the optic muscles to solve this evolutionary glitch.

Bates believed that eye strain caused vision to deteriorate, and his treatment was simple: like any other muscles, the eye muscles need periods of rest and **exercise** in order to achieve optimal performance. He focused on the functioning of the six small muscles that control the eye's shape. When they become tense, they gradually grow weak and result in nearsightedness, farsightedness, astigmatism, or "lazy eye."

The Bates method received acclaim several years after Bates's death (1931), when author Aldous Huxley boasted that after two months on the Bates program, he went from being almost blind to being able to read without wearing glasses.

KEY TERMS

Astigmatism—An eye condition that causes a person to see distorted images due to an abnormality in the curvature of the eye's lens.

Farsightedness—Being able to see more clearly those objects far away as opposed to those that are near. Also called hyperopic.

Nearsightedness—Being able to see more clearly those objects that are near as opposed to those in the distance. Also called myopia.

Benefits

An advantage of the Bates method is that the treatment is relaxing. Also, if patients stick to the routine and eye improvement is gained, they may benefit by being able to discard their corrective lenses, escaping a lifetime of costs for glasses, lenses, and contact solutions. The treatment is also much less invasive than refractive surgery, which is costly and has risks, just like any other operation.

Description

The Bates method maintains that vision problems are caused by physiological and psychological **strains** and therefore cannot be corrected by wearing glasses. He believed that a combination of rest and exercise would mend the eyes and devised several exercises aimed at strengthening and retraining the eye muscles.

The exercises themselves are simple, but Bates stressed that it takes discipline and attention to detail in order to achieve improvement. Some of the principal exercises of the Bates method are described below.

Palming

Palming is aimed at calming the visual system. In this exercise, patients close their eyes and cover them with the palms of their hands, allowing the fingers to cross on the forehead. The hands should be cupped so that no pressure is put on the eyeballs. Next, the patient should open his or her eyes and see if any light is getting in. If so, the hands should be moved so that no light enters and then close the eyes again. The warmth of a person's hands, combined with blocking out all light, will relax a pair of tense eyeballs.

Sitting at a table is a good palming position. A person can place a cushion on the table on which to rest their arms, and should check the height to be sure their hands are not too high or too low. Lying on the back, with knees raised and feet flat on the floor, is also a good position. While palming, patients should imagine a relaxing scene, such as a sunrise or ocean.

A description of the exercise posted on the Bates Association for Vision Education website suggests palming in 5–10 minute sessions, at least once a day. If this is found unpleasant, a person can try mini-sessions, palming for a period of 15 breaths, up to 20 times a day. Palming may also help when the eyes become tired and bleary.

Swinging

Swinging is meant to train the eyes not to stare. Bates maintained that the rigidity of staring was bad for the eyes. To do this exercise, the patient should focus on a fixed object, then swing the head or the entire body from side to side while keeping the object in view by moving the head instead of the eyes.

Test-card practice

Based on the idea that practice makes perfect, this exercise involves practicing eye charts. Patients are asked to focus on a letter, then close their eyes and visualize the black letter for several seconds. After several sessions, Bates maintains, the letters will appear blacker and clearer.

Sunning

Sunning is aimed at reducing light sensitivity. Bates believed the sun has a therapeutic effect, so patients are asked to close their eyes and face the sun. It is advised to sun only in the morning or evening and only for short periods of time.

Centralization

Centralization, or central fixation, is aimed at training the eye not to overstrain itself by taking in too much at once. This exercise involves training the eyes to focus on a single point, rather than an entire picture. The eye has a point in the middle of the vision field where vision is sharpest. This exercise is aimed at training people to look only at that point. Patients are asked to look at an object piece by piece instead of trying to look at it in its entirety, which Bates maintains is beyond the physical capabilities of the eye. Bates believed that looking at an entire picture created strain, causing bad eyesight. This is not an exercise per se, but rather something patients are asked to do all day long.

Color days

This involves spending the day focused on looking for a specific color. When looking at a color, patients are asked to focus on the color, not the form. Colors change every day.

People interested in the Bates method can pay a professional trained in the method to teach them the exercises or they can simply read about them in books or on the internet for no cost. Bates believed that improvement would vary, depending on the degree of problem and a person's devotion to doing the exercises.

Preparations

There are no pre-therapy procedures.

Precautions

People should be aware that the theory remains untested and they may be wasting their time on the exercises. This method should not be a substitute for appropriate medical treatment in the case of **cataracts**, **glaucoma**, and other eye diseases.

Side effects

There are no side effects, but patients should be cautious when using the sunning exercise, which may cause solar retinitis, or inflammation of the retina, causing permanent damage.

Research and general acceptance

Though the Bates method was devised a century ago, it has never been tested in a clinical setting. At best, anecdotal evidence is all there is to substantiate its use.

The orthodox ophthalmologists of Bates's time, as well as those of today, have largely dismissed his theories as based on flawed science. Traditional ophthalmologists hold that the lens—not the eye muscles—is responsible for focus and therefore cannot be fixed through a series of exercises. Traditional ophthalmologists believe that problems like nearsightedness are anatomic conditions that cannot be fixed by strengthening the eye muscles.

As Philip Pollack noted in his book *The Truth About Eye Exercises*, Bates used testimonials and case histories depicting successful treatment as scientific proof his theory was sound. Pollack also lambasted Bates for describing rare cases as the norm, using them as justification for his methods.

The Bates method has not found widespread use and is generally not accepted by the medical establishment. In

his book *Health Education Authority Guide to Complementary Medicine and Therapies*, A. Woodham cautions that the medical consensus is that "eye exercises can improve the sight in some cases, but these need a lot of dedication and perseverance. Do not expect miracles."

Training and certification

Natural vision improvement techniques, such as the Bates method, are generally taught by behavioral optometrists or vision therapists. Vision therapists may not necessarily be trained in optometry. It is possible, however, to find practicing optometrists trained by the Bates Association for Vision Education, which offers courses on the method.

Resources

BOOKS

Bates, W. *The Bates Method for Better Eyesight without Glasses*. New York: Henry Holt & Co., 1987.

Cheney, E. *The Eyes Have It: A Self Help Manual for Better Vision*. York Beach, Maine: Samuel Weiser, Inc., 1987.

PERIODICALS

Booth, Brian. "Nature Cures: Hydrotherapy, Bates Method." *Nursing Times* 91 no. 20 (May 1995): 42 43.

Karatz, May Annexton. "William Horatio Bates, M.D., and the Bates Method of Eye Exercises." *New York State Journal of Medicine* 75 no. 7 (June 1975): 1105 1110.

ORGANIZATIONS

College of Optometrics in Vision Development. P.O. Box 285, Chula Vista, CA 91912. (619) 425 6191. Fax: (619) 425 0733.

OTHER

"Bates Method." *The Vision Improvement Site*. http://lightning.prohosting.com/ hanwen/vision/bates.htm. 16 July 2000.

"Fallacies of the Bates System." *Quackwatch.com*. http://www.quackwatch.com. 14 July 2000.

"Who Was Dr. Bates?" *Bates Association for Vision Education*. http://www.seeing.org/intro/faq/faq01.htm. 14 July 2000.

Lisa Frick

Bayberry

Description

Bayberry, also known as wax myrtle, waxberry, or candelberry, is both a shrub and a tree. All members of the bayberry family are classified botanically as *Myricaceae*, and many varieties are found all over the world, including Japan, South America, the West Indies, the United Kingdom, and in the United States.

American bayberry (*Myrica cerifera*) is a shrub that grows 3–8 ft (1–2.4 m) high. It is found in eastern North America, in marshes and bogs near sandy Atlantic coastal areas, as well as in similar areas along the shores of the Great Lakes. American bayberry is the variety most often mentioned by herbalists.

American bayberry and its British Isles cousin, English bog myrtle, are very alike in appearance, and grow to a similar height. Foliage is evergreen and consists of knife-blade shaped shiny leaves that have small spots on them. When crumpled in one's hand, bayberry leaves and its bark produce a pleasant, balsamic aroma. However, they have a very bitter, astringent taste. The small berries are in globular clusters at stem junctions, crusted with a greenish-white waxy substance sprinkled with small black flecks. The exterior of bayberry root bark is mottled, with smooth reddish-brown cork underneath.

General use

Both American bayberry and English bog myrtle, besides sharing a similar appearance, have similar medicinal qualities. Like all bayberry varieties, they are classified as astringent herbs. Some evidence suggests that these herbs have antimicrobial capabilities, in that they are able to prevent the development of pathogenic activity from microbes, and are useful in regulating mucus in the body.

Both varieties' bark and roots contain starch, lignin, gum, albumen, tannic and gallic acids, astringent resin, a red coloring substance, a vaporous oil, and an acid similar to saponin. Powdered bayberry root is useful as a bowel astringent in the treatment of **diarrhea** and **colitis**, a soothing and helpful gargle for the **common cold** or a **sore throat**, and as a douche in the treatment of leukorrhea, an abnormal white or yellow mucoid discharge from the vagina or cervix. In the *Herbal Materia Medica*, bayberry root bark is classified as an astringent, a circulatory stimulant, as well as a diaphoretic, a remedy which dilates superficial capillaries and induces perspiration, sometimes used to reduce fevers.

The berries of both American bayberry and English bog myrtle, when boiled in water, produce myrtle wax, which is composed of stearic, palmitic, myristic, and oleaic acids. This is used in making bayberry-scented soaps and bayberry candles, which are fragrant, more brittle than bees' wax candles, and are virtually smokeless. Four pounds of berries produce approximately one

pound of wax. A briskly stimulating shaving cream was also made from this bayberry wax.

The wax's modern medicinal uses were first discovered and came into use in 1722, and included the making of surgeon's soap plasters. The water that the berries were boiled in during wax-extraction, when boiled down to an extract, has been used in the North Country of England and Scotland for centuries as a treatment for dysentery. Narcotic properties are also attributed to bayberry wax.

In *A Modern Herbal*, it was written that the leaves of English bog myrtle were commonly used in France to induce both **menstruation** and abortion.

In China, bayberry leaves are infused to make a tea which is used both to relieve stomach problems, and as a cordial, which is a stimulating medicine or drink.

A mouthwash particularly useful in inhibiting hallitosis can be made from either the powdered root or leaves.

Bayberry bark has traditionally been used to tan leather and dye wool.

Bayberry branches have been used in lieu of **hops** in the fermentation of *gale beer*, popular in northern England, and reported to have more than the usual "thirst-quenching" ability.

Bayberries can be ground to use as spice, or added to broths.

In the West Indies, *Pimenta acris*, commonly called wild cinnamon or bayberry, is used in making both bay rum and oil of bayberry.

M. pennsylvanica's root can be used to induce **vomiting**.

The Brazilian species, *Tabocas combicurdo*, is described in *A Modern Herbal* as a "pick-me-up."

Preparations

Bayberry preparations are made by collecting root bark in late fall or early winter, drying thoroughly, and either pulvarizing into a powder or chopping the bark. It should be stored in a tightly sealed container, away from light.

A decoction or tea is prepared by adding a teaspoonful of powdered bayberry bark to a cup of cold water and bringing this to a boil. If using chopped, not powdered, bark, the decoction is simmered. This *tea* is then left to steep for 15–20 minutes before drinking. It may be taken up to three times a day for a limited period of time, as chronic use at this dosage could damage a person's kidneys and liver. The same preparation can be used as a gargle for sore throat.

Tincture of bayberry preparations are also available in some locales. Usual dosage is one-half teaspoonful in water.

Precautions

As noted previously, English bog myrtle has historically been shown as having characteristics capable of inducing abortion. Its leaves, in nature, also have a poisonous, volatile oil present, which can be removed by boiling. Though no studies were found indicating the same capabilities for American bayberry, because of their many similarities, it should be assumed that neither English bog myrtle nor American bayberry leaves should be ingested in their natural, unprepared state. Additionally, aforementioned dosages of a bayberry decoction or tea should not be taken on a chronic basis, as damage to the kidneys and liver could occur.

Side effects

Powdered bayberry root, if inhaled, can cause convulsive episodes of both **sneezing** and coughing.

Several varieties of the bayberry family are used as emetics, which are agents used to induce vomiting, and can also cause **nausea**.

Interactions

To date, no reported interactions with either food, drug, or other herbal preparations have been found.

Resources

BOOKS

Grieve, M. and C.F. Leyel Barnes. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultivation and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes and Noble Publishing, 1992.

Hoffman, David and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. Barnes and Noble Publishing, 1999.

Thayer, Henry. *Fluid and Solid Extracts*. Geo.C.Rand & Avery, 1866.

Joan Schonbeck

Bearberry *see* **Uva ursi**

Beard moss *see* **Usnea**

Bedsores

Definition

Bedsores are the result of inflammation and damage caused by irritation to the skin and inhibited blood flow. The condition occurs when skin is rubbed against a bed, chair, cast, or other hard object for an extended period of time. Bedsores can range from mild inflammation to deep **wounds** that involve muscle and bone. **Infections** can be a serious complication to the condition.

Description

Bedsores are also called decubitus ulcers, pressure ulcers, or pressure sores. They often start out with shiny red skin that becomes itchy or painful, then quickly **blisters** and deteriorates into open sores. Once there is a break in the skin, there is a strong possibility of the sore becoming infected, causing further medical problems. Bedsores are most apt to develop over the bony prominences of the ankles, the hip bones, the lower back, the shoulders, the spinal column, the buttocks, and the heels of the feet. Bedsores are most likely to occur in people who must use wheelchairs or who are confined to bed.

Bedsores are medically categorized by stages:

- Stage I: The skin reddens, but it remains unbroken.
- Stage II: Redness, swelling, and blisters develop. There is possibly peeling of the outer layer of the skin.
- Stage III: A shallow open wound develops on the skin.
- Stage IV: The sore deepens, spreading through layers of skin and fat down to muscle tissue.
- Stage V: Muscle tissue is broken down.
- Stage VI: The underlying bone is exposed, and there is danger of severe damage and infection.

Causes and symptoms

Bedsores most often happen when the most superficial blood vessels are pressed against the skin and squeezed shut, closing off the flow of blood. If the supply of blood to an area of skin is cut off for more than an hour, the tissue will began to die due to lack of oxygen and nutrients. Ordinarily, the layer of fat under the bony areas of the skin helps keep the blood vessels from being compressed in this way. Also, people have a normal impulse to change positions frequently when they are sitting or lying down, so the blood supply is usually not kept from any area of the skin for very long. Bedsores are most likely to occur in people who have lost the protective fat layer or whose movement impulse is hindered.

Friction or rubbing from poorly fitted shoes or clothing and wrinkled bedding often cause a sore to develop. Constant exposure to the moisture of urine, feces, and perspiration may also cause the skin to deteriorate. In such cases there is an increased the risk of skin infection as well as sores.

Risk factors for bedsores:

- older than 60 years of age
- heart disease
- diabetes
- diminished tactile sensation
- incontinence
- malnutrition
- obesity
- paralysis or immobility
- poor circulation
- prolonged bed rest
- spinal cord injury
- anemia
- disuse atrophy

KEY TERMS

Disuse atrophy—Condition of muscles that have lost size, strength, and function due to lack of mobility.

Gangrene—A serious condition where there is decay or death of an organ, tissue, or bone caused by a lack of oxygen and nutrients and by bacterial infections.

Incontinence—Inability to control bladder or bowel movements.

Inflammation—An immune reaction to tissue injury or damage, usually characterized by pain, swelling and redness.

Poultice—Moistened herbs applied directly to a site of injury or infection.

Tactile sense—Receiving information about the body and the environment via contact with the skin. When this is lost through illness, a person may receive injuries without being aware of it.

Diagnosis

Physical examination of the skin, medical history, and patient and caregiver observations are the basis of diagnosis. Any sign of reddening of the skin will be closely monitored.

Treatment

Contrasting hot and cold local applications can increase circulation to problem areas and help flush out waste products, speeding the healing process. Hot compresses should be applied for three minutes, followed by 30 seconds of cold compress application, repeating the cycle three times. The cycle should always end with the cold compress. In addition, **zinc** and vitamins A, C, E, and B-complex should be taken to help maintain healthy skin and repair injuries.

Herbal remedies

A poultice can be made of equal parts of powdered **slippery elm**, *Ulmus fulva*; **marsh mallow** root, *Althaea officinalis*; and *Echinacea spp*. The herbs should be blended together with a small amount of hot water and applied to the skin three or four times per day to relieve inflammation. Poultices used on broken skin or infected areas should never be reused.

An infection-fighting rinse can be made by diluting two drops of essential **tea tree oil**, *Melaleuca spp*., in eight ounces of water. This should be used to bathe the wound when bandages are changed.

An herbal tea made from *Calendula officinalis* can be used as an antiseptic wash and a wound healing agent. **Calendula** cream can also be applied to the affected area.

A poultice made from **goldenseal**, *Hydrastis canadensis,* and water or goldenseal ointment can be applied to areas of inflammation several times per day to heal the skin and prevent infection.

Allopathic treatment

A healthcare provider should be consulted whenever a person develops bedsores. An emergency situation may be indicated if sores become tender, swollen, or warm to the touch, if the patient develops a **fever**, or if the sore has pus or a foul-smelling discharge.

For mild bedsores, treatment basically involves relieving pressure on the area and keeping the skin clean and dry. When the skin is broken, a non-stick covering may be used. A saline solution is often used to clean the wound site whenever a fresh bandage is applied. Disinfectants are applied if the site is infected. The doctor may also prescribe antibiotics, special dressings or drying agents, and ointments to be applied to the wound. Heat lamps are used quite successfully to dry out and heal the sores. Warm whirlpool treatments are sometimes also recommended for sores on the arm, hand, foot, or leg.

In a procedure called debridement, a scalpel may be used to remove dead tissue or other debris from the wound. Deep sores that don't respond to other therapy may require skin grafts or plastic surgery. If there is a major infection, oral antibiotics may be given. If a bone infection, called osteomyelitis, develops or infection spreads through the bloodstream, aggressive treatment with antibiotics over the course of several weeks may be required.

Expected results

With proper treatment, bedsores should begin to heal two to four weeks after treatment begins. Left untreated, however, **gangrene**, osteomyelitis, or a systemic infection may develop. In the United States, about 60,000 deaths a year are attributable to complications caused by bedsores.

Prevention

Prompt medical attention can prevent pressure sores from deepening into more serious infections. People whose movement or sense of touch is limited by disability and disease should be monitored to insure that the skin remains clean, dry, and healthy. A bedridden patient should be repositioned at least once every two hours while awake. A person who uses a wheelchair should remember to shift the body's position often or they should be helped to reposition the body at least once an hour. To avoid injury, it is important to lift, rather than drag, a person being repositioned. Wheelchair users should sit up as straight as possible, with pillows behind the head and between the legs if needed. Donut-shaped seat cushions should not be used because they may restrict blood flow.

Even slight friction can remove the top layer of skin and damage the blood vessels beneath it. Pillows or foam wedges can be used to keep the ankles from rubbing together and irritating each other; pillows placed under the lower legs can raise the heels off the bed. To minimize pressure sores, there should be adequate padding in beds, chairs, and wheelchairs. Those who are bed-ridden can be protected by using sheepskin pads, specialized cushions, and mattresses filled with air or water. In addition, a 1997 study indicates that topical use of **essential fatty acids** can help the skin stay healthy.

Resources

BOOKS

Berkow, MD, Robert, editor in chief, et al. *The Merck Manual of Medical Information, Home Edition*. New York: Pocket Books, 1997.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Virginia: Time Life, Inc., 1996.

PERIODICALS

Declair, V. *Ostomy Wound Management* 43, no. 5 (1997): 48 52.

ORGANIZATIONS

International Association of Enterstomal Therapy, 27241 La Paz Road, Suite 121, Laguna Niguel, CA 92656

National Pressure Ulcer Advisory Panel, SUNY at Buffalo, Beck Hall, 3435 Main Street, Buffalo, NY 14214 Web site: http://www.npuap.org.

Patience Paradox

KEY TERMS

Antidiuretic—A substance that diminishes the formation of urine.

Behavior modification—Therapy aimed at changing behavior by substituting problem behaviors with more useful activities.

Culture test—A laboratory test to grow samples of an infecting organism from discharge or samples of affected tissue.

Diuretic—A substance that stimulates the formation and excretion of urine.

Rapid eye movement sleep—A stage of sleep during which dreams occur. This stage usually alternates with a heavier, more restful stage of sleep.

Sitz bath—A hydrotherapy treatment for soaking the pelvic or genital areas.

Urethra—The tube that drains urine from the bladder.

Urologist—A physician who specializes in treating problems of the urinary tract.

Bedwetting

Definition

Bedwetting, or enuresis, is a childhood condition of urinating in bed while asleep at night. It is a chronic condition that often resolves by itself before the teenage years.

Description

One of the major tasks of toddlerhood is to learn how to achieve conscious control over the timing of urination. Most children do not become fully toilet trained until they are about two to four years old. Before then, the parts of the nervous system in charge of bladder control are not fully developed and functional. In general, boys take longer to learn to control their bladders than girls, and daytime bladder control is easier for a child than overnight bladder control. There is a genetic aspect to bedwetting, so that parents who once had the condition often have children who wet the bed at night.

Causes and symptoms

Bedwetting is often due to the normal immaturity of the nervous system and the urinary system. For instance, up to age six, bedwetting is often due to nothing more than the bladder having a small capacity. In addition, the muscles that control the opening and closing of the urethra may not be sufficiently developed. Often it takes a while for a child to learn recognition of bladder fullness, waking up, and going to the toilet. In most cases, urinary capacity and control increase over time, and the bedwetting problem will eventually be outgrown.

Surprisingly, a major cause of bedwetting is lack of sleep. If a child is not sleeping enough hours, then there will be less of the light, rapid eye movement (REM) sleep, and more periods of heavy, deep sleep. During the periods of deep sleep some children will have difficulty becoming aware of the urge to urinate and awakening to go to the toilet.

Bedwetting may be a sign of allergic reactions, which end up irritating sphincter muscles around the urethra. This contributes to a loss of bladder control during sleep. Heavy **snoring**, mouth breathing, and night sweats may all be indications of the presence of **allergies**.

Bedwetting can sometimes be due to emotional and psychological **stress**, including major life changes such as moving or a divorce. This usually leads to the type of bedwetting called secondary enuresis, in which a previous level of accomplishment with bladder control is lost. In other words, a child who has been dry at night will suddenly start wetting the bed again. This may indicate an underlying problem such as **constipation**, diabetes, physical defects in the urinary tract,

sacral nerve disorders, a pelvic growth, urinary stasis, infection, **kidney stones**, or kidney damage. Secondary enuresis also frequently occurs in children who are being physically or sexually abused. A pediatrician should be consulted if the condition persists.

Only about 1% of bedwetting is caused by a serious underlying problem. If the following symptoms are present, a pediatrician or a pediatric urologist should be consulted:

- straining during urination
- a burning feeling or other discomfort during urination
- constant or recurrent dribbling of urine
- cloudy or pink urine
- bloodstains or other discharge on underpants or nightclothes
- an unpleasant urine odor
- onset of abdominal pain, backache or fever
- constant thirst, especially at night
- sudden loss of bladder control previously mastered
- a child over the age of two who still shows no signs of being ready to learn bladder control

Diagnosis

When bedwetting is resistant to home treatments or when more serious symptoms are present, a visit should be made to a healthcare provider. This is especially warranted if the child is older than six. A thorough history and physical exam should be taken along with a urine sample. Analysis and culture tests can be done on the urine to determine if an infection is present. Further evaluations may be made using ultrasound, an x ray of the kidney, or a consultation with a urologist. If the bedwetting appears to be connected with issues of stress or family problems, a mental health consultation may be recommended.

Treatment

Sitting in a cool sitz bath (pelvic area only immersed) for about five minutes daily can tone up the urethral sphincter. This can be done using a bathtub filled with about two or three inches of water, having the child sit in a large basin of water or using a sitz basin (available from larger drugstores and medical supply stores).

"Hands-on" treatments such as **acupressure**, **reflexology**, and **shiatsu** can be used to relax the child, counteract stress, and improve the actions of the nervous system. **Hypnotherapy** can also be helpful in improving bedwetting. Among other things, the child will be given positive goal affirmations to say before going to bed. This should help make the urge to urinate during the night more conscious, and therefore encourage the child to awaken and go to the toilet.

The best way to use **homeopathy** is to see a homeopath for individual prescribing. *Equisetum* 6c, may be useful, especially if there are dreams or nightmares connected with the bedwetting. For bedwetting in very excitable, outgoing children, which occurs soon after falling asleep, *Causticum* 6c may be recommended. The remedies should be given once per day at bedtime for up to two weeks. A practitioner should be consulted for more specific remedies.

Herbal medicine

A strong tea can also be made using equal parts of **horsetail**, *Equisetum arvense;* **St. John's wort**; **cornsilk**, *Zea mays;* and **lemon balm**, *Melissa offinalis*. Two to three handfuls of the mixture should be placed in a quart or liter jar and then covered with boiling water. The tea should be allowed to steep overnight. The child should be given half a cup of the tea three times per day, with the last dose being given at least two hours before bedtime.

Nettles, *Urtica dioica,* can be made into a pleasant tea and consumed throughout the day as a tonic for the kidneys. The tea can be mixed with equal parts of fruit juice as a pleasant drink for the child.

Aromatherapy uses the essential oil of cypress, *Cupressus sempervirens* to treat chronic bedwetting. Several drops of cypress oil should be put in olive oil for massage. The oil should be rubbed onto the child's stomach right before bedtime.

Behavior modification programs may be suggested. In one type, alarms that are triggered by body moisture are worn overnight, waking the child at the first sign of bedwetting. The child can then go use the toilet to finish emptying the bladder. This will eventually train the child to awaken and use the toilet upon experiencing the sensation of a full bladder. Nighttime toilet training using the alarm may take up to four or five months to be effective, however. Another program focuses on the child's effort with urinating before going to bed, recording wet and dry nights, changing wet clothing and bedding, and discussing progress. Positive reinforcements, such as gold stars on a chart and other rewards, are given for nights that the child does not urinate in bed.

Allopathic treatment

If other treatments fail to work, treatment with medication may be suggested. With the use of the drug

imipramine, improvement will usually occur in the first week of treatment if it is going to be helpful. The drug can be discontinued if it does not work within a week or after a month has gone by with no bedwetting. Unfortunately, relapses are very common with this treatment. Also, since imipramine is a strong drug, the blood needs to be tested every other week for abnormal side effects. A nasal spray containing Demopressin, an antidiuretic drug, has been shown to be effective in diminishing bedwetting. It is necessary to use the spray at least four to six weeks for maximum effectiveness. Demopressin also has negative side effects and is, therefore, only recommended for short-term use.

Expected results

Bedwetting is usually outgrown at some point. However, underlying disease conditions may have to be assessed and treated.

Prevention

Caffeine has a diuretic effect, and should be avoided. It is found in coffee, chocolate, tea, and many sodas. Food labels should be examined to determine caffeine content.

Resources

BOOKS

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Virginia: Time Life, Inc., 1996.

Kirchheimer, Sid and the editors of Prevention Magazine Health Books. *The Doctors Book of Home Remedies II: Over 1,200 New Doctor Tested Tips and Techniques Anyone Can Use to Heal Hundreds of Everyday Health Problems*. Pennsylvania: Rodale Press, 1993.

Lockie, Dr. Andrew and Dr. Nicola Geddes. *The Complete Guide to homeopathy: The principles and Practice of Treatment with a Comprehensive Range of Self Help Remedies for Common Ailments*. London: Dorling Kindersley, Ltd., 1995.

OTHER

AlternativeMedicine.com. http://www.alternativemedicine.com

American Academy of Pediatrics. http://www.aap.org/family/bedwet.htm.

Medicinal Herbs Online. http://www.egregore.com/diseases/ bedwetting.html.

Patience Paradox

Bee pollen

Description

Bee pollen is the dust-size male seed found on the stamen of any flower blossom. The pollen collects on the legs of honeybees as they move from flower to flower. The bees secrete a number of enzymes into the pollen. Pollen is usually collected commercially by placing a special device at the entrance of beehives that brushes the substance from their hind legs into a collection receptacle.

General use

Bee pollen is among the oldest known dietary supplements. Its use as a rejuvenator and medicine date back to the early Egyptians and ancient Chinese. It has been called many things, from a fountain of youth to an "ambrosia of the gods." The Greek physician Hippocrates, sometimes called the father of modern medicine, used it as a healing substance 2,500 years ago. It is rich in vitamins, especially B vitamins, and contains trace amounts of minerals, elements, **amino acids**, and enzymes.

The pollen is composed of 55% carbohydrates, 35% protein, 3% minerals and vitamins, 2% fatty acids, and 5% other substances. It contains very small amounts of many substances considered to be **antioxidants**, including betacarotene, vitamins C and E, **lycopene**, **selenium**, and flavonoids.

Proponents of bee pollen offer a wide range of claims regarding its nutritional and healing properties. These include enhancing the immune system, controlling weight, relieving allergy symptoms, increasing strength, improving sexual function, enhancing vitality and stamina, slowing the **aging** process, and prolonging life. None of these claims have been substantiated by scientific studies.

Bee pollen is said to strengthen the immune system through its antioxidant properties. Antioxidants are used to deactivate free radicals in the body. Free radicals are byproducts of oxygen that can damage cells and are linked to many degenerative diseases, especially those associated with aging. They are also associated with the aging process itself. Antioxidants may block further damage and even reverse much of the cell oxidation already done. Bee pollen is suggested to help counteract the effects of radiation and environmental pollutants that weaken the immune system, supporters say.

In the January 2000 issue of *Bee Online*, an Internet publication of the American **Apitherapy** Society,

KEY TERMS

Antioxidant—A substance that opposes oxidation damage anywhere in the body caused by free oxygen radicals.

Flavonoids—A group of about 5,000 substances, mostly derived from food, that have super antioxidant qualities.

Free oxygen radicals—Also called free radicals, these are by-products of oxygen that cause oxidative damage to the body's cells.

Gout—A disease causing inflammation of the joints, especially the knees, toes, and fingers due to the deposit of crystallized uric acid in the joints.

Stamen—The male fertilizing organ of flowering plants, bearing pollen.

Uric acid—A compound that can form deposits in joints and tissues. This disease is known as gout or hyperuricemia.

Steve Schecter, naturopathic doctor, said bee pollen is beneficial in reducing the effects of radiation treatment in women with **cancer**. A group of 25 women undergoing treatment for **uterine cancer** also took 20 g (about two teaspoons) of bee pollen three times a day. The women reported improvements in their appetites and sense of well being, and less severe **nausea** associated with radiation therapy. Their serum protein levels increased and red and white blood cell counts also improved.

Although many plant pollens can cause or exacerbate **allergies** and **hay fever**, bee pollen can actually help reduce the symptoms of these conditions. Local bee pollen therapy is recommended to start before the allergy season begins and it may take a few weeks for the pollen to work. According to an article in the February 1998 issue of *Better Nutrition*, an Oklahoma allergist successfully used bee pollen to treat 22,000 patients with allergies. However, those allergic to bee **stings** may experience severe (anaphylactic) reactions to the pollen.

Bee pollen is often used by athletes to improve strength, endurance, energy, and speed. It is said to help muscles recover more quickly from **exercise** and to increase mental stamina. "Bee pollen is used by almost every Olympic athlete in the world," said James Higgins, treasurer of the American Apitherapy Society, in an interview in the August 1999 issue of *Better Nutrition*. "It gives them more energy and better performance for events like marathons, and they aren't as exhausted the next day."

Preparations

It takes about two hours for bee pollen to be absorbed into the bloodstream. It is available in health food stores in gelatin capsules, tablets, and granules. Capsules and tablets generally contain 500-1000 mg of bee pollen. A 100-count bottle costs $5-8 on average. Granules are sold by the ounce or pound. A one-pound bag costs about $20. The recommended dosages for preventative purposes are an eighth to a quarter teaspoon of granules once a day to start, gradually increasing over a month to one to two teaspoons, one to three times a day. The dosage for short-term therapeutic use is 3/8-3/4 teaspoon to start, increasing to three to six teaspoons, one to three times a day. The recommended preventative dosage for capsules is two 450-580 mg capsules, three to four times a day, and three times that dosage for therapeutic purposes. Bee pollen is also available in liquid, cream, salve, and tincture form, mainly for use on skin conditions, sores, pounds, and **bruises**. Bee pollen should not be heated, since it will lose its potency.

Precautions

Persons who are allergic to bee stings or products should not use bee pollen since it may cause a serious allergic reaction, including death. Anyone uncertain if they are allergic to bee pollen should sample only a few granules first to see if there is any type of reaction, or have an allergy test. Those using bee pollen to reduce hay **fever** should be sure to consume local bee pollen to obtain the best results.

Side effects

There are rare cases of minor side effects, such as gastrointestinal irritation and **diarrhea**, associated with ingesting bee pollen.

Interactions

Bee pollen has no known negative interactions with other drugs, vitamins, or supplements.

Resources

BOOKS

Balch, James F. *Prescription for Nutritional Healing*. Avery Publishing Group, 1997.

Elkins, Rita. *Bee Pollen, Royal Jelly, Propolis, and Honey: An Extraordinary Energy and Health Promoting Ensemble*. Woodland Publishing, 1999.

Geelhoed, Glenn W. and Jean Barilla. *Natural Health Secrets From Around the World*. Keats Publishing, 1997.
Jensen, Bernard. *Bee Well, Bee Wise*. Bernard Jensen Pub lisher, 1994.
Wade, Carlson. *Carlson Wade's New Fact Book on Bee Pollen and Your Health*. Keats Publishing, 1994.

PERIODICALS

Adderly, Brenda. "The Latest Buzz on Products of the Hive." *Better Nutrition* (August 1999): 42.
Hovey, Sue. "One Pill Makes You Larger." *Women's Sports and Fitness* (April 1997): 79 80.
Satel, Sally and James Taranto. "Bogus Bee Pollen." *The New Republic* (January 8, 1996): 24 26.
Scheer, James."Products of the Hive: Sticky, Sweet and Healthful." *Better Nutrition* (February 1998): 60 63.
Somer, Elizabeth."Tasty Relief: The Benefits of Using Food as Nutrition." *Men's Fitness* (July 1998): 44 46.

ORGANIZATIONS

American Apitherapy Society. 5390 Grande Road, Hills boro, OH 45133. (937) 364 1108. aasoffice@in touch. net. http://www.apitherapy.org.

Ken R. Wells

Bee sting therapy *see* **Apitherapy**
Bee stings *see* **Bites and stings**
Behavioral medicine *see* **Mind/Body medicine**

Behavioral optometry

Definition

Behavioral optometry is a system of eye care that emphasizes visual training as a way to improve the way a patient uses his or her eyes. Rather than simply prescribe lenses to compensate for eyesight weaknesses, behavioral optometrists attempt to train the patient to see better across a range of different circumstances.

Origins

Behavioral optometry traces its roots to the writings of Dr. William H. Bates, a New York City ophthalmologist. Bates began writing in the 1920s about alternatives to the use of corrective lenses. He believed that many physical and emotional stresses caused vision problems, and that alleviating these stresses could improve vision. He noted that modern humans spend an inordinate amount of time doing close work such as reading, while the human eye may have been originally adapted for distance vision. Bates devised a program of eye training that allowed patients to gradually improve their vision without glasses. The English novelist Aldous Huxley recovered from near-blindness using Bates's system, and wrote a book about his experience. Other optometrists built on Bates's insights, supplementing his research and ideas. Some researchers focused on the fact that the need for corrective lenses rises in proportion to a person's level of education. They concluded that the **stress** of reading was probably responsible for poor eyesight. Others noted that vision problems increase as cultures become increasingly industrialized and developed. Practitioners of behavioral optometry who built on and extended Bates's ideas include Dr. Raymond L. Gottlieb and Dr. Jacob Liberman, both influential authors and teachers. Behavioral optometrists are distinctly a minority in the field of optometry, but they can be found across the United States and worldwide.

Benefits

Behavioral optometrists promise many benefits from this way of treating vision problems. Perhaps the foremost is that people can learn to live without the discomfort and bother of wearing eyeglasses or contact lenses. Behavioral optometry also focuses on children, particularly those with learning difficulties. These children can benefit from learning to train their eyes and so overcome reading problems due to inability to concentrate or inability to keep the eyes in place on the page. Behavioral optometry also tries to help patients deal with stress, so that vision training can lead to a more relaxed and healthy lifestyle. In addition, behavioral optometry has been used to develop the special visual acuity that is needed for sports; and some practitioners are trained to treat patients who have suffered vision trauma such as **stroke**, or to work with autistic or disabled children.

Description

Behavioral optometry aims to treat the whole patient, not just correct his or her vision. The first step in an examination may be a wide-ranging series of tests and questions, geared to determine the patient's overall visual abilities. This term means not just how well the eyes read letters on a chart, but such broader areas of visual perception as hand-eye coordination and color perception. Behavioral optometrists will prescribe corrective lenses, but these are usually somewhat different from traditional glasses. The lenses are designed to relieve the stress caused by such close-focus work as reading or working at a

KEY TERMS

Ophthalmologist—A physician who specializes in treating diseases and disorders of the eye.

Optometrist—A professional who examines the eyes for vision defects in order to fit the patient with corrective lenses or prescribe other appropriate treatment.

computer. But for distance seeing, the lenses may not be as accurate as traditional lenses, since the behavioral optometrist seeks to teach the eyes to relearn distance vision skills that have atrophied. Many behavioral optometrists prescribe lenses that include a series of small prisms, which are supposed to help the eyes develop better vision patterns. Behavioral optometrists also practice vision therapy, in which the optometrist works closely with the patient in step-by-step exercises to help the eyes relax and relearn lost skills. These are not merely eye exercises, because exercising the muscles around the eye can **fatigue** them instead of strengthen them. The therapy might involve learning new skills such as juggling, drawing, dancing, or ball games, as well as **relaxation** techniques. The optometrist may also work with the patient to alter diet, sleep patterns, and lifestyle stress.

Research and general acceptance

Though behavioral optometrists are definitely a minority within the field of optometry, a body of research supports their methods. This can be found in professional journals such as *Journal of Behavioral Optometry* and *Journal of Optometric Vision Development*. Bates's method has been in use since the 1920s, and much anecdotal evidence attests to its efficacy, including the dramatic case of writer Aldous Huxley. Other patients and practitioners have written of their ability to function without glasses and overcome learning disabilities through behavioral optometry. And one of the major contentions of behavioral optometry is that conventional optometry does not cure the eye conditions it treats. Myopic patients are given glasses, and then a stronger pair of glasses, and then a stronger, as vision gradually worsens. Behavioral optometrists use this development as evidence that conventional optometry fails its patients.

Training and certification

In the United States, there are three major training institutions for behavioral optometry. The College of Optometrists and Vision Development offers courses and examinations leading to an international certificate in behavioral optometry. Clinical education workshops are offered by the Optometric Extension Program Foundation in Santa Ana, California. The Baltimore Academy of Behavioral Optometry offers in-depth coursework in behavioral optometry to qualified optometrists. Only people who already have a degree in optometry can take these courses. Technicians also work with behavioral optometrists. These technicians need have no specific educational background, but to become certified, they must work for 2,000 hours under a certified behavioral optometrist and pass a written and oral examination.

Resources

BOOKS

Bates, William. *The Bates Method for Better Eyesight With out Glasses*. New York: Henry Holt & Co., 1981.

Liberman, Jacob. *Take Off Your Glasses and See*. New York: Crown Publishers, 1995.

ORGANIZATIONS

Baltimore Academy of Behavioral Optometry. 16 Green meadow Drive, Suite 103. Timonium, MD 21093. (800) 447 0370.

College of Optometrists in Vision Development. 353 H. Street, Suite C. Chula Vista, CA 91910. (888) 268 3770.

Optometric Extension Program Foundation. 2912 South Daimler Street, Suite 100. Santa Ana, CA 92705. (949) 250 8070.

Angela Woodward

Behavioral therapy

Definition

Behavioral therapy, or behavioral modification, is a psychological technique based on the premise that specific, observable, maladaptive, badly adjusted, or self-destructing behaviors can be modified by learning new, more appropriate behaviors to replace them.

Origins

Reward and punishment systems have been used historically in an attempt to influence behavior, from child rearing to the criminal justice system. Modern behavioral therapy began in the 1950s with the work of B. F. Skinner (1904–1990) and Joseph Wolpe (1915–1997). Wolpe treated his patients who suffered from **phobias** with a technique he developed called

systematic desensitization. Systematic desensitization involved gradually exposing a patient to an anxiety-provoking stimuli until the **anxiety** response was extinguished, or eliminated.

Skinner introduced a behavioral technique he called operant conditioning. Operant conditioning is based on the idea that individuals will choose their behavior based on past experiences of consequences of that behavior. If a behavior was associated with positive reinforcements or rewards in the past, individuals will choose it over behavior associated with punishments.

By the 1970s, behavior therapy enjoyed widespread popularity as a treatment approach. After that, the attention of behavioral therapists focused increasingly on their clients' cognitive processes, and many therapists began to use cognitive behavior therapy to change clients' unhealthy behavior by replacing negative or self-defeating thought patterns with more positive ones.

Benefits

Behavioral therapy can be a useful treatment tool in an array of mental illnesses and symptoms of mental illness that involve maladaptive behavior, such as **substance abuse**, aggressive behavior, anger management, eating disorders, phobias, and anxiety disorders. It is also sometimes used to treat organic disorders such as incontinence and **insomnia** by changing the behaviors that might be contributing to these disorders.

Cognitive-behavioral therapy is an offshoot of behavioral therapy that focuses on changing maladaptive behaviors by changing the faulty thinking patterns behind them. It is a recommended treatment option for a number of mental disorders, including affective (mood) disorders, personality disorders, social phobia, **schizophrenia**, obsessive compulsive disorder (OCD), agoraphobia, **post-traumatic stress disorder** (PTSD), and **attention-deficit hyperactivity disorder** (ADHD). It is also frequently used as a tool to deal with chronic **pain** for patients with illnesses such as **rheumatoid arthritis**, back problems, and **cancer**.

Behavioral therapy techniques are sometimes combined with other interventions such as medication. Treatment depends on the individual patient and the severity of symptoms surrounding the behavioral problem.

Description

Behavioral therapy, or behavior modification, is based on the assumption that emotional problems, like any behavior, are learned responses to the environment and can be unlearned. Unlike psychodynamic therapies, it does not focus on uncovering or understanding the unconscious motivations that may be behind the maladaptive behavior. In other words, behavioral therapists do not try to find out why their patients behave the way they do; they just help them learn to change the behavior.

Initial treatment sessions are typically spent explaining the basic tenets of behavioral therapy to the patient and establishing a positive working relationship between therapist and patient. Behavioral therapy is a collaborative, action-oriented therapy, and as such, it empowers patients by giving them an active role in the treatment process. It also discourages overdependence on the therapist, a situation that may occur in other therapeutic relationships. Treatment is typically administered in an outpatient setting in either group or individual sessions. Treatment is relatively short compared to other forms of **psychotherapy**, usually lasting no longer than 16 weeks or sessions.

There are a number of different techniques used in behavioral therapy to help patients change their behaviors. These include:

- Behavioral homework assignments. The therapist often requests that the patient complete homework assignments between therapy sessions. These may consist of real-life behavioral experiments in which patients are encouraged to try new responses to situations discussed in therapy sessions.
- Contingency contracting. In conjunction with the patient, the therapist outlines a written or verbal contract of desired behaviors for the patient. The contract may have certain positive reinforcements (rewards) associated with appropriate behaviors and negative reinforcements (punishments) associated with maladaptive behavior.
- Modeling. The patient learns a new behavior through observation.
- Rehearsed behavior. The therapist and patient engage in role-playing exercises in which the therapist acts out appropriate behaviors or responses to situations.
- Skills training techniques. The patient undergoes an education program to learn social, parenting, or other relevant life skills.
- Conditioning. The therapist uses reinforcement to encourage a particular behavior. For example, a child with ADHD may get a gold star every time he stays focused on tasks and accomplishes certain daily chores. The gold star reinforces and increases the desired behavior by identifying it with something

positive. Reinforcement can also be used to extinguish unwanted behaviors by imposing negative consequences (also called punishment and response).

- Systematic desensitization. Patients are gradually exposed to a situation they fear, either in a role-playing situation or in reality. The therapist employs relaxation techniques to help them cope with their fear reaction and eventually eliminate the anxiety altogether. For example, patients in treatment for agoraphobia, a fear of open or public places, relax and then picture themselves on the sidewalk outside of their house. In the next session, patients may relax themselves and then imagine a visit to a crowded shopping mall. The imagery gets progressively more intense until eventually, therapist and patient approach the anxiety-producing situation in real life by visiting a mall. By repeatedly pairing a desired response (relaxation) with a fear-producing situation (open, public spaces), the patient gradually becomes desensitized to the old response of fear and learns to react with feelings of relaxation.
- Flooding. Flooding is an accelerated version of systematic desensitization, in which patients are exposed directly to the anxiety-provoking situation that they fear most (either through mental visualization or real life contact) in an effort to extinguish the fear response.
- Progressive relaxation. As the name implies, progressive relaxation involves complete relaxation of the muscle groups of the body and smooth, even breathing until the body is completely tension free. It is used by behavioral therapists both as a relaxation exercise to relieve anxiety and stress and as a method of preparing the patient for systematic desensitization. Progressive relaxation is performed by first tensing and then relaxing the muscles of the body, one group at a time. The therapist may suggest that the patient use one of many available instructional relaxation recordings for practicing this technique at home.

Cognitive-behavioral therapy (CBT) integrates features of behavioral modification into the traditional cognitive restructuring approach. In this approach, the therapist works with the patient to identify the thoughts that are causing distress and employs behavioral therapy techniques to alter the resulting behavior. Patients may have certain fundamental core beliefs, known as schemas, which are flawed and are having a negative impact on the patients' behavior and functioning. For example, patients suffering from **depression** may develop a social phobia because they are convinced they are uninteresting and unlikable. A cognitive-behavioral therapist would test this assumption, or schema, by asking patients to name family and friends that care for them and enjoy their company. By showing patients that others value them, the therapist exposes the irrationality of the assumption. The therapist thus provides a new model of thought for patients to use in changing their previous behavior pattern (i.e., an affirmation, such as "I am an interesting and likeable person; therefore, I make new social acquaintances with ease"). Additional behavioral techniques such as conditioning and systematic desensitization may then be used to gradually reintroduce patients to social situations.

Additional treatment techniques that may be employed with cognitive-behavioral therapy include:

- Cognitive rehearsal. Patients imagine a difficult situation, and the therapist guides them through the step-by-step process of facing and successfully dealing with it. Patients then work on practicing, or rehearsing, these steps mentally. Ideally, when the actual situation arises in real life, patients draw on the rehearsed behavior to address it.
- Journal therapy. Patients keep a detailed diary recounting their thoughts, feelings, and actions when specific situations arise. The journal helps to make patients aware of their maladaptive thoughts and their consequences on behavior. In later stages of therapy, the journal may serve to demonstrate and reinforce positive behavior.
- Validity testing. Patients are asked to test the validity of the automatic thoughts and schemas they encounter. The therapist may ask patients to defend or produce evidence that a schema is true. If patients are unable to meet the challenge, the faulty nature of that schema is exposed.

Biofeedback, a patient-guided treatment also associated with behavioral therapy, teaches individuals to control muscle tension, pain, body temperature, brain waves, and other bodily functions and processes through **relaxation**, visualization, and other techniques. In some cases, positive reinforcements are used to reward patients who generate the correct biofeedback response during treatment. The term biofeedback refers to the biological signals that are fed back to the patient in order for the patient to develop techniques of controlling them.

Preparations

Patients may seek therapy independently or be referred for treatment by a primary physician, psychologist, psychiatrist, or other healthcare professional. Because patients and therapists work closely together to achieve specific therapeutic objectives, it is important that their working relationship be

comfortable and that their treatment goals are compatible. Prior to beginning treatment, the patient and therapist have a consultation session, or mutual interview. The consultation gives the therapist the opportunity to make an initial assessment (a detailed behavioral analysis of the particular incidents which lead up to and ensue after a specific unwanted behavior) of the patient and recommend a course of treatment and goals for therapy. It also gives the patient an opportunity to find out important details about the therapist's approach to treatment, professional credentials, and any other relevant, important issues.

In some managed-care clinical settings, an intake interview or evaluation is required before a patient begins therapy. The intake interview is used to evaluate the patient and assign the person to a therapist. It may be conducted by a psychiatric nurse, counselor, or social worker.

Precautions

Behavioral therapy may not be suitable for some patients. Those who do not have a specific behavioral issue they wish to address and whose goals for therapy are to gain insight into the past may be better served by psychodynamic therapy. Patients must also be willing to take a very active role in the treatment process.

Behavioral therapy may also be inappropriate for cognitively impaired individuals (e.g., patients with organic brain disease or a traumatic brain injury) depending on their level of functioning.

Because of the brief nature of behavioral therapy, relapse is reported in some patient populations. However, follow-up sessions can frequently put patients back on track to recovery.

Research and general acceptance

The use of behavioral modification techniques to treat an array of mental health problems has been extensively described and studied in medical literature. Much research by the medical community on behavioral therapy focuses on exploring its effectiveness as a treatment for various types of problems. Behavioral therapy is a well accepted form of treatment for some problems, such as phobias. As of 2008, using behavioral therapy to treat other problems, such as chronic pain, is newer and less widely accepted application.

Types of problems that have been documented as successfully treated by behavioral therapy or a combination of behavioral therapy and other interventions include binge-eating, management of chronic lower back pain, depression, and **obsessive-compulsive disorder**.

KEY TERMS

Cognitive-behavioral therapy—An offshoot of behavioral therapy that focuses on changing maladaptive behaviors by changing the faulty thinking patterns behind them.

Cognitive restructuring—A technique used in cognitive-behavioral therapy. The process of replacing maladaptive thought patterns with constructive thoughts and beliefs.

Maladaptive—Unsuitable; maladaptive behavior is behavior that is inappropriate to a given situation.

Psychodynamic therapy—A therapeutic approach that assumes improper or unwanted behavior is caused by unconscious, internal conflicts and focuses on gaining insight into these motivations.

Relapse—A return of behaviors or symptoms after initial treatment.

Schemas—Fundamental core beliefs or assumptions that are part of the perceptual filter through which people view the world. Cognitive-behavioral therapy seeks to change maladaptive schemas.

Training and certification

Behavioral therapists are typically psychologists (PhD, PsyD, EdD, or MA), clinical social workers (MSW, DSW, or LSW), counselors (MA or MS), or psychiatrists (MD with specialization in psychiatry). Other healthcare providers may suggest brief behavioral interventions, but more extensive treatment should be done by individuals who are specifically trained in behavioral therapy techniques.

Resources

BOOKS

Edelman, Sarah. *Change Your Thinking: Overcome Stress, Combat Anxiety and Depression, and Improve Your Life with CBT*. New York: Marlowe, 2007.

Keegan, Mary Eamon. *Empowering Vulnerable Populations: Cognitive Behavioral Interventions*. Chicago: Lyceum Books, 2008.

Lam, Danny C. K. *Cognitive Behavioral Therapy: A Practi cal Guide to Helping People Take Control*. New York: Routledge, 2008.

Ramsay, J. Russell, and Anthony L. Rostain. *Cognitive Behavioral Therapy for Adult ADHD: An Integrative Psychosocial and Medical Approach*. New York: Rout ledge, 2007.

PERIODICALS

Bland, Phillip. "Internet Based CBT Not Effective as Inter vention for Depression." *The Practitioner* (September 25, 2007): 20.

Diefenbach, Gretchen J., et al. "Changes in Quality of Life Following Cognitive Behavioral Therapy for Obses sive Compulsive Disorder." *Behavior Research and Therapy* 45, no. 12 (December 2007): 3060 3069.

Jancin, Bruce. "CBT Eases Psychiatric Aspects of Irritable Bowel Syndrome." *Family Practice News* 38, no. 1 (January 1, 2008): 32.

ORGANIZATIONS

National Association of Cognitive Behavioral Therapists, PO Box 2195, Weirton, WV, 26062, (800) 853 1135, http://www.nacbt.org/.

Paula Ford-Martin
Helen Davidson

Belladonna

Description

Belladonna (*Atropa belladonna*), also known as as deadly nightshade, devil's cherries, devil's herb, divale, dwale, dwayberry, great morel, naughty man's cherries, and poison black cherry, is a perennial herb that has been valued for its medicinal properties for over five centuries. Belladonna is a member of the Solanaceae (nightshade) family and can be identified by its bell-shaped, purple flowers and cherry-sized green berries that mature to a dark purple or black color. The tall, branching plant can grow to a height of at least 5 ft (1.5 m) and is native to Europe, North Africa, and Asia and is cultivated in North America and the United Kingdom. Introduced to a number of places, including the United States and Ireland, belladonna grows wild there.

Belladonna leaves are large (up to 10 in [25 cm] in length) and grow in pairs on either side of the plant stem. Near the flowers or blossoms, one of each leaf pair is noticeably smaller in size. Both the leaves and root have a sharp, unpleasant odor and bitter taste. As the name deadly nightshade suggests, the herb is highly toxic even when taken in extremely low concentrations.

One of the first widespread uses of the herb was purely for cosmetic purposes. Sixteenth-century Italian women reportedly applied belladonna solutions to their eyes to dilate the pupils and achieve a dreamy and supposedly more desirable appearance (hence the name belladonna, which is Italian for beautiful lady).

Deadly nightshade Atropa belladonna fruits. *(© blickwinkel / Alamy)*

Atropine, an alkaloid of belladonna that blocks certain nerve impulses, is still used in modern times by some ophthalmologists to dilate the pupils for eye examinations.

General use

Belladonna has a long history of medicinal applications in healthcare. Belladonna alkaloids are anticholinergic, which means that they block certain nerve impulses involved in the parasympathetic nervous system that regulates certain involuntary bodily functions or reflexes, including pupil dilation, heart rate, secretion of glands and organs, and the constriction of the bronchioles in the lungs and the alimentary canal (digestive tract). Belladonna relaxes the smooth muscles of the internal organs and inhibits or dries up secretions (e.g., perspiration, mucous, breast milk, and saliva).

Belladonna alkaloids, the active ingredients of the plant, include atropine and scopolamine. These alkaloids are extracted from the leaves and root of the plant and administered either alone or in combination with other herbal remedies or prescription medications. However, even tiny doses are toxic and should be taken only by prescription.

Belladonna alkaloids are used to treat a variety of symptoms and conditions, including the following:

- Gastrointestinal disorders. Because the alkaloids relax the smooth muscles of the gastrointestinal tract and reduce stomach acid secretions, they are useful in treating colitis, diverticulitis, irritable bowel syndrome, colic, diarrhea, and peptic ulcer.
- Asthma. By relaxing the bronchioles, belladonna alleviates the wheezing symptoms of an asthma attack.

- Excessive sweating. Belladonna slows gland and organ secretion, which makes it useful in controlling conditions that cause excessive sweating.
- Nighttime incontinence. Belladonna acts as a diuretic and can be helpful in treating excessive nighttime urination and incontinence.
- Headaches and migraines. The pain-relieving properties of atropine, a belladonna alkaloid, are useful in treating headaches.
- Muscle pains and spasms. Belladonna is frequently prescribed to ease severe menstrual cramps.
- Motion sickness. Scopolamine, an alkaloid of belladonna, is helpful in treating motion sickness and vertigo.
- Parkinson's disease. Belladonna can alleviate the excessive sweating and salivation associated with the disease, as well as controlling tremors and muscle rigidity.
- Biliary colic. Muscle spasm, or colic, of the gallbladder and liver can be relieved through the muscle relaxing properties of belladonna.

Homeopathic use

Belladonna is a frequently prescribed homeopathic remedy used to treat illnesses that manifest symptoms similar to those that belladonna poisoning triggers (i.e., high **fever**, **nausea**, delirium, **muscle spasms**, flushed skin, dilated pupils). These include the **common cold**, otitis media (**earache**), fever, arthritis, menstrual cramps, **diverticulitis**, muscle **pain**, sunstroke, **toothache** and teething discomfort, **conjunctivitis**, headaches, **sore throat**, and **boils** and abscesses. As with all homeopathic remedies, the prescription of belladonna depends on the individual's overall symptom picture, mood, and temperament. When used as a homeopathic remedy, belladonna is administered in a highly diluted form to trigger the body's natural healing response without risk of belladonna poisoning or death.

Results of a clinical trial performed at the National **Cancer** Institute of Milan, Italy, indicated that homeopathic remedies of belladonna can be useful in relieving the discomfort, warmth, and swelling of the skin associated with radiotherapy for **breast cancer** (i.e., radiodermatitis).

Preparations

Belladonna leaf is harvested between May and July and dried at temperatures no greater than 140°F (60° C). The roots of *Atropa belladonna* plants that are two to four years old are also harvested for herbal preparations in early fall between mid-October and mid-November. The roots are then cleaned and dried at temperatures no greater than 122°F (50°C). After drying, the leaves and roots are crushed for use in a number of forms, including decoctions, tinctures, infusions, plasters, pills, suppositories, liquid solutions or suspensions, and powders. They can be used both alone and in combination with other herbs and medications.

It is extremely dangerous to self-prescribe belladonna, and it should always be taken under the direction of a doctor or other qualified healthcare professional. The frequency and quantity of dosage will depend on both the patient and the illness for which the herb is prescribed, but the doses are always extremely small. For example the *Physicians Desk Reference (PDR) for Herbal Medicines* recommends an average single dose of 0.05–0.10 g. Each patient's illness is different and some patients experience toxicity at unusually low doses.

For homeopathic remedies, the plant is broken apart and juice is extracted through a pressing process. The extract is then mixed with a water/alcohol solution by a ratio of either 1:10 or 1:100, and this process is repeated up to 30 times to form an extremely diluted dose of the extract. Homeopathic belladonna remedy is generally added to pellets of sugar for easier administration. The dilution and dosage frequency depend on the symptoms being treated, but homeopathic remedies are typically administered only until the patient starts to show signs of improvement so that the body's natural healing response can take over.

Belladonna is available by prescription both alone (in high concentration strength) and in combination with other drugs. As of 2008 available prescription combinations included belladonna with opium (for uterine pain), kaolin and pectin (for **diarrhea**), phenobarbital (for menopausal symptoms and migraine prophylactic), other barbiturates (for **insomnia** and for cramping and muscle spasms in the digestive tract), or belladonna and opium suppositories (for severe intestinal cramping).

Belladonna preparations should be stored in airtight containers away from direct light. Under these conditions, most preparations will remain potent for up to three years.

Precautions

Ingestion of high concentrations of atropine, a potent alkaloid found in belladonna, can cause severe illness and death. Atropine is fatal in doses as small as 100 mg, which is equivalent to 5–50 g of belladonna herb, depending on the potency of the particular plant. For children, a fatal dose is significantly less. For this

reason, belladonna should never be used unless prescribed by a trained practitioner.

Individuals suffering from kidney disease, intestinal blockage, **glaucoma**, enlarged prostate, urinary blockage, severe ulcerative **colitis**, or myasthenia gravis are advised not to take belladonna, as are those patients with a known allergy to belladonna. Patients with chronic health conditions should never take belladonna without a doctor's prescription.

Pregnant or breastfeeding women should avoid all but homeopathic belladonna, unless prescribed by a doctor.

Because of the sedative qualities of belladonna, individuals taking the herb should use caution when driving or operating machinery. Alcohol and other central nervous system (CNS) depressants should also be avoided, as they may increase drowsiness and **dizziness** in the patient taking belladonna.

If individuals taking homeopathic dilutions of belladonna experience worsening of their symptoms (known as a homeopathic aggravation), they should contact their healthcare professional. A homeopathic aggravation can be an early indication that a remedy is working properly, but it can also be a sign that a different remedy is called for.

Side effects

Toxic signs of belladonna include **dry mouth**, drowsiness, dizziness, **constipation**, and nausea. Some side effects, including pupil dilation, blurred vision, fever (due to the inability to perspire), inability to urinate, arrhythmia, and excessive dry mouth and eyes, can also be early indications of belladonna overdose. Individuals experiencing these side effects should inform their healthcare practitioner immediately.

Belladonna overdose is also indicated by a burning throat, delirium, restlessness and mania, hallucinations, difficulty breathing, and flushed skin that is hot and dry. Without proper treatment, constriction of the airway can cause suffocation. If any of these symptoms occur, individuals should seek emergency medical attention immediately. Treatment of belladonna overdose is typically gastric lavage, which involves the insertion of a tube down the patient's throat and washing out the stomach with a solution of **activated charcoal** or tannic acid to neutralize the atropine. Oxygen may also be required until breathing is stabilized, and barbiturates may be administered to counteract mania and/or excitation.

KEY TERMS

Alkaloids—A family of chemical compounds whose members contain nitrogen.

Allopathic—Healthcare practice that uses remedies and treatments that cause different effects than the symptoms they are intended to treat; conventional medicine is usually considered allopathic in nature.

Anticholinergic—A medication or other substance that blocks certain parasympathetic nerve impulses.

Decoction—An herbal extract produced by mixing an herb in cold water, bringing the mixture to a boil, and letting it simmer to extract water. The decoction is then strained and drunk hot or cold. Decoctions are usually chosen over infusion when the botanical in question is a root or bark.

Homeopathic—Remedies and treatments that cause similar effects to the symptoms they are intended to treat in an effort to stimulate the body's natural immune response system.

Infusion—An herbal preparation made by pouring boiling water over an herb and letting the brew steep for 20 minutes, then straining. Tea is made by infusion.

Mania—Hyperelevated, or excessively excited mood.

Naturalized—Plants that are introduced in the wild.

Prophylactic—A preventative treatment.

Radiodermatitis—Red, irritated, and inflamed skin caused by x rays, radiation treatment, or other radiation exposure.

Tinctures—An alcohol liquid extract of an herb.

USP—The *U.S. Pharmacopoeia* contains nationally and internationally recognized drug standards published by the United States Pharmacopeia Convention and used as a standard by FDA and other federal regulatory agencies.

Interactions

Certain medications may increase the effects of belladonna. These medications include central nervous system (CNS) depressants, monoamine oxidase (MAO) inhibitors, tricyclic antidepressants, quinidine, amantadine, antihistamines, and other anticholinergics. Other medications, including anticoagulants (blood thinners) and corticotropin (ACTH), become less effective when

used with belladonna, while some drugs, such as diarrhea medicines containing kaolin and attapulgite, may decrease the therapeutic response to belladonna when they are taken with the herb. Patients taking these or any other medications or herbal remedies should inform their healthcare professional.

Alcohol, a CNS depressant, can also enhance the sedative effect of belladonna and should be avoided during belladonna treatment.

Individuals considering treatment with homeopathic dilutions of belladonna should consult their healthcare professional about possible interactions with certain foods, beverages, prescription medications, aromatic compounds, and other environmental elements that could counteract the efficacy of belladonna treatment.

Resources

BOOKS

Gruenwald, Joerg, Thomas Brendler, and Christof Jaenicke, eds. *PDR for Herbal Medicines*., 4th ed. London: Thomson Healthcare, 2007.

Ratsch, Christian. *The Encyclopedia of Psychoactive Plants: Ethnopharmacology and Its Applications*. South Paris, ME: Park Street Press, 2005.

PERIODICALS

Piccillo, G., et al. "Anticholinergic Syndrome Due to 'Devil's Herb': When Risks Come from the Ancient Time." *International Journal of Clinical Practice* (April 2006): 492 494.

Ulbricht, Catherine, et al. "An Evidence Based Systematic Review of Belladonna by the Natural Standard Research Collaboration." *Journal of Herbal Pharma cotherapy* (May 2005): 61 90.

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (512) 926 4900, http://www.herbalgram.org.

Office of Dietary Supplements. National Institutes of Health, Building 31, Room 1B25, 31 Center Dr., MSC 2086, Bethesda, MD, 20892 2086, (301) 435 2920, http://odp.od.nih.gov/ods/.

Paula Ford-Martin
David Edward Newton, Ed.D.

Benign prostatic hypertrophy *see* **Prostate enlargement**

Bernard training *see* **Auditory integration training**

Beta-methylbutyric acid

Description

Beta-methylbutyric acid, technically known as "beta-hydroxy beta-methylbutyric acid," or more commonly known as "HMB," is a metabolite of the amino acid leucine. The dietary supplement HMB is used by athletes to build muscles. It has also been used to treat the muscle deterioration in cases of **AIDS** (acquired immunodeficiency syndrome), and by people seeking to lose weight or manage their **cholesterol**.

General use

Human muscles have a particularly high concentration of leucine, so this amino acid is often broken down and utilized during strenuous **exercise**. HMB is found in citrus fruit, catfish, and **alfalfa**. It was first found to be of use in agriculture as an additive to help pigs, chickens, and other farm animals gain muscle and lose fat. After a research trial conducted by the University of Iowa at Iowa City showed positive results, HMB caught attention as promising for human use.

A four-week double-blind study in 1995 involved 17 exercise-trained and 23 untrained males, divided into two groups. One group took daily capsules containing 3 g of HMB, and the other took placebos. Everyone observed an identical weight-training regimen three times a week. Upon the trial's completion, the group that took the HMB demonstrated an average 3.1% increase in lean muscle mass, as compared with 1.9% for those who took the placebos. Also, the HMB group lost an average of 7.3% initial body fat, against 2.2% for the placebo group. The men who took HMB were able to average 22 pounds more with the bench press than they did at the beginning of the study. The men who did not, averaged a 14-pound increase. The results indicated that when taken as a supplement of up to 3 g a day, HMB could increase lean muscle mass and strength in athletes who use it during weight training. Theories suggested that HMB possibly suppresses protein breakdown that follows exercise that is rigorous and of long-term duration.

By the Summer Olympics in Atlanta in 1996, the publicity of the possible benefits of HMB had spread among athletes. Because it was not a banned substance, demand was heavy, and it continued to remain popular among athletes as a nutritional supplement. Its popularity was particularly evident among weight trainers, but it was also reported as useful for any athlete undergoing resistance training.

In the years that followed, HMB research focused on use of the supplement by athletes, AIDS patients, and people seeking to manage their cholesterol. A study described in the May/June 2000 issue of *Journal of Parenteral and Enteral Nutrition* described research into the effect of HMB on the lean tissue loss in people living with AIDS. In the double-blind study, 68 people received a placebo or a combination of three nutrients. The combination mixture consisted of 3 g HMB, 14 g L-glutamine (Gln), and 14 g L-arginine (Arg). Participants took this dosage daily for eight weeks. The study ended with 43 participants, and the conclusion that the combination "can markedly alter" lean tissue loss.

Sports Nutrition Review Journal, 2004 evaluated HMB and concluded that there was "fairly good evidence" that the supplement enhanced training adaptations for people who initiated training. The journal maintained more research was needed to determine if it would enhance "training adaptations in athletes."

Studies of HMB and exercise during the 1990s and 2000s involved small numbers of participants and produced varied results. In some cases, improvement was reported; in others, the outcome indicated little or no benefit. In addition, cholesterol was studied in research into the effect of HMB in activities such as weight training. As of February 2008, some in the medical community maintained that larger clinical studies were needed to determine the effectiveness of HMB. In addition, research into the longtime use of HMB was needed.

Preparations

HMB is available in powder, capsule, and tablet form. In addition, combination products containing HMB include capsules, fruit-flavored mixes, protein bars, and meal-replacement shakes. HMB is frequently combined with **creatine** monohydrate, an amino acid found in muscles. That combination is thought by some to increase the effect of each supplement and could be helpful for people who plan to do intense training.

According to some studies, a person taking HMB could see "measurable increases" in strength and lean body mass within several weeks. That information was posted on the Web site of Metabolic Technologies, Inc. (MTI), a research-based company in Iowa that developed HMB.

The usual dosage of HMB is 3 g per day. However, the amount will vary based on the reason the person is taking the supplement. According to MTI, a person may customize the daily dosage by calculating an amount based on the formula of 38 mg multiplied by body weight that is expressed in kilograms.

KEY TERMS

Leucine—An amino acid produced by the hydrolysis of proteins by pancreatic enzymes during digestion and by putrefaction of nitrogenous organic matter.

Another consideration is that product strengths vary, so it is important to follow package directions or consult with a health-care professional. Seeing a physician before taking any dietary supplement is particularly important for adolescents and people with a preexisting condition such as high blood pressure, heart valve or blood valve diseases, and severe liver and kidney diseases.

Pregnant women and nursing mothers should not take HMB because safety studies have not been performed for those population groups, according to the MTI Web site in February 2008.

Precautions

The U.S. Food and Drug Administration does not regulate dietary supplements such as HMB, so these products do not have to undergo the rigorous testing that is required for the approval of drugs. Thus, supplements have not proven to be safe or effective. Furthermore, ingredients are not standardized to comply with federal regulations.

Side effects

People who take HMB may find they are allergic to it and experience symptoms such as breathing problems, chest **pain**, and skin **hives**, according to *Physicians' Desktop Reference*. Other symptoms include tightness in the chest or throat, a rash, and itchy or swollen skin. People experiencing those symptoms should immediately stop taking the supplement and contact their doctor.

Interactions

As of February 2008, there were no known adverse reactions when HMB was taken with other drugs or food supplements.

Resources

OTHER

"HMB." *Physician's Desktop Reference*. http://www.pdrhealth.com/drugs/altmed/altmed mono.aspx?contentFileName ame0435.xml&contentName HMB&contentId 591 (February 24, 2008).

Iowa State University Extension. "Eat to Compete," January 12, 2006. http://www.extension.iastate.edu/nutrition/sport/supplements.html (February 14, 2008).

Mississippi Baptist Health Systems EBSCO Content. "Hydroxymethyl Butyrate (HMB)." http://www.mbmc.org/healthgate/GetHGContent.aspx?token 9c315661 83b7 472d a7ab bc8582171f86&chunkiid 21551 (February 14, 2008).

Sports Nutrition Society. *Sports Nutrition Review Journal,* 2004. http://www.sportsnutritionsociety.org/site/pdf/Kreider SNRJ 1 1 1 44 2004.pdf (February 14, 2008).

ORGANIZATIONS

Metabolic Technologies, Inc, 2711 S. Loop Dr., Suite 4400, Ames, Iowa, 50010 8656, http://www.hmb.org.

National Center for Complementary and Alternative Medicine, National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Jane Spehar
Liz Swain

Beta carotene

Description

Beta carotene is one of the most important naturally occurring **antioxidants**. It is a fat-soluble pigment found in plants (notably carrots and many colorful vegetables and fruits) and in the sea alga *Dunaleilla salina* and *D. bardawil*. Natural beta carotene supplements are derived primarily from *D. salina*. Beta carotene is one of the major dietary **carotenoids** and one of the most biologically active of approximately 800 carotenes and more than 1,000 carotenoids present in food. It is responsible for the orange or yellow colors of many fruits and vegetables. In the human body, beta carotene is found in lipids and in fat tissues. Sometimes beta carotene is called provitamin A because it is more easily converted to **vitamin A** (retinol) in the liver than other carotenoids. Beta carotene is considered to be a conditionally essential

Beta carotene content of some common foods

Vegetable	Serving	International Units (IU)	Daily Allowance (DA)
Carrot	1 whole raw, 7.5 in (19 cm)	20,250	410%
Carrot	Sliced and boiled, 0.5 cup (118 ml)	19,150	380%
Carrot juice	Canned, 0.5 cup (118 ml)	12,915	260%
Spinach	Frozen and boiled, 0.5 cup (118 ml)	7,395	150%
Sweet potatoes	Canned and drained, 0.5 cup (118 ml)	7,015	140%
Mango	Sliced raw, 0.5 cup (118 ml)	6,425	130%
Vegetable soup	Canned, ready to serve, 1 cup (237 ml)	5,880	115%
Cantaloupe	Raw, 1 cup (237 ml)	5,160	100%
Kale	Frozen and boiled, 0.5 cup (118 ml)	4,130	80%
Pumpkin	1 cup cooked, boiled, drained, without salt	2,650	50%
Spinach	Raw, 1 cup (237 ml)	2,015	40%
Apricot nectar	Canned, 0.5 cup (118 ml)	1,650	35%
Oatmeal	1 packet instant plain	1,510	30%
Tomato juice	Canned, 6 oz. (177 ml)	1,010	20%
Apricots	2 halves with skin packed in juice	610	10%
Red pepper	1 raw ring, 3 in (7.8 cm); 0.25 in (0.64 cm) thick	570	10%
Peas	Frozen and boiled, 0.5 cup (118 ml)	535	10%
Peaches	1 medium raw fruit	525	10%
Peaches	Canned halves or slices in water, 1 cup (237 ml)	470	10%
Papaya	Raw cubes, 1 cup (237 ml)	400	8%

(Illustration by Corey Light. Cengage Learning, Gale)

nutrient because it becomes essential when vitamin A intake is low.

Beta carotene consists of a chain of 40 carbon atoms, with conjugated double bonds and a ring structure at each end of the chain. Depending on the positions of the molecular groups attached to the carbon chain, naturally occurring beta carotene may be any of the following:

- All-*trans* beta-carotene
- 9-*cis* beta-carotene
- 13-*cis* beta-carotene, in smaller amounts. Synthetic beta carotene is primarily all-*trans*.

In plants and alga, beta carotene and other carotenoids attract light for photosynthesis and provide protection from toxic forms of oxygen. Beta carotene is a powerful antioxidant because it destroys toxic free radicals, including singlet oxygen—an oxygen atom that is missing an electron and is very damaging to human tissue if not taken up quickly and deactivated.

General use

Vitamin A precursor

Vitamin A is obtained in the diet from animal products or is made in the liver from beta carotene and other carotenoids. Vitamin A is essential for the following:

- vision and eye health
- normal cell division
- growth
- reproduction and fertility
- immune system function
- skin and mucous membrane health

In sub-Saharan Africa about three million children under the age of five suffer from an eye disorder caused by vitamin-A deficiency that can lead to blindness and death. Although red palm oil, a traditional African food, contains high provitamin A, its substitution by imported cooking oils has reduced this dietary source in many homes. Many vegetables and fruits also contain provitamin A but are not always consumed in adequate amounts. Vitamin A deficiency is the leading cause of blindness worldwide.

In the 1920s vitamin-A deficiency was linked to stomach **cancer** and to precancerous conditions in the epithelial (lining) cells of the throat and lungs. In 1977 vitamin A supplementation was shown to inhibit certain cancers and to reduce the growth of certain tumors in at-risk animals.

Dietary beta carotene

Carotenoids, including beta carotene, that are obtained from food may have the following:

- antioxidant activity
- immune-system-enhancing activity
- activity against some cancers and precancerous conditions
- a role in preventing coronary heart disease, including heart attack and stroke

Epidemiological studies that looked at cancer rates and diet found that at least five daily servings of green, orange, red, and yellow vegetables and fruits appeared to significantly reduce the risk of stomach, lung, prostate, breast, head, and neck cancer, and possibly slow the progression of others. In 1971 a large study of humans linked cancer death rates to low levels of beta carotene in the blood. Subsequent studies linked high blood levels of dietary beta carotene to lower cancer risks. However, subsequent evidence linked these results to a combination of antioxidants found in fruits and vegetables, rather then to beta carotene alone. High beta carotene levels in the blood may be associated with a reduced risk of **asthma**.

Supplemental beta carotene

Supplemental beta carotene has been claimed to do the following:

- inhibit precancerous lesions in those at risk of oral cancer
- protect against gastric and esophageal cancers
- reduce the risk of prostate cancer
- lower the overall cancer risk
- protect against sunburn

However, as of 2008 there was very little evidence that supplemental beta carotene is an effective cancer-preventing substance, except perhaps in those with poor **nutrition** or low baseline levels of beta carotene in the blood. Additional studies showed that beta carotene supplements do not reduce the risk of cancer, **heart disease**, or **cataracts**. Two studies of beta carotene and cancer produced mixed results. A Swedish study of 82,000 men and women reported in 2007 that people who had high intakes of beta carotene, alpha carotene, and vitamin A, were 40% to 60% less likely to develop stomach cancer than people with low intakes of the three supplements. However, in smokers, the supplements offered no protection against stomach cancer. A long-term French study of nearly 60,000 women reported in 2006 that those with high intakes of beta carotene who were non-smokers had a

significantly decreased risk for developing tobacco-related cancers whereas smokers who had a high intake of beta carotene significantly increased their risk of getting tobacco-related cancers. Lung, head, neck, urinary tract, digestive tract, cervix, thyroid, and ovarian cancers are associated with **smoking**. Previous studies had found no such increases in **lung cancer** in those taking beta carotene. Since there is conflicting research, it is probably best for smokers and people being treated for asbestos exposure to avoid taking beta carotene supplements.

A long-term study of 16,548 men in the United States reported in 2006 that taking a high dose of beta carotene had no effect on the risk of developing **prostate cancer**.

Yet supplemental beta carotene does appear to increase the amounts of some types of immune-system cells. Studies have shown that women with low dietary intake or low blood levels of beta carotene are at increased risk for **cervical dysplasia** (abnormal cell growth) and cervical cancer.

The Age-Related Eye Disease Study found that a combined supplement of beta carotene, **vitamin C**, **vitamin E**, **zinc**, and **copper** reduced the risk of disease progression and vision loss in people with advanced **macular degeneration**. The supplement did not slow disease progression in those with early-stage macular degeneration. However, a controlled study of 22,000 males aged 40–84 years reported in 2007 that long-term beta-carotene supplementation neither decreased nor increased the risk of the eye condition age-related maculopathy, also called macular **retinopathy**, that is, any condition or disease of the macula, the small spot in the retina where vision is keenest.

One study found that supplementation with a mixture of antioxidants—beta carotene, alpha-tocopherol, and plant sterols—lowered **cholesterol** levels in the blood.

Beta carotene at 25,000 international units (IU) daily may be useful for treating **psoriasis**, a skin condition. Beta carotene supplements also are used to treat **acne**. Two 25,000-IU supplements daily, in combination with other supplements, sometimes are used to treat stomach ulcers.

Studies reported in 2006 and 2007 that antioxidants, including beta carotene, did not protect women from developing heart disease; that beta carotene supplementation did not improve cognitive performance in older men who took it for less than 15 years but improved it in men who took it for 15 years or longer, including reducing the risk of developing **dementia**; and that people who had a diet high in beta carotene slowed age-related loss of lung power by 32%.

Preparations

Measuring beta carotene

As of the late 2000s, a recommended dietary allowance (RDA) for beta carotene had not been established and most foods were not labeled as to vitamin A content. There are two incompatible systems for quantifying beta carotene. IUs are used most often for nutritional labeling:

- 1 IU equals 0.6 µg of all-*trans* beta carotene
- 3.33 IU of all-*trans* beta carotene, 2 µg is equal to 1 µg of all-*trans* retinol (vitamin A)
- 5,000 IU equals 3 mg of beta carotene, the RDA for vitamin A
- 1 IU equals 1.2 µg of other provitamin A carotenoids

The second system uses retinol equivalents (RE):

- 1 RE equals 1 µg of all-*trans* retinol
- 1 RE equals 6 µg of all-*trans* beta carotene
- 1 RE equals 12 µg of other provitamin A carotenoids

Dietary beta carotene

Daily values (DVs) are determined from the RDA. They are based on a 2,000-calorie diet and usually are expressed as a percentage of an RDA. The IUs and DVs for beta carotene, per serving, in common foods are listed in table 1.

Carrots and sweet potatoes that are more orange contain more beta carotene. New carrot cultivars that contain more beta carotene have been developed and high-beta-carotene sweet potatoes have been introduced into sub-Saharan Africa to treat vitamin-A deficiency.

Other foods that contain beta carotene include:

- avocados
- broccoli
- chard
- coffee
- collard greens
- palm oil and other food colorants
- squash
- string beans
- watermelon
- yams

According to the Institute of Medicine, a daily intake of 3–6 mg of beta carotene keeps the blood

level within the range associated with a lower risk for chronic diseases. The recommended daily diet of five or more servings of fruits and vegetables provides 3–6 mg of beta carotene (if carrots, sweet potatoes, papaya, apricots, or other very high carotenoid food is used, the RDA can be met in a single serving). In contrast, the average American diet contains 1.3–2.9 mg daily. Vegetarians may have twice as much beta carotene in their blood as compared to non-vegetarians because they generally consume more greens and fruits.

Beta carotene in food is found within an oil or a matrix of sugars and proteins; therefore, the absorption of beta carotene by the body varies greatly. The elderly and those with poor digestion and liver trouble may be at risk for insufficient absorption from an adequate beta carotene diet.

Animal sources of vitamin A are more easily absorbed than plant sources of beta carotene, particularly if the vegetables and fruits are eaten raw or whole. Although beta carotene can be converted to vitamin A in the body, it has its own unique physiological functions. Beta carotene and vitamin A are not totally identical in the health benefits they deliver, so it is good to eat sources of both. While supplementation is helpful to those who have trouble absorbing adequate beta carotene, getting all or some beta carotene through food sources rather than supplements alone is by far the best. This is substantiated by research showing there are many beneficial carotenoids in foods and that they may also work together synergistically to optimize health.

Supplemental beta carotene

Beta carotene supplements are inexpensive and readily available over-the-counter. They are available as pills, powders, and oils, and they vary greatly in potency. Some supplements contain a mixture of carotenoids. There is a major problem with shelf life stability for beta carotene, as it "oxidizes" quickly when in pure form. When buying a supplement of it, shelf life stability or the presence of such stabilizers as vitamin E can guarantee biological activity of the capsule.

Supplemental intake of beta carotene probably should not exceed 3–15 mg per day. Common preparation of supplemental beta carotene include:

- 30- or 60-mg capsules
- 5,000-, 10,000-, or 25,000-IU capsules
- 10,000- or 25,000-IU tablets A typical dosage of beta carotene for treating cancer is 75,000–150,000 IU daily. Absorption of beta carotene in nutritional supplements can be 70% or more. There is no established maximum daily intake for beta carotene.

Some common beta carotene nutritional supplements are:

- A-Caro-25
- B-Caro-T
- Biotene
- Caroguard
- Caro-Plete
- Dry Beta Carotene
- Lumitene
- Marine Carotene
- Mega Carotene
- Oceanic Beta Carotene
- Superbeta Carotene
- Ultra Beta Carotene

Manufacturers often supplement food with beta carotene. One study showed that bakery products enriched with beta carotene increased beta carotene levels in the blood.

Precautions

Antioxidants such as beta carotene often work together with other antioxidants and an excess or deficiency of one can inhibit the other. The Food and Nutrition Board of the Institute of Medicine does not recommend beta carotene supplementation except in cases of vitamin A deficiency.

Pregnant and nursing mothers should limit their intake of supplemental beta carotene to 6 mg per day or less.

Side effects

Even long-term high-dosage use of supplemental beta carotene appears to be non-toxic. Daily doses of 30 mg or more over a long period may cause carotenosis (carotenodermia), a yellowing of the skin, which is harmless and reversible. In contrast, very high daily doses of vitamin A are dangerous and damage the liver and other organs, as well as provoke **hair loss**).

Interactions

Drugs and other substances that may interfere with beta-carotene absorption include:

- Cholestyramine
- Colestipol

KEY TERMS

Alpha-tocopherol—An antioxidant derivative of vitamin E that stabilizes cell membranes.

Antioxidant—A substance that prevents oxidation, such as cellular damage caused by free radicals.

Carotenoid—A large class of red and yellow pigments found in some plants and in animal fat.

Carotenosis (carotenodermia, carotenemia)—A yellowish pigmentation of the skin caused by high levels of carotene in the blood.

Cholesterol—An important sterol that is deposited on blood vessel walls in arteriolosclerosis.

Daily value (DV)—The percentage of the RDA of a nutrient that is present in a food or supplement.

Epithelium—Layers of cells covering internal and external body surfaces.

Free radical—An atom or compound with an unpaired electron; oxygen free radicals can damage cells and cell constituents.

Immune system—The body system that protects against foreign pathogens and abnormal cells.

International unit (IU)—A widely accepted definition that is used to quantify a given substance.

Macular degeneration—Progressive deterioration of the macula the light-sensitive cells of the central retina of the eye.

Provitamin A—A carotenoid, such as beta carotene, that can be converted into vitamin A in the liver.

Recommended dietary allowance (RDA)—The average daily dietary intake of a nutrient that is sufficient to meet the nutritional requirements of 97 98% of healthy individuals of a given age and gender.

Retinol equivalent (RE)—1 µg of all-*trans* retinol (vitamin A), 6 µg of all-*trans* beta carotene.

Vitamin A (retinol).—An essential nutrient for vision that is obtained from animal products or made in the liver from carotenoids such as beta carotene.

- mineral oil
- Olestra
- Orlistat
- pectin

The absorption of luteine, another carotenoid antioxidant, may be reduced if taken in conjunction with beta carotene.

Resources

BOOKS

Bruning, Nancy Pauling. *The Real Vitamin and Mineral Book: The Definitive Guide to Designing Your Personal Supplement Program,* 4th ed. New York: Avery, 2007.

Jeep, Robin, et al. *The Super Antioxidant Diet and Nutrition Guide: A Health Plan for the Body, Mind, and Spirit*. Charlottesville, VA: Hampton Roads, 2008.

Milbury, Paul E., and Alice C. Richer. *Understanding the Antioxidant Controversy: Scrutinizing the "Fountain of Youth."* Westport, CT: Praeger, 2007.

Panglossi, Harold V., ed. *Antioxidants: New Research*. Haupauge, NY: Nova Science, 2006.

Presman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals,* 3rd ed. New York: Alpha (Penguin Group), 2007.

PERIODICALS

Brunk, Doug. "Antioxidants Do Not Protect Women Against Heart Risks." *Family Practice News* (Septem ber 15, 2007): 17.

Challem, Jack. "Are Antioxidant Supplements Still Safe? Were Important Details Omitted from a Recent Study on Antioxidants? A Closer Look Reveals the Real Story." *Better Nutrition* (May 2007): 16.

Gaby, Alan R. "Beta Carotene and Cancer: Good for Non Smokers, Bad for Smokers?" *Townsend Letter: The Examiner of Alternative Medicine* (August/September 2006): 51(2).

MacDougall, David S. "Benefits of Antioxidants Are Lim ited: Vitamin E, Vitamin C, or Beta Carotene Supple ments Do Not Cut Population's Risk for Prostate Cancer." *Renal & Urology News* (April 2006): 38.

Medley, Jennifer. "Beta Carotene: With Most Food Based Nutrients, We Simply Have to Trust that They Are There, but If You're on the Lookout for Beta Carotene Rich Foods, Just Turn to the Rainbow." *Kiwi Magazine* (November/December 2007): 26.

Moon, Mary Ann. "Antioxidant Doesn't Benefit Cognitive Performance Short Term." *Family Practice News* (December 15, 2007): 27.

ORGANIZATIONS

American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL, 60606, (800) 877 1600, http:// www.eatright.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http:// www.homeopathyusa.org.

Dieticians of Canada, 480 University Ave., Suite 604, Tor onto, ON, M5G 1V2, Canada, (416) 596 0857, http:// www.dieticians.ca.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, http:// www.ods.od.nih.gov.

Margaret Alic
Ken R. Wells

Beta hydroxy

Description

Beta hydroxy acids (BHAs) are a group of acids once used primarily for the treatment of dry skin, **acne**, and **warts**. During the 1990s, beta hydroxy acids "increasingly appeared" in anti-aging cosmetics, according to the U.S. Food and Drug Administration (FDA). The cosmetics were promoted for the supposed ability of the skin-care products to reduce the appearance of fine lines and wrinkles. Manufacturers claimed that products containing BHAs improved skin quality.

Common beta hydroxy acids include salicylic acid, benzoic acid and beta hydroxybutanoic acid. Salicylic acid is the most widely used BHA in skin care products, and it is widely regarded by the public, medical community and skin care product manufacturers as a BHA. However, according to the FDA, salicylic acid is not considered to be a true BHA. Salicylic acid may be listed by that name or as related substances such as salicylate, **sodium** salicylate, and willow extract, according to the FDA.

BHAs are exfoliants, which means that they cause the top layers of the skin to exfoliate or peel. Exfoliation leaves behind fresh skin that is also smoother and softer than before. Beta hydroxys are said to work by speeding up the turnover of skin cells. They dissolve the glue that holds dead skin cells in the top layers, allowing the fresh cells beneath to emerge. Chemical exfoliation with beta hydroxys is said to peel away a variety of such age-related skin problems as wrinkles, acne, age spots, blemishes, and skin unevenness. Used on a regular basis at a low concentration in cleansers or acne treatments, BHAs refresh the skin and clear away the dirt and oils that often cause acne eruptions. In addition to cosmetic applications, these chemicals also are used as treatments for a variety of skin disorders including **psoriasis**, seborrhea, **dandruff**, and warts.

BHAs are found in many skin care products. They are also found naturally in fresh fruit (berries, pineapple, papaya, etc.), milk and yogurt, **wintergreen** leaves, sweet birch, and some other plants.

Structurally, BHAs appear to be very similar to another group of chemicals used in skin care products, the alpha hydroxy acids or AHAs. These two groups of chemicals have similar activities as well; both are skin exfoliants. BHAs, however, are believed to be less irritating to the skin than AHAs. They are also more effective in preventing acne eruptions and smoothing the skin.

General use

Skin cleansing

Many skin cleansers contain BHAs because they help remove excess oil from the face. They can, however, remove oil only on the surface and cannot affect oil production under the skin. To help maintain healthy skin, these cleansers should be used once or twice a week to improve skin tone and texture. BHA-containing preparations should be left on the face for a short time only and rinsed off with generous amounts of water. Because the skin is more sensitive to sunlight after the use of products containing BHAs, users should apply sunscreens and avoid prolonged sun exposure.

Wrinkles and age spots

Wrinkles are signs of the normal **aging** process. Over the years, the skin becomes thinner, drier and less elastic as its collagen and elastin fibers gradually lose their elasticity. To improve the appearance of the skin and to correct minor blemishes and uneveness, some people have chemical peels with hydroxy acids. Chemical peels have become one of the most popular methods for removing wrinkles. This process uses concentrated preparations of BHAs, alpha hydroxy acids, or combinations of both to remove the top layer of skin. The chemical peel allows a newer layer of skin to replace the older layer. Some fine lines and wrinkles may also be removed.

Because of potential scarring and other severe adverse reactions, chemical peels should be performed by a professional, usually a board-certified dermatologist or a licensed estheticist (skin care specialist).

For best results, chemical peels are often used in combination with such other anti-wrinkle treatments as collagen, fat implants or laser surgery. For relatively young people, a chemical peel with BHA often provides satisfactory results. Those above the age of 40 sometimes choose to have collagen or fat implants together with the peel. Some older patients may have both a chemical peel and a special kind of laser surgery called laser resurfacing. While chemical peels can remove some fine wrinkle lines, laser resurfacing is a more powerful tool. It can remove deeper wrinkles and skin imperfections.

Acne therapy

Acne is a skin disorder caused by excessive production of oil under the uppermost layers of skin. When the oil cannot pass through the hair follicles, the pores under the skin are plugged up, trapping the oil and dead skin cells underneath the skin. These

plugged pores become fertile breeding grounds for a type of bacterium called *Propionibacterium acnes*, sometimes called the acne bacillus, to grow inside the pore, causing irritation, inflammation, and in due time, pimples.

Because it is an effective cleanser, a 1% solution of salicylic acid can enter the pores and help to remove excess oil, dirt, and dead skin cells. It reduces skin breakouts by preventing the buildup of dead skin cells associated with acne formation. Beta hydroxy acids, including salicylic acid, are good treatments for acne because they are relatively mild. Because they are applied topically, they do not cause systemic side effects as oral antibiotics sometimes do. In addition, they are especially appropriate for the treatment of acne because they have anti-inflammatory properties. BHAs, however, do not have the antimicrobial properties of such topical medications as benzoyl peroxide.

Psoriasis

Psoriasis is a chronic skin condition requiring lifelong treatment with topical lotions and creams, phototherapy (using radiation or ultraviolet light), or medications taken by mouth. Salicylic acid can be used to treat psoriasis. Salicylic acid facilitates the removal of scaly skin. In so doing, it helps moisturizers and other topical medications for psoriasis work more effectively.

Warts

Salicylic acid is also an effective and mild treatment for warts and plantar warts. Patients should wash and dry the area around the wart thoroughly before applying the product. Then they should apply a thin film of salicylic acid over each wart and allow it to dry. The product should be applied once or twice a day. Salicylic acid acts slowly and may take as long as 12 weeks before one can see results.

Other uses

The anti-inflammatory properties of BHAs are useful in treating such other skin conditions as dandruff or seborrheic **dermatitis**, a condition characterized by oily skin.

Preparations

Salicylic acid is often found in many over-the-counter skin care products such as soaps, cleansers, acne medications, and anti-wrinkle creams. These products, however, contain only 2% of salicylic acid. This concentration is strong enough for exfoliation but not for chemical peel treatment.

Chemical peel preparations contain very high concentrations (up to 30%) of beta hydroxy acids in combination with alpha hydroxy acids. Because of the potential for scarring and other severe adverse reactions, these prescription-strength products are not sold to the general public. They are available only to licensed dermatologists or estheticians.

Individuals who are prescribed AHA formulations by a healthcare professional should follow their doctor's directions for use of the product.

BHAs can also be found in certain fruits and vegetables. For example, thin layers of papaya can be applied on the face and allowed to remain for a while. Papaya pulp helps soften the skin and decrease its unevenness. It is most beneficial to dry, sun-damaged skin, although it may also cause allergic reactions in some sensitive people. Pineapple is another natural product that contains beta hydroxy acid. Pineapple can be put into a blender or juicer to obtain fresh juice. The juice can be applied to the skin; again, however, it may cause allergic reactions.

Skin test

Before using a new product containing BHA, it is important to test the substance on a small portion of the skin. A small, dime-sized drop of the BHA product should be applied to a small patch of skin inside the elbow or wrist. The skin patch should be monitored for 24 hours for reactions such as irritation or stinging. If the person experiences those reactions, a doctor should be consulted.

Precautions

The FDA regulates skin care products as if they were cosmetics, so products containing BHA don't undergo the rigorous testing for safety and effectiveness that is required for drugs. However, the FDA does become involved when it appears that cosmetics may contain ingredients that are harmful to people.

People who use skin care products containing BHAs should be aware of the following considerations and side effects:

- Increased sensitivity to sunlight. Exfoliated skin is very tender and sensitive to sunlight. Studies have shown that skin treated with these exfoliants has twice the sun damage compared to untreated skin. Therefore, it is important to use suncreen with an SPF (sun protection factor) of at least 15. People should avoid direct exposure to the sun when using products containing BHAs.

KEY TERMS

Collagen—A fibrous tissue found in bones, connective tissue, and cartilage.

Elastin—A yellow fibrous protein that is the basic component of elastic connective tissue.

Exfoliate—To remove or peel off flakes or layers of skin.

Plantar warts—Warts located on the sole of the foot.

- Sensitization to other products. The use of salicylic acid sometimes sensitizes the skin to other cosmetics and causes redness and irritation. In order to avoid skin sensitization, it is best to use only mild cleansers and wait at least 10–30 minutes before using another cosmetic or skin care product. Another way to avoid skin sensitization is to use the BHA product every other day instead of daily.
- Stinging. Salicylic acid may produce a stinging sensation when first applied. That is because it is a mild skin irritant. Products containing salicylic acid should not be applied on raw or abraded skin, as they may cause redness and intense itching.
- Allergic reactions. Some salicylic acid products can provoke hypersensitivity reactions. Any products that cause skin to burn, sting, redden, or break out should be discontinued immediately.
- Blotchy skin. Sometimes BHA chemical peels cause scarring and discoloration of some parts of the skin. This occurs most often with the more concentrated BHA products. Scarring and blotchy skin also tend to occur more frequently in people with darker skin.
- Dry skin. A person with dry skin should not use BHA cleansers too frequently (more than once a week) because they tend to dry the skin even further.
- Eye irritation. Skin care products containing salicylic acid tend to cause the eyes to redden and water. Avoid applying these cleansers, cream or lotion too close to the eyes.

Side effects

Patients should stop using the product and contact their doctors or pharmacists for advice if the following adverse effects occur:

- dry skin
- eye irritation
- allergic reaction
- skin irritation

Interactions

Because salicylic acid tends to sensitize the skin, allow at least 10–30 minutes to elapse between the use of products containing salicylic acid and applying cosmetics or other skin care products.

Resources

BOOKS

Baumann, Leslie. *The Skin Type Solution*. Bantam Books, 2006.

Day, Doris with Sondra Forsyth. *Forget the Facelift*. Avery (Penguin Group), 2005.

ORGANIZATIONS

American Academy of Dermatology. P.O. Box 4014. Schaumburg, IL 60168 4014. (888) 462 DERM. Fax: (847) 330 8907. http://www.aad.org.

Cosmetic Ingredient Review. 1101 17th St. N.W. Suite 412, Washington D.C. 20036 4702. (202) 331 0651. http://www.cir safety.org

U.S. Food and Drug Administration. 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov. To report adverse effects of a cosmetic product, call: (800) 270 8869.

OTHER

Mayo Clinic Staff. "Wrinkle Creams: Your Guide To Younger Looking Skin." (October 12, 2006). http://www.mayoclinic.com/health/wrinkle creams/SN00010 (February 8, 2008).

Samuel Uretsky, Pharm.D.
Liz Swain

Betaine hydrochloride

Description

The digestive process takes place as food passes through the gastrointestinal tract, which consists of the mouth, esophagus, stomach, small intestine, and large intestine. Betaine hydrochloride ($C_5H_{12}NO_2Cl$) is a source of hydrochloric acid, a naturally occurring stomach acid that helps break up fats and proteins for further digestion in the small intestine. Gastric (stomach) acid also aids in the absorption of nutrients through the walls of the intestines into the blood.

Gastric acid helps protect the gastrointestinal tract from harmful bacteria. A normal level of gastric acid in the stomach—100,000 to 1,000,000 times more acidic than water—is sufficient to destroy bacteria, but a low level increases the likelihood and severity of certain bacterial and parasitic intestinal **infections**.

One study showed that **fasting** people with normal gastric acid levels in the stomach had almost no bacteria in the small intestine, while individuals with low levels of hydrochloric acid had some bacterial colonization in the stomach.

Betaine hydrochloride is a synthesized chemical, which is derived from beets. Therapeutic doses cannot be realized by ingesting beets. Gastric acid is produced by stomach cells and is not available from any food source. Occasionally, betaine ($C_5H_{11}NO_2$) is recommended to reduce blood levels of homocysteine, which is associated with **heart disease**. This form of betaine, which is different from betaine hydrochloride, is available only with a doctor's prescription.

General use

Some research suggests that individuals with a wide variety of chronic disorders, such as **allergies**, **asthma**, and **gallstones**, do not produce adequate amounts of stomach acid. Many people with **rheumatoid arthritis** are deficient in stomach acid and other digestive factors. Taking betaine hydrochloride with meals can aid in protein digestion and possibly reduce food sensitivities through improved digestion.

Naturopaths have long held that low stomach acid is a widespread problem that interferes with the digestion and absorption of nutrients. Betaine hydrochloride is one of the most common recommendations for this condition. It helps make some minerals and other nutrients more absorbable and may be especially helpful with nutritional supplements, which are often taken in tablets or capsules that may not be easily digested.

Based on naturopathic theories about the importance of stomach acid, betaine hydrochloride has been recommended for a wide variety of problems, including **anemia**, asthma, **atherosclerosis**, **diarrhea**, excess candida yeast, food allergies, gallstones, **hay fever** and allergies, inner ear infections, rheumatoid arthritis, and thyroid conditions. Many naturopathic physicians also believe that betaine hydrochloride can help conditions such as ulcers, **indigestion**, and esophageal reflux (**heartburn**). Conventional treatment for those conditions involves reducing stomach acid; according to one theory, however, lack of stomach acid leads to incomplete digestion of proteins, which causes allergic reactions and other responses that lead to increased ulcer **pain**. In keeping with this theory, some doctors may recommend animal-derived pancreatic enzymes for patients experiencing allergic reactions to food. Vegetarians may wish to take betaine hydrochloride as an alternative to pancreatic enzymes, since it is not an animal product. Individuals suffering from allergies, ulcers, or heartburn should talk to their doctors before using betaine hydrochloride.

Betaine hydrochloride may be used as a lipotropic. Lipotropics aid in preventing the accumulation of fat in the liver and usually help in the **detoxification** of metabolic wastes and toxins. They may be used to help with weight loss.

Benefits of lipotropics

- Detoxification of the waste byproducts of protein synthesis.
- Increasing resistance to disease by stimulating the thymus gland.
- Stepping up production of lecithin in the liver, which can lower cholesterol levels.
- Preventing plaque deposits in arteries.
- Preventing gallstone formation.
- Protecting against diabetic neuropathy, a condition in which the cranial and spinal nerves, as well as the nerves in the bladder and bowel, may be affected.

Betaine hydrochloride has been used as a source of hydrochloric acid in the treatment of hypochlorhydria, a condition in which an abnormally low amount of hydrochloric acid is in the stomach. It has been used in preparations for the treatment of liver disorders, hypokalaemia (abnormally low levels of **potassium** in the blood), CO_2 production in double contrast radiography, and high homocysteine. Betaine hydrochloride has also been used to treat tic douloureux (a condition which involves spasmodic pain along the course of a facial nerve), cystinuria (a hereditary defect that results in recurrent kidney stone formation), and vitiligo (a condition that is characterized by milky-white patches on otherwise normal skin).

Preparations

Betaine hydrochloride (also called betaine HCl) is typically taken in tablets or capsules of 5–10 grains (325–650 mg) each with a meal that contains protein. Naturopathic or nutritionally oriented physicians may make recommendations of such tablets based on their diagnoses.

Precautions

People with a history of ulcers, heartburn, or other gastrointestinal symptoms should see a nutritionally oriented doctor before taking betaine hydrochloride, and no one should take more than 10 grains (650 mg) without a physician's recommendation. Large amounts of betaine hydrochloride can burn

KEY TERMS

Cystinuria—Excess cystine, lysine, arginine, and ornithine in urine due to defective transport system of these acids in kidney and intestines.

Gastric acid—Also, stomach acid; helps break up fats and proteins for further digestion, aids in the absorption of nutrients through the walls of the intestines into the blood, and helps protect the gastrointestinal tract from harmful bacteria.

Homocysteine—An amino acid in the blood, too much of which is related to a higher risk of vascular disease.

Lipotropic—Substances that help prevent or correct excessive fat deposits in liver.

the lining of the stomach. If a burning sensation is experienced, betaine hydrochloride should be immediately discontinued.

Side effects

Side effects are seldom seen, but as of 2008 betaine hydrochloride had not been through rigorous safety studies. Its safety, especially for young children, pregnant or nursing women, or those with severe liver or kidney disease, is not known.

In very high doses, betaine hydrochlorine has been associated with heartburn.

Interactions

People taking nonsteroidal anti-inflammatory drugs (NSAIDs), cortisone-like drugs, or other medications that could cause peptic ulcers should not take betaine hydrochloride.

Resources

PERIODICALS

Challem, Jack. "Navigating the labyrinth: 30 things you need to know about nutritional supplements." *Vegeta rian Times* (January 1998), no. 245: 66 67.

Gormley, James J. "Healthful weight loss includes L carnitine, chromium, and lipotropics." *Better Nutrition* (May 1996) 58, no. 5: 40 41.

OTHER

PharmaSave Library. http://www.pharmasave.com/health library.php/.

Melissa C. McDade
Rhonda Cloos, RN

Bhakti yoga

Definition

Bhakti **yoga** is one of six major branches of yoga, representing the path of self-transcending love or complete devotion to God or the divine. A practitioner of bhakti yoga regards God as present in every person or sentient being. Although bhakti yoga developed within a Hindu culture, it can be practiced by members of Western religions, as it focuses the believer's mind and heart on God as a supreme Person rather than an impersonal Absolute. Unlike **hatha yoga**, which is the form of yoga most familiar to Americans, bhakti yoga does not place great emphasis on breathing patterns or asanas (physical postures), but rather on acts of worship, devotion, and service.

Origins

Bhakti yoga is thought by some to be the oldest form of yoga, with its roots in the Vedas, or ancient scriptures of India. Some of the hymns in the Vedas are thought to be four thousand years old. Bhakti yoga did not emerge as a distinctive form of yoga, however, until about 500 B.C., the time of the composition of the *Bhagavad-Gita*, a Sanskrit work containing the teachings of Krishna, one of the most beloved of Hindu deities.

Bhakti yoga eventually became the focus of a popular devotional movement in India known as the bhakti-marga or "road of devotion." This movement flourished between 800 and 1100 A.D.. Around 900, devotees of Krishna who belonged to the bhakti-marga produced a scripture known as the *Bhagavad-Purana*, which contains Krishna's instructions to his worshipers. In one passage from the *Bhagavad-Purana*, Krishna praises bhakti above all other paths to bliss. He is represented as saying, "The wise person should abandon bad company and associate with the virtuous, for the virtuous ones sever the mind's attachments [to worldly concerns] by their utterances.... O greatly blessed devotee, these blessed ones constantly tell my story, by listening to which people are released from sin. Those who respectfully listen to, esteem, and recite my story become dedicated to me and attain faith and devotion to me."

Benefits

The chief benefit of bhakti yoga, from the perspective of its practitioners, is greater love for and closeness to God, and to other people (and all beings) as reflections of God. Although bhakti yoga is also

beneficial to mental and physical well-being, improved health is not the primary reason most adherents choose this form of yoga.

Description

The Hindu sacred texts list nine forms of bhakti yoga:

- Sravana. Sravana is the Sanskrit term for listening to poems or stories about God's virtues and mighty deeds. Sravana bhakti cannot be practiced in isolation, however; the devotee must hear the stories from a wise teacher, and seek the companionship of holy people.
- Kirtana. Kirtana refers to singing or chanting God's praises. Ram Dass has said of this form of bhakti "When you are in love with God, the very sound of the Name brings great joy."
- Smarana. Smarana is remembrance of God at all times, or keeping God in the forefront of one's consciousness. In Christian terms, smarana is what the French monk Brother Lawrence (1605–1691) meant by "the practice of the presence of God."
- Padasevana. This form of bhakti yoga expresses love toward God through service to others, especially the sick.
- Archana. Archana refers to worship of God through such external images as icons or religious pictures, or through internal visualizations. The purpose of archana is to purify the heart through love of God.
- Vandana. Vandana refers to prayer and prostration (lying face downward on the ground with arms outstretched). This form of bhakti yoga is intended to curb self-absorption and self-centeredness.
- Dasya. In dasya bhakti, the devotee regards him- or herself as God's slave or servant, carrying out God's commandments, meditating on the words of God, caring for the sick and the poor, and helping to clean or repair sacred buildings or places.
- Sakha-bhava. This form of bhakti yoga is a cultivation of friendship-love toward God—to love God as a member of one's family or dearest friend, and delight in companionship with God.
- Atma-nivedana. Atma-nivedana is complete self-offering or self-surrender to God. Unlike some other forms of yoga, however, bhakti yoga does not teach that the devotee completely loses his or her personal identity through absorption into the divine. God is regarded as infinitely greater than the human worshiper, even one at the highest levels of spiritual attainment.

The nine types of bhakti yoga are not considered a hierarchy in the sense that some are regarded as superior to others in guiding people toward God. An Indian teacher of bhakti yoga has said, "A devotee can take up any of these paths and reach the highest state. The path of bhakti is the easiest of all [types of yoga] and is not very much against the nature of human inclinations. It slowly and gradually takes the individual to the Supreme without frustrating his [sic] human instincts."

KEY TERMS

Asanas—Physical postures associated with the practice of hatha yoga.

Sanskrit—The classical literary language of India. It is considered the oldest living language of the Indo-Aryan family.

Preparations

The practice of bhakti yoga does not require any special physical or emotional preparation. It is a good idea, however, for Western readers to gather more information about a specific form of bhakti yoga that may interest or attract them. This preparation is particularly important because the tendency of Western culture to separate intellect from feeling leads many people to think of bhakti as sheer emotional fervor that does not engage the mind, whereas many of the great teachers of bhakti yoga were known for their wisdom and mindfulness as well as intensity of devotion. Useful resources for learning more about bhakti yoga include such periodicals as *Yoga Journal* and the various organizations listed below.

Precautions

Bhakti yoga tends to attract persons of a strongly emotional nature. There is some risk, however, of such individuals remaining spiritually immature or joining cult-like groups. The Hare Krishna movement, for example, is an offshoot of one school of bhakti yoga, the Gaudiya vaishnava tradition. Although some members of the movement consider their participation meaningful, others have left because they experienced it as repressive and intolerant of other faiths.

Side effects

There are no known side effects associated with the practice of bhakti yoga.

Research and general acceptance

A number of research studies have shown that such spiritual and devotional practices as those

associated with bhakti yoga have positive effects on physical as well as emotional health. The positive physical effects include strengthening of the immune system, lowered blood pressure, and improved ability to cope with chronic **pain**. Chanting or hymn singing (kirtana) has been shown to be particularly effective in pain management.

Several research studies published in early 2004 report that all forms of yoga are becoming increasingly popular among Americans over 40—particularly women and people living in urban areas—for general wellness as well as back pain or other specific health problems. At least 15 million adults in the United States have participated in yoga programs, according to a study conducted at Harvard Medical School. Ninety percent of those contacted by telephone in a research sample said that they found yoga very or somewhat helpful. A survey of **cancer** patients in a supportive care program at Stanford University found that yoga and **massage therapy** were the activities that drew the largest number of participants.

Training and certification

There are no international or nationwide licensing or credentialing procedures for spiritual guides or teachers of bhakti yoga. The web site of the American Yoga Association (AYA) does, however, include an article on "How to Choose a Qualified Teacher."

Resources

BOOKS

Dass, Ram. *Journey of Awakening: A Meditator's Guide book*. New York: Bantam Books, 1978. Contains some prayers, hymns, chants, and other suggestions for devotion drawn from Christian and Jewish sources that can be used in the practice of bhakti yoga.

Dossey, Larry, MD. *Healing Beyond the Body: Medicine and the Infinite Reach of the Mind*. Boston: Shambhala Publications, Inc., 2001.

Feuerstein, Georg, and Stephan Bodian, eds. *Living Yoga: A Comprehensive Guide for Daily Life*, Part III, "Culti vating Love: Bhakti Yoga." New York: Jeremy P. Tarcher/Perigee Books, 1993.

Pelletier, Kenneth, MD. *The Best Alternative Medicine*, Chapter 2, "Sound Mind, Sound Body." New York: Simon & Schuster, 2002.

Sivananda, Swami, and the Staff of the Sivananda Vedanta Yoga Center. *Yoga Mind and Body*. New York: DK Publishing, 1998.

PERIODICALS

Rosenbaum, E., H. Gautier, P. Fobair, et al. "Cancer Sup portive Care, Improving the Quality of Life for Cancer Patients. A Program Evaluation Report." *Supportive Care in Cancer* 12 (May 2004): 293 301.

Saper, R. B., D. M. Eisenberg, R. B. Davis, et al. "Preva lence and Patterns of Adult Yoga Use in the United States: Results of a National Survey." *Alternative Therapies in Health and Medicine* 10 (March April 2004): 44 49.

Wolsko, P. M., D. M. Eisenberg, R. B. Davis, and R. S. Phillips. "Use of Mind Body Medical Therapies." *Journal of General Internal Medicine* 19 (January 2004): 43 50.

OTHER

Yoga.com Staff. "History of Bhakti Yoga." [cited May 23, 2004]. http://www.yoga.com/ydc/enlighten/enlighten_document.asp.

ORGANIZATIONS

American Yoga Association (AYA), P.O. Box 19986,, Sar asota,, FL, 34276, (941) 927 4977, Fax: (941) 921 9844, http://www.americanyogaassociation.org.

Yoga Alliance, 122 West Lancaster Avenue, Suite 204,, Reading,, PA, 19607 1874, (610) 777 7793, Fax:(610) 777 0556, http://www.yogaalliance.org.

Yoga Research and Education Center (YREC), P. O. Box 426,, Manton,, CA, 96059, (530) 474 5700, http://www.yrec.org.

Rebecca Frey

Bilberry

Description

Bilberry, *Vaccinium myrtillus*, is a European berry shrub that is related to the blueberry, huckleberry, and bearberry plants that grow in the United States. Bilberry is a small, wild, perennial shrub that grows throughout Europe and is now cultivated from the Far East to the United States. The shrub yields large amounts of small, darkish blue berries. Besides their medicinal use, they are often eaten fresh or made into jams and preserves. The leaves of the plant are used medicinally as well, but to a lesser extent than the berries. The qualities of the herb are sour, astringent, cold, and drying.

Bilberry has been used by European herbalists for centuries. In Elizabethan times, bilberries were mixed with honey and made into a syrup called *rob* that was prescribed for **diarrhea** and stomach problems. The berries were also used for **infections**, scurvy, and **kidney stones**. The leaves of the plant were used as a folk remedy for diabetes. Bilberry is most famous, though, for its long use as a medicine for eye and vision

Northern Bilberry. *(© Arco Images / Alamy)*

problems. Legend has it that during World War II, British and American pilots discovered that eating bilberry jam before night missions greatly improved their night vision. Bilberries then became a staple for Air Force pilots. Since then, extensive research in Europe has shown that bilberries contain specific compounds that have beneficial effects on the eyes and circulatory system. In France, bilberries have been prescribed since 1945 for diabetic **retinopathy**, a major cause of blindness in diabetics.

Bilberries are high in substances called *flavonoids*, which are found in many fruits, vegetables, grains, beans, peas, and are particularly abundant in citrus fruits and berries. Flavonoids are chemicals technically known as polyphenols. Flavonoids have antioxidant and disease-fighting properties. **Antioxidants** are substances that help cells in the body resist and repair damage. The flavonoids found in bilberry provide the blue color of the berry. The bilberry flavonoids are called *anthocyanosides*, which were found to be the main active ingredients.

Bilberry flavonoids can increase certain enzymes and substances in the eyes that are crucial to good vision and eye function. Furthermore, anthocyanosides can increase circulation in the blood vessels in the eyes, and help these blood vessels repair and protect themselves. Specifically, research has shown that anthocyanosides help stabilize and protect a protein called collagen, which is a basic building block of veins, arteries, capillaries, and connective tissue. Particularly, anthocyanosides seem to work favorably in the tissues found in the retina, the back of the eye where major functions of vision take place. The retina is composed of millions of tiny nerve cells and blood vessels, which anthocyanosides can help support. Bilberry is a common treatment for many varieties of retinopathy, a disorder in which the intricate blood and nerve vessels in the retina are damaged. Retinopathy particularly affects people with diabetes, high blood pressure, and **sickle cell anemia**.

Many studies have documented bilberry's usefulness as a medicinal herb. One study demonstrated that bilberry extract used with **Vitamin E** prevented the progression of **cataracts** in 48 of 50 patients with cataract formations. In animal studies, bilberry reduced and stabilized blood sugar levels. In an Italian

KEY TERMS

Atherosclerosis—Disease in which the arteries and circulation are impaired from hardening and clogging, often from high cholesterol levels.

Cataracts—Eye condition in which the lenses harden and lose their clarity.

Glaucoma—Eye disease that can cause blindness; characterized by excess fluid between the iris and cornea of the eye.

Macular degeneration—Disease in which the macula, the part of the retina responsible for precise vision, deteriorates.

study, bilberry's flavonoids lowered **cholesterol** levels in the blood and improved circulation.

General use

Bilberry is most commonly used as a component of treatment for various vision and eye disorders, including **glaucoma**, cataracts, and **macular degeneration**. However, people with glaucoma should be monitored by an eye doctor regularly, and those with acute glaucoma should not depend on bilberry alone to protect their vision. They can use bilberry along with other emergency medical treatments. Bilberry is included in the treatments for many types of retinopathy and is also used for eye **fatigue**, poor night vision, and nearsightedness. It can be used as a preventative measure for glaucoma and cataracts, and to help those who require precise night vision like cab drivers and pilots. Bilberry's circulation improving and cholesterol lowering qualities make it useful in the treatment of **varicose veins** and **atherosclerosis**. It is also occasionally prescribed for arthritis.

Preparations

Fresh bilberries can be eaten like blueberries, although they are difficult to find outside of Europe. Two to four ounce servings of the fresh fruit can be eaten three times a day. One to two cups each day is a good dose. Dried bilberries are sometimes available in herb or organic health food stores, and two or three small handfuls can be eaten per day. However, dried berries are likely to contain only a small amount of the flavonoids.

Bilberry supplements are widely available in health food stores. They can be purchased as capsules and liquid extracts. A high-quality supplement may contain a standardized formula of up to 25% anthocyanocides. The dosage recommended with this percentage of active ingredients is 80-160 mg taken three times daily. Bilberry supplements may be taken with food or on an empty stomach. Bilberry jam and syrup may also be used.

For eye and circulatory problems, bilberry can be taken with ginkgo to increase its beneficial effects. Vitamins A, C and E may also enhance bilberry's healing effects in the eye. Some suggestions have been made that other flavonoid-containing supplements, such as **pine bark extract** and **grape seed extract**, can possibly enhance bilberry's healing properties.

Precautions

Bilberry may be used as prevention and herbal support for eye conditions, but should not replace medical care. People with vision problems should be thoroughly and immediately examined by an ophthalmologist (eye specialist) before any treatment or remedy is used.

Side effects

Bilberries can be taken in large doses without any side effects. However, bilberry leaves shouldn't be taken in large doses or over long periods of time because they are toxic.

Resources

BOOKS

Keville, Kathi. *Herbs: An Illustrated Encyclopedia*. New York: Friedman/Fairfax, 1994.

Mayell, Mark. *Off the Shelf Natural Health*. New York: Bantam, 1995.

PERIODICALS

HerbalGram (a quarterly journal of the American Botanical Council and Herb Research Foundation) P.O. Box 144345, Austin, TX 78714 4345, (800) 373 7105, http://www.herbalgram.org.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl Street, Boulder, CO 80302.

OTHER

Dietary Supplement Quality Initiative. http://www.dsqi.org.

Douglas Dupler

Binge eating disorder

Definition

Binge eating disorder (BED) is characterized by a loss of control over eating behaviors. The binge eater consumes unnaturally large amounts of food in a short time period, but unlike a bulimic, doesn't regularly engage in any inappropriate weight-reducing behaviors (like excessive **exercise**, **vomiting**, taking laxatives) after the binge episodes.

Description

About three percent of women and one-tenth as many men have duffered from either bulimia or binge eating disorder at some time in their lives. BED typically strikes individuals between their adolescent years and their early 20s. Because of the nature of the disorder, most BED patients are overweight or obese. Studies of weight loss programs have shown that an average of 30% of individuals enrolling in these programs report binge eating behavior. Binge eating in milder forms is even more common, as are attempts to compensate for the binges.

Symptoms of binge-eating disorder

Recurrent episodes of binge eating, characterized by eating an excessive amount of food within a discrete period of time and by a sense of lack of control over eating during the episode

The binge-eating episodes are associated with at least 3 of the following: eating much more rapidly than normal; eating until feeling uncomfortably full; eating large amounts of food when not feeling physically hungry; eating alone because of being embarrassed by how much one is eating; feeling disgusted with oneself, depressed, or very guilty after overeating

Marked distress about the binge-eating behavior

The binge eating occurs, on average, at least 2 days a week for 6 months

The binge eating is not associated with the regular use of inappropriate compensatory behaviors (e.g., purging, fasting, excessive exercise)

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Bulimia—An eating disorder characterized by binge eating and then excessive behavior (such as vomiting, misusing laxatives, or exercising excessively) to rid the body of the food eaten.

Cognitive behavioral therapy—A therapy that focuses on changing negative behavior in order to alter the attitudes or harmful thinking patterns that cause the behavior.

Causes and symptoms

Binge eating episodes may act as a psychological release for excessive emotional **stress**. Other circumstances that may predispose an individual to BED include heredity and mood disorders, such as major **depression**. BED patients are also more likely to have an additional diagnosis of impulsive behaviors (for example, compulsive shopping), **post-traumatic stress disorder** (PTSD), **panic disorder**, or personality disorders. More than half also have a history of major depression. In 2002, the American Psychiatric Association was considering including BED as a psychiatric diagnosis.

Individuals who develop BED often come from families who put an unnatural emphasis on the importance of food. For example, these families may use food as a source of comfort in times of emotional distress. As children, BED patients may have been taught to clean their plates regardless of their appetite, or to be a good girl or boy and finish all of the meal. Cultural attitudes towards beauty and thinness may also be a factor in BED.

During binge episodes, BED patients experience a definite sense of lost control over their eating. They eat quickly and to the point of discomfort, even if they aren't hungry. They typically binge alone two or more times a week, and often feel depressed and guilty when the episode is over.

Diagnosis

BED is usually diagnosed and treated by a psychiatrist and/or a psychologist. In addition to an

interview with the patient, personality and behavioral inventories, such as the Minnesota Multiphasic Personality Inventory (MMPI), may be administered as part of the assessment process. One of several clinical inventories, or scales, may also be used to assess depressive symptoms, including the Hamilton Depression Scale (HAM-D) or Beck Depression Inventory (BDI). These tests may be administered in an outpatient or hospital setting.

Treatment

Many BED individuals binge after long periods of excessive dieting; therapy helps normalize this pattern. The initial goal of BED treatment is to teach the patient to gain control over his or her eating behavior by focusing on eating regular meals and avoiding snacking. Cognitive **behavioral therapy**, group therapy, or interpersonal **psychotherapy** may be used to uncover the emotional motives, distorted thinking, and behavioral patterns behind the binge eating. The overweight BED patient may be placed on a moderate exercise program and a nutritionist may be consulted to educate the patient on healthy food choices and strategies for weight loss.

Initial treatment may focus on curbing the depression that is a characteristic feature of BED. Recommended herbal remedies to ease the symptoms of depression may include **damiana** (*Turnera diffusa*), ginseng (*Panax ginseng*), kola (*Cola nitida*), lady's slipper (*Cypripedium calceolus*), **lavender** (*Lavandula angustifolia*), lime blossom (*Tilia x vulgaris*), oats (*Avena sativa*), **rosemary** (*Rosmarinus officinalis*), **skullcap** (*Scutellaria laterifolia*), **St. John's wort** (*Hypericum perforatum*), **valerian** (*Valeriana officinalis*), and vervain (*Verbena officinalis*).

Binge-eating episodes that appear to be triggered by stress may be curbed by educating the patient in **relaxation** exercises and techniques, including **aromatherapy**, breathing exercises, **biofeedback**, **music therapy**, **yoga**, and massage. Herbs known as adaptogens may also be prescribed by an herbalist or holistic healthcare professional. These herbs are thought to promote adaptability to stress, and include **Siberian ginseng** (*Eleutherococcus senticosus*), ginseng (*Panax ginseng*), wild yam (*Dioscorea villosa*), borage (*Borago officinalis*), **licorice** (*Glycyrrhiza glabra*), **chamomile** (*Chamaemelum nobile*), and nettles (*Urtica dioica*). Tonics of skullcap (*Scutellaria lateriafolia*), and oats (*Avena sativa*), may also be recommended to ease **anxiety**.

Allopathic treatment

Treatment with antidepressants may be prescribed for BED patients. Selective serotonin reuptake inhibitors (such as Prozac) are usually preferred because they offer fewer side effects. However, clinical studies don't show much effectiveness for use of antidepressants in treating BED. Psychotherapy shows better results. Once the binge eating behavior is curbed and depressive symptoms are controlled, the physical symptoms of the disorder can be addressed.

Expected results

The poor dietary habits and **obesity** that are symptomatic of BED can lead to serious health problems, such as high blood pressure, heart attacks, and diabetes, if left unchecked. BED is a chronic condition that requires ongoing medical and psychological management. To bring long-term relief to the BED patient, it is critical to address the underlying psychological causes behind binge eating behaviors. It appears that up to 50% of BED patients will stop bingeing with cognitive behavioral therapy.

Resources

BOOKS

Abraham, Suzanne and Derek Llewellyn Jones. *Eating Disorders: The Facts*. 4th ed. Oxford: Oxford University Press, 1997.

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed. Washington, DC: American Psychiatric Press, Inc., 1994.

Siegel, Michele, Judith Brisman, and Margot Weinshel. *Surviving an Eating Disorder: Strategies for Family and Friends,* 2nd ed. New York: Harper Perennial, 1997.

PERIODICALS

Brewerton, Timothy D. "Binge Eating Disorder: Recogni tion, Diagnosis, and Treatment." *Medscape Mental Health* 2, no. 5 (1997). http://www.medscape.com.

"Treatment of Bulimia and Binge Eating." *Harvard Mental Health Letter* (July 2002).

Tufts University. "Binge Eating Disorder Comes Out of the Closet: Experts Say Leading Obesity Factor Has Long Been Overlooked." *Tufts University Diet & Nutrition Letter* 14, no. 11 (January 1997): 4 5.

ORGANIZATIONS

American Psychiatric Association (APA). Office of Public Affairs. 1400 K Street NW, Washington, DC 20005. (202) 682 6119. http://www.psych.org/.

American Psychological Association (APA). Office of Pub lic Affairs. 750 First St. NE, Washington, DC 20002 4242. (202) 336 5700. http://www.apa.org/.

Eating Disorders Awareness and Prevention. 603 Stewart St., Suite 803, Seattle, WA 98101. (800) 931 2237. http://www.edap.org

National Eating Disorders Organization (NEDO). 6655 South Yale Ave., Tulsa, OK 74136. (918) 481 4044.

Overeaters Anonymous World Service Office. 6075 Zenith Ct. NE, Rio Rancho, NM 87124. (505) 891 2664. http://www.overeatersanonymous.org/.

Paula Ford-Martin
Teresa G. Odle

Biocytin *see* **Brewer's yeast**

Biofeedback

Definition

Biofeedback, or applied psychophysiological feedback, is a patient-guided treatment that teaches an individual to control muscle tension, **pain**, body temperature, brain waves, and other bodily functions and processes through **relaxation**, visualization, and other cognitive control techniques. The name biofeedback refers to the biological signals that are fed back, or returned, to the patient in order for the patient to develop techniques of manipulating them.

Origins

In 1961, Neal Miller, an experimental psychologist, suggested that autonomic nervous system responses (for instance, heart rate, blood pressure, gastrointestinal activity, regional blood flow) could be under voluntary control. As a result of his experiments, he showed that such autonomic processes were controllable. This work led to the creation of biofeedback therapy. Willer's work was expanded by other researchers. Thereafter, research performed in the 1970s by UCLA researcher Dr. Barry Sterman established that both cats and monkeys could be trained to control their brain wave patterns. Sterman then used his research techniques on human patients with **epilepsy**, where he was able to reduce seizures by 60% with the use of biofeedback techniques. Throughout the 1970s, other researchers published reports of their use of biofeedback in the treatment of cardiac arrhythmias, headaches, **Raynaud's syndrome**, and excess stomach acid, and as a tool for teaching deep relaxation. Since the early work of Miller and Sterman, biofeedback has developed into a front-line behavioral treatment for an even wider range of disorders and symptoms.

Benefits

Biofeedback has been used to successfully treat a number of disorders and their symptoms, including tempromandibular joint disorder (TMJ), chronic pain, **irritable bowel syndrome** (IBS), Raynaud's syndrome, epilepsy, **attention-deficit hyperactivity disorder** (ADHD), migraine headaches, **anxiety**, **depression**, traumatic brain injury, and **sleep disorders**.

Illnesses that may be triggered at least in part by **stress** are also targeted by biofeedback therapy. Certain types of headaches, high blood pressure, **bruxism** (teeth grinding), **post-traumatic stress disorder**, eating disorders, **substance abuse**, and some anxiety disorders may be treated successfully by teaching patients the ability to relax and release both muscle and mental tension. Biofeedback is often just one part of a comprehensive treatment program for some of these disorders.

NASA has used biofeedback techniques to treat astronauts who suffer from severe space sickness, during which the autonomic nervous system is disrupted. Scientists at the University of Tennessee have adapted these techniques to treat individuals suffering from severe **nausea** and **vomiting** that is also rooted in autonomic nervous system dysfunction.

Recent research also indicates that biofeedback may be a useful tool in helping patients with **urinary incontinence** regain bladder control. Individuals learning pelvic-floor muscle strengthening exercises can gain better control over these muscles by using biofeedback. Sensors are placed on the muscles to train the patient where they are and when proper contractions are taking place.

Description

During biofeedback, special sensors are placed on the body. These sensors measure the bodily function that is causing the patient problem symptoms, such as heart rate, blood pressure, muscle tension (EMG or electromyographic feedback), brain waves (EEC or electroencephalographic feedback), respiration, and body temperature (thermal feedback), and translates the information into a visual and/or audible readout, such as a paper tracing, a light display, or a series of beeps.

While the patient views the instantaneous feedback from the biofeedback monitors, he or she begins to recognize what thoughts, fears, and mental images influence his or her physical reactions. By monitoring this relationship between mind and body, the patient can then use these same thoughts and mental images as subtle cues, as these act as reminders to become deeply relaxed, instead of anxious. These reminders also work to manipulate heart beat, brain wave patterns, body temperature, and other bodily functions. This is achieved

ELMER GREEN (1918–)

A life dedicated to science has propelled Elmer Green, Ph.D. into careers as a physicist and a biological psychologist. Both led to his most noted work, the influence on the birth of the biofeedback movement. While the mechanics of moving parts and machinery lured the investigator from LaGrand, Oregon, to his work as a civilian scientist with the Navy in the late 1940s, it was his wife Alyce who caused him to ponder biophysiology and human development. In 1953 she read a book titled *The Human Senses* by Frank Geldard. It was their interests as a couple that led to their continued education at the University of Chicago. In 1957 Green began work for his Ph.D. studies in biopsychology, while Alyce studied for her Master's degree in psychology.

Numerous opportunities, including assisting with the development of a machine for the automated detection of brain damage, led to his position at the Menninger Institute in Topeka, Kansas, in 1964. While there he established the psychophysiology laboratory and the Voluntary Controls Program. It was his treatment of a colleague's wife's headaches that Green became convinced that skin temperature was an autonomic nervous system variable that was responsive to psychophysiologic self regulation aided by thermal biofeedback. By learning to control temperature he found that headache control could be enhanced. Green's success attracted support by several of the Menninger staff who also began research and use of biofeedback therapy for headaches and hypertension.

The 1960s proved exciting for Green as he, Alyce, and colleague Dale Walters became involved with EEG Biofeedback, and studied the process of meditation a therapy the Greens had long practiced. In April 1969, Green and his wife organized the Council Grove Conference for the study of the voluntary control of internal states. The conference served as a step toward forming the Biofeedback Research Society, which later became the Biofeedback Society of America, and currently the Association for Applied Psychophysiology and Biofeedback.

Together, Elmer and Alyce Green authored numerous papers, book chapters, and wrote the book, *Beyond Biofeedback*(1977). They lectured throughout the United States and around the world for more than 20 years on multiple topics including EEG biofeedback training and psychophysiologic control.

Green co founded the International Society For the Study of Subtle Energies and Energy Medicine (ISSSEEM) in 1990 and served as its director. Alyce died in 1994 of Alzheimer's disease. In 2008, 90 year old Green works as a professional consultant and director emeritus of the Voluntary Controls Program at the Menninger Clinic. He also serves as the science director of the Dove Health Alliance in Aptos, California, and authored a book titled *The Ozawkie Book of the Dead* that was published in 2001.

through relaxation exercises, mental imagery, and other cognitive therapy techniques.

As the biofeedback response takes place, patients can actually see or hear the results of their efforts instantly through the sensor readout on the biofeedback equipment. Once these techniques are learned and the patient is able to recognize the state of relaxation or visualization necessary to alleviate symptoms, the biofeedback equipment itself is no longer needed. The patient then has a powerful, portable, and self-administered treatment tool to deal with problem symptoms.

Biofeedback that specializes in reading and altering brain waves is sometimes called *neurofeedback*. The brain produces four distinct types of brain waves—delta, theta, alpha, and beta—that all operate at a different frequency. Delta, the slowest frequency wave, is the brain wave pattern associated with sleep. Beta waves, which occur in a normal, waking state, can range from 12-35 Hz. Problems begin to develop when beta wave averages fall in the low end (underarousal) or the high end (overarousal) of that spectrum. Underarousal might be present in conditions such as depression or attention-deficit disorder, and overarousal may be indicative of an anxiety disorder, obsessive compulsive disorder, or excessive stress. Beta wave neurofeedback focuses on normalizing that beta wave pattern to an optimum value of around 14 Hz. A second type of neurofeedback, alpha-theta, focuses on developing the more relaxing alpha (8-13 Hz) and theta waves (4-9 Hz) that are usually associated with deep, meditative states, and has been used with some success in substance abuse treatment.

Through brain wave manipulation, neurofeedback can be useful in treating a variety of disorders that are suspected or proven to impact brain wave patterns, such as epilepsy, attention-deficit disorder, migraine headaches, anxiety, depression, traumatic brain injury, and sleep disorders. The equipment used for neurofeedback usually uses a monitor as an output device. The monitor displays specific patterns that the patient attempts to change by producing the appropriate type of brain wave. Or, the monitor may reward the patient for producing the appropriate brain wave by producing a positive reinforcer, or reward. For example, children may be rewarded with a series of successful moves in a displayed video game.

KEY TERMS

Autonomic nervous system—The part of the nervous system that controls so-called involuntary functions, such as heart rate, salivary gland secretion, respiratory function, and pupil dilation.

Bruxism—Habitual, often unconscious, grinding of the teeth.

Epilepsy—A neurological disorder characterized by the sudden onset of seizures.

Placebo effect—Placebo effect occurs when a treatment or medication with no known therapeutic value (a placebo) is administered to a patient, and the patient's symptoms improve. The patient believes and expects that the treatment is going to work, so it does. The placebo effect is also a factor to some degree in clinically-effective therapies, and explains why patients respond better than others to treatment despite similar symptoms and illnesses.

Raynaud's syndrome—A vascular, or circulatory system, disorder which is characterized by abnormally cold hands and feet. This chilling effect is caused by constriction of the blood vessels in the extremities, and occurs when the hands and feet are exposed to cold weather. Emotional stress can also trigger the cold symptoms.

Schizophrenia—Schizophrenia is a psychotic disorder that causes distortions in perception (delusions and hallucinations), inappropriate moods and behaviors, and disorganized or incoherent speech and behavior.

Temporomandibular joint disorder—Inflammation, irritation, and pain of the jaw caused by improper opening and closing of the temporomandibular joint. Other symptoms include clicking of the jaw and a limited range of motion.

Depending on the type of biofeedback, individuals may need up to 30 sessions with a trained professional to learn the techniques required to control their symptoms on a long-term basis. Therapists usually recommend that their patients practice both biofeedback and relaxation techniques on their own at home.

Preparations

Before initiating biofeedback treatment, the therapist and patient will have an initial consultation to record the patients medical history and treatment background and discuss goals for therapy.

Before a neurofeedback session, an EEG is taken from the patient to determine his or her baseline brainwave pattern.

Biofeedback typically is performed in a quiet and relaxed atmosphere with comfortable seating for the patient. Depending on the type and goals of biofeedback being performed, one or more sensors will be attached to the patient's body with conductive gel and/or adhesives. These may include:

- Electromyographic (EMG) sensors. EMG sensors measure electrical activity in the muscles, specifically muscle tension. In treating TMJ or bruxism, these sensors would be placed along the muscles of the jaw. Chronic pain might be treated by monitoring electrical energy in other muscle groups.
- Galvanic skin response (GSR) sensors. These are electrodes placed on the fingers that monitor perspiration, or sweat gland, activity. These may also be called skin conductance level (SCL) sensors.
- Temperature sensors. Temperature, or thermal, sensors measure body temperature and changes in blood flow.
- Electroencephalography (EEG) sensors. These electrodes are applied to the scalp to measure the electrical activity of the brain, or brain waves.
- Heart rate sensors. A pulse monitor placed on the finger tip can monitor pulse rate.
- Respiratory sensors. Respiratory sensors monitor oxygen intake and carbon dioxide output.

Precautions

Individuals who use a pacemaker or other implantable electrical devices should inform their biofeedback therapist before starting treatments, as certain types of biofeedback sensors have the potential to interfere with these devices.

Biofeedback may not be suitable for some patients. Patients must be willing to take a very active role in the treatment process. And because biofeedback focuses strictly on behavioral change, those patients who wish to gain insight into their symptoms by examining their past might be better served by psychodynamic therapy.

Biofeedback may also be inappropriate for cognitively impaired individuals, such as those patients with organic brain disease or a traumatic brain injury, depending on their levels of functioning.

Patients with specific pain symptoms of unknown origin should undergo a thorough medical examination before starting biofeedback treatments to rule out any serious underlying disease. Once a diagnosis has

been made, biofeedback can be used concurrently with conventional treatment.

Biofeedback may only be one component of a comprehensive treatment plan. For illnesses and symptoms that are manifested from an organic disease process, such as **cancer** or diabetes, biofeedback should be an adjunct to (complementary to), and not a replacement for, conventional medical treatment.

Side effects

There are no known side effects to properly administered biofeedback or neurofeedback sessions.

Research and general acceptance

Preliminary research published in late 1999 indicated that neurofeedback may be a promising new tool in the treatment of **schizophrenia**. Researchers reported that schizophrenic patients had used neurofeedback to simulate brain wave patterns that antipsychotic medications produce in the brain. Further research is needed to determine what impact this may have on treatment for schizophrenia.

The use of biofeedback techniques to treat an array of disorders has been extensively described in the medical literature. Controlled studies for some applications are limited, such as for the treatment of menopausal symptoms and premenstrual disorder (PMS). There is also some debate over the effectiveness of biofeedback in ADHD treatment, and the lack of controlled studies on that application. While many therapists, counselors, and mental health professionals have reported great success with treating their ADHD patients with neurofeedback techniques, some critics attribute this positive therapeutic impact to a **placebo effect**.

There may also be some debate among mental health professionals as to whether biofeedback should be considered a first line treatment for some mental illnesses, and to what degree other treatments, such as medication, should be employed as an adjunct therapy.

Training and certification

Individuals wishing to try biofeedback should contact a healthcare professional trained in biofeedback techniques. Licensed psychologists, psychiatrists, and physicians frequently train their patients in biofeedback techniques, or can recommend a specialist who does. In some cases, a licensed professional may employ a biofeedback technician who works under their direct guidance when treating patients. There are several national organizations for biofeedback therapists, including the Biofeedback Certification Institute of America, which also certifies therapists in the practice.

Resources

BOOKS

Robbins, Jim. *A Symphony in the Brain: The Evolution of the New Brain Wave Biofeedback*. Boston, MA: Atlantic Monthly Press, 2000.

PERIODICALS

Burgio, K.L. et al. "Behavioral vs. Drug Treatment for Urge Urinary Incontinence in Older Women: A randomized controlled trial." *Journal of the American Medical Association* 280 (Dec. 1998): 1995 2000.

Robbins, Jim. "On the Track with Neurofeedback." *News week* 135, no. 25 (June 2000): 76.

ORGANIZATIONS

The Association for Applied Psychotherapy and Biofeed back. 10200 W. 44th Avenue, Suite 304, Wheat Ridge, CO 80033 2840. (303) 422 8436. http://www.aapb.org

Biofeedback Certification Institute of America.10200 W. 44th Avenue, Suite 310, Wheat Ridge, CO 80033. (303) 420 2902.

Paula Ford-Martin

Bioflavonoids

Description

Bioflavonoids, or flavonoids, are a large class of **antioxidants**. They are compounds abundant in the pulp and rinds of citrus fruits and other foods containing **vitamin C**, such as soybeans and root vegetables. Other major sources of bioflavonoids include tea, vegetables such as broccoli and eggplant, **flaxseed**, and whole grains. Bioflavonoids are active ingredients in many herbal remedies. These include **feverfew**, *Tanacetum parthenium*; *Ginkgo biloba*; **licorice** root, *Glycyrrhiza glabra*; **St. John's wort**, *Hypericum perforatum*; and *Echinacea* spp.

Bioflavonoids help maximize the benefits of vitamin C by inhibiting its breakdown in the body. In 1935, Hungarian-American physiologist Albert Szent-Györgyi (1893–1986) demonstrated that an extract he called citrin, made from lemon peels, was more effective than pure vitamin C in preventing scurvy. In 1936, Szent-Györgyi found that citrin was a mixture of bioflavonoids, including the flavone **hesperidin** and a flavonol glucoside. Szent-Györgyi believed that

bioflavonoids should be considered vitamins but was not able to substantiate that they were essential nutrients. Still, many researchers and physicians believe that dietary intake of bioflavonoids is beneficial for blood vessel health and possibly for protection against **heart disease**.

Bioflavonoids are categorized in a variety of ways, sometimes with overlapping categories. Types of bioflavonoids include flavones, isoflavonoids, flavanones (such as catechins and naringin), and flavanols.

General use

In their natural state, bioflavonoids are usually found in close association with vitamin C. In treating medical conditions, vitamin C and bioflavonoids enhance the action of each other's compound. Therefore, when taken as supplements, they often should be used in combination to increase effectiveness. In general, all bioflavonoids are potentially useful as antioxidants, antivirals, and anti-inflammatories. Other health benefits of the various bioflavonoids include:

- Preventing nosebleeds, miscarriages, postpartum bleeding, and other types of hemorrhages
- The treatment and prevention of menstrual disorders
- Protecting against cancer and heart disease
- Anticoagulant activity (preventing blood clotting)
- Reducing the occurrence of easy bruising
- Decreasing cholesterol level
- Improving symptoms related to aging
- Protecting against infections
- Counteracting the effects of pollution, pesticides, rancid fats, and alcohol
- Reducing pain
- Improving circulation
- Improving liver function
- Improving vision and preventing eye diseases
- Strengthening the walls of the blood vessels

Major bioflavonoids and their actions

Rutin can be used to treat chronic venous insufficiency (a condition in which blood drains inadequately from a body part), **glaucoma**, **hay fever**, **hemorrhoids**, **varicose veins**, poor circulation, oral herpes, **cirrhosis**, **stress**, low serum **calcium**, and **cataracts**. It is helpful in reducing weakness in the blood vessels and resultant hemorrhages. Rutin can relieve the **pain** from bumps and **bruises**. Rutin may be taken to help reduce serum **cholesterol**. It is useful in treating rheumatic diseases such as **gout**, arthritis, **systemic lupus erythematosus** (a chronic disease marked by a rash on the face with a variety of symptoms), and **ankylosing spondylitis** (a condition affecting ligaments in the spine, involving the hips and shoulders). Rutin is most abundant in apricots, buckwheat, cherries, prunes, rose hips, the whitish rind of citrus fruits, and the core of green peppers.

Anthocyanins and proanthocyanidins can be used to treat a number of eye conditions such as cataracts, **night blindness**, diabetic **retinopathy** (a progressive retina disease that is a complication of diabetes), and **macular degeneration** (a hereditary condition causing loss of vision). They are also useful for strengthening the walls of the blood vessels and, therefore, may help prevent bruising, hemorrhoids, varicose veins, and spider veins. These bioflavonoids can help to prevent **osteoporosis** by stabilizing collagen, the major protein in bone. They can reduce cholesterol deposits in arteries and prevent damage to the artery walls. These actions reduce the possibilities of heart disease and strokes. Anthocyanins and proanthocyanidins can produce dilation of blood vessels and prevent **blood clots**. Proanthocyanidins are able to cross the blood-brain barrier to protect the brain from damage by free radicals and infection. Good sources of anthocyanins and proanthocyanidins include blackberries, cranberries, black and **green tea**, raspberries, grapes, eggplant, red cabbage, elderberries, and red wine.

Hesperidin is useful in treating the complaints of **menopause** and in dealing with the viruses that cause herpes, the flu, and certain respiratory ailments. Hesperidin fights allergic reactions by blocking the release of histamine. It may also help reduce **edema** (accumulation of fluid) in the legs. Hesperidin deficiency has been linked to weaknesses in the walls of the blood vessels, pain and weakness in the hands and feet, and leg cramps at night. Hesperidin is found most commonly in the pulps and rinds of citrus fruits.

Ellagic acid helps to inhibit **cancer** by neutralizing the effect of certain carcinogens. It is particularly helpful in reducing the effects of nitrosamines, which are found in tobacco and processed meat products such as bacon and hot dogs. Ellagic acid reduces the effects of the toxic and carcinogenic factors (aflatoxins) produced by *Aspergillus flavus* molds on food. Aflatoxins may cause liver damage and cancer. Ellagic acid diminishes the effects of polycyclic hydrocarbons produced by tobacco smoke and air pollution, as well. Sources of ellagic acid include strawberries, grapes, apples, cranberries, blackberries, and walnuts.

Quercetin is a good antihistamine. It can help reduce the inflammation that results from hay **fever**, **allergies**, **bursitis**, gout, arthritis, and **asthma**. It may lessen other asthma symptoms. Quercetin stimulates **detoxification** in the liver. It strengthens the blood vessels, and is useful in treating **atherosclerosis** (plaque build-up in the arteries) and high cholesterol levels. It may help inhibit tumor formation. Quercetin can be used to treat many of the complications of diabetes. For example, it blocks the accumulation of sorbitol, which has been linked with nerve, eye, and kidney damage in diabetics; and it regulates blood sugar levels. Quercetin inhibits the growth of *Helicobacter pylori,* which is responsible for the development of peptic ulcers. It can also help diminish the effects of the herpes virus, the Epstein-Barr virus (a common virus and a common cause of **mononucleosis**), and the polio virus. Quercetin is found in green tea, onion skins, kale, red cabbage, green beans, tomatoes, potatoes, lettuce, strawberries, cherries, and grapes. It is also found in smaller amounts in many other foods.

Catechins and tannins can be used to stimulate detoxification by the liver and to strengthen the blood vessels. They also help reduce the inflammatory response. Catechins and tannins may help inhibit the formation of tumors. In addition, catechins can be used to inhibit the breakdown of collagen and to treat **hepatitis** and arthritis. Catechins and tannins are both found in green and black teas.

Kaempferols stimulate liver detoxification and strengthen the blood vessels. They may also inhibit tumor formation. Strawberries, leeks, kale, broccoli, radishes, endives, and red beets all are good sources of kaempferols, but kaempferols are very common and found in many plants and foods. Naringen may slow the progression of heart disease and visual degeneration in diabetes. It is a potent anticoagulant that keeps the arteries clear and strong to prevent strokes, heart attacks, and the blindness of diabetes. Naringen is an active ingredient in grapefruits. Genestein is known to be a regulator of estrogen. It is useful in treating disorders of **menstruation** and menopause. Genestein is found in soybeans and soy products.

Preparations

Since bioflavonoids are so widely available in fruits in high concentrations, daily consumption of whole fresh fruits and fresh fruit juices is the best way to get adequate amounts of bioflavonoids. Highly concentrated liquid extracts of some fruits are also available.

KEY TERMS

Antioxidants—Nutrients that protect against oxidation, a chemical reaction that can damage human cells.

Blood-brain barrier—A feature of the brain thought to consist of walls of capillaries that prevent or delay the passage of some drugs and chemicals into the central nervous system.

Free radicals—By-products of the process of energy production in the human body. Free radicals are atoms or groups of atoms with an odd number of electrons. They can damage important cellular components and can be checked by antioxidants.

Precautions

Bioflavonoids are generally safe, even at very high doses. However, pregnant women are advised not to take megadoses of bioflavonoids. Preliminary studies indicated that there may be a link between infant **leukemia** and high doses of bioflavonoids in the mother.

Side effects

Bioflavonoids are not toxic, even at high levels. They are water soluble; therefore, any amount in excess of what is needed by the body is excreted in the urine.

Interactions

Bioflavonoids are usually found in close association with vitamin C, and they enhance its effect. There are no known drug interactions.

Resources

BOOKS

Andersen, Oyvind M., and Kenneth R. Markham, eds. *Flavonoids: Chemistry, Biochemistry, and Applications*. Boca Raton, FL: CRC Press, 2006.

Challem, Jack, and Marie Moneysmith. *User's Guide to Carotenoids & Flavonoids: Learn How to Harness the Health Benefits of Natural Plan Antioxidants*. Laguna Beach, CA: Basic Health, 2005.

Grotewald, Eric. *The Science of Flavonoids*. New York: Springer, 2006.

Patience Paradox
David Edward Newton, Ed.D.

Bioidentical hormone replacement therapy

Definition

Supplementation of hormones that are identical in structure and function to the hormones naturally occurring in the body.

Description

Increasing numbers of women and their physicians are opting for the use of natural, bioidentical hormones to manage the symptoms of **menopause**. This trend has occurred largely as a response to the outcome of several studies which concluded that the risks of using conventional hormone–replacement therapy (HRT) outweighed the benefits. Bioidentical hormone replacement therapy (BHRT) is perceived as a safer alternative for treating menopausal symptoms such as **hot flashes**, **insomnia**, night sweats, poor memory and concentration, and genitourinary symptoms. BHT is also used to help maintain bone density after menopause and prevent **osteoporosis**.

Bioidentical hormones are laboratory–produced hormones that are identical to those found in the human body. They are derived from plant sources, from molecules found in soy (genistein) and wild yam (diosgenin). Although derived from plants, bioidentical hormones are not the same as over–the–counter formulations made from plants. The human body lacks enzymes necessary to convert plant molecules to hormone molecules that are identical to endogenous hormones. The plant products are not hormonally active in their natural form, although they do affect hormone levels as botanical agents. Likewise, bioidentical hormones are not the same as "plant–based" products produced by pharmaceutical companies, which are natural substances converted to synthetics so the product may be patented. These synthetic derivatives have different action and metabolism in the body and are not identical to endogenous hormones.

Conventional hormones are produced by pharmaceutical manufacturers and are available in a limited variety of doses and delivery methods. Conventional HRT are composed of either synthetic estrogen, a synthetic progesterone–like hormone called progestin, or conjugated equine estrogen (CEE). CEE is obtained from the urine of pregnant mares and contains at least 100 different types of estrogen. HRT is often poorly tolerated by women who take them. Between one–third and two–thirds of women discontinue use within the first year due to side effects. Many of the unwanted side effects of conventional HRT are attributable to synthetic progestins, and include weight gain, bloating, breast tenderness and irregular bleeding.

Physicians have prescribed conventional HRT for decades. Estrogen replacement therapy was popularized in the late 1960s, a time in which the predominant perception of menopause was that of a deficiency state. Estrogen was thought to be an elixir of youth, and was given routinely to perimenopausal and menopausal women. Estrogen supplementation was given by itself until it was found in the mid–1970s that increased estrogen in the absence of progesterone caused the uterine lining to thicken, and increased the risk of **uterine cancer**. Subsequently, estrogen has been supplemented in combination with progesterone except in cases where the woman has had a hysterectomy.

Conventional HRT was in widespread use in the United States until studies published between the late 1990s and 2003 revealed serious health risks associated with combined estrogen and progestin HRT. The Women's Health Initiative, a clinical trial with over 16,000 women using HRT, was discontinued prematurely due to participants experiencing an increased risk of **stroke**, cardiovascular disease, **breast cancer** and **dementia**. Negative health outcomes were most significant in women using HRT greater than five years, but many problems occurred within the first year of use. Other large–scale clinical trials such as the Postemenopausal Estrogen/Progestin Interventions (PEPI), the Heart and Estrogen/Progestin Replacement Study (HERS) and the Million Women Study produced similar results, and use of conventional HRT dramatically declined.

Bioidentical hormones have been endorsed by advocates as being safer alternatives to conventional HRT. However, clinical trials confirming their safety are limited with the exception of a few small American and European studies. Further research is needed to confirm that bioidentical hormones are safer than conventional HRT by virtue of being used in smaller doses, having the same mechanism of action, and being more efficiently metabolized and excreted by the body.

Bioidentical hormones are different from conventional hormones in several significant ways. They differ in molecular structure, metabolism, bioavailability, and receptor affinity. The molecular structure of bioidentical hormones is identical to those produced in the body (endogenous). Because they are identical to endogenous hormones, they are metabolized in the same way as hormones made in the body, thereby reducing circulation of potentially toxic metabolic byproducts. For

example, synthetic estrogen is slower to be metabolized and excreted than endogenous or bioidentical estrogen. As a result, it has greater potential to damage cells and tissues. Additionally, bioidentical hormones are an exact fit with endogenous hormone receptor sites.

Preparations

Bioidentical hormones can be prepared in many different forms to directly affect target tissues and to enhance absorption and bioavailability. Bioidentical hormones may be delivered in capsules, sublingual pellets, or a variety of transdermal applications. They may be formulated into creams, ointments, or patches. Transdermal application has the benefit of acting directly on target tissue, and may be used for vulvar or vaginal creams to address atrophy and dryness. Prescriptions for bioidentical hormones can be individualized to meet the needs of each woman and compounded in unique doses, combinations, and delivery methods.

Bioidentical hormone replacement preparations can be individually tailored to contain combinations of natural estrogens, progesterone, testosterone and **DHEA**. Each hormone has a unique action in the body, and can be supplemented based on a woman's individual needs as determined by hormone profile testing ordered by her health care provider.

In premenopausal women, estrogen is produced in the ovaries from hormone precursors **androstenedione** and testosterone. After menopause, the majority of estrogen in the body is converted from precursor hormones in the fat tissue, and by the adrenal glands. There are three forms of estrogen that naturally occur in the body: estrone (E1), estradiol (E2) and estriol (E3). Of these forms, estradiol is the most metabolically active, and elevated endogenous levels have been linked to disease.

Estradiol, when used therapeutically, decreases hot flashes and night sweats and improves cognition, mood, sleep and memory. Estriol is a very mild form of estrogen that is elevated during **pregnancy**, and has shown to be protective for breast tissue. It is used therapeutically to treat genitourinary symptoms of low estrogen such as vaginal dryness and urinary tract **infections**. Estrogen is found in very minute amounts in the body, as it is extremely potent and has potentially harmful effects. Elevated estradiol levels are linked with increased incidence of breast and uterine **cancer**. Estrone is the hormone that is produced by hormone conversion in the fat tissue of postmenopausal women, and usually is found in sufficient quantities unless a woman is very thin. Elevated estrone levels are associated with increased risk of estrogen–dependent cancers.

Estrogen is metabolized in the liver through several phases designed to render it inactive, but keep the byproducts available should they be needed. Estrogen metabolism can follow various pathways to produce three different end products: 2–, 4– and 16–hydroxylated estrogens. When estrogen is metabolized down the 4–hydroxylation pathway, the result is metabolites that are unstable and potentially damaging to cells and tissues.

Progesterone is an estrogen–balancing hormone that modifies the stimulating effect estrogen has on the uterus and arteries. When given alone or in combination with estrogen, progesterone can improve sleep and mood, as well as help strengthen bones. It is important to make the distinction between the biological hormone progesterone and synthetic hormones called progestins found in many conventional HRT formulations. Progestins are similar enough in molecular structure to natural progesterone to stimulate receptors, but do not have the same activity in the body. The American College of Obstetricians and Gynecologists recommend that progestins be prescribed with estrogen to avoid uterine hyperplasia. But while progestins have a beneficial effect on the uterus, they may be harmful to the brain and cardiovascular system. The WHI demonstrated that when medroxyprogesterone, a synthetic progestin, was combined with estrogen in HRT, there was a substantial increase in risk of **heart attack** and stroke, greater than estrogen alone.

Testosterone is prescribed for women to improve libido, build bone and muscle mass. Supplemental testosterone in women who are found to be deficient can improve mood and vitality, as well as help regulate **cholesterol** and blood glucose levels.

DHEA is a precursor androgen hormone that is used as a building block for other hormones, as well as having activity of its own. DHEA works similarly to testosterone to build bone and muscle. DHEA levels may be suppressed from chronic **stress** and exhaustion, which can be detected on hormone profile testing of blood, saliva or urine.

Formulations of BHRT that include estrogen are typically either a two–estrogen (Bi–est) or three–estrogen (Tri–est) formulation. Bi–est compounds are comprised of between 50–80% estriol and 20–50% estradiol. Tri–est formulas typically contain 80% estriol, 10% estradiol and 10% estrone and may be suitable for slim or underweight postmenopausal women who are not producing endogenous estrone. Progesterone may be delivered orally or topically.

KEY TERMS

Bioavailability—The extent to which a drug enters circulation to be usable at receptor sites.

Bioidentical—Identical in chemical structure to that which is naturally occurring in the body.

Endogenous—Produced or originating from the body.

Estradiol—A steroid hormone produced in the ovary, a highly potent form of estrogen.

Estriol—A steroid hormone thought to be the metabolic byproduct of estrone and estradiol. It is produced in higher concentrations during pregnancy.

Estrone—A steroid hormone that is metabolically weaker than estradiol but more potent thatn estriol.

Precautions

The Women's Health Initiative was a large–scale clinical trial with several arms, aimed at studying the effects of conventional hormone replacement therapy. The study evaluating combined estrogen–progestin therapy was discontinued due to the preponderance of negative effects of HRT. Proponents of bioidentical hormone replacement therapy suggest that it is a safer alternative to conventional HRT because it is identical to endogenous hormone in its activity and metabolism. However, further research is needed to fully assess the risks and benefits associated with BHRT. As of early 2008, conservative recommendations for bioidentical hormone therapy limit use to five years or less, using the lowest dose to achieve desired results.

Side Effects

Bioidentical hormone replacement therapy is generally well–tolerated, with fewer side effects than are found with conventional hormone replacement therapy: **headache**, breast tenderness, digestive symptoms, vaginal discharge or spotting. Symptoms to be concerned about include chest **pain**, **dizziness** or fainting, change in speech or vision, breast lumps and abnormal vaginal bleeding.

Interactions

Bioidentical estrogens should be avoided in women with a history of estrogen–dependent cancer. Women with a family history of breast cancer may consider avoiding supplemental estrogens. BHRT may also not be suitable for women with a history of stroke or heart attack, **blood clots** or liver problems.

Resources

BOOKS

Hudson, Tori, ND. *Women's Encyclopedia of Natural Medicine: Alternative Therapies and Integrative Medicine*. Los Angeles, CA: Keats Publishing, 1999.

Lee, John R and Virginia Hopkins. *What Your Doctor May Not Tell You About Menopause: The Breakthrough Book on Natural Hormone Balance*. New York, NY: Time Warner Book Group. 2004.

Lee, John R., Jesse Hanley, MD and Virginia Hopkins. *What Your Doctor May Not Tell You About Perimenopause: Balance Your Hormones and Your Life from Thirty to Fifty*. New York, NY: Time Warner Book Group. 1999.

Love, Susan. *Susan Love's Menopause and Hormone Book: Making Informed Choices*. New York, NY:Three Rivers Press. 2003.

Northrup, Christiane. *The Wisdom of Menopause: Creating Physical and Emotional Health and Healing During the Change*. New York, NY: Bantam Dell. 2003.

PERIODICALS

Anderson, GL, Limacher M, Assaf AR, et al. "Effects of Conjugated Equine Estrogen in Postmenopausal Women with Hysterectomy: the Women's Health Initiative Randomized Controlled Trial." *JAMA*. 2004;291(14):1701 1712.

Cirigliano M. "Bioidentical Hormone Therapy: A Review of the Evidence." *Journal of Women's Health*. 2007 Jun;16(5):600 631.

Eden, JA, NF Hacker, M Fortune. "Three Cases of Endometrial Cancer Associated with "Bioidentical" Hormone Replacement Therapy." *Medical Journal of Australia*. 2007;187(4):244 245.

Hays, B. "Solving the Puzzle of Hormone Replacement." *Alternative Therapies*. 2007;13(3):50 57.

Lewis J.G., H. McGill, V.M. Patton et al. "Caution on the Use of Saliva Measurements to Monitor Absorption of Progesterone from Transdermal Creams in Postmenopausal Women." *Maturitas*. 2002 Jan 30;41(1):1 6.

Moskowitz, D. "A Comprehensive Review of the Safety and Efficacy of Bioidentical Hormones for the Management of Menopause and Related Health Risks." *Alternative Medicine Review*. 2006;11(3):208 223.

Nelson H.D., Humphrey L.L., Nygren P. et al. "Postmenopausal Hormone Replacement Therapy; Scientific Review." *JAMA*. 2002;288:872 881.

North American Menopause Society. "Position Statement: Estrogen and Progesten Use in Peri and Postmenopausal Women." *Menopause*. March 2007; 14(1):168 182.

Rossouw J.E., G.L. Anderson, R.L. Prentice et al. "Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results From the Women's Health Initiative Randomized Trial." *JAMA*. 2002;288:321 333.

Yager, J.D. "Endogenous Estrogens as Carcinogens Through Metabolic Activation." *Journal of the National Cancer Institute Monographs*. 2000; 27:67 73.

ORGANIZATIONS

Women in Balance, P.O. Box 5517, Washington, DC, 20016, http://www.womeninbalance.

Women to Women, P.O. Box 306, Portland, ME, 04112, (800)798 7902, http://www.womentowomen.com.

Diana Christoff Quinn, ND

Biological dentistry *see* **Holistic dentistry**

Biota

Description

Biota, the common name for *Biota orientalis,* is used in Chinese healing and called *bai zi ren*. In English biota is sometimes called oriental arborvitae.

Biota is a slow-growing tree native to China. It grows to a height of about 45 ft (15 m) in moist, well-drained soils throughout East Asia. It tolerates air pollution well and will grow in cities. When cultivated, biota produces an abundant seed crop. The leaves and seeds are used in healing. A yellow dye can be made from the young branches. Many varieties of biota are used for ornamental landscaping.

Biota, the herb, is sometimes confused with *Thuja occidentalis*. **Thuja** is a North American tree in the cedar family that is called American arbor vitae. The leaves of thuja are sometimes used by Western herbalists but are used in very different ways from *B. orientalis*.

General use

Biota is one of the less important of the 50 fundamental herbs of Chinese herbalism. In Chinese herbalism, biota is said to have a neutral nature and a sweet, acid taste. It is associated primarily with the heart and digestive system and is often a component of *shen* tonics.

Biota seeds are used as a sedative, to help disperse **anxiety** and fear, and to alleviate **insomnia**. Other uses are to treat heart palpitations, nervous disorders, night sweats, and **constipation**. Biota is said to be especially helpful for treating constipation in the elderly due to its oily nature.

Biota leaves, either fresh or dried, are used to treat a variety of conditions, including the following:

KEY TERMS

Shen—One of the five body energies, influencing mental, spiritual, and creative energy. Shen tonics address deficiencies in this type of energy.

- various kinds of bleeding
- bacterial infection
- fever
- cough
- bronchitis
- asthma
- premature baldness
- skin infections
- mumps
- arthritis pain
- dysentery caused by bacteria
- constipation

As an herb, biota has not received much attention from scientists. There have been very few chemical analyses or test-tube studies done on biota leaves or seeds in either Asia or the United States and no reported studies done on humans. Virtually all health claims for this herb are based on its use in **traditional Chinese medicine** and observations of herbalists rather than controlled scientific studies.

Preparations

Biota seeds are prepared by boiling, and extracts are made of the leaves. Commercially most biota is sold as capsules. Most often biota is used as part of a formula or tonic. It is a component of formulas that tend to stimulate the heart and relieve **stress**, **fatigue**, and forgetfulness.

Biota is one ingredient of the cerebral tonic pills called *bu nao wan*. These pills are used to improve concentration and treat conditions such as **Alzheimer's disease**. They are also given to combat restlessness and agitation.

Another common formula that contains biota is ginseng and zizyphus (*tian wang bu xin dan*). This formula treats insomnia and disturbed sleep, nightmares, anxiety, restlessness, forgetfulness, heart palpitations, and hard, dry bowel movements. It is available in both tea and capsule form. Dosage varies considerably depending on the formula and the condition being treated.

Precautions

Some herbal practitioners recommend that biota not be taken by pregnant women.

Side effects

No undesirable side effects have been reported.

Interactions

Biota and other Chinese herbs are often used together with no reported interactions. Since biota has been used almost exclusively in Chinese medicine, there are no studies of its interactions with Western pharmaceuticals.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Poto mac, MD, 20859, (301) 340 1960, www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), www.cieer.org.

Tish Davidson, A. M.

Biotherapeutic drainage

Definition

Biotherapeutic drainage is a homeopathic method of helping the body eliminate wastes.

Description

Biotherapeutic drainage incorporates homeopathic formulas to clear the body of toxins. Such formulas, referred to as the UNDA numbers, were developed in Europe during the 1920s and 1930s by George Discri, Louis Reuter and Anthoine Nebel. The foundation for the formulas lies in alchemical metallurgy, and the principles of three types of medicine: anthroposophical, homeopathic, and Chinese. The remedies are referred to as the UNDA compounds.

According to the philosophy behind biotherapeutic drainage, clearing the body of toxins opens the pathway for medicines and other treatments to work at lower dosage levels.

UNDA remedies are made from natural plant and animal substances. The remedies prescribed are dependent upon the goal of treatment.

KEY TERMS

Anthroposophical medicine—A form of alternative medicine dating back to the 1920s. The focus is on ensuring that individuals possess within themselves an environment conducive to health.

General uses

UNDA therapies are used as alternative therapies for a variety of health conditions, including the following:

- Digestive disorders
- Spasmodic and congestive disorders
- Nasal congestion
- Loss of appetite
- Emotional strain
- Sleep disorders
- Skin irritation, cuts, burns, warts
- Laryngitis, pharyngitis

Precautions

Some UNDA formulations are contraindicated in patients who have a pacemaker or who take cardiac medications. A healthcare professional should be consulted before individuals decide to take these preparations.

Preparations

Products are available in a number of formulations, including **aromatherapy**, drops, oral preparations, and topical applications.

Side effects

Side effects vary by product. Individuals should discontinue use and contact a healthcare provider if signs of an allergic reaction are noted, including **itching**, redness, swelling, difficulty breathing, **hives** or rash.

Resources

OTHER

Thom, Dick. "Biotherapeutic Drainage using the UNDA Numbers." JELD Publications: Portland, 2003. http://www.healingdragon.net.

Rockwell Nutrition. http://www.rockwellnutrition.net.

Rhonda Cloos, RN

Biotin

Description

Biotin is a member of the B complex family, but is not actually a vitamin. It is a coenzyme that works with vitamins. Also known as vitamin H and coenzyme R, it was first isolated and described in 1936. It is water soluble and very unstable; it can be destroyed by heat, cooking, exposure to light, soaking, and prolonged contact with water, baking soda, or any other alkaline substance. The body obtains biotin from foods such as eggs, liver, and cereals. It is also synthesized in the intestines by bacteria.

General use

Biotin is utilized by every cell in the body and contributes to the health of skin, hair, nerves, bone marrow, sex glands, and sebaceous glands. Apart from being a vital cofactor to several enzymes, biotin is essential in carbohydrate metabolism and the synthesis of fatty acids. It is also involved in the transformation of **amino acids** into protein. Biotin is involved with cell growth and division through its role in the manufacture of DNA and RNA, the genetic components of cells.

Adequate biotin is required for healthy nails and hair, and biotin deficiency is known to be a factor in balding and the premature graying of hair. Some practitioners claim that, as part of an orthomolecular regime, it can reverse the graying of hair. When para-aminobenzoic acid (PABA) and biotin are taken together in adequate amounts they can restore hair color. Biotin supplements will also effectively treat weak, splitting nails.

Biotin can be a valuable tool to combat yeast **infections**, which are notoriously difficult to fight. In their book *The Yeast Syndrome*, John Parks Trowbridge and Morton Walker describe how adequate levels of biotin can prevent *Candida albicans* from developing from its yeast-like state into fungal form, in which it sends out mycelium that further invade body organs.

Seborrheic **dermatitis**, or Leiner's disease, which is a non-itchy, red scaling rash affecting infants during the first three months of life, is also treated with biotin and other B complex vitamins.

Biotin has been used in conjunction with other nutrients as part of weight loss programs, as it aids in the digestion and breakdown of fats.

High doses of biotin are sometimes used by the allopathic medical profession to treat diabetes since it enhances sensitivity to insulin and effectively increases levels of enzymes involved in glucose metabolism. Research reported indicates that a combination of **chromium** picolinate and biotin may improve glucose management in 15% of patients who have type 2 diabetes. Biotin is also used to treat patients with **peripheral neuropathy**, a complication of diabetes, and patients with Duchenne muscular dystrophy, who suffer from metabolic deficiencies.

Biotin can be found in beans, breads, **brewer's yeast**, cauliflower, chocolate, egg yolks, fish, kidney, legumes, liver, meat, molasses, dairy products, nuts, oatmeal, oysters, peanut butter, poultry, **wheat germ**, and whole grains.

Recommended dietary allowance of biotin

Age	mcg/day
Children 0-6 mos.	5
Children 7-12 mos.	6
Children 1-3 yrs.	8
Children 4-8 yrs.	12
Children 9-13 yrs.	20
Children 14-18 yrs.	25
Adults ≥ 19 yrs.	30
Pregnant women	30
Breastfeeding women	35

Foods that contain biotin

	mg
Liver, cooked, 3 oz.	27
Egg, 1 cooked	25
Bread, whole wheat, 1 slice	6
Swiss chard, cooked, 1/2 cup	5.2
Salmon, cooked, 3 oz.	4
Chicken, cooked, 3 oz.	3
Cauliflower, raw, 1/2 cup	2
Pork, cooked, 3 oz.	2

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

Preparations

The recommended daily allowance for adults in the United States is 30 mcg. Daily requirements are estimated at 30 mcg for adults and 35 mcg for women who are nursing. Supplementation ranges from 100–600 mcg per day, and can be obtained in the form of brewer's yeast, which contains biotin as part of the B complex, or as an individual biotin supplement.

Precautions

The body needs biotin on a daily basis since it is not stored to any great extent. Biotin requirements increase during **pregnancy** and lactation. Researchers have investigated the need for supplemental biotin during pregnancy. Nearly 50% of pregnant women appear to be deficient in biotin, which could result in birth defects (according to animal studies). Scientists suggest that biotin be included in prenatal multivitamin formulas.

Those taking antibiotics should supplement their **diets** with biotin. Certain individuals are at risk for biotin deficiency, including infants who are fed biotin-deficient formula or who have inherited deficiency disorders, patients who are fed intravenously, and anyone who habitually eats a lot of raw egg whites because they contain a protein called avidin, which prevents the absorption of biotin.

Mild deficiency

Because biotin is synthesized in the gut, deficiency symptoms are rare. Symptoms of deficiency may include weakness, lethargy, grayish skin color, **eczema** (which may appear as a scaly red rash around the nose, mouth, and other orifices), **hair loss**, **cradle cap** in infants, muscle aches, impaired ability to digest fats, **nausea**, **depression**, loss of appetite, **insomnia**, high **cholesterol** levels, eye inflammation, sensitivity to touch, **anemia**, and tingling in the hands and feet.

Extreme deficiency

Symptoms of extreme biotin deficiency include elevation of cholesterol levels, heart problems, and paralysis. When extreme deficiency is a problem, the liver may not be able to detoxify the body efficiently, and depression may develop into hallucinations. Infants may exhibit developmental delay and lack of muscle tone.

Biotin deficiency could result in a loss of immune function, since animal experiments have shown that biotin deficiency leads to a decrease in white blood-cell function. Because biotin is essential to the body's metabolic functions, any deficiency could result in impaired metabolism as well.

Overdose

There have been no reports of effects of overdose of biotin, even at very high doses, primarily because any excess is excreted in the urine.

KEY TERMS

Coenzyme—A non-protein organic compound that plays an essential role in the action of particular enzymes.

Lactobacillus—A bacteria present in the gut of healthy people.

Mycelium—Fine thread-like tendrils that are capable of invading body organs and are sent out by a fungus to seek nutrition.

Peripheral neuropathy—Weakness and numbness of the nerves in the fingers and toes, which may progress up the limbs; often a complication of diabetes.

Side effects

There are no side effects associated with biotin supplementation.

Interactions

Biotin works in conjunction with all the B vitamins, which are synergistic, meaning they work best when all are available in adequate amounts.

Raw egg white contains the protein avidin, which prevents absorption of biotin.

Sulfa drugs, estrogen, and alcohol all increase the amount of biotin needed in the body. In addition, anticonvulsant drugs may lead to biotin deficiency. Long-term use of antibiotics may prevent the synthesis of biotin in the gut by killing off bacteria that help the body produce biotin. Supplements of lactobacillus may help the body make sufficient amounts of biotin after long term antibiotic use.

Resources

BOOKS

Shils, Maurice E., ed. *Modern Nutrition in Health and Dis ease*. Philadelphia : Lippincott,Williams & Wilkins, 2006.

Zempleni, Janos, ed. *Handbook of Vitamins*. Boca Raton, FL: CRC Press, 2007.

PERIODICALS

Boccaletti, V., et al. "Familial Uncombable Hair Syndrome: Ultrastructural Hair Study and Response to Biotin." *Pediatric Dermatology* (May/June 2007): E14 E16.

Campbell, R. Keith. "A Critical Review of Chromium Picolinate and Biotin." *U.S. Pharmacist* (November 2006): 1 4.

Whatham, Andrew, et al. "Vitamin and Mineral Deficien cies in the Developed World and Their Effect on the Eye and Vision." *Ophthalmic and Physiological Optics* (January 2008): 1 12.

OTHER

Micronutrient Information Center. "Biotin." Linus Pauling Institute. http://lpi.oregonstate.edu/infocenter/vita mins/biotin/. (March 3, 2008).

Patricia Skinner
Teresa G. Odle
David Edward Newton, Ed.D.

Bipolar disorder

Definition

Bipolar, or manic-depressive disorder, is a mood disorder that causes radical emotional changes and mood swings, from manic highs to depressive lows. The majority of bipolar individuals experience alternating episodes of mania and **depression**.

Description

In the United States alone, bipolar disorder afflicts approximately 2.3 million people, and nearly 20% of this population will attempt suicide without effective treatment intervention. The average age at onset of bipolar disorder is from adolescence through the early twenties. However, because of the complexity of the disorder, a correct diagnosis can be delayed for several years or more. In a survey of bipolar patients conducted by the National Depressive and Manic Depressive Association (NDMDA), one-half of respondents reported visiting three or more professionals before receiving a correct diagnosis, and over one-third reported a wait of 10 years or more before they were correctly diagnosed.

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (*DSM-IV*), the diagnostic standard for mental health professionals in the United States, defines four separate categories of bipolar disorder: bipolar I, bipolar II, cyclothymia, and bipolar not-otherwise-specified (NOS).

Bipolar I disorder is characterized by manic episodes, the "high" of the manic-depressive cycle. A bipolar patient experiencing mania often has feelings of self-importance, elation, talkativeness, increased sociability, and a desire to embark on goal-oriented activities, coupled with the characteristics of irritability, impatience, impulsiveness, hyperactivity, and a decreased need for sleep. Usually this manic period is followed by a period of depression, although a few bipolar I individuals may not experience a major depressive episode. Mixed states, where both manic or hypomanic symptoms and depressive symptoms occur at the same time, also occur frequently with bipolar I patients (for example, depression with racing thoughts of mania). Also, dysphoric mania is common (mania characterized by anger and irritability).

Bipolar II disorder is characterized by major depressive episodes alternating with episodes of hypomania, a milder form of mania. Bipolar depression may be difficult to distinguish from a unipolar major depressive episode. Patients with bipolar depression tend to have extremely low energy, retarded mental and physical processes, and more profound **fatigue** (for example, hypersomnia; a sleep disorder marked by a need for excessive sleep or sleepiness when awake) than unipolar depressives.

Cyclothymia refers to the cycling of hypomanic episodes with depression that does not reach major depressive proportions. One-third of patients with cyclothymia will develop bipolar I or II disorder later in life.

A phenomenon known as rapid cycling occurs in up to 20% of bipolar I and II patients. In rapid cycling, manic and depressive episodes must alternate frequently, at least four times in 12 months, to meet the diagnostic definition. In some cases of "ultra-rapid cycling," the patient may bounce between manic and depressive states several times within a 24-hour period. This condition is very hard to distinguish from mixed states.

Bipolar NOS is a category for bipolar states that do not clearly fit into the bipolar I, II, or cyclothymia diagnoses.

Causes and symptoms

The source of bipolar disorder has not been clearly defined. Because two-thirds of bipolar patients have a family history of affective or emotional disorders, researchers have searched for a genetic link to the disorder. Several studies have uncovered a number of possible genetic connections to the predisposition for bipolar disorder. Recent studies emphasize a hereditary connection and early research links several chromosomes, one particularly related to bipolar II, to development of the disorder. A 2003 study found that **schizophrenia** and bipolar disorder could have similar genetic causes that arise from certain problems with genes associated with myelin development in the central nervous system. (Myelin is a white, fat-like

KEY TERMS

Affective disorder—An emotional disorder involving abnormal highs and/or lows in mood. Now termed mood disorder.

Anticonvulsant medication—A drug used to prevent convulsions or seizures; often prescribed in the treatment of epilepsy. Several anticonvulsant medications have been found effective in the treatment of bipolar disorder.

Antipsychotic medication—A drug used to treat psychotic symptoms, such as delusions or hallucinations, in which patients are unable to distinguish fantasy from reality.

Benzodiazepines—A group of tranquilizers having sedative, hypnotic, antianxiety, amnestic, anticonvulsant, and muscle relaxant effects.

DSM-IV—Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). This reference book, published by the American Psychiatric Association, is the diagnostic standard for most mental health professionals in the United States.

ECT—Electroconvulsive therapy sometimes is used to treat depression or mania when pharmaceutical treatment fails.

Hypomania—A milder form of mania that is characteristic of bipolar II disorder.

Mania—An elevated or euphoric mood or irritable state that is characteristic of bipolar I disorder.

Mixed mania/mixed state—A mental state in which symptoms of both depression and mania occur simultaneously.

Neurotransmitter—A chemical in the brain that transmits messages between neurons, or nerve cells. Changes in the levels of certain neurotransmitters, such as serotonin, norepinephrine, and dopamine, are thought to be related to bipolar disorder.

Psychomotor retardation—Slowed mental and physical processes characteristic of a bipolar depressive episode.

substance that forms a sort of layer or sheath around nerve fibers.)

Another possible biological cause under investigation is the presence of an excessive **calcium** build-up in the cells of bipolar patients. Also, dopamine and other neurochemical transmitters appear to be implicated in bipolar disorder and these are under intense investigation.

Over one-half of patients diagnosed with bipolar disorder have a history of **substance abuse**. There is a high rate of association between cocaine abuse and bipolar disorder. Some studies have shown up to 30% of abusers meeting the criteria for bipolar disorder. The emotional and physical highs and lows of cocaine use correspond to the manic depression of the bipolar patient, making the disorder difficult to diagnose.

For some bipolar patients, manic and depressive episodes coincide with seasonal changes. Depressive episodes are typical during winter and fall, and manic episodes are more probable in the spring and summer months.

Symptoms of bipolar depressive episodes include low energy levels, feelings of despair, difficulty concentrating, extreme fatigue, and psychomotor retardation (slowed mental and physical capabilities). Manic episodes are characterized by feelings of euphoria, lack of inhibitions, racing thoughts, diminished need for sleep, talkativeness, risk taking, and irritability. In extreme cases, mania can induce hallucinations and other psychotic symptoms such as grandiose illusions.

Diagnosis

Bipolar disorder usually is diagnosed and treated by a psychiatrist and/or a psychologist with medical assistance. In addition to an interview, several clinical inventories or scales may be used to assess the patient's mental status and determine the presence of bipolar symptoms. These include the Millon Clinical Multiaxial Inventory III (MCMI-III), Minnesota Multiphasic Personality Inventory II (MMPI-2), the Internal State Scale (ISS), the Self-Report Manic Inventory (SRMI), and the Young Mania Rating Scale (YMRS). The tests are verbal and/or written and are administered in both hospital and outpatient settings.

Psychologists and psychiatrists typically use the criteria listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) as a guideline for diagnosis of bipolar disorder and other mental illnesses. *DSM-IV* describes a manic episode as an abnormally elevated or irritable mood lasting a period of at least one week that is distinguished by at least three of the mania symptoms: inflated self-esteem, decreased need for sleep, talkativeness, racing thoughts, distractibility, increase in goal-directed

activity, or excessive involvement in pleasurable activities that have a high potential for painful consequences. If the mood of the patient is irritable and not elevated, four of the symptoms are required.

Although many clinicians find the criteria too rigid, a hypomanic diagnosis requires a duration of at least four days with at least three of the symptoms indicated for manic episodes (four if mood is irritable and not elevated). *DSM-IV* notes that unlike manic episodes, hypomanic episodes do not cause a marked impairment in social or occupational functioning, do not require hospitalization, and do not have psychotic features. In addition, because hypomanic episodes are characterized by high energy and goal directed activities and often result in a positive outcome, or are perceived in a positive manner by the patient, bipolar II disorder can go undiagnosed.

In late 2001, a study reported at an international psychiatric conference that impulsivity remains a key distinguishing characteristic for bipolar disorder, at least when patients are in manic phases.

Bipolar symptoms often present differently in children and adolescents. Manic episodes in these age groups typically are characterized by more psychotic features than in adults, which may lead to a misdiagnosis of schizophrenia. Children and adolescents also tend toward irritability and aggressiveness instead of elation. Further, symptoms tend to be chronic, or ongoing, rather than acute, or episodic. Bipolar children are easily distracted, impulsive, and hyperactive, which can lead to a misdiagnosis of **attention-deficit hyperactivity disorder** (ADHD). Furthermore, their aggression often leads to violence, which may be misdiagnosed as a conduct disorder.

Substance abuse, thyroid disease, and use of prescription or over-the-counter medication can mask or mimic the presence of bipolar disorder. In cases of substance abuse, the patient must ordinarily undergo a period of **detoxification** and abstinence before a mood disorder is diagnosed and treatment begins.

Treatment

Alternative treatments for bipolar disorder generally are considered to be complementary treatments to conventional therapies. General recommendations for controlling bipolar symptoms include maintaining a calm environment, avoiding overstimulation, getting plenty of rest, regular **exercise**, and proper diet. **Psychotherapy** and counseling are generally recommended treatments for the disease, whether treated alternatively or allopathically. Psychotherapy, such as cognitive-behavioral therapy, can be a useful tool in helping patients and their families adjust to the disorder and in reducing the risk of suicide. Also, educational counseling is recommended for the patient and family. In fact, a 2003 report revealed that people on medication for bipolar disorder have better results if they also participate in family-focused therapy.

Chinese herbs also may help to soften mood swings. **Traditional Chinese medicine** (TCM) remedies are prescribed based on the patient's overall constitution and the presentation of symptoms. These remedies can stabilize moods, not just treat swings in mood. A TCM practitioner might recommend a mixture called the **Iron** Filings Combination (which includes the Chinese herbs asparagus, **ophiopogon**, **fritillaria**, arisaema, orange peel, polygala, acorus, forsythia, hoelen, fu-shen, scrophularia, uncaria stem, salvia, and iron filings) to treat certain types of mania in the bipolar patient. There are other formulas for depression. A trained practitioner should guide all of these remedies. Compliance can be better with natural remedies if they work. These remedies do not flatten moods and people in manic states do not like to be suppressed.

Acupuncture can be used for treatment to help maintain a more even temperament.

Biofeedback is effective in helping some patients control symptoms such as irritability, poor self control, racing thoughts, and sleep problems. A diet low in **vanadium** (a mineral found in meats and other foods) and high in **vitamin C** may be helpful in reducing depression.

In 2003, a report stated that rhythm therapy, or simply taking steps to go to bed and wake up at consistent times each day, helps some people with bipolar disorder maintain mood stability, especially when faced with psychosocial **stress**.

Recommended herbal remedies to ease depressive episodes may include **damiana** (*Turnera diffusa*), ginseng (*Panax ginseng*), kola (*Cola nitida*), lady's slipper (*Cypripedium calceolus*), **lavender** (*Lavandula angustifolia*), lime blossom (*Tilia x vulgaris*), oats (*Avena sativa*), **rosemary** (*Rosmarinus officinalis*), **skullcap** (*Scutellaria laterifolia*), **St. John's wort** (*Hypericum perforatum*), **valerian** (*Valeriana officinalis*), and vervain (*Verbena officinalis*).

Allopathic treatment

Allopathic treatment of bipolar disorder is usually by means of medication. A combination of mood stabilizing agents with antidepressants, antipsychotics, and anticonvulsants is used to regulate manic and depressive episodes.

Mood stabilizing agents such as lithium, carbamazepine, and valproate are prescribed to regulate the manic highs and lows of bipolar disorder:

- Lithium (Cibalith-S, Eskalith, Lithane, Lithobid, Lithonate, Lithotabs) is one of the oldest and most frequently prescribed drugs available for the treatment of bipolar mania and depression. Lithium has also been shown to be effective in regulating bipolar depression, but is not recommended for mixed mania. Possible side effects of the drug include weight gain, thirst, nausea and hand tremors. Prolonged lithium use may also cause hyperthyroidism (a disease of the thryoid that is marked by heart palpitations, nervousness, the presence of goiter, sweating, and a wide array of other symptoms).
- Carbamazepine (Tegretol, Atretol) is an anticonvulsant drug usually prescribed in conjunction with other mood stabilizing agents. The drug is often used to treat bipolar patients who have not responded well to lithium therapy. Blurred vision and abnormal eye movement are two possible side effects of carbamazepine therapy.
- Valproate (divalproex sodium, or Depakote; valproic acid, or Depakene) is one of the few drugs available that has been proven effective in treating rapid cycling bipolar and mixed states patients. Valproate is prescribed alone or in combination with carbamazepine and/or lithium. Stomach cramps, indigestion, diarrhea, hair loss, appetite loss, nausea, and unusual weight loss or gain are some of the common side effects of valproate.

Because antidepressants may stimulate manic episodes in some bipolar patients, their use is typically short-term. Selective serotonin reuptake inhibitors (SSRIs) or, less often, monoamine oxidase inhibitors (MAOIs) are prescribed for episodes of bipolar depression. Tricyclic antidepressants used to treat unipolar depression may trigger rapid cycling in bipolar patients and are, therefore, not a preferred treatment option for bipolar depression.

Electroconvulsive therapy (ECT), has a high success rate for treating both unipolar and bipolar depression, and mania. However, because of the convenience of drug treatment and the stigma sometimes attached to ECT, ECT usually is employed after all pharmaceutical treatment options have been explored. ECT is given under anesthesia and patients are given a muscle relaxant medication to prevent convulsions. The treatment consists of a series of electrical pulses that move into the brain through electrodes on the patient's head. Although the exact mechanisms behind the success of ECT are not known, it is believed that this electrical current alters the electrochemical processes of the brain, consequently relieving depression. In bipolar patients, ECT often is used in conjunction with drug therapy.

Long-acting benzodiazepines such as clonazepam (Klonapin) and alprazolam (Xanax) are used for rapid treatment of manic symptoms to calm and sedate patients until mania or hypomania have waned and mood stabilizing agents can take effect. Neuroleptics such as chlorpromazine (Thorazine) and haloperidol (Haldol) also are used to control mania while a mood stabilizer such as lithium or valproate takes effect. Clozapine (Clozaril) is an atypical antipsychotic medication used to control manic episodes in patients who have not responded to typical mood stabilizing agents. The drug also has been a useful prophylactic, or preventative treatment, in some bipolar patients.

The treatment rTMS, or repeated transcranial magnetic stimulation, is a relatively new and still experimental treatment for the depressive phase of bipolar disorder. In rTMS, a large magnet is placed on the patient's head and magnetic fields of different frequency are generated to stimulate the left front cortex of the brain. Unlike ECT, rTMS requires no anesthesia and does not induce seizures.

Expected results

While most patients will show some positive response to treatment, response varies widely, from full recovery to a complete lack of response to all treatments, alternative or allopathic. Drug therapies frequently need adjustment to achieve the maximum benefit for the patient. Bipolar disorder is a chronic recurrent illness in over 90% of those afflicted, and one that requires lifelong observation and treatment after diagnosis. Patients with untreated or inadequately treated bipolar disorder have a suicide rate of 15-25% and a nine-year decrease in life expectancy. With proper treatment, the life expectancy of the bipolar patient will increase by nearly seven years and work productivity increases by 10 years.

Prevention

The ongoing medical management of bipolar disorder is critical to preventing relapse, or recurrence, of manic episodes. Even in carefully controlled treatment programs, bipolar patients may experience recurring episodes of the disorder. Patient education in the form of psychotherapy or self-help groups is crucial for training bipolar patients to recognize signs of mania and depression and to take an active part in their treatment program.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Press, Inc., 1994.

Whybrow, Peter C. *A Mood Apart*. New York: Harper Collins, 1997.

PERIODICALS

Biederman, Joseph A. "Is There a Childhood Form of Bipolar Disorder?" *Harvard Mental Health Letter*. 13, no. 9 (March 1997): 8.

Bowden, Charles L."Choosing the Appropriate Therapy for Bipolar Disorder." *Medscape Mental Health*. 2, no. 8 (1997). http://www.medscape.com.

Bowden, Charles L. "Update on Bipolar Disorder: Epi demiology, Etiology, Diagnosis, and Prognosis." *Med scape Mental Health*. 2, no. 6 (1997). http:// www.medscape.com.

"Family focused Therapy May Reduce Relapse Rate." *Health & Medicine Week* (September 29, 2003): 70.

Francis, A., J.P Docherty, and D.A. Kahn. "The Expert Consensus Guideline Series: Treatment of Bipolar Dis order." *Journal of Clinical Psychiatry*. 57, supplement 12A (November 1996): 1 89.

Sherman, Carl. "Progress in Bipolar Genetics slow, but promising." *Clinical Psychiatry News*.29, no. 12 (December 2001): 4.

Sherman, Carl. "Impulsivity a Key Characteristic of Bipolar Disorder." *Clinical Psychiatry News*.29, no. 11 (November 2001): 35.

"Schizophrenia and Bipolar Disorder Could Have Similar Genetic Causes." *Genomics & Genetics Weekly* (Sep tember 26, 2003): 85.

Spete, Heidi. "Rhythm Therapy Can Stabilize Bipolar Disorder Patients." *Clinical Psychiatry News*. (July 2003): 55.

ORGANIZATIONS

American Psychiatric Association (APA). Office of Public Affairs. 1400 K Street NW, Washington, DC 20005. (202) 682 6119. http://www.psych.org/.

National Alliance for the Mentally Ill (NAMI). 200 North Glebe Road, Suite 1015, Arlington, VA 22203 3754. (800) 950 6264. http://www.nami.org.

National Depressive and Manic Depressive Association (NDMDA). 730 N. Franklin St., Suite 501, Chicago, IL 60610. (800) 826 3632. http://www.ndmda.org.

National Institute of Mental Health (NIMH). 5600 Fishers Lane, Rm. 7C 02, Bethesda, MD 20857. (301) 443 4513. http://www.nimh.nih.gov/.

Paula Ford-Martin
Teresa G. Odle

Birth *see* **Childbirth**

Bites and stings

Definition

A bite is an injury caused by an animal, such as a mammal or insect, that breaks the skin. A sting is a puncture wound made by insects or marine animals. There is often a danger of infection from toxins or venom with bites and stings.

Description

In the United States, dogs surpass all other mammals in the number of bites inflicted on humans. Children face a greater risk than adults, and children under 10 years old are more liable than anyone to suffer serious bites to the face, neck, and head. Cat bites are far less common than dog bites, but they carry a higher risk of infection. Bites from wild animals should be of especial concern due to the risk of **rabies**. More than 70,000 human-to-human bites a year are reported in the United States. Human bites are more infectious than those of any other animal.

The most common invertebrates responsible for bites and stings include lice, bedbugs, fleas, mosquitoes, black flies, fire ants, chiggers, ticks, centipedes, scorpions, spiders, bees, and wasps. Black widows and brown recluse spiders are the two most common poisonous spiders in the United States. The bites of most other spiders in North America cause only minor reactions. Ticks attach themselves to the skin and feed on the blood of animals. Most are relatively harmless, but some carry diseases such as Rocky Mountain spotted **fever** and **Lyme disease**. Now, people worry about the danger or West Nile virus from mosquito bites. Bees and wasps will sting to defend their nests or if they are disturbed. Fifty or more people a year die in the United States after being stung by bees, wasps, or fire ants. Almost all of those deaths are the result of allergic reactions.

The poisonous snakes of the United States are divided into two families, pit vipers (which include rattlesnakes, copperheads, and cottonmouths, also called water moccasins) and the coral snake family. Pit vipers are responsible for about 99% of the poisonous snakebites in the United States. Each year about 8,000 people in the United States fall victim to a venomous snakebite. However, only about 15 of those people die. Most deaths are due to rattlesnake bites. In comparison, coral snakes are responsible for about 25 bites a year in the United States.

Jellyfish, stingrays, sea urchins, sea anemones, barracudas, and coral pose a threat to those who live

KEY TERMS

Antivenin—Antibodies taken from the serum of horses that can be used to neutralize the venom of snakes and insects.

Compress—A cloth used to apply heat, cold, or medications to the skin.

Debridement—The surgical removal of dead tissue.

Edema—An accumulation of excess fluid in the tissues of the body, often due to inflammation or injury.

Electrocardiography—A procedure for measuring heart activity.

Hemorrhaging—Heavy or uncontrollable bleeding.

Necrosis—The death of tissue in response to injury or disease.

Tetanus—A potentially fatal infection of the central nervous system, found in wounds.

or vacation in coastal communities. The majority of stings received from marine animals happen in salt water and are rarely life-threatening.

Causes and symptoms

The typical animal bite results in a laceration, tear, puncture, or crush injury. Cat bites are mostly found on the arms and hands, with deep puncture **wounds** that can reach to muscles, tendons, and bones. Human bites result from fights, sexual activity, and seizures. They may also be due to spousal or child abuse. Children often bite other children, but those bites are hardly ever severe. Human bites are capable of transmitting a wide range of dangerous diseases, including **hepatitis** B, **syphilis**, and **tuberculosis**.

People do not always feel a spider bite. In most cases, spider bites produce only minor symptoms. The first, and possibly only, evidence of a bite may be a mild swelling of the injured area and puncture marks or **blisters**. The affected area may be painful, itchy, or discolored. With more serious bites, there may be severe **muscle cramps** and rigidity of the abdominal muscles shortly after being bitten. Other possible symptoms include excessive sweating, **nausea**, **vomiting**, headaches, fever, **chills**, **edema**, and **dizziness**, as well as problems with breathing, vision, and speech. In addition, a brown spider's bite can lead to necrotic arachnidism, in which the tissue around the bite dies. This can produce an open sore that that can take years to heal completely. The symptoms of bee and wasp stings include **pain**, redness, swelling, and itchiness at the area of the sting. Multiple stings can have much more severe consequences. The danger signs of a severe allergic reaction, called anaphylactic shock, need immediate medical attention. They include nausea, chest pain, abdominal cramps, **diarrhea**, and difficulty swallowing or breathing.

Venomous pit viper bites usually begin to swell within 10 minutes and sometimes are painful. Other symptoms include edema at the wound site, skin blisters and discoloration, weakness, sweating, nausea, faintness, dizziness, bruising, and tender lymph nodes. Severe poisoning can lead to tingling sensations, muscle contractions, an elevated heart rate, rapid breathing, large drops in body temperature and blood pressure, vomiting of blood, and coma. Coral snake bites are painful, and the effects of the venom may include tingling at the wound site, weakness, nausea, vomiting, excessive salivation, and irrational behavior. Nerves can become paralyzed, causing double vision, difficulty swallowing and speaking, and respiratory problems. Poisonous snakes often introduce little or no venom into the victim's body when they bite. The symptoms of these bites are not so severe. However, there is still a danger that the wounds can become infected by harmful microorganisms from the snake's mouth.

Jellyfish venom is delivered by barbs located on their tentacles. These barbs can penetrate the skin of people who brush up against them, even if the jellyfish is dead or the tentacle is severed from the body. Painful and itchy red lesions arise instantly on contact. The pain can continue up to 48 hours. Severe cases may lead to skin necrosis, **muscle spasms and cramps**, vomiting, nausea, diarrhea, headaches, excessive sweating, and other symptoms. In rare cases, jellyfish venom may cause cardiorespiratory failure.

Tail spines are the delivery mechanism for stingray venom. Stingray venom produces immediate, excruciating pain that lasts several hours. They cause deep puncture wounds, which may become infected if pieces of the spines become embedded in them. Sometimes the victim suffers a severe reaction, including vomiting, diarrhea, hemorrhaging, a drop in blood pressure, and cardiac arrhythmia.

Signs of infection in a bite or sting site include redness, pain, swelling, warmth, and a discharge filled with pus. An inflammation of the connective tissue, called cellulitis, may also result. Sometimes systemic, and possibly life-threatening, **infections** develop, especially among those who are immunosuppressed.

Diagnosis

Most bites and stings are minor and do not need to be formally diagnosed. When required, though, diagnosis relies on a physical examination of the victim, information about the circumstances of the injury, and a look at the animal that caused the injury, if possible. It is especially important to retrieve the live animal or carcass of dogs, wild animals, snakes, and spiders for assessment. Information about **tetanus** immunization history and possible **allergies** to venom is important. A physical exam may be required to assess damage caused by deep puncture wounds or severe crush injuries. Chest x rays and electrocardiography may be required to assess severe symptoms. Laboratory tests for identifying the microorganisms may be ordered if there is an infection. Blood and urine tests also may be taken. Testing the blood for hepatitis B and other diseases is always necessary after a human bite, for example. Medical professionals should also look for indications of spousal or child abuse in cases of human bites.

Treatment

Some bites and stings, such as those from venomous snakes, require immediate medical attention, as do a host of others. So often, it is best to check with a medical/emergency practitioner first. Also, once a patient begins treating a bite or sting with an alternative method, if signs of infection or severe allergic reaction appear, he or she should seek immediate medical help.

Homeopathic remedies can be useful for relieving the pain and swelling of bites and stings. If there is a possible allergic reaction, these remedies can be used while awaiting emergency care. *Aconitum* can be helpful, especially if the person feels fearful or panicked after being stung. *Aconitum* should be used while symptoms are intense, and then can be followed a by another remedy, as indicated. *Apis mellifica* is especially useful for bee stings, and it can help to reduce the allergic reaction. *Carbolicum acidum* can also be used to treat an allergic reaction, especially when the person feels sick and weak and has trouble breathing. *Cantharis,Ledum palustre,Hypericum,* and *Urtica urens* are other useful remedies that may be indicated. A 6c or 12c dose of the chosen remedy can be taken every 15 minutes for up to four doses.

Neem, an Ayurvedan remedy, can be used to soothe minor bites and stings as well as to keep insects away. A thick paste can be made from neem powder blended with warm water. It can then be applied to the affected area twice daily. To prevent insect bites altogether, neem oil can be rubbed on exposed skin as a repellant. Another Ayurvedic remedy for soothing insect bites uses the herb cilantro. One cup of the fresh leaves should be mixed with 1/3 cup of water in a blender and strained. The juice should be stored in the refrigerator, and 2 tbsp can be taken three times per day. The pulp should be saved and applied directly to affected areas once or twice daily.

A compress made from meat tenderizer that contains either papain or **bromelain** breaks down the venom of bites and stings. This is because most venom is protein-based. The meat tenderizer functions by breaking down such proteins, which neutralizes the venom. A thick paste can be made using warm water or rubbing alcohol and powdered meat tenderizer and then applied directly to the affected areas for relief. Powdered bromelain or papain can also be used. The typical home's kitchen or medicine cabinet holds quick soothers for bee and wasp stings. Bicarbonate of soda or ammonia can soothe a bee sting and vinegar or lemon juice have been shown to help soothe wasp stings.

Allopathic treatment

Minor animal bites can be treated at home. The wound should be washed with soap and water. Applying pressure to the injured area with a clean towel or sterile bandage can stop bleeding. Antibiotic ointment and a sterile dressing can be applied to the wound if necessary. Alternately, to minimize swelling and infection, ice can be applied to the wound. Bites that do not stop bleeding after 15 minutes with pressure should be seen by a medical professional. Medical attention may also be required if there are signs of infection. People who have been bitten by a cat or by a human should always see a doctor. The same is true for snake bites; bites that are deep or gaping; bites to the head, hands, or feet; and bites that may be in conjunction with broken bones, damaged nerves, or any other major injury. If an unfamiliar animal bites, especially for no apparent reason, rabies may be suspected. A physician should be consulted. Dogs, raccoons, skunks, bats, coyotes, foxes, and ground hogs often carry rabies. In cases of suspected rabies, the victim will be given several injections with rabies vaccine. Diabetics, **AIDS** patients, **cancer** patients, people who have not had a tetanus shot in five years, and anyone else who has increased susceptibility to infection should also seek medical treatment for all bites and serious sting wounds.

Medical treatment may require the removal of dead and damaged tissue. Any patient whose tetanus shots are not up-to-date should receive a booster shot. Some wounds are left open and allowed to heal on their own, while others may require stitches. Antibiotics are

usually limited to patients whose injuries or other health problems make them likely candidates for infection. Cat bites and human bites, however, are usually treated with antibiotics. The patient may also require immunization against hepatitis B and other diseases. A follow-up visit could be required.

An ice pack should be applied to the area of a spider bite as soon as it is discovered. Treatment for a serious spider bite may involve the administering of muscle relaxants, antihistamines, antibiotics, pain medication, and possibly a tetanus shot. Areas of necrosis may need debridement and skin grafts. An antivenin is available, but it is not necessary in most cases, and could possibly cause unpleasant side effects.

Most stings can be treated at home. A stinger can be scraped off the skin with a blade, fingernail, credit card, or stiff piece of paper. Tweezers are not recommended, since they may actually push more venom into the wound. The area should then be cleaned and covered with ice. Aspirin and other painkillers, antihistamines, and calamine lotion are good for reducing symptoms. People who experience an allergic reaction, or who are at risk for one, should seek immediate medical attention. People who are allergic should carry emergency kits containing epinephrine to counter anaphylactic shock at all times. Ticks can be carefully removed at home using tweezers. It is important to be sure that the head of the tick is not left embedded in the skin. If symptoms such as fever, rash or pain develop after a tick bite, a physician should be consulted immediately.

Although most snakes are not poisonous, any snakebite should immediately be examined at a hospital. If there is time, the victim should wash the wound site with soap and water, and then keep the injured area still and at a level lower than the heart. The injured person should not have anything to eat or drink, especially alcohol, until an evaluation and treatment is obtained. There is controversy about the use of tourniquets as well as sucking out venom. These should only be done when help is far away and by someone familiar with first aid techniques. Minor rattlesnake bites can be successfully treated without antivenin, as can the bites of copperhead and water moccasins. However, coral snake and the more dangerous rattlesnake bites require antivenin. Other treatment measures include antibiotics to prevent infection and a tetanus booster shot.

When dealing with bites or stings of marine animals, the victim should be kept still. Gloves should be worn when removing stingers. The area should be washed with saltwater and then soaked in very hot water for 30-90 minutes to neutralize the venom. Vinegar and other substances are used to neutralize jellyfish barbs, which are then scraped off. A doctor will usually examine stingray wounds to ensure that no pieces of the spines remain. Anesthetic ointments, antihistamine creams, and steroid lotions are sometimes beneficial. If the bites or stings are severe, they may require emergency care.

Expected results

Most bites and stings require little intervention, and clear up in a few hours or days. Those most at risk of severe problems with bites and stings are very young children, the elderly, those who are immunosuppressed, and people who are allergic to venom. Serious bites and stings require prompt treatment to ensure a favorable outcome. Infected bites may require hospitalization and can be fatal if neglected. In some cases, medication and surgery may be necessary. Some snakebites may result in amputation, permanent deformity, or loss of function in the injured area. People who are allergic to stings may experience a severe, and occasionally fatal, reaction.

Prevention

Insect repellant can help prevent insect bites and stings. Those with concentrated amounts of DEET stay effective longer. Sweet-scented fragrances should be avoided. Wearing white or khaki-colored clothing, including socks and long pants, helps protect the skin from bites or stings. Care and attention should always be used when going into wilderness areas. Posted warnings in swimming areas should be heeded. Unfamiliar animals should not be touched. Dead or dying animals should be avoided, as they may still be able to cause injury. When threatened by a dog, a person should remain still. If an attack seems unavoidable, lying face down with the hands and forearms covering sensitive areas may be the best protection. A rabies vaccine may be taken preventively if there is a high risk of exposure due to work or travel.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Washington: Future Medicine Pub lishing, 1993.

Bennett, J. Claude and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia: W.B. Saunders, 1996.

PERIODICALS

Kuritzky, Louis. "Comparative Efficacy of Insect Repellents Against Mosquito Bites." *Primary Care Reports* (September 2, 2002):S20.

PERIODICALS

"Pain Relief for Stings can be Found in the Kitchen Cab inet." *Contemporary Pediatrics* (August 2002):129 131.

PERIODICALS

Peterson, Lyle, and Anthony A. Martin. "West Nile Virus: A Primer for the Clinician." *Annals of Internal Medicine* (August 6, 2002):173 177.

OTHER

"Common First Aid Procedures: Bites and Stings." *Colum bia University College of Physicians & Surgeons Com plete Home Medical Guide*. http://cpmcnet.columbia.edu/texts/guide/hmg14_0004.html#14.6 (January 17, 2001).

Patience Paradox
Teresa G. Odle

Bitter melon

Description

Bitter melon (*Momordica charantia*) is a tropical plant that grows in Asia, Africa, the Caribbean, and South America. It is also known as balsam pear. This annual of the Cucurbitaceae family is a thin, climbing vine with long, stalked leaves that flowers in July or August. The plant bears a long, cucumber-shaped fruit that hangs like a pendulum, with small bumps all over it. The plant, which is green when it is young and yellowish-orange when it is ripe, fruits around September or October. All parts of the plant—the seeds, leaves and vines—are used for medicinal purposes, but the actual fruit of the bitter melon is most

Bitter melon. *(Yiap Pictures / Alamy)*

commonly used. The name of the plant's genus, *Momordica*, is derived from the Latin word for bite, as the seeds of the fruit are serrated and appear as if they have been chewed or bitten.

General use

Bitter melon is used both as a medicine and as a food. It is often added to dishes, for all parts of the plant, as its name suggests, taste very bitter and add an astringent or sour quality to foods. Bitter melon contains a protein, MAP30, that was patented by American scientists in 1996. These scientists stated that MAP30 is effective against tumors, **AIDS**, and other viruses. The plant has been used around the world, from native healers in the Amazon to Ayurvedic doctors in India, to treat diabetes as it is a natural hypoglycemic. In India, the plant is also used in treating **hemorrhoids**, abdominal discomfort, **fever**, warm **infections**, and skin diseases.

Diabetes

Bitter melon has been used to treat **diabetes mellitus**. The plant contains at least three known compounds that significantly lower the body's blood sugar level. The plant's phytochemical composition is a combination of steroidal saponins, charantin, peptides, and alkaloids that contribute to bitter melon's hypoglycemic effects. In the Amazon, the juice of the fruit is used, either alone or in conjunction with a leaf decoction, to treat diabetes. In India, where the plant is called kalara, the leaves are ground up, the juice is extracted, and the extract taken early in the morning for 15 days.

Human immunodeficiency virus (HIV)

The alpha- and beta-momorchardin proteins contained in bitter melon have an inhibiting effect on human immunodefiency virus (HIV) infection, according to a test-tube study published in the *Journal of Naturopathic Medicine*. Bitter melon can be used alone for the treatment of HIV, but it has also been used in combination with other AIDS treatments.

Herpes

True to its antiviral properties, the MAP30 found in bitter melon can also be used by patients with herpes. In a 1982 study of the effects of bitter melon on the herpes simplex virus-1 (HSV-1), MAP30 inhibited the reproduction of the virus, as well as reducing its ability to form plaques (patches of irritated skin).

KEY TERMS

Abortifacient—A substance that induces abortions.

Charantin—A compound with hypoglycemic effects that can be extracted from bitter melon with alcohol.

Emmenagogue—A type of medication that brings on or increases a woman's menstrual flow.

Hypoglycemia—An abnormally low level of glucose in the blood.

Scabies—A skin disease caused by an itch mite that burrows into the skin.

Psoriasis

Bitter melon inhibits the activity of guanylate cyclase, an enzyme that is involved in **psoriasis**.

Skin conditions

Practitioners of **Ayurvedic medicine** have used bitter melon as a treatment for skin diseases, especially **scabies**. The juice is extracted from the leaf and applied externally to the affected area. In **traditional Chinese medicine**, bitter melon is used to treat dry coughs, **bronchitis**, and throat problems. The seeds are used topically for skin swellings caused by **sprains** and **fractures**, and for sores that are slow to heal.

Preparations

Patients who do not mind the extremely bitter taste can eat a small melon. Otherwise, up to 50 ml of fresh bitter melon juice can be taken once a day. Patients who do not want the bitterness of the fresh fruit or fresh fruit juice can take a fresh fruit tincture in 5 ml doses two or three times per day.

Precautions

Bitter melon is an abortifacient, so it should not be taken by women who are pregnant or nursing. It is also a medicinal herb that should not be given to small children and infants due to its hypoglycemic effects. Bitter melon is also an emmenagogue, which means that it brings on or increases menstrual flow in women.

Side effects

If too much bitter melon juice is taken, it can cause mild abdominal **pain** or **diarrhea**.

Interactions

Although bitter melon is commonly used for patients with diabetes, it should be taken with caution. Bitter melon should not be used by diabetic patients who are currently taking such prescription medications as chlorpropamine, glyburide, or phenformin, as well as insulin, for their condition. Bitter melon can increase the effects of these drugs and lead to severe **hypoglycemia**. Patients with diabetes should always take bitter melon under the supervision of a medical or herbal professional.

Resources

ORGANIZATIONS

American Association of Naturopathic Physicians. P. O. Box 20386. Seattle, WA 98112.

American Foundation of Traditional Chinese Medicine (AFTCM). 505 Beach Street. San Francisco, CA 94133. (415) 776 0502. Fax: (415) 392 7003. aftcm@earthlink.net.

Katherine Y. Kim

Bitters

Description

Bitters are herbs and herbal preparations that have a characteristically sharp effect on the palate. The name derives from the Middle English verb *bitan*,, which means "to bite." In the Ayurvedic medical tradition of India, other such groupings of herbs include astringent (e.g. cucumber), salty, pungent (e.g. horseradish or **ginger**), sweet, and sour. Both traditional Chinese and Indian **Ayurvedic medicine** regard the action of bitters as drying. Bitters are also antibacterial, cleansing, detoxifying, germicidal, parasiticidal, stimulating, and tonifying.

While the Chinese and Ayurvedic systems of medicine were familiar with bitters as long ago as 5,000 years, two more recent paths of historical rediscovery and development have contributed substantially to promoting the benefits of bitters. Chronologically, the first of these involves one of the fathers of Western medicine, also regarded as "the father of chemistry," the Swiss physician Paracelsus (1493–1541). Paracelsus is credited with the beginnings of a formula still in use. His development of the formula may have benefited from Marco Polo's travels to China, the opening of the trading route from China known as The Silk Road, and the distribution of commerce through the Venetian trading empire.

A quarter of a century later, the Swedish naturalist and healer, Jonathan Samst, resurrected his family's traditional formula called *elixir ad longam vitam* (elixir for a long life), traceable to the formula of Paracelsus. This mainly European development also branched out to include monasteries, such as the Benedictines, and several European families involved in trade, organized as "Houses." As a result, several Italian, French, and German original bitter herb beverages are commercially available.

The second discovery tradition begins with a German medical doctor, Johann Gottlieb Benjamin Siegert, who in 1820 left Germany to join the South American revolutionary, Simon Bolivar, in winning independence from Spain. Siegert was appointed surgeon general at the military hospital in a trading port town at the mouth of the Orinoco River. The name of this port town, Angostura, is likely familiar to bartenders and gin drinkers. Dr. Siegert, scientifically seeking a more effective means of treating the many wounded who also suffered from **fever** and internal stomach disorders, spent more than four years researching the properties and qualities of local plants and herbs that might be useful to his cause. In 1824, Dr. Siegert, with his privately developed formula called *Amargo Aromatico* (aromatic bitter) used by his patients, family and friends, unwittingly initiated what is today The House of Angostur. This is an industry located on 20 acres in Trinidad, with worldwide distribution.

Bitters include, but are not limited to:

- gentian root (*Gentiana spp.*)
- aloe (Aloe vera syn. *A. barbadensis*)
- wormwood (*Artemisia absinthium*) from which absinthe was made
- dandelion root (*Taraxacum officinale*)
- angelica root (*Angelica archangelica*)
- senna leaves (*Cassia senna*)
- zedoary root (*Curcuma zedoaria*)
- myrhh (*Commiphora molmol*)
- cinchona bark (*Cinchona spp.*)
- turmeric (*Curcuma longa syn. C. domestica*)
- shitetta (*Swertia chirata syn. Ophelia chirata*)
- saffron (*Crocus sativa*)

Other plants may possess the principals and actions of bitters, but are primarily listed in another category. For example, **goldenseal** (*Hydrastis canadensis*) contains the bitter berberine compounds, but is primarily categorized as an astringent.

KEY TERMS

Alkaloids—A group of plant substances that are basic rather than acidic. They are considered to have strong chemical and pharmacological actions, such as combining with fatty acids to form soap, or combining with acids to form chemical salts used in medicine; may be used in anticancer therapies.

Anthraquinones—A group of plant substances known to produce an irritant laxative effect.

Astringent—Having the characteristic of drawing together or tightening.

Biliary duct disease—Disease of the anatomic duct from the liver, which joins the duct from the gall bladder to form the common bile duct before entering the small intestine.

Crohn's disease—An inflammatory small intestine disease named after the gastroenterologist, Burrill B. Crohn, characterized by symptoms of cramping, especially after meals, and chronic diarrhea of loose, liquid, frequent stools.

Complex sugars—A category of carbohydrate compounds within plants, found to have antiviral and anti-inflammatory effects; they have a more complex structure than the sweet, simple dietary sugars.

Choline and inositol—Two of the vitamins in the B vitamin complex.

Elixir—Similar to a liquid extract, sweetened, and with added aromatic principals, said to be one of the most common forms of liquid herbal medicines for oral consumption.

Extract, or herbal extract—An herbal remedy in which water or alcohol is used to dissolve the medicinally desired components from plant materials. Prepared extracts may be solid or liquid.

Furocoumarins—A kind of compound found in certain foods and plants including celery, limes, and angelica root, known to effect the skin and the immune system; may increase the risk of skin cancer. One source reports that studies with celery lead researchers to conclude that the risk for developing skin cancer is small. Caution, however, is advised, especially with continuous use and significant exposure to sunlight. Fungi were occasionally noted to increase the furocoumarin content of foods.

Furanosesquiterpenes—A sub-class of compounds known as terpenes in the oils of plants and foods that do not contain an alcohol portion. These compounds tend to be found in volatile oils, and are related to the aroma of volatile and essential oils.

Germicidal—Known to kill germs.

Glutathione—Formed from three amino acids (protein building blocks), glutathione is an antioxidant involved in cellular respiration, protection of red blood cells, and the detoxification by the liver of foreign substances.

Irritable bowel syndrome (IBS)—Conditions of the large intestine, which may involve diarrhea and constipation, or alternating bouts of one or the other.

Methionine—A sulfur containing essential amino acids.

N-acetylcysteine (NAC)—A compound amino acid and antioxidant that protects the liver, supports the immune system, and helps break up mucous.

Parasiticidal—Known to kill or eliminate parasites.

Peristalsis—A wave-like action of rhythmic contractions throughout the smooth muscles of the digestive tract, from esophagus to rectum.

Volatile oils—One of the primary chemical characteristics of bitter herbs, these are oils are known for their anti-inflammatory qualities, quick evaporation, and distinctive aromas.

Chemically, the bitter herbs frequently contain volatile oils with anti-inflammatory qualities. Volatile oils evaporate quickly, and have distinctive aromas, forming the chemical basis of **aromatherapy**. Three well-known foods with bitter principles that demonstrate the aromatic characteristic in bitters are coffee, chocolate, and stout beer. Although purveyors and consumers may mask the bitter taste with milk, sugar, or other additives, the bitter action of stimulation of the digestive system remains, and is appreciated by many. In addition to volatile oils, the bitters contain a wide variety of active chemical components, including:

- furocoumarins, also in celery, which stimulate gastric juice secretion and relax the muscles
- complex sugars (complex carbohydrates), which have antiviral and anti-inflammatory effects
- furanosesquiterpenes (a fat in edible oils), with possible antiseptic activity
- anthraquinones, which have an irritant laxative effect

- alkaloids (in chocolate, mildly) with antispasmodic, antibacterial, and pain relieving effects
- other vitamins, minerals, and compounds, some that have demonstrated anticancer effects

General use

For several hundred to several thousand years, the chief medicinal and culinary use of bitter herbs has been to stimulate digestion and improve elimination. This is clearly demonstrated with coffee, chocolate, and stout beer. Nerve endings in the tongue, reacting to the bitter flavor, increase the flow of saliva and trigger a wave-like action of rhythmic contractions throughout the smooth muscles of the digestive tract, from esophagus to rectum. This wave-like action, known as peristalsis, is the means by which food and its non-digestable remainder is moved through the body. The taste of bitters also initiates the flow of stomach, liver, and pancreatic secretions. Bitters, therefore, are known to improve nutrient digestion and absorption. They are regarded as appropriate accompaniments to fatty or heavy meals, which otherwise tend to be digested sluggishly. Bitters are said to tonify and strengthen the digestive system, which may make them useful in the treatment of digestive organs including the stomach, liver, pancreas, and bowels, under the guidance of a healthcare professional.

Bitters also promote circulation. Many anecdotes attest to their usefulness in treating the **pain** of arthritis and rheumatism, animal **bites**, **colic**, **constipation**, and **hemorrhoids**. Their aromatic principals make bitters useful in arousal from fainting. Antiseptic characteristics help in reducing fever, cleansing **wounds**, and the promotion of proper healing. This antiseptic action is a reason why **hops** (*Humulus lupulus*) was used in beer making as a preservative, prior to pasteurization. It is reported that the amount of hops, and therefore the amount of bitterness, is what distinguishes beer from ale and stout (the most bitter). The stimulant action of bitter herbs on the liver, according to one source, makes bitters a first aid remedy for **hangover**. Its purported remarkable effects on gin drinking seem to have contributed to the popularity of Dr. Siegert's Aromatic Bitter in England, and amongst royalty when he first took his product to London in 1862.

Preparations

A number of preparations of bitters are commercially available. Many brand name bitter aperitif (before dinner) and digestif (after dinner) alcoholic beverages and liqueurs have been in use since the mid-1800s. Bitter tonics and extracts, usually in an alcohol base, are available for internal and external use. For internal use, it is recommended that extracts be added to water. Externally, they may be applied on cotton wool as a compress. References to external application also suggest first applying **calendula** (*Calendula officinalis*) ointment or oil, moistening the cotton wool with the bitter herb tonic, and covering with plastic wrap. The ointment or oil prevents drying of the affected area, and the plastic keeps the area warm.

Encapsulations of bitter herbs are now available, which allow consumers to avoid the bitter taste. However, the capsules may be less effective since arousal of the tongue is an initiating physiologic factor in stimulating the digestive system.

Sources recommend that users read label warnings carefully, follow the manufacturer's dosing suggestions, and pay attention to adverse effects, if any, that occur within several hours of taking the bitters.

Precautions

The chief, and almost universal precaution noted with the use of bitter herbal products, is that they are not to be taken internally by children and pregnant or nursing women. Another widely found precaution is avoidance of bitters by persons who have diseases of the gall bladder or the biliary ducts, **irritable bowel syndrome** (IBS), **Crohn's disease**, or other digestive disorders. Some precautions also exist for avoidance if one has kidney disease. Since bitters are known to be drying, caution is also advised regarding dehydration, and avoidance of the simultaneous use or overuse of alcohol products, which are also known to be drying.

Side effects

In general, bitters may cause dehydration in children, and uterine bleeding and miscarriage in women. Individual ingredients may also produce undesirable side effects. For example, **angelica** root may cause hormonal imbalances in children. It may also cause skin sensitivities, especially for persons with **psoriasis**, when used with prolonged exposure to sunlight. **Senna** may cause severe abdominal cramping. Both angelica root and senna are the herbs found in a noted bitter herb tonic. One source advises the universal precaution of paying particular attention to **dizziness**, **nausea**, or skin **rashes**, especially if they occur within several hours of taking a product.

To limit or avoid side effects, sources recommend following the directions of the manufacturer, one's healthcare professional provider, and general health guidelines.

Interactions

The following interactions pertain to the use of bitter herb formulas.

Herb-alternative drug favorable interactions

Formulas using **dandelion** root and leaf as part of the treatment for liver or gall bladder disease, are reported to be facilitated by supplements that contain **methionine**, **choline** and **inositol**, and N-acetylcysteine (NAC). Assistance from a healthcare professional is recommended.

Formulas using dandelion root and leaf as part of the treatment for kidney disease, are reported to be facilitated by supplements. Assistance from a healthcare professional is recommended.

Herb-drug unfavorable interactions

Formulas using any of the berberine compound herbs such as goldenseal, oregon grape root (*Berberis aquifolium*), or **barberry** (*Berberis vulgaris*), for example, are reported to be contraindicated with the use of tetracycline antibiotics.

Formulas using dandelion root or leaf are reported to be contraindicated with **potassium** sparing diuretics, such as amiloride.

Formulas using sedatives such as hops are generally contraindicated with antidepressants, **smoking** cessation prescriptions, or sedatives, and are specifically contraindicated with bupropion and buspirone.

Herb-food unfavorable interactions

No specific unfavorable interactions have been found. However, precautions exist against potential interactions between bitter herb formulas and nonprescription, over the counter (OTC) drugs containing **caffeine** or an alcohol base. Sources recommend following all label advisories.

Resources

BOOKS

Meletis, Chris D., N.D. *Natural Health Magazine, Com plete Guide to Safe Herbs*. New York: D.K. Publishing, Inc., 2002.

White, Linda B., and Steven Foster. *The Herbal Drugstore*. Rodale Press, 2000.

OTHER

Angostura, Ltd. "The Story of Angostura Bitters." [cited April 26, 2004]. http://www.angostura.com/test/flash/history.shtml.

Blumenthal, Mark. "A Matter of Taste; Herbal Bitters Can Help Sweeten Up Your Life." *EastWest*19 (1989) [cited April 26, 2004]. http://galenet.galegroup.com/servlet/HWRC.

Claff, Chester E. A., Jr., Ph.D., "Translator's Guide to Organic Chemical Nomenclature." *Translation Journal, Science and Technology* May 3, 2003 [cited April 26, 2004]. http://accurapid.com/journal/15org.htm.

"Furocoumarins." Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment. *Furocoumarins, Toxicity*. [cited April 29, 2004]. http://www.archive.official documents.co.uk/document/doh/toxicity/chap 1c.htm.

"Herbal Bitters." *RemedyFind* 2000 2003 [cited April 26, 2004]. http://remedyfind.com/rem.asp?ID 242.

"The Long Elixir of Life." *Swedish Bitters* [cited April 26, 2004]. http://www.SwedishBitters.com.

"Swedish bitters, ancient herbal remedy, revived." *Better Nutrition for Today's Living* 57 (1995) [cited April 26, 2004]. http://galenet.galegroup.com/servlet/HWRC.

Katy Nelson, N.D.

Black cohosh

Description

Black cohosh (*Cimicufuga racemosa*) is a member of the Ranunculaceae family. Its nicknames of squawroot and snakeroot denote its Algonquian heritage and differentiate it from the common snake root plant (*Aristolochia serpentaria*). It should also not be confused with **blue cohosh** (*Caulophyllum thalictroides*); their only similarity is that both are roots.

Black cohosh grows from a gnarled black root, hence its name; it has a smooth stem and big multiple leaves with jagged edges. In summer, white flowers develop from what are called racemes. These flowers emit a stinky odor. Able to grow to 9 ft (3 m) tall, black cohosh is native to North America and is found on hills and in forests located at high levels. It is found from Ontario, Canada to Maine to the southern states of Georgia and Missouri.

Black cohosh contains several components, as outlined by Phyllis A. Balch in her book *Prescription for Nutritional Healing*:

- actaeine
- cimicifugin
- estrogenic substances
- isoferulic acid
- oleic acid
- palmitic acid
- pantothenic acid

Black cohosh plants. *(©PlantaPhile, Germany. Reproduced by permission.)*

- phosphorus
- racemosin
- tannins
- triterpenes
- vitamin A

General use

Black cohosh has a history of usage for women's health problems, dating back to the Algonquian natives living in the Ohio Valley. However, according to Michael Castleman in his 1991 book *The Healing Herbs*, the Algonquians also boiled the roots in water and drank the concoction for **fatigue**, arthritis, **sore throat**, and a typical occurrence of that time, rattlesnake **bites**. The Eclectic doctors of the 1800s also recommended black cohosh for what they called hysterical diseases, i.e. female reproductive diseases, as well as for fevers, **rashes**, sleeplessness, and **malaria**. A popular patent medicine company of the same era, the Lydia E. Pinkham's Vegetable Compound, sold a potion containing black cohosh for menstrual complaints.

In the early 2000s, black cohosh is still used for gynecological problems from **menstruation** to **menopause**, with several studies between 1965 and the early 2000s backing up this pattern of usage. A 2002 study of menopausal women in the San Francisco Bay Area found that women taking black cohosh and other herbal remedies for their symptoms reported higher satisfaction with their treatment than women receiving conventional allopathic therapy.

The most famous research was a 1982 open study in which 629 women took 80 mg of black cohosh over a period of six to eight weeks. Over 80% of the women experienced relief from several menopausal symptoms—hot flashes, perspiration, headaches, vertigo, heart palpitations, irritability, sleep disturbances, and **depression**. A later random study focused on 60 women under 40 years of age who had hysterectomies, with one ovary remaining. The women were either given black cohosh or hormone replacement therapy (HRT) of estrogen or estrogen-progestin combinations. Although the HRT met with better results, the study concluded that black cohosh was a favorable natural alternative for post hysterectomy.

A 1998 German clinical study showed that black cohosh has good therapeutic results in treating symptoms of menopause but that black cohosh did not show any hormone-like activity as previously thought. A second German study, published in 2002, reported that black cohosh has antiestrogenic effects.

Because the collective results of a number of studies show synthetic hormone replacement therapy, which contains estrogen, increases **breast cancer** risk by 1–30%, black cohosh is being considered as an alternative. A 1998 study at the University of Bridgeport in Connecticut reviewed eight previous studies of black cohosh as treatment for menopausal symptoms. This study stated that black cohosh is a safe alternative to estrogen replacement therapy (ERT) for women for whom ERT is contraindicated and for women who declined ERT. Some contraindicated conditions from ERT include a history of estrogen-dependent **cancer**, unidentified uterine bleeding, liver disease, gallbladder disease, **endometriosis**, **uterine fibroids**, and **fibrocystic breast disease**.

In a 1999 *in vitro* study at the New York College of Osteopathic Medicine, several herbs, including black cohosh, **hops**, and vitex, were shown to inhibit the growth of T-47D cells. The study concluded that these herbs may be useful in preventing breast cancer.

A 1999–2000 study at Cedars-Sinai Hospital in Los Angeles, California, focused on the efficacy and safety of several traditional phytomedicines, including black cohosh root extract, to treat women's gynecological conditions, such as PMS and menopause. This study concluded that both **dong quai** and black cohosh are safe to use for relieving menopausal symptoms, but only black cohosh showed efficacy. The study stated that information regarding safety for use during **pregnancy** and lactation is limited and suggested pharmacists study scientific literature to help decide the value of recommending these herbs for use.

A 1999 national survey of 500 midwives belonging to the American College of Nurse-Midwives and 48 nurse-midwife education programs was undertaken by the West Virginia University School of Medicine. The purpose was to determine if colleges were educating their students in the use of herbs to stimulate labor. Of the 172 surveys returned, 90 used herbal preparations and 82 did not. Herbal usage was broken down as follows: black cohosh (45%), **evening primrose oil** (60%), blue cohosh (64%), and **castor oil** (93%). Those who used these herbs did so because they are natural, and those who refrained from using them cited the lack of sufficient research about the safety.

In 2007, researchers at the University of Pennsylvania School of Medicine in Philadelphia published a retrospective study of nearly 2,500 women that found a 61% reduction in the risk of getting breast cancer in women who took black cohosh.

In 2006, healthcare regulators in the United Kingdom ordered that all black cohosh products sold in the U.K. contain a warning on the label stating that black cohosh can increase the risk of liver disorders. German health officials followed suit in 2007, asking manufacturers to include a warning in packages of black cohosh stating the risk of liver toxicity. In 2007, the government agency United States Pharmacopia proposed that a similar requirement be placed on the labels of dietary supplements containing black cohosh sold in the United States, warning of potential liver damage. The proposed warning, still under consideration as of early 2008, would state, "Caution: In rare cases black cohosh has been reported to affect the liver. Discontinue use and consult a healthcare practitioner if you have a liver disorder or develop symptoms of liver trouble, such as abdominal **pain**, dark urine, or jaundice." The warning came following several reports in the United States and Europe of liver damage associated with black cohosh use.

Black cohosh can also decrease blood pressure by "opening the blood vessels in the limbs (peripheral vasodilation)" according to a study referred to by Michael Castleman in his book *The Healing Herbs*. A person with **hypertension** should first consult a physician before taking black cohosh.

Other possible benefits of black cohosh are to alleviate **muscle spasms**, reduce **neuralgia** pain, and relieve bronchial **infections** by stopping the compulsion to **cough**. Black cohosh has also been recommended as a glandular tonic.

Preparations

Black cohosh may be taken in capsule, extract, tea, or tincture.

To make a tea, one boils 1/2 tsp powdered black cohosh root for each cup (250 ml) of water for 30 minutes. After it cools, it can be sipped with lemon and honey to mask its bitter taste.

One teaspoon of black cohosh tincture can be taken on a daily basis. Ten to 30 drops of extract mixed in water can be taken daily. Two to five capsules (40 mg/capsule) may be taken daily. The German Commission E recommends taking two 20 mg capsules daily, one in the morning and one at night. These tablets are available under the name Remifemin, a black cohosh extract. A 2002 German study found that these standard dosages are effective for most women and that there is no therapeutic benefit from higher dosages.

Precautions

Black cohosh should not be used during pregnancy except at the time of birth. It should also not be taken by those with a chronic disease or by women taking birth control pills or HRT. Children under 12 years and adults over 62 should start with lower dosages.

The German Commission E recommends taking black cohosh for six months at a time only. However, other studies with animals showed no toxicity problems. It is always best to first consult a health care practitioner.

Side effects

An overdose (over 900 mg/day) could cause **dizziness**, **nausea** and **vomiting**, **diarrhea**, pain in the abdomen, headaches, joint pains, and a lowered heart rate. These conditions could also appear sometimes while a person is taking low dosages of black cohosh. Large dosages can also cause poisoning symptoms.

KEY TERMS

Eclectics—Nineteenth-century herbal scientists in the United States who founded the Reformed Medical School. Their outlook was based on herbal medicines of practitioners in Europe and Asia and uses by Native Americans.

Efficacy—The power to bring about intended results.

Extract—A concentrated form of the herb made by pressing the herb with a hydraulic press, soaking it in water or alcohol, then letting the excess water or alcohol evaporate.

German Commission E—The world standard for regulatation of herbal products.

Hypertension—Another name for high blood pressure, which occurs when blood pressure is above 140/90. Called the silent disease, it often has no symptoms, but if left untreated, it can lead to stroke or a heart attack.

Hysterectomy—Removal of the uterus by surgery either to remove tumors, treat cancer, or precancerous conditions. Surgery is performed through the abdominal wall or through the vagina.

Menopause—Literally means cessation of the menses. Average age of occurrence in women is 51, although it can occur earlier or later.

Menstruation—A monthly occurrence of blood and uterine material discharge from a woman's vagina while she is in her reproductive years.

Oleic acid—Oily acid found in most vegetable and animal oils and fats. Used to make ointments.

Progesterone—Female hormone that prepares the uterus for the fertilized egg. Progesterone is normally produced in the ovaries, except when a woman is pregnant, then it is produced in the placenta. The adrenal glands also produce small amounts of progesterone.

Tannins—Phenolic compounds that occur naturally in plants. Tannins help form proteins, alkaloids and glucosides from a solution. Tannins are found in tea and coffee.

Tincture—Herbs preserved usually in alcohol. The concentration of the herb is usually low, on a strength ratio of 1:10 or 1:5.

Interactions

Women taking black cohosh should not take it together with birth control pills; HRT; such sedatives as diazapam; or blood pressure medications.

Resources

BOOKS

Balch, Phyllis A. *Prescription for Nutritional Healing,* 4th ed. New York: Avery Publishing Group, 2007.

PERIODICALS

Bone, Kerry. "Black Cohosh and Breast Cancer Risk: Ben efit Shown." *Townsend Letter: The Examiner of Alternative Medicine* (October 2007): 62(2).

Bone, Kerry. "Black Cohosh Proven Effective in Recent Clinical Trials." *Townsend Letter: The Examiner of Alternative Medicine* (August/September 2006): 42(3).

Hudson, Tori. "Black Cohosh Associated with Breast Can cer Risk Reduction." *Townsend Letter: The Examiner of Alternative Medicine* (August/September 2007): 160.

Hudson, Tori. "Black Cohosh, St. John's Wort, and Meno pause Symptons." *Townsend Letter: The Examiner of Alternative Medicine* (January 2008): 117(2).

Rebbeck, Timothy R., et al. "A Retrospective Case Control Study of the Use of Hormone Related Supplements and Association with Breast Cancer." *International Journal of Cancer* (April 1, 2007): 1523 1528.

Sego, Sherril. "Black Cohosh." *Clinical Advisor* (June 2006): 104(2).

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Australian Homeopathic Association, 6 Cavan Ave, Renown ParkSA, 5008, Australia, (61) 8 8346 3961, http://www.homeopathyoz.org.

Council for Homeopathic Certification, PMB 187, 16915 SE 272nd St., Suite 100, Covington, WA, 98042, (866) 242 3399, http://www.homeopathicdirectory.com.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, http://www.ods.od.nih.gov.

Sharon Crawford
Ken R. Wells

Black cumin seed extract

Description

Black cumin seed (*Nigella sativa*)is an annual herbaceous plant and a member of the Ranunculaceae (buttercup) family. The fruit of the plant, the black seeds, accounts for its name. Black cumin seed (also

called black seed) should not be confused with the herb, cumin (*Cumunum cyminum*, which is found in many grocery stores.

Considered native to the Mediterranean region, black cumin seed is cultivated in North Africa, Asia, and southeastern Europe. The largest producers of black cumin seed are Egypt, India, Pakistan, Iran, Iraq, and Turkey. Other species, such as Turkish black cumin (*Nigella damascena*), are not used medicinally; and one type, *Nigella garidella*, is even poisonous.

Playfully referred to as "Love in the Mist," the black cumin seed plant has leaves that grow in pairs. The lower leaves are short and supported by slender stems, while the upper leaves generally grow to approximately 4 inches (10 cm) in length. The stalk of the plant, with its bluish white flower petals, can grow up to 18 inches (46 cm) in height while its fruit matures. At first, the seeds (the fruit of the plant) are held in a capsule in the center of the flower. The capsule opens upon maturity, revealing lightly colored seeds. It is only upon their exposure to air that the seeds become black.

Most often, the extract is produced by a process referred to as cold pressing. Temperatures no higher than 140–176°F (60–80°C) are applied to the seeds to help release the oil and preserve its benefits.

Rich with compounds such as nigellone and thymoquinone, black cumin seed is thought to contain over 100 ingredients; many remain unknown. However, experts agree that the most important compounds contained in the extract are the fatty acids and nutrients. Some components of black cumin seed extract are as follows:

- myristic acid
- palmitic acid
- palmitoleic acid
- stearic acid
- oleic acid
- linoleic acid (omega-6)
- linolenic acid (omega-3)
- arachidonic acid
- protein
- thiamin
- riboflavin
- pyridoxine
- niacin
- folacin
- calcium
- iron
- copper
- zinc
- phosphorous

KEY TERMS

Prostaglandins—Fatty acid derivatives that are present in many tissues of the body, and affect all organs.

Hypertension—High blood pressure, which occurs when the reading is above 140/90. Called the silent disease, it often has no symptoms, but if left untreated, can lead to stroke or a heart attack.

Hysterectomy—Removal of the uterus by surgery either to remove tumors, treat cancer or precancerous conditions. Surgery is performed through the abdominal wall or through the vagina.

General use

Black cumin seed has been used for centuries to treat respiratory and digestive problems, parasites, and inflammation. In ancient times, it was a remedy for a variety of health conditions including, colds, **infections**, headaches, and toothaches. The pharoahs' personal doctors are reported to have offered black cumin seed as a digestive aid after large meals. In fact, the extract was found in the tomb of King Tutankhamun, presumably to protect him in the afterlife.

Black cumin was also used as a remedy for skin diseases, dry skin, **dandruff**, and **wounds**.

At one time, black cumin seed was highly valued in Europe, but by the eighteenth century it had lost popularity and was primarily used as a garden decoration. However, black cumin seed extract has regained popularity and is now more widely used as a remedy in Europe and North America.

Many herbalists in current times embrace the healing properties of black cumin seed extract. For example, the extract is sometimes used externally to treat such skin care problems as **psoriasis**, **eczema**, and dry skin, and internally to treat stomach problems, respiratory ailments, and **allergies**, as well as to improve circulation and the immune system. In recent years, the extract has been the subject of immune system research.

One reason that is often given for the medicinal value of black cumin seed extract is its richness in polyunsaturated fatty acids, which help to produce prostaglandin E1. Prostaglandin E1 has many functions in the

body, particularly in relation to the immune system, sugar metabolism, skin infections, and **blood clots**. It is also believed to protect the stomach lining.

Experts point out that the medicinal value may be provided by a unique and mysterious synergy (combined action) between the multitude of compounds present in the seeds. In addition, the extract, which is more concentrated than the seeds alone, is said to have greater healing power. A study at Cairo University in Egypt showed a boost in antibacterial activity when the extract was used in combination with antibiotics such as streptomycin and gentamicin. In the same study, it showed additional antibacterial function in combination with erythromycin, tobramycin, doxycycline, and ampicillin, to kill *E. Coli* and the pathogenic yeast, *Candida albicans*. In addition, the study showed that the extract destroyed non-fatal subcutaneous staphylococcal infection in mice.

In 2003, one study noted the antifungal activity of black cumin seed extract against *Candida albicans*. In the study, mice were injected with *Candida albicans*, producing colonies of the organism in their liver, spleen, and kidneys. The researchers found that treatment with black cumin seed extract 24 hours after inoculation inhibited growth of the *Candida albicans*. With continued treatment, the extract significantly decreased the amount of *Candida albicans* found in the kidneys, liver, and spleen.

Aside from verifying its antibacterial and antifungal properties, researchers in recent years have tested the anti-inflammatory and analgesic effects of black cumin seed extract. In 1995, a group of scientists from the Department of Pharmacy at King's College in London found that the extract contains these properties, and is an antioxidant as well. They believe the anti-inflammatory and antioxidant abilities may be linked to ingredients such as thymoquinone and unsaturated fatty acids. Ultimately, the researchers concluded that black cumin seed extract is a justified treatment for rheumatism and related inflammatory diseases.

In 2001, a study performed at the Department of Pharmacology at King Faisal University in Saudi Arabia, reported anti-inflammatory and analgesic activity from the use of black cumin seed extract in animals. Paw **edema** (swelling) was reduced, as was reaction time in response to extreme heat. A 2003 study confirmed the analgesic effects of the extract. Studies in this area are likely to continue well into the future.

Researchers have also investigated and verified the extract's antihistamine activity, focusing on nigellone, an ingredient in black cumin seed extract. One 1993 study found that nigellone acted as an inhibitory agent on histamine (a substance involved in an allergic response, causing widening of blood vessels and tightening of bronchial passages) by inhibiting protein kinase C, known to initiate histamine release. In 2003, another study concluded that black seed oil is an effective treatment for allergies.

Preparations

There are many applications made with black cumin seed extract. It can be found in teas, **cough** syrups, wound salves, compresses, massage oils, and other products. Black seed honey, soap, shampoo, and creams are all available commercially.

The extract has a strong flavor, which is improved by mixing it with honey. Herbal teas also help dilute its strength. As with any product used for medicinal purposes, it is important to read and follow the label instructions and warnings.

Although black cumin seed extract is not normally associated with severe skin irritation, a skin patch test should be conducted before using it for the first time. A small amount of diluted extract is placed on the inside of one elbow and covered with a bandage. After 24 hours, any redness or irritation is indicative of a negative reaction. This test should be done before a person proceeds with more extensive use.

Black cumin seed extract, in these dosages, is used as a remedy for the following conditions:

- Headache. A few drops of the diluted extract are rubbed on the patient's forehead. Some patients may also find it helpful to take 1/2 teaspoon of the extract after breakfast, lunch, and dinner.
- Cough. The dose is 1/2 teaspoon of diluted black cumin seed extract in the morning. A dry cough may require one teaspoon of the extract twice a day, mixed with one cup of coffee or hot tea. The extract can be rubbed on the chest and back for additional relief.
- Common cold. One teaspoon of the extract is mixed with hot lemon tea and honey two or three times a day.
- Diarrhea. One teaspoon of extract is mixed with one cup of yogurt twice a day.

Precautions

Black cumin seed extract is not to be used during **pregnancy**.

Its safety in young children has not been established. Patients with liver or kidney disease are advised

not to use this product unless a physician directs them to do so.

Black cumin seed extract is said to lower blood sugar levels; therefore, a diabetic patient is advised to consult with a physician before using.

Side effects

In general, if used as directed, black cumin seed extract is not associated with serious side effects. However, it has been reported that black cumin seed extract has a very low degree of toxicity, and may cause significant negative effects on liver and kidney function. A recommended daily allowance (RDA) has not been established for the extract, so it is wise to consult with a physician before beginning any internal treatment.

Interactions

There does not appear to be a list of serious interactions associated with the use of black cumin seed extract; however, it is recommended that anyone taking prescription drugs seek the opinion of a physician and/or pharmacist before using black cumin seed extract in combination with the prescribed treatment.

Resources

BOOKS

Luetjohann, S. *The Healng Power of Black Cumin*. Twin Trees, WI: Lotus Light Publications, 1998.

Schleicher, P., and M. Saleh. *The Magical Egyptian Herb for Allergies, Asthma, and Immune Disorders*. Rochester, VT: Healing Arts Press, 2000.

PERIODICALS

Albert Matesz, R. "One of life's tiny treasures." *The Herb Companion* October 2003; 16: 16 25. 1998.

Ali, B. H., and G. Blunden. "Pharmacological and toxico logical properties of Nigella sativa." *Phytotherapy Research*. (April 2003): 299 305.

Al Ghamdi, M.S. "The anti inflammatory, analgesic, and antipyretic activity of Nigella sativa." *Journal of Eth nopharmacology*. (June 2001): 45 48.

Al Naggar, T. B., M. P. Gomez Serranillos, M. E. Carre tero, and A. M. Villar. "Neuropharmacological activity of Nigella sativa L Extracts." *Journal of Ethnopharma cology*. (September 2003): 63 68.

Chakravarty, N. "Inhibition of histamine release from mast cells by nigellone." *Annals Allergy*. (March 1993): 237 42.

Hanafy, M. S., and M. E. Hatem. "Studies on the antimi crobial activity of Nigella sativa seed (black cumin)." *Journal of Ethnopharmacology*. (September 1991): 275 8.

Kalus, U., A. Pruss, J. Bystron, A. Smekalova, J. J. Lichius, and H. Kiesewetter. "Effect of Nigella sativa (black seed) on subjective feeling in patients with allergic diseases." *Phytotherapy Research*. (December 2003): 1209 14.

Khan, M. A., M. K. Ashfaq, H. S. Zuberi, M. S. Mahmood, and A. H. Gilani. "The in vivo antifungal activity of the aqueous extract from Nigella sativa seeds." *Phytother apy Research* (February 2003): 183 6.

OTHER

Blackseedusa.com. "Frequently asked questions." [cited May 14, 2004]. http://blackseedusa.com.

Peles, U. "Prostaglandin." [cited May 14, 2004]. http://www.peles.com/injection.html.

Wagner, H. "Black seed oil." [cited May 14, 2004]. http://www.amazingherbs.com.

Lee Ann Paradise

Black currant seed oil

Description

The black currant, or *Ribes nigrum*, is a deciduous shrub of the Saxifragaceae family. Though all parts of the shrub are used—berries, bark, leaves, and seeds—it is the oil of the seed that is used most commonly today. Black currant seed oil is rich in **essential fatty acids**, which promote and maintain the body's vital functions. Essential fatty acids provide energy, regulate body temperature and metabolism, protect tissues, and insulate nerves. Approximately 17% of black currant seed oil consists of an omega-6 fatty acid, gamma-linolenic acid (GLA). Another 13% consists of an omega-3 fatty acid, alpha-linolenic acid. **Evening primrose oil** is primarily used for its essential fatty acid content, but it contains only about 8% gamma-linolenic acid, half of what is found in black currant seed oil. Because both omega-6 and omega-3 acids are needed in our **diets**, a supplement of black currant seed oil is beneficial. These essential fatty acids are broken down by the body into prostaglandins, the body's regulating substances that block **pain** and govern many other physical functions, especially in proper functioning of the circulatory system.

General use

Because black currant seed oil is so high in gamma-linolenic acid, which makes prostaglandins, it is a highly effective anti-inflammatory herb. The oil is best used for chronic inflammatory conditions, cramps, and aches. It also boosts the immune system, and helps women with their menstrual cycles and **menopause**, while also easing discomforts associated

KEY TERMS

Prostaglandins—A class of fatty acids found in the body that regulate the contraction of smooth muscle, inflammation, body temperature, and many other functions.

with **premenstrual syndrome**. Black currant seed oil is also used to treat skin disorders.

Rheumatoid arthritis

As an anti-inflammatory agent, black currant seed oil works well in **rheumatoid arthritis** patients by decreasing morning stiffness in their joints. The *British Journal of Rheumatology* has noted that black currant seed oil may be so effective in rheumatoid arthritis patients because of a "reduction in the secretion of the inflammatory cytokines 11-1 and TNF-alpha." Cytokines are a source of inflammation. By preventing their production, black currant seed oil offers some relief.

Cardiovascular disorders

Black currant seed oil is beneficial to patients with cardiovascular problems, as prostaglandins counteract the constriction of blood vessels. Two Canadian studies have also showed that **omega-6 fatty acids** lower blood pressure.

Women's health problems

Because prostaglandins regulate the menstrual cycle, black currant seed oil is helpful for women before and during **menstruation**. Gamma-linolenic acid produces anti-inflammatory prostaglandins, as opposed to inflammatory prostaglandins, thus lessening the severity of premenstrual cramps. Gamma-linolenic acid has also been shown to alleviate the symptoms of **depression** and breast tenderness associated with PMS. Menopausal women have also found black currant seed oil to be helpful.

Skin disorders

The anti-inflammatory properties of black currant seed oil are also effective against skin irritations when taken orally. A study at the Skin Study Center in Philadelphia showed that black currant seed oil also helps with dry skin disorders, as the gamma-linolenic acid protects against the water loss that contributes to **itching** and other symptoms associated with dry skin.

Preparations

Black currant seed oil is available in capsule form. When it is taken as a supplement, one to three 500-mg capsules should be taken daily, unless a physician recommends otherwise. The capsules usually contain black currant seed oil, vegetable glycerine and gelatin.

Precautions

There are no known precautions to observe when taking black currant seed oil.

Side effects

Apart from possible allergic reactions, there are no major side effects with black currant seed oil.

Interactions

There are no known interactions between black currant seed oil and standard pharmaceutical preparations.

Resources

OTHER

Grieve, M. *A Modern Herbal*. 1931. Botanical.com. http://www.botanical.com (January 17, 2001).

HealthQuest. 1998 1999. http://www.hquest.com (January 17, 2001).

Katherine Y. Kim

Black haw

Description

Viburnum prunifolium, also known as black haw, is a shrub or small tree with serrated oval leaves. Its white flowers and dark berries occur in clusters. The stem bark of black haw is approved for use in foods in the United States. It is native to the woodlands of temperate and subtropical parts of North America, Europe, and Asia. Its other names are stagbush and American sloe. Black haw belongs to the same genus as *Viburnum opulus*, the guelder rose, which is also known as **cramp bark**. The two are sometimes used interchangeably and have similar properties, but black haw is more specific in its effects on the uterus. The actions of black haw are described as antispasmodic, sedative, astringent, muscle relaxant, cardiotonic, uterine relaxant, and anti-inflammatory.

Black haw (Viburnum prunifolium). *(© Geoffrey Kidd / Alamy)*

KEY TERMS

Astringent—A substance that causes soft tissue to contract or constrict. Black haw has some astringent properties.

Infusion—The most potent form of extraction of a herb into water. Infusions are steeped for a longer period of time than teas.

Nervine—A substance that has a quieting effect on the nervous system.

Spasmolytic—A substance or medication that relieves cramping.

Tincture—The extraction of a herb into an alcohol solution for either internal or external use.

General use

Black haw has been used traditionally for problems related to the female reproductive tract. It acts as a general antispasmodic that may relax skeletal muscle as well, but is particularly effective on the uterus. As such, it is a potential agent to be included in the treatment of threatened miscarriage, menstrual cramps, false labor, and the afterpains of **childbirth**. The antispasmodic properties of black haw are also reportedly useful for **colic**, bladder spasms, cramping **pain** in the bile ducts, **diarrhea**, and heavy bleeding during **menopause**. Black haw may also have some ability to lower high blood pressure.

The most common use of black haw is as an antispasmodic for menstrual pain. To relax the uterus and relieve menstrual cramping, the most commonly recommended dose is 5 mL (1tsp.) of the tincture in water, taken three to five times daily as needed. Tinctures of black haw are generally prepared by placing an ounce of fresh herb in an ounce of 50% alcohol, and steeping the mixture for six weeks. Alcohol may extract certain chemical components of the herb more or less strongly than water does, so tinctures may exert different levels of activity than teas (generally the least strong preparations) or infusions. Tinctures and other preparations of black haw are commercially available from some herbalists or health food stores.

Black haw is sometimes used to prevent chronic miscarriage. It has been similarly utilized for the condition of irritable uterus occurring in late **pregnancy**. The reported nervine (nerve-calming) effect of black haw may be useful in addition to its spasmolytic properties. One recommended dose for these indications is 1–2 cups of tea per day as soon as pregnancy is diagnosed. Alternatively, the patient may take 0.5 cup per day of an infusion of black haw. A tea can be prepared with 1 tsp of dried herb in 1 cup of boiling water, steeped for up to 20 minutes. An infusion is prepared by putting 1 oz of black haw in a pint jar, filling the jar with boiling water, and steeping for eight hours. This preparation is thought to act as a uterine relaxant but will not prevent a miscarriage due to abnormalities in the fetus or placenta. Women should consult a health care practitioner knowledgeable about herbal use in pregnancy before using black haw or any other herbal remedy when pregnant.

For afterpains following childbirth, 1 oz of black haw or cramp bark can be combined with 0.5 oz of **blue cohosh** root and 0.25 oz of dried **hops** flowers. The mixture of herbs is steeped in a quart of boiling water for eight hours to make an infusion for the relief of uterine pain. This combination is also said to aid milk production and encourage sleep. Small amounts of the infusion are taken as needed.

One of the historical uses of black haw was for the relief of **asthma**. Evidence from contemporary clinical studies does not support this use, although black haw's activity as a smooth muscle relaxant could theoretically relieve bronchoconstriction. On the other hand, some components of black haw, particularly the salicylates, have the potential to trigger an

asthmatic reaction in sensitive individuals. Asthma is a serious condition that should be monitored and managed by a health care provider. Conventional medications are available that are generally safe and proven effective to control asthma.

Preparations

The bark of the branches and roots of the plant contain the pharmacologically active ingredients of black haw. These components include salicyclic acid, salicin, oxalic acid, tannins, and scopoletin. The latter ingredient is probably the uterine relaxant. The salicylate constituents would contribute to black haw's anti-inflammatory effects. The root bark should be harvested only in the fall. Bark from the branches may be used either in spring or fall.

Fresh plant material from the shrub may be grown or purchased to make teas, tinctures, or infusions. Some of these remedies are described above. These preparations may also be commercially available from professional herbalists or specialty stores.

Precautions

People who are allergic to aspirin could theoretically have a reaction to black haw, as one of its components is a salicylate (compound related to aspirin). Bleeding time may also be prolonged as a result in patients who take high chronic doses of black haw. Patients with a history of **kidney stones** should not use this herb, as the oxalic acid it contains could increase the risk of a recurrence of the disorder.

Some sources say that black haw should not be used in pregnancy. Women should consult a health care practitioner experienced in the use of natural remedies for advice on the use of black haw for the prevention of miscarriage or other possible indications for pregnancy.

Side effects

This species of *Viburnum* has not been well-studied in regard to its efficacy, side effects, or safety, although it has centuries of traditional use in humans.

Interactions

There are no identified interactions of black haw with foods, other herbs, or standard medications.

Resources

BOOKS

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

Jellin, JM, F Batz, and K Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. Stockton, CA: Therapeutic Research Fac ulty, 1999.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: DK Publishing, Inc., 1993.

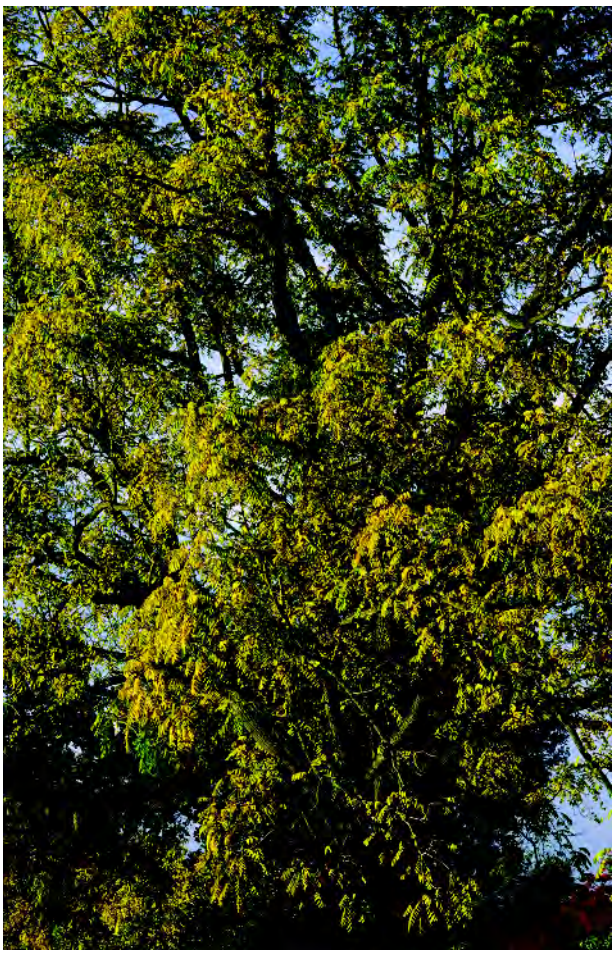
Weed, Susun. *Wise Woman Herbal for the Childbearing Year*. Woodstock, NY: Ash Tree Publishing, 1986.

Judith Turner

Black walnut

Description

Black walnut, *Juglans nigra*, is a short-trunked forest tree with a spreading crown that can grow to 100 ft (30 m). It is native to Eastern North America, where it is found from New Brunswick south to



Black walnut tree in autumn. *(© John Glover / Alamy)*

A black walnut tree. *(© Photo Researchers, Inc. Reproduced by permission.)*

Georgia and as far west as Kansas and Minnesota. Although chiefly valued for its decorative fine-grained wood, the tree's bark, root, leaves, and nuts all have medicinal properties. These qualities are similar to those of the closely related *Juglans regia* (better known as English walnut), the tree most commonly used by commercial walnut growers.

General use

The main active ingredients of black walnut are tannins such as galloyglucose and ellagitannins, and juglone (5-hydroxy-alphanapthaquinone). Walnut shells are very rich in **vitamin C**, and betacarotene, B_1, B_2, and B_6 are found in the leaves.

Herbalists use external applications of the plant for a variety of skin complaints including ringworm, **jock itch**, **athlete's foot**, **psoriasis**, **blisters**, **eczema**, scabbing pruritus, varicose ulcers, and even **syphilis** sores. The oil is a traditional hair tonic. Black walnut preparations have also been used for eye **infections** and irritations of the eyelid.

Internally, black walnut extracts are taken for ailments such as **gout**, rheumatism, glandular disturbances, **worms**, and parasites. It is also used to stimulate the appetite and as a laxative. Some authors consider it a blood purifier. There is evidence dating back to the 1960s showing that chemical components in the nut may help reduce blood pressure.

An April 2000 report in the *Annals of Internal Medicine* raised hope that walnuts might help reduce harmful LDL **cholesterol**. In a study conducted by a researcher at the Hospital Clinic Provincial in Barcelona, it was reported that substituting 8-11 walnuts a day for olive oil and other fatty foods in the cholesterol-lowering **Mediterranean diet** significantly improved the diet's effectiveness. In fact, the average reduction of LDL cholesterol in walnut dieters was twice that of participants using the traditional Mediterranean diet. However, the walnuts were added to a diet already known to be healthy, so the findings do not necessarily imply that addition of the nuts to a less nutritious diet would have a similar effect.

The ancient Doctrine of Signatures stated that hints to the healing properties of plants could be found in their physical appearance. In accordance with this belief, walnuts, with their convoluted surface,

KEY TERMS

Laminitis—A veterinary term for inflammation in the foot of a horse.

LDL cholesterol—Low-density lipoprotein cholesterol. A blood lipid that increases risk of coronary artery disease.

Mediterranean diet—A low-cholesterol diet that emphasizes vegetables and fish, and limits consumption of red meat and eggs.

Serotonin—A chemical compound that acts as a neurotransmitter, conveying information within the nervous system. Insufficient serotonin is believed to be a cause of depression. Too much serotonin may be responsible for migraines or nausea.

Tannin—An acidic substance often found in plants. Tannins are used for numerous medical purposes and are used to tan leather, color fabrics and ink. They are also used to contribute to the color and flavors of tea.

have long been thought useful in treating brain disorders. Discorides, the ancient Greek author of *De materia medica* which has been the foremost textbook of pharmacology for 16 centuries, considered walnuts to have an excitatory effect on the head. This effect has been attributed to the plant's high levels of serotonin.

In East Asia, dried black walnut is used to treat **cough**, **asthma**, and **bronchitis**. In chronic bronchitis and asthma in older patients, it is given two or three times a day for as long as two months. This is said to improve appetite and sleep patterns. East Asian practitioners also employ the plant in kidney stone remedies to ease **pain**.

The plant has dental applications. Homeopaths use a tincture of black walnut leaves to treat cutting wisdom teeth. In Pakistan, walnut bark is used in toothpaste.

Preparations

Black walnut extract can be bought at health food stores as a liquid or in capsules. Amateur herbalists can also prepare their own black walnut teas or salves. One traditional herbalist quoted in the 1989 book *Herbal Medicine Past and Present* said, "I take a double handful of hulls in boiling water to make a tea. Then I add hog lard and boil again to reduce it to a salve."

The following formula for English walnut leaves is from the 1994 book *Herbal Drugs and Phytopharmaceuticals:* "Making the tea: 1.5 g [1.67 tsp] of the finely chopped [leaves are] put into cold water, heated to boiling, and after three to five minutes passed through a tea strainer, Internally as an adjuvant ... for skin conditions, a cupful of the tea is drunk one to three times a day. For dressings and lotions, a decoction of 5 g [5.6 tsp] drug in 200 ml [3.8 oz (US)] water is used."

Another source recommends an extract produced by boiling black walnut bark in water for 10 or 15 minutes.

According to folklore, drinking a mixture of walnut kernel ash and red wine prevents loss of hair, but also tints it blonde. Another traditional preparation was to gargle with juice from unripened green walnut husks mixed with honey.

Black walnut leaves should be collected, free of leafstalk, early in the summer. The nuts are considered mature four-and-a-half to five months after flowering, and are harvested in the fall. Commercial growers use trunk and limb shakers to remove walnuts when the green, fleshy shucks begin to split and the inner nut is a light tan color. They then use forced-air dryers to reduce the moisture content to 8%.

Precautions

Directions and dosages should be carefully followed, as black walnut contains juglone, a powerful and toxic substance that prevents many plants from growing within the tree's root zone, extending as much as 80 ft (24 m) from a mature black walnut trunk. Juglone is especially strong in the roots, but is also found in the leaves, bark, and wood. Use of black walnut sawdust or wood chips as bedding material for horses has caused laminitis. In high doses, juglone is a kidney and liver toxin. Pollen from black walnut trees (usually shed in May) is a common cause of **allergies** in hypersensitive persons.

In their 1996 book *Botanical Medicine: A European Professional Perspective,* Dan Kenner and Yves Requena warn that black walnut should not be used against a cough involving **fever**.

Juglone can stain the skin yellow, brown, or black. This effect is so pronounced that black walnut oil is used to stain furniture and in artist's pigments.

Side effects

Acknowledging the previous precautions, black walnut generally has no adverse side effects when properly administered in appropriate doses. However, users are advised to consult a health professional before using it.

Interactions

Although interactions are unlikely, it is advisable to see a health professional before using black walnut extracts or capsules.

Resources

BOOKS

D'Amelio, Frank Sr. *Botanicals: A Phytocosmetic Desk Reference*. CRC Press, 1999.

Gruenewald, Joerg, Thomas Brendler, and Christof Jae nicke, eds. *Physicians' Desk Reference for Herbal Med icines*. Medical Economics Company, Inc., 1998.

Kenner, Dan and Yves Requena. *Botanical Medicine: A European Professional Perspective*. Paradigm Publica tions, 1996.

PERIODICALS

Zambon, Daniel, et al."Substituting Walnuts for Monoun saturated Fat Improves the Serum Lipid Profile of Hypercholesterolemic Men and Women." *Annals of Internal Medicine* (April 2000) 132: 533 537.

David Helwig

Bladder cancer

Definition

Bladder **cancer** is a disease in which the cells lining the urinary bladder lose the ability to regulate their growth and start dividing uncontrollably. This abnormal growth results in a mass of cells that form a tumor.

Description

Bladder cancer attacks the urinary bladder, a hollow, muscular organ that stores the urine received from the kidneys until it is excreted out of the body. Bladder cancer is the sixth most common cancer in the United States, and the development of new cases is on the rise. Because of improved diagnosis and treatment, however, the number of deaths from bladder cancer has been decreasing. The disease is almost three times as common among men as women, and the risk of the disease increases with age. Most cases of bladder cancer are found in people in their sixties.

Causes and symptoms

Smoking is considered one of the greatest risk factors for bladder cancer. The risk is probably due to the cancer-promoting substances found in tobacco collecting in the urine, and then becoming concentrated in the bladder while awaiting excretion. Other chemicals, including aniline dyes, beta-naphthylamine, benzadine salts, and mixtures of aromatic hydrocarbons also are believed to be cancer-causing agents. These chemicals are widely used in the rubber, leather, textile, chemical, plastics, petroleum, wood, and paint industries. It may take up to 50 years after the original chemical exposure for bladder cancer to develop. Studies have shown that hormone replacement therapy (HRT), a treatment used by many postmenopausal women, significantly increases the risk of bladder and other cancers.

Frequent urinary tract **infections**, kidney and bladder stones, and other conditions that cause long-term irritation to the bladder may increase the risk of bladder cancer. If there is a past history of tumors in the bladder, there is a strong possibility of their recurrence.

One of the first warning signals of bladder cancer is blood in the urine. Sometimes, there is enough blood to change the color of the urine to yellow-red or dark red. However, during the early stages of bladder cancer there are often no observable symptoms of the disease. Change in bladder habits, such as painful urination, increased frequency of urination, and increased urgency in the need to urinate, are all symptoms of bladder cancer. They are also common symptoms of less serious diseases of the urinary tract and prostate gland.

Diagnosis

Several tests are available to determine whether bladder cancer is present. As a first step, a physician takes a complete medical history to check for any risk factors. He or she then conducts a thorough physical examination to assess all signs and symptoms. Laboratory testing of a urine sample helps rule out the presence of a bacterial infection.

More in-depth tests are used to make a positive diagnosis. The intravenous pyelogram (IVP) is an x-ray examination performed after a dye is injected into the blood stream. It clearly outlines the kidneys, ureters, bladder, and urethra to detect abnormalities in the lining of these organs.

In a procedure known as a cystoscopy, a thin hollow lighted tube is placed into the bladder. If any suspicious masses are seen, a small piece of the tissue can be removed using a pair of biopsy forceps. The tissue is then examined microscopically to verify if cancer is present. Imaging tests such as chest x rays, computed tomography (CT) scans, and magnetic resonance imaging (MRI) may be done to determine if the cancer has spread to other organs.

Treatment

Most alternative treatments for cancer should be used in addition to allopathic treatment. A well-developed treatment plan for cancer should be discussed with an oncologist (cancer specialist) or other physician.

Studies indicate that **garlic** may stop the spread of bladder cancer. It also can help reduce the body wasting and **fatigue** that may accompany cancer, as well as reduce the side effects of radiation and chemotherapy. Practitioners recommend the equivalent of one to two cloves per day.

European **mistletoe**, *Viscum album L.,* is recommended to stimulate the immune system and to kill cancer cells. It also has been reported to reduce tumor size. The most widely available mistletoe extract is sold under the name of Iscador. Iscador is available in Europe only, especially Switzerland. A three-month supply can be purchased and brought back to the United States. Mistletoe often is taken in injectable form and should be administered under a physician's supervision.

High doses of multivitamins have been reported to be useful in decreasing the possibility of the recurrence of bladder cancer. Treatment should be monitored by a qualified healthcare practitioner.

Other complementary and alternative treatments include **guided imagery**, local and general **hyperthermia**, and Chinese herbs. These herbs have been shown effective in controlled trials, particularly as a complement to chemotherapy.

Allopathic treatment

Treatment for bladder cancer depends on the stage of the tumor. The standard modes of treatment are surgery, immunotherapy, radiation therapy, and chemotherapy. Surgery is considered an option only when the disease is in its early stages. If the tumor is small and has not spread to the inner layers of the bladder, surgery can be done without cutting open the abdomen. A cystoscope is placed through the urethra and up into the bladder, and the tumor is removed through it. A high-energy laser beam or other cautery instrument may be introduced through the cystoscope to burn away any remaining cancer.

If cancer has invaded deep into the walls of the bladder, surgery will be done through an incision in the abdomen. Part or all of the bladder and surrounding organs such as the prostate or the uterus, ovaries, and fallopian tubes may have to be removed. If the entire urinary bladder is removed, an alternate place must be created for the urine to be stored before it is excreted. To do this, the ureters are connected to a surgically created opening in the skin, called a stoma. This procedure is called a urostomy. A procedure can create a new bladder (called a neo-bladder) using a portion of the patient's intestine.

Radiation therapy uses high-energy rays to kill cancer cells. It is generally used after surgery to destroy any cancer cells that have not been removed during surgery. In addition, if the tumor is large or is in a location that makes surgery difficult, radiation may shrink the tumor prior to surgery. Radiation is sometimes used together with chemotherapy in place of surgery. Radiation therapy eases **pain**, bleeding, and blockages in cases of advanced bladder cancer.

Chemotherapy uses drugs to destroy cancer cells. Generally a combination of drugs is more effective than any single drug in treating bladder cancer. Medications are either introduced into the bloodstream by injecting them into a vein in the arm, or they may be taken orally in pill form. Anticancer drugs may also be introduced directly into the bladder to treat superficial tumors. Chemotherapy may be given following surgery to kill any remaining cancer cells. Research has shown improved outcomes when bladder cancer patients were given chemotherapy followed by surgery. In a study of 307 patients, those with this combination of therapy lived two years longer than those treated only with surgery.

Immunotherapy, or biological therapy, uses the body's own immune system to fight the disease. In the case of early-stage bladder cancer, *bacille Calmette-Guerin* (BCG), a weakened strain of **tuberculosis**, may be placed directly into the bladder. As the immune system rallies to fight off the tuberculosis, it also attacks and kills cancer cells. This therapy has been shown to be effective in controlling superficial bladder cancer.

New treatments are continuously being investigated. Scientists have made great strides in gene mapping and research in the twenty-first century. A type of gene therapy on experimental animals has produced significant success and human trials have begun on the new technique.

Expected results

If cancer is detected early and is limited to the inner lining of the bladder, it responds well to treatment. Most bladder cancers are first seen at this stage. At least 90% of patients survive five years or more after an initial diagnosis. However, if the disease has spread to nearby tissues, the survival rates drop to 49%, and if

KEY TERMS

Cautery instrument—A device that applies heat to the tissues to destroy damaged or diseased areas.

Cystoscope—An instrument used to view and introduce treatments into the urinary tract.

Metastasize—The spread of cancer to an area away from its original site.

Oncologist—A doctor who specializes in treating cancer.

Superficial tumor—A tumor that has not penetrated deep into the body organ.

Tumor—An uncontrolled growth of tissue, which may be cancerous.

Ureters—The tubes that carry urine from the kidney into the bladder for storage.

Urethra—The tube that carries urine out of the bladder and outside the body. The urethra is also used to gain access to the bladder for such tests as a cystoscope.

the cancer metastasizes to distant organs only about 6% of patients will survive five years or more.

Bladder cancer has a very high rate of recurrence. Even after tumors are totally removed, there is a high chance that new tumors will develop. Therefore, those who have had bladder cancer should have frequent and thorough follow-up care.

Prevention

Those who have a history of bladder cancer, who have been regularly exposed to cancer-causing chemicals, or who have had conditions that cause long-term irritation to the bladder, should undergo regular screening tests for bladder cancer. This regimen will help ensure that the disease is detected in the early stages and treated appropriately.

Avoiding risk factors, such as tobacco, is the best alternative. Appropriate safety precautions should be maintained when working with cancer-causing chemicals. Working with such chemicals should be avoided. Women may want to discuss with their physicians the risks versus benefits of hormone replacement therapy.

Since **stress** and irritation of the bladder may contribute to bladder cancer, the health of the bladder and urinary tract should be carefully maintained.

Caffeine, which is found in coffee, tea, colas, and chocolate, is thought to be a factor in cancer of the lower urinary tract, including the bladder, and should be avoided. It also is important to have adequate fluid intake to flush potential toxins out of the urinary tract. At least six to eight glasses of water as well as fluids such as plain herbal teas and diluted fruit or vegetable juices should be consumed daily. A dropperful (25–30 drops) of a tincture of burdock seed, *Artium lappa,* will help flush the entire urinary tract, relieve bladder irritation and inflammation, and strengthen the bladder.

Resources

BOOKS

Dunetz, Gary N. *Bladder Cancer: A Resource Guide for Patients and Their Families*. Bloomington, IN.: Authorhouse, 2006.

Ellsworth, Pamela, and Brett Carswell. *100 Questions & Answers About Bladder Cancer*. Sudbury, MA: Jones & Bartlett, 2005.

Parker, James N., and Philip M. Parker. *The Official Patient's Sourcebook on Bladder Cancer: A Revised and Updated Directory for the Internet Age*. San Diego: ICON Health Publications, 2002.

Raghaven, Derek, and Kathleen Tuthill. *Bladder Cancer: A Cleveland Clinic Guide*. Cleveland, OH: Cleveland Clinic Press, 2008.

PERIODICALS

Birkhahn, Marc, Anirban P Mitran, and Richard J. Cote. "Molecular Markers for Bladder Cancer: The Road to a Multimarker Approach." *Expert Review of Anticancer Therapy* (December 2007): 1717 1727.

Karak, Fadi El, and Aude Flechon. "Gemcitabine in Blad der Cancer." *Expert Opinion in Pharmacotherapy* (December 2007): 3251 3256.

Madeb, Ralph, et al. "Current State of Screening for Bladder Cancer." *Expert Review of Anticancer Therapy* (July 2007): 981 987.

OTHER

eMedicineHealth. "Bladder Cancer." http://www.emedicinehealth.com/bladder_cancer/article_em.htm (March 3, 2008).

Medline Plus. "Bladder Cancer. National Library of Medicine." http://www.nlm.nih.gov/medlineplus/bladdercancer.html (March 3, 2008).

National Cancer Institute. "Bladder Cancer." http://www.cancer.gov/cancertopics/types/bladder (March 3, 2008).

Patience Paradox
Teresa G. Odle
David Edward Newton, Ed.D.

Bladder infection

Definition

Bladder infection, also called cystitis, refers to infection and inflammation of the urinary bladder. Urethritis is an inflammation of the urethra, which is the passageway that connects the bladder with the exterior of the body. Sometimes cystitis and urethritis are referred to collectively as a lower urinary tract infection, or UTI. Infection of the upper urinary tract involves the spread of bacteria to the kidney and is called pyelonephritis.

Description

The frequency of bladder **infections** in humans varies significantly according to age and sex. The male/female ratio of UTIs in children younger than 12 months is 4:1 because of the high rate of birth defects in the urinary tract of male infants. In adults, the male/female ratio of UTIs is 1:50. After age 50, however, the incidence among males increases due to prostate disorders.

UTIs are common in females. It is estimated that 50% of adult women experience at least one episode of dysuria (painful urination); half of these patients have a bacterial UTI. Between 2 to 5% of women's visits to primary care doctors are for UTI symptoms. About 90% of UTIs in women are uncomplicated but recurrent.

UTIs are uncommon in younger and middle-aged men, but may occur as complications of bacterial infections of the kidney or prostate gland.

In children, bladder infection is often caused by congenital (present at birth) abnormalities of the urinary tract. Vesicoureteral reflux is a condition in which a child cannot completely empty the bladder. It allows urine to remain in or flow backward (reflux) into the partially empty bladder.

Causes and symptoms

The causes of bladder infection vary according to gender because of the differences in anatomical structure of the urinary tract.

Females

Most bladder infections in women are so-called ascending infections, which means that they are caused by bacteria traveling upward through the urethra to the bladder. The relative shortness of the female urethra (1 to 2 in. [3-5 cm] in length) makes it easy for bacteria to gain entry to the bladder, where they multiply. The most common bacteria associated with UTIs in women include *Escherichia coli* (about 80 % of cases), *Staphylococcus saprophyticus*, *Klebsiella*, *Enterobacter*, and *Proteus* species. Risk factors for UTIs in women include:

- Sexual intercourse. The risk of infection increases if the woman has multiple partners.
- Use of a diaphragm for contraception.
- An abnormally short urethra.
- Diabetes or chronic dehydration.
- The absence of a specific enzyme (fucosyltransferase) in vaginal secretions. The lack of this enzyme makes it easier for the vagina to harbor bacteria that cause UTIs.
- Inadequate personal hygiene. Bacteria from fecal matter or vaginal discharge can enter the female urethra because its opening is very close to the vagina and anus.
- History of previous UTIs. About 80% of women with bladder infection develop recurrences within two years.

The early symptoms of bladder infection in women are dysuria (**pain** on urination), urgency (sudden strong desire to urinate), and increased frequency of urination. About 50% of female patients experience **fever**, pain in the lower back or flanks, **nausea** and **vomiting**, or shaking **chills**. These symptoms indicate pyelonephritis, or spread of the infection to the upper urinary tract.

Males

Most UTIs in adult males are complications of kidney or prostate infections. They usually are associated with a tumor or **kidney stones** that block the flow of urine and are often persistent infections caused by drug-resistant organisms. UTIs in men are most likely to be caused by *E. coli* or another gram-positive bacterium. *S. saprophyticus*, which is the second most common cause of UTIs in women, rarely causes infections in men. The symptoms of bladder infection and pyelonephritis in men are the same as in women. Risk factors for UTIs in men include lack of circumcision (the foreskin can harbor bacteria that cause UTIs) and urinary catheterization (the longer the period of catheterization, the higher the risk of UTI).

Hemorrhagic cystitis

Hemorrhagic cystitis, which is marked by large quantities of blood in the urine, is caused by an acute bacterial or viral infection of the bladder. In some

cases, hemorrhagic cystitis is a side effect of therapy or treatment with cyclophosphamide. Hemorrhagic cystitis in children is associated with adenovirus type 11. In some cases, hematuria results from athletic training, particularly in runners.

Diagnosis

When bladder infection is suspected, a doctor will first examine the patient's abdomen and lower back to evaluate pain and unusual enlargements of the kidneys or swelling of the bladder. In small children, a doctor will check for fever, abdominal masses, and a swollen bladder.

The next step in diagnosis is collection of a urine sample. The procedure differs somewhat for women and men. Laboratory testing of urine samples can now be performed with dipsticks that indicate immune system responses to infection, as well as with microscopic analysis of samples. Normal human urine is sterile. The presence of bacteria or pus in the urine usually indicates infection. The presence of blood in the urine (hematuria) may indicate acute UTI, kidney disease, kidney stones, inflammation of the prostate (in men), **endometriosis** (in women), or **cancer** of the urinary tract.

Females

Female patients sometimes require a pelvic examination as part of the procedure to diagnose bladder infections. The patient lies on an obstetrical table with feet in stirrups. The doctor may take a vaginal culture smear. The patient often is asked to provide a urine sample. A midstream urine sample of 200 mL is collected to test for bladder infection. Often, just a "clean catch," or midstream sample, is needed without a pelvic exam.

A high bacterial count in the urine sample indicates urethritis. A count of more than 100,000 (10^5 bacteria CFU/mL, or colony-forming units per milliliter) in the midstream sample indicates a bladder or kidney infection. A colony is a large number of microorganisms that grow from a single cell. Bacterial count can be given in CFU or colony forming units.

Males

In male patients, the doctor will cleanse the opening to the urethra with an antiseptic before collecting the urine sample. The first 10 mL of urine are collected separately. The patient then urinates a midstream sample of 200 mL. Following the second sample, the doctor will massage the patient's prostate and collect several drops of prostatic fluid. The patient then urinates a third urine specimen for prostatic culture.

A high bacterial count in the first urine specimen or the prostatic specimen indicates urethritis or prostate infections, respectively. A bacterial count greater than 100,000 bacteria CFU/mL in the midstream sample suggests a bladder or kidney infection. Children may need to be catheterized (a sterile procedure), in which case a culture of 1,000 bacteria CFU/mL is indicative of infection.

Other tests

Women with recurrent UTIs can be given ultrasound exams of the kidneys and bladder together with a voiding cystourethrogram to test for structural abnormalities. (A cystourethrogram is an x-ray test in which an **iodine** dye is used to better view the urinary bladder and urethra.) Voiding cystourethrograms are also used to evaluate children with UTIs. In some cases, computed tomography scans (CT scans) can evaluate patients for possible cancers or other masses in the urinary tract.

Treatment

Diet

Dietary changes that may help to control and prevent bladder infection include:

- Drinking 8–12 glasses of water daily, which helps to wash out bacteria (although this may also dilute antibacterial factors in the urine).
- Acidifying the urine by limiting alkaline foods (dairy, soda, and citrus).
- Following a diet rich in grains, vegetables, and acidifying juices.
- Eliminating foods that irritate the bladder (coffee, black tea, alcohol, and chocolate).
- Eliminating high sugar foods (sweet vegetables, fruits, sugar, and honey).
- Drinking unsweetened cranberry juice to acidify the urine and provide hippuric acid. Cranberry capsules can substitute for the juice.
- Ingesting at least one clove of garlic (or up to 1,200 mg garlic as a tablet) daily for its anti-infective properties.

Herbals and Chinese medicine

Herbals that possess antibacterial, antioxidant, demulcent, astringent, antiviral, antispasmodic, and/or diuretic properties are useful in treating bladder infection. Herb tinctures have a more rapid effect

than teas. Useful herbals include bearberry (*Arctostaphylos uva-ursi*), **buchu** (*Barosma betulina*), **cornsilk** (*Zea mays*), cinnamon, cedar, pipsissewa (*Chimaphilia*), Oregon grape root (*Berberis aquifolia*), **goldenseal** (*Hydrastis canadensis*), marshmallow root (*Althea officinalis*), kava, and birch. A tincture recipe for bladder infection is as follows:

- cornsilk, 2 parts
- bearberry, 2 parts
- *Viburnum prunifolium*, 1 part
- *Valeriana officinalis*, 1 part

The patient should take 5 mL of the tincture three times daily. An infusion of *Archillea millefolium* should be drunk frequently. The patient can take 1.5 g to 3 g of the Chinese patent medicine Qing Lin Wan (Green Unicorn Pill) twice daily.

Supplements

The antioxidant vitamins A, C, and E may be beneficial in treating bladder infection. The patient should take 400–600 IU of **vitamin E** and 300 mg vitamin B_6 daily. Ascorbic acid is irritating to the bladder so **vitamin C** should be taken in the form of **calcium** ascorbate, about 6,000 to 20,000 mg per day. **Magnesium** may be helpful in treating renal disease. **Zinc** may boost the immune system.

Homeopathic medicine also can be effective in treating bladder infection. Choosing the correct remedy (based on the patient's symptoms) is always key to the success of homeopathic treatment. Homeopathic remedies for bladder infection include Spanish fly (*Cantharis*), sarsaparilla, stavesacre (*Staphysagria*), and Oregon grape (*Berberis aquifolium*). The correct homeopathic treatment is effective within 12 hours. **Acupuncture** also can be helpful in treating acute and chronic cases of bladder infection.

Allopathic treatment

Medications

Uncomplicated cystitis is treated with antibiotics. These include penicillin, ampicillin, and amoxicillin; sulfisoxazole or sulfamethoxazole; trimethoprim; nitrofurantoin; cephalosporins; or fluoroquinolones. Treatment for women is short-term; most patients respond within three days. Reports have shown that presumed uncomplicated UTIs in women could often be treated over the telephone when the patient reported her symptoms to a nurse who had a series of prepared questions. Men typically do not respond as well and require seven to 10 days of oral antibiotics for uncomplicated UTIs. Patients of either gender may be given phenazopyridine (Pyridium, Urogesic) or flavoxate (Urispas) to relieve painful urination. Trimethoprim (Trimpex, Proloprim, Primsol) and nitrofurantoin (Furadantin, Macrobid, Macrodantin) are preferred for treating recurrent UTIs in women.

Over 50% of older men with UTIs also suffer from infection of the prostate gland. Some antibiotics, including amoxicillin and the cephalosporins, do not affect the prostate gland. Fluoroquinolone antibiotics or trimethoprim are the recommended drugs for these patients.

Surgery

A minority of women with complicated UTIs may require surgical treatment to prevent recurrent infections. Surgery is also used to treat reflux problems (movement of the urine backwards) or other structural abnormalities in children and anatomical abnormalities in adult males.

Expected outcome

In many cases, alternative medicines can resolve bladder infections quickly. It is important that patients see a doctor if symptoms do not subside after a few days, or if they worsen. The prognosis for recovery from uncomplicated bladder infection is excellent. However, complicated UTIs in males are difficult to treat because they often involve bacteria that are resistant to commonly used antibiotics.

Prevention

Researchers are trying to develop a vaccine for UTIs. A study of women with frequent infections showed that a vaccine administered by a vaginal suppository headed off bladder infections in many of the study participants. A later study used antigens found on the surface of *E. coli* as components of a possible vaccine against UTIs. Although encouraging results were reported, no vaccine has been developed. The following measures may be taken to prevent bladder infection:

- Drinking large amounts of fluid.
- Reducing intake of sugar.
- Urinating frequently and as soon as the need arises.

Women with two or more UTIs within a six-month period are sometimes given prophylactic antibiotic treatment, usually nitrofurantoin or trimethoprim for three to six months. In some cases the patient is advised to take an antibiotic tablet following sexual intercourse.

KEY TERMS

Bacteriuria—The presence of bacteria in the urine.

Catheterize—A procedure whereby a thin tube, called a catheter, is inserted into the urethra to collect urine, which drains into an external collection bag.

Demulcent—An agent that eases the pain and discomfort of mild inflammation by forming a film over a mucous membrane.

Dysuria—Painful or difficult urination.

Hematuria—The presence of blood in the urine.

Pyelonephritis—Infection of the kidney.

Urethritis—Inflammation of the urethra, the passage through which urine is eliminated from the body.

Other preventive measures for women include:

- Urinating frequently, particularly after intercourse.
- Proper cleansing of the area around the urethra (wiping front to back).
- Acupuncture.

The primary preventive measure specifically for males is prompt treatment of prostate infections. Chronic prostatitis may go unnoticed but can trigger recurrent UTIs. In addition, males who require temporary catheterization following surgery can be given antibiotics to lower the risk of UTIs.

Resources

BOOKS

Iannini, Paul B. *Contemporary Diagnosis and Management of Urinary Tract Infections*. Newton, PA: Handbooks in Health Care, 2003.

Kavaler, Elizabeth. *Seat on the Aisle, Please!: The Essential Guide to Urinary Tract Problems in Women*. New York: Springer, 2006.

Kilmartin, Angela. *The Patient's Encyclopaedia of Urinary Tract Infection, Sexual Cystitis and Interstitial Cystitis*. Chula Vista, CA New Century Press, 2004.

Rane, Abhay. *Urinary Tract Infections*. Jupiter, FL.: Merit Publishing, 2008.

Sadler, Carrie, et al. *Women's Health*. New York: Oxford University Press, 2008.

PERIODICALS

Butrick, Charles W. "Patients With Chronic Pelvic Pain: Endometriosis or Interstitial Cystitis/Painful Bladder Syndrome?" *Journal of the Society of Laparoendoscopic Surgeons* (April/June 2007): 182 189.

Christofi, Nicholas, and Andrew Hextall. "An Evidence based Approach to Lifestyle Interventions in Urogy naecology." *Menopause International* (December 2007): 154 159.

Theoharides, Theoharis. "Treatment Approaches for Pain ful Bladder Syndrome/Interstitial Cystitis." *Drugs* (November 2007): 215 235.

OTHER

eMedicineHealth. *Urinary Tract Infections*. http://www.emedicinehealth.com/urinary_tract_infections/article_em.htm

Belinda Rowland
Teresa G. Odle
David Edward Newton, Ed.D.

Bladderwrack

Definition

Bladderwrack is a type of brown seaweed found along the northern coasts of the Atlantic and Pacific oceans, the North Sea, and the Baltic Sea. It has long been used to treat a number of medical conditions, including gastrointestinal problems and **hypothyroidism**, and for the treatment of **wounds**.

Description

The scientific name for bladderwrack is *Fucus vesiculosus*. It is also known by a number of common names, including black tang, rockweed, bladder Fucus, sea **oak**, black tany, cut weed, and rock wrack.

Bladder wrack is a type of seaweed, long used to treat a number of medical conditions, including gastrointestinal problems and hypothyroidism, and for the treatment of wounds. *(Andrew J. Martinez / Photo Researchers, Inc.)*

The most characteristic feature of the bladderwrack is a long thallus (stem) containing air-filled sacs that keep the plant afloat. The thallus is harvested, dried, and used for a variety of medicinal purposes. Bladderwrack's medicinal value probably depends on three primary constituents: **iodine**, alginic acid, and fucoidan. The amount of each constituent present in a sample of bladderwrack differs significantly depending on the area from which the plant is harvested.

Iodine is an essential mineral in the human diet. It is needed to ensure proper functioning of the thyroid. An excess of iodine results in a condition known as **hyperthyroidism**, in which the thyroid is over-active, while a deficiency of iodine results in hypothyroidism, a condition in which the thyroid is less active than normal. Alginic acid acts as a dietary fiber in the human digestive system, contributing to the normal function of the digestive and excretory systems. A form of alginic acid is used in the manufacture of certain antacids that reduce stomach upset and other digestive problems. Other claims have been made for the value of alginic acid, including its use in the healing of wounds and the treatment of some diseases and **infections**. Fucoidan is also a type of dietary fiber with similar value in the human digestive system. Some authorities believe it may have other medical value, as in the reduction of **cholesterol** and blood sugar levels. Little or no scientific evidence exists to support these claims.

Use

Humans have used the ashes produced by burning seaweed as a medicine since at least the 1700s. The procedure involves harvesting seaweed from the oceans and burning it with charcoal. The ashes thus produced are then taken internally or placed on a wound. The primary use of bladderwrack ashes produced in this way was the treatment of goiter. Goiter is a condition that results in the enlargement of the thyroid gland because the body lacks sufficient iodine in the bloodstream. In an effort to produce more iodine, the thyroid grows larger and larger, producing a goiter that may be as large as a grapefruit. Addition of iodine to a person's diet reduces the risk of goiter. A secondary use of bladderwrack ashes was in the treatment of skin disorders.

In 1862, French dermatologist Louis-Victor D. Duchesne-Duparc found that bladderwrack was an effective treatment for overweight and **obesity**. He eventually began making pills containing bladderwrack that he sold as diet aids. That application continued in to the early 2000s to be an important use of bladderwrack. It is an ingredient in a variety of weight-control products, such as the Bio-Mark Weight Control System, Lee Causey's Slim n' Up, and Starlight International's Natural Trim products. Some alternative therapists have made a number of other claims for the value of bladderwrack, including its ability to relieve the symptoms of rheumatism and arthritis, as an anti-coagulant and anti-estrogen, and as a treatment for **diabetes mellitus**, human immunodeficiency virus (HIV) disease and **AIDS**, and a variety of other diseases.

KEY TERMS

Goiter—An enlargement of the thyroid gland caused by insufficient production of iodine.

Hyperthyroidism—Excess functioning of the thyroid gland, resulting in overproduction of the thyroid hormones.

Hypothyroidism—Reduced functioning of the thyroid gland, resulting in underproduction of the thyroid hormones.

Thyroid—An essential gland located at the base of the neck, responsible for a number of important biological functions, including the rate of metabolism.

Effectiveness

As of 2008 no scientific studies on the medical effects of bladderwrack had been reported. At that point, all claims for the beneficial effects of the plant were based on historical and anecdotal evidence. In 2001, the National Toxicology Program (NTP) of the U.S. Department of Health and Human Resources undertook a study of the substance to determine its possible health risks. The study was motivated by concerns over the use of bladderwrack in diet supplements. The supposition had been that bladderwrack's weight-loss effects are caused by iodine present in the plant. That iodine causes the thyroid gland to become more active, thus increasing a person's metabolism, resulting in a lost of weight. However, the level of iodine required to produce this effect is sufficient to produce hyperthyroidism in an individual, a potentially serious health problem. The results of the NTP study were not available as of 2008.

Resources

PERIODICALS

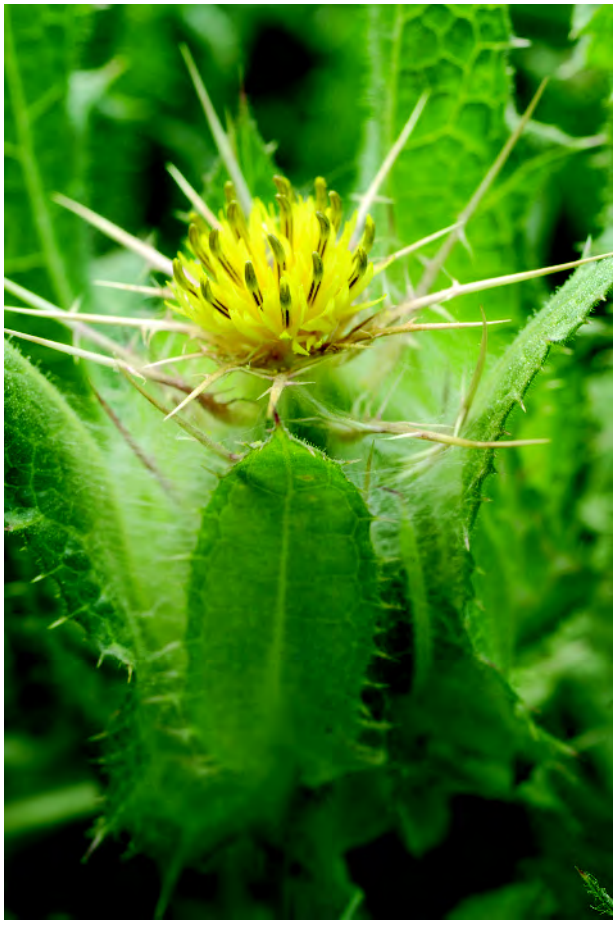
"Seaweed and Soy: Companion Foods in Asian Cuisine and Their Effects on Thyroid Function in American Women." *Journal of Medicinal Food* (March 2007): 90 100.

David E. Newton, Ed.D.

Blessed thistle

Description

Blessed thistle, *Cnicus benedictus* (also known as *Carduus benedictus* and *Carbenia benedicta*), is a member of the Asteracea, or daisy, family. The bitter-tasting, prickly thistles are considered "noxious weeds" when they take root and grow abundantly in open fields and meadows. The presence of this beneficial Mediterranean native, however, indicates fertile ground. The ancient Romans ate the leaf fresh and boiled the root as a vegetable. Thistle was once used as a nutritious fodder for cattle in Scotland, and the leaf, folded between two slices of buttered bread, was eaten with the breakfast meal. In the Middle Ages, thistle was one of the most common European medicinal herbs. Shakespeare wrote about it in his play, *Much Ado About Nothing,* with the advice: "Get you some of this distilled Carduus Benedictus and lay it to your heart; it is the only thing for a qualm." The belief in thistle as a heart tonic persists. One English herbalist, writing in the mid-twentieth century, declared blessed thistle "Good for all organs of the body, especially the heart and brain." Like many native European herbs, blessed thistle is credited with magical powers. It is said to be effective in exorcism, hex-breaking, and in purification spells. Grown outside the home, this blessed herb is said to attract peace, love, and harmony.



Blessed Thistle (Cnicus benedictus). *(© Arco Images / Alamy)*

Blessed thistle is also known as holy thistle, St. Benedict thistle, cardin, and spotted thistle. This herbaceous annual has been cultivated for centuries as a medicinal herb. It was a component of many herbal remedies used to combat the plague. The herb was also cultivated in monastery gardens as a cure for smallpox. Its specific name is in honor of St. Benedict, the founder of a holy order of monks.

Other thistles, including *Carduus marianus* or *Silybum marianum*, also sometimes known as holy thistle, Our Lady's **milk thistle**, Marian thistle, and wild **artichoke** have similar medicinal applications, particularly as liver tonics.

Thistles are naturalized throughout North America, found growing wild in sunny locations and stony soils. Blessed thistle grows from a thick taproot first forming a rosette of narrow leaves at ground level. The stems arising from the root are erect and hairy. Dark green, narrow leaves clasp the stem. They are deeply lobed, wavy and toothed on the margins, and veined. Each toothed lobe bears a prickly spine. Even the pale yellow flower heads, blooming at the top of the stem, are covered with prickly spines. The stem is reddish brown and branched reaching to two feet in length. The hardy thistle will self-sow and thrive in good soil. If left to grow wild and uncultivated, thistles may become intrusive.

General use

The entire plant is edible, though the prickly spines can be troublesome. The herb contains B-complex vitamins, **calcium**, **iron**, and **manganese**. Blessed thistle is considered by many contemporary herbalists and in traditional folk use as a tonic, astringent, diaphoretic (increases perspiration), emetic (induces **vomiting**), and stimulant. Both the blessed thistle and milk thistles are recommended as a liver tonic, particularly when the liver disease is brought on by **alcoholism**. It has been used in treatment of **jaundice** and **hepatitis**. A tea from the leaves, taken warm, will increase perspiration, reduce congestion, and help to bring down **fever**. A mild infusion is astringent and may relieve **diarrhea**, but a very strong infusion is emetic and may cause **nausea** and vomiting. Blessed thistle is considered to

be one of the best herbs to stimulate the flow of milk in lactating women (lactating women should always consult their physicians before taking this herb), and its emmenagogue action (promotes menstrual discharge) helps to regulate female hormone balance and relieve menstrual **pain**. Blessed thistle has also been used to treat the vaginal discharge known as leucorrhea. The herb is used in the commercial manufacture of herbal **bitters**, and is considered a general tonic and digestive. Its bitter properties increase the flow of bile and other gastric secretions. The herb may stimulate appetite and relieve flatulence. Blessed thistle is said to relieve melancholy and lethargy, and was traditionally fed to mentally ill persons. It acts to increase blood circulation and aids memory. Applied externally in poultice form, blessed thistle is a good treatment for **shingles**, **wounds**, and ulcers. The plant has antimicrobial properties. The essential oil has been shown to have antibiotic action against **infections**, specifically *Staphylococcus aureus* and *S. faecalis*. Blessed thistle has a history in folk use for the treatment of heart ailments, cancers, and as a contraceptive, but these, and other traditional uses, have not been confirmed by research.

Preparations

Collect thistle on a hot and dry mid-summer afternoon, just as the herb begins to bloom. Harvest from the wild in areas where herbicides are not used, or from a cultivated garden patch. The leaves and flowering stems may be hung to dry in a light, airy room away from direct sunlight. Cut the dried herb and store in a clearly-labeled, dark-glass container. Seeds may be gathered in the fall.

Tincture: Combine 4 oz of fresh, or half as much dried, thistle leaf with 1 pt of brandy, gin, or vodka in a glass container. The alcohol should be enough to cover the flowers. The ratio should be close to 50/50 alcohol to water. Stir and cover. Place the mixture in a dark cupboard for three to five weeks. Shake the mixture several times each day. Strain and store in a tightly-capped, clearly labeled, dark glass bottle. A standard dose is 1–2 ml of the tincture three times a day. Tinctures, properly prepared and stored, will retain medicinal potency for two years or more.

Infusion: Use twice as much fresh, chopped herb as dried herb. Steep 1–2 teaspoons of finely chopped fresh or dried thistle per cup of boiled, unchlorinated water for 10–15 minutes. Strain and cover. Drink warm, sweetened with honey if desired. A standard dose is three cups per day. Strong infusions of thistle may cause diarrhea. A prepared herbal infusion will keep for up to two days in the refrigerator and retain its healing qualities.

Precautions

There are no reported incidents of thistle toxicity. However, as with most medicinal herbs, they should not be taken during **pregnancy**. Children under two years should not be given the herb. Lactating women should consult with a qualified herbalist before using the herb. Strong infusions of blessed thistle may cause nausea and vomiting.

Side effects

None reported.

Interactions

None reported.

Resources

BOOKS

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

Magic And Medicine of Plants. The Reader's Digest Association, Inc. 1986.

Coon, Nelson. *An American Herbal, Using Plants For Healing*. Pennsylvania: Rodale Press, 1979.

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. Lynn Sonberg Book Associates, 1996, (Wing Books, 1997 edition).

Hoffmann, David. *The New Holistic Herbal, 2nd edition*. Massachusetts: Element, 1986.

Mabey, Richard. *The New Age Herbalist*. New York: Simon & Schuster, Inc., 1988.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

Meyer, Joseph E. *The Herbalist*. Clarence Meyer, 1973.

Murray, Michael T. *The Healing Power of Herbs, 2nd ed.* California: Prima Publications, Inc., 1995.

Phillips, Roger, and Nicky Foy. *The Random House Book of Herbs*. New York: Random House, 1990.

Polunin, Miriam and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Company, 1992.

Thomson, William A. R. *Medicines From The Earth*. San Francisco: Harper & Row, 1983.

Weiss, Gaea, and Shandor Weiss. *Growing & Using The Healing Herbs*. NY: Wing Books, 1992.

OTHER

Grieve, Mrs. M. *A Modern Herbal*. Available at: Botanical.com, http://www.botanical.com/botanical/mgmh/t/thistl11.html.

Clare Hanrahan

Blisters

Definition

Blisters are small, raised lesions where fluid has collected under the skin. They may be caused by an allergic reaction, **burns**, **frostbite**, or by excessive friction or trauma to the skin. Blisters may also be a symptom of a systemic illness, or of a specific skin disorder.

Description

The thin-skinned sac of a blister contains fluid, and in most cases should not be ruptured, as rupturing can introduce infection and slow the healing process. Blisters that contain blood instead of fluid are aptly named blood blisters, and are caused by a rupture of blood vessels beneath the surface of the skin, usually due to trauma.

Causes and symptoms

Blisters can be caused by a number of conditions and environmental agents, including:

- Friction. Rubbing or pinching can cause skin irritation and blistering. Friction blisters frequently occur on the hands and feet.
- Disease. Blisters are symptomatic of skin disorders such as impetigo, incontinentia pigmenti syndrome (IPS), and pemphigus vulgaris. Blisters may also be caused by diseases such as herpes and chickenpox.
- Contact dermatitis. Skin contact with an allergen (e.g., latex, cosmetics, cleaning solutions) can trigger redness, irritation, rash, and blistering of the skin. Blisters also typically appear after skin contact with poison ivy, oak, or sumac.

Man with blistered arm from poison ivy. *(Custom Medical Stock Photo. Reproduced by permission.)*

- Burns. Blisters appear in cases of severe sunburn and thermal burns.
- Frostbite. Severely frostbitten skin frequently blisters.
- Trauma. Blood blisters are caused by trauma to the skin.

Other new causes of blisters are discovered by clinicians. In 2002, a report discussed how a newly identified autoimmune blistering disease involving the mucous membranes also increased the risk of some solid cancers.

Diagnosis

Diagnosis and treatment of most minor blisters can typically be made at home by examination of the affected area. Blisters thought to be caused by a systemic illness or disease may require professional diagnosis by a physician, dermatologist, or other healthcare professional. A medical history, physical examination, and further medical testing may be part of the diagnostic procedure.

Treatment

Unless they are hindering movement or are extremely painful due to their size and/or location, blisters should not be ruptured, or "popped," as doing so can introduce bacteria into the wound. If a blister does burst, the extra skin should be left intact. Blisters that are excessively large or painful should only be punctured using antiseptic procedures, preferably by or under the direction of a qualified healthcare professional.

Treatment of blisters depends on their cause. Blisters that are symptomatic of a disease or disorder require treatment of the illness itself. Blisters caused by friction or trauma can be treated by cleansing with mild soap, applying an antiseptic, and covering the area with a sterile bandage. An herbalist, aromatherapist, or holistic healthcare professional may recommend a compress of an antiseptic or anti-microbial herb such as marigold (*Calendula officinalis*), **thyme** (*Thymus vulgaris*), **lavender** (*Lavandula angustifolia*), or **tea tree oil** (*Melaleuca alternifolia*).

The blister should be kept clean and the bandage changed frequently. Blood blisters should be bandaged firmly to apply pressure to the area and prevent further blood vessel ruptures.

Allopathic treatment

Conventional medicine typically follows the same procedures for treating skin blisters. A prescription or over-the-counter antiseptic ointment may be recommended to clean the blistered area.

KEY TERMS

Impetigo—A bacterial infection of the skin characterized by skin blistering.

Incontinentia pigmenti syndrome (IPS)—An inherited skin disorder characterized by blistered lesions in infancy, which heal but leave uneven pigmentation of the skin.

Pemphigus vulgaris—An autoimmune skin disorder that causes blistering of the skin and mucous membrane.

Expected results

With proper treatment, most minor blisters will heal without complication in a matter of days. More serious blisters caused by severe burns and certain diseases may produce permanent scarring or discoloration of the skin.

Prevention

Friction blisters can be prevented by wearing adequate protection on the area prone to blistering. For example, long distance runners can purchase properly fitting shoes. People who work with their hands or feet can purchase special gloves or shoes and boots. For instance, in 2002, a boot company introduced safety toe footwear for occupational use with enough room for toes to move freely without rubbing against steel–toe caps.

Fair-skinned individuals who are prone to **sunburn** should take extra precautions to avoid skin blistering, such as using a high SPF sunscreen (at least 30 SPF) and wearing a large brimmed hat and long-sleeved, loose clothing in the sun.

Resources

BOOKS

Lawless, Julia. *The Complete Illustrated Guide to Aroma therapy*. Boston, MA: Element Books, 1997.

PERIODICALS

Minter, Stephen G. "Safety Boots to Prevent Blisters." *Occupational Hazards* (May 2002): 106.

Worcester, Sharon."Risk of Solid Cancers Raised by Blis tering Disease (Study of 35 Patients)." *Skin &Allergy News* (June 2002): 45.

Paula Ford-Martin
Teresa G. Odle

Blood clots

Definition

A blood clot is a mass of blood cells and blood components that form to stop the bleeding that occurs when a blood vessel is injured. When a blood vessel is broken, platelets in the blood become sticky and clump together at the site of the injury. They begin to form a mass to stop the flow of blood.

Description

Clotting is the body's normal response to a bleeding injury, a necessary function to prevent a person from losing too much blood. Most blood clots dissolve into the blood when the body has healed the vessel. Blood clots, however, can be potentially dangerous if they occur within healthy blood vessels or if they do not dissolve when their work is done. A *thrombus* is a blood clot that forms along the wall of the heart or a blood vessel. This type of clot can slow blood flow, and if the clot becomes large enough, it may stop the flow of blood in the vessel. An *embolus* is a clot that forms in one area of the body, travels through the bloodstream, and lodges in another vessel in the body. Emboli are less common and more dangerous because they can cause a sudden blockage in blood flow (embolism), which can be fatal. An embolism occurring in an artery will block blood flow to an organ or tissue and can cause tissue damage or death. An embolism in the following locations results in the given condition:

- embolism in a cerebral (brain) artery can cause a stroke
- embolism in a coronary artery can cause a heart attack
- embolism in a pulmonary (lung) artery can cause shortness of breath or death
- embolism in a retinal artery can cause sudden blindness in one eye
- embolism in an artery supplying blood to a limb can cause tissue damage and possibly gangrene
- embolism in any artery leading to an organ can cause loss of that organ's function

Causes and symptoms

Several factors contribute to the formation of blood clots. **Phlebitis** is a condition that may increase abnormal blood clot formation. Blood diseases or other conditions—especially inflammation—that alter the quality of the blood can also affect clot formation.

Both plaque formation in the arteries (**atherosclerosis**) and damaged blood vessels increase the chance of blood clots because they slow blood flow and provide a place for platelets to collect and form a clot. Genetic factors also play a role in predisposition to form blood clots. Diet can have an effect on clot formation as well. **Cholesterol** and saturated fats, which are also implicated in atherosclerosis, can contribute to clot formation. People whose **diets** are low in **essential fatty acids**, vegetables, and fish, and who do not take in proper amounts of nutrients and **antioxidants**, are at a higher risk for clots. Conditions or body positions that slow blood circulation—extended bed rest or sitting in a car or airplane for long periods of time—may cause blood clots to form in the legs. Blood clots can be caused by increased fibrinogen (a blood-clotting factor) due to estrogen in the late stages of **pregnancy** and from long-term use of birth control pills. Other factors include **varicose veins**, **childbirth**, **sickle cell anemia**, **smoking**, **obesity**, liver disease, and cardiovascular disorders.

There may be no obvious symptoms of a blood clot. When symptoms do occur, they often appear suddenly and indicate the location of the clot. Extreme **dizziness** that occurs without warning can indicate a clot in a cerebral artery. Sudden complete or partial blindness in one eye could indicate a clot within the retinal artery. A hard blue bulge in a vein or unexpected **pain** in an arm or leg, along with numbness, weakness, or another sign that blood is not reaching the area, could indicate a blood clot. **Blisters** or ulcers on the skin may occur as well. A clot in an artery near a major organ such as the heart or lung will produce pain or decreased activity in that organ. **Gangrene** (death of tissue) may occur if blood flow to a region is blocked for an extended period of time.

Diagnosis

Patients describe the severity and location of the pain they have been experiencing. A physician may also notice such physical signs of a blood clot as the swelling blue bulge, discoloration of a limb, or an ulcer. Medical personnel check for a missing or lowered pulse or blood pressure in a limb. A Doppler ultrasound examination, angiography, or arteriography may be used to detect the location of the clot. In 2007, the American College of Physicians and the American Academy of Family Physicians endorsed the Wells Prediction Rule for diagnosing venous thromboembolism (a blood clot in a vein rather than an artery). The Wells rule assigns points based on the following conditions in patients:

- Cancer treatment in the previous six months
- Paralysis, paresis, or a plaster cast on the legs or feet
- Recently bedridden for four days or longer or major surgery that required anesthesia within 12 weeks
- Localized tenderness along the deep venous system in the legs, especially the back of the upper legs
- Swelling of the entire leg
- Swelling of the calf of 3 centimeters (1.2 inches) or more compared to a normal calf
- Pitting edema of the leg with symptoms
- Collateral superficial veins in the symptomatic leg

Treatment

Nutritional therapy may include the following: vitamins B_3 (**niacin**), B_6, C, and E; fatty acid and **garlic** supplements; and the minerals **zinc**, **magnesium**, and **manganese**. Herbal remedies may include **cayenne** (*Capsicum frutescens*), other hot peppers, and gingko (*Ginkgo biloba*) to help reduce the protein fibrin, which is a necessary factor in blood clots. **Bilberry** (*Vaccinium myrtillus*), **turmeric** (*Curcuma longa*), and **ginger** (*Zingiber officinale*) help reduce platelets' stickiness, which is essential for clot formation. Onion (*Allium sepa*) and garlic (*Allium sativum*) help reduce fibrin and platelet stickiness. A study by researchers at Brigham and Women's Hospital in Boston reported in 2007 that women who took **vitamin E** supplements reduced their risk of blood clots by 18 percent over women who did not take vitamin E. Several small clinical studies on humans reported that both fresh onions *Allium cepa* and commercial onion extracts actually lower blood cholesterol levels, lower blood pressure, and help prevent the formation of blood clots. Although these studies have been done on only a small number of people, they are consistently supported by additional data from animal and test-tube studies. In addition, many of these properties have been found in garlic, which is a close relative to onion.

Patients who are taking prescribed anticoagulant drugs should consult their doctors before starting vitamin, nutritional, or herbal therapies.

Hydrotherapy treatment for blood clots can include contrast applications. The patient alternates using hot and cold treatments on the body in the area of the clot to increase blood flow. A naturopath will recommend specific remedies based on the symptoms and personality of a particular patient. A remedy for blood clots may include *Hamamelis*. Massage can be helpful if blood clots are a result of poor circulation, although care should be taken if

a person suffers from phlebitis, since a clot could mobilize and lodge elsewhere.

Allopathic treatment

Anticoagulant (anticlotting) drugs are usually prescribed for patients with blood clots. The drug streptokinase helps dissolve clots that are already present in the body. Heparin inhibits platelet clumping and can be prescribed after surgery when blood is likely to clot. One promising treatment to prevent clot formation associated with septic shock is a recombinant form of activated human protein C, a natural anticoagulant. Doctors may prescribe aspirin for people who are at risk for having blood clots, although aspirin can injure the stomach lining. Patients may want to ask their doctors about what can be done to minimize damage from aspirin. Surgery is only recommended to remove blood clots that appear to be life-threatening or will cause tissue death if not removed.

Expected results

If a clot goes undetected it is potentially dangerous and can lead to a **stroke**, **heart attack**, or other serious complication. Any sudden unexplained pain or loss of function should be checked by a doctor. If the blood flow to a limb is blocked for an extended period of time, gangrene may set in, and the limb may require amputation. Diet and **exercise** can help prevent future clots.

Prevention

Some risk factors, such as genetically related diseases, cannot be minimized. But minimizing other risk factors helps prevent problems with blood clots. Quitting smoking, maintaining correct weight, and improving **nutrition** can help reduce the risk of problematic blood clotting.

A healthy diet with high-fiber, low-cholesterol foods and plenty of fruits and vegetables can help prevent blood clots and many of the conditions that can lead to blood clots, such as atherosclerosis. In addition, such foods as garlic, ginger, onions, and hot peppers can help reduce platelet stickiness and formation of clots. Fish oils and supplements that add nutrients to the diet are recommended as well.

Moderate exercise helps keep off extra weight and improves circulation, both of which help reduce risk factors for formation of blood clots. Exercise can also reduce the risk of blood clots in women who use birth control pills for long periods of time. Those who must sit for long periods of time—on an airplane, in a car, or at work—can help prevent blood clots by wearing loose clothing, walking, and stretching their legs whenever possible. Flexing and releasing the lower body muscles, even while sitting, can help improve circulation as well.

KEY TERMS

Collateral superficial veins—Veins that are readily visible and stick up from the skin surface.

Embolism—Obstruction or blockage in a blood vessel caused by an embolus.

Embolus—A clot that forms in one place in the body and then travels and lodges elsewhere. Emboli is the plural of embolus.

Phlebitis—Inflammation of the blood vessel walls.

Pitting edema—Swelling caused by excess water that can be detected when the skin is pressed with a finger and an indentation remains after the finger is withdrawn.

Thrombus—A clot that forms in the heart or blood vessel and remains there.

Venous thromboembolism—A blood clot in a vein rather than an artery, which, if it breaks free, can travel to a lung.

Resources

BOOKS

Schmukler, Alan. *Homeopathy: An A to Z Home Handbook*. Woodbury, MN: Llewellyn, 2006.

PERIODICALS

Allina, Amy. "The FDA Gets It Right Blood Clots and the Contraceptive Patch." *Women's Health Activist* (January/February 2006): 4.

Compart, Andrew. "WHO Looks at Risks of Blood Clots Among Long Haul Travelers." *Travel Weekly* (July 9, 2007): 14.

Mohn, Tanya. "Flying and Blood Clots: A Deadly Risk." *New York Times* (November 6, 2007): C5.

Sherman, Carl. "Blood Clots: An Updated Guide from the Experts; Two Primary Care Organizations Have Issued New Recommendations that Will Enhance Your Ability to Diagnose and Treat Venous Thromboembolism." *Clinical Advisor* (April 2007): 52(4).

Sherman, Carl. "Curtailing Blood Clots: New Recommendations Address the Diagnosis and Treatment of Venous Thromboembolism." *Cortlandt Forum* (May 2007): 72(3).

"Stockings Sharply Reduce Blood Clots." *Harvard Reviews of Health News* (May 11, 2007): N/A.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Heart Association, 7320 Greenville Ave, Dallas, TX, 75231, (800) 373 242 8721, http://www.americanheart.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Heart and Stroke Foundation of Canada, 222 Queen St., Suite 1402, Ottawa ON, K1P 5V9, Canada, (613) 569 4361, http://www.heartandstroke.ca.

Heather Bienvenue
Ken R. Wells

Blood poisoning

Definition

Blood poisoning, also known as septicemia or sepsis, occurs when the bloodstream becomes infected by bacteria (i.e., staphylococci, streptococci), viruses, or fungi introduced through a wound, **abscess**, or other injury. Septicemia may also originate from a localized infection in the body.

Description

About 100,000 new cases of septicemia occur in the United States each year; approximately two-thirds of the cases are diagnosed in hospitalized patients. Septicemia is an extremely dangerous disorder because it spreads rapidly throughout the body. If bacteria continue to multiply in the bloodstream and the condition progresses to septic shock, blood pressure drops rapidly and organ systems begin to shut down. Septic shock leads to multiple-organ dysfunction syndrome (MODS), and may result in death. Although the mortality rate of patients with sepsis has dropped from 31% in 1979 to 11% in 2004, over 30,000 sepsis patients die in the United States each year. Men are more likely than women to develop sepsis, and the prevalence rate among African Americans is twice the rate seen in Caucasians.

Causes and symptoms

A septic infection can originate in any wound, including **burns**, **cuts**, punctures, scrapes, abscesses, or a soft tissue infection. It can also start as a specific infection such as a **sinus infection** or appendicitis. Invasive surgical procedures and medical devices, such as catheters, vascular access grafts, and intravenous (IV) lines, also carry a risk of introducing bacteria to the bloodstream if not appropriately cared for and cleaned. A large percentage of septicemia patients acquire the infection in a hospital setting.

Septicemia symptoms include

- elevated white blood cell count
- fever and chills
- rapid breathing
- sudden drop in blood pressure
- tachycardia (a rapid, pounding heartbeat)
- confusion and possible loss of consciousness
- warm, flushed skin
- skin irregularities, such as subcutaneous red lines, swelling, bleeding under the skin, or necrosis (tissue death)

Septic shock can occur when septicemia is not treated adequately or quickly enough. Symptoms of septic shock include:

- severe drop in blood pressure (systolic pressure less than 90 mmHg and/or less than 40 mmHg of the patient's baseline blood pressure)
- organ dysfunction (such as kidney failure) due to reduced blood flow to the organ systems
- loss of consciousness

There are some known risk factors for developing septicemia. These include:

- Having a chronic disorder or disease. The body has a difficult time fighting infection if the immune system is already weakened.
- Use of immunosuppressive drugs. These drugs also weaken the immune system.
- Taking intravenous medications or drugs. Needles can introduce infectious organisms into the bloodstream if not used in a sterile manner.

Diagnosis

There is no specific laboratory test for early diagnosis of septicemia. Blood cultures can sometimes determine the presence of bacteria in the bloodstream once the infection has spread; however, a blood culture requires an incubation time of 24 hours or longer. Given the rapidly progressing nature of septicemia, cultures are more effective for confirming the diagnosis and narrowing the choice of antibiotics, as treatment usually must begin before the cultures are complete. In some cases, septicemia patients may have negative blood cultures. Further analysis of blood samples by a trained hematologist may be

required to make a diagnosis. If the infection is thought to have spread from a wound or injury, tissue samples from that site may also be analyzed. Other body fluids, such as urine and sputum, may be cultured for organisms.

Treatment

Septicemia is a potentially fatal, rapidly progressing disease. Any individual who suspects he or she may have septicemia should immediately seek emergency medical care.

Allopathic treatment

Septicemia is treated with a course of intravenous antibiotics. The type of antibiotic used depends on the infectious agent. Blood cultures, wound cultures, and other diagnostic tests will help the healthcare provider select the most effective medication. A catheter is used to drain pus and fluids from abcesses or other sites of infection. Blood pressure medications and fluids are administered to stabilize blood pressure. In cases where the patient is suffering from significant respiratory distress, a ventilator may be required. Further organ support such as dialysis may be administered if the patient progresses to septic shock.

A very promising treatment for sepsis, activated human protein C, has been shown to cut the mortality rate of patients with severe sepsis by 6.1% in the first 28 days after treatment. The drug, also known as drotrecogin alfa, was approved by the FDA in the fall of 2001, and is marketed under the trade name Xigris. It is the only drug approved by the FDA for use specifically in the treatment of severe sepsis. Xigris cannot, however, be given to patients at high risk for active bleeding, including those who have just had surgery, have been diagnosed with an aneurysm or gastrointestinal bleeding, or who are being treated with warfarin (Coumadin) or platelet inhibitors.

Expected results

In 2004, the latest year for which data are available, the mortality rate for patients with septicemia was 11.3%. As the disease progresses to septic shock and organ systems start to be involved, the prognosis worsens. Approximately half of all patients with septic shock die. The patient's overall physical health—especially his or her heart function— has a large bearing on the chance for recovery. Early intervention and aggressive treatment of localized **infections** offer the best chance for survival.

Prevention

Meticulous infection control techniques are the best defense against septicemia. For hospitalized patients who are already at a higher risk of contracting the disease, great care should be taken to treat and clean **wounds**, sutures, and burns using sterile techniques in an antiseptic environment. The same rules apply for maintaining such invasive medical devices as intravenous lines, catheters, and gastric and nasal tubes. The use of these devices should be limited whenever possible.

One controversial form of prevention is the use of antibiotic-coated catheters in hospitalized patients. While these catheters appear to be effective in lowering the sepsis mortality rate, some doctors are concerned that their use may also encourage the development of new **strains** of bacteria resistant to antibiotics.

Individuals can take appropriate precautions when treating cuts, scrapes, and other minor wounds at home. Using clean or gloved hands, these injuries should be thoroughly cleansed of dirt and debris with antibacterial soap and water. A sterile compress containing a preparation of naturally antibacterial, antiseptic herbs such as tea tree (*Melaleuca alternifolia*) or **calendula** (*Calendula officinalis*) can also be used to treat the wound site. A medicated cream or analgesic herbal preparation (e.g., **lavender**, or *Lavandula angustifolia*) can soothe associated **pain** and promote healing. A waterproof bandage will protect the wound from dirt and germs. The healing progress should be monitored closely, and a healthcare provider should be contacted immediately should any of the symptoms of septicemia occur.

KEY TERMS

Blood culture—A test used to find and identify infectious organisms in the blood. Blood drawn from the patient is placed in a culture medium and the sample is observed for the growth of bacteria. If bacteria grow, they are analyzed for identification.

Hematologist—A physician who specializes in the study of blood and diseases of the blood.

Intravenous—Within a vein.

Subcutaneous—Under the skin.

Resources

BOOKS

Baudouin, Simon V., M.D., ed. *Sepsis*. New York: Springer, 2007.
Septicemia. San Diego: ICON Health Publications, 2005.

PERIODICALS

Juan Torresa, Antoni, and Stephan Harbarth. "Prevention of Primary Bacteraemia." *International Journal of Microbial Agents* (November 2007): 80 87.

Naber, C. K. "Future Strategies for Treating *Staphylococcus aureus* Bloodstream Infections." *Clinical Microbiology and Infection* (March 2008): 26 34.
Reddy, Srinivas, et al. "Profile of Opportunistic Infections among Patients on Immunosuppressive Medication." *APLAR Journal of Rheumatology* (September 2006): 269 274.
"Septicemia." *Health Statistics from the Americas* (2006): 19 24.

Paula Ford-Martin
Rebecca J. Frey, Ph.D.
David Edward Newton, Ed.D.

Bloodroot

Description

Bloodroot (*Sanguinaria canadensis*) is a perennial plant with a white flower that blooms in early spring. It belongs to the poppy family (*Papaveraceae*) and grows in wooded areas throughout the northeastern regions of the United States and Canada. The leaves are palm-shaped and the flowers have eight to 12 petals. The root is thick and round and 1–4 in (2.5–10 cm) long. The plant generally grows to a height of 6 in (12 cm).

Bloodroot gets its name from its bright red root that, when cut open, oozes a crimson, blood-like juice. Other names for bloodroot are coon root, Indian plant, snakebite, sweet slumber, paucon, red root, and tetterwort.

Native Americans used bloodroot for medicinal, spiritual, and practical purposes. A dye made from the red sap of the root was used as body paint for war dances and ceremonies, as well as to color fabric. It was used medicinally as a remedy for fevers, **cancer**, rheumatism, to induce **vomiting**, and as an oral antiseptic.

General use

The known active components of bloodroot are isoquinoline alkaloids, which have antibacterial,

The perennial blood root plant. *(© Photo Researchers, Inc. Reproduced by permission.)*

antimicrobial, expectorant, and antiseptic properties. Sanguinarine, a primary alkaloid of bloodroot, is noted for its ability to destroy bacteria that can cause **gum disease** (gingivitis) and dental plaque. In fact, because of its bacteria-inhibiting properties, sanguinarine is an ingredient in many oral hygiene products such as toothpastes and mouthwashes. Sanguinarine also has pain-relieving qualities. A gargle made from bloodroot can be used to soothe a **sore throat**.

Bloodroot is generally prescribed as an external treatment as it is poisonous if ingested in large amounts. However, bloodroot is a powerful expectorant and has been a primary, albeit rare, internal treatment for chronic **bronchitis**, **croup**, coughs, **asthma**, and other respiratory afflictions. In fact, bloodroot was catalogued as an expectorant in the *Pharmocopoeia of the United States* from 1820 to 1926.

Due to its bacteria-fighting compounds, herbalists often recommend bloodroot as a topical application for skin problems such as chronic **eczema**, fungus, **athlete's foot**, ringworm, venereal **blisters**, and **rashes**.

Bloodroot has a long history of use as a folk remedy for cancer. Native Americans used bloodroot to heal various forms of cancers and tumorous growths. Many modern herbalists prescribe a salve made from the root to remove **warts**, growths, and cancerous tumors. Bloodroot is currently the subject of several studies and experiments, but little scientific research has been performed to substantiate the use of bloodroot as a cure for certain cancers. Some studies have revealed that the alkaloid sanguinarine may inhibit the formation of tumors. However, the safety and effectiveness of its use has not been fully evaluated.

Preparations

The parts used medicinally are the whole plant and root, or rhizome, which is collected in the fall.

Bloodroot is an ingredient in some homeopathic remedies, pharmaceutical preparations, **cough** formulas, toothpaste, and mouthwash. It is also available as a tincture and in dried root form, chopped and in powder.

A salve made from bloodroot can be used to remove warts and other growths.

Precautions

Bloodroot is a potentially toxic herb. Take internally only under the supervision of a health care professional or qualified herbalist. (Topical use on unbroken skin is generally safe.)

Internal use of this herb should be supervised by a health care professional.

Pregnant or nursing women or women who are trying to conceive should avoid this herb.

Long term internal consumption may contribute to **glaucoma**. Persons with glaucoma should not use bloodroot.

The internal use of bloodroot by children is considered unsafe.

KEY TERMS

Alkaloid—An organic compound found in plants. It possesses a wide range of therapeutic and sometimes toxic properties.

Antimicrobial—A substance that kills microorganisms (bacteria, fungus, parasites) or stops their growth.

Antiseptic—A substance that prevents infection.

Expectorant—A substance that acts to promote coughing and mucus secretion from the lungs and respiratory tract.

Perennial—A plant that grows every year without reseeding.

Tincture—An alcohol extract of fresh or dried herb.

Salve—Topical ointment or paste made by blending it with olive oil, then mixing it with melted beeswax.

Side effects

Internal doses in excess of 300 mg have been shown to cause vomiting. Higher doses are considered toxic and poisonous.

When taken in excess, bloodroot can also cause **nausea**, impaired vision, intense thirst, **dizziness**, a slowed heart rate, and a burning of the stomach.

Bloodroot contains skin-irritating compounds. When applied topically it may burn the skin or cause the skin to become red.

Interactions

Toothpastes or mouthwashes usually only contain small amounts of sanguinarine and are considered safe for long-term use.

Resources

BOOKS

Chevalier, Andrew. *The Encyclopedia of Medicinal Plants*. DK Publishing Inc., 1996.

Heinerman, John. *Heinerman's Encyclopedia of Healing Herbs and Spices*. Parker Publishing Company, 1996.

Jennifer Wurges

Bloodwort *see* **Yarrow**

Blue-green algae *see* **Spirulina**

Blue gum *see* **Eucalyptus**

Blue cohosh

Description

Blue cohosh *Caulophyllum thalictroides* is a perennial flowering plant that grows in moist forest regions throughout the eastern United States. The plant—also known as squaw root, blue ginseng, papoose root, and yellow ginseng—grows up to 3 ft (1 m) tall, and its greenish yellow flowers turn into small blue berries in autumn. The berries of the plant are toxic and should not be used for medicinal purposes. The root of the plant, harvested in the fall, is the part used medicinally, and it has a bittersweet flavor. Blue cohosh has long been believed to conform to the *doctrine of signatures*, which is an ancient idea that the physical shape of plants gives a clue to their medicinal uses. Blue cohosh has branches that are arranged like limbs in spasm, and the herb has been used to treat **muscle spasms**. It should not be confused with an unrelated herb, **black cohosh**, which has different properties, treatment uses, and side effects.

Blue cohosh has been listed on the threatened list in Rhode Island since 2002 by the USDA Natural Resources Conservation Center. It is also on the watch list in several other states due to over-harvesting and habitat destruction. Efforts were underway in the late 2000s by several environmental organizations, such as the Natural Resources Conservation Center and the non-profit organization, United Plant Savers, to conserve and restore native medicinal plants, such as blue cohosh.

Blue cohosh was widely used by Native Americans to treat a variety of conditions, ranging from parasites to nervous disorders. Native Americans referred to the herb as squaw root or papoose root because of its effectiveness in treating female problems, including easing the **pain** of labor and **childbirth**.

Blue cohosh contains several important minerals, including **potassium**, **magnesium**, **calcium**, **iron**, silicon and **phosphorus**. Active ingredients isolated from the herb, called glycosides, include *caulosaponin* and *caulophyllosaponin*. These compounds have been shown to activate smooth muscle contraction and stimulate uterine contractions to induce labor. Blue cohosh also has been shown to reduce muscle spasms (anti-spasmodic).

General use

Blue cohosh is one of the most commonly recommended herbal preparations used to stimulate labor contractions, particularly by nurse-midwives, according to a 1999 survey conducted by the *Journal of Nurse Midwifery*. Blue cohosh may be used when induction of labor is indicated in specific circumstances, such as when uterine contractions are brief or irregular.

In addition to its use to induce labor, blue cohosh has been indicated for the treatment of menstrual problems, such as **amenorrhea** (absence of menstrual cycles), **dysmenorrhea** (painful periods), and menstrual cramps. Because of its antispasmodic properties, blue cohosh also has been used to treat some cases of **asthma**, **colic**, and nervous coughs, as well as to reduce pain in some cases of **rheumatoid arthritis**.

Blue cohosh is used in **homeopathy**, and the homeopathic remedy made from blue cohosh is called Caulophyllum. It may be used to treat menstrual cramps, PMS, dysmenorrhea, and for support during childbirth. Homeopaths may also use Caulophyllum to treat **gout**, rheumatism, false labor pains, and **gonorrhea**.

Preparations

Blue cohosh is available as dried root, capsules, and in tinctures (liquid extracts). To prepare a tea, one ounce of the root can be added to one pint of water and steeped for half an hour. Two tablespoons of the tea can be taken every two to three hours. The root can be ground into powder, and 3–9 g (0.11–0.32 oz) of it can be taken several times per day. For the herbal tincture, the recommended dosage is 5 drops every 4 hours or 10 drops in hot water every 10 hours.

The homeopathic remedy Caulophyllum is available in tablet, liquid dilution, or tincture form in a

wide variety of potencies. Dosing regimens vary among individual practitioners.

Precautions

People diagnosed with **diverticulitis**, gastric ulcers, esophageal reflux, **heart disease**, high blood pressure, or ulcerative **colitis** should not use blue cohosh.

According to the American **Pregnancy** Association (www.americanpregnancy.org), blue cohosh is considered unsafe during pregnancy and should only be taken with extreme caution, under medical supervision. Women who are breastfeeding should not take blue cohosh, as the safety of the herb during lactation is unknown.

Blue cohosh has abortifacient and *emmenagogue* properties, which means it can terminate a pregnancy and stimulate menstrual flow, respectively. Blue cohosh should *never* be used to induce abortion, as it has been shown to cause serious harm to both mother and fetus. One study reported a 21-year-old woman who developed abdominal cramps, heavy sweating, rapid heartbeat, and **nausea** after taking blue cohosh in an attempt to induce abortion.

Caulosaponin is the glycoside compound in blue cohosh that causes the uterus to contract. This compound also causes the blood vessels in the heart to constrict, decreasing the flow of oxygen to the heart, thus having a potentially toxic effect on heart muscle.

The results of several case reports suggest that the use of blue cohosh as an agent for labor induction is unsafe for both the mother and fetus. The earliest case report of harm from a mother's use of blue cohosh was published in 1998. The infant developed congestive heart failure shortly after birth. Additional case reports have shown adverse perinatal events associated with maternal ingestion of blue cohosh, including one infant's inability to breathe spontaneously at birth, resulting in permanent central nervous system hypoxic-ischemic damage, and another infant who had severe congestive heart failure and myocardial infarction at birth, with additional cardiac abnormalities at age two.

Another case report published in the July 15, 2004, issue of the *New Engand Journal of Medicine* described a healthy woman who drank blue cohosh tea to induce labor at 40 weeks gestation, as directed by her obstetrician. The woman had a resulting cesarean section after a failed attempt at vaginal delivery. Within 26 hours of birth, her infant experienced a **stroke**, with focal motor seizures of the right arm. A computed-tomography scan showed an infarct in the cerebral artery. Interestingly, the baby's urine and meconium tested positive for the cocaine metabolite benzoylecgonine, and the mother's bottle of blue cohosh also tested positive for this metabolite. Although the finding should be interpreted with caution, the authors of the case report indicated the causal relationship between the herbal preparation and the infant's condition required further study.

Several systemic literature reviews verify the conclusion from these case reports that there is insufficient data to support the efficacy and safety of blue cohosh for use as an agent to induce labor. Although the body of literature elicits caution regarding the extensive use of blue cohosh during pregnancy, more research is needed to provide definitive conclusions, especially since the data about the dosage, frequency and duration of use in several of these case reports are varied and, in some cases, unclear.

Side effects

In addition to potentially toxic cardiac effects, including perinatal stroke, the side effects of blue cohosh include nausea and **vomiting**, chest pain, headaches, difficulty breathing, tightness in the throat, excessive thirst, skin rash, muscle weakness, and general weakness.

Symptoms of an overdose of blue cohosh resemble those of nicotine poisoning and may include muscle weakness, convulsions, violent stomach cramps, **headache**, loss of coordination, and heart failure.

Interactions

Several herbs are frequently used with blue cohosh in formulas for improving menstrual problems, including false unicorn root, **chasteberry tree**, **angelica**, and rue. To reduce the risk of miscarriage during pregnancy, blue cohosh may be combined with false unicorn root and **cramp bark**. To induce labor, blue cohosh may be taken with black cohosh, under the supervision of a skilled medical professional.

With regard to prescription medications, blue cohosh interferes with the effectiveness of nitrates, calcium channel blockers, and **digitalis** (drugs given to treat high blood pressure and heart disease, including heart failure). It opposes the activity of drugs given to control diabetes. Blue cohosh should not be taken with prescription diuretics as it can intensify their effects and cause a loss of potassium from the body.

KEY TERMS

Abortifacient—A drug or device used to terminate an unwanted pregnancy. Blue cohosh has abortifacient properties.

Antispasmodic—A substance that relieves spasms in blood vessels or cramping in muscles. Blue cohosh has antispasmodic properties.

Caulosaponin—The chemical compound found in blue cohosh that is used to stimulate uterine contractions during labor. It can have toxic side effects in humans.

Dysmenorrhea—Painful menstruation.

Miscarriage—Case when a fetus is prematurely ejected from the uterus during pregnancy.

Uterus—Female reproductive organ located in the lower abdomen that contains the fetus during pregnancy.

Resources

BOOKS

Skendiri, Gazmend. *Herbal Vade Mecum*. Rutherford, NJ: Herbacy Press, 2006.

PERIODICALS

Dugoua J., D. Perri, D. Seely, E. Mills, and G. Koren. "Safety and Efficacy of Blue Cohosh (Caulophyllum Thalictroides) During Pregnancy and Lactation." *Canadian Journal of Clinical Pharmacology* 15, no. 1(January 2008): e66 e73.

Kistin S. J., and A. D. Newman. "Induction of Labor with Homeopathy: A Case Report." *Journal of Midwifery and Women's Health* 52, no. 3 (May 1, 2007): 303 307.

Smith, C. A. "Homoeopathy for Induction of Labour." *Cochrane Database of Systemic Reviews* no. 4 (2007).

OTHER

"HerbalGram." *Journal of the American Botanical Council*. 6200 Manor Rd., Austin, TX 78723. (800) 373 7105. www.herbalgram.org.

Natural Resources Conservation Center, USDA. The PLANTS Database, National Plant Data Center, Baton Rouge, LA 70874 4490. http://plants.usda.gov.

ORGANIZATIONS

American Academy of Clinical Toxicology, 777 East Park Dr., PO Box 8820, Harrisburg, PA, 17105, (717) 558 7847, www.clintox.org.

American Botanical Council, 6200 Manor Rd, Austin, TX, 78723, (800) 373 7105, www.herbalgram.org.

American Herbal Pharmacopoeia, PO Box 66809, Scotts Valley, CA, 95067, (831) 461 6318, www.herbal ahp. org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agriculture. 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov/.

Herb Research Foundation, 4140 Fifteenth St, Boulder, CO, 80304, (303) 449 2265, www.herbs.org.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, www.nationalcenterforhomeopathy.org.

Douglas Dupler
Rebecca J. Frey, PhD
Angela M. Costello

Body lice *see* **Lice infestation**

Body odor

Definition

Body odor is the unpleasant smell caused by the mixing of perspiration, or sweat, and bacteria on the skin. Sweat is generally an odorless body secretion. When bacteria multiply on the skin and break down these secretions, however, the resulting by-products may have a strong and disagreeable odor. This odor is often due to poor personal hygiene, but excessive perspiration or some other underlying disease is sometimes involved.

Causes and symptoms

People produce two kinds of sweat, eccrine and apocrine. Eccrine sweat glands secrete a mixture of water, salt (**sodium** chloride), urea, and lactic acid onto the skin. When a person is overheated, sweat seeps over the body, especially where the eccrine glands are numerous. These glands are concentrated in the armpits, the palms of the hands, the soles of the feet, and the forehead. As the sweat dries off, the skin is cooled by the surrounding air. Eccrine glands do not release any tissue cells or cell contents into their watery secretions.

In contrast with eccrine sweat, apocrine sweat is a heavier liquid containing various organic substances, including pheromone hormones. These glands are found mostly under the arms and around the groin. They develop during puberty, and are thought to serve a biological function in sexual attraction. Apocrine glands take their name from the fact that these glands release the apical portion, or tip, of the secreting cell into the liquid along with the other substances.

Sweat is essentially odorless when it is secreted, and the sweat from the eccrine glands remains so. It creates, however, a moist environment in which some of the bacteria that naturally occur on human skin can multiply. These bacteria are attracted to the sweat produced by the apocrine glands, and a strong odor is produced when these substances interact. On the other hand, the eccrine sweat glands may also help to regulate the types of bacteria on the body surface. Researchers in Germany have recently discovered that these glands secrete a peptide that has antimicrobial properties strong enough to kill some disease bacteria.

People who have a condition known as hyperhidrosis tend to sweat excessively, and therefore, they are more likely to develop a strong body odor. Bromhidrosis is the name for a medical condition in which an individual's sweat always has an unpleasant odor.

The human body normally has a slight sweaty or musky odor. Generally, bathing with soap and water, together with the use of deodorants or antiperspirants, is sufficient to prevent a truly unpleasant, unhealthy odor. There are, however, several factors that may contribute to chronic body odor. These include:

- Poor hygiene and inadequate bathing.
- An imbalance in the bacteria that inhabit the gut. Antibiotics may contribute to this condition.
- An inborn error of metabolism or some other problem that may cause about 7% of those suffering from body odor to be unable to digest certain foods. These undigested foods, which are often proteins, cause the body to give off unpleasant odors.
- Certain medications, including bupropion (Wellbutrin), venlafaxine (Effexor), tamoxifen, and pilocarpine (Salagen). These drugs may be responsible for the excretion of odors.
- Such disease conditions as liver disease, kidney disease, diabetes mellitus, a yeast infection, fungal infections, or gastrointestinal disorders may lead to body odor.
- Pathological skin conditions, including cancer, hemorrhoids, and ulcers, may produce unpleasant smelling discharges on the skin or body surface.
- Coffee and other stimulants increase apocrine gland secretion, increasing the possibility of unpleasant odors.
- States of high anxiety and stress that stimulate perspiration may increase the risk of body odors.
- Chain-smoking and heavy drinking. Alcohol and nicotine increase the rate of perspiration.

Diagnosis

Since body odor may be caused by an underlying condition, a thorough medical exam is recommended along with a blood screen and blood chemistry panel.

Treatment

The following remedies are mostly for the topical relief of body odor. For more thorough treatment, the underlying conditions should also be addressed.

- Two or three charcoal capsules per day for several weeks can help absorb waste products and reduce fermentation that may cause body odor.
- Chlorophyll tablets can be taken by mouth to absorb body toxins and odors.
- Sage tea, *Salvia officinalis*, or sage extracts can be taken internally and an undiluted alcohol extract of sage can be applied under the arms.
- Essential oils of rosemary, *Rosmarinus officinalis,* and thyme, *Thymus vulgaris,* can be used under the arms or on the feet.
- Baking soda or body powder will keep affected areas dry and absorb or mask odors.
- The diet should be altered to improve digestion, ensure regular bowel movements, and resolve constipation. There should be an increased intake of fluids to flush the system; six to eight glasses of water should be consumed daily.

Allopathic treatment

Mostly topical treatments are recommended. These include the use of antiperspirants containing chlorhexidine or aluminum chloride applied under the arms, around the groin, on the feet, or under the breasts to relieve odor and wetness. Deodorant preparations that do not contain antiperspirants also work well. Topical antibacterial creams or lotions may also be used. In cases of unrelieved excess sweating, a physician may suggest surgical removal of the sweat glands beneath the armpits.

Prevention

Good hygiene practices are important in preventing body odor. These include regular baths or showers; wearing cotton socks and non-synthetic shoes that breathe; changing the socks once or twice daily; and keeping the feet dry and bare as much as possible. Special foot powders and odor-absorbing shoe inserts may be helpful if foot odor is a particular problem.

Some foods and spices can intensify body odor. Onions, **garlic**, and cumin contain oils that may cause

KEY TERMS

Apocrine—A type of glandular secretion in which the top portion of the secreting cells is released along with the secreted substances.

Blood chemistry panel—A general set of tests measuring substances in the blood that may indicate common diseases.

Bromhidrosis—A medical condition in which a person's sweat always smells unpleasant.

Eccrine—A type of gland that produces a clear watery secretion without releasing cells or cell contents into the secretion.

Hyperhidrosis—A condition in which a person produces excessive amounts of perspiration.

Pheromone hormones—Substances secreted in order to bring out a response from other members of the same species, particularly in regard to sexual arousal.

Topical—Applied on the surface of the body.

odor as they are excreted through the skin. **Caffeine** and nicotine increase sweating and therefore the risk of odor.

Resources

BOOKS

Dollemore, Doug, and the Editors of Prevention Health Books for Seniors. *The Doctor's Book of Home Rem edies for Seniors*. New York: St. Martin's Press, 2000.

The Editors of Prevention Magazine Health Books. *The Doctor's Book of Home Remedies II: Simple, Doctor Approved Self Care Solutions for 146 Common Health Conditions*. Emmaus, PA: Rodale Press, 2002.

PERIODICALS

Stephenson, Joan. "Sweat Defense." *Journal of the American Medical Association* 286 (December 12, 2001): 2801.

OTHER

HealthWorld Online. http://www.healthy.net.

Patience Paradox
Rebecca J. Frey, PhD

Boils

Definition

Boils are bacterial **infections** of hair follicles and the surrounding skin that form pustules around the follicle. Boils are sometimes called furuncles. When several furuncles merge to form a single deep sore with several "heads," or drainage points, the result is called a carbuncle.

Description

Boils are firm, red swellings about 5–10 mm across that are slightly raised above the skin surface. They are sore to the touch. A boil usually has a visible central core of pus; a carbuncle is larger and has several visible heads. Boils occur most commonly on the face, back of the neck, buttocks, upper legs and groin area, armpits, and upper torso. Carbuncles are less common than single boils; they are most likely to form at the back of the neck. Men are more likely than women to develop carbuncles.

As the infection that causes the boil develops, an area of inflamed tissue gradually forms a pus-filled swelling or pimple that is painful to touch. As the boil matures, it forms a yellowish head or point. It may either continue to swell until the point bursts open and allows the pus to drain, or it may be gradually reabsorbed into the skin. It generally takes between one and two weeks for a boil to heal completely after it comes to a head and discharges pus. The bacteria that cause the boil can spread into other areas of the skin or even into the bloodstream if the skin around the boil is squeezed. If the infection spreads, the patient will usually develop **chills**, **fever**, and swollen lymph nodes. Red lines may appear on the skin running outward from the boil.

Boils and carbuncles are common problems in the general population, particularly among adolescents and adults. People who are most likely to develop these skin infections include those with:

- diabetes, especially when treated by injected insulin
- alcoholism or drug abuse
- recent experience of childbirth, especially women who are breastfeeding their babies
- poor personal hygiene
- crowded living arrangements
- jobs or hobbies that expose them to greasy or oily substances, especially petroleum products
- hair styles requiring frequent use of hair relaxers
- allergies or immune system disorders, including HIV infection

Causes and symptoms

Boils are most often caused by *Staphylococcus aureus* (staph), a bacterium that causes an infection in an oil gland or hair follicle. Although the surface of human skin is usually resistant to bacterial infection,

staph can enter through a break in the skin surface, including breaks caused by needle punctures for insulin or drug injections. Hair follicles that are blocked by greasy creams, petroleum jelly, hair relaxers, or similar products are more vulnerable to developing boils. These bacterial skin infections can be spread by shared cosmetics or washcloths, close human contact, or by contact with pus from another boil or carbuncle.

Carbuncles are formed when the bacteria infect several hair follicles that are close together. Carbunculosis is a word that is sometimes used to refer to the development of carbuncles. The abscesses spread until they merge with each other to form a single large area of infected skin with several pus-filled heads. Patients with carbuncles may also have a low-grade fever or feel generally unwell.

Furunculosis is a word used to refer to recurrent boils. Many patients have repeated episodes of furunculosis that are difficult to treat because their nasal passages carry colonies of staph. Skin and anal colonization are fairly common as well. Persistent furunculosis may be an indication of a depressed immune system. A physician should be consulted if boils are a persistent problem in order to determine whether there is an underlying disease such as diabetes, HIV infection, or immune system disorders.

Diagnosis

A diagnosis of boils is usually made on the basis of visual examination of the skin. For the most part, boils are not difficult to distinguish. A doctor can make a culture from pus taken from the boil to confirm the diagnosis and treatment. The patient's nasal discharge may also be tested. In cases of persistent recurrent boils, family members or close contacts may be examined to see if they are carriers of staph.

Treatment

Patient education is an important part of the treatment of boils. Patients need to be warned against squeezing boils because of the danger of spreading the infection into other parts of the skin or bloodstream. It is especially important to avoid squeezing boils around the mouth or nose, because infections in these areas may be carried to the brain, although this happens rarely. Patients should also be advised about keeping the skin clean, washing their hands carefully before and after touching the boil, avoiding the use of greasy cosmetics or creams, and keeping their towels and washcloths separate from those of other family members.

The use of the following supplements is reported to be effective in treating boils: **zinc**, 45 mg per day; **vitamin A**, 50,000 IUs per day for two weeks; **vitamin C**, 1 g three times per day; and beta-carotene, 100,000 IUs per day.

Taking the proper homeopathic medication in the first stages of a boil can bring about early resolution of the infection and prevent pus formation. The most likely choices are **belladonna** or ***Hepar sulphuris***. If the boil has already formed, ***Mercurius vivus*** or **silica** may be recommended to bring the pus to a head.

A variety of herbal remedies can be applied topically to fight infection. These include **essential oils** of bergamot, *Citrus bergamia;* **chamomile**, *Matricaria recutita;* **lavender**, *Lavandula officinalis;* and **sage**, *Salvia officinalis;* as well as **tea tree oil**, *Melaleuca spp*. Application of a paste or poultice containing **goldenseal** root, *Hydrastis canadensis,* is recommended to help kill bacteria and to reduce inflammation. Washing the skin around the affected area with a mixture of goldenseal, *Hydrastis canadensis,* and **witch hazel**, *Hamamelis virginiana,* dissolved in warm water is also recommended.

Allopathic treatment

Boils are usually treated with application of antibiotic creams, following the application of hot compresses. The compresses help the infection to come to a head and drain and are an important part of the treatment regime. Carbuncles and furunculosis are usually treated with oral antibiotics as well as antibiotic creams or ointments. The usual course of oral antibiotics is 5-10 days; however, patients with recurrent furunculosis may be given oral antibiotics for longer periods. Patients with bacterial colonies in their nasal passages are often given mupirocin ointment (Bactroban) to apply directly to the lining of the nose and should wash the area once a month with an antiseptic soap such as Phisohex.

Boils or carbuncles that are very large or that do not resolve may be opened with a sterile needle or surgical knife to allow the pus to drain. Surgical treatment of boils is often painful and usually leaves noticeable scars.

The increase of antibiotic- and biocide-resistant **strains** of *Staphylococcus aureus* has caused growing concern among doctors, as some of these strains are now resistant to disinfectants used to clean endoscopes and other surgical equipment. **Resveratrol**, which is a phytoalexin, or compound formed by plants at the site of a fungal or bacterial invasion, appears to be highly effective in treating boils and other skin infections in humans caused by *S. aureus*.

KEY TERMS

Antiseptic—A substance that works to inhibit the growth and reproduction of bacteria and viruses.

Biocide—Any chemical that works to kill microorganisms and other forms of life by poisoning. Hospital disinfectants are examples of biocides.

Carbuncle—A localized skin inflammation consisting of deep interconnected boils.

Compress—Cloth applied to heat, cold or medication to the skin.

Follicle—The small sac at the base of a hair shaft. The follicle lies below the skin surface.

Furuncle—The medical name for a boil.

Phytoalexin—A type of compound formed in a plant at the site of invasion by microorganisms that helps the plant resist disease. A phytoalexin called resveratrol appears to be useful in treating boils.

Pustule—A small raised pimple or blister-like swelling of the skin that contains pus.

Expected results

Boils usually drain or are reabsorbed in two or three days. Recurrent boils and carbuncles, however, are fairly common. In addition, although the spread of infection from boils is relatively unusual, there have been deaths reported from brain infections caused by squeezing boils on the upper lip or in the tissue folds at the base of the nose.

Prevention

To minimize the risk of developing bacterial skin infections the skin should be kept clean; to avoid spreading the infection, washcloths, towels, and facial cosmetics should not be shared with others. A healthy diet should be maintained and allergic foods should be eliminated. This will ensure that the immune system will be supported, and that boils will be prevented.

Resources

BOOKS

Conn, Rex B., ed., et. al. *Current Diagnosis 9*. Philadelphia: W.B. Saunders, 1997.

Rakel, Robert E., ed. *Conn's Current Therapy*. Philadelphia: W.B. Saunders, 1998.

Tierney, Jr., Lawrence, ed., et. al. *Current Medical Diagnosis & Treatment, 1998*. Connecticut: Appleton & Lange, 1997.

Turkington, Carol A., and Jeffrey S. Dover. *Skin Deep: An A Z of Skin Disorders, Treatments, and Health*. New York: Facts On File, 1996.

PERIODICALS

Amir, L. "Breastfeeding and *Staphylococcus aureus*: Three Case Reports." *Breastfeeding Review* 10 (March 2002): 15 18.

Chan, M. M. "Antimicrobial Effect of Resveratrol on Dermatophytes and Bacterial Pathogens of the Skin." *Biochemical Pharmacology* 63 (January 15, 2002): 99 104.

Fraise, A. P. "Susceptibility of Antibiotic Resistant Cocci to Biocides." *Journal of Applied Microbiology* 92 (2002 Supplement): 158S 162S.

Kaur,B. J., H. Singh, and A. Lin Greenberg. "Irritant Contact Dermatitis Complicated by Deep Seated Staphylococcal Infection Caused by a Hair Relaxer." *Journal of the National Medical Association* 94 (February 2002): 121 123.

Oliveira, D. C., A. Tomasz, and H. de Lencastre. "Secrets of Success of a Human Pathogen: Molecular Evolution of Pandemic Clones of Methicillin Resistant *Staphylococcus aureus*." *Lancet Infectious Diseases* 2 (March 2002): 180 189.

Patience Paradox
Rebecca J. Frey, PhD

Bonemeal

Description

Bonemeal is a product created from the waste resulting from the slaughter of animals, especially beef cattle, by meat processors. It is a white powder made by grinding either raw or steamed animal bones. This results in a product that contains the same nutrients necessary for the production of, and maintenance of, bone in both humans and animals.

The composition of bonemeal can vary. **Phosphorus**, in the form of chemical compounds related to phosphates, makes up 20–30% of the powder. In addition to its mineral content, depending upon the amount of tendon and muscle left on the bones, bonemeal can be a fairly good source of protein.

The nutrients typically present in bonemeal include the minerals **calcium**, phosphorus, **iron**, **magnesium** and **zinc**, as well as traces of other elements. Bonemeal, especially when not steamed or cooked, is also rich in vitamins A and D.

General use

Calcium is the most significant nutrient in bonemeal. Calcium is particularly significant to women because of its essential role in the prevention of **osteoporosis**. A 1999 report of the American Dietetic Association and Dietitians of Canada entitled *Women's Health and Nutrition* states that either osteoporosis or osteopenia affects more than 30 million Americans (mostly women).

That same report states that osteoporosis is an irreversible disease process. However, it has been found that increasing bone mass early in life may prevent its occurrence or at least lessen its severity. Bone is living tissue that is, like other cells in the body, in a constant state of buildup and breakdown. This process of bone buildup and breakdown is very dependent upon the amount of calcium taken in. Calcium, especially when ingested along with **vitamin D**, increases bone mass, and can actually sustain the health of bones during the later portions of a woman's life when the body naturally loses bone during **menopause** and old age. It is estimated that menopausal women age 50–60 can lose 10–40% of their bone mass.

It is consistently reported that American women are not meeting even minimum requirements for calcium intake according to the recommendations of the American Dietetic Association (ADA). Although the ADA recommends that people's intake of calcium be consumed via foods rich in this element, such as low-fat dairy foods, it further recognizes that some people cannot eat these foods at all, or cannot take in sufficient quantities to maximize bone health. It therefore concludes that for those persons who cannot consume sufficient calcium rich foods, it will usually be necessary for them to take supplements containing calcium, and sometimes vitamin D as well. Bonemeal provides both of these nutrients. Recent research even reports that calcium supplements can help prevent formation of **kidney stones** when combined with a fairly low animal protein, low salt diet. Doctors once advised a low-calcium diet to prevent kidney stones.

Bonemeal, with its 20–30% phosphate content, is an important organic fertilizer used in gardening of all types. Raw bonemeal works more slowly as a fertilizer than steamed bonemeal. Both work more slowly than other fertilizers, making bonemeal an ideal source of nourishment for bulb plants, such as tulips, crocuses, daffodils, and irises, that are planted several months before growth and blooming occur.

KEY TERMS

Osteopenia—A disease of the bone, characterized by reduced bone mass leading to increased susceptibility to fractures. It is common among teenaged girls, and is often responsible for fractures of the lower arm.

Ruminant—Any of various hoofed, even-toed, usually horned mammals of the suborder Ruminantia, such as cattle, sheep, goats, deer, and giraffes.

Preparations

Bonemeal tablets are available from health food stores. A typical dose of four tablets per day would commonly contain the following nutrients:

- calcium: 880 mg
- phosphorus: 400 mg
- iron: 1.8 mg
- natural vitamin A: 4,000 units
- natural vitamin D: 400 units
- red bone marrow: 15 mg

Precautions

Phosphates present in bonemeal could potentially be leached into water systems if bonemeal fertilizer is used along shorelines. Phosphates have the capability to drastically alter the chemical makeup of lakes and rivers, and can kill aquatic life if present in sufficient quantities.

Many bonemeal products contain high, even dangerous, levels of lead. Labels should be read carefully to make sure the product has been tested. Unfortunately, preliminary research in the United Kingdom in 2002 found that the bone-boosting effects of calcium supplements did not have the same long-lasting effects of drinking milk.

Resources

PERIODICALS

Affenito, Sandra G., and Jane Kerstetter. "Position of the American Dietetic Association and Dietitians of Can ada: Women's Health and Nutrition." *Journal of the American Dietetic Association* 1999.

"Calcium Supplements' Effects Short lives." *Nutraceuticals International* (January 2002).

"Unrestricted Calcium Intake Protects Against Recurrent Kidney Stones Better than a Restricted Calcium Diet." *Environmental Nutrition* (March 2002): 3.

OTHER

MacDonald, Sarah. *Phosphorus Boosters*. Canada/Nova Scotia Agreement on the Agricultural Component of the Green Plan.

New Zealand Federal Ministry of Agriculture. *Part II: Addressing The Issue*. 1997.

Vitamin Power. "Bone Meal Plus." http://vitaminpower.com/.

Joan Schonbeck
Teresa Odle

Boneset

Description

Boneset (*Eupatorium perfoliatum*) is a common perennial that is native to the eastern United States and Canada, with a range from Nova Scotia to Florida. Other names for boneset are feverwort, sweat plant, and thoroughwort. The Native American name for boneset translates into ague-weed (ague is the name for malarial **fever**). The common name, boneset, comes from break-bone fever, an influenza-like illness causing severe bone **pain** that was treated with *Eupatorium perfoliatum*.

Boneset prefers a damp environment and is found in marshes and meadows, often at the edge of a wooded area. Although boneset can reach a height of 5 ft (1.5 m), it is usually only 2–4 ft (0.6–1.2 m) tall. It has an erect, round, hairy stem that branches at the top. The leaves are large (4–8 in, or 10–20 cm, long), directly across from one another, and are joined at the stem. Lower leaves are large, and they become progressively smaller higher up the plant. They are spear shaped with toothed edges and pointy tips, have prominent veins, a rough topside, and a downy, dotted, sticky underside.

Boneset. *(©PlantaPhile, Germany. Reproduced by permission.)*

Boneset blooms between July and September. Large, numerous, white or purple flower clusters, which appear at the ends of the branches, are comprised of 10–20 florets (small flowers). Boneset has a faint aroma and a very bitter taste.

Constituents and bioactivities

Boneset contains a wide variety of compounds with biological activity that contribute to its medicinal value. Constituents of boneset include:

- sesquiterpene lactones (euccannabinolide, eufoliatin, eufoliatorin, eupafolin, euperfolide, euperfolitin, and helenalin)
- polysaccharides (4-0-methylglucuroxylans)
- flavonoids (astragalin, eupatorin, hyperoside, kaempferol, quercitin, rutin, etc.)
- diterpenes (dendroidinic acid and hebenolide)
- sterols
- volatile oil
- tannic acid
- resin
- gum

Sesquiterpene lactones have antimicrobial, antitumor, and cytotoxic activities. The flavonoid eupatorin has cytotoxic activity. Sesquiterpene lactones and polysaccharides stimulate the immune system. Boneset extracts also activate defense mechanisms against viral **infections**.

Boneset has stimulant, febrifuge (reduces body temperature), laxative (promotes bowel movements), diaphoretic (promotes sweating), bitter, tonic (restores tissue tone), anti-spasmodic (relieves **muscle spasms**), carminative (relieves intestinal **gas**), and astringent (causes skin contraction) activities.

General use

Boneset was used by Native Americans (who later taught the colonists) to treat **influenza**, colds, and other infectious diseases as well as fever, arthritis, and rheumatism. By the eighteenth and nineteenth centuries, European settlers considered boneset to be a cure-all. As a result, boneset was used to treat many different diseases and conditions. It was, perhaps, among the most widely used herbal medicines in the United States. Dried boneset was kept on hand by families, as well as doctors, for immediate use, especially during the flu season.

Boneset is used to treat colds, influenza, fevers, coughs, upper respiratory tract congestion, migraine, **headache**, skin conditions, **worms**, **malaria**, **constipation**, arthritis, muscular rheumatism, **jaundice**, and general debility. Boneset is also used to treat secondary infections that arise during colds or flu. Secondary infections, such as **bronchitis**, **pneumonia**, or **tonsillitis**, are infections that occur while the patient has another illness. Currently, herbalists recommend boneset primarily for relieving the aches and pains associated with fever, clearing congestion, and relieving pain caused by arthritis and rheumatism.

Boneset is considered to be among the best remedies for the flu. Its wide spectrum of activities brings relief to the many symptoms associated with the flu. It helps reduce fever by promoting sweating, reduces aches and pains, and relieves congestion by loosening phlegm and promoting coughing. Boneset also stimulates the immune system, which promotes the destruction of the influenza virus.

Preparations

All above-ground portions of the plant have medicinal value. Boneset is harvested after flowering has begun. The biological activities can be extracted either in water or alcohol, or the plant can be used as the fresh or dried herb. Boneset is used in the dried form and is available commercially as dried flowers and leaves, as a tincture (an alcohol solution), and in tablets and capsules.

Boneset is usually taken as an infusion (tea). To make the infusion, 2-3 teaspoons of dried herb are steeped in one cup of boiling water for 10-15 minutes. To improve boneset's bitter taste, lemon and honey may be added to the infusion, or the infusion may be mixed with a flavorful herbal tea or fruit juice.

Boneset may be taken as soon as flu symptoms appear. To treat influenza, fever, or colds, one cup of hot boneset infusion should be drunk every two hours—up to six cups daily—for two days. Then the dose can be reduced to four cups daily. High doses shouldn't be taken over a long period of time. The tea should be stopped if it has been used for a week and has not helped improve symptoms. To act as a diaphoretic, the patient should remain in bed covered with multiple blankets. Sweating begins after the patient has drunk four to five doses of the hot infusion. Up to four cups may be drunk within six hours; however, the patient should not drink more than six cups within 24 hours. Alternatively, 2-4 ml of the tincture may be taken three times a day.

KEY TERMS

Cytotoxic—An agent that destroys the cells of a specific organ. Anticancer agents are cytotoxic.

Diaphoretic—An agent that induces sweating that is usually used to treat fever.

Perennial—A plant that regrows each year from its roots.

Tonic—An agent that restores normal tone to tissues. Tonics are used to treat indigestion, general debility, and other disorders.

When taken in larger doses, boneset infusion can act as an emetic (causes **vomiting**) and purgative (causes evacuation of the bowels). Boneset infusion is drunk cold, in moderate doses (one-fourth cup), to act as a tonic to treat **indigestion** and general debility.

Boneset may be taken in combination with **cayenne**, **elder** flowers, **ginger**, **lemon balm**, **peppermint**, or **yarrow** to treat influenza. For bronchial conditions, boneset may be taken with **pleurisy** root and elecampane.

Precautions

Fresh boneset contains tremerol, a toxic chemical which can cause rapid breathing and vomiting. Higher doses can cause coma and death. Dried boneset does not contain tremerol. Boneset may cause liver toxicity, so alcoholics and people with liver disease should consult an herbalist before using this herb. Boneset should not be taken for longer than two weeks at a time.

Side effects

Boneset does not generally cause any serious side effects. However, taking large doses of boneset may cause **nausea** or **diarrhea**. Boneset may cause liver toxicity in chronic high doses.

Interactions

As of early 2000, there was no evidence of interactions between boneset and other herbals or conventional medicines.

Resources

PERIODICALS

Sharma, Om P., Rajinder K. Dawra, Nitin P. Kurade, and Pritam D. Sharma. "A Review of the Toxicosis and Biological Properties of the Genus Eupatorium." *Nat ural Toxins* 6 (1998): 1 14.

OTHER

"Boneset." *A Modern Herbal*. http://www.botanical.com/botanical/mgmh/b/bonese65.html.

"Boneset." *Planet Botanic*. http://www.planetbotanic.com/boneset.htm.

Hoffman, David L. "Boneset." *HealthWorld Online*. http://www.healthy.net/library/books/hoffman/materiamedica/boneset.htm.

Belinda Rowland

Bone spurs

Definition

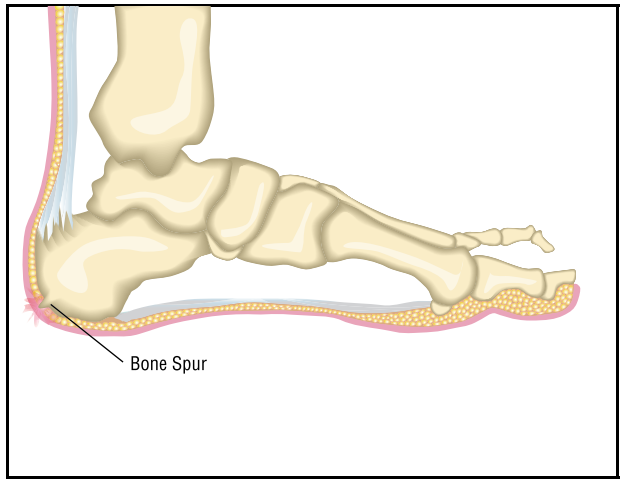
Bone spurs are abnormal, bony growths at the end of bones. They are most commonly located in the spine or other weight-bearing joints.

Description

Bone spurs may grow on the ends of bones in any part of the body. The spurs have no protective cartilage, as other bones do, and may rub against other bones, blood vessels, or nerves. The spurs may cause slight discomfort or severe **pain**.

Causes and symptoms

Bone spurs have several possible causes. Some are a result of **osteoarthritis**. This condition begins without symptoms from age 20–30, and is marked by the loss of cartilage in the joints. Once the cartilage is gone, there is no cushion to protect the joints from the strain of physical activity or bearing weight. The bones rub together and bone spurs may grow in and around the joints. By the age of 70, almost everyone is afflicted with this condition. Bone spurs can also be found in older adults who have disk problems. As people grow older, the disks in the spinal column can become tough and shrink. The distance between the vertebrae decreases as the disks shrink, and bone spurs, or knobby growths, then appear on the vertebrae. Those who have placed an excessive amount of **stress** on their bodies, such as dancers, athletes, and laborers may develop bone spurs.



A bone spur. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

Spurs in particular regions of the spine may cause pain in a specific area. Those located in the upper vertebrae of the neck (cervical region) may cause stiffness and pain in the back and neck.

Spurs located in the feet can be particularly painful. Bone spurs occur most often on the heel (**heel spurs**), but can be found on any part of the foot that has been under pressure. This condition can be caused by shoes that fit improperly, excessive use, or heredity.

Most bone spurs cause pain because of their movement against nerves or other bones. Pain or stiffness in the back or neck, or tingling in the hands, arms, or neck, can indicate bone spurs on the spine. Headaches and **dizziness** may also occur, and a person may not be able to keep balanced. A heel spur can cause a sharp pain when weight is placed on one or both feet. If there is a severe, shooting pain in the neck or back with slight movement, this could be a sign of a bone spur pinching a nerve or interfering with muscle movement.

Diagnosis

A medical practitioner may order a computer assisted tomography (CAT) scan or x ray to rule out other causes of back pain and to help locate any existing bone spurs. An electromyography (EMG) can look at the condition of nerves that supply muscles to see if they are affected by bone spurs. Magnetic resonance imaging (MRI) can look at bones, nerves, and disks to check for abnormalities.

Treatment

Exercise and a healthy weight are key ingredients to managing the pain associated with bone spurs. Exercise may be limited by the location of the spur and its effects on movement. Swimming or other forms of water activity, such as water aerobics, may be less stressful for the body, and can also increase flexibility and mobility. Weight loss can also be beneficial in alleviating the pain associated with bone spurs, since

less weight puts less stress on any joints which are lacking cartilage or plagued with bone spurs.

There are several options for managing the pain caused by bone spurs and increasing movement. A chiropractor may use manipulation and physical therapy to relieve pain associated with bone spurs in the vertebrae. Physical therapy may also increase movement of the affected area. **Acupuncture** can be used to relieve some joint pain. A homeopath will assess more than a patient's physical condition to determine the proper remedy. To prescribe a remedy, a homeopath must have information about the conditions that trigger pain in a patient. **Guided imagery** can help alleviate pain. **Feldenkrais** method can be used to retrain the body's movement when it is inhibited by pain. **Yoga** is another **movement therapy** that can help decrease the stress placed on affected areas, as well as help the body relax and strengthen muscles. **Sodium** in the diet may help break down **calcium** so that it can be resorbed into the blood. Those on a low-sodium diet for health reasons should talk to their doctors before increasing the sodium in their **diets**.

Allopathic treatment

A doctor will usually prescribe anti-inflammatory painkillers, such as aspirin or ibuprofen, to help relieve pain. Resting and keeping pressure off of the affected area can also help diminish the pain. A back or neck brace can provide additional support and relieve pressure. A foam cushion placed in the shoe, with a hole cut out for the spur, can help relieve the pain of a spur on the foot. Severe cases may call for surgery, but this relief may be temporary, since bone spurs can grow back in the same place.

Expected results

Once bone spurs form, patients can use different therapies to manage the pain associated with this ailment and to help improve their range of movement. While surgery may be used to remove a bone spur in severe cases, there is a chance that another could grow to take its place.

Prevention

Maintaining a healthy body weight and reducing stress on one's joints are steps individuals can take to reduce the chance of bone spurs. Exercises which work the muscles of the whole body, such as walking, biking, swimming, and tennis, are recommended for weight loss and muscle strength.

Resources

BOOKS

Somerville, Robert. *The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments*. Alexandria, VA: Time Life Inc., 1996.

PERIODICALS

"Better than aspirin?" *Industry Week* (July 7, 1997): 32.

OTHER

DrKoop.com. *Osteoarthritis*. http://www.drkoop.com. (July 17, 2000).

National Institute of Arthritis and Musculoskeletal and Skin Diseases. *Osteoarthritis*. (May 1, 1999).

Footcare Direct. *Hammertoes/Bone Spurs*. http://www.footcaredirect.com. (July 17, 2000).

Heather Bienvenue

Borage oil

Description

Borage, whose botanical name is *Borago officinalis*, is an annual herb in the Boraginaceae family. There are as many as 2,500 species in this family of plants. The specific designation *officinalis* indicates the herb's inclusion in official listings of medicinal plants. Borage is a wild-growing, hardy native of the Mediterranean region, cultivated and naturalized throughout Great Britain and North America. Traditionally associated with courage, borage was used to flavor the wine for soldiers preparing for battle. The English word "borage" may be derived from the word *borrach*, a Celtic word meaning "a person of courage." In folk tradition throughout its long history of recorded use, borage was believed to dispel melancholy and ease grief and sadness. According to the ancient Greek physician Dioscorides, borage can "cheer the heart and lift the depressed spirits." Common names for the herb include burrage, common bugloss, star flower, tailwort, or beebread. Borage self-seeds freely and flourishes in rich, well-drained soil in full sun. It is a good companion herb in the cottage garden, attracting honey bees and imparting strength and insect resistance to nearby plants, particularly strawberry and tomato.

Borage's silvery-green, oblong to ovate, textured leaves form a basal rosette, then grow alternately up a succulent hollow round stem containing a clear mucilage. The leaves and sprawling branches are covered in bristly white hairs that impart a silvery sheen to the herb and are irritating to the skin on contact. Borage

can reach a height of 2 ft (0.6 m), with leaves as long as 5 in (13 cm). The five-petaled star-shaped blue flowers, each with five black anthers, grow in loose, downward-turning clusters at the apex of the stems. Borage may bloom continuously from early spring until frost. The large, brownish-black seeds are three-sided and may be viable for as long as eight years. The roots are shallow and spreading.

General use

Borage seed oil

In contrast to borage's centuries of use as an herb, borage seed oil has only been used for the last 10 years. Borage oil, extracted from the seeds by cold pressing, contains omega-6 **essential fatty acids**, with as much as a 25–30% concentration of gamma linolenic acid (GLA). GLA is a derivative of the **omega-6 fatty acids**. It is an essential fatty acid used by the body to produce prostaglandins, the hormone-like substances in the body that may be out of balance in **premenstrual syndrome** (PMS) or during **menopause**. GLA also appears to reduce the adherence of plaque (abnormal patches of hardened deposits) to artery walls, thus lowering the risk of coronary **heart disease**. GLA helps to relieve PMS, regulate the menstrual cycle, and ease the **hot flashes** and mood swings of menopause.

At present, borage seed oil is best known for its anti-inflammatory properties. The oil has been shown in clinical studies with human subjects to be useful in treating the following conditions:

- rheumatoid arthritis
- atopic eczema
- infantile seborrheic dermatitis
- Raynaud's phenomenon
- Sjögren's syndrome
- juvenile rheumatoid arthritis (JRA)

In addition, the GLA in borage seed oil prevents the formation of **blood clots**, helps to keep cell membranes flexible, and supports the body's immune function.

Other claims for borage seed oil that have not been tested in clinical studies include its use as a remedy for hangovers, as an anti-aging preparation, and as a wrinkle reducer. Various borage oil products that make these claims, however, are readily available over the Internet.

Culinary and medicinal uses

Borage's culinary and medicinal uses have been known for at least 2000 years. Borage is a cooling, cleansing, and refreshing herb with adaptogenic, demulcent, diuretic, expectorant, and anti-inflammatory properties. The entire plant contains mucilage, tannin, essential oil, **potassium**, **calcium**, pyrrolizioline alkaloids, saponins, and **vitamin C**, as well as a high amount of mineral salts. The leaves have been used as an adrenal tonic to balance and restore the health of the adrenal glands following periods of **stress**. A tea made from the leaves and blossoms will also promote lactation, relieve fevers, and promote sweating. The soothing mucilage in borage makes it a beneficial treatment for dry **cough** and throat irritation. Borage tea is also a good remedy to use with such digestive disturbances as **gastritis** and **irritable bowel syndrome**. European herbalists use borage tea to restore strength during convalescence. It may be of particular benefit during recovery from surgery or following steroid treatment. Borage tea is also helpful in clearing up such skin problems as **boils** and **rashes**, and has been used as an eyewash.

About a dozen clinical tests of the medicinal applications of borage in human subjects have been conducted since 1989. In addition, some researchers are now testing the effects of borage on skin cells in animal studies.

Preparations

The leaves, flowers, and seeds of borage have nutritive and medicinal properties. Harvest borage leaves on a dry day, just as the plant begins to blossom. Strip the leaves from the stems and spread out on a tray. The plant has a high water content and the leaves may discolor if dried in direct heat. Place the drying trays in a warm, airy room out of direct sun. When thoroughly dry, store the leaves in dark, tightly-sealed containers. Borage flowers can be collected by gently pulling on the stamen tips to separate the blossom from the green backing attached to the stem. The blossoms may be used fresh, or frozen individually in ice-cube trays for later use.

- Infusion: Place 2 oz (56 g) of fresh borage leaves in a warmed glass container. Bring 2.5 cups (590 ml) of fresh, nonchlorinated water to the boiling point, add it to the herbs. Cover. Allow the tea to steep for 10 minutes, strain, and drink warm. The prepared tea can be stored for two days in the refrigerator. Borage tea may be enjoyed by the cupful up to three times a day. Some herbalists suggest combining borage with

hawthorn berries (*Crataegus oxyacantha*) as a heart tonic.

- Poultice: Chop fresh borage leaves and stems in sufficient quantity to cover the area being treated. Cover the herb with a strip of cotton gauze to hold the poultice in place. The poultice may be soothing and healing to skin inflammations, though the prickly hairs may be irritating.
- Culinary: Borage leaves, eaten fresh, have a crisp, cool taste, reminiscent of cucumber but with a somewhat prickly texture. Borage blossoms are sometimes used as a garnish on salads or crystallized and used to decorate cakes.
- Borage oil is available commercially as bottled oil and in capsule form. One manufacturer offers a package containing 90 capsules for $20. The usual recommended doses of GLA range from 100–300 mg daily (1 tbsp of bottled oil or 1–3 capsules). The dosage and duration of use, however, are best determined by a qualified herbal practitioner.

Precautions

Borage oil has been shown to contain small amounts of such pyrrolizidine alkaloids (PAs) as lycopsamine, amabiline, and thesinine. Some pyrrolizidine alkaloids, particularly unsaturated ones, may be toxic to the liver even in small amounts. Some herbalists stress that use of borage oil should be avoided unless the preparations are certified to be free of these potentially harmful, unsaturated pyrrolizidine alkaloids. In addition, borage oil should be refrigerated after opening to keep it stable, as GLA is damaged in the presence of oxidation. Blending small amounts of **vitamin E** or vitamin C into the oil will also help to slow down the process of oxidation.

The long-term use of herbal borage in medicinal preparations is not recommended.

Side effects

Some minor side effects have been reported when borage preparations are taken internally, even when taken in appropriate forms and in therapeutic dosages. These side effects include bloating, **nausea**, **indigestion**, and **headache**. External contact with fresh borage leaves may cause skin rashes in sensitive persons. Any adverse reactions to borage preparations (or any other herbal products used as dietary supplements) should be reported to the Food and Drug Administration's Center for Food Safety and Applied **Nutrition** (CFSAN), listed under Resources below.

KEY TERMS

Adaptogen—A substance that acts in nonspecific ways to improve the body's level of functioning and its adaptations to stress.

Antioxidant—An agent that helps to protect cells from damage caused by free radicals, the destructive fragments of oxygen produced as a byproduct during normal metabolic processes.

Demulcent—A substance that soothes irritated mucous membranes. Borage contains a mucilage that can be used as a demulcent.

Gamma linolenic acid (GLA)—An essential fatty acid that is found in borage seed oil.

Mucilage—A gummy, gelatinous substance found in the stems of borage that is useful for treating throat irritations.

Raynaud's phenomenon—A vascular disorder in which the patient's fingers ache and tingle after exposure to cold or emotional stress, with characteristic color changes from white to blue to red. Raynaud's phenomenon may be seen in scleroderma and systemic lupus erythematosus.

Sjögren's syndrome—An autoimmune disorder characterized by excessive dryness of the eyes and mouth.

Interactions

Adverse interactions have been reported between borage and three types of prescription medications: anticoagulants (blood thinners), anticonvulsants (drugs to prevent seizures), and anxiolytics (tranquilizers). Borage may prolong bleeding time if taken together with anticoagulant medications. Borage has also been reported to lower the seizure threshold if taken together with anticonvulsant medications. Lastly, borage has been reported to increase the degree of sedation when taken with anxiolytics.

Resources

BOOKS

Bremnes, Lesley. *The Complete Book of Herbs*. New York: Henry Holt, 1995.

Hoffmann, David. *The New Holistic Herbal, 2nd ed.* Boston: Element, 1986.

McIntyre, Anne. *The Complete Woman's Herbal*. London: Dorling Kindersley Limited, 1988.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.
Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Western Herbal Medicine. New York: Simon & Schuster, 2002.
Tyler, Varro E., Ph.D. *Herbs of Choice: The Therapeutic Use of Phytomedicinals*. New York: The Haworth Press, Inc., 1994.

PERIODICALS

Chung, S., S. Kong, K. Seong, et al. "[Gamma] Linolenic Acid in Borage Oil Reverses Epidermal Hyperprolifer ation in Guinea Pigs." *Journal of Nutrition* 132 (October 2002): 3090 3097.
"ShiKai Borage Therapy." (Shopper.) *Contemporary Long Term Care* 25 (September 2002): 43.
Turon, F., P. Bachain, Y. Caro, et al. "A Direct Method for Regiospecific Analysis of TAG Using Alpha MAG." *Lipids* 37 (August 2002): 817 821.

ORGANIZATIONS

Herb Research Foundation, 1007 Pearl St., Suite 200, Boulder, CO 80302, (303) 449 2265, http://www.herbs.org.
United States Food and Drug Administration (FDA), Cen ter for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway, College Park, MD 20740, (888) SAFEFOOD, http://www.cfsan.fda.gov.

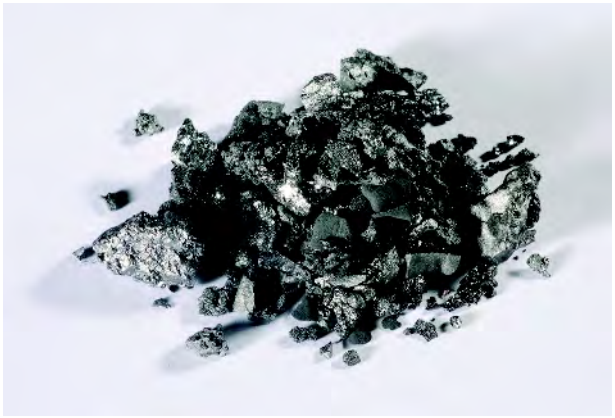
Clare Hanrahan
Rebecca J. Frey, PhD

Boron

Description

Boron is a trace mineral that has gained popularity because of claims that it can strengthen bones, build muscle mass, and boost brain activity. While such macrominerals as **calcium**, **magnesium**, and **potassium** have become household names because they make up over 98% of the body's mineral content, certain trace minerals are also considered essential in very small amounts to maintain health and ensure proper functioning of the body. They usually act as coenzymes, working in conjunction with proteins to facilitate important chemical reactions. While boron is considered essential for plants, it is not known if the mineral is necessary for humans. Evidence has been mounting, however, which suggests boron may be an important micronutrient.

Studies indicate that boron may contribute to the way that calcium (a vital building block of bone) and other minerals are processed by the body. Boron appears to increase the amount of calcium absorbed from food and lower the amount excreted by the body. These effects may help to keep bones strong. Boron may also improve mental functioning, strengthen the immune system, boost energy utilization, and affect **cholesterol** production. While the effects of a boron-free diet have not been observed in people, animal studies suggest that a lack of boron can be unhealthy. In one investigation, for example, a boron-deficient diet fed to animals seemed to increase the amount of calcium they lost. It also appeared to have a negative effect on bone development and energy utilization. It is not certain, however, that study results such as this confirm the nutritional importance of boron for human beings. Research is still necessary to determine if boron can produce significant health benefits safely and effectively. The proper dosage of the mineral has not been established.



Studies indicate that boron may contribute to the way that calcium (a vital building block of bone) and other minerals are processed by the body. *(Phil Degginger / Alamy)*

General use

While not extensively studied, boron has been touted as having a number of beneficial effects. Some people take it to help treat **osteoporosis** or arthritis and to alleviate menopausal symptoms. It has been reported to enhance mental activity, memory, and hand-eye coordination. Some body builders and athletes take boron supplements as a muscle-enhancing agent despite a lack of evidence to support this use. Overall, boron appears to have the most potential as a possible bone-builder and brain booster.

Most of the research suggesting that boron may be helpful for arthritis is indirect and circumstantial. Early studies in sheep and chickens indicated that

boron may be useful in helping to treat the disease. There is also an interesting relationship between the incidence of arthritis and boron intake in certain geographical locations. In parts of the world where boron intake is high (intake can range anywhere from 3–10 mg), usually as a result of high boron levels in the soil and water, the number of people who develop arthritis tends to be lower than in areas where people consume less of the mineral. Boron levels in the water and soil are usually highest in arid climates, such as the desert regions of the United States and South America, the Red Sea region of the Middle East, and parts of Australia. There are few human studies of boron in relation to arthritis, although one small investigation in people has suggested that boron may help to relieve symptoms of the disease.

While there is some evidence that boron may be helpful in the treatment of postmenopausal osteoporosis, the mineral does not appear to ease the symptoms associated with **menopause**. In a five-week study involving 46 menopausal women, about 50% of those who received boron supplements experienced more frequent and severe **hot flashes** (as well as night sweats) and generally had an increase in menopausal symptoms. Over one-third of the women who received boron reported that the mineral made no difference in their symptoms. Boron had a beneficial effect in only 15% of the women who took it. These findings suggest that boron may actually aggravate menopausal symptoms more often than it alleviates them.

Researchers from the Grand Forks Human **Nutrition** Research Center, which is affiliated with the United States Department of Agriculture (USDA), investigated the role of boron in brain and psychological function in several studies involving humans and animals. In one study, increasing boron intake in rats receiving a boron-deficient diet seemed to increase mental activity. Studies conducted in people suggested that a lack of boron can decrease mental activity and have a negative effect on hand-eye coordination, the ability to concentrate, and short-term memory. These findings seem to indicate an important role for boron in keeping the brain fit.

The use of boron by body builders stems from its apparent ability to increase testosterone levels. Because testosterone is known to play an important role in the development of muscles, some weight lifters have taken boron supplements because they believe it will increase levels of male hormone and make them stronger. There is no evidence, however, that boron can increase muscle mass or athletic performance. Boron supplements are generally not considered effective as a muscle-enhancing agent.

KEY TERMS

Hot flash—A temporary sensation of warmth that starts in the chest and radiates into the neck and face, usually associated with the menopause in women. It is sometimes called a hot flush.

Micronutrient—An element essential to health that is required only in very small amounts. Micronutrients are sometimes called trace elements.

Osteoporosis—An age-related disease in which bones become fragile and prone to debilitating fractures.

Preparations

A recommended daily allowance (RDA) for boron has not been established. The estimated dosage of boron, which is available as an over-the-counter dietary supplement, is generally 3 mg a day. Even without taking supplements, most people get anywhere from 1–3 mg of boron through diet. For this reason, some authorities suggest avoiding boron supplements altogether and eating foods known to contain the mineral. Good sources of boron include fruits especially pears, apples, peaches, grapes, and raisins; leafy vegetables; peanuts and tree nuts; and beans. Beer and wine also contain boron. Drinking water can be a good source of the mineral depending on geographical location. Getting too much of the mineral through food and drink is not considered a significant risk because boron is present only in very small amounts in plants and animals.

Precautions

Boron is not known to be harmful when taken in recommended dosages, although there are some precautions to consider. Boron appears to increase estrogen levels, especially in women receiving estrogen therapy. For this reason, women receiving hormone therapy should talk to their doctors before taking boron supplements. Combining the mineral with estrogen drugs may result in elevated and potentially unhealthy levels of female hormone. However, it is considered safe for women on estrogen therapy to eat boron-containing foods. In fact, many of the fruits

and vegetables containing the mineral are believed to contribute to good health.

The long-term health risks associated with taking boron supplements are unknown.

Side effects

When taken in recommended dosages, boron has not been associated with any significant or bothersome side effects. At very high dosages, boron may cause **nausea** and **vomiting**, **diarrhea**, and headaches.

Interactions

Combining boron and estrogen-containing drugs may cause an undesirable increase in estrogen levels.

Resources

BOOKS

Xu, F., et al., eds. *Advances in Plant and Animal Boron Nutrition*. New York: Springer, 2006.

PERIODICALS

Miggiano, G. A., and L. Gagliardi. "Diet, Nutrition, and Bone Health." *Clinical Trial* (January April 2005): 47 56.

ORGANIZATIONS

Grand Forks Human Nutrition Research Center, 2420 2nd Ave North, Grand Forks, ND, 58202, http://www.gfhnrc.ars.usda.gov.

Greg Annussek
David Edward Newton, Ed.D.

Boswellia

Description

Boswellia is the purified resin made from the gum from the *Boswellia serrata* or *Boswellia carteri* trees. For medicinal purposes, the products of these two trees are used in similar ways.

B. serrata is a moderately large branching tree that grows in the hilly regions of India. It grows to a height of about 12 ft (4 m). The sticky resin, or sap, from the tree is also called Indian frankincense, Indian olibanum, dhup, and salai **guggul**. *B. carteri* is a related tree that grows in parts of North Africa, especially Somalia, and in some parts of Saudi Arabia. The resin from this tree is called frankincense.

KEY TERMS

Diuretic—A diuretic is any substance that increases the production of urine.

Expectorant—Any substance that promotes the expulsion of mucus from the lungs.

General use

Boswellia is a significant herb in the Ayurvedic system of health and healing. **Ayurvedic medicine** is a Hindu-based system of individualized healing that has been practiced in India for more than 2,000 years. It is a complex system that recognizes different human temperaments and body types. Each of these types have different qualities that affect the health and natural balance of the person.

Disease can result from any of seven major causes: heredity, congenital, internal, external trauma, seasonal, habits, or supernatural factors. Disease can also be caused by misuse of the five senses: sight, touch, taste, hearing, and smell. Diagnoses are made through questioning, observation, examination, and interpretation. Health is restored by evaluating the exact cause of the imbalance causing the disease or condition and then prescribing herbs, exercises, diet changes, and/or **meditation** to help restore the natural balance of body, mind, and spirit. Cures are highly individualized, so that the same symptoms may require different remedies in different people.

Boswellia is a guggul. A guggul (sometimes spelled guggal) is a sticky gum resin that comes from the sap of a tree. Ayurvedic healers have used boswellia for centuries to treat arthritis and rheumatism. In traditional Ayurvedic medicine, it has many other uses. These included being used as an antiseptic, expectorant, and diuretic.

In traditional Ayurvedic medicine, many conditions are treated with boswellia. These include:

- arithritis and rheumatism
- asthma
- bronchitis
- diarrhea
- jaundice
- ringworm and other skin diseases
- syphillis
- ulcers
- undescended testicles

Modern usage has focused on the use of *B. serrata*. This is most likely to be used by Western herbalists and found in natural products stores. Modern herbalists use boswellia primarily to treat arthritis and other inflammatory conditions. Boswellia can be taken internally or can be applied as a component of anti-arthritis cream.

Some very promising scientific evidence backs up this traditional use of boswellia. Compounds isolated from boswellia have demonstrated anti-inflammatory in laboratory studies. In experimental animals they reduced swelling as effectively as non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (Advil, Nuprin, Motrin) and produced none of the side effects such as irritation of the stomach seen with NSAIDs. This could prove important for people who must take anti-inflammatory drugs for a long period of time. Other animal studies have suggested that boswellia lowers **cholesterol** and triglyceride (a type of fat) levels in the blood.

In other controlled human studies, boswellia was shown to decrease the duration of bronchial **asthma**, possibly by blocking formation of the chemicals that cause the blood vessels to contract. It has also been shown to be safe and effective in human studies for the treatment of arthritis.

Preparations

Boswellia is harvested from trees in late October by cutting away a flap of bark 6–8 in (15-20 cm) wide. For about two weeks, the gum is then scraped away from this wound. This material is then purified and used in healing.

Commercially available boswellia is standardized as an extract to a strength of 60–65% boswellic acid. Dosage varies depending on the patient's condition. For example, people with rheumatic conditions might take 150 mg of boswellic acid three times per day. Follow the directions on commercially available tablets. Creams containing boswellic acid can be applied externally.

Precautions

Some herbalists suggest that pregnant women, people with immune system diseases such as **AIDS**, and the frail elderly not take boswellia.

Side effects

Generally boswellia appears to be well tolerated with very few side effects. In rare cases it can cause **diarrhea**, **nausea**, and skin rash.

Interactions

There are few, if any, studies of how boswellia interacts with traditional Western medicines. It has been used for many years in combination with other Ayurvedic herbs without incident. With interest in boswellia high in modern research laboratories, more information on drug interactions is likely to be forthcoming.

Resources

BOOKS

Graedon, Joe, and Teresa Graedon. *The People's Pharmacy Guide to Home and Herbal Remedies*. New York: St. Martin's Press, 1999.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1998.

ORGANIZATIONS

American School of Ayurvedic Sciences, 2115 112th Avenue, NE, Bellevue, WA 98004, (425)453 8002.

The Ayurvedic Institute. P. O. Box 23445, Albuquerque, NM 87112, (505)291 9698.

Tish Davidson

Botanical medicine

Definition

Botanical medicine is a component of the healing arts that draws on the accumulated and developing knowledge of the medicinal properties of plants in the prevention and treatment of disease. Botanical medicine includes:

- medical herbalism, a healing art that relies on the synergistic and curative properties of plants to treat symptoms and disease and maintain health.
- pharmocognosy, the study of the pharmaceutical properties of natural products.
- ethnobotany, the study of the use plants in different cultures.

Botanical medicine is an important component of many traditional medical systems and therapies, including **traditional Chinese medicine** (TCM), **Ayurvedic medicine**, naturopathy, indigenous and shamanic medicine, **homeopathy**, flower essence therapy, and **aromatherapy**. Botanical medicine has survived for many

thousands of years in some form and in all cultures throughout the world.

Origins

Plants have been used since prehistoric times as medicinal remedies applied in various ways to provide relief from irritations as minor as a mosquito bite to situations as catastrophic as the plague. In modern medicine, some drugs are derived from plants, and many of these medicines are used in ways that are similar to their traditional uses. Many more drugs in modern medicine, however, are synthetic, and part of the reason for this trend is economic: plants can rarely be patented, so a pharmaceutical company cannot gain the exclusive right to sell a plant-derived medication even after expensive research and marketing. Also, the processing of plants into a medicine cannot be as easily standardized and controlled as the manufacture of synthetic compounds. As a result, the efficacy and safety of only a relative few of the traditionally used botanical remedies have been verified by clinical research. Approximately only 5,000 of the estimated 500,000 known species (including subspecies) of plants have been identified and studied for their medicinal properties.

The knowledge of the healing properties of herbs has been preserved from the time of the clay tablets of the ancient Sumerians more than 5,000 years ago, to the sacred texts and pharmacopoeias of the Hindu and Chinese cultures, to the works of Greek and Roman physicians preserved by Byzantine scholars, to the European folk herbalists and physicians such as Nicholas Culpeper (1616–1654), to the Native American herbalists. One of the earliest records of botanical medicine is the *Pen T'Shao Kang Mu*, a work attributed to China's Yellow Emperor around 2500 B.C. Another is the Ebers papyrus, an Egyptian medical text dating from 1550 B.C. The *Rig-veda*, an ancient Hindu scripture, lists more than 1,000 medicinal plants used in the ancient Ayurvedic system of medicine, already well developed by 1000 B.C.

Theophrastus (327–285 B.C.) is considered the first scientific botanist; he recorded the use of more than 500 medicinal plants. The Greek physician Dioscorides produced what has been called the first true herbal text, or herbal, *De materia medica*, in the first century A.D. In the Middle Ages, the monks in European monasteries worked to preserve this ancient knowledge by copying texts and cultivating extensive gardens of medicinal plants. European folk medicine was passed from generation to generation through oral tradition, and with the introduction in Germany of the printing press in 1439, the information became more widely available in popular printed texts. Colonists brought their herbal knowledge and plant specimens to settlements in North America and learned from the indigenous peoples how to make use of plants native to the New World. The first record of Native American herb use is the manuscript of the Native Mexican physician Juan Badianus in 1552.

The use of herbs for medicinal purposes was developed over the centuries by personal experimentation, local custom, anecdote, and folk tradition. According to the World Health Organization, an estimated 80% of the global population continues to rely on medicinal plant preparations to meet primary healthcare needs. The specific chemical constituents of herbs and their medicinal actions are the subject of ongoing scientific experimentation.

Benefits

Botanical medicines, when administered properly and in designated therapeutic dosages, can be effective, trigger fewer side effects for many patients than pharmaceutical drugs, and are generally less costly than prescription pharmaceutical drugs.

The benefits of botanical medicine may be subtle or dramatic, depending on the remedy used and the illness being addressed. Herbal remedies usually have a much slower effect than pharmaceutical drugs, in part because the active ingredients are less concentrated than in manufactured compounds. Some herbal remedies have a cumulative effect and work slowly over time to restore balance; others are indicated for short-term treatment of acute symptoms. Botanical medicine may be especially beneficial when administered to help with chronic symptoms.

Description

Traditional Chinese medicine

Traditional Chinese medicine (TCM) employs ancient techniques, developed over many thousands of years. Among them are **acupuncture**, **moxibustion**, and herbal formulas. Moxibustion is a process that combines acupuncture with the traditional application of the herb **mugwort**, *Artemisia vulgaris*, known as *Ai ye* or *Hao-shu*. This is a method of heating specific acupuncture points on the body to treat physical conditions, particularly chronic **pain**. When burnt, the mugwort produces a mild heat able to penetrate deeply into the muscle.

TCM also employs specific herbal formulas to restore health and maintain a dynamic balance between two distinct forces known as *yin* and *yang*,

particularly with regard to the *qi*. Qi (pronounced "CHEE") is the vital energy flowing along the meridians or energy pathways of the body. The TCM practitioner is a skilled observer who relies on diagnostic techniques, including measuring pulse rate from several positions and noting the general appearance of the patient, including complexion, eyes, nails, hair, tongue, and posture. The assessment not only includes consideration of the patient's symptomatic complaints, but of numerous personal characteristics, including family history, lifestyle, emotional health, environment, diet, and **exercise**. The medicinal herbs prescribed are usually prepared as a formula based on the individual needs of each patient.

Ayurvedic medicine

Ayurvedic literally means the science of life or longevity; Ayurvedic medicine has been practiced in India for more than 5,000 years. This method of healing is concerned equally with the body, mind, and spirit of the person and combines natural therapies to restore balance and harmony. Ayurvedic physicians, like the practitioners of traditional Chinese medicine, use educated observation in diagnosis. In Ayurvedic medicine, there are three basic *doshas*, or metabolic body types. The success of Ayurvedic treatment depends on the proper diagnosis of imbalances in these characteristic aspects.

Ayurvedic medicine emphasizes self-care strategies such as a healthy diet, **yoga**, **meditation**, breathing, and exercises to restore the innate harmony of the body. Taste is an important indicator of the medicinal properties of an herb. Plants are categorized according to six plant essences: sweet, sour, salty, pungent, bitter, and astringent. An understanding of how these plant essences act in the body is a necessary component in Ayurvedic medicine for prescribing herbal remedies.

Indigenous and shamanic medicine

Indigenous and shamanic healing systems rely on extensive folk knowledge of botanical and animal medicine combined with ceremonial ritual in the treatment of disease. The particular form of indigenous medicine is unique to each tribe. The specific herbal remedies are primarily passed on through oral tradition.

Naturopathy

Naturopathic medicine was established in the eighteenth and nineteenth centuries. The naturopathic doctor, or naturopath, uses gentle methods to boost the body's healing, including nutritional supplements, herbal remedies, proper diet, and exercise. The doctor works with the patient to educate the person on ways to restore and maintain a healthy balance in the internal environment that will prevent further illness. Licensed naturopathic doctors pass examinations that include basic clinical botanical medicine competency as well as homeopathy.

Homeopathy

The German physician Samuel Hahnemann (1755–1843) founded Homeopathy in the late eighteenth century. Homeopathy embraces the philosophy of "like cures like." Homeopathy uses extremely diluted solutions of herbs, animal products, and chemicals that are believed to hold a "trace memory" or an energetic imprint of the substance used. Sold as over-the-counter medicine, homeopathic remedies are exempt from government regulations applied to pharmaceuticals. Homeopathic remedies may be sold without proof of safety and efficacy as long as they are labeled with the directions for use and the level of dilution.

Flower essences

The use of flower essences attempts to address a more subtle energy beyond the physical symptoms and to treat the emotional and mental roots of disease. The English physician Edward Bach (1886–1936) developed a method of extracting what he considered the essence of flowers, which he believed had the ability to address a broad range of psychological conditions. This system became known as Bach **Flower Remedies**. This botanical therapy attempts to match the energetic essence of particular flowers with the same energy in the higher self of an individual, thus strengthening the higher energies and promoting self-realization and restoring health. Bach's theory was that the source of all illness could be found in the conflict between the demands of one's higher self, striving to realize its full potential, and the individual personality or ego with its limiting beliefs and actions that obstruct and block this self-realization. The remedies are believed to have a subtle, soul-healing effect based on an instinctual soul rapport with the particular herb.

Aromatherapy

Aromatherapy uses the essential oil of various herbs extracted by steam distillation or cold pressing of flower, leaf, stem, or root to treat various physical and emotional problems. Herbs have long been valued for their healing fragrance. In 1564 the alchemist Giovanni Battista della Porta (1535 or 1538–1615) wrote about methods used to separate **essential oils** from the aromatic distilled waters that had been used in previous centuries. Modern-day aromatherapy was

developed by the French chemist Réné-Maurice Gattefossé (1881–1950) in 1937. Aromatherapy identifies the distinct healing properties of various pure essential oils. The small size of the molecules in essential oils enables the chemicals to penetrate tissue easily and to act rapidly on the limbic system, which is believed to be the seat of emotions.

Preparations

The quality of any herbal remedy and the chemical constituents found in the herb depend greatly on the conditions of weather, the soil where the herb was grown, the timing and care in harvesting, and the manner of preparation and storage. Herbs are prepared in a variety of ways depending on the part of the plant that is medicinally active and the results sought. The kinds of herbal preparations are numerous and varied. Some of these preparations are as follows:

- Infusion. Infusion is appropriate for extracting medicinal properties of the leaf, flower, and stem of the plant. Either fresh or dried herb may be used. A standard infusion combines 1 tsp of dried herb, or 2 tsp of chopped fresh herb, per cup of water. Fresh, chlorine-free water is brought to the boiling point in a non-metallic pot, and the herbs are added. A cover prevents the escape of volatile oils. The tea is infused for 10 to 15 minutes, strained, and can be consumed warm or cold. The prepared tea keeps up to two days in the refrigerator.
- Decoction. Decoction is the best method to extract the mineral salts and other healing components from the coarser herb materials, such as the root, bark, seeds, and stem of the plant. One ounce (28 g) of the dried plant materials, or 2 oz (56 g) of fresh plant parts, is added to 1 pint (500 mL) of pure, chlorine-free water in a non-metallic pot. The mixture is brought to a boil, and then the heat is lowered, so the mixture can simmer for about 30 minutes. After straining and covering, a decoction may be refrigerated for up to two days and retain its healing qualities.
- Tincture. Tincture is a method to prepare a concentrated form of the fresh herbal remedy for therapeutic use. These solutions, properly prepared and stored, retain medicinal potency for many years. To prepare a tincture, a clean glass container is packed with chopped fresh or dried herb, and enough good quality brandy or vodka to cover is poured over the herb. The alcohol/water ratio varies, dependent on the plant and the intended extract. The concentration (depending on the herb) is 25 to 90%; often the ratio of alcohol to water is about 50/50. The container then is sealed with an airtight lid. The mixture is left in a darkened place to steep for two weeks and is shaken daily. After straining the mixture through a cheesecloth or muslin bag and pouring it into a dark bottle for storage, it is ready for use. Dosage depends on the herb and its designated use. A standard dosage is .5 to 1 tsp (2–4 ml) of the tincture three times a day. Other fluid extracts may be prepared with glycerin or vinegar.
- Capsule. A capsule is a convenient form for ingesting dried, powdered herbs. Gelatin capsules are available in the standard size 00, which holds 200 to 250 mg of powdered herb. Prepared capsules should be stored in dark glass containers.
- Oil infusion. With this method, the chopped fresh or dried herb is placed in a glass storage container. Enough cold-pressed vegetable oil, such as sunflower or olive oil, is poured into the jar to cover the herb completely. This mixture is sealed and placed on a sunny windowsill for two or three weeks. The infused oil is strained into another jar of the chopped fresh or dried herb. This mixture steeps on a sunny windowsill for another two weeks. After being strained through cheesecloth, this infused oil can be stored in a cool, dark location for future use.
- Ointments. These are prepared with powdered or freshly chopped plant parts combined with melted petroleum jelly, lanoline, beeswax, and vegetable oil. The mixture is simmered in a double boiler for about two hours then strained through cheesecloth and poured into small glass storage containers. Ointments are a spreadable consistency and provide a protective layer for topical application of medicinal herbs to the skin.
- Poultice. A poultice is a hot mixture of the chopped fresh or dry herb that has been boiled briefly and cooled to a tolerable temperature before application to the affected area. A small amount of oil should be applied to the skin before placing the poultice to prevent the herb from sticking. The poultice can be covered with a gauze strip to hold it in place. The poultice can be refreshed every 2 to 3 hours as needed.
- Essential oils. This is the highly concentrated extract of an herb obtained through steam distillation or cold compress methods. Essential oils should be diluted in water or in a nontoxic carrier oil before application to the skin to prevent contact dermatitis (rash) or sensitization. Essential oils are used for topical application, in bath water, and in aromatherapy. The toxicity of the concentrated essential oil varies depending on the chemical constituents of the herb.

The above list is by no means exhaustive. There are many other botanical medicine preparations available.

Precautions

Herbal remedies prepared by infusion, decoction, or alcohol tincture from the appropriate plant part, such as the leaf, root, or flower, are generally safe when ingested in properly designated therapeutic dosages. However, many herbs have specific contraindications for use when certain medical conditions are present. Contraindications also exist for pregnant or breastfeeding women. Some herbs are toxic, even deadly, in large amounts, and there is little research on the chronic toxicity that may result from prolonged use on any others.

Herbal remedies are sold in the United States as dietary supplements. The United States Food and Drug Administration (FDA) regulates dietary supplements, including botanical medicines, under the 1994 Dietary Supplement Health and Education Act (DSHEA). At the time the act was passed, legislators believed that because many dietary supplements come from natural sources such as plants and have been used for hundreds of years by practitioners of complementary and alternative medicine (CAM), these products did not need to be as rigorously regulated as prescription and over-the-counter pharmaceuticals.

DSHEA regulates botanical medicines in the same way that food is regulated. Like food manufacturers, manufacturers of herbal remedies do not have to prove that the remedy is either safe or effective before it can be sold to the public. Manufacturers of conventional pharmaceutical drugs, however, must prove both safety and effectiveness in humans before a new drug is approved for use. With all dietary supplements, the burden of proof falls on the FDA to show that the supplement is either unsafe or ineffective before the remedy can be restricted or banned. Information about an herbal remedy's safety and effectiveness is typically gathered only after people using the product develop health problems or complain that the product does not work. Initially, supplement manufacturers were not required to report consumer complaints of complications or side effects to the FDA. However, beginning in 2007, a federal law requires that all manufacturers of dietary supplements, including botanical products, report consumer complaints of adverse events (negative side effects) to the FDA. This requirement will make accumulating information on the safety of these products faster and easier.

Botanical medicines are required to be clearly labeled with the word "supplement." In addition, the label must show the volume or weight of the contents, the serving size, a list of dietary ingredients and nondietary ingredients (e.g., artificial color, binders, fillers, flavorings), the name of the manufacturer, packer, or distributor, directions for use, and scientific name of any herbs the product contains.

Unlike conventional drugs, the label for a botanical medicines does not have to show any statements about possible side effects. However, botanical medicines, like all dietary supplements, are not legally allowed to claim that they will cure, treat, mitigate, prevent, or diagnose a specific disease.

Manufacturers of botanical medicines are required to follow federal Good Manufacturing Practices (GMPs) that regulate sanitary and other conditions under which these products are prepared, packaged, and stored. These GMPs, however, are much less stringent than those that regulate the manufacture of pharmaceutical drugs. They do not, for example, assure that the amount of active ingredient in each pill or capsule of an herbal remedy is the same. Some supplement manufacturers try to assure consistency of their product, by confirming that each batch contains the same amounts of active ingredients. This type of standardization is not required by law, and the word "standardized" on the label is not an indication that the product meets any legal requirements as to quality or consistency of contents.

Self-diagnosis and treatment with botanical medicinals may be risky. Consulting a certified clinical herbalist or naturopathic physician is prudent before undertaking a course of treatment. A widely circulated 2002 report stated that patients often fail to inform their physicians about herbal products they are using and that patients do not think of them as medicines. Yet many botanical remedies can interact with allopathic medicines and either cancel their effects or cause adverse effects. For example, **garlic**, ginseng, ginkgo, **feverfew**, **licorice**, and other common remedies have anticoagulant properties that can put patients as risk of bleeding during surgery. Since the 2002 report, traditional physicians have been encouraged to ask patients specifically about herbal remedies, vitamins, minerals, and other supplements they may be taking.

Advances in communication technology have made warnings about herbal remedies more important than ever. The Internet includes many sites with unregulated and often unhealthful advice about use of herbal remedies. Many herbalists and allopathic physicians urge patients to use caution when seeking information on herbal treatments on the Internet. One example of a dangerous herb heavily promoted on the Internet is **ephedra** *Ephedra sinica*) also known as ma huang. In the late twentieth century, ephedra gained popularity as a weight-loss supplement. The herb can

cause life-threatening side effects, and since April 2004, sale of products containing ephedra have been banned in the United States, although this herb is still promoted on some Internet sites.

Essential oils should not be taken internally without expert guidance due to the potential for toxicity even in very small amounts. They are not to be used in any form by pregnant or breastfeeding women without competent medical consultation. Essential oil extracts do not contain the full range of phytochemicals present in the whole plant.

Homeopathic remedies are generally safe because of their extremely diluted nature. These remedies must not be relied upon for treatment of any serious illness or injury. If symptoms persist, other qualified medical help should be sought.

Side effects

Herbs contain many phytochemicals formed in the metabolic process of the plant. These chemicals act on the body in different ways; some of these act on the whole body, whereas others act on a specific organ or system. An herb's effect may be due to a particular chemical in the herb, or it may be due to an interaction among constituents within the plant. Interactions with other herbs, or with pharmacological drugs, is a matter of concern and a growing area of research.

The pure essential oils of aromatic plants, extracted by steam distillation or cold pressing techniques, have been used for more than a century in medicines, food, drink, perfumes, detergents, soaps, cosmetics, in various industrial applications, and in aromatherapy. Some compounds found in plant oils can cause sensitization even in very small amounts. Side effects from external application of some essential oils may include mild skin irritation, such as **itching** and burning; sensitization, which may lead to recurrent mild to severe adverse reactions, such as burning and rash each time the essential oil is used; and phototoxicity, a situation in which certain essential oils react with ultraviolet light and cause reactions from mild skin blotching to severe burning when the skin is exposed to sunlight.

Research and general acceptance

Botanical treatments are generally accepted as part of mainstream medical treatment around the world except in the United States, where herbal remedies are sold as dietary supplements. As of 2008, the branch of the FDA that regulates botanical products under the rubric of dietary supplements is the Center for Food Safety and Applied **Nutrition** (CFSAN). The other U.S. government agency that has some oversight of botanical preparations is the National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health, established by an act of Congress in 1998. NCCAM also supports clinical trials and research into botanical products, herbalism, and other alternative therapies that make use of plant-derived products.

In Germany, an expert committee known as the Commission E was established by the government in 1978 to evaluate the safety and efficacy of 300 herbs and herb combinations sold in that country. No equivalent regulatory commission exists in the United States. Several scientific journals, such as the *Journal of Ethnobotany* and the *Journal of Ethnopharmacology* disseminate information or current research on botanical medicines.

Determining the safety or toxicity of essential oils has primarily been accomplished through animal testing. Human trials of essential oils using volunteers have also been conducted. The World Health Organization (WHO), the Council of Europe, and the FDA accomplish some regulation of and guidelines for the use of essential oils, particularly in food. Two sources of information on the safety of essential oils used in aromatherapy are the Research Institute for Fragrance Materials and the International Fragrance Research Association. These organizations evaluate essential oils and publish findings in the journal, *Food and Chemicals Toxicity*.

In homeopathic medicine, the effectiveness of a remedy is "proved" by experimentation and anecdotal reports by famous homeopathic practitioners rather than by any type of organized clinical trials. However, in 1997, homeopathic remedies were tested clinically and an international team of researchers who reviewed more than one hundred controlled studies concluded that the collective results of 26 of these controlled studies indicate that homeopathic remedies produce a somewhat greater benefit than a placebo in the treatment of illness.

Training and certification

Naturopathic physicians are licensed as primary care physicians in many states and complete a four-year graduate level course at a naturopathic medical school. Naturopaths are trained in nutritional medicine, homeopathic medicine, botanical medicine, **hydrotherapy**, psychology, and counseling.

Traditional Chinese medicine practitioners are heir to the benefits of thousands of years of tradition. This ancient system of health care saw a revival in China after efforts by Chinese Nationalists in the 1930s to eliminate traditional Chinese medical practices in favor of Western medical methods. The ancient

KEY TERMS

Alternative medicine—A system of healing that rejects conventional, pharmaceutical-based medicine and accepts the use of dietary supplements and therapies such as herbs, vitamins, minerals, massage, and cleansing diets. Alternative medicine includes well-established treatment systems such as homeopathy, traditional Chinese medicine, and Ayurvedic medicine, as well as current fad-driven treatments.

Complementary medicine—Includes many of the same treatments used in alternative medicine but uses them to supplement conventional drug and therapy treatments, rather than to replace conventional medicine.

Dietary supplement—A product, such as a vitamin, mineral, herb, amino acid, or enzyme, that is intended to be consumed in addition to an individual's diet with the expectation that it will improve health.

Ethnobotany—The study of the plant lore and agricultural practices of a people or culture.

Limbic system—The structures of the brain concerned with emotion and motivation.

Naturopathic medicine—An alternative system of healing that uses primarily homeopathy, herbal medicine, and hydrotherapy and rejects most conventional drugs as toxic.

Pharmacopoeia—A book describing drugs, chemicals, and medicinal preparations, especially one recognized as an authority and serving as a standard.

Sensitization—The process by which the immune system becomes sensitive or hypersensitive to a specific chemical and reaction to it when re-exposed.

Yang—Qualities opposite of yin, such as warmth, activity, light, and activity.

Yin—Qualtities opposite of yang, such as cold, stillness, darkness, and passiveness.

way persisted, and traditional Chinese medicine is taught in Chinese medical schools using the traditional medical literature. In the 1990s, China opened its hospitals to U.S. students of acupuncture and Chinese herbology.

Western herbalism is taught in many schools of herbal medicine in the United States, as well as through correspondence and online courses. Certification as a clinical herbalist is not required in the United States, and herbal remedies are widely available without a medical prescription.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

Premla, M. S. *Ayurvedic Herbs: A Clinical Guide to the Healing Plants of Traditional Indian Medicine*. New York: Routledge, 2006.

Yarnell, Eric, and Karen Abascal. *Clinical Botanical Medi cine,* 2nd rev. ed. Larchmont, NY: Mary Ann Liebert, 2008.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http:// www.amfoundation.org.

American Association of Naturopathic Physicians, 435 Wisconsin Ave. NW, Suite 403, Washington, DC, 20016, (202) 237 8150, (866) 538 2267, http://www. naturopathic.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Botanical Council, 6200 Manor Rd, Austin, TX, 7872, (512) 926 4900, http://www.herbalgram.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http:// www.holisticmedicin.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http:// homeopathyusa.org.

Flower Essence Society, PO Box 459, Nevada City, CA, 95959, (530) 265 9163, (800) 736 9222, http://www.flo wersociety.org., National Center for Complementary and Alternative Medicine Clearinghouse., PO Box 7923, Gathersburg, MD, 20898, (888) 644 6226, http:// nccam.nih.gov.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http:// www.homeopathic.org/.

National Institute of Ayurvedic Medicine, 375 Fifth Ave., 5th Floor, New York, NY, 10016, (212) 685 8600, http://niam.com/.

Clare Hanrahan
Teresa G. Odle
Rebecca J. Frey, PhD
Tish Davidson, A. M.

Botulism *see* **Food poisoning**

Breast cancer

Definition

Breast **cancer** is the abnormal growth and uncontrolled division of cells in the breast. These malignant cancer cells form masses (tumors) that invade and destroy surrounding normal tissue. Cancer cells shed from tumors have the ability to spread by way of the circulatory and lymphatic systems from the breast to distant parts of the body, invade other tissues, and form new tumors. This process is called metastasis. If metastasis is not controlled, breast cancer can result in death.

Description

A woman's breast is made up of clumps of cells (glands) that, when stimulated by the proper hormones, secrete milk into a network of small tubes (ducts) that collect the milk and carry it to the nipple. The breast also contains fatty tissue, lymph vessels, and blood vessels. Breast cancer most often begins in the cells that line the ducts (ductal cancer). Groups of glands in breast tissue are called lobules. Cancer can also begin in the lobules (lobular cancer) and much more rarely in other tissues of the breast.

Depending on where in the breast the cancer starts, the disease develops certain characteristics that are used to classify breast cancer into subtypes. Ductal carcinoma begins in the ducts. Lobular carcinoma has a pattern involving the lobules or glands. The more important classification of the disease is related to the tumor's stage or capability to invade and spread, as this characteristic defines the disease as a true cancer. The stage before invasive cancer is called *in situ*, meaning that the early malignancy is located in one spot and has not yet spread. For example, ductal carcinoma in situ is considered a minimal breast cancer.

How breast cancer spreads

The primary tumor begins in the breast itself, but once it becomes invasive, cancer cells may move beyond the breast to the regional lymph nodes. Cells from the tumor also break off and travel through the lymphatic system and blood vessels to other parts of body where they form new tumors. This process is called metastasis.

The lymphatic system carries lymph throughout the body. Lymph is a clear fluid that contains immune system cells that fight infection. It moves through a system of lymph channels and lymph nodes. In the nodes, lymph is filtered, and foreign material and dead cells are removed. Eventually lymph drains into the bloodstream. Nearly all organs in the body have a primary lymph node group filtering fluid that comes from that organ. In the breast, the primary lymph nodes are under the armpit, or axilla. Classically, a primary tumor that begins in the breast first spreads to the regional lymph nodes under the arm. Cancer cells may also invade blood vessels at their site of origin. When cancer cells enter the blood vessels, the circulatory system provides the way for the cancer to spread to distant parts of the body.

Breast cancer tends to follow this progression, although it often becomes widespread early in the course of the disease. By the time one can feel a lump in the breast, it is often 0.4 in (1 cm) in diameter and contains about one million cells. Estimates suggest it may take 1 to 5 years for a tumor of this size to develop. During that time, the cancer cells may be spreading to other parts of body. Favorite sites of distant involvement for breast cancer are the lung, bones, liver, and the skin and soft tissue. The number of regional lymph nodes containing cancer cells remains the single most reliable indicator of whether the cancer has become widely metastasized. Because tests to discover metastasis in other organs may not be sensitive enough to reveal tiny tumors, the evaluation of the axillary nodes for regional metastasis becomes important in making treatment decisions regarding any given case. If breast cancer spreads to other major organs of the body, its presence will compromise the function of those organs. Compromised vital organ function can result in death.

Every woman is at risk for breast cancer. If she lives to be 85, there is a one in eight (12%) chance that she will develop breast cancer at some time during her life. As a woman ages, her risk of developing breast cancer rises dramatically regardless of her family history. The breast cancer risk of a 25-year-old woman is only one out of 19,600; by age 45, it is one in 93. Fewer than 5% of cases are discovered before age 35, and the majority of all breast cancers are found in women over age 50.

The American Cancer Society estimated that about 182,500 new cases of breast cancer would be diagnosed in 2008. About 40,000 women die of breast cancer each year. More cases of breast cancer are being diagnosed because of the increased use of screening mammograms; however, deaths from breast cancer are declining because the disease is being diagnosed in earlier, more treatable stages.

Causes and symptoms

All cancer is thought to occur because of small changes (mutations) in genes. A gene is a small packet

of deoxyribonucleic acid (DNA), the genetic master molecule of all cells that is inherited from each parent. Genes control all aspects of development and metabolism. Small changes in the structure of genes can cause changes in proteins that regulate metabolic functions. In healthy cells, cell division is controlled by proteins regulated by genes. Specific genes make proteins that signal healthy cells when to stop dividing. In cancer, the controlling gene(s) is damaged or mutated and does not produce the proteins necessary to signal cells to stop dividing. The mutations that cause breast cancer do not have a single cause. Genetic, environmental, and lifestyle factors all play a role in determining who gets breast cancer. Although men can get breast cancer, women are 100 times more likely to develop the disease.

There are a number of risk factors for the development of breast cancer; however, among experts there is some disagreement about how important each of these factors is. Risk factors include:

- age. 80% of breast cancers are found in women over age 50.
- a family history of breast cancer in mother or sister.
- carrying the BRCA1 and BRCA2 genes. Women with these genes account for 5 to 10% of breast cancer cases and have an 80% chance of developing breast cancer at some time during their life.
- history of abnormal breast biopsies or previous history of breast cancer.
- having first menstruation before age 12 or entering menopause after age 55.
- having no children or having a first child after age 30.
- daily alcohol consumption of two drinks or more.
- obesity and a high fat diet.
- breast exposure to radiation (e.g., in treatment of other cancers).
- postmenopausal hormone replacement therapy (HRT) with a combination estrogen/progesterone drug. Estrogen alone does not appear to increase risk. The longer a woman used HRT, the more her risk increases.

In addition, some other aspects of **nutrition** and lifestyle in Western countries may be responsible for higher rates of breast cancer in these societies. For example, aromatic hydrocarbons in tobacco and certain hydrocarbons in well-done meat may act as carcinogens. Nitrates used in preserving some meat are also suspected of being carcinogens. Breastfeeding for at least one year, an activity performed by only a small percentage of women in industrialized countries, seems to have a protective effect against breast cancer.

Although many factors may increase the risk of developing breast cancer, some women with multiple risk factors never develop the disease, and about 70% of women who get breast cancer have no recognized risk factors. Breast cancer cannot be prevented. Nevertheless, breastfeeding for more than one year, moderate **exercise**, such as walking 10 hours a week, and a diet low in saturated (animal) fats and high in fruits, vegetables, and whole grains have been shown in multiple studies to lower risk of developing breast cancer. These lifestyle choices are endorsed both by alternative and conventional medical practitioners.

Changes in the breast that may indicate breast cancer and should be brought to the immediate attention of a healthcare professional include:

- a lump or thickening in breast or armpit.
- changes in a nipple (thickening, pulling in, bleeding, or discharge).
- dimpled or reddened skin over the breast.
- change in breast size or shape.
- abnormality on a mammogram.

Every lump found in the breast is not cancer. Fibrocystic changes in the breast are extremely common. Fibrocystic condition of the breast is a leading cause of non-cancerous breast lumps. Fibrocystic changes also can cause **pain**, swelling, and discharge from the nipple. Noncancerous (benign) lumps can be either solid or filled with fluid. Signs and symptoms of fibrocystic changes overlap with those of breast cancer. Complete diagnostic evaluation of any significant breast abnormality is essential to differentiate between fibrocystic changes and breast cancer. Certain benign changes in the breast also may be linked to increased risk for breast cancer.

Diagnosis

All women are encouraged to do regular, monthly breast self-examinations, which involves feeling the breasts for any abnormal lumps or pain. A physician will also examine a woman's breasts during routine physical examinations and during regular gynecological examinations.

More than 90% of all breast cancers are detected by mammogram screening. A mammogram is a non-invasive, low-dose x ray that produces a two-dimensional picture of the breast. A typical mammography screening includes two views of each breast, one from above, and one from the side. The test causes no lasting pain, although a woman briefly may feel uncomfortable because her breasts must be compressed to produce an adequate x ray.

Normally, the technologist examines the x-ray films immediately to make sure the x rays are of good quality. A radiologist (doctor who specializes in interpreting x rays) will review the x rays and determine if follow-up tests are needed. The American Cancer Society recommends yearly mammograms for all women over age 40. Women at high risk for breast cancer may begin having mammograms at an earlier age. This test is usually covered by insurance. Mammography is helpful in detecting breast cancer too small to be identified on physical examination. However, 10 to 13% of breast cancer is not detected with mammography. Detection depends in part on the skill of the radiologist reading the x ray. Centers that specialize in mammograms have a better detection rate than general radiologic facilities.

If anything irregular is detected on the mammogram, such as a mass, significant changes from earlier mammograms, abnormalities of the skin, or enlargement of the lymph nodes, additional imaging tests may be done, including a repeat mammogram, magnetic resonance imaging (MRI) of the breast, or a breast ultrasound. None of these is invasive. A breast ultrasound can help distinguish between a fluid-filled cyst and a solid mass. If imaging confirms that a solid lump is present, a biopsy may be done for definitive diagnosis.

Biopsy of the breast is a removal of breast tissue for examination of abnormal cells by a pathologist. Depending on the situation, different types of biopsy may be performed. In an incisional fine needle biopsy, a thin needle is inserted into the abnormal area of the breast, and cells from the area are suctioned into the needle. They are then prepared for microscopic evaluation. Fine needle biopsies are quick procedures done under local anesthetic. A core needle biopsy is an incisional biopsy also done under local anesthesia, only using a larger needle. In excisional biopsy or lumpectomy, the entire lump area and some surrounding tissue is removed for examination.

Once diagnosis is established and before treatment begins, more tests are done to determine if the cancer has spread beyond the breast. These tests are likely to include a chest x ray, blood tests, and liver function tests. Along with the liver function measured by a blood sample, the level of alkaline phosphatase, an enzyme from bone, is also determined. A radionuclear bone scan may be ordered. This test looks at the places in the body to which breast cancer usually metastasizes. A computed tomography (CT) scan also may be ordered. The physician will do a careful examination of the lymph nodes under the armpit (axillary lymph nodes) to assess likelihood of regional metastasis. Sometimes, the physician will remove all the axillary lymph nodes to assess breast cancer stage.

Using the results of these studies, the stage of cancer is defined, which helps establish a treatment protocol and prognosis. In the United States, formal staging is done using the TNM system. This system considers the tumor size and how much it has grown (T), whether the cancer has spread to the lymph nodes (N), and whether it has metastasized (M) to distant sites in the body. Stages are summarized below.

- Stage I. The cancer is no larger than 2 cm and no cancer cells are found in the lymph nodes.
- Stage II. The cancer is no larger than 2 cm but has spread to the lymph nodes or is larger than 2 cm but has not spread to the lymph nodes.
- Stage IIIA. The tumor is larger than 5 cm and has spread to the lymph nodes or is smaller than 5 cm but has spread to the lymph nodes, which have grown into each other.
- Stage IIIB. Cancer has spread to tissues near the breast or to lymph nodes inside the chest wall, along the breastbone.
- Stage IV. Cancer has spread to skin and lymph nodes near the collarbone or to other organs of the body.

Treatment

The best chance for successful treatment is to find breast cancer early. Breast cancer is a life-threatening disease, and a correct diagnosis and appropriate treatment with surgery, chemotherapy, and/or radiation is critical to controlling the illness. Complementary treatments used along with conventional medicine are often successful in moderating side effects and improving the patient's quality of life.

Acupuncture and **guided imagery** may be useful tools in treating pain symptoms and side effects of chemotherapy associated with breast cancer. Acupuncture involves the placement of a series of thin needles into the skin at targeted locations on the body, known as acupoints, in order to harmonize the energy flow within the human body. Guided imagery involves creating a visual mental image of pain. Once the pain can be visualized, the patient can adjust the image to make it more pleasing, and thus more manageable.

Many herbal remedies are available to lessen pain symptoms and chemotherapy side effects such as **nausea**, and to promote **relaxation** and healing. However, breast cancer patients should consult with their healthcare professional before taking any herbal treatments. Depending on the preparation and the type of herb,

these remedies may interact with and enhance or diminish the effects of prescribed medications. One herb that is generally regarded as helpful in relieving the nausea that accompanies chemotherapy is **ginger** (*Zingiber officinale*).

Results of a clinical trial performed at the National Cancer Institute of Milan, Italy, indicated that homeopathic remedies of **belladonna** (*Atropa belladonna*) can be useful in relieving the discomfort, warmth, and swelling of the skin associated with radiation therapy for breast cancer. As with all homeopathic remedies, the prescription of belladonna depends on an individual's overall symptom picture, mood, and temperament, and should be prepared by a trained homeopathic professional. When used as a homeopathic remedy, belladonna is administered in a highly diluted form to trigger the body's natural healing response without risk of belladonna poisoning or overdose.

Allopathic treatment

Allopathic treatments offer the best chance of surviving breast cancer. Treatment options include surgery, chemotherapy, radiation, and the use of biotherapeutics. Breast cancer is treated in two ways: locally to eliminate tumor cells from the breast by surgery and radiation and systemically to destroy cancer cells that have traveled to other parts of the body. Systemic therapy includes the use of drugs in chemotherapy, hormonal treatments to reduce the amount of estrogen circulating in the blood, and biotherapeutics to target stray cancer cells.

Surgery

Historically, surgical removal of the entire breast and axillary lymph nodes, along with the muscles down to the chest wall (radical mastectomy), was performed as the preferred therapy for breast cancer. Between 1975 and 2005, surgery remained a primary option, but other therapies rose in importance. Some studies have suggested that breast conserving treatment (as opposed to radical mastectomy) improves the quality of life for women without compromising survival. Ultimately, the extent of surgery depends on the type of breast cancer, whether the disease has spread, and the patient's age and health.

Removing the tumor and a border of normal tissue around it will remove the cancer while saving most of the breast tissue. However, the longer a tumor has been growing in the breast, the more likely it will be that the cancer cells have spread to the lymph nodes. Breast cancer cells are likely to spread to these nodes under the arm or in the chest. During surgery, some of the nodes are removed to check for cancer cells.

The presence of cancer cells in the lymph nodes may require more extensive surgery. If the cancer has spread to the nodes, the patient will need either radiation, chemotherapy, hormone therapy, or a combination of all three after surgery. This supplemental treatment is called adjuvant therapy. Even if no cancer is found in the nodes, radiation almost always follows surgery, and a combination of chemotherapy and radiation offers the best chance of long-term survival.

Surgery can be combined with breast reconstruction (creating a new breast-shaped mound). Patients who want breast reconstruction should tell the surgeon before surgery, since this could change the way the surgeon operates.

Radiation

Once the tumor has been removed, the oncologist (cancer doctor) usually recommends radiation therapy to destroy or shrink any remaining breast cancer cells. Radiation stops cells from dividing. It works especially well on fast-growing cancer cells. Radiation also affects normal cells in the target area. Healthy cells that divide quickly, like those of the skin and hair, are affected the most. Radiation can cause **fatigue**, skin problems, and **hair loss**. Radiation therapy is usually begun post-operatively after surgical **wounds** have healed.

Chemotherapy

Survival after breast cancer surgery is improved by the addition of post-operative chemotherapy. Post-surgical chemotherapy therapy in patients who have no evidence of residual disease is performed on the assumption that some patients have metastases that are too small to be detected. This condition occurs because the surgeon has probably not removed every single cancerous cell. Loose cancer cells, if not killed by chemotherapy, may travel through the circulatory system and form new tumors elsewhere. Chemotherapy may also be given in some circumstances before surgery. Chemotherapy is administered either orally or by injection into a blood vessel and usually involves multiple drugs. It is given in cycles, followed by a period of time for recovery, followed by another course of drugs.

Chemotherapy can produce significant side effects, including nausea and **vomiting**, temporary hair loss, mouth or vaginal sores, fatigue, weakened immune system, and **infertility**. Complementary therapies are often helpful in reducing some of these side effects.

Hormone therapy

Many breast cancers, particularly those originating in post-menopausal women, are responsive to hormones. These cancers have receptors on their cells for the hormone estrogen. Part of the post-surgery primary tumor assessment is evaluation for the presence of estrogen and progesterone receptors. If they are present on the cancer cells, altering the hormone status of the patient will slow tumor growth and have a positive impact on survival. Hormonal status may be changed with drug therapy. The drug tamoxifen binds to estrogen receptors on the cancer cells, so that hormones cannot interact with the cells and stimulate their growth. If the patient has these receptors, tamoxifen is commonly prescribed for five years as an adjunct to primary treatment. In women whose cancer cells have estrogen receptors, tamoxifen reduces the chance of breast cancer reoccurring by about 50%.

Toremifene (Fareston) and fulvestrant (Faslodex) are drugs similar to tamoxifen that target hormone receptors on cancer cells. They are often used when cancer cells are unresponsive to tamoxifen. In addition, a group of drugs called aromatase inhibitors that block the enzymes that produce estrogen in post-menopausal (but not pre-menopausal) women have been used to treat both early and late advanced breast cancer. These drugs include letrozole (Femara), anastrozole (Arimidex), and exemestane (Aromasin). Using these agents has reduced the need for surgical removal of hormone-producing glands, such as the ovary or adrenal, that was sometimes necessary in the past.

BIOTHERAPEUTICS. Biotherapeutics are a type of targeted therapy. Large amounts of antibodies of a single type (called monoclonal antibodies) that react with specific receptors on cancer cells are made in the laboratory. In the patient, they inactivate or destroy those cells containing that specific receptor, but do not react with other cells. Trastuzumab (Herceptin) and lapatinib (Tykerb) target cells that contain a growth protein known as HER/2. Between 15 and 25% of women have breast cancer that responds to these drugs. Bevacizumab (Avastin) is a biotherapeutic used to treat breast cancer that has metastasized. It helps prevent tumors from becoming established by interfering with the growth of blood vessels in the tumor. Without access to nutrients in the blood, the tumors cannot increase in size. Biotherapeutics are typically used in addition to chemotherapy drugs.

Expected results

Lymph node involvement is one of the best indicators of breast cancer survival rates. The ten-year

KEY TERMS

Adjuvant therapy—Treatment involving radiation, chemotherapy (drug treatment), hormone therapy, biotherapeutics, or a combination of any of these given after the primary treatment in order to rid the body of residual microscopic cancer.

Antibody—A protein produced by the immune system to fight infection or rid the body of foreign material. The foreign material that stimulates the production of antibodies is called an antigen. Specific antibodies are produced in response to each different antigen and can only inactivate that particular antigen.

Benign—Not malignant, noncancerous.

Biopsy—A procedure in which suspicious tissue is removed and examined by a pathologist for cancer or other disease. For breast biopsies, the tissue may be obtained by open surgery or through a needle.

Complementary therapy—Includes many of the same treatments used in alternative medicine, such as herbal medicine, massage, and focused imaging, but uses them to supplement conventional drug and therapy treatments, rather than to replace conventional medicine.

Homeopathic—Practice that uses very diluted remedies and treatments that cause similar effects to the symptoms they are intended to treat in an effort to stimulate the body's natural immune response system.

Hormones—Chemicals produced by glands in the body that circulate in the blood and control the actions of cells and organs. Estrogens are hormones that affect breast cancer growth.

Hormone therapy—Treating cancers by changing the hormone balance of the body, instead of by using cell-killing drugs.

Lumpectomy—A surgical procedure in which only the cancerous tumor in the breast is removed, together with a rim of normal tissue.

Lymph nodes—Small, bean-shaped masses of tissue scattered along the lymphatic system that act as filters and immune monitors, removing fluids, bacteria, or cancer cells that travel through the lymph system. Breast cancer cells in the lymph nodes under the arm or in the chest are a sign that the cancer has spread and that it might recur.

Malignant—Cancerous.

Mammography—X-ray imaging of the breast that can often detect lesions in the tissue too small or too deep to be felt.

survival rate for women with no lymph node involvement is 65 to 80%. If 1 to 3 nodes are involved, the ten-year survival rate is 35 to 65%. If more than four nodes contain cancer, the ten-year survival rate is 13 to 24%. Other factors such as tumor size and whether the cancer is sensitive to biotherapeutics also affect survival rates.

It is typical after breast cancer treatment to be depressed or moody, to cry, lose appetite, or feel unworthy or less interested in sex. If these problems last for an extended time, individual counseling is appropriate. Exercise and **yoga** can help the patient regain strength and flexibility and improve mood. Many women find that attending a support group of breast cancer survivors is helpful during this stage.

Prevention

While breast cancer cannot be prevented, making lifestyle choices that eliminate the risk factors listed above is both prudent and promotes general health and wellbeing. Despite questions about the effectiveness of mammography in detecting breast cancer, regular mammogram screening remains the most effective tool available for detecting breast cancer at an early stage when it is most treatable. A baseline mammogram should be done by age 35, so that this normal x ray can be used to compare to future mammograms. In addition, women should perform breast self-examinations on their breasts at the same time each month. The American Cancer Society (ACS) publishes guidelines recommending how often and at what ages women should have screening mammograms. In 2008 the recommendation was for annual screening mammograms for women beginning at age 40. Very high-risk women with a family history of breast cancer who carry the BRCA1 and BRCA2 genes may want to discuss preventative mastectomy with their physician. As of 2008, preventive surgery remained controversial.

Resources

BOOKS

Geffen, Jeremy R. *The Journey Through Cancer: Healing and Transforming the Whole Person*. New York: Three Rivers Press, 2006.

Kaelin, Carolyn M., Francesca Coltrera, Josie Gardiner, and Joy Prouty. *The Breast Cancer Survivor's Fitness Plan*. New York: McGraw Hill, 2007.

Link, John S. *Breast Cancer Survival Manual: A Step by Step Guide for the Woman with Newly Diagnosed Breast Cancer*., 4th ed. New York: Henry Holt, 2007.

Visel, Dave *Living With Cancer: A Practical Guide*. New Brunswick, NJ: Rutgers University Press, 2006.

PERIODICALS

Alternative Therapies Magazine. PO Box 627, Holmes, PA 19043 9650. http://www.alternative therapies.com.

OTHER

"The ABCs of Breast Cancer Guide." *Susan G. Komen Breast Cancer Foundation* 2008. http://cms.komen.org/komen/AboutBreastCancer/TheABCsofBreastCancerGuide/index.htm. (April 6, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Cancer Society, 1599 Clifton Road NE, Atlanta, GA, 30329 4251, (800) ACS 2345, http://www.cancer.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

National Cancer Institute Public Inquiries Office, 6116 Executive Blvd., Room 3036A, Bethesda, MD, 20892 8322, (800) 4 CANCER, http://www.cancer.gov.

National Center for Complementary and Alternative Med icine Clearinghouse, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://dietary supplements.info.nih.gov.

Paula Ford-Martin
Teresa G. Odle
Tish Davidson, A. M.

Breast disease *see* **Fibrocystic breast disease**

Breast-feeding problems

Definition

The term "breast-feeding problems" is used to describe a variety of physical, behavioral, and emotional difficulties with nursing an infant.

Description

Breast-feeding, or nursing, is the practice of nourishing an infant with the milk in the human breast. Full-term babies have a natural suckling instinct, and breast-feeding comes naturally to most as soon as they leave the womb. After delivery, levels of prolactin, the hormone that triggers milk product, begin to rise in

the body. At first, babies feed on a nutrient-rich substance known as **colostrum**, which is produced by the breast before milk production begins. New mothers will experience engorgement in the days following the birth of their babies, where breast milk "comes in" and engorges the breasts. After this time, regular feedings and proper breast-feeding techniques usually ensure a healthy milk supply for most babies until it is time to wean. However, breast-feeding can be a complex process and in many cases, there is a problem with the infant's suckling technique, the mother's milk supply, or other factors, and breast-feeding problems result.

Causes and symptoms

Inadequate weight gain and a failure to thrive in nursing infants is the most obvious sign that there is a breast-feeding problem.

A number of factors may interfere with successful breast-feeding. These include:

- Milk supply problems. A variety of factors can cause an inadequate supply in new mothers. Milk production is largely a supply and demand process. If the baby does not feed frequently enough, milk production will adjust itself, going down accordingly. A study published in 2002 showed that women who gave birth to a second child within two years of the birth of their first child produced about 30 percent more breast milk in the first week after birth with their second baby.
- Latching problems. Some babies, particularly preterm infants, have difficulty suckling. This can be due to an abnormality of the mouth, or simply to a lack of coordination of the jaw muscles. In addition, the mother may not be placing her breast into the infant's mouth properly.
- Scheduling problems. Breastfed infants should be nursed at least once every three hours during the day, and should go no more than five hours at night between feedings. Scheduling also becomes a problem for women who work outside the home, as they often find that their milk flow diminishes after they return to work.
- Nipple and breast problems. Infants may have difficulty latching on to inverted or flat nipples. Other structural problems such as insufficient mammary glandular tissue, may result in reduced milk production. In addition, cracked and sore nipples and breast infections (mastitis) can make nursing painful.
- Retained placenta. If a woman's milk has not "come in" and she continues to experience abnormal bleeding after delivery, she may still be retaining pieces of the placenta within her uterus.

KEY TERMS

Latching—A term used to describe a baby's mouth hold on his or her mother's nipple.

Prolactin—A hormone secreted after delivery which stimulates the production of milk.

- Stomach sleeping. A nursing mother who sleeps on her stomach may experience decreased milk production due to the extended pressure on her breasts.
- Stress and fatigue. New mothers need proper rest in order to produce an adequate milk supply. The ability to relax is also fundamental to proper breast-feeding. Women who are stressed can have difficulty achieving milk "let-down," the sensation of the mammary glands releasing milk.
- Psychological issues. Some women are unable to breastfeed because of preconceived notions about the practice, or ideas instilled by their parents and peers, that have put up a psychological barrier for them. A 2002 study showed that most women are uncomfortable breast feeding in public and may even abandon the practice because they don't want to be shut off from others or feel squeamish about feeding their babies even in front of friends and family members.

Diagnosis

Breast-feeding problems are first determined by an infant's inability to gain weight. Most babies lose some weight in the first week of life. However, they should regain the weight quickly and be back at their birthweight at two weeks of age. An average weight gain of 6–8 oz per week should be maintained through the second or third month. After that, growth charts can demonstrate whether the child is gaining adequate weight.

Once a problem has been established, a healthcare practitioner will ask questions about the baby's feeding schedule and may observe the mother's breast-feeding technique so he or she can determine if an improper latching technique or inadequate suckling is causing the difficulty. Lactation counselors can be helpful in diagnosing these problems. Further physical examination and tests may be necessary to determine if structural breast problems or placental fragments are causing the difficulties.

Treatment

Proper treatment for breast-feeding difficulties depends on the cause of the problem.

Inadequate milk production

Milk production can be boosted in several ways. The easiest way is for the mother to encourage more frequent feedings at the breast. If this is impractical or the baby does not cooperate, milk production can often be increased through intermittent use of a breast pump, a device that expresses milk from the breast. Breast pumps are available in manual and electric models, and can be purchased or rented. Pumped breast milk can be bottled or frozen, and fed by bottle to the baby at a later time, although if milk production is a problem the mother will probably want to put the baby to the breast at every opportunity.

Milk thistle, or *Silybum marianum*, is sometimes prescribed to promote increased breast milk secretion. Although the herb is considered safe for nursing mothers, it should be acquired from a reputable source and prescribed by an herbalist, naturopathic physician, or other healthcare professional familiar with its use.

Each breast contains both foremilk and the richer, fat laden hindmilk. Infants need the nutrients and fat of the hind milk, but must get through the foremilk to reach it. This is why it is important that the mother completely empty one breast before starting the baby on the other one. This can be accomplished by nursing at least 10 minutes per breast. If the baby does not completely empty a breast, the job can be finished with the aid of a breast pump. The next time the mother nurses, she should start the child on the opposite breast.

Latching problems

To ensure proper breast-feeding, the mother should encourage the baby to latch on to the entire nipple, with his or her lips past the outside perimeter of the areola, before starting to suck. The mother will likely have to guide the breast into the baby's mouth, and repositioning may be required.

Practice makes perfect, and sometimes all an infant needs to improve his latching and suckling technique is time. If the baby has a structural problem in his mouth, such as a cleft palate, a breast pump may be required to keep milk production going. In some cases where suckling does not improve, feeding with a supplementary **nutrition** system may be required. The system consists of a feeding bottle containing the mother's own breast-pumped milk, and two tubes that run down from the bottle and attach to the nipples. Milk flows easily from the tubes with a weak sucking action from the baby. Both baby and mother can still maintain closeness while providing the baby with adequate milk flow.

Scheduling problems

Nursing infants who are sleeping through the night without a feeding are probably not getting enough milk. They should go no longer than five hours at night without feeding, and may require waking to ensure they get enough to eat.

Women who have returned to work can use a portable breast pump at least once during the work day to encourage sustained milk flow and to store milk for their babies to eat during their time away from home.

Nipple and breast problems

Liquid **vitamin E** applied regularly to sore or cracked nipples can soothe the **pain** and help the healing process. Women who think they have a breast infection should see their healthcare provider immediately, as they will probably require a course of antibiotics.

Retained placenta

Minor surgery known as a dilatation and curettage (D and C) is usually required to remove pieces of placenta that were retained by the uterus. Once the placenta has been removed, prolactin levels should rise, stimulating milk production.

Stress and fatigue

Relaxation exercises, **yoga**, **meditation**, massage, and **aromatherapy** can all be useful tools for relieving **stress**. Women should establish a quiet, restful environment for nursing. Warm compresses to the breast may also assist in milk let down. If it is feasible, taking naps when the baby is sleeping can help to ease the **fatigue** caused by nighttime feedings.

Psychological issues

Support from family and friends is necessary for any new mother, especially one that chooses to nurse her child. If no familiar support network exists, women may seek help from groups for nursing mothers such as the LaLeche league.

Many hospitals offer mothers and their spouses classes on breast-feeding techniques and nursing issues. Women who have negative feelings about breast-feeding may find classes helpful in overcoming these issues.

Expected results

In most cases, treatment for breast-feeding problems is successful and mother and baby do well. Other

women may be able to breastfeed in limited amounts, but require supplementing their child's diet with formula to ensure proper weight gain and adequate nutrition. For a small percentage of women, physical problems or psychological issues may prevent successful nursing altogether.

Prevention

The best way for a new mother to prevent nursing problems is to take care of herself by eating right, drinking plenty of fluids, and staying rested and relaxed. It's important, because breast feeding incidence and duration are both associated with reduced **breast cancer** risk in women, according to a large international study released in 2002.

Resources

BOOKS

Eiger, Marvin S., and Sally Olds. *The Complete Book of Breast feeding*. New York: Bantam Books, 1999.

Eisenberg, Arlene et al. *What to Expect the First Year*. 2nd edition. New York: Workman Publishing, 1996.

PERIODICALS

"Milk Production and Number of Births (Breastfeeding)." *Special Delivery* (Fall 2002):18.

"Mothers Uncomfortable Breastfeeding in Public." *Aus tralian Nursing Journal* (July 2002):31.

Worcester, Sharon. "Breast feeding Linked to Reduced Breast Ca Risk (Duration and Incidence)." *OB GYN News* (September 1, 2002):18 21.

ORGANIZATIONS

The LaLeche League. 1400 N. Meacham Rd., Schaumburg, IL 60173 4048. (847) 519 7730. http://www.lalecheleague.org.

Paula Ford-Martin
Teresa G. Odle

Breath therapy

Definition

Breath therapy is an umbrella term that includes a broad range of therapeutic approaches that emphasize the importance of breathing and its potential to affect human health. Most breath therapies employ specific types of breathing exercises, often done in conjunction with other practices. In addition to the ones mentioned here, yoga-like breath therapies include **qigong** and **t'ai chi** ch'uan. These Chinese exercises involve breathing and physical movements.

Woman in breathing therapy. *(© mediacolor's / Alamy)*

Origins

The therapeutic use of many breath techniques has been explored in various forms since ancient times.

Yoga

Developed thousands of years ago in India, **yoga** in modern times takes many forms. Patanjali, sometimes known as the "Father of Yoga," codified yoga philosophy and technique in his *Yoga Sutras*, written sometime during the last several centuries of the pre-Christian era.

Breathwork

Breathwork refers to a number of different breath-based therapies, most of which were developed after the 1970s. Rebirthing, also known as intuitive

breathing, uses breathing techniques (in conjunction with affirmations and other cognitive practices) as a form of **psychotherapy**. The intent is for the person to reexperience and release birth trauma and other emotional and psychological blockages.

Holotropic breathwork

Holotropic breathwork was developed during the mid-1970s by Stanislav Grof and his wife, Christina Grof. Breathwork is done in a group setting, and the goals of the process are wholeness, healing, and wisdom. Experiences such as rebirthing may be the means to those goals, but those experiences are not the purpose of the process, according to the Holotropic Breathwork Web site.

Relaxation response

Herbert Benson of Harvard Medical School began studying the physiological effects of breathing and **meditation** techniques on the human body in the 1960s. This work led him to pinpoint a specific psychophysiological condition said to offer various therapeutic effects. In the 1970s, Benson founded the Mind Body Medical Institute at Harvard. He was later associated with the Benson-Henry Institute for Mind Body Medicine.

Benefits

Most breath therapies are commonly used both to promote general well-being and to address specific psychological, physical, and/or spiritual conditions. General benefits include reduced **stress**, enhanced energy and vitality, and (in the case of yoga and other similar practices) increased flexibility. Breath therapies have also been used to treat a wide range of specific complaints, such as **asthma**, high blood pressure, headaches, and **rheumatoid arthritis**. Breathing exercises have helped some children avoid asthma attacks and improve lung function. Breathing therapy has been used to help reduce anger, exhaustion, hostility, and risk of new heart problems in some people who have had heart surgery. Yoga, in particular, is increasingly being used in the early 2000s as a companion therapy to conventional treatment for such critical illnesses as **cancer**, **heart disease**, and HIV/AIDS.

Breath therapy will not cure those conditions but breath-therapy **relaxation** techniques help to reduce stress and promote a sense of well-being.

Used as a form of psychotherapy, both breathwork and meditation are said to help practitioners address old conflicts, enhance their self-esteem, and achieve greater peace of mind.

In addition to these benefits, spiritual seekers may explore these therapies to achieve higher consciousness.

Description

Yoga

Yoga is based on the belief that mind, body, and spirit are united. Most schools of yoga incorporate breathing exercises (known as pranayama) as one key component, along with physical poses (asanas) and, sometimes, chanting and/or sitting meditation.

One basic form of pranayama is three-level breathing, in which the practitioner first fills the abdomen, then the rib cage, and then the upper chest, before exhaling in reverse order. This action is performed slowly, with inhaled breath taken deep into the body, causing the person to relax. Another breathing technique sometimes used in yogic practice is alternate-nostril breathing, in which air is taken in through one nostril and expelled through the other, often using the hand or a finger to close the unused nostril. A more intensive breathing technique, often associated with the kundalini school of yoga, is the breath of fire. This movement involves pumping the diaphragm to draw in and expel air rapidly. More advanced yogic practice may also involve any number of other breathing techniques.

Breathwork

Various types of breathwork employ a breathing technique originally associated with rebirthing, known as conscious (or circular) connected breath. This technique, performed lying down, involves a continuous cycle of inhaling and exhaling air through the mouth. The person inhales as fully as possible and allows a natural, relaxed exhale, with no pause between intake and release. Holotropic breathwork uses deep and rapid breathing coordinated with dramatic sounds and rhythms to induce psychedelic states.

Relaxation response

Based on his study of the effects of transcendental meditation (a popular approach brought to the West by Maharishi Mahesh Yogi of India), Herbert Benson developed a nonreligious approach to meditation that combines breathing techniques, sitting quietly, and focusing the mind in order to achieve the "relaxation response."

Deep breathing

This technique, also known as belly breathing and relaxed breathing, is somewhat similar to pranayama. The person takes slow, deep breaths to relax. When a person becomes anxious or stressed, the body responds automatically with the fight-or-flight reaction. The body tenses and the heart beats faster. The person breathes from the diaphragm, taking shallow breaths.

The person counteracts this fight-or-flight response by taking deep breaths. The mouth is closed and the person slowly inhales air through the nose. The person holds the air in the lungs for about five seconds. During this time, the inhaled air causes the belly to expand like a balloon. The person releases the air by slowly exhaling it through the mouth. The inhale-exhale cycle is repeated as many times as needed until the person feels calmer.

Precautions

Many breath therapies are intended to be practiced in a safe, controlled environment, under the guidance of a trained facilitator or teacher. As a general rule, it is wise to ask about the training, qualifications, and experience of such facilitators, especially before beginning a rigorous or costly program based on a little-known therapy.

Although breathing is a natural process that is essential to life and breathing exercises are generally taken to be beneficial, some precautions may be advisable. People suffering from asthma or other breathing-related disorders should notify their doctor about any alternative therapy they consider. They should also notify their guide in the therapy of choice about their condition and any medication they take. People suffering from mental disturbances or disorders should be cautious about experimenting with practices designed to induce altered states of consciousness.

Furthermore, it may be necessary to consult a doctor before beginning a physical program such as yoga bodywork. This precaution is especially important for people diagnosed with conditions such as high blood pressure and **osteoarthritis**. While there are yoga classes designed for pregnant women, expectant mothers should first check with their obstetricians.

Side effects

Prolonged, intensive breathing may sometimes create **dizziness** or fainting. Related techniques used in some of the various breath therapies may have other side effects that should be considered before starting a therapeutic program. For example, people doing yoga bodywork may injure themselves or aggravate pre-existing medical conditions.

Research and general acceptance

Deep breathing is accepted by the medical community as an effective method of reducing stress. Furthermore, numerous clinical studies since the 1970s have demonstrated specific benefits associated with various breathing techniques and/or breath-based therapies, particularly certain types of yoga and meditation. Breathing exercises help to reduce stress and may help lower blood pressure and respiratory rate. Yoga bodywork helps to improve a person's flexibility and may help people diagnosed with mild or moderate asthma.

Breath therapy has been researched at the University of California San Francisco's Osher Center for Integrative Medicine. In a randomized controlled trial, the center studied the effect of breath therapy on 36 people diagnosed with chronic lower back **pain**, according to a May 2007 notice on the center's website. The study compared breath therapy and traditional physical therapy. The center charted results at the beginning of the study, six to eight weeks later, and after six months. The center concluded that patients using breath therapy "improved significantly."

Holotropic Breathwork was the subject of several small studies that were described in unpublished dissertations, according to the September 2007 issue of the *Journal of Alternative & Complementary Medicine*. The article authors provided an overview of the studies and concluded with recommendations for the format of future studies. These included selecting an "adequate sample size".

Training and certification

There was no national certification standard for yoga instructors as of February 2008. However, the American Yoga Association website offered recommendations about how to select an instructor. Practitioners of Holotropic Breathwork earn certification in Grof Transpersonal Training. The process requires about 600 hours of residential training that takes at least two years to complete.

Deep breathing can be self-taught and may be supplemented by relaxation CDs and audiotapes.

Resources

BOOKS

Mayo Clinic. *Mayo Clinic Book of Alternative Medicine*. New York: Time Inc. Home Entertainment, 2007.

PERIODICALS

Comarow, Avery. "Embracing Alternative Care: Top Hospitals Put Unorthodox Therapies into Practice." *U.S. News & World Report* January 9, 2008. http://health.usnews.com/articles/health/2008/01/09/embracing alternative care.html (February 24, 2008).

Rhinewine, Joseph P., and Oliver J. Williams. "Holotropic Breathwork: The Potential Role of a Prolonged, Voluntary Hyperventilation Procedure as an Adjunct to Psychotherapy." *Journal of Alternative & Complementary Medicine* (September 2007): 771–776.

OTHER

University of California, San Francisco Osher Center for Integrative Medicine. "Randomized Controlled Trial of Breath Therapy for Patients with Chronic Low Back Pain." May 3, 2007. http://www.osher.ucsf.edu/Research/abstract_breath.aspx (February 24, 2008).

ORGANIZATIONS

American Yoga Association, PO Box 19986, Sarasota, FL, 34276, http://www.americanyogaassociation.org.

Association for Holotropic Breathwork International, PO Box 400267, Cambridge, MA, 02140, (617) 674 2474, http://www.breathwork.com.

Benson Henry Institute for Mind Body Medicine, 824 Boylston Street, Chestnut Hill, MA, 02467, (617) 732 9130, http://www.mbmi.org/home.

Peter Gregutt
Liz Swain

Breema

Definition

Breema is a bodywork technique that has been described as a cross between partner **yoga** and **Thai massage**. The practitioner works with a fully clothed participant on movements that focus on being present in the moment. Nine Universal Principles guide the actions, and the goal of a session is to activate the body's self-corrective reflexes to create a balanced state of energy. Self-Breema is designed for individuals to perform.

Origins

Breema originated in a mountain village in the Near East and was established in the United States with the founding in 1980 of the Breema Center in Oakland, California. Jon Schreiber and a group of colleagues founded the center. Schreiber, a graduate of the Palmer College of **Chiropractic**, served as director after the center opened. He is said to have incorporated Breema into his clinical practice because of its ability to vitalize and heal the body. Schreiber has taught and written about the Breema system since the 1980s.

As of the spring of 2008, Breema classes and workshops were offered at the center and in states ranging from Alabama to West Virginia. Classes and workshops are also held in various countries, including Canada, Argentina, Brazil, Australia and New Zealand, India, Japan, Great Britain, Austria, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, Switzerland, and Sweden.

Furthermore, the University of Oregon offered Breema classes for college credit, according to the spring 2005 *Well Now* newsletter. Author Hanna Budan wrote that the Breema course was a "unique bodywork and **meditation** class" that helped people remain in the present instead of concentrating on the past or future. That emphasis on connecting mind and body in the present could help students overwhelmed by the stresses of college life, Budan wrote.

Benefits

According to the Breema Center, the primary benefit of Breema is bringing individuals to a level at which they feel nurtured rather than drained by their relationship to their body, surroundings, people, feelings, and other aspects of life. The center maintained that Breema's nurturing atmosphere allows the mind, body, and feelings to become present, receptive, and vital. Secondary benefits that stem from this nurturing include the following:

- renewed vitality
- increased mental clarity and focus
- relief of tension
- increased flexibility
- mental and emotional balance and harmony
- gentle musculoskeletal realignment
- reduced stress
- improved nervous system function
- improved circulation and digestion.

Description

Author Maggie Simon wrote in a 2006 *Share Guide* article that Breema has been described as a cross between partner yoga and Thai massage. However, the aim of Breema was to "nurture an experience of presence," with both practitioner and recipient benefiting form the experience, Simon wrote.

Breema has three important components. They are bodywork, Self-Breema exercises, and the nine Universal Principles of Breema.

Bodywork

Since Breema regards the body as an energy system, the bodywork is intended "to enhance the flow of life energy and bring one to the present," according to information from the center. A person receiving a Breema treatment is fully clothed and either lies or sits on a padded floor.

The recipient works with the practitioner in bodywork described by the center as a harmonious choreography of supported movements, gradual leaning, gentle stretching and bending, holding postures, "nurturing brushes," and rhythmic tapping. Breema treatments are tailored to each recipient at each visit; there is no standard program or sequence. Treatment sessions may last from about 30 minutes to an hour.

Self-Breema exercises

Self-Breema exercises are done individually, so that the person may "experience being both the practitioner and recipient at the same time." The program emphasizes the naturalness of all Self-Breema moves and postures. No muscular force or unusual contortions of the body are involved. Like the bodywork sessions, Self-Breema exercises are customized for each individual to support and balance the flow of life energy through the body, release tension, and increase vitality and dexterity.

Universal Principles

Breema maintains that Universal Principles govern all of life as well as bodywork and health maintenance. Breema's nine Universal Principles are:

- Body comfortable. The body is viewed as an "aspect of a unified whole."
- No extra. Nothing more is needed to express a person's true nature.
- Firmness and gentleness. People who are present manifest both firmness and gentleness simultaneously.
- Full participation. Body, mind, and feelings are united "in a common aim."
- Mutual support. "Giving and receiving support take place simultaneously."
- No judgment. People who come to the present are free from judgment.
- Single moment/Single activity. Each moment is an expression of a person's true nature.
- No hurry/No pause. Neither is found in the "natural rhythm of life energy."
- No force. Letting go of assumptions of separation is letting go of force.

The Breema principles are intended to free people from the conceptual body, defined as "the ideas and images of our body that we carry in our mind." The aim of Breema is "to increase vitality, not to fight sickness, and to create an atmosphere which allows the body to move toward a natural state of balance."

Working with the nine principles of Breema is thought to create a receptive mind, supportive feelings, and a relaxed body. The energy that is usually consumed by conflict between mind and feelings and physical tension becomes available.

Preparations

Breema treatments do not require special preparation other than the wearing of loose and comfortable clothing that allows for free movement.

Precautions

Common sense precautions for any kind of bodywork include seeking advice from a qualified medical practitioner before starting a new program. This precaution is particularly important for people with chronic heart or lung disease, persons recovering from surgery or acute illness, and those with arthritis or other disorders that affect the muscles and joints.

Side effects

As of February 2008, there were no known side effects of Breema therapy in healthy people.

Research and general acceptance

As of February 2008, no published information was available regarding independent scientific studies of Breema.

Training and certification

The Breema Center in Oakland is the world headquarters for training and certifying instructors and practitioners. The center offers a 165-hour practitioner certificate program in Breema bodywork. The coursework encompasses 130 hours of Breema bodywork, 15 hours of anatomy and physiology, and 20 hours of Breema Practitioner Colloquium. The certificate program takes a minimum of six months to complete. The Breema Center is a vocational school licensed by the State of California Bureau for Private

KEY TERMS

Self-Breema—A personalized form of Breema bodywork that the individual performs on his or her own body, without an instructor as partner. It is intended to supplement Breema bodywork treatment sessions with an instructor.

Postsecondary and Vocational Education. To become an instructor, certified Breema practitioners must have years of experience, receive extensive training with Schreiber, and fulfill annual continuing education requirements.

Resources

BOOKS

Schreiber, Jon. *Breema and the Nine Principles of Harmony*. Oakland, CA: Breema Center, 2007.

Schreiber, Jon. *Every Moment Is Eternal: The Timeless Wisdom of Breema*. Oakland, CA: Breema Center, 2007.

PERIODICALS

Budan, Hanna. "Breema: The Art of Being Present." *Well Now* (Spring 2005): 3.

Simon, Maggie. "Understanding Breema." *Share Guide* (September/October 2006): 38 39.

ORGANIZATIONS

Breema Center, 6076 Claremont Ave, Oakland, CA, 94618, (510) 428 0937, http://www.breema.com.

Rebecca Frey
Liz Swain

Brewer's yeast

Description

Brewer's yeast is an ingredient used to ferment sugars to alcohol in the brewing of beer. It consists of the ground, dried cells of *Saccharomyces cerevisiae,* a one-celled plant that is a variety of fungus.

Brewer's yeast is an inactive yeast that has no fermenting or leavening power. Brewer's yeast should not be confused with torula yeast, nutritional yeast, or baker's yeast. These yeasts do not have the same metabolic, physiologic, taxonomic, and genetic properties as brewer's yeast. Brewer's yeast also should not be confused with the yeast that causes vaginal infections, *Candida albicans*.

Brewer's yeast contains all the essential **amino acids**, 14 minerals, and 17 vitamins. It is one of the best natural sources of the B-complex vitamins thiamin, **riboflavin**, niacin, B_6, **pantothenic acid**, **biotin**, and **folic acid**. It is also high in minerals, including **chromium**, **zinc**, **iron**, **phosphorus**, **magnesium**, and **selenium**. Brewer's yeast is also a good source of protein. It contains approximately 16 g of protein per 30 g of powdered yeast. Brewer's yeast is a good source of RNA, an immune-enhancing nucleic acid that may help in the prevention of degenerative diseases and slowing of the **aging** process.

General use

Vegetarians typically use brewer's yeast as a source of protein, vitamins, and minerals. In addition to being an excellent nutritional supplement, brewer's yeast is often recommended to regulate blood sugar levels, raise HDL **cholesterol** levels, improve the health of the skin, prevent **constipation**, control **diarrhea**, and repel insects in pets.

Brewer's yeast is one of the best sources of the mineral chromium. Two tablespoons of brewer's yeast yields about 120 micrograms (mcg) of chromium, an amount equal to the recommended daily allowance. Chromium plays a role in raising HDL cholesterol levels (the good cholesterol) and is an important factor in regulating blood sugar levels. High levels of chromium increase glucose tolerance.

Diabetes and **hypoglycemia** are two conditions in which blood sugar levels are unstable. Brewer's yeast has been reported to help improve symptoms of diabetes and hypoglycemia, and may act to prevent diabetes from developing in persons with a family history of diabetes and in those who have problems with blood sugar metabolism. Several studies have reported that people with diabetes improve hemoglobin levels, **fasting** glucose levels, and glycemia with brewer's yeast supplementation. However, the authors of a 2007 systemic review of randomized controlled trials published in *Diabetes Care* journal concluded that future studies were needed to address the limitations in the current research before specific health claims can be made about the effects of brewer's yeast on diabetes and hypoglycemia. As more clinical data continue to be published, additional scientific evidence will be available to support health risk reduction claims.

B-complex vitamins are important for healthy skin and nails. Persons deficient in these vitamins may benefit from taking brewer's yeast, as it is rich in B-complex vitamins. A compound derived from brewer's yeast, skin respiratory factor (SRF), reportedly has wound

healing properties. SRF has been a component in over-the-counter hemorrhoid remedies for more than four decades. SRF also has been used to treat skin problems. Brewer's yeast has been used in the treatment of **contact dermatitis**, a condition of the skin characterized by red, itchy, and inflamed skin.

Brewer's yeast may help to prevent constipation. Thirty grams of brewer's yeast contains approximately 6 grams of dietary fiber (24% of the recommended daily amount). Fiber is an important part of the diet as it helps increase the bulk of fecal matter, thereby promoting healthy bowels and intestines. Brewer's yeast has also been found to be helpful in cases of diarrhea. The yeast acts to encourage the growth of good bacteria in the intestines.

Generous doses of brewer's yeast may help to prevent cancers such as prostate cancer. When combined with **wheat germ**, brewer's yeast is helpful in preventing heart problems. Brewer's yeast may also be helpful in the treatment of **fatigue**, low energy, or appetite loss.

Pet owners have known about the ability of brewer's yeast to repel ticks and fleas for many years. Wafers that contain brewer's yeast can be given to animals for this purpose. Powdered brewer's yeast may also be sprinkled on the animal's food. The large amounts of **thiamine** in brewer's yeast may repel mosquitoes from humans as well.

Preparations

Brewer's yeast is available at most health food stores in tablets, flakes, and powder form. Brewer's yeast can be added to foods (soups, casseroles, baked goods) to increase their nutritional value. It is also a popular addition to drinks, juices, and shakes, and is marketed as a protein supplement, energy booster, and immune enhancer. The product label will provide instructions on how to take it. Brewer's yeast does not require refrigeration and has a long shelf life.

The quality of brewer's yeast varies depending upon the manufacturer. Some packaged brewer's yeasts are processed to remove the alcohol and/or chemical byproducts that may be left behind in the brewing process. This processing phase lowers the nutritional quality of the yeast. High quality brewer's yeast is grown on molasses or sugar beets and is grown specifically for supplemental purposes. As a result, there is no need for further processing. Brewer's yeast powder is often bitter tasting. Some powders are "debittered."

Brewer's yeast contains higher levels of phosphorus than **calcium**. Too much phosphorus may deplete the body of calcium. To create a balance, some manufacturers add calcium to their brewer's yeast products.

When prescribing brewer's yeast as a food supplement, doctors often recommend a daily dosage of 1–2 tbsp. For a person with diabetes, the recommended dose is 1 tbsp. twice daily.

Ticks and fleas can be prevented by sprinkling powdered brewer's yeast on the animal's food in a dosage of 1 tsp. for cats and 1 tsp. per pound of body weight for dogs.

Precautions

Daily dosage on the product label should not be exceeded.

Those allergic to yeast or susceptible to yeast **infections** should contact their healthcare practitioner before taking brewer's yeast.

Persons with **gout**, vaginal infections, or *Candida albicans* should avoid using brewer's yeast.

Persons with diabetes should consult their healthcare practitioner before using brewer's yeast. Brewer's yeast may interfere with insulin requirements.

The use of brewer's yeast is not appropriate for people who have severely weakened immune systems due to disease or **cancer** treatments, as they can develop serious infections.

Persons with an intestinal disease should not take brewer's yeast.

Brewer's yeast is safe in pregnant or nursing women at doses of 1–2 tbsp. per day.

Side effects

Initial use may cause bloating and **gas**. To lessen these effects, it is best to begin with small amounts of brewer's yeast (less than 1 tsp. daily) and gradually increase to the recommended dosage.

If **nausea** or diarrhea occur, brewer's yeast should be discontinued and the person should follow up with a healthcare practitioner.

Interactions

As of 2008 there were no documented interactions between brewer's yeast and any pharmaceutical drugs or herbal remedies.

Resources

BOOKS

Berdanier C., and J. T. Dywer, eds. *Handbook of Nutrition and Food,* 2nd ed. Boca Raton, FL: CRC Press, 2006.

Huffnagle G. B., and S. Wernick. *The Probiotics Revolution: The Definitive Guide to Safe, Natural Health Solutions Using Probiotic and Prebiotic Foods and Supplements*. New York: Bantam Books, 2007.

PERIODICALS

Balk E. M., A. Tatsioni, A. H. Lichtenstein, J. Lau, and A. G. Pittas. "Effect of Chromium Supplementation on Glucose Metabolism and Lipids: A Systematic Review of Randomized Controlled Trials." *Diabetes Care* 30, no. 8 (August 2007): 2154 2164.

Moyad, M. A. "Brewer's/Baker's Yeast (Saccharomyces Cerevisiae) and Preventive Medicine: Part I." *Urologic Nursing* 27, no. 6 (December 2007): 560 561.

OTHER

Saccharomyces Genome Database. (650) 725 8956. http://www.yeastgenome.org.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.

Food and Agricultural Organization of the United Nations, http://www.fao.org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agricul ture, 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov.

International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, DC, 20036, (202) 296 6540, http://www.ific.org.

Jennifer Wurges
Angela M. Costello

Bromelain

Description

Bromelain, also known as bromelin, is a protein-digesting enzyme extracted from the flesh and stem of the pineapple plant, *Ananas comosus*. Although the people of Guadeloupe introduced Christopher Columbus to the fruit in 1493, Europeans did not recognize the pineapple's beneficial attributes until later. Pineapple had a long history of traditional use among the native peoples of Central and South America. They applied pineapple dressings to **wounds** and skin injuries to reduce inflammation, and eased **stomachaches** and **indigestion** by drinking the juice of the fruit.

KEY TERMS

Mastitis—Inflammation of the breast.

Menorrhagia—Excessive bleeding at the time of a menstrual period, either in amount of blood or number of days, of both.

Plaque—An abnormal hardened deposit on the inner wall of an artery.

Protease enzyme—Any of a group of enzymes that help to break down proteins into smaller amino acid compounds. Bromelain belongs to this enzyme group.

Bromelain was first isolated from pineapple juice in 1891 and introduced as a therapeutic supplement in 1957. The active ingredients of bromelain are found in the juice and stem of the pineapple plant, but the stem contains more bromelain than the fruit.

General use

Bromelain is most notable for its effectiveness in the reduction of inflammation and decreasing swelling, but the scope of its benefits continues to increase. As a natural anti-inflammatory enzyme, bromelain has many uses. Arthritis patients may reduce the swelling that causes joint **pain** by taking bromelain. Bromelain may also be helpful for the pain, numbness, tingling, aching, and loss of motor and sensory function in the fingers resulting from **carpal tunnel syndrome** (CTS).

The protease enzyme is beneficial in reducing the clumping of platelets (small platelike bodies in the blood), the formation of plaques in the arteries, and the formation of **blood clots**. All these effects help to prevent and treat cardiovascular disease. Bromelain has also been discovered to have anti-tumor action, as well as helping the body absorb medications.

Although bromelain is often labeled an alternative treatment, mainstream medical research continues to study its effectiveness in the prevention and treatment of hematomas, or localized blood clots. Bromelain has been found useful in the reduction of swelling and congestion in the affected tissue after an athletic injury or surgery. It is commonly used in Germany for this purpose.

Bromelain's anti-clotting activity may be useful in preventing strokes, one of the most feared results of obstructions in the circulatory system. Due to the lack of oxygenated blood flowing to the brain, a **stroke** can

cause permanent damage to the affected area of the central nervous system. Bromelain is thought to help maintain healthy cardiac tissue and reduce the risk of stroke by its anti-inflammatory activity. By preventing mild infection or inflammation caused by the fatty substances inside the blood vessels where plaque may form, bromelain helps to reduce inflammation by digesting the byproducts of tissue repair.

Bromelain is helpful to people with colds due to its ability to reduce mucus and keep it moving out of the body. Bromelain has also been shown to reduce the painful inflammation associated with costochondritis, an inflammation of the cartilage that attaches the ribs to the breastbone. In addition, bromelain appears to be beneficial to **asthma** patients. Asthma is caused by spasms of the bronchial passages that restrict the flow of air in and out of the lungs. Taking bromelain may reduce the excess mucus that tends to collect in the respiratory systems of asthma patients. In addition, people who suffer from **hay fever** and similar seasonal **allergies** may also be helped by bromelain's antiinflammatory activity.

Additional benefits of bromelain include reducing the painful symptoms of **varicose veins**, including dull aches, tired legs and feet, and itchy skin.

Research has also shown that bromelain benefits cows as well as humans. Bromelain has been shown to reduce the white blood cell count in cows with mastitis. This reduction increases the quality of their milk. Researchers have found that bromelain works to reduce inflammation by interfering with the synthesis of prostaglandins and other inflammatory substances.

Preparations

Bromelain is available as a dietary supplement that is offered in several different tablet strengths. For **rheumatoid arthritis**, the recommended dosage of bromelain is 250–750 mg, taken two or three times a day between or before meals. In Germany, the standard dosage to reduce swelling after surgery is 80–320 mg daily. The supplement has been found to offer the most benefit when taken on an empty stomach, and its therapeutic effects are also enhanced when taken in higher doses.

Increasing the dosage of bromelain to 400–1,000 mg per day has shown to reduce the symptoms of **angina** pectoris (the severe pain and feeling of constriction about the heart that often radiates to the left shoulder and down the left arm).

Precautions

Bromelain has shown to be generally safe when taken in moderate doses, although a preliminary report links an increased heart rate with the use of the supplement. People with an inflammation of the stomach lining should not use digestive enzyme supplements such as bromelain. In addition, the safe use of bromelain in pregnant or nursing women, small children, and people with kidney or liver disease has not been established.

Side effects

While bromelain can be taken safely without side effects in moderate doses, there are anecdotal reports of allergic reactions to it. Other side effects that have been observed include **nausea**, **vomiting**, **diarrhea**, and menorrhagia (excessively heavy menstrual flow).

Interactions

Because of bromelain's anti-clotting activity, it should not be combined with other blood-thinning medications such as warfarin (Coumadin), heparin, or aspirin. It is also possible that bromelain could cause bleeding problems if it is combined with other complementary therapies that thin the blood, such as **garlic** or gingko biloba.

Resources

PERIODICALS

Petry, Judy J. "Nutritional supplements and surgical patients." *AORN Journal* (June 1997).
Kelly, G.S. "Bromelain: A Literature Review and Discus sion of Its Therapeutic Applications." *Alternative Medicine Review* (November 1, 1996).

ORGANIZATIONS

American Botanical Council. PO Box 201660, Austin, TX 78720 1660.

OTHER

HealthWorld Online. http://www.healthy.net (January 17, 2001).

Beth Kapes

Bronchitis

Definition

Bronchitis is an inflammation of the air passages between the nose and the lungs, including the windpipe, or trachea, and the larger air tubes, called bronchi, that bring air into the lungs from the trachea. When bronchitis is mild and brief in duration, it is called acute.

Chronic bronchitis is recurrent, has a prolonged course, and is often a sign of a serious underlying lung disease.

Description

Acute bronchitis

Bronchitis is an inflammation of the breathing airways accompanied by coughing and spitting up of phlegm. It can be caused by exposure to a cold or the flu, infection, or irritants. Although the symptoms of acute and chronic bronchitis are similar, their causes and treatments are different. Acute bronchitis is most common in winter. It usually follows an upper respiratory infection, and may be accompanied by a secondary bacterial infection. The recovery time for acute bronchitis is usually within two weeks, although the **cough** may persist longer. Like any upper airway inflammatory process, acute bronchitis can increase a person's likelihood of developing **pneumonia**.

Anyone can get acute bronchitis, but infants, young children, and the elderly are more likely to suffer from the disease. Smokers and people with heart or lung diseases have a higher risk of developing acute bronchitis. Individuals exposed to chemical fumes or high levels of air pollution also have a greater chance of developing acute bronchitis.

Chronic bronchitis

Chronic bronchitis is one of a group of diseases that fall under the name *chronic obstructive pulmonary disease,* or COPD. Other diseases in this category include **emphysema** and chronic asthmatic bronchitis. Chronic bronchitis is a major cause of disability and death in the United States. In 2007, the American Lung Association estimated that about 9.5 million Americans suffered from the disease. Chronic bronchitis shows symptoms similar to acute bronchitis, but recurs and is present for at least three months a year. More women than men develop chronic bronchitis. As the number of women who smoke has increased, so has their rate of chronic bronchitis. The number of women with chronic bronchitis is about twice the number of men. Because this disease progresses slowly, middle-aged and older people are more likely to be diagnosed with chronic bronchitis.

Causes and symptoms

Acute bronchitis

Acute bronchitis usually begins with the symptoms of a cold, such as a runny nose, **sneezing**, and dry cough. However, the cough soon becomes deep and painful. Coughing brings up a greenish yellow phlegm or sputum. These symptoms may be accompanied by a **fever** of up to 102°F (39°C). **Wheezing** after coughing is common. About 90% of acute bronchitis is caused by a bacterial infection.

In uncomplicated acute bronchitis, the fever and most other symptoms except the cough disappear after three to five days. Coughing may continue for several weeks. Acute bronchitis is often complicated by a bacterial infection, in which case the fever and a general feeling of illness persist.

Chronic bronchitis

Chronic bronchitis is caused by inhaling respiratory tract irritants; it may also be due to recurrent bouts of acute bronchitis. The most common cause, however, is the irritation of cigarette smoke. The cells that line the respiratory system contain fine, hair-like outgrowths called cilia. Normally, the cilia of many cells beat rhythmically to move mucus along the airways. When smoke or other irritants are inhaled or when there is irritation from repeated dry coughing, the cilia become paralyzed or break off and the airways become inflamed, narrowed, and clogged. This leads to difficulty breathing and can progress to emphysema, which is a life-threatening disease. A mild cough is usually the first visible sign of chronic bronchitis. Coughing brings up phlegm, and may be accompanied by wheezing and shortness of breath.

Diagnosis

General

Initial diagnosis of bronchitis is based on observing the patient's symptoms and health history. The physician will perform a chest examination with a stethoscope, listening for specific sounds that indicate lung inflammation and airway narrowing. A sputum culture may be performed, particularly if the sputum is green or has blood in it, to determine whether a bacterial infection is present and to identify the disease-causing organism so that an appropriate antibiotic can be selected. Occasionally, in diagnosing a chronic lung disorder, the sample of sputum is collected using a procedure called a bronchoscopy.

Chronic bronchitis

A pulmonary function test is important in diagnosing chronic bronchitis and other variations of COPD. The test uses an instrument called a spirometer, which measures the volume of air entering and leaving the lungs. A doctor may do a chest x ray, an electrocardiogram (ECG), and blood tests as well.

Other tests may be used to measure how effectively oxygen and carbon dioxide are exchanged in the lungs.

Treatment

The treatment of chronic bronchitis is complex and depends on the stage of the disease and the presence of other health problems. Lifestyle changes, such as quitting **smoking** and avoiding secondhand smoke or polluted air, are essential first steps. Controlled **exercise** performed on a regular basis is also important.

There are a multitude of botanical and herbal medicines that can be used to treat bronchitis. Examples from **aromatherapy** include **essential oils** of any of the following: benzoin, *Styrax benzoin;* camphor, *Cinnamomum camphora;* **eucalyptus**, *Eucalyptus globulus;* **lavender**, *Lavandula officinalis;* pine, *Pinus sylvestris;* sandalwood, *Santalum album;* and **thyme**, or *Thymus vulgaris*. Any one or combination of these oils should be added to water and inhaled in a warm steam. They can also be dabbed onto a cloth, and the aroma can be inhaled deeply through the nose. A mixture of the essential oils of clove, *Eugenia aromaticum;* cinnamon, *Cinnamomum zeylanicum;* **lemon balm**, *Melissa officianalis;* and lavender, *Lavandula officinalis,* is reported to be particularly effective when taken as a steam inhalation.

Herbalists recommend taking a tea, syrup or tincture of any of the following herbs:

- mullein, *Verbascum thapsus*
- coltsfoot, *Tussilago farfara*
- aniseed, *Pimpinella anisum*
- hyssop, *Hyssopus officinalis*
- elecampane, *Inula helenium*
- garlic, *Allium sativum*

Recommended homeopathic remedies include:

- *Aconite* 6c
- *Kali bichromicum* 6c
- *Phosphorus* 6c

Acupuncture can be useful in preventing chronic bronchitis attacks and in resolving colds that lead to acute attacks.

For a mild case of acute bronchitis, over-the-counter remedies of homeopathic medicine, **traditional Chinese medicine**, and Ayurveda are widely available and quite helpful. Practitioners of these disciplines can be very effective and should be consulted when dealing with more severe or chronic cases. **Hydrotherapy** and massage with tapping and **cupping** is also recommended to loosen mucus, improve breathing, and heighten the immune response to the condition.

Consuming the juice of a lemon squeezed into a cup of water may be consumed to clear out mucus. Hot, spicy foods can help open the air passages. These foods include **garlic**, onions, chili peppers, and horseradish, and should be consumed liberally.

Allopathic treatment

Acute bronchitis

When no secondary infection is present, acute bronchitis is treated in the same way as the **common cold**. Home care includes drinking plenty of fluids, resting, abstaining from smoking, increasing moisture in the air with a cool mist humidifier, and taking acetaminophen (Datril, Tylenol, Panadol) for fever and **pain**. Aspirin should not be given to children because it is associated with seizures in young people. Cough syrups are recommended to reduce coughing, soothe irritation, and increase expectoration of mucus.

It is important for mucus to be cleared from the lungs. Cough suppressants should be limited because they may lead to mucus accumulation in the plugged airways, resulting in a breeding ground for pneumonia bacteria. If the patient is coughing up phlegm, the cough should be allowed to continue to bring up mucus and irritants from the lungs. Cough medicines with expectorants may, therefore, be helpful. Expectorant cough medicines thin the mucus in the lungs, making it easier to cough up and expel. People who are unsure about what types of medications are contained in over-the-counter cough syrups should ask their pharmacist for an explanation.

If a secondary bacterial infection is present, the infection may be treated with an antibiotic. Patients need to take the entire amount of antibiotic prescribed. A number of studies have shown, however, that antibiotics have only limited value in the treatment of acute bronchitis. These studies suggest that, in many cases, a drug is prescribed to make physicians and patients feel as if they are "doing something."

Chronic bronchitis

Drug therapy uses bronchodilators to relax the muscles of the bronchial tubes and allow increased airflow. They can be taken by mouth or inhaled using a nebulizer. Common bronchodilators include albuterol (Ventolin, Proventil, Apo-Salvent) and metaproterenol (Alupent, Orciprenaline, Metaprel, Dey-Dose). Antiinflammatory medications are added to reduce swelling of the airway tissue. Corticosteroids, such as prednisone, can be taken orally or intravenously. Other steroids may be inhaled. Medications are also given to reduce the quantity of mucus. As the disease progresses, the patient may need supplemental

KEY TERMS

Bronchoscopy—An examination of the lungs and airway passages using a flexible fiberoptic instrument.

Emphysema—A disease involving destruction of air sacs in the lungs, so that they do not take in oxygen easily and have the tendency to retain air within the lungs.

Mucus—The slippery secretion of the mucous membranes of the respiratory tract.

Nebulizer—A device that delivers medicine into the airways in the form of a mist.

Phlegm—A thick secretion of mucus that may clog the airway passages; it is produced in response to irritation.

Sputum—Mucus and other substances coughed up from the lungs.

Trachea—A cartilage tube in the area of the throat that carries air to the lungs.

oxygen. A one-time pneumonia vaccination may also be recommended.

In 2002, the United States Food and Drug Administration (FDA) approved a drug therapy for the treatment of chronic bronchitis, as well as other pulmonary diseases. Called Severent Diskus, or salmeterol, the product is a long-acting bronchodilator that can be inhaled twice a day and will last for 12 hours. It works well for patients with the chronic form of bronchitis, but is not intended for use in acute episodes. In 2005, the FDA asked the manufacturers of Severent Diskus to add a warning label to the product indicating that the drug can have lethal effects in some cases and that it should be used only if other treatments have been ineffective.

Expected results

When treated, acute bronchitis normally lasts one to two weeks if no complications occur, although a cough may continue for several more weeks. Unfortunately, there is no cure for chronic bronchitis, and the disease can often lead to or coexists with emphysema. On the whole, all forms of COPD are a leading cause of death.

Prevention

The best way to prevent bronchitis is to avoid becoming a smoker or to stop smoking. Smokers are 10 times more likely to die of COPD than non-smokers. Smokers who stop show improvement in lung function. Other preventive measures include avoiding chemical and environmental irritants, such as air pollution, and maintaining good overall health.

Supplementation with vitamins A, C, and E, **zinc**, and **bioflavonoids**, may also be helpful in preventing recurrence and secondary **infections**. Dairy products, sugary foods, and eggs should be avoided, as they may increase the tendency to form mucus in the lungs.

Resources

BOOKS

Acute Bronchitis A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego: ICON Health Publications, 2004.

Anzueto, Antonio. *Contemporary Diagnosis and Management of Bronchitis*. Newton, PA.: Handbooks in Health Care, 2006.

Chronic Bronchitis A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego: ICON Health Publications, 2004.

PERIODICALS

Bush, Andrew, and Anne H. Thomson. "Acute Bronchiolitis." *BMJ* (November 2007):1037 1041.

Fabbri, L. M., et al. "Update in Chronic Obstructive Pulmonary Disease 2005." *American Journal of Respiratory and Critical Care Medicine* (October 2006):1056 1065.

Wenzel, Richard P., and Alpha A. Fowler. "Acute Bronchitis." *New England Journal of Medicine* (November 2006):2125 2130.

ORGANIZATIONS

National Heart, Lung, and Blood Institute Information Center, P.O. Box 30105, Bethesda, MD, 20824 0105.

National Jewish Center for Immunology and Respiratory Medicine, 1400 Jackson Street, Denver, CO, 80206.

Patience Paradox
Teresa G. Odle
David Edward Newton, Ed.D.

Bruises

Definition

Bruises, or ecchymoses, are a discoloration and tenderness of the skin or mucous membranes due to the leakage of blood from an injured blood vessel into the tissues. Pupura refers to bruising as the result of a disease condition. A very small bruise is called a petechia. These often appear as many tiny red dots clustered together, and could indicate a serious problem.

Description

Bruises change colors over time in a predictable pattern, so that it is possible to estimate when an injury occurred by the color of the bruise. Initially, a bruise will be reddish, the color of the blood under the skin. After one to two days, the red blood cells begin to break down, and the bruise will darken to a blue or purplish color. This fades to green at about day six. Around the eighth or ninth day, the skin over the bruised area will have a brown or yellowish appearance, and it will gradually diminish back to its normal color.

Long periods of standing will cause the blood that collects in a bruise to seep through the tissues. Bruises are actually made of little pools of blood, so the blood in one place may flow downhill after awhile and appear in another. For instance, bruising in the back of the abdomen may eventually appear in the groin; bruising in the thigh or the knee will work its way down to the ankle.

Causes and symptoms

Healthy people may develop bruises from any injury that doesn't break through the skin. Vigorous **exercise** may also cause bruises due to bringing about small tears in blood vessels walls. In a condition known as purpura simplex, there is a tendency to bruise easily due to an increased fragility of the blood vessels. Bruises also develop easily in the elderly, because the skin and blood vessels have a tendency to become thinner and more fragile with **aging**, and there is an increased use of medications that interfere with the blood clotting system. In the condition known as purpura senilis, the elderly develop bruises from minimal contact that may take up to several months to completely heal.

The use of nonsteroidal anti-inflammatories such as ibuprofen (Advil) and naproxen (Aleve) may lead to increased bruising. Aspirin, antidepressants, **asthma** medications, and cortisone medications also have this effect. The anti-clotting medications also known as blood thinners, especially the drug Warfarin (Coumadin), may be the cause of particularly severe bruising.

Sometimes bruises are connected with more serious illnesses. There are a number of diseases that cause excessive bleeding or bleeding from injuries too slight to have consequences in healthy people. An abnormal tendency to bleed may be due to hereditary bleeding disorders, certain prescription medications, diseases of the blood such as **leukemia**, and diseases that increase the fragility of blood vessels. If there are large areas of bruising or bruises develop very easily, this may herald a problem. Other causes that should be ruled out include liver disease, **alcoholism**, drug addiction, and acquired immune deficiency syndrome (**AIDS**). Bruising that occurs around the navel may indicate dangerous internal bleeding; bruising behind the ear, called Battle's sign, may be due to a skull fracture; and raised bruises may point to autoimmune disease.

Diagnosis

Bruising is usually a minor problem, which does not require a medical diagnosis. However, faced with extensive bruising, bruising with no apparent cause, or bruising in certain locations, a physician will pursue an evaluation that will include a number of blood tests. If the area of the bruise becomes hard, an x ray may be required.

Treatment

Several types of topical applications are usually recommend to speed healing and to reduce the **pain** associated with bruises. **Vitamin K** cream can be applied directly to the site of injury. Astringent herbs such as **witch hazel**, *Hamamelis virginiana*, can be used. This will tighten the tissues and therefore diminish the bruising. The homeopathic remedy, *Arnica montana*, can be applied as a cream or gel to unbroken skin.

Oral homeopathic remedies may reduce bruising, pain, and swelling as well. *Arnica montana*, at 30 ml (1 oz), taken one to two times per day is highly recommended. For **ledum**, 30 ml (1 oz) one to two times per day is also useful.

Allopathic treatment

A bruise by itself needs no medical treatment. It is often recommended that ice packs be applied on and off during the first 24 hours of injury to reduce the bruising. After that, heat, especially moist heat, is recommended to increase the circulation and the healing of the injured tissues. Rest, elevation of the effected part, and compression with a bandage will also retard the accumulation of blood. Rarely, if a bruise is so large that the body cannot completely absorb it or if the site becomes infected, it may have to be surgically removed.

Expected results

The blood under the skin which causes the discoloration of bruising should be totally reabsorbed by the body in three weeks or less. At that time, the skin color should completely return to normal.

Sometimes, a bruise may become solid and increase in size instead of dissolving. This may indicate blood trapped in the tissues, which may be need to be drained. This is referred to as a hematoma. Less commonly, the body may develop **calcium** deposits at the injury site in a process called heterotopic ossification.

Prevention

Vitamin K promotes normal clotting in the blood, and therefore may help reduce the tendency to bruise easily. Green leafy vegetables, **alfalfa**, broccoli, seaweed, and fish liver oils are dietary sources of vitamin K. Other good foods to eat would be those containing **bioflavonoids**, such as reddish-blue berries. These can assist in strengthening the connective tissue, which will decrease the spread of blood and bruising. **Zinc** and **vitamin C** supplements are also recommended for this.

Resources

BOOKS

Editors of Prevention Magazine Health Books, eds. *The Doctors Book of Home Remedies*. Prevention Health Books, 2000.

Feinstein, Alice, ed. *Prevention's Healing With Vitamins: The Most Effective Vitamin and Mineral Treatments for Everyday Health Problems and Serious Disease*. Pre vention Health Books, 1998.

Williams,William J. *Williams' Hematology*. New York: McGraw Hill, 1995.

Patience Paradox

Bruxism

Definition

Bruxism is the habit of clenching and grinding the teeth. It most often occurs at night during sleep, but may also occur during the day. It is an unconscious behavior or habit perhaps performed to release **anxiety**, aggression, or anger.

Description

Bruxism is one of the oldest disorders known, and approximately one in four adults experience it. It can occur in children and adolescents as well; cases of bruxism in children as young as 24 months have been reported. Most people are not aware of the disorder until their teeth have been damaged.

Causes and symptoms

While bruxism is typically associated with **stress**, it may also be triggered by abnormal occlusion (the way the upper and lower teeth fit together) or crooked or missing teeth. Symptoms of bruxism include: dull headaches, earaches, sensitive teeth, sore and tired facial muscles, and locking, popping, and clicking of the jaw. During a dental examination, a dentist may recognize damage resulting from bruxism, including: enamel loss from the chewing surfaces of teeth, flattened tooth surfaces, loosened teeth, and fractured teeth and fillings. Left untreated, bruxism may lead to tooth loss and jaw dysfunction.

Bruxism also appears to be associated with Rett syndrome, an X-linked neurodegenerative disorder that occurs almost exclusively in girls. It is not known as of 2008 why children with this disorder frequently develop bruxism.

Diagnosis

Medical and dental histories, examinations, and x rays are usually necessary to differentiate bruxism from other conditions that may cause similar **pain**, such as ear **infections**, dental infections, and **temporomandibular joint syndrome** (TMJ). In many cases, untreated bruxism can lead to chronic TMJ due to the stress that prolonged grinding places on the jaw and the temporomandibular joint.

Wearing away of the tooth surface is generally regarded as the most important clinical sign of bruxism. Although there is no universally accepted scale for measuring the degree of tooth wear, a 2002 Dutch study reported on a five-point scale that appears to be a reliable instrument for diagnosing bruxism. The five points are as follows:

- 0 = no wear.
- 1 = visible wear within the tooth enamel.
- 2 = visible wear with dentine exposure and loss of crown height.
- 3 = loss of crown height between 1/3 and 2/3.
- 4 = loss of crown height greater than 2/3.

Treatment

Stress management and **relaxation** techniques, such as hypnosis and **guided imagery**, may be useful in breaking the habit of jaw clenching and teeth grinding. Tight jaw muscles are often relaxed by applying warm compresses to the sides of the face. **Acupuncture** may relieve the jaw tension associated with both bruxism and TMJ. **Massage therapy** and deep tissue

KEY TERMS

Crown—The part of a tooth that is covered by enamel.

Dentine—The hard major portion of a tooth below the enamel.

Enamel—The hard outermost surface of a tooth.

High spot—An area of a tooth or restoration that feels abnormal or uncomfortable because it hits its opposing tooth before other teeth meet.

Night guard—A removable custom-fitted plastic appliance that fits between the upper and lower teeth to prevent them from grinding against each other.

Occlusion—The way upper and lower teeth fit together during biting and chewing.

Rett syndrome—An X-linked disorder of the nervous system found almost exclusively in girls. Children with Rett's syndrome often develop bruxism, for reasons as yet unknown.

Rolfing—Based on the belief that proper alignment of various parts of the body is necessary for physical and mental health, rolfing uses deep tissue massage and movement exercises in an attempt to bring the body into correct alignment.

Temporomandibular joint (TMJ)—The jaw joint formed by the mandible (lower jaw bone) moving against the temporal bone of the skull.

realignment, including **rolfing**, can also assist in releasing the clenching pattern.

Anti-spasmodic herbal preparations which also contain central nervous system relaxant properties, such as **chamomile** (*Matricaria chamomilla*), may be prescribed before bed to prevent grinding while asleep.

Biofeedback, which teaches an individual to control muscle tension and any associated pain through thought and visualization techniques, is also a treatment option for bruxism. In biofeedback treatments, sensors placed on the surface of the jaw are connected to a special machine that allows the patient and healthcare professional to monitor a visual and/or audible readout of the level of tension in the jaw muscles. Through relaxation and visualization exercises, the patient learns to relieve the tension and can actually see or hear the results of their efforts instantly through the sensor readout on the biofeedback equipment. Once the technique is learned and the patient is able to recognize and differentiate between the feelings of muscle tension and muscle relaxation, the biofeedback equipment itself is no longer needed and the patient has a powerful, portable, and self-administered treatment tool to deal with pain and tension.

Allopathic treatment

To prevent further damage to the teeth and jaw, bruxism is treated by placing a removable custom-fitted plastic appliance called a night guard between the upper and lower teeth. Although the clenching and grinding behavior may continue, the teeth wear away the plastic instead of each other.

In some cases, abnormal occlusion may be adjusted and high spots removed so that the teeth fit together in a more comfortable position. Missing teeth may be replaced and crooked teeth may be straightened with orthodontic treatment to eliminate possible underlying causes of bruxism. In cases where jaw muscles are very tight, a dentist may prescribe muscle relaxants.

Expected results

Bruxism may cause permanent damage to teeth and chronic jaw pain unless properly diagnosed and promptly treated. It is considered a major risk factor for the failure of dental implants. The behavior may be eliminated if its underlying causes are found and addressed.

Prevention

Increased awareness in patients prone to anxiety, aggression, or anger may prevent the habit of bruxism from developing.

Resources

PERIODICALS

Baba, K., T. Haketa, and S. Akishige, et al. "Validation of Diagnostic Criteria for Sleep Bruxism." *Journal of Oral Rehabilitation* 29 (September 2002): 872.

Coyne, B. M., and T. Montague. "Teeth Grinding, Tongue and Lip Biting in a 24 Month Old Boy with Meningo coccal Septicaemia. Report of a Case." *International Journal of Paediatric Dentistry* 12 (July 2002): 277 280.

Lobbezoo, F., W. J. Groenink, and A. A. Kranendonk, et al. "A Reliability Study of Clinical Occlusal Tooth Wear Measurements." *Journal of Oral Rehabilitation* 29 (September 2002): 881 882.

Lynch, C. D., and R. J. McConnell. "The Cracked Tooth Syndrome." *Journal of the Canadian Dental Association* 68 (September 2002): 470 475.

Magalhaes, M. H., J. Y. Kawamura, and L. C. Araujo. "General and Oral Characteristics in Rett Syndrome."

Special Care in Dentistry 22 (July August 2002): 147 150.
Misch, C. E. "The Effect of Bruxism on Treatment Planning for Dental Implants." *Dentistry Today* 21 (September 2002): 76 81.

ORGANIZATIONS

Academy of General Dentistry. Suite 1200, 211 East Chi cago Avenue, Chicago, IL 60611.(312)440 4300. http:// www.agd.org. agdjournal@agd.org.
American Dental Association. 211 East Chicago Avenue, Chicago, IL 60611. (312)440 2500. http://www.ada.org.
Association for Applied Psychophysiology and Biofeed back. Suite 304, 10200 W. 44th Ave., Wheat Ridge, CO 80033 2840. (303)422 8436. http://www.aapb.org.

Paula Ford-Martin
Rebecca J. Frey, PhD

Bryonia

Description

Bryonia is a toxic plant in the gourd family. There are two species used in healing, *Byronia alba* and *Bryonia diocia*. *B. alba* is most commonly used in homeopathic healing.

Bryonia is a native European perennial climbing vine with red berries, white flowers, and a thick, white, fleshy taproot, or primary root. The root is the part of the plant used in healing. It has a strong, bitter odor and taste and can cause death within hours by inflammation of the digestive system. Bryonia is also called devil's turnip, common bryony, white bryony, or wild **hops**. In **homeopathy** it is abbreviated bry.

White Bryony. *(© Arco Images / Alamy)*

KEY TERMS

Gangrene—Gangrene is tissue death cause by a lack of blood flow to the tissues followed by a bacterial infection. It is progressive and often results in amputation of the affected part of the body.

Leprosy—Leprosy is a chronic disease that causes slow breakdown of bones, muscles, nerves, and skin.

Pleurisy—The lining of the lungs becomes inflamed and secretes mucus into the lung cavity.

General use

Homeopathic medicine operates on the principle that like heals like. This means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow another homeopathic law, the Law of Infinitesimal. In opposition to traditional medicine, the Law of Infinitesimal states that the lower a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount, if any, remains in a large amount of the diluting liquid.

In homeopathic terminology, the effectiveness of remedies is proved by experimentation and reporting done by famous homeopathic practitioners. Bryonia was proved as a remedy by the German founder of homeopathy, Dr. Samuel Hahnemann (1775–1843) in 1834.

In homeopathic medicine, bryonia is used to treat symptoms that develop slowly. These symptoms include feeling lethargic, tired, irritable, extremely thirsty, and feeling excruciating **pain** upon the slightest movement. Psychological symptoms include feeling mentally sluggish. People who need bryonia may fall into a stupor and be confused when called back to reality, especially at night. Some people feel indecisive and restless despite the fact that any movement makes their symptoms worse.

Bryonia is used to treat dry, spasmodic **cough** that causes pain, **influenza** symptoms, and severe headaches that develop slowly. It is also used to treat chronic diseases such as arthritis, painful or swollen joints, and rheumatism.

Other conditions for which homeopathic healers recommend bryonia include inflammation of the chest, **pleurisy**, **pneumonia**, and other lung conditions. Byronia is also said to have an effect on the digestive system. It is used to treat abdominal pain, acute **gastroenteritis**, **diarrhea** (especially diarrhea that is worse in the morning), **nausea**, and **vomiting**.

In homeopathic medicine the fact that certain symptoms get better or worse under different conditions is used as a diagnostic tool to indicate what remedy will be most effective. Symptoms that benefit from treatment with bryonia get much worse with movement. The smallest movement aggravates the person needing bryonia. Symptoms may get worse after eating and drinking, despite the fact that people needing bryonia crave cool drinks and food. Symptoms also get worse in heat and in the summer. People may feel dizzy in the heat and have trouble sleeping. Pain is worse at night and on the right side of the body. Symptoms improve with rest, application of pressure to the painful part of the body, remaining still, and a cool environment.

Homeopathy also ascribes certain personality types to certain remedies. The bryonia personality is said to be insecure about their financial situation, even when they are wealthy, and thus become materialistic. People with the bryonia personality tend to be calculating, clean-living, prudent, and meticulous about details, fitting the stereotype of an accountant or banker.

Outside of homeopathy, bryonia has a long history of folk use. The Greeks used bryony to treat **gangrene**, and in the Middle Ages it was used to treat leprosy. Modern herbalists use bryony to treat painful joints. It may be taken internally, or the leaves may be applied externally to increase blood flow to the painful area. It is also used to treat **asthma**, **bronchitis**, pleurisy, and intestinal ulcers. Some herbalists use it to reduce blood pressure.

Preparations

The root is dug in the autumn, chopped, then pounded into a pulp. For homeopathic remedies, the dried plant material is ground finely then prepared by extensive dilutions. There are two homeopathic dilution scales of dilution, the decimal (x) scale with a dilution of 1:10 and the centesimal (c) scale where the dilution factor is 1:100. Once the mixture is diluted, shaken, strained, then re-diluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Bryonia is available commercially in tablets in many different strengths. Dosage depends on the symptoms being treated.

Homeopathic and orthodox medical practitioners agree that by the time the initial remedy solution is diluted to strengths used in homeopathic healing, it is likely that very few, if any, molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called potentization that has not yet been explained by mainstream scientists.

Precautions

Bryonia is a poisonous plant and should be used as a folk remedy very, very cautiously. It can cause death. When taken in the extremely dilute doses recommended by homeopaths, it has no toxicity, although some individuals may have a personal adverse reaction to the remedy.

Side effects

When taken in the recommended homeopathic dilute form, no side effects have been reported. When taken in larger doses, bryonia irritates and inflames the digestive system, which may result in death.

Interactions

Studies on interactions between bryonia and conventional pharmaceuticals or other herbs have not been found.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. Boston: DK Publishers, 1996.

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. 3rd edition. New York: Putnam, 1997.

Hammond, Christopher. *The Complete Family Guide to Homeopathy*. London: Penguin Studio, 1995.

Lockie, Andrew, and Nicola Geddes. *The Complete Guide to Homeopathy*. London: Dorling Kindersley, 1995.

Ullman, Robert, and Judyth Reichenberg Ullman. *Homeopathic Self Care*. Rocklin, CA: Prima Publishing, 1997.

ORGANIZATIONS

Foundation for Homeopathic Education and Research. 21 Kittredge Street, Berkeley, CA 94704. (510) 649 8930.

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206) 776 4147.

National Center for Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314. (703)548 7790.

Tish Davidson

Buchu

Description

Buchu is the bushy shrub known as *Barosma betulina* or *Auguthosma betulina*. It is native to the Cape region of South Africa where it grows wild on sunny hillsides. It is also cultivated in other areas of Africa and in parts of South America. Commercially, buchu is used to enhance black currant flavor in alcoholic beverages such as cassis, a black currant brandy, and as a fragrance in perfumes. The entire plant is strongly aromatic with a spicy odor and mint-like taste.

Buchu grows to a height of about 6 ft (2 m). The small, wrinkled, leathery leaves are used in healing. The leaves have many raised oil glands on their surface that contain the volatile oil that is the chief medicinal component of the plant. Leaves are harvested in the summer when the plant is in bloom and dried for future use. Two related species, *B. crenulata* and *B. serratifolia* are often used interchangeably with *B. betulina*. The Barosma species of buchu should not be confused with Indian buchu (*Myrtus communis*). Barosma buchu leaves are exported commercially from South Africa to Great Britain, Netherlands, and the United States.

General use

Buchu was a traditional folk remedy of the Khoikhoi, a native people of the Cape region of South Africa. The Khoikhoi used buchu as a stimulant, a diuretic, and to relieve bloating.

Buchu was introduced in Great Britain around 1800 and was officially listed as a medicine in the *British Pharmacopoeia* by 1821. British physicians used it to treat inflammations of the urinary system including cystitis, urethritis, and nephritis. South African herbalists still use it to treat these ailments.

Buchu was introduced in the United States shortly after it appeared in Great Britain. By the mid-1800s, it was a popular patent medicine used for treating urinary complaints. In the United States and Germany today, buchu is still used by herbalists as a diuretic. It is recommended to treat symptoms of high blood pressure and is an ingredient in herbal formulas to relieve premenstrual bloating. It is also used as a stomach tonic.

Buchu is believed to have antiseptic properties. German herbalists recommend it as a treatment for irritable bladder, for mild inflammations of the urinary tract, bladder **infections**, and for prostatitis. American herbalists recommend that compresses soaked in buchu tea be applied to **bruises** to accelerate healing. The tea is also used as a vaginal douche to treat yeast (*Candida*) infections.

KEY TERMS

Cystitis—An inflammation or irritation of the bladder and uterus.

Diuretic—Any substance that increases the production or release of urine.

Nephritis—An inflammation or irritation of the kidneys.

Prostatitis—An inflammation or irritation of the prostate.

Tincture—An alcohol-based extract of medicinal plants.

Urethritis—An inflammation or irritation of the urethra, the tube that drains the bladder.

The German Federal Health Agency's Commission E was established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications. The E Commission found that buchu's diuretic properties were of the same magnitude as ordinary coffee or tea, which are also diuretics of weaker forms. It declined to recommend buchu as a diuretic.

Some laboratory studies found that buchu extracts did not inhibit the growth of any bacteria that commonly cause urinary tract infections. On the basis of these studies, the E Commission also declined to recommend buchu as a treatment for urinary infections. The United States Food and Drug Administration also declined to approve buchu as an ingredient in non-prescription formulas to relieve premenstrual symptoms.

Preparations

Buchu can be prepared as an infusion, a tincture, or in capsules. An essential oil is produced by steam distillation. The infusion is usually made by steeping 0.5 oz (15 g) of the herb in 2 cups (500 ml) of boiling water. This is drunk two or three times a day. Buchu is also available in commercial herbal teas. Ten to 40 drops of the tincture or extract is taken with water three times a day. Commercial capsules containing 200 mg of the herb are available and are generally taken

one to three times daily for a limited time period, usually a week or less.

Buchu is also used in combination with other herbs in commercially available remedies. It is often used in combination with corn silk (*Zea maize*) and **juniper** (*Juniperus communis*) in treatments for cystitis and urinary tract infections, and is combined with **uva ursi** (*Arctostaphylos uva ursi*) in formulas to treat premenstrual bloating.

Precautions

Buchu should not be self-prescribed by people who have **kidney infections**, **pain** during urination, blood in the urine, or any problems with kidney function. Bladder and kidney infections need prompt attention by a medical doctor. Herbalists often recommend that buchu should be avoided by pregnant or breastfeeding women. The volatile oil of buchu contains the compound pulegone that stimulates the uterus to contract and is potentially toxic to the kidneys and liver in excess or over prolonged doses.

Side effects

Due to its diosmin and **essential oils** (diosphenol and pulegone) buchu is a potential kidney and liver irritant in high or prolonged doses. It could also increase the risk of a miscarriage in pregnant women.

Interactions

There has been little scientific study of the interaction of buchu and Western pharmaceuticals. No interactions have been reported nor have there been any reports of herbal interactions.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. Bos ton: DK Publishers, 1996.

Lawless, Julia. *The Illustrated Encyclopedia of Essential Oils*. Rockport, MA: Element, 1995.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1998.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

Tish Davidson

Buckeye *see* **Horse chestnut**

Buckthorn

Description

Buckthorn is the common name for one of several species of shrubs or small trees of the genus *Rhamnus* that are used for medicinal purposes. The two most common species are *R. frangula* and *R. cathartica*.

R. cathartica is also called common or European buckthorn. It was known as a healing herb hundreds of years ago in Anglo-Saxon England, where it was called waythorn, highwaythorn, hartshorn, or ramsthorn. It is also sometimes called purging buckthorn because of its laxative properties. The berries of European buckthorn can be used in healing. The ripe berries of this species are black and the size of a pea.

R. cathartica is a shrubby tree that grows to a height of about 18 ft (6 m). Its twigs are often tipped with small spines, accounting for the "thorn" in its name. Common buckthorn is found throughout Great Britain, continental Europe, and North Africa, where it grows wild in partial sun along the edges of roads and woodlands. It was introduced into North America as an ornamental landscaping plant but has naturalized and become a nuisance plant in much of Canada and the northern United States, where its thick growth crowds out native plants.

R. frangula is shorter, wider, and more shrublike than *R. cathartica*. It grows in damp soil in Great Britain, continental Europe, and parts of Turkey. It was also imported into North America. Bark from the trunk and branches of *R. frangula* is gathered and used in preparing a laxative and a hepatic, or liver medication. *R. frangula* is also called alder buckthorn, black dogwood, frangula bark, alder dogwood, arrow wood, or Persian berries. It is not related to North American dogwood species.

A third species of healing Rhamnus, *R. purshianus*, grows in western North America and is called California buckthorn. Its bark also produces a laxative that is milder than those derived from either of the other two species. Sea buckthorn, *Hippophae rhamnoides*, although it is used in healing and shares a common name with these other species, is not related to the *Rhamnus* buckthorns, nor is it used in the same ways.

General use

All three types of buckthorn are strong laxatives. The berries of *R. cathartica* produce the harshest laxative effect (*cathartica* is a Latin word related to "catharsis," which means purging). The fruit can be used either dried or fresh to treat **constipation** and to

Buckthorn. *(© Arco Images / Alamy)*

soften stools to give relief from **hemorrhoids**, anal fissures, or rectal surgery. The berries are also sometimes mixed with other herbs in "blood purifying" formulas.

The dried bark of *R. frangula* and *R. purshianus* is also used as a laxative. In earlier times it was used to cleanse the gastrointestinal tract before exploratory surgery. Occasionally buckthorn is used in veterinary medicine as a laxative for dogs.

The laxative effect of all these species is well documented. Buckthorn works by causing the large intestine to contract. The contractions shorten the time that waste material remains in the large intestine and allow the formation of softer, moist stools.

In addition to medical uses, buckthorn contains several different pigments used as dyes: yellow from the leaves and bark, green from unripe berries, and blue-gray from ripe berries. *R. frangula* is also a source of high-quality charcoal used for artistic sketching.

Preparations

The berries of *R. cathartica* are harvested when ripe. If used fresh, they can be pressed to yield a bitter, extremely foul-tasting juice that can be mixed with sugar and flavorings to produce a laxative syrup. The dried berries are powdered, then added to liquid.

The bark of *R. frangula* and *R. purshianus* is harvested in the summer and dried. Young bark is preferred, because the longer the bark is stored, the less potent its laxative properties. Bark used medicinally should be stored *at least* one year before use. Fresh bark acts as an irritant to the gastrointestinal system. A fluid extract or a decoction is then prepared from the bark and mixed with water and flavorings. The ideal dose is the smallest amount necessary to produce soft stools.

Precautions

Buckthorn should not be used by people suspected of having appendicitis or intestinal obstructions, by pregnant or breastfeeding women, the frail elderly, or children under age 12.

Side effects

Buckthorn can cause **nausea**, **vomiting**, and gastrointestinal spasms in large doses or in sensitive

KEY TERMS

Decoction—Decoctions are made by simmering an herb in water, then straining it.

Diuretic—Any substance that increases the production of urine.

Edema—Fluid retention, often leading to swelling in the hands and feet.

Electrolytes—Ions whose movement and balance are essential for proper biochemical functioning of the body.

Hepatic—A drug or medication that acts on the liver.

individuals. Buckthorn causes stool to move more rapidly through the large intestine and allows the body less time to reabsorb fluids and electrolytes. Because of this rapid movement, electrolytes can be lost if stools are too frequent and watery. The long-term use of buckthorn can cause **potassium** imbalances. In rare cases this imbalance can cause heart irregularities, **edema**, and other serious health reactions.

Interactions

Potassium imbalance is worsened by taking thiazide diuretics, corticosteroids, and **licorice** root.

Resources

BOOKS

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

OTHER

"Plants for the Future: *Rhamnus cathartica* and *Rhamnus frangula*." http://www.metalab.unc.edu (January 17, 2001) .

Tish Davidson

Bugle weed

Description

Bugle weed is the common name given to at least two low-growing flowering ground cover plants which are members of the Ajuga family, *Lycopus europaens* and *Lycopus virginicus*. Ajugas are part of the Lamiaceae, the same grouping to which plants of the mint family belong. Other names by which bugle weed is known include water bugle, sweet bugle, Virginian water **horehound**, and gypsy weed. Bugle weeds usually have shining, oval-shaped leaves that are reminiscent of spinach leaves in appearance and have glandular dots on their underside. This foliage grows thickly along the surface of a spreading transverse root. Bugle weed blooms in spring, typically producing flowers of a startling cobalt blue. Some species, however, have pink or white flowers. Bugle weed flowers are tubular and lipped in appearance, growing in whorls along the erect spikes that rise from the dense foliage.

Bugleweed. *(© Geoffrey Kidd / Alamy)*

There are different varieties of bugle weed with varying characteristics:

- *Ajuga genevensis*, or Geneva bugle weed, is one of the taller varieties. It has very dense, dark green leaves, which can grow to 4–5 in (10–12 cm) in length, and produce spikes 6–12 in (15–30 cm) high with either pink or blue flowers in clusters along the spike.
- *Ajuga pyramidalis*, or upright bugle weed, is a bushy, slower-growing plant with very shiny leaves that are slightly puckered. This variety also has bright blue flowers.
- *Ajuga Reptans* is the most common type of bugle weed. It is smaller, with 4–10 in (10–20 cm) spikes, and leaves 2–3 in (5–7.5 cm) in length. Its flowers are the same cobalt blue, and leaves may be either dark green or bronze-colored. There are several highly attractive sub-types in the *A. reptans* grouping. *A. reptans alba* has white flowers; *Atropurpurea* has

bronze leaves; burgundy glow bugle weed has three-toned white, green and pink foliage; and several others are combinations of these.

Bugle weed grows in either sun or shade, in well-drained, fairly rich soil. It establishes itself rather quickly and spreads via underground roots. It can become very invasive, and generally provides a mat of dense ground cover that does not permit the growth of weeds or other plants. It can be propagated by dividing the plants.

It is believed that bugle weed is native to the Northern Hemisphere, worldwide. Species of bugle weed are found in Europe, Asia, and North America. Like other members of the Laminaceae or mint family, bugle weed has a mild, pleasant, mint-like aroma when it is freshly picked. It contains flavone glycosides, volatile oils, and tannins.

General use

Beside its horticultural use as an attractive spreading ground cover in rock gardens and other types of gardens, bugle weed is useful medicinally for several different purposes. It is an astringent, and is considered to have sedative qualities as well. It can calm **anxiety** symptoms, including heart palpitations. It is a valued **cough** suppressant. In old herbal remedy books such as Thayer's *Fluid and Solid Extracts*, and even in the more recent *A Modern Herbal*, the authors state that in addition to cough suppression, bugle weed is also useful for healing **tuberculosis** and stopping bleeding from the lungs. It has long been recognized in Western herbal medicine as a cardiac tonic and can actually slow a rapid heart rate and improve the functioning of a weak heart by increasing the strength of the heartbeat. Because of its diuretic properties, bugle weed is useful in removing excess fluid from the body and thus improving circulation. It has been shown to inhibit the body's metabolism of **iodine**, and is helpful for this reason in treating **hyperthyroidism**. Poultices containing bugle weed leaves in combination with other herbs have been found to speed the healing of bruised areas. Lastly, bugle weed is useful in weaning babies as it helps to suppress the production of breast milk.

Preparations

All parts of the bugle weed that grow above ground are used in herbal medicine. It is collected in early spring before the flower buds open. The entire plant is dried and pulverized, and used as a decoction or tea. The tea is made by pouring a cup of boiling water over one teaspoonful of dried bugle weed, and allowing this mixture to steep for 10–15 minutes. This tea may be taken three times a day. A bugle weed tincture is also available. Poultices are made from the leaves, stems and flower buds, steeped in boiling hot water. Clean white cloth is soaked in this mixture, cooled until warm but not hot enough to burn the patient, and applied to the bruised area.

KEY TERMS

Diuretic—A type of drug that helps remove excess water from the body by increasing the amount lost in urine.

Hyperthyroidism—Overactivity of the thyroid gland and therefore, simultaneous overproduction of thyroid hormones.

Poultice—A soft wet mass of cloth, applied warm or hot to an injured part of the body as a therapeutic measure.

Sedative—A drug or agent that calms or soothes a patient. Bugle weed has sedative qualities.

Precautions

Bugle weed should not be used internally if a person has a thyroid condition unless they have consulted a physician or health care practitioner. Because of bugle weed's influence on thyroid function and its ability to reduce secretions (including breast milk), it should be used only for short periods and prescribed by a trained practitioner.

In addition, plants in the mint family, which includes bugle weed, are high in methyl salicylate. This compound causes **allergies** in some people.

Side effects

The *Complete German Commission E Monographs* includes reports of uncommon cases of long-term high-dosage therapy with bugle weed preparations resulting in enlargement of the thyroid gland. When this herb is used in the treatment of hyperthyroidism, its sudden stoppage can result in an increase in the symptoms.

Interactions

Bugle weed preparations may interfere with the use of radioactive isotopes used in some diagnostic procedures.

Resources

BOOKS

Blumenthal, Mark. *The Complete German E Monographs, Therapeutic Guide to Herbal Medicine,* 1998.

Grieve, M., and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. New York: Barnes and Noble Publishing, 1992.

Hoffman, David, and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. New York: Barnes and Noble Publishing, 1999.

Joan Schonbeck

Bulimia nervosa

Definition

Bulimia nervosa is a serious and sometimes life-threatening eating disorder that mainly affects young women. People with bulimia, known as bulimics, consume large amounts of food, or binge, and then try to rid themselves of the food and calories, or purge, through **fasting**, excessive **exercise**, **vomiting**, or use of laxatives. Bulimics often feel that the behavior serves to reduce **stress** and relieve **anxiety**. Because bulimia results from an excessive concern with weight control and self-image, and is often accompanied by **depression**, it is also considered a psychiatric illness.

Symptoms of bulimia nervosa

Recurrent episodes of binge eating, characterized by eating an excessive amount of food within a discrete period of time and by a sense of lack of control over eating during the episode

Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting or misuse of laxatives, diuretics, enemas, or other medications (purging); fasting; or excessive exercise

The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months

Self-evaluation is unduly influenced by body shape and weight

(Illustration by Corey Light. Cengage Learning, Gale)

Description

Bulimia nervosa is a serious health problem affecting many people in the United States. The bingeing and purging activity associated with this disorder can cause severe damage, even death, although the risk of death is not as high as for **anorexia nervosa**, an eating disorder that leads to excessive weight loss.

Binge eating may in rare instances cause the stomach to rupture. In the case of purging, heart failure can result due to loss of vital minerals such as **potassium**. Vomiting causes other serious problems, including acid-related scarring of the fingers if used to induce vomiting, and damage to tooth enamel. In addition, the esophagus, or the tube that brings food from the mouth to the stomach, often becomes inflamed and salivary glands can become swollen. Irregular menstrual periods can also result, and interest in sex may diminish.

Most bulimics find it difficult to stop their behavior without professional help. Many typically recognize that the behavior is not normal, but feel out of control. Some bulimics struggle with other compulsive, risky behaviors such as drug and alcohol abuse. Many also suffer from other psychiatric illnesses, including clinical depression, anxiety, and **obsessive-compulsive disorder** (OCD).

Bulimia nervosa is primarily a disorder of industrialized countries where food is abundant and the culture values a thin appearance. Internationally, the rate of bulimia has been increasing since the 1950s. Bulimia is the most common eating disorder in the United States. Overall, about 3% of Americans are bulimic. Of these 85–90% are female. The rate is highest among adolescents and college women, averaging 5–6%. In men, the disorder is more often diagnosed in homosexuals than in heterosexuals. Some experts believe that number of diagnosed bulimics represents only the most severe cases and that many more people have bulimic tendencies, but are successful in hiding their symptoms. In one study, 40% of college women reported isolated incidents of bingeing and purging.

Bulimia affects people from all racial, ethnic, and socioeconomic groups. The disorder usually begins later in life than anorexia nervosa. Most people begin bingeing and purging in their late teens through their

twenties. Men tend to start at an older age than women. About 5% of people with bulimia begin the behavior after age 25. Bulimia is uncommon in children under age 14.

Competitive athletes have an increased risk of developing bulimia nervosa, especially in sports where weight it tied to performance and where a low percentage of body fat is highly desirable. Jockeys, wrestlers, bodybuilders, figure skaters, cross-country runners, and gymnasts have higher than average rates of bulimia. People such as actors, models, cheerleaders, and dancers who are judged mainly on their appearance are also at high risk of developing the disorder. This same group of people is also at higher risk for developing anorexia nervosa. Some people are primarily anorexic and severely restrict their calorie intake while also purging the small amounts they do eat. Others move back and forth between anorectic and bulimic behaviors.

Causes and symptoms

Causes

Bulimia nervosa is a complex disorder that does not have a single cause. Research suggests that some people have a predisposition toward bulimia and that something then triggers the behavior, which then becomes self-reinforcing. Hereditary, biological, psychological and social factors all appear to play a role.

- Heredity: Twin studies suggest that there is an inherited component to bulimia nervosa, but that it is small. Having a close relative, usually a mother or a sister, with bulimia slightly increases the likelihood of other (usually female) family members developing the disorder. However, when compared other inherited diseases or even to anorexia nervosa, the genetic contribution to developing this disorder appears less important than many other factors. Family history of depression, alcoholism, and obesity also increase the risk of developing bulimia.
- Biological factors: There is some evidence that bulimia is linked low levels of serotonin in the brain. Serotonin is a neurotransmitter. One of its functions is to help regulate the feeling of fullness or satiety that tells a person to stop eating. Neurotransmitters are also involved in other mental disorders such as depression that often occur with bulimia. Other research suggests that people with bulimia may have abnormal levels of leptin, a protein that helps regulate weight by telling the body to take in less food. Research in this area is relatively new, and the findings are still unclear.
- Psychological factors: Certain personality types appear to be more vulnerable to developing bulimia. People with bulimia tend to have poor impulse control. They are of often involved in risky behavior such as shoplifting, drug and alcohol abuse and risky sexual activities. People with bulimia have low-self worth and depend on the approval of others to feel good about themselves. They are aware that their behavior is abnormal. After a binge/purge session, they are ashamed and vow never to repeat the cycle, but the next time they are unable to control the impulse to eat and purge. They also tend to have a black-or-white, all-or-nothing way of seeing situations. Major depression, obsessive-compulsive disorder, and anxiety disorders are more common among individuals who are bulimic.
- Social factors: The families of people who develop bulimia are more likely to have members who have problems with alcoholism, depression, and obesity. These families also tend to have a high level of open conflict and disordered, unpredictable lives. Often something stressful or upsetting triggers the urge to diet stringently and then begin binge/purge behaviors. This may be as simple as a family member as teasing about the person's weight, nagging about eating junk food, commenting on how clothes fit, or comparing the person unfavorably to someone who is thin. Life events such as moving, starting a new school, and breaking up with a boyfriend can also trigger binge/purge behavior. Overlaying the family situation is the false, but unrelenting, media message that thin is good and fat is bad; thin people are successful, glamorous, and happy, fat people are stupid, lazy, and failures.

Symptoms

Many people with bulimia will consume 3,000–10,000 calories in an hour. One distinguishing aspect of bulimia is how out of control people with bulimia feel when they are eating. They will eat and eat, continuing even when they feel full and become uncomfortable.

According to the American Anorexia/Bulimia Association, Inc., warning signs of bulimia include:

- eating large amounts of food uncontrollably (bingeing)
- vomiting, abusing laxatives or diuretics, or engaging in fasting, dieting, or vigorous exercise (purging)
- preoccupation with body weight
- using the bathroom frequently after meals
- depression or mood swings

- irregular menstrual periods
- onset of dental problems, swollen cheeks or glands, heartburn or bloating

Diagnosis

Bulimia nervosa is officially recognized as a psychiatric disorder in the *Diagnostic and Statistical Manual for Mental Disorders Fourth Edition-Text Revision (DSM-IV-TR)* published by the American Psychiatric Association. The DSM-IV-TR sets guidelines for diagnosing psychiatric illnesses.

According to the standards of the DSM-IV-TR, Bulimia nervosa is diagnosed when most of the following conditions are present:

- Repeated episodes of binge eating followed by behavior to compensate for the binge (i.e. purging, fasting, over-exercising). Binge eating is defined as eating a significantly larger amount of food in a limited time than most people typically would eat.
- Binge/purge episodes occur at least twice a week for a period of three or more months.
- The individual feels unable to control or stop an eating binge once it starts and will continue to eat even if uncomfortably full.
- The individual is overly concerned about body weight and shape and puts unreasonable emphasis on physical appearance when evaluating his or her self-worth.
- Bingeing and purging does not occur exclusively during periods of anorexia nervosa.

Bulimia is treated most successfully when diagnosed early. But because the bulimic may deny there is a problem, getting medical help is often delayed. A complete physical examination in order to rule out other illnesses is the first step toward diagnosis.

Treatment

Alternative therapies may be used as complementary to conventional treatment program for bulimic patients. They include diet, nutritional therapy, herbal therapy, **homeopathy**, **hydrotherapy**, **biofeedback** training, **hypnotherapy**, **massage therapy** and **light therapy**.

Diet

The following dietary changes may be helpful for bulimic patients:

- Eating small but nutritious meals at regularly scheduled hours.
- Avoiding sweet, baked goods or any other foods that may cause craving.
- Avoiding allergenic foods.
- Limiting intake of alcohol, caffeine, monosodium glutamate (MSG), and salty foods.

Nutritional therapy

The following supplements may help improve bulimic symptoms and prevent deficiency of essential vitamins and minerals:

- Multivitamin and mineral supplement to prevent deficiency of essential nutrients.
- Vitamin B complex with C.
- Zinc supplement. Bulimic patients may have zinc deficiency, and zinc is an important mineral needed by the body for normal hormonal activity and enzymatic function.

Homeopathy

A homeopathic physician may prescribe patient-specific remedies for the treatment of bulimia.

Light therapy

Light therapy. Exposure to artificial light, available through full spectrum light bulbs or specially designed "light boxes," may be useful in reducing bulimic episodes, especially during the dark winter months.

Hypnotherapy

Hypnotherapy may help resolve unconscious issues that contribute to bulimic behavior.

Exercise

Yoga, **qigong**, **t'ai chi** or dance not only make patients physically healthier but can also make them feel better about themselves.

Other treatments.

Other potentially beneficial treatments for bulimia include Chinese herbal therapy, hydrotherapy and biofeedback training.

Allopathic treatment

Early treatment of bulimia with a combination of drug and behavioral therapies is necessary to prevent serious health consequences. A comprehensive treatment plan is called for in order to address the complex interaction of physical and psychological problems of bulimia.

Behavioral approaches include individual **psychotherapy**, group therapy, and family therapy. Cognitive

behavioral therapy, which teaches patients how to change abnormal thoughts and behavior, is also used. **Nutrition** counseling and self-help groups are often helpful.

Antidepressants commonly used to treat bulimia include desipramine (Norpramin), imipramine (Tofranil), and fluoxetine (Prozac). These medications also may treat any co-existing depression.

In addition to professional treatment, family support plays an important role in helping the bulimic person. Encouragement and caring can provide the support needed to convince the sick person to get help, stay with treatment, or try again after a failure. Family members can help locate resources, such as eating disorder clinics in local hospitals or treatment programs in colleges designed for students.

KEY TERMS

Binge—To consume large amounts of food uncontrollably within a short time period.

Diuretic—A drug that promotes the formation and excretion of urine.

Neurotransmitters—Certain brain chemicals that may function abnormally in acutely ill bulimic patients.

Obsessive-compulsive disorder (OCD)—A disorder that may accompany bulimia, characterized by the tendency to perform repetitive acts or rituals in order to relieve anxiety.

Purge—To rid the body of food and calories, commonly by vomiting or using laxatives.

Expected results

The long-term outlook for recovery from bulimia is mixed. About half of all bulimics show improvement in controlling their behavior after short-term interpersonal or cognitive behavioral therapy with nutritional counseling and drug therapy. However, after three years, only about one-third are still doing well. Relapses are common, and binge/purge episodes and bulimic behavior often comes and goes for many years. Stress seems to be a major trigger for relapse.

The sooner treatment is sought, the better the chances of recovery. Without professional intervention, recovery is unlikely. Untreated bulimia can lead to death directly from causes such as rupture of the stomach or esophagus. Associated problems such as **substance abuse**, depression, anxiety disorders, and poor impulse control also contribute to the death rate.

Prevention

Some ways to prevent bulimia nervosa from developing are as follows:

- If you are a parent, do not obsess about your own weight, appearance, and diet in front of your children.
- Do not tease your children about their body shapes or compare them to others.
- Make it clear that you love and accept your children as they are.
- Try to eat meals together as a family whenever possible.
- Remind children that the models they see on television and in fashion magazines have extreme, not normal or healthy bodies.
- Do not put your child on a diet unless advised to by your pediatrician.
- Block your child from visiting pro-bulimia Web sites. These are sites where people with bulimia give advice on how to purge and support each other's binge/purge behavior.
- If your child is a competitive athlete, get to know the coach and the coach's attitude toward weight.
- Be alert to signs of low self-worth, anxiety, depression, and drug or alcohol abuse and seek help as soon as these signs appear.
- If you think your child has an eating disorder, do not wait to intervene and seek professional help. The sooner the disorder is treated, the easier it is to cure.

Relapses happen to many people with bulimia. People who are recovering from bulimia can help prevent themselves from relapsing by:

- never dieting; instead plan healthy meals
- eating with other people, not alone
- staying in treatment; keep therapy appointments
- monitoring negative self-talk; practicing positive self-talk
- spending time doing something enjoyable every day
- staying busy, but not overly busy; getting at least seven hours of sleep each night
- spending time each day with people you care about and who care about you

Resources

BOOKS

Carleton, Pamela and Deborah Ashin. *Take Charge of Your Child's Eating Disorder: A Physician's Step By Step*

Guide to Defeating Anorexia and Bulimia. New York: Marlowe & Co., 2007.
Heaton, Jeanne A. and Claudia J. Strauss. *Talking to Eating Disorders: Simple Ways to Support Someone Who Has Anorexia, Bulimia, Binge Eating or Body Image Issues*. New York, NY: New American Library, 2005.
Kolodny, Nancy J. *The Beginner's Guide to Eating Disorders Recovery*. Carlsbad, CA: Gurze Books, 2004.
The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments. Richmond, VA: TimeLife Education, 1997.
Messinger, Lisa and Merle Goldberg. *My Thin Excuse: Understanding, Recognizing, and Overcoming Eating Disorders*. Garden City Park, NY: Square One Pub lishers, 2006.

PERIODICALS

Berg, Frances M. "Eating Disorders Affect Both the Mind and Body." *Healthy Weight Journal*. 9/2 (1995): 27 31.
Cismoski, Janet, et al. "Teen Nutrition." *Whose Kids?...Our Kids!* 6 (1995).
Levine, Michael P. "10 Things Men Can Do and Be to Help Prevent Eating Disorders." *Healthy Weight Journal*. 9/1 (1995): 15.

ORGANIZATIONS

American Anorexia/Bulimia Association, Inc, 293 Central Park West, Suite IR, New York, NY, 10024, (212) 501 8351
American Psychological Association, 750 First Street, NE, Washington, DC, 20002 4242, (202) 336 5500, (800) 374 2721, http://www.apa.org.
National Association of Anorexia Nervosa and Associated Disorders (ANAD), P.O. Box 7, Highland Park, IL, 60035, (847) 831 3438, http://www.anad.org.
National Eating Disorders Association, 603 Stewart Street, Suite 803, Seattle, WA, 98101, (206) 382 3587, (800) 931 2237, http://www.edap.org.

Mai Tran

Bunion

Definition

A bunion is an abnormal enlargement of the joint (the first metatarsophalangeal joint, or MTPJ) at the base of the great or big toe (hallux). It is caused by inflammation and usually results from chronic irritation and pressure from poorly fitting footwear.

Description

A displacement of two major bones of the foot (hallux valgus) causes bunions, although not everyone with this displacement will develop the joint swelling and bone overgrowth that characterize a bunion. One of the bones involved is called the first metatarsal bone. This bone is long and slender, with the big toe attached on one end and the other end connected to foot bones closer to the ankle. This foot bone is displaced in the direction of the four other metatarsals connected with the toes. The other bone involved is the big toe itself, which is displaced toward the smaller toes. As the big toe continues to move toward the smaller toes, it may become displaced under or over the second toe. The displacement of these two foot bones causes a projection of bone on the inside portion of the forefoot. The skin over this projection often becomes inflamed from rubbing against the shoe, and a callus may form.

The joint contains a small sac (bursa) filled with fluid that cushions the bones and helps the joint to move smoothly. When a bunion forms, this sac becomes inflamed and thickened. Inflammation of the bursa is called **bursitis**. The swelling in the joint causes additional **pain** and pressure in the toe.

Bunions can also form on the bones that attach the little toe to the foot (the fifth metatarsal bone). These bunions are called tailor's bunion or bunionette.

KEY TERMS

Bursitis—Inflammation of the bursa.

Orthopedics—A medical specialty concerned with treating diseases, injuries, and malformations of the bones and supporting structures, such as tendons, ligaments, and muscles.

Orthotic—A device or brace used to control, correct, or compensate for a bone deformity.

Podiatry—A medical specialty concerned with treating diseases, injuries, and malformations of the feet.

Causes and symptoms

Bunions may form as a result of abnormal motion of the foot during walking or running. One common example of an abnormal movement is an excessive amount of **stress** placed upon the inside of the foot. This leads to friction and irritation of the involved structures. Age has also been noted as a factor in developing bunions, in part because the underlying bone displacement worsens over time unless corrective measures are taken.

Wearing improperly fitting shoes, especially those with a narrow toe box and excessive heel height, often causes the formation of a bunion. This forefoot deformity is seen more often in women than men. The higher frequency in females may be related to the strong link between footwear fashion and bunions. In fact, in a recent survey of more than 350 women, nearly 90% wore shoes that were at least one size too small or too narrow. Shoes without proper arch supports contribute to bunions, since they allow the foot to roll inward, or pronate, putting more pressure on the joint of the big toe.

Because genetic factors can predispose people to hallux valgus bone displacement, a strong family history of bunions can increase the likelihood of developing this foot disorder. Various arthritic conditions and several genetic and neuromuscular diseases, such as Down syndrome and Marfan syndrome, cause muscle imbalances that can create bunions from displacement of the first metatarsal and big toe. Other possible causes of bunions are leg-length discrepancies (with the bunion present on the longer leg) and trauma occurring to the joint of the big toe. Persons with flat feet or **gout** are at increased risk for developing bunions.

Symptoms of bunions include the common signs of inflammation such as redness, swelling, and pain. The discomfort is primarily located along the inside of the foot just behind the big toe. Because of friction, a callus may develop over the bunion. If toes overlap, additional rubbing and pain occur. Inflammation of this area causes a decrease in motion with associated discomfort in the joint between the big toe and the first metatarsal. If allowed to worsen, the skin over the bunion may break down causing an ulcer, which also presents a problem of potential infection. (Foot ulcers can be particularly dangerous for people with diabetes, who may have trouble feeling the ulcer forming and healing if it becomes infected.)

Diagnosis

A thorough medical history and physical exam by a physician is always necessary for the proper diagnosis of bunions and other foot conditions. X rays can help confirm the diagnosis by showing the bone displacement, joint swelling, and, in some cases, the overgrowth of bone that characterizes bunions. Doctors will also consider the possibility that the joint pain is caused by or complicated by arthritis (which causes destruction of the cartilage of the joint), gout (which causes the accumulation of uric acid crystals in the joint), tiny **fractures** of a bone in the foot (stress fractures), or infection, and may order additional tests to rule out these possibilities.

Treatment

The first step in treating a bunion is to remove as much pressure from the area as possible. A foam-rubber pad may be worn at night while sleeping to separate the big toe from the other toes. Various taping techniques can be useful to realign the toe and decrease friction and rubbing that may be present. Most patients are instructed to rest or choose exercises that put less stress on their feet, at least until the misalignment is corrected.

Persons with bunions should wear shoes that have enough room in the toe box to accommodate the bunion. High-heeled shoes and tight-fitting socks or stockings should be avoided. Sandals are a good choice. Shoes may be stretched to provide more comfort or customized to relieve pressure on the affected area. Shoes should be removed periodically during the day to give feet a break. Dressings and pads help protect the bunion from additional shoe pressure. Arch supports can reduce the pressure on the bunion. The application of splints or customized shoe inserts (orthotics) to correct the alignment of the big toe joint is effective for many bunions. These can correct the excessive pronation (turning inward) so that the pressure is not continually on the big toe.

Deep friction massage techniques by a physical or massage therapist can be helpful to increase circulation, reduce inflammation, and prevent soft tissue build-up. Physical therapy also provides useful approaches, such as ultrasound, to help retard or reverse the formation of the bunion.

One study found that using an extract from marigold (*Tagetes patula*) with a protective pad led to a reduction in the size and pain of bunions. A used **chamomile** tea bag applied to a bunion may be helpful. Massaging with essential oil of chamomile or with a cream containing chamomile may provide relief. The homeopathic remedy *Calcarea phosphorica* can be useful in balancing the bone formation and remodeling.

Soaking the affected foot in warm water may reduce pain. Elevating the affected foot and applying ice and compression to the bunion can be helpful, especially after **exercise**.

Dietary supplements and dietary changes may help to treat bunions. Vitamins which may be helpful in treating the bursitis associated with bunions include A, B complex, C, and E. Increasing the intake of protein may also be beneficial.

Acupuncture can be useful in treating the symptoms as the spleen meridian is roughly where the pain occurs. Other treatments may help stabilize the foot.

Allopathic treatment

Nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (Advil, Motrin), acetaminophen (Tylenol), or naproxen **sodium** (Aleve) may be taken to help reduce bunion pain. Physicians may also use steroid injections with local anesthetic around the bunion to reduce inflammation. Other drugs may be necessary should an infection occur.

If conservative treatments are not successful, surgical removal of the bunion may be necessary to correct the deformity. This procedure is called a bunionectomy, and there are many variations on the operation, which is usually performed by a surgeon who specializes in treating bone conditions (orthopedics) or by one who specializes in treating the foot (podiatry). The procedure chosen depends upon the angle of the bone misalignment, condition of the bursa, and strength of the bones. Most bunionectomies involve the removal of a section of bone and the insertion of pins to rejoin the bone. Sometimes the surgeons may move ligaments (which connect bone to bone in the joint) or tendons (which connect bone to muscle) in order to realign the bones.

Expected results

Often, modifications in footwear allow a good recovery without a need for surgery. If surgery is necessary, complete healing without complications requires approximately four to six weeks. Even after surgery corrects the bone misalignment, patients are usually instructed to continue wearing low-heeled, roomy shoes to prevent the bunion from reforming. Complications of bunions include infection of the bunion and inflammation and arthritic changes in other joints as a result of difficulty in walking.

Prevention

Prevention begins with proper foot wear. Shoes with a wide and deep toe box are best. High-heeled shoes should not be worn for longer than three hours at a time. If a bunion is present and becomes inflamed, the foot should be elevated with the application of an ice pack over the painful area for not more than 20 minutes every other hour. Daily exercise strengthens the muscles of the legs and feet and may prevent bunion formation. Women who wear high-heeled shoes should do calf stretches on a regular basis. Use of arch supports or custom made orthotics can help people whose feet rotate inward as they walk or those with different leg lengths. Stretching the Achilles tendon can counteract stresses on the forefoot.

Resources

BOOKS

Richard B. Birrer, et al. *Common Foot Problems in Primary Care,* 2nd ed. Philadelphia, PA: Hanley & Belfus, Inc., 1998.

PERIODICALS

Cimons, Marlene. "Bothersome Bunions." *Runner's World* 34 (May 1999): 46+.

ORGANIZATIONS

American Orthopedic Foot and Ankle Society. 222 South Prospect, Park Ridge, IL 60068.

American Podiatry Medical Association. 9312 Old George town Road, Bethesda, MD 20814.

OTHER

"Foot Pain." *WebMD*. http://my.webmd.com/content/dmk/dmk_article_40037.

Griffith, H. "Complete Guide to Symptoms, Illness & Surgery." The Putnam Berkley Group, Inc., 1995. Available at: http://www.thriveonline.com.

Belinda Rowland

Bupleurum *see* **Chinese thoroughwax**

Burdock root

Description

Great burdock, *Arctium lappa*, is a coarse biennial herb native to Europe and Asia, and naturalized throughout North America since its introduction by European settlers. This massive herb is thought of as a tenacious weed by many gardeners but it is valued by herbalists worldwide as a medicinal and culinary storehouse. Great burdock may grow as tall as 9 ft (3 m) in its second year. Common burdock, *Articum minus*, a smaller species, is abundant in North America, growing to 5 ft (1.5 m) tall. There are about 10 species of burdock.

Over the centuries, the hardy burdock has acquired many names, including beggar's buttons, bardana, burr seed, clot-bur, clothburr, cocklebur, cockle buttons, fox's clote, great burr, Gypsy rhubarb, happy major, hardock, hareburr, love leaves, personata, philanthropium, thorny burr, and turkey burrseed. In Japan the herb is known as gobo and is cultivated for its somewhat sweet-tasting root, an

ingredient in numerous culinary dishes. Gobo has been grown in the United States as a vegetable for soups and salds since the 1980s. In Russia, a common name for the herb is *lapuh*. Most common folk names for this member of the Compositae family refer to the large and prickly seed covers that adhere securely to passersby.

Burdock has a deep primary root producing a large rosette of basal leaves in the first year that may grow as large as 1.5 ft (0.45 m) long and nearly as wide. In the second year of growth, burdock shoots upward with a stout, grooved, branching stem. Leaf stalks are longer than the leaves, and each has a purple hue at the base that extends up the stalk along the inner groove and into the leaf veins. Stalks are hollow in common burdock. Leaves resemble those of rhubarb in size and shape. They are dark green on top and a downy, pale green on the underside. Flower heads are round and thistle-like, with numerous, small purple-hued, funnel-shaped blooms in mid-summer to early fall. Blossoms are surrounded by stiff, prickly, hook-tipped burrs that grasp and hold firmly to clothing and fur.

General use

Burdock's fibrous primary root and rhizome expand to about 1 ft (0.3 m) underground. Most of the herb's medicinal constituents are stored in these underground parts. The entire plant has both nutritive and medicinal uses. The roots contain as much as 45% inulin, as well as alkaloids, essential oil, flavonoids, glycosides, mucilage, polyacetylenes, resin, tannins, and volatile oil. The seeds are rich in vitamins A and B and **essential fatty acids**. Both the seeds and the root have a demulcent quality that is soothing to the mucous membranes of the body. The leaves are generally less potent than the root and seed when used in medicinal preparations.

Burdock is primarily a tonic and alterative herb. The cumulative effect of its use is said to bring a subtle strengthening and cleansing to the entire system. Though most of the therapeutic benefits attributed to this stately herb have not been clinically proven, burdock has been long tested in folk use, and is a safe, if mild, herbal remedy. Burdock has been traditionally used as a blood purifier. It promotes perspiration and the release of toxins from the body. It is helpful in clearing up such skin conditions as **psoriasis** and dry, scaly **eczema**. It works best when used over a period of time. The bitter properties of burdock, particularly noticeable in the dried leaf and seed, stimulate bile secretions. It is a good digestive herb and liver remedy. Burdock's anti-microbial and fungistatic properties have been traced to as many as 14 different polyacetylene compounds in the root. Burdock has been used to treat **boils**, **canker sores**, carbuncles, **measles**, and **sties**. It will help restore friendly bacteria in the system after antibiotic use, and may bring relief in cases of chronic arthritis and **gout**. Burdock may also help reduce blood sugar levels.

KEY TERMS

Alterative—A medication that is given to gradually overcome a disorder or disease condition, or to restore normal body functioning. Burdock has been classified historically as an alterative.

Gobo—A variety of burdock that can be used as a vegetable for soups and salads. It is sometimes known as Japanese burdock.

Rhizome—A horizontal underground stem that sends up shoots from its upper surface.

Tonic—A medication or herbal preparation that is given to restore or increase muscle tone, or to generally promote the vital functions of the body.

In medieval times burdock was used for more serious problems, such as the treatment of **syphilis** and leprosy. Hildegard of Bingen, a twelfth-century German abbess, considered burdock a valuable remedy for cancerous tumors. Herbalists in other cultures and times, including the Americas, China, India, and Russia have turned to the root of this familiar herb for a folk treatment of **cancer**. The oil of burdock, known as *repeinoe maslo*, used over a period of six to eight months, was said to help stimulate the growth of new hair. A drink prepared with aged wine and fine-shredded, fresh burdock leaves was taken after the bite of a mad dog. A poultice of the fresh leaf, applied to the forehead was used to relieve **headache**. Shredded leaves were also combined with an egg white, beaten until stiff, and the mixture was applied to **burns** to speed healing.

Burdock seeds have also been used in medicinal preparations, particularly to treat psoriasis and to stimulate the digestive process. In Chinese medicine seeds were used as a treatment for feverish colds and **sore throat**.

Burdock has been recently shown to have significant antibacterial and anticandidal activity, which helps to explain its place in folk medicine as a treatment for various infectious diseases. In addition, a team of Asian researchers reported in 2002 that burdock appears to counteract the damaging effects of alcohol on the liver.

Preparations

Burdock root is harvested from the first-year plant in the early fall. Roots are deep and may be difficult to extract. The leaves are best used when fresh, as the dried leaf is bitter. Harvesting is done before the plant flowers.

- Decoction: Burdock's medicinal properties, concentrated in the root, are best extracted by decoction. Add about 1 tsp of thinly-sliced, fresh or dried burdock root per 8 oz of cold water in a glass or ceramic pot. Bring to a boil. Reduce heat and simmer for about 20 minutes. Drink up to three cups daily.
- Poultice: Simmer fresh, chopped burdock leaves for up to five minutes. Drain, squeezing out the liquid. Cool until warm. Apply to the affected area and secure with a clean strip of cotton gauze. A little oil applied to the skin first may keep the poultice from sticking when dry. Prepare a fresh poultice every few hours until the desired relief is obtained.
- Tincture: Combine one part fresh herb to three parts alcohol (50% alcohol/water solution) in glass container. Set aside in dark place. Shake daily for two weeks. Strain through muslin or cheesecloth, and store in dark bottle. The tincture should maintain potency for two years. Standard dosage, unless otherwise prescribed, is 1/2 tsp, three times daily.
- Culinary: Fresh burdock roots are mild tasting and somewhat sweet. They may be peeled and thinly sliced to add to soups, salads, and in a mixture of stir-fried vegetables. The young leaves of the first year plant may be eaten fresh or steamed as a nutritious potherb, and the fresh stalks, peeled and steamed until tender, are also a culinary treat. Burdock root, roasted and ground to a powder, has been used as coffee additive or substitute.

Precautions

Some commercially available burdock leaves and roots have been suspected of being adulterated, on occasion, with the root of the deadly **belladonna** (*Atropa belladonna*) with toxic consequences to unwary users. Consumers of herbal remedies should find a reliable source for medicinal herbs to avoid hazardous mistakes. Pregnant women should not use burdock, as it has a reported action as a uterine stimulant.

Precautions

Medicinal preparations containing burdock should not be used by pregnant or lactating women. Burdock prepared as a vegetable, however, appears to be safe.

Side effects

Large doses of medicinal preparations containing burdock may cause the level of **potassium** in the blood to drop too low. There have also been case reports of people developing an allergic skin rash from touching the leaves and stems of the plant.

Interactions

Burdock has been reported to interact with medications given to control diabetes. Persons with diabetes should consult a physician before taking any herbal preparation containing burdock. In addition, burdock has been reported to intensify the activity of diuretics (drugs given to increase urine output) and lithium.

Burdock may also interfere with the absorption of **iron** and other minerals in the diet. Persons who must take supplemental iron or other dietary minerals should consult their health practitioner before taking burdock.

Resources

BOOKS

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies, 3rd ed. Emmaus, PA: Rodale Press, Inc., 1997.

Hoffmann, David. *The New Holistic Herbal,* 2nd ed. Boston, MA: Element, 1986.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston, MA: Shambhala, 1992.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

Polunin, Miriam, and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Com pany, 1992.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Weiss, Gaea and Shandor. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Holetz, F. B., G. L. Pessini, N. R. Sanches, et al. "Screening of Some Plants Used in the Brazilian Folk Medicine for the Treatment of Infectious Diseases." *Memorias do Instituto Oswaldo Cruz* 97 (October 2002): 1027 1031.

Lin, S. C., C. H. Lin, C. C. Lin, et al. "Hepatoprotective Effects of *Arctium lappa Linne* on Liver Injuries Induced by Chronic Ethanol Consumption and Poten tiated by Carbon Tetrachloride." *Journal of Biomedical Science* 9 (September October 2002): 401 409.

Rodriguez, P., J. Blanco, S. Juste, et al. "Allergic Contact Dermatitis Due to Burdock (*Arctium lappa*)." *Contact Dermatitis* 33 (August 1995): 134 135.

Strauch, Betsy. "An Herb To Know Burdock." *The Herb Companion* (Oct./Nov. 1999).

ORGANIZATIONS

American Herbalists Guild. 1931 Gaddis Road, Canton, GA 30115. (770) 751 6021. http://www.americanherbalistsguild.com.

Herb Research Foundation. 1007 Pearl Street, Boulder, CO 80302.(303) 449 2265.

Clare Hanrahan
Rebecca J. Frey, PhD

Burns

Definition

Burns are injuries to the tissues caused by heat, friction, electricity, radiation, or chemicals. Such injuries cause the breakdown of body proteins, death of cells, loss of body fluids, and **edema**.

Description

Burns vary depending on the cause, the intensity, and the body parts involved. They are classified by degree, based on the severity of the tissue damage: A first-degree burn causes redness and swelling in the outermost layers of skin called the epidermis. A second-degree burn involves redness, swelling, and blistering. The damage extends beneath the epidermis to the deeper layers of skin, the dermis. A third-degree burn, also called a full-thickness burn, destroys the entire depth of skin, causing significant scarring. Damage also may extend to the underlying fat, muscle, or bone. Third-degree burns require immediate medical attention. Burns are the third leading cause of accidental death in North America.

The severity of a burn is judged by the amount of body surface area (BSA) involved as well as the depth of the burn. A burn is considered to be critical, or major, if a person has third-degree burns on more than 10% of the BSA or second-degree burns covering more than 25% of an adult's BSA, and more than 20% of a child's BSA. Such burns are serious and should be treated in a specialized hospital burn unit. Burns involving the hands, feet, face, eyes, ears, or genitals are considered critical, as well. Moderate burns are defined as first- or second-degree burns covering 15%-25% of an adult's body or 10%-20% of a child's body, or a third-degree burn on 2%-10% BSA. These burns also require medical attention.

KEY TERMS

Debride—To surgically remove dead tissue.

Intravenous fluids—Nutrients and medicines that can be fed quickly and directly into the veins.

Keloid—An overgrowth of scar tissue that does not resolve.

Mother tincture—An alcohol and water mixture used to extract homeopathic substances. The tincture is then diluted to make a homeopathic remedy.

Shock—An abnormal condition resulting from low blood volume. Signs of shock include rapid pulse and breathing; cool, moist, pale skin; and bluish lips and fingernails.

Skin graft—Surgery used to cover burned or injured areas of the body with new skin.

Thermal burn—Tissue injury caused by extreme heat.

Nourish yin—In TCM, to cool the body and replenish its fluids.

Causes and symptoms

Burns may be caused by any encounter, however brief, with heat greater than 120°F (49°C). The source of this heat may be the sun, hot liquids, steam, fire, electricity, friction (rug burns and rope burns,) and chemicals. Signs that the skin has been burned are localized redness, swelling, and **pain**. A blister may develop. The skin may peel, appear white or charred, and feel numb. A burn may trigger a **headache** or **fever**, and extensive burns may induce shock.

Thermal burns are caused by heat sources such as fire, hot liquids, gases or other objects. Radiation burns are usually due to excess exposure to the sun's rays, tanning beds, or x rays. Chemical burns are most likely to come from strong acids, alkalis, phenols, or **phosphorus**. Electrical burns may be quite severe due to the high heat generated by electric currents.

Diagnosis

A physician will diagnose a burn based upon visual examination, and will ask questions to determine the history of contact with possible sources of damage. Depending on the circumstances, there should be an evaluation of the condition of the lungs and breathing, related injuries, evidence of any suspected child abuse, and the extent and location of the burn. Shock and

infection are often the results of moderate and major burns, and should be included in any evaluation.

Treatment

A number of herbal remedies, applied topically, can help mild burns heal. These include **aloe**, *Aloe barbadensis* or *Aloe vera*; **St. John's wort**, *Hypericum perforatum; Calendula officinalis;* **comfrey** root, *Symphytum officinale;* and **tea tree oil**, *Melaleuca* spp.

Nutritional support is particularly important for burn victims. Supplementing the diet with vitamins A, C, and E, **zinc** and B-complex, **essential fatty acids** (omega-3 and omego-6), and eating foods high in these nutrients can be very beneficial to the healing process. Proteins and fluid intake should be increased to replace losses. The **traditional Chinese medicine** (TCM) approach recommends foods that remove heat and toxins, nourish yin, and promote the production of body fluids. These foods include mung beans, kidney beans, lima beans, soybeans, cucumbers, potatoes, summer squash, sweet potatoes, and barley. In addition, freshly juiced **ginger**, potatoes, and cucumbers can be applied to burns to reduce pain and swelling. The pulp of fresh pumpkin can be used as a poultice (soft compress applied to the affected area). **Chamomile** tea decreases **anxiety**.

Homeopathic treatment should be given as soon as possible after the onset of the burn injury. **Cantharis** 30c is the most noteworthy remedy for burns. It is recommended to keep **blisters** from forming. A dose can be taken every 15 minutes for up to six doses.

Homeopathic **calendula** mother tincture can be useful to promote the healing of burns. Ten drops should be added to one ounce of water and applied to the burn three times daily. *Arnica montana* 30c can help prevent shock. *Urtica urens* 6c and Causticum 6c may also be useful for burns. Urtica may be applied to the skin as an ointment as well.

Guided imagery can assist with pain control.

Allopathic treatment

Burn treatment usually consists of relieving pain, preventing infection, and maintaining body fluids, electrolytes, and calorie intake while the body heals. Children and the elderly are more vulnerable to complications from burn injuries and require more intensive care. Other factors that influence treatment include associated injuries such as bone **fractures** and smoke inhalation, presence of a chronic disease, a history of abuse, and the occurrence of shock or infection. Moderate and major burns should always be treated by a medical practitioner.

The first act of treating a burn is to stop the burning process. Small thermal burns should be immediately placed in cold water if possible. To avoid infection, the wound should be cleaned with soap and water, and all dirt should be carefully removed. Butter, shortening, or similar salve should never be applied to the burn since it prevents heat from escaping and drives the burning process deeper into the skin. Minor burns should be cleaned gently with soap and water. If the skin is broken or apt to be disturbed, the burned area should be coated lightly with an antibacterial ointment and covered with a sterile bandage. Pain relievers such as aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) may be used as needed. A doctor should be consulted if signs of infection appear: increased warmth, redness, pain, or swelling; pus or similar drainage from the wound; swollen lymph nodes; or red streaks spreading from the burn.

At an accident site, the victim should be immediately removed from the burning process. Clothing should be removed from all affected areas. Any clothing embedded in the burn should not be disturbed. Dry chemicals should be brushed from the skin; burns caused by acids, alkalis, phosphorus, or organic compounds, such as phenols and cresols, should be flushed with water continuously over an extended time.

In cases of moderate and major burn damage, further medical treatment may include assessment of breathing and treatment if the patient's airways or lungs have been damaged; a flush of any chemicals; and the administering of intravenous fluids, since burns may dramatically deplete body fluids. Antibiotic ointments are usually applied to burns, and the patient is also given antibiotics intravenously to prevent infection. A **tetanus** shot may also be given. Dead tissue is surgically removed, or debrided. Once the burned area is cleaned and treated, it is usually covered with sterile bandages. Oral narcotics such as codeine may be required for pain relief. The burn patient may have to undergo physical and occupational therapy. If there is extensive scarring, a skin graft is usually performed.

Expected results

Prognosis is dependent upon the degree of the burn, the amount of body surface covered, whether critical body parts are affected, any additional injuries or complications, and the promptness of medical treatment. The epidermis in first-degree burns regenerates rapidly; not much scarring results unless infection

develops. With deeper burns, the process of healing is slow, and scars often develop. This may limit mobility and function, making physical therapy necessary. In some cases, surgery may be advisable to remove scar tissue and restore appearance. Some people, especially young women and people with dark skin, may develop keloids.

Secondary **infections** are common, and may be a major cause of loss of function, disfigurement, and death. Patients with burns over more than 40% BSA, those older than 60 years old, and those with inhalation injuries are at risk for burn injuries that result in death.

Prevention

Burns are commonly received from fires in the home. Properly placed and working smoke detectors in combination with rapid evacuation plans will minimize a person's exposure to smoke and flames in the event of a fire. Children must be taught never to play with matches, lighters, fireworks, gasoline or cleaning fluids.

Burns from scalding with hot water or other liquids may be prevented by setting the water heater thermostat no higher than 120°F (49°C), checking the temperature of bath water before getting into the tub, and turning pot handles on the stove out of the reach of children. Care should be used when removing covers from pans of steaming foods and when uncovering or opening foods heated in a microwave oven.

Sunburns may be avoided by the liberal use of sunscreen. Hats, loose clothing, and umbrellas also provide protection, especially between 10 a.m. and 3 p.m., when the most damaging ultraviolet rays are present.

Burns are often received from electrical appliances. Care should be exercised around stoves, space heaters, irons, and curling irons. Electrical burns may be prevented by covering unused outlets with safety plugs and keeping electrical cords away from infants and toddlers who might chew on them.

Chemical burns may be prevented by wearing protective clothing, including gloves and eye shields. Chemicals should always be used according to the manufacturer's instructions and properly stored when not in use.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Washington: Future Medicine Pub lishing, 1995.

Lininger, D.C., Skye, editor in chief, et al. *The Natural Pharmacy*. California: Prima Health, 1998.

Lockie, Dr. Andrew and Dr. Nicola Geddes. *The Complete Guide to homeopathy: The principles and Practice of Treatment with a Comprehensive Range of Self Help Remedies for Common Ailments*. London: Dorling Kindersley, Ltd., 1995.

ORGANIZATIONS

Shriners Hospitals for Children. 2900 Rocky Point Drive, Tampa, FL 33607 1435.

OTHER

Health Answers. http://www.healthanswers.com (January 17, 2001).

The Merck Manual. http://www.merck.com/pubs/mmanual/section20/ chapter276/276a.htm (January 17, 2001).

Patience Paradox

Bursitis

Definition

Bursitis is the painful inflammation of one or more bursae, which are padlike sacs found in parts of the body that are subject to friction. Bursae cushion the movements between the bones, tendons and muscles near the joints. Bursitis is most often caused by repetitive movement and is known by several common names, including weaver's bottom, clergyman's knee, housemaid's knee, and miner's elbow, depending on the area of injury.

Description

There are over 150 bursae in the human body. Usually bursae are present from birth, but they may form in response to repeated pressure. Each sac contains a small amount of synovial fluid, a clear liquid that acts as a lubricant. The bursae may become inflamed through traumatic injury, infection, or the development of arthritis. The inflammation then causes **pain** whenever the joint is moved. The most common site for bursitis to occur is the shoulder joint (subdeltoid), but it also is seen in the elbows (olecranon), hips (trochanteric), knees, heels (Achilles), and toes. The affected area may be referred to as "frozen," because movement is so limited. In the knee there are four bursae, and all can become inflamed with overuse.

Causes and symptoms

The most common cause of bursitis is repeated physical activity, but it can flare up for no known

KEY TERMS

Arthritis—Inflammation of a joint that may lead to changes in the joint's structure. It causes pain and swelling. Rheumatoid arthritis is a chronic disease that leads to crippling deformities.

Bursa—A sac that contains synovial fluid and cushions the joints.

Gout—A hereditary metabolic disease that is a form of arthritis and causes inflammation of the joints. It is more common in men.

Kinesiology—The science or study of movement.

Synovia—A clear, somewhat sticky lubricating fluid secreted by membranes that surround the joints.

reason. It can also be caused by trauma, **rheumatoid arthritis**, **gout**, and acute or chronic infection.

Pain and tenderness are common symptoms of bursitis. If the affected joint is close to the skin, as with the shoulder, knee, elbow, or Achilles tendon, swelling and redness are seen and the area may feel warm to the touch. The bursae around the hip joint are deeper, and swelling is not as obvious. Movement may be limited and is painful. In the shoulder, it may be difficult to raise the arm outward from the side of the body. Putting on a jacket or combing the hair, for example, become troublesome activities.

In acute bursitis symptoms appear suddenly; with chronic bursitis, pain, tenderness, and limited movement reappear after **exercise** or strain.

Diagnosis

When a patient has pain in a specific joint, a careful physical examination is needed to determine what type of movement is affected and if there is any swelling present. Bursitis will not show up on x rays, although sometimes there are also **calcium** deposits in the joint that can be seen. Inserting a thin needle into the affected bursa and removing (aspirating) some of the synovial fluid for examination can confirm the diagnosis. In most cases, the fluid will not be clear. It can be tested for the presence of microorganisms, which would indicate an infection, and for crystals, which could indicate gout. In instances where the diagnosis is difficult, a local anesthetic (a drug that numbs the area) is injected into the painful spot. If the discomfort stops temporarily, bursitis is probably the correct diagnosis.

Treatment

Nutritional therapy

Naturopaths and nutritionists emphasize the role of diet as an underlying cause of bursitis. They believe that the faulty use of calcium by the body, **magnesium** deficiencies, and food **allergies** may play a role. Their recommended diet may include the following:

- fresh fruits, vegetables and whole grains
- avoidance of foods that may cause allergies or digestive problems
- multivitamin and mineral supplements
- vitamins A, C and E, selenium, and zinc supplements

Herbal therapy

Herbalists have recommended the following herbs or plant products for treatment of bursitis:

- curcumin (turmeric)
- bromelain (an enzyme found in pineapple)
- ginger
- grape-seed extract
- pine-bark extract
- citrus bioflavonoids

Homeopathy

Homeopathic remedies for bursitis include *Belladonna*, *Bryonia* and *Rhus toxicodendron*.

Hydrotherapy

The application of ice soon after an injury helps decrease the inflammation of acute bursitis. After two days of treatment with ice, however, heat instead of ice is more helpful. A warm heating pad or hot showers or baths can also relieve the symptoms of bursitis.

Acupuncture

Acupuncture has been proven effective in treating hip and shoulder pain caused by bursitis and other conditions.

Chiropractic

Spinal manipulation by a chiropractor may help improve movement in the affected joints by relieving some of the pressure on them.

Body work

Body work starts with adequate rest and massage of the bursitic area. Massage can increase blood circulation in the area, reducing the inflammation and pain. Following the initial phase of body work, patients may

participate in **yoga** exercises that help to improve joint mobility and strengthen the muscles surrounding the joints.

Allopathic treatment

Conservative treatment of bursitis is usually effective. The application of heat, rest, and immobilization of the affected joint area is the first step. A sling can be used for a shoulder injury; a cane is helpful for hip problems. The patient can take nonsteroidal anti-inflammatory drugs (NSAIDs) like aspirin, ibuprofen, and naproxen to relieve the pain and inflammation. Once the pain decreases, exercises of the affected area can begin. If the nearby muscles have become weak because of the disease or prolonged immobility, then exercises to build strength and improve movement are best. A doctor or physical therapist can prescribe an effective regimen.

If the bursitis is related to an inflammatory condition like arthritis or gout, then management of that disease is needed to control the bursitis.

When bursitis does not respond to conservative treatment, an injection into the joint of a long-acting corticosteroid preparation like prednisone can bring immediate and lasting relief. The drug is mixed with a local anesthetic and works on the joint within five minutes. Usually one injection is all that is needed.

Surgery to remove the damaged bursa may be performed in extreme cases.

If the bursitis is caused by an infection, then additional treatment is needed. Septic bursitis is caused by the presence of a pus-forming organism, usually *Staphylococcus aureus*. Septic bursitis requires treatment with antibiotics, which can be taken by mouth, injected into a muscle, or injected directly into a vein (intravenously). The bursa will also need to be drained by needle two or three times over the first week of treatment.

Expected results

Bursitis usually responds well to treatment, but it may develop into a chronic condition if the underlying cause is not corrected.

Prevention

Aggravating factors should be eliminated to prevent bursitis. Overexercising or the repetition of a movement that triggers the condition should be avoided. Doing exercises to strengthen the muscles around the joint will also help. When doing repetitive tasks, the patient should take frequent breaks and alternate the repetitive activity with others that use different parts of the body. To cushion the joints, it is a good idea to use cushioned chairs when sitting and foam kneeling pads for the knees. Leaning on the elbows, kneeling, or sitting on a hard surface for a long period of time should be avoided. Not wearing high heels can help prevent bursitis in the heel, as can changing to new running shoes as soon as the old ones are worn out.

Resources

BOOKS

Bennett, J. Claude, and Fred Plum. *Cecil's Textbook of Medicine*. Philadelphia: W. B. Saunders Co., 1994.

Bennett, Robert M. "Bursitis, Tendinitis, Myofascial Pain, and Fibromyalgia." In *Conn's Current Therapy*. Edited by Robert E. Rakel. Philadelphia: W. B. Saunders Co., 1998.

"Bursitis." *The Medical Advisor: The Complete Guide to Alternative and Medical Treatments*. Richmond, VA: TimeLife Inc., 1997.

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine Publish ing, 1995.

Murray, Michael, and Joseph Pizzorno. *Encyclopedia of Natural Medicine,* revised 2nd ed., Rocklin, CA: Prima Health, 1998.

OTHER

Applied Medical Infomatics Inc., 1997. "Bursitis." http://www.healthanswers.com.

Mai Tran

Butcher's broom

Description

Butcher's broom is the root of the plant *Ruscus aculeatus*. *R. aculeatus* is a common evergreen shrub native to Mediterranean countries. It is related to asparagus. The shrub grows to less than 3 ft (1 m) in height and about the same size in girth in shady, moist, uncultivated ground. Its leaves are small and laced with brown membranes. The root, which is the medicinal part, is fleshy. Butcher's broom has a few small greenish white flowers that mature into red, cherry-sized berries. This herb has spread to many other parts of the world including Great Britain, the United States, and western Asia. Other names for Butcher's broom include kneeholm, knee holly, sweet broom, Jew's myrtle, pettigree, and box holly.

Butcher's broom. *(©PlantaPhile, Germany. Reproduced by permission.)*

General use

Butcher's broom has been used in folk medicine as far back as the first century A.D. In the past, it was used as a laxative and as a treatment for **gout**, **jaundice**, **kidney stones**, and broken bones. It was also used as a diuretic to reduce swelling in the hands and feet, and to reduce inflammation due to arthritis. At one time, the plant was eaten as a vegetable in the United States. The seeds have been roasted and used as a coffee substitute.

Few of these uses survive today. Modern herbalists primarily use butcher's broom as supportive therapy for poor circulation, **hemorrhoids**, varicose vein syndrome, and other manifestations of leaky vein walls and poor venous blood return to the heart. For these conditions, it is taken internally. Although butcher's broom will not cure these conditions, it is used to relieve symptoms such as leg cramps, **pain**, heaviness in the legs, swelling of the legs and feet, and it can strengthen vein walls. Butcher's broom is also used externally as an ointment or suppository to treat **itching** and burning associated with hemorrhoids.

Butcher's broom had been in decline as a medicinal herb until the 1950s. Then researchers discovered that an extract of the root contained two compounds, ruscogenin and neuorscogenin, that could constrict the veins in dogs and other laboratory animals. This improves blood flow and increases the strength and tone of those veins.

Interest in butcher's broom increased. The herb was included in many popular formulations for treating poor leg circulation in Europe (and less so in the United States). A few controlled human studies were conducted. People showed some of the same reactions to the drug as laboratory animals, but the improvements in blood flow were slight, and little was known about the safety of the drug. As a result, the United States Food and Drug Administration (FDA) felt the study data was not conclusive enough to approve butcher's broom as a drug. However, the German Federal Health Agency's Commission E (established in 1978 to independently review and evaluate scientific literature and case studies on herb and plant medications) has approved butcher's broom for use in

KEY TERMS

Diuretic—Any substance that increases the production of urine.

Gout—A painful inflammation of the joints, usually caused by excessive uric acid in the blood.

alleviating the discomforts associated with chronic venous insufficiency.

There is less scientific data about treating hemorrhoids with butcher's broom. Although there are compounds in butcher's broom that constrict blood vessels and reduce inflammation, it isn't clear whether these compounds are effective in ointments and suppositories applied externally to hemorrhoids. Recent research done in Palestine also suggests that extracts of *R. aculeatus* have a mild and selective antifungal property. Although initial studies look promising, more controlled research needs to be done on people to conclusively define the role of butcher's broom in healing.

Preparations

The root of butcher's broom is harvested in the fall and dried before use. It is available in commercial capsules, tablets, and tinctures for internal use, and in ointments and suppositories for external use. Tablets often contain about 300 mg of the dried extract. However, patients should follow package directions or directions from their healthcare provider in using this herb.

Precautions

Not much is known about the safety of butcher's broom, which is one reason why the FDA did not approve its use as a drug. However, no health problems are known to result when this herb is used as directed, and it has been used for centuries. People with high blood pressure should not take butcher's broom. Conditions for which butcher's broom is used can be serious. This herb is intended as supportive therapy for these conditions. People with chronic venous insufficiency should be under the care of a trained doctor.

Side effects

In rare cases, butcher's broom may cause **nausea** and stomach upset. No other side effects have been reported.

Interactions

It is not known how butcher's broom interacts with any other herbs or medicines. Few, if any, scientific studies have been done on its interactions with traditional medications.

Resources

BOOKS

Pierce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: William Morrow and Company, 1999.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1998.

OTHER

"Plants for the Future: Ruscus aculeatus." http://www.metalab.unc.edu.

Tish Davidson

Buteyko

Definition

Buteyko, also called the Buteyko Method or Buteyko Breathing Technique, is an **asthma** management method based on breathing exercises that reduce airway constriction. The therapy is a learned breathing technique that is designed to slow and lessen the intake of air into the lungs. If practiced over time, it is thought to reduce the symptoms and severity of conditions such as asthma. The technique of shallow, controlled breathing is believed to counteract hyperventilation, a condition referred to as over-breathing.

Origins

The Buteyko method is named after its developer, Russian scientist Konstantin Buteyko. In the 1950s in Moscow, Buteyko was involved in studies of the breathing patterns in sick and healthy people. That involvement started when he was a student at the First Medical Institute in Moscow. During an assignment to monitor the breathing of ill patients, Buteyko noticed that breathing tended to be deeper in patients who were very ill or approaching death. Buteyko discovered that by recording the increases in breathing that he could "form a prognoses on how many days or hours were left before a patient died," according to the Buteyko Education and Training Centre website. Buteyko's findings led to a lifelong interest in how the way people breathe affects health.

After graduating in 1952, Buteyko's research included a study of what happened when healthy people breathed too deeply. According to the website, Buteyko noticed that some experienced **dizziness** and **nausea**. Buteyko, who suffered from **hypertension**, also used himself as a subject. Buteyko theorized that over-breathing could be the cause of some medical conditions. He slowed his breathing and noticed a reduction in hypertension symptoms like headaches and rapid heartbeat.

Buteyko concluded that long-term over-breathing was a cause of imbalance in the body. He called this habit "hidden hyperventilation." Professor Buteyko claimed to cure patients of respiratory disorders by correcting their breathing to more shallow and slower patterns. He also conducted scientific studies on the mechanisms of over-breathing's negative effects on the body.

Buteyko maintained that over-breathing causes an imbalance in the carbon dioxide levels in the body, especially in the lungs and bloodstream. This in turn changes blood oxygen levels and decreases the amount of oxygen that cells receive. Body acidity/alkalinity balance can also be influenced by breathing pattern, and CO_2/O_2 concentrations. Buteyko believed that over time, hyperventilation could **stress** systems of the body including the respiratory, circulatory, and nervous systems.

According to Buteyko, breathing difficulties such as asthma are believed to be symptoms of over-breathing. In addition, he viewed many diseases as the body's reaction to over-breathing. Buteyko also believed that over-breathing was a bad habit that people learned. He cited the prevailing beliefs in Russian society that deep breathing was good for the body and the nerves. He also identified improper breathing habits as being caused by the excess consumption of protein, which requires increased metabolism for digestion and thus deeper breathing. Other causes of improper breathing habits include stress and a sedentary lifestyle.

Buteyko claimed that hyperventilation caused symptoms such as bronchial spasms, excess mucus, nervous problems, dizziness, headaches, and **allergies**. He also theorized that over-breathing was directly linked to many diseases including asthma, hypertension, **heart disease**, strokes, **hemorrhoids**, and **eczema**. Buteyko's philosophy of medicine was that a physician has no right to treat a patient if he or she has not determined the cause of the disease. Only after discovering the root of the disease is it possible to begin recovery.

For Buteyko, deep breathing was the cause of many diseases. He viewed hyperventilation as a bad habit that could be easily replaced with a healthier pattern. He developed a technique to recondition breathing patterns, and supposedly demonstrated success in healing some diseases and conditions with the technique. By January 1, 1967, more than 1,000 people had been treated and reportedly recovered from asthma, hypertension or **angina**.

Buteyko's method met resistance from the mainstream Russian medical system until a 1980 study confirmed the success of a 1968 trial. The earlier trial involved 46 people who were reportedly cured by the Buteyko treatment. However, details about their conditions were not available.

During the 1990s, one of Buteyko's pupils, Alexander Stalmatski, went to Australia to train practitioners in the Buteyko method. He stayed in Australia for six years and then took his teachings to England. In the early 2000s, Australia and England had the largest number of trained Buteyko practitioners. The method also has practitioners in counties including the United States, Canada, and Ireland, and New Zealand.

By 2008, the Buteyko method was promoted as a technique to manage conditions like asthma rather than as a cure for conditions. On the Buteyko Education and Training Centre site, the method is described as "a series of lectures related to breathing" along with techniques and exercises for people to follow. The method no longer includes a diet.

Benefits

The Buteyko breathing technique is a drug-free method for adults and children seeking to manage asthma and other breathing-related conditions. People diagnosed with conditions like asthma use this method to control their breathing and possibly lessen the need for medication. The method is also used for respiratory conditions including **bronchitis**, allergies, **rhinitis**, and **sleep apnea**.

Description

When a person hyperventilates, the individual breathes deeply and quickly. This may cause the level of carbon dioxide in the blood to become too low. When a person begins to hyperventilate, the medically accepted methods of restoring the carbon dioxide level include taking slow, deep breaths; practicing a

relaxation technique, or breathing into a paper bag for from five to 15 minutes.

Asthma is a condition that produces inflammation in the airways. The inflammation causes the person to react to triggers such as allergens, dust, and stress. The triggers cause a reaction that produces symptoms such as **wheezing**, coughing, and difficulty breathing.

During an attack, Buteyko maintained that asthma sufferers breathe about twice as fast as people without the condition. The Buteyko method aims to correct the breathing pattern, thereby maintaining balanced body CO_2 and cellular oxygenation levels. With careful and consistent practice of the technique, Buteyko believed that people could retrain their breathing patterns and often improve their symptoms.

In the February 2008 issue of *Better Nutrition*, Emily Kane wrote that the method was "somewhat similar" to breathing into a paper bag when an asthma attack was imminent.

The Buteyko method strives to remove the bad habits of over-breathing and to replace them with new habits of slower, shallower breathing, called "reduced breathing." Emphasis is placed on posture and relaxation in the upper body. Proper breathing technique is one in which the navel and lower rib cage move out slowly during inspiration and move inward during a relaxed expiration. People are taught to avoid breathing through the mouth as much as possible, taking breaths through the nostrils even during **exercise** and sleep.

During training for reduced breathing, the pulse is monitored as a feedback signal: shallow and efficient breathing reduces the pulse and heart rate. During training, there is also attention to what is called a controlled pause, in which breathing stops and the duration of pausing the breath is recorded and extended through practice. In correct Buteyko breathing, the body can maintain a controlled pause of 40 to 60 seconds. For asthma sufferers, the controlled pause is typically five to 15 seconds. However, those training in the technique could result in the controlled pause being held for a longer time.

When the technique is effectively practiced and reduced breathing becomes habitual, Buteyko supporters maintain that fewer allergens are inhaled. They claim that the airways become less dehydrated and irritated. Advocates of this technique believe that mucus and histamine production decreases, inflammation decreases, and breathing becomes easier.

Preparation

People seeking to learn the Buteyko method are encouraged to find a certified practitioner or class. Practitioners give individual and group instruction, with class time ranging from eight to 12 hours. Furthermore, books, videos, and DVDs provide step-by-step instructions in the technique for people who want to learn Buteyko at home.

Precautions

People should consult with their doctor or health practitioner before beginning a Buteyko program. Asthma sufferers learning the Buteyko technique should continue use of their asthma medication, but may taper down with dosages under their doctors' supervision.

Side Effects

No unfavorable side effects to the Buteyko method had been reported as of February 2008.

Research and General Acceptance

The Buteyko method was more prevalent in Australia and England than it was in the United States, as of 2008. Conclusive scientific studies of the method had not been conducted at that time.

As of 2008, there were some indications that Buteyko might help lessen the need for medication, but the technique did not seem to help with lung function. Furthermore, research during the 2000s about the effects of Buteyko produced varied results.

Research included a study described in the December 2003 issue of the *Journal of the New Zealand Medical Association*. The randomized trial involving 34 asthmatics between the ages of 18 and 70 compared people who were taught the Buteyko Breathing Technique to a control group. After six months, researchers concluded that Buteyko was a safe and efficient asthma management technique that merited additional study.

The August 2006 issue of *Thorax* featured information about an Australian study at the University of Sydney, New South Wales. The research involving 57 asthma sufferers compared two breathing exercises: shallow breathing through the nose and non-specific body exercises. After a two-week run-in period, participants did their exercises twice a day and as needed for 30 weeks. Researchers concluded that breathing exercises "may" be helpful for people with mild asthma. However, they found no evidence to favor shallow breathing over the upper-body exercises.

KEY TERMS

Allergen—A foreign substance that causes the airways to narrow and produces symptoms of asthma when inhaled.

Asthma—Respiratory disease characterized by constriction of the airways in the lungs, causing difficulty in breathing.

Training and Certification

Trained instructors may lead individual and group training sessions. Certification classes are available in the United States and other countries.

As of 2008, practitioner certification training was offered jointly through Buteyko International and the Buteyko Clinic of Moscow. The North American affiliate of the international organization, the Buteyko Clinic of Canada, is located in Richmond, a city outside of Vancouver. The clinics schedule training sessions in locations including New York. As of 2008, training cost 2,500 Euros ($3,701.27 in U.S. dollars). The training process included long-distance learning followed by 10 days of practical training with patients at the Buteyko Clinic. Practitioners then taught basic Buteyko for six months to gain practical experience and case studies for the certification process.

Resources

BOOKS

McKeown, Patrick G. *Asthma Free Naturally: Everything You Need to Know About Taking Control of Your Asthma: Featuring the Buteyko Breathing Method Suitable for Adults and Children*. Harper Thorson, 2005.

PERIODICALS

Kane, Emily. "Balance Your Hormones." *Better Nutrition*. (February 2008): 36 39.

McHugh, Patrick; Aitcheson, Fergus; Duncan, Bruce; Houghton Frank. "A Randomised Controlled Trial of the Buteyko Technique as an Adjunct to Conventional Management of Asthma." *Journal of the New Zealand Medical Association*. (12 Decembers 2003): 1187.

Slader, C.A.; Reddel, H.K.; Spencer, L.M.; Belousova, E.G.; Armour, C.L.; Bosnic Anticevich, S.Z.; Thien, F.C.; and Jenkins, C.R. "Double Blind Randomised Controlled Trial of Two Different Breathing Techni ques in the Management of Asthma." *Thorax*. (August 2006) 651 6.

Thomas, Sandy. "Buteyko: A useful tool in the management of asthma?" *International Journal of Therapy & Rehabilitation*. (October 2004) 476 479.

ORGANIZATIONS

American Lung Association. 61 Broadway, 6th Floor, New York, NY 10006. (212) 315 8700. http://www.lungusa.org.

Asthma and Allergy Foundation of America. 1233 20th Street, NW, Suite 402, Washington, DC, 20036. (800) 727 8462. http://www.aafa.org.

Buteyko Asthma Education USA. 2507 Brewster Road, Indianapolis, IN, 46268. (877) 278 4623. http://www.buteyko usa.com

Buteyko Clinic of Canada. 9620 Williams Road, Richmond, BC, V7A 1H2, Canada. (604) 723 0479. http://www.buteykointernational.com.

Buteyko Education and Training Centre. http://www.buteyko.com.

Douglas Dupler
Liz Swain

Butternut *see* **Black walnut**

C

Cadmium poisoning

Definition

Cadmium is a metal with an atomic number of 48 and atomic weight of 112.41. In the periodic table of the elements, cadmium is located between **zinc** and mercury. It is used in a large number of industrial applications. In the United States, about 1.2 million pounds of cadmium were used industrially in 2006. Consumption of cadmium has been decreasing significantly because of concerns over health and environmental issues.

The uses for cadmium include:

- component of several metal alloys
- component of solder (metallic cement), particularly solder for aluminum
- electroplating
- nickel plating
- engraving
- cadmium vapor lamps
- nickel-cadmium batteries
- treatment of parasites in pigs and poultry

Cadmium can be very toxic, and is dangerous if swallowed or inhaled. While spontaneous recovery from mild cadmium exposure is common, doses as low as 10 mg can cause symptoms of poisoning. There is no accepted fatal dosage.

Description

The symptoms of ingested cadmium poisoning are:

- increased salivation
- choking
- vomiting
- abdominal pain
- anemia
- painful spasms of the anal sphincter

When cadmium dust or powder is inhaled, the first symptoms are a sweet or metallic taste, followed by throat irritation. Other symptoms that may appear in three to five hours include:

- dry throat
- cough
- headache
- vomiting
- chest pain
- pulmonary edema, a congestive lung condition
- bronchospasm, the abnormal tightening of airways that may be accompanied by wheezing and coughing
- pneumonitis, inflammation of the lung
- muscle weakness
- leg pain

When a person has exposure to cadmium in low doses over a long period of time, symptoms may include loss of sense of smell, **cough**, shortness of breath, weight loss, and tooth staining. Chronic cadmium exposure may cause damage to the liver and kidneys.

Causes and symptoms

The most common cause of cadmium poisoning is lack of proper precautions in places where cadmium is used. In such industries, air quality should be regularly monitored. Cadmium-plated containers should never be used to store acidic foods such as fruit juices or vinegar.

Fossil fuels, such as coal and oil, release cadmium fumes into the air. Chronic cadmium poisoning is also possible through soil or water contamination. This problem may occur with improper disposal of nickel-cadmium batteries used in items such as cameras. Cadmium poisoning has been associated with itai-itai disease in Japan.

Diagnosis

Cadmium poisoning is usually diagnosed by its symptoms, particularly if there is reason to believe that the patient has been exposed to cadmium. Because patients may not request treatment for up to a day following cadmium exposure, diagnosticians should carefully question any patient who shows symptoms consistent with this condition.

Treatment

Other than symptomatic treatment, there are no good options for dealing with cadmium poisoning. Hemodialysis may be used to remove circulating cadmium from the bloodstream, although literature on the subject is scarce. The addition of a chelating agent, particularly ethylenediamine tetraacetic acid (EDTA), will increase the amount of cadmium removed by the dialysate (the fluid used in dialysis to carry substances to or remove from the kidney during hemodialysis).

These treatments are effective only for oral poisoning, and have no demonstrated benefit in cadmium fume inhalation.

Allopathic treatment

There are no generally accepted treatments for the acute effects of cadmium poisoning. Other than dialysis, dimercaptosuccinic acid (DMSA), an oral chelating agent, has been recommended for removal of cadmium from the blood.

Expected results

The prognosis depends on the nature and severity of the cadmium load. Most cases of mild exposure resolve spontaneously after a few days. In other cases, cadmium can lead to permanent damage with shortened lifespan, or even death.

Cadmium may be carcinogenic.

Long-term exposure may also result in bone defects including **osteoporosis**.

Prevention

All work done in areas where cadmium fumes may be present should be well ventilated. Ground water and soil should be checked for cadmium. Cadmium-coated containers should, in general, be avoided. They should never be used with acidic liquids such as fruit juices. Coal and oil-burning utilities should be monitored for cadmium discharge. Nickel-cadmium batteries should be recycled or disposed of as toxic waste.

KEY TERMS

Chelating—A chemical term denoting a compound that has a central metallic ion attached via covalent bonds to two or more non-metallic atoms in the same molecule.

Hemodialysis—A procedure for removing metabolic waste products or toxic substances from the bloodstream.

Itai-itai disease—The first reported cases of cadmium poisoning in the world, seen in Japan in about 1950. The name means "ouch-ouch" and represents the sufferers' screams of pain. The disease caused bone and kidney defects. It was caused by cadmium pollution from mines.

Pneumonitis—Inflammation of lung tissue.

Osteoporosis—A disease in which the bones become extremely porous, are subject to fracture, and heal slowly.

Resources

BOOKS

Beers, Mark H., and Robert Berkow. "Poisoning" in *Merck Manual of Diagnosis and Therapy*. Whitehouse Station, N.J.: Merck Research Laboratories, 2004.

Occupational Safety and Health Administration.*Cadmium*. Washington, D.C.: U.S. Department of Labor, Occu pational Safety and Health Administration, 2004.

Scoullos, M. J., et al. *Mercury Cadmium Lead Handbook for Sustainable Heavy Metals Policy and Regulation*. New York: Springer, 2002.

Tolcin, Amy C. *Cadmium*. Washington, D.C.: U.S. Geo logical Survey, 2007.

PERIODICALS

Hung, Yao Min, and Hsiao Min Chung. "Acute Self Poisoning by Ingestion of Cadmium and Barium." *Nephrology Dialysis Transplantation* (May 2004): 1308 1309.

Blanusa, Maja, et al. "Chelators as Antidotes of Metal Toxicity: Therapeutic and Experimental Aspects." *Current Medicinal Chemistry* (November 2005): 2771 2794.

ORGANIZATIONS

Occupational Safety & Health Administration, 200 Consti tution Avenue, N.W., Washington, D.C., 20210, http://www.osha.gov/.

Samuel Uretsky, Pharm.D.
David Edward Newton, Ed.D.

Caffeine

Description

Caffeine is a drug that stimulates the central nervous system (CNS). Caffeine is found naturally in coffee, kola seed kernels or nuts (*Cola nidtida*), and a variety of teas. Other foods and beverages, such as chocolate and soft drinks, also contain caffeine, and the drug can be purchased in over-the-counter tablet and capsule form (No Doz, Overtime, Pep-Back, Quick-Pep, Caffedrine, and Vivarin). Some prescription **pain** relievers, medicines for migraine headaches, and antihistamines, also contain caffeine.

General use

Caffeine makes people more alert and less drowsy and improves one's coordination. It is sometimes included in athletes' **diets** to improve physical performance. In addition, one study found that older people who were given a cup of caffeinated coffee in the morning had fewer late-day memory problems than those who were given decaffeinated coffee. Combined with certain pain relievers or medicines for treating **migraine headache**, caffeine enables those drugs to work more quickly and effectively. Caffeine alone can also help relieve headaches. Antihistamines are sometimes combined with caffeine to counteract the drowsiness caused by these drugs. Caffeine is also sometimes used to treat other conditions, including breathing problems in newborns and in young babies after surgery.

Preparations

Kola can be prepared in decoction or tincture form. A decoction is prepared by mixing 1–2 tsp of powdered **kola nut** in a cup of water. After bringing the water to a boil, the decoction should be simmered on low heat for 10 to 15 minutes. Tinctures of kola nut can be purchased at many health food stores or from mail order suppliers. A tincture is an herbal preparation made by diluting the herb in alcohol, glycerin, or vinegar. Dosage of kola tincture varies by formula and the symptoms or illness it is supposed to treat, but an average recommended dosage might be 1–4 mL three times daily. Powdered kola nut and kola tinctures should be stored in airtight containers away from direct light to maintain potency.

For over-the-counter caffeine preparations, adults and children age 12 years and older should take 100–200 mg no more than every three to four hours. In timed-release form, the dose is 200–250 mg

Caffeine content of common dietary and medicinal sources

Source	Standard amount in milligrams (mg)
Bottled beverages (12 oz)	
Red Bull	115.5
Jolt	72
Mountain Dew	55
Diet Coke	45
Dr. Pepper	41
Coca Cola Classic	34
Coffee (8 oz)	
Brewed	80-135
Expresso (2 oz)	100
Instant	65-100
Decaf brew	3-4
Tea (8 oz)	
Iced	47
Brewed	40-60
Instant	30
Green	15
Chocolate	
Dark chocolate bar (1 oz)	20
Hot cocoa (8 oz)	14
Milk chocolate bar (1 oz)	6
Chocolate milk (6 oz)	4
Medications (per tablet)	
Vivarin	200
No-Doz	100
Midol, Maximum Strength	60
Anacin	32
Dristan	16

(Illustration by Corey Light. Cengage Learning, Gale)

once a day. Timed-release forms should not be taken less than six hours before bedtime. Caffeine pills or tablets are typically not recommended for children under 12 years of age.

Precautions

If caffeine is administered in a kola preparation, kola should always be obtained from a reputable source that observes stringent quality control procedures and industry-accepted good manufacturing practices. Consumers should look for the designations "U.S.P." (U.S. Pharmacopeia) or "NF" (National Formulary) on kola nut labeling. Herbal preparations manufactured under USP or NF guidelines meet nationally recognized strength, quality, purity, packaging, and labeling standards as recommended by the United States Food and Drug Administration (FDA).

Persons should avoid taking too much caffeine as an over-the-counter drug. It is important for individuals to consider how much caffeine is being taken in from coffee, tea, chocolate, soft drinks, and other foods. It is advisable to check with a pharmacist or healthcare professional to find out how much caffeine is safe to use.

Caffeine cannot replace sleep and should not be used regularly to stay awake as the drug can lead to more serious **sleep disorders**, such as **insomnia**.

People who use large amounts of caffeine over long periods build up a tolerance to it. When that happens, they have to use more and more caffeine to get the same effects. Heavy caffeine use can also lead to dependence. If an individual stops using caffeine abruptly, withdrawal symptoms may occur, including **headache**, **fatigue**, drowsiness, yawning, irritability, restlessness, **vomiting**, or runny nose. These symptoms can go on for as long as a week. In addition, caffeine dependence is not confined to the adult population. Studies have shown that American teenagers have a high rate of caffeine dependence, partly because they consume large amounts of carbonated beverages that contain caffeine.

If taken too close to bedtime, caffeine can interfere with sleep. Even if it does not prevent a person from falling asleep, it may disturb sleep during the night.

The notion that caffeine helps people become sober after drinking too much alcohol is a myth. In fact, using caffeine and alcohol together is not a good idea. The combination can lead to an upset stomach, **nausea**, and vomiting.

Older people may be more sensitive to caffeine and thus more likely to have certain side effects, such as irritability, nervousness, **anxiety**, and sleep problems. Research also suggest that people with insulin-dependent diabetes should monitor their caffeine intake. One study found that caffeine appears to decrease insulin sensitivity by about 15%.

Allergies

Anyone with **allergies** to foods, dyes, preservatives, or to the compounds aminophylline, dyphylline, oxtriphylline, theobromine, or theophylline should check with a physician before using caffeine. Anyone who has ever had an unusual reaction to caffeine should also check with a physician before using it again.

Pregnancy

Caffeine can pass from a pregnant woman's body into the developing fetus. Although there is no evidence that caffeine causes birth defects in people, it does cause such effects in laboratory animals given very large doses (equal to human doses of 12–24 cups of coffee a day). In humans, evidence exists that doses of more than 300 mg of caffeine a day (about the amount of caffeine in two to three cups of coffee) may cause miscarriage or problems with the baby's heart rhythm. Women who take more than 300 mg of caffeine a day during **pregnancy** are also more likely to have babies with low birth weights. Any woman who is pregnant or planning to become pregnant should check with her physician before using caffeine.

Breast-feeding

Caffeine passes into breast milk and can affect the nursing baby. Nursing babies whose mothers use 600 mg or more of caffeine a day may be irritable and have trouble sleeping. Women who are breast-feeding should check with their physicians before using caffeine.

Other medical conditions

Caffeine may cause problems for people with these medical conditions:

- peptic ulcer
- heart arrhythmias or palpitations
- heart disease or recent heart attack (within a few weeks)
- high blood pressure
- liver disease
- insomnia (trouble sleeping)
- anxiety or panic attacks
- agoraphobia (fear of being in open places)
- premenstrual syndrome (PMS)

KEY TERMS

Arrhythmia—Irregular heart rhythm.

Central nervous system (CNS)—The brain, spinal cord, and nerves throughout the body.

Decoction—An herbal extract produced by mixing an herb in cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. The decoction is then strained and consumed hot or cold. Decoctions are usually chosen over infusion when the botanical or herb in question is a root, seed, or berry.

Palpitation—Rapid, forceful, throbbing, or fluttering heartbeat.

Tinctures—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture. Tinctures can also be prepared using vinegar or glycerin, instead of alcohol.

Withdrawal symptoms—A group of physical or mental symptoms that may occur when a person suddenly stops using a drug to which he or she has become dependent.

Side effects

At recommended doses, caffeine can cause restlessness, irritability, nervousness, shakiness, headache, lightheadedness, sleeplessness, nausea, vomiting, and upset stomach. At higher than recommended doses, caffeine can cause excitement, agitation, anxiety, confusion, a sensation of light flashing before the eyes, unusual sensitivity to touch, unusual sensitivity of other senses, ringing in the ears, frequent urination, muscle twitches or tremors, heart arrhythmias, rapid heartbeat, flushing, and convulsions.

Interactions

Using caffeine with certain other drugs may interfere with the effects of the drugs or cause unwanted—and possibly serious—side effects. Certain drugs interfere with the breakdown of caffeine in the body. These include oral contraceptives that contain estrogen, the antiarrhythmia drug mexiletine (Mexitil), the ulcer drug cimetidine (Tagamet), and the drug disulfiram (Antabuse), used to treat **alcoholism**.

Caffeine interferes with drugs that regulate heart rhythm, such as quinidine and propranolol (Inderal). Caffeine may also interfere with the body's absorption of **iron**. Anyone who uses iron supplements should take them at least an hour before or two hours after using caffeine.

Serious side effects are possible when caffeine is combined with certain drugs. For example, taking caffeine with the decongestant phenylpropanolamine can raise blood pressure. Very serious heart problems may occur if caffeine and monoamine oxidase inhibitors (MAO) are taken together. These drugs are used to treat Parkinson's disease and **depression** and other psychiatric conditions. Persons who use caffeine should consult with a pharmacist or physician to find out which drugs can interact with caffeine.

Because caffeine stimulates the nervous system, anyone taking other central nervous system stimulants should be careful about using caffeine.

Resources

BOOKS

Klosterman, Lorrie. *The Facts about Caffeine*. Salt Lake City: Benchmark Books, 2006.

Weinberg, Bennett Alan. *The World of Caffeine: The Science and Culture of the World's Most Popular Drug*. London: Taylor & Francis, 2007.

PERIODICALS

Barrow, Karen. "Wired Nation: Many Teens Are Guzzling Canned Caffeine. What Effect Does This Hyped up Habit Have on the Body?" *Science World* (November 12, 2007): 22 26.

Boschert, Sherry. "Caffeine, Medications Treat Excessive Sleepiness." *Family Practice News* (November 1, 2005): 74.

Ritchie, K., et al. "The Neuroprotective Effects of Caffeine." *Neurology* (August 2007): 536 545.

Satel, Sally. "Is Caffeine Addictive? A Review of the Lit erature." *American Journal of Drug and Alcohol Abuse* (December 2006): 493 502.

ORGANIZATIONS

Office of Dietary Supplements, National Institutes of Health, Building 31, Room 1B25, 31 Center Drive, MSC 2086, Bethesda, MD, 20892 2086, (301) 435 2920, (301) 480 1845, http://odp.od.nih.gov/ods/.

Paula Ford-Martin
Rebecca J. Frey, Ph.D.
David Edward Newton, Ed.D.

Calcarea carbonica

Description

Calcarea carbonica, abbreviated as *Calcarea carb.*, is a homeopathic remedy made from the middle layer of shells. In chemical terms, *Calcarea carbonica* is

impure **calcium** carbonate, $CaCO_3$. Unlike most homeopathic remedies, which are made from substances soluble in water or alcohol, *Calcarea carbonica* must be prepared by a process called trituration. Triturated material is ground or pounded until it is reduced to a fine powder. The discovery of trituration is a tribute to the genius of Samuel Hahnemann (1755–1843), the founder of **homeopathy**. Hahnemann's method of preparing insoluble substances brought about a new therapeutic method.

General use

Homeopathic medicine operates on the principle that "like heals like" which means that a disease can be cured by treating it with substances that produce the same symptoms as the disease, while also working in conjunction with the homeopathic law of infinitesimals. In opposition to traditional medicine, the law of infinitesimals states that the lower a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

Calcarea carbonica is a remedy used more frequently in so-called constitutional prescribing than in treatment of acute conditions. In constitutional prescribing, the homeopathic practitioner selects a remedy to treat the patient's complete symptomatology, based on a careful evaluation of the person's overall health. In homeopathy, constitution includes a person's heredity and life history as well as present lifestyle, environment, and medical history in the narrow sense. Constitutional treatment is based on the assumption that chronic or recurrent illnesses reflect a specific weakness or vulnerability in the patient's total constitution. It is intended to stimulate healing at the deepest levels of the person's emotions and psyche as well as physical characteristics.

Calcarea carbonica is one of the three most important remedies, along with *Lycopodium* and *Sulphur* in the traditional homeopath's medicine chest because all three are antipsoric remedies. The term antipsoric is derived from Hahnemann's theory of miasms. In homeopathy, a miasm is an inherited fundamental weakness or predisposition to chronic diseases. Hahnemann thought that the most ancient and universal miasm, the one that underlay the majority of the chronic illnesses that afflict humans, is the psoric miasm, or Psora. To define a remedy as antipsoric is to say that it is capable of healing a basic source of constitutional vulnerability to disease. Because *Calcarea carbonica* is an antipsoric remedy, it is also a polychrest remedy. Polychrest is the term used in homeopathy for a remedy that has many uses. *Calcarea carbonica* is used to treat a variety of diseases and disorders such as **acne**, arthritis, vaginal discharges in women, night terrors in children, and ringworm on the scalp.

Calcarea carbonica is, in general, considered a "chilly" remedy, appropriate for people who suffer keenly from the cold and have difficulty keeping warm. A homeopathic practitioner who is asking a patient about symptoms will inquire about the circumstances (e.g., light or dark, heat or cold, rest or activity) that make the patient feel better or worse. These factors are called modalities in homeopathy. In terms of modalities, patients who need *Calcarea carbonica* feel worse when they are cold. They may complain of a cold sensation in the abdomen and cold, clammy feet at night. Dampness, activity, and fright also make them feel worse. They feel better when they are warm and lying down.

Other aspects of *Calcarea carbonica* patients that are noted in the homeopathic literature are their tendency to tire easily, to move slowly and sluggishly, to sweat readily, and to have poor muscle tone and swollen lymph nodes. As a rule, they are passive, overweight people with fair or chalky complexions, large heads, and large puffy abdomens. They appear to be bloated rather than solidly muscular. Their perspiration and other body discharges often have a sour smell. Women may have excessively heavy menstrual periods (menorrhagia) and sore breasts before the flow begins. *Calcarea carbonica* patients often crave cold or iced drinks even when they do not have much appetite. By contrast, they may have cravings for indigestible nonfood items (pica), such as coal or chalk. They may dislike milk or meat and complain of headaches and **nausea** after meals.

The intellectual constitution of *Calcarea carbonica* patients is marked by the same slowness and lack of energy that characterizes their physical movements. They may complain of heaviness or sensations of pressure in the head when they are asked to do anything requiring intellectual effort. Children with a *Calcarea carbonica* constitution are slow to teethe and to walk, but they are also likely to be stubborn and strong-willed. Emotionally, *Calcarea carbonica* patients tend to be afraid of the dark, of isolation, of getting sick, and of going insane.

Preparations

Calcarea carbonica is available in tablet form as a single remedy and in a number of combination remedies. Since it is a polychrest remedy, it is manufactured

KEY TERMS

Aggravation—In homeopathy, a temporary worsening or intensification of the patient's symptoms prior to improvement and healing.

Antipsoric—A homeopathic remedy that is an effective constitutional treatment for the psoric miasm. *Calcarea carbonica* is one of three major antipsoric remedies.

Constitutional prescribing—Homeopathic treatment based on a total assessment of the person's life history, heredity, lifestyle, and present environment, as distinct from prescribing based on immediate acute symptoms.

Materia medica—A Latin phrase that means "the materials of medicine." In homeopathy, a *materia medica* is a book that lists the various homeopathic remedies together with the symptoms that they treat.

Miasm—In homeopathy, a hereditary weakness of the constitution and a corresponding predisposition to chronic disease.

Modality—A factor or circumstance that makes a patient's symptoms better or worse. Modalities include such factors as time of day, room temperature, the patient's level of activity, and sleep patterns.

Polychrest—A homeopathic remedy that can be given for a wide variety of diseases and conditions.

Psora—According to Hahnemann, the oldest and most universal miasm, responsible for human vulnerability to the majority of non-venereal chronic diseases.

Trituration—A method of preparing a homeopathic remedy from an insoluble substance by grinding or pounding it into a fine powder. *Calcarea carbonica* is prepared from shells by trituration.

by all major suppliers of homeopathic medicines and can be easily purchased from homeopathic pharmacies or over the Internet.

Precautions

In homeopathy, most precautions about the remedies concern proper storage and administration. Homeopathic practitioners believe that remedies lose their power from exposure to heat, light, or other substances. Guidelines for proper storage of homeopathic remedies include keeping them away from strong sunlight and high temperatures, keeping them in their original containers, and not storing them near perfumes, bleach, or other strong-smelling substances. In addition, patients under the care of a homeopath are instructed to avoid coffee or products containing camphor (e.g., lip balms, chest rubs) during a period of homeopathic treatment and for two days after the last dose. Homeopaths believe that these substances counteract the effects of homeopathic remedies.

Precautions regarding homeopathic remedies also include avoiding contamination of the medicine. The patient should not touch the medicine; it should be dispensed into a cup and tipped directly into the mouth. Homeopathic remedies are not taken with water but allowed to dissolve in the mouth. Patients are asked not to eat or drink for about 20 minutes before and after each dose.

Side effects

Calcarea carbonica, like other homeopathic remedies, has so little of the original substance in the tablets that it is highly unlikely to produce side effects in the usual sense. In addition, because *Calcarea carbonica* is given more often for constitutional treatment than for acute illnesses, it is not as likely to produce the temporary worsening of the patient's symptoms known as aggravation.

Interactions

Homeopathic remedies are so dilute that they are highly unlikely to interact with allopathic medications. However, homeopathic *materia medica* indicates that the remedies can be complementary or incompatible with one another. According to Hahnemann, *Calcarea carbonica* should not be given before *Sulphur*. *Calcarea carbonica* is complementary with **belladonna** but incompatible with **bryonia**.

Resources

BOOKS

Chernin, Dennis. *The Complete Homeopathic Resource for Common Illnesses*. Berkeley, CA: North Atlantic Books, 2006.

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines,* 3rd ed. New York: Tarcher, 2004.

OTHER

British Homeopathic Library.Hom Inform. [cited April 20, 2008]. http://www.hom inform.org.

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax Street, Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://homeopathyusa.org.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http://www.homeopathic.org/contact.htm.

Rebecca Frey
Tish Davidson, A. M.

Calcium

Description

As the most plentiful mineral in the body, calcium plays a key role in the development and maintenance of bones and teeth. Calcium enables the contraction of muscles, including the function of the body's most important muscle, the heart. It is also essential for normal blood clotting, proper nerve impulse transmission, and the appropriate support of connective tissue.

Almost every segment of the population—women, children, teenagers, men, unborn babies, and the elderly—benefit from calcium in their daily **diets**. The mineral is an important dietary supplement for those who are undergoing significant periods of bone growth, such as in childhood, during **pregnancy**, and while breast-feeding.

Calcium is an effective weapon for the **aging** population as they combat **osteoporosis**. A condition that simply means "porous bones," osteoporosis attacks bones when they are their most vulnerable. As the body ages, bones lose more calcium, and it becomes vital to supplement the diet with calcium in order to encourage bone growth and prevent or slow the process of bone loss.

Recommended dietary allowance of calcium

Age	mg/day
Children 0-6 mos.	210 (AI)
Children 7-12 mos.	270 (AI)
Children 1-3 yrs.	500
Children 4-8 yrs.	800
Children 9-13 yrs.	900
Children 14-18 yrs.	1,300
Adults 19-50 yrs.	1,000
Adults > 50 yrs	1,200
Pregnant women ≤ 18 yrs.	1,300
Breastfeeding women ≤ 18 yrs.	1,300
Pregnant women ≥ 19 yrs.	1,000
Breatfeeding women 19 ≥ yrs.	1,000

Foods that contain calcium	mg
Yogurt, plain, 1 cup	415
Cheese, mozzarella, 1.5 oz.	372
Sardines with bones, canned in oil, 3 oz.	324
Cheese, cheddar, 1.5 oz.	305
Milk, any type, 1 cup	300
Yogurt with fruit, 1 cup	245-384
Tofu, firm, with calcium sulfate, 1/2 cup	204
Orange juice, fortified, 6 oz.	200-260
Salmon with bones, canned, 3 oz.	181
Spinach, cooked, 1/2 cup	120
Beans, white, cooked, 1/2 cup	113
Instant breakfast drink, powder, prepared with water	105-250
Cereal, fortified, 1 cup	100-1,000
Bok choy, cooked, 1/2 cup	61
Beans, pinto or red, cooked, 1/2 cup	43
Bread, whole wheat, 1 slice	20

AI = Adequate intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

General use

While the body relies on the presence of calcium for many of its everyday functions, reasons why the mineral should be supplemented in the diet are numerous. Calcium is beneficial to everyone, but research has found that women may benefit more than men. Studies have shown that pregnant women who do not get enough calcium in their diets can increase the bone mineral content of their fetus by as much as 15% by taking 1,300 mg of a calcium supplement per day during their second and third trimesters. For those women who already consume enough calcium, the additional supplements do not have this effect. Additional research shows that calcium deficiencies lead to preeclampsia during pregnancy, causing high blood pressure, swelling, and weight gain greater than 1 lb (0.5 kg) per day. The risk of preeclampsia is reduced by 45–75% for women who receive calcium supplementation.

Premenstrual syndrome (PMS) is another condition that may be alleviated by the use of calcium supplements. Researchers at the National Institute of Mental Health (NIMH) have concluded that women who take 1,200 mg of calcium per day reduce their overall PMS symptoms by more than 50%. In one

study, calcium supplementation led to the reduction of psychological PMS symptoms (such as mood swings) by 45%, food cravings by 54%, and bloating and water retention by 36%.

Some studies have shown that increasing the amount of daily calcium consumed by women may reduce their risk of **stroke**. Women in the 1999 Nurses' Health Study who took more than 400 mg of calcium daily were at the lowest risk for a stroke, while those who consumed more than 600 mg each day did not have an increased benefit. Researchers explain these results by suggesting that the risk of stroke is reduced by calcium from decreased **cholesterol** levels, or by stopping the formation of **blood clots** that cause strokes. More recent studies raise doubts about the 1999 findings, however. In 2008, researchers at New Zealand's University of Auckland reported that calcium supplements actually increased the risk of stroke among postmenopausal women.

For elderly postmenopausal women, the prevention of osteoporosis becomes critical. A number of studies have demonstrated that a low-dose hormone replacement therapy (HRT) combined with calcium and **vitamin D** supplementation is an effective therapeutic option for prevention of osteoporosis. Estriol, which is used in HRT, appears to be helpful in controlling menopausal symptoms.

Calcium alone is frequently prescribed with estrogen at the beginning of **menopause** to treat or prevent osteoporosis. This therapy is recommended to guard against the increased loss of calcium in the bones due to advancing age. As bones lose more calcium they become dense and brittle, and more vulnerable to the attack of osteoporosis. This condition is most common in people over age 70, and in women after menopause, where it may increase the risk of broken hips, ribs, and pelvis, and the weakening of other bones. Increased physical **exercise** is also important for bone strengthening.

On the other hand, although calcium supplementation is useful in lowering the risk of osteoporosis in Western women, more research is needed to determine why the rates of osteoporosis are low in some Eastern societies with low-calcium diets. There is evidence that osteoporosis, like coronary artery disease, is primarily a problem in Western societies. In addition, accumulating evidence that a diet high in fruits and vegetables helps to prevent **fractures** suggests that the level of calcium in the diet is not the only nutritional factor involved in osteoporosis.

Calcium has been shown to be beneficial to the colon. Among persons taking calcium supplements, research points to a modest reduction in the recurrence of colon polyps. Colon polyps are benign tumors that may become cancerous. Researchers believe that calcium binds to carcinogens, preventing abnormal cell growth.

Stemming from its active role in building bone density throughout the body, calcium may prove particularly beneficial for strengthening the jawbone. Researchers have reported that calcium supplementation may prevent periodontal disease, for this reason Periodontal, or gum, disease is an infection caused by bacteria that deposits in pockets between the teeth and gums, and is the leading cause of tooth loss in the United States. As the infection progresses, the jawbone that holds a tooth in place is eventually destroyed, causing the tooth to loosen and fall out. Researchers believe that calcium's overall bone-building role results in the formation of a stronger jawbone that is better able to fight off **gum disease**.

While calcium supplements can be found in many forms, research has shown a promising benefit if it is obtained from dairy foods rather than supplements or leafy greens. Calcium in the form of dairy may actually prevent weight gain. In one study, those who consumed at least 1,000 mg of calcium a day (equaling about three cups, or 750 ml) of skim milk, gained 6–7 lb (about 3 kg) less over two years than those with low-calcium diets. Researchers who conducted the study speculate that calcium probably prevents weight gain by increasing the breakdown of body fat and decreasing its formation. It is important to note, however, that dairy products should be consumed in moderation, as other research has indicated that dairy products are not necessarily a good source of absorbable calcium. In addition, other studies indicate that women are often reluctant to increase their intake of dairy products because they dislike milk, suffer from lactose intolerance, or fear that they will gain too much weight.

Calcium is proving essential to those children around the world stricken by rickets. Rickets is a deficiency condition in children that affects developing cartilage and newly formed bone throughout the body, causing severe deformities. Often thought to be a result of inadequate intake of vitamin D from dietary sources or lack of exposure to sunlight, research has found that children with rickets respond well to calcium supplementation. While rickets is still rare in most developed countries, it remains a problem in many other parts of the world. Researchers conclude that effective treatment for the condition is calcium supplementation alone or in combination with vitamin D. Osteomalacia, or the adult form of rickets, also responds to calcium supplementation.

Evidence is accumulating in the United States that women are not the only group at risk for insufficient dietary levels of calcium. Children and adolescents are also at risk, according to a report from the National Institutes of Health. Researchers found that "only 13.5% of girls and 36.3% of boys ages 12 to 19 in the United States get the recommended daily amount (RDA) of calcium, placing them at serious risk for osteoporosis and other bone diseases" in their adult years. The report listed increased consumption of soft drinks and decreased consumption of milk as contributing to the problem.

Preparations

Calcium may be supplemented in the diet in a variety of ways. Numerous foods are rich in calcium, including dairy products (such as milk, yogurt, and cheese) and leafy green vegetables like turnip greens, broccoli, kale, and collards. Canned salmon, sardines, shrimp, and tofu are also high in calcium. More foods are being fortified with calcium, making it easier to ensure the proper amount of the mineral is consumed. Calcium-fortified foods range from **cranberry** juice cocktail, cereal, and waffles, to orange juice and flour. With almost every segment of the population consuming too little calcium, researchers recommend calcium-fortified foods to increase daily calcium intake.

While the types of foods containing calcium continues to increase, most people still lack enough of the essential mineral. For those who are not getting adequate calcium from foods, supplements are an acceptable alternative. The chemical form of calcium supplements comes in these varieties: carbonate, citrate, lactate, phosphate, chelate, and citrate malate. Supplements are available as tablets, syrup, or suspension. Calcium supplements should be stored at room temperature and away from moisture and sunlight. They should not be stored in the bathroom, and the liquid forms should not be frozen.

Experts state that calcium is best absorbed from the citrate malate form, or the type of calcium found in some juices, but they recommend calcium carbonate for the overall amount of calcium it offers as well as its affordability. Calcium carbonate can be found in antacids, and is absorbed better when taken with meals. Food slows down the time it takes substances to travel through the gut, giving the calcium more time to be absorbed. Absorption is key for the proper functioning of calcium. Sufficient levels of vitamin D and hydrochloric acid in the stomach, and the presence of other minerals such as **magnesium** and phosphorous, are essential for quick absorption.

The body may also be better able to absorb calcium when it is taken along with ingredients extracted from **chicory** root. Research indicates that Raftilin inulin and Raftilose oligofructose, both extracts from chicory root, are dietary fibers that are not digested in the stomach or the small intestine. Instead, they are fermented by bifidobacteria in the colon, beneficially leading to increased calcium absorption throughout the body, with emphasis on bone tissue. Additionally, oligofructose improves the texture and mouth feel while improving taste and fruit flavors in low-fat yogurts. Inulin is used for fat replacement and fiber enrichment of reduced-fat and fat-free sour cream and whipped topping.

There are many ways to ensure calcium is part of a daily diet, but it is important that the recommended daily allowance (RDA), or appropriate dosage of the mineral be followed. The RDA of calcium for adults is 800 mg; pregnant women and young adults should be certain their intake equals 1,200 mg per day. Adults over age 50 should increase their intake to 1,000 mg per day with supplements that include vitamin D.

Calcium supplements may be taken with a large glass of water during or after a meal. Tablets in chewable form must be chewed thoroughly before swallowing, and effervescent tablets should be diluted in cold water or juice before taking. Experts recommend that other medications be taken two hours after any calcium supplement. The simultaneous intake of calcium may interfere with the absorption of other drugs. For best absorption of the mineral, no more than 500 mg of calcium should be taken at one time.

Precautions

When adding calcium supplements to the diet, practitioners recommend that it not be taken within one to two hours of eating bran or whole grain cereals or breads. Large amounts of alcohol or caffeine-containing beverages or tobacco should be avoided. Large amounts of calcium, phosphates, magnesium, or vitamin D in medication or dietary supplements should not be taken unless directed by a physician. Those with **diarrhea**, stomach problems, parathyroid disease, sarcoidosis, or **kidney stones** should consult with their physician before taking calcium.

Side effects

Calcium is typically well tolerated by those who add it to their diets, but if the mineral is taken in high levels it can cause several side effects, including: **nausea**, **vomiting**, loss of appetite, **constipation**, stomach **pain**, thirst,

KEY TERMS

Carcinogen—Any substance or agent that produces or instigates cancer.

Preeclampsia—A toxemia of pregnancy that causes increasing hypertension, headaches, and swelling of the lower extremities.

Sarcoidosis—A disease of unknown etiology, which causes widespread lesions that may affect any organ or tissue of the body.

Stroke—A hemorrhage into the brain, formation of a clot in an artery, or rupture of an artery that causes sudden loss of consciousness, followed by paralysis.

dry mouth, increased urination, and weakness. While these side effects are rare, a person is even more unlikely to experience the life-threatening symptoms of an irregular or very slow heart beat. If these dangerous symptoms appear while taking calcium, use of the mineral should be discontinued and emergency treatment should be sought. An overdose of a calcium supplement may lead to confusion, irregular heartbeat, **depression**, bone pain, or coma.

Interactions

All over-the-counter (OTC) or prescription medications should be reviewed with a physician before beginning calcium supplementation.

According to the *Complete Guide to Prescription & Nonprescription Drugs*, the following are some of the drugs that may cause possible interactions if taken with calcium:

- alendronate
- anticoagulants
- calcitonin
- calcium-containing medicines
- chlorpromazine
- oral contraceptives
- corticosteroids
- digitalis preparations
- diuretics, thiazide
- estrogens
- etidronate
- iron supplements
- meperidine
- mexiletine
- nalidixic acid
- nicardipine
- nimodipine
- oxyphenbutazone
- para-aminosalicyclic acid (PAS)
- penicillins
- pentobarbital
- phenylbutazone
- phenytoin
- pseudoephedrine
- quinidine
- salicylates

Resources

BOOKS

Krebs, Joachim, and Marek Michalak, eds. *Calcium : A Matter of Life or Death*. Amsterdam: Elsevier Science, 2007.

Weaver, Connie M., and Robert P. Heaney, eds. *Calcium in Human Health*. Totowa, N.J.: Humana Press, 2005

PERIODICALS

Austin, Steve. "Vitamin D and Calcium Supplementation Reduce Cancer Incidence in Women in a Randomized Trial." *Original Internist* (September 2007): 141 142.

D'Amico, Cara. "Calcium & You: Not Getting Enough Calcium in Your Body Is Bad News for Your Growing Bones. Here's What You Can Do about It." *Scholastic Choices* (April 2007): 22 26.

Kranz, S., P. J. Lin, and D. A. Wagstaff. "Children's Dairy Intake in the United States: Too Little, Too Fat." *Journal of Pediatrics* (July 2007): 642 646.

Lee, Y. H., et al. "Inadequate Dietary Calcium Intake in Elderly Patients with Hip Fractures." *Singapore Medi cal Journal* (December 2007): 1117 1121.

Park, Yikyung, et al."Calcium, Dairy Foods, and Risk of Incident and Fatal Prostate Cancer." *American Journal of Epidemiology* (October 2007): 1270 1279.

Walsh, Nancy. "Supplemental Calcium Fails to Prevent Weight Gain." *Family Practice News* (December 2006): 38 39.

ORGANIZATIONS

Food and Drug Administration, Office of Consumer Affairs, HFE 88, Rockville, MD, 20857, http://www.fda.gov/.

Beth Kapes
Rebecca J. Frey, Ph.D.
David Edward Newton, Ed.D.

Calendula

Description

Calendula (*Calendula officinalis*) is also known as garden marigold, holligold, goldbloom, golds, ruddes, Mary bud, bull's eyes, and pot marigold. It is a member of the Asteraceae family. Other members of this plant family include daisies, **arnica**, **chamomile**, and **yarrow**. This bright, flowering herb opens its gold blossoms in the morning and closes them at dusk, or when rain threatens. Calendula is native to Asia and southern and central Europe. Early settlers brought the herb to North America where it has become a garden favorite. It is cultivated throughout the world and valued for its culinary and medicinal uses. The first name, *Calendula*, is from the Latin *kalendae*, the word Romans used to indicate that it bloomed throughout the year in their area. The second name *officinalis* indicates that calendula was included in official lists of medicinal herbs. The common name marigold refers to the blossoms' association with the Virgin Mary.

Calendula is a familiar garden plant with yellow or orange-gold blooms that have a strong and distinctive scent. The plant likes sun and will re-seed from year to year, even in poor soil. The erect, square and branching stems emerge from a taproot to grow up to 2 ft (0.6 m) high. The lower leaves are broad and spatula shaped. Upper leaves may be oblong, are smooth at the edges, and are arranged alternately along the stem. Blossoms may be single or double, are 1–4 in (2.54–10.2 cm) across, and are made of many small florets. The bushy herb blooms continuously throughout the summer. Seeds are crescent to horseshoe shaped with a rough exterior.

General use

Calendula has been used for centuries as a culinary, medicinal, and magical herb. It was believed that calendula could bring protection against dangerous influences. The seventeenth century astrologer and doctor, Nicholas Culpeper, taught that the marigolds were under the influence of the constellation Leo. The flowers, he said were "a comforter of the heart and spirits." The bright yellow blossom of this herb was used to make a dye to color cheese and butter. In the kitchen, leaves and florets were added to sauces, soups, porridge, and puddings for color and medicinal benefit. The dried, powdered blossoms have also been used as a substitute for **saffron** in cooking. During the Civil War, calendula was used to stop the blood flow from battle **wounds**. Calendula blossom preparations continue to be valued as an antiseptic for external application to scrapes, **burns**, **cuts**, or wounds. Local application, in the form of a plant poultice or an infusion soaked in a cloth and applied to a wound, is an effective healing remedy. The Romans valued the herb for its ability to break fevers. During the Middle Ages, calendula used for protection against the plague. In early American Shaker medicine, calendula was a treatment for **gangrene**.

In addition to its first aid uses, calendula also acts as a digestive remedy. An infusion or tincture of the flowers, taken internally, is beneficial in the treatment of ulcers, stomach cramps, **colitis**, herpes viruses, yeast **infections**, and **diarrhea**. An infusion may also be used as an external wash helpful in treating bee **stings**, eye inflammations, **boils** and abscesses, **varicose veins**, **eczema**, **acne**, and as a gargle for mouth sores or a rinse to relieve **toothache**. The flowers have antispasmodic, antimicrobial, and antiviral properties. They improve the circulation of the blood and the lymphatic fluids and aid in elimination of toxins from the body. The juice from the fresh flowers or stem is said to help remove **warts** and help heal mucous membranes and skin. An infusion or tincture of the herb is also helpful in cases of painful or delayed **menstruation**, and the herb is a beneficial ally in the transition to **menopause**. The tincture also has many other uses, such as a topical wash for **diaper rash** in infants, a mouth gargle for sores, a vaginal douche for yeast, an internal soother for inflamed lungs, a topical for **hemorrhoids**, etc.

Despite a large number of studies on the chemical constituents of calendula flowers, the agents responsible for the herb's healing properties haven't been clearly determined. Constituents include saponins, **carotenoids**, resin, bitter principle, essential oil, sterols, flavonoids, and mucilage.

Preparations

Calendula blossoms are harvested when fully open throughout the flowering season. The flower heads are picked on a sunny day after the morning dew has evaporated. The blossoms are then spread on a paper-lined tray to dry in a bright and airy room away from direct sun. The temperature in the drying room should be at least 70°F (21°C). When the blossoms are completely dry, the florets are removed, and the center part of the blossom is thrown away. The dried florets are then be stored in a dark glass container with an airtight lid. The dried herb will maintain medicinal potency for 12 to18 months. The container should be clearly labeled with the name of the herb, the date, and place harvested. The fresh juice of calendula

flowers is preserved with 20% alcohol; the traditional tincture contains 50% alcohol.

Infusions are made by placing 2 oz (56.7 g) of fresh or half as much dried calendula blossom florets in a warm glass container. Then 2.5 cups (0.56 kg) of fresh, nonchlorinated water that has been boiled is added to the herbs. The mixture is then covered and steeped for ten to fifteen minutes. Next, the mixture is strained and the tea is drunk warm. The prepared tea will store for about two days in the refrigerator. Calendula blossom tea may be drunk by the cupful up to three times a day, as needed, or applied as an external skin wash.

An ointment is made by mixing dried and powdered calendula florets with olive oil. The combination is then mixed with melted beeswax. Then it is poured into dark glass jars while still warm. The mixture is sealed tightly with a lid when cool.

Precautions

Calendula shouldn't be used during **pregnancy**. It also shouldn't be confused with the French marigold *Tagetes patula*, sometimes grown in gardens as an insect repellant.

Side effects

Calendula is a relatively mild, nontoxic herbal medicine with no known side effects reported.

Interactions

None reported.

Resources

BOOKS

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

Phillips, Roger, and Nicky Foy. *The Random House Book of Herbs*. New York: Random House, 1990.

Tyler, Varro E., Ph.D. *Herbs Of Choice, The Therapeutic Use of Phytomedicinals*. New York: The Haworth Press, Inc., 1994.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Weiss, Gaea, and Shandor Weiss. *Growing & Using the Healing Herbs*. New York: Wings Books, 1992.

Clare Hanrahan

Calluses *see* **Corns and calluses**

Camellia sinensis see **Green tea**

Canadensis *see* **Elder**

Cancer

Definition

Cancer is not a single disease but a group of about 100 diseases characterized by the uncontrolled growth of abnormal cells, many of which form masses (tumors), and the ability of those cells to spread by way of the circulatory and lymphatic systems from the original site to distant parts of the body, invade other tissues, and form new tumors. This process is called metastasis. If metastasis is not controlled, cancer can result in death.

Description

Cancer is the second leading cause of death (after **heart disease**) in the United States. According to the American Cancer Society, in 2008 cancer accounted for one out of every four deaths or over half a million people. In 2008, more than 1.4 million Americans were anticipated to be newly diagnosed with cancer. This number excludes the 1 million Americans who were expected to be diagnosed with basal and squamous cell **skin cancer** (non-melanoma skin cancer) or all those who were to be diagnosed with carcinoma in situ (early cancer that has not spread). In people diagnosed with cancer between 1996 and 2003, the five-year survival rate (people alive five years after they were diagnosed) for all cancers combined was about 66%, although survival rates of different types of cancer vary substantially. The National Health Institute estimated that in 2007 the cost of cancer in the United States was $219.2 billion.

Although cancer can develop in people of any age or race, more than three-quarters of cancers are diagnosed in people over age 55. Although all racial groups are affected by cancer, African American men get cancer at a higher rate than any other racial groups, followed in number by white men, then African American women. In 2008, the most common cancers diagnosed in the United States were non-melanoma skin cancer, **lung cancer**, **colorectal cancer** (cancer of the colon and/or rectum), **breast cancer** (in women), and **prostate cancer** (in men). Cancer of the bladder, non-Hodgkin's lymphoma, melanoma (aggressive skin cancer), kidney, **leukemia** (blood cancer), endometrium (lining of the uterus), pancreas, and thyroid complete the list of major cancers that affect most Americans.

Cancer is thought to occur because of small changes (mutations) in genes. A gene is a small packet of deoxyribonucleic acid (DNA), the master molecule

Cancer-fighting foods

Foods	Effects on cancer
Avocados	May attack free radicals in the body by blocking intestinal absorption of certain fats; may be useful in treating viral hepatitis (a cause of liver cancer)
Beans	May prevent or slow genetic damage to cells, prevent prostate cancer, and lower the risk of digestive cancers
Berries	May help prevent skin, bladder, lung, and breast cancers and slow the reproduction of cancer cells
Cabbage and cauliflower	May slow cancer growth and development and help to reduce the risk of lung, prostate, and bladder cancers
Broccoli	May prevent some types of cancer, including stomach, colon and rectal
Carrots	May reduce a wide range of cancers including lung, mouth, throat, stomach, intestine, bladder, prostate and breast
Chili peppers and jalapeños	May prevent cancers such as stomach cancer
Cruciferous vegetables (broccoli, cauliflower, kale, Brussels sprouts, and cabbage)	May help decrease prostate and other cancers
Dark green leafy vegetables	May reduce the risk of lung and breast cancer
Figs	May shrink tumors
Flax	May reduce the risk of breast, skin, and lung cancer
Garlic	May increase the activity of immune cells that fight cancer and indirectly help break down cancer causing substances. May help block carcinogens from entering cells and slow tumor development. May render carcinogens in the liver inactive May lower risk of a variety of cancers including stomach, colon, lung and skin
Grapefruits	May prevent cancer by sweeping carcinogens out of the body and inhibit the proliferation of breast-cancer cells in vitro
Grapes	May inhibit the enzymes that can stimulate cancer-cell growth and suppress immune response
Kale	May help stop the conversion of certain lesions to cancerous cells in estrogen-sensitive tissues, suppress tumor growth, and block cancer-causing substances from reaching their targets
Licorice root	May prevent the growth of prostate cancer
Mushrooms	May help the body fight cancer and build the immune system
Nuts	May suppress the growth of cancers
Oranges and lemons	May stimulate cancer-killing immune cells like lymphocytes that may function in breaking down cancer-causing substances
Papayas	May reduce absorption of cancer-causing nitrosamines from the soil or processed foods. May minimize cervical dysplasia and certain cancers
Red wine	May inhibit cell proliferation and help prevent cancer
Rosemary	May inhibit the development of breast and skin tumors
Seaweed and other sea vegetables	May help in the fight against breast cancer
Soy products like tofu	May help to prevent breast and prostate cancer by blocking and suppressing cancerous changes
Sweet potatoes	May prevent cancer cells from dividing, reduce the risk of cancer of the stomach, lung, colon, rectum, liver and pancreas, and protect against various types of cancer
Tomatoes	May combat prostate cancer and protect against breast, lung, mouth, stomach, and pancreatic cancer. May reduce risk of breast, prostate, pancreas and colorectal cancer. May prevent cellular damage that leads to cancer.
Tumeric	May inhibit the production of the inflammation-related enzyme cyclo-oxygenase 2 (COX-2), which reaches abnormally high levels in certain inflammatory diseases and cancers, especially bowel and colon cancer
Whole grains	May help decrease the risk of developing most types of cancer

(Illustration by GGS Information Services. Cengage Learning, Gale)

of the cell that is inherited from each parent. Genes control all aspects of development and metabolism. Small changes in the structure of genes can cause changes in proteins that regulate body functions.

One characteristic different types of cancer have in common is unregulated cell growth. In healthy cells, cell division is controlled by proteins regulated by genes. Specific genes make proteins that signal healthy cells when to stop dividing. In cancer, the controlling gene(s) is damaged or mutated and does not produce the proteins necessary to signal cells to stop dividing. Abnormal cells are formed all the time from mutations, but in a healthy individual, the immune system recognizes these cells as abnormal and destroys them. However, some mutant cells may escape destruction and survive to grow into tumors. Cancer cells continue to divide aggressively, often forming a clump called tumor or neoplasm. (Neoplasm means "new growth.") Cells can break off from the tumor, travel through the circulatory system to other parts of the body and lodge

Cancer in the bronchus. *(© Medical-on-Line / Alamy)*

in new tissues where they begin to grow again and form new tumors.

Tumors are of two types, benign and malignant. A benign tumor is not considered cancer. It is a slow growing tumor that does not spread or invade surrounding tissue, and once removed, it is not likely to recur. A malignant tumor, by contrast, invades surrounding tissue and has the capacity to spread to other parts of the body. Even when the original, or primary, tumor is removed, if the cancer cells have spread (metastasized) or if all the primary tumor cells are not removed or killed, cancer recurs.

Cancers are defined by the type of cell in which they originate and the organ of the body where the primary tumor is located. Carcinomas are cancers that arise in the epithelium (the layer of cells covering the body's surface and lining the internal organs and various glands). About 90% of human cancers are carcinomas. Carcinomas can be subdivided into two types: adenocarcinomas and squamous cell carcinomas. Adenocarcinomas are cancers that develop in an organ or a gland, while squamous cell carcinomas are cancers that originate in the skin. Melanomas are cancers that originate in the skin in the pigment cells (melanocytes). Sarcomas are cancers of the supporting tissues of the body, such as bone, muscle, and blood vessels. Gliomas are cancers of the nerve tissue and are usually found in the brain and spinal cord. Cancers of the blood arise in the bone marrow and are called leukemias, and cancers of the lymph glands are called lymphomas. These two cancers do not form primary tumors.

Causes and symptoms

Cancer does not have a single identifiable cause. Researchers believe that about three-quarters of all cancers are caused by changes in the cell's DNA that occur because of interaction with the environment. Some cancers are caused by faulty DNA in genes inherited from the individual's parents, however, fewer than 10% of all cancers are clearly hereditary. The most common causes of cancer appear to involve an interaction between the individual's genetics, the environment, and lifestyle choices. These include such factors as tobacco use, exposure to ultraviolet light, radiation, industrial chemicals such as asbestos, and environmental toxins. The cell's DNA is also affected by internal conditions such as inherited mutations (changes in the gene passed from parent to offspring), hormone levels in the body, immune system functioning, and damage caused by cellular metabolism. These internal factors can predispose the individual to developing certain types of cancer. Cancers that are known to have a hereditary link include breast cancer, colon cancer, **ovarian cancer**, and **uterine cancer**. In some cases, scientists have been able to identify defects in specific genes that predispose an individual to developing a certain type of cancer.

Advances in molecular biology and cancer genetics have contributed to the development of several tests designed to assess one's risk of getting cancers. These new techniques include genetic testing to identify mutations in certain genes that have been linked to particular cancers. As of 2008, however, there were limitations to genetic testing and its utility and ethical use appeared ambiguous.

Risk factors

The major risk factors for developing cancer are:

- tobacco use
- alcohol use/abuse
- sexual and reproductive behavior
- specific dietary factors
- exposure to certain infectious agents
- family history of cancer (genetic inheritance)

- occupational exposure to carcinogens
- environmental exposure to carcinogens (pollution)

TOBACCO. Tobacco use is thought to be the cause of about one-third of all cancers and 80 to 90% of lung cancer cases. **Smoking** has also been shown to be a contributory factor in cancers of the upper respiratory tract, esophagus, larynx, bladder, pancreas, and probably liver, stomach, breast, and kidney, as well. Chewing tobacco, snuff, and pipe smoking have been linked to cancers of the mouth and throat. Scientists also have demonstrated that exposure to secondhand smoke can increase the risk of an individual developing cancer. The American Cancer Society estimated in 2008 that about 170,000 cancer deaths annually are directly caused by tobacco use.

ALCOHOL. Heavy consumption of alcohol is a risk factor in certain cancers, such as liver cancer. Alcohol, in combination with tobacco, significantly increases the chances that an individual will develop mouth, pharynx, larynx, and esophageal cancers.

DIET. The American Cancer Society anticipated that about one-third of the cancer deaths in 2008 would be caused by **obesity**, lack of physical **exercise**, and poor **nutrition**. High intake of fat leading to obesity has been associated with cancers of the breast, colon, rectum, pancreas, prostate, gall bladder, ovaries, and uterus.

SEXUAL AND REPRODUCTIVE BEHAVIOR. The human papillomavirus (HPV), which is spread through sexual activity with an infected individual, has been shown to cause cancer of the cervix. In 2007, a vaccine against the virus that causes cervical cancer was introduced. The vaccination process requires three doses of vaccine spread over one year and is paid for by some insurance companies. Having multiple sex partners and becoming sexually active early increases a woman's chance of contracting cervical cancer. In addition, it has also been shown that women who have not had children or who have children late in life have an increased risk for both ovarian and breast cancer.

INFECTIOUS AGENTS. Research scientists believe as of 2008 that about 15% of the world's cancer deaths may be caused by viruses, bacteria, or parasites.

FAMILY HISTORY. Certain cancers such as breast, colon, ovarian, and uterine cancer, tend to run in families. A few cancers, such as the eye cancer retinoblastoma, a specific subtype of colon cancer, and a subtype of breast cancer known as early-onset breast cancer, have definitively been linked to certain genes that can be tracked within a family. It appears that inheriting specific genes makes a person susceptible to certain types of cancers.

OCCUPATIONAL HAZARDS. Certain occupations expose workers to hazards that increase the risk of cancer. For example, asbestos workers have an increased incidence of a specific type of lung cancer. Similarly, a higher likelihood of getting **bladder cancer** is associated with dye, rubber, and gas workers; skin and lung cancer with smelters, gold miners, and arsenic workers; leukemia with glue and varnish workers; liver cancer with PVC manufacturers; and lung, bone, and bone marrow cancer with radiologists and uranium miners.

ENVIRONMENT. Exposure is believed to cause 1 to 2% of all cancer deaths. Ultra-violet radiation from the sun accounts for a majority of melanoma deaths. Other sources of radiation are x rays, radon gas, and ionizing radiation from nuclear material. Environmental pollution can be difficult to pinpoint as a source of cancer because cancer often develops years after exposure. However, researchers have estimated that about 1% of cancer deaths are due to air, land, and water pollution.

Alternative views of cancer causes

Practitioners of systems of alternative medicine tend to disagree with conventional medical findings about the causes of cancer, claiming that environmental pollution and emotional and psychological factors are major causes of the disease. Samuel S. Epstein, professor emeritus of Occupational and Environmental Medicine at the University of Illinois and the chairman of the Cancer Prevention Coalition, is one of the strongest critics of those approaches to preventing and treating cancer accepted by the National Cancer Institute (NCI), the American Cancer Society (ACS), and conventional Western medicine.

Epstein's views echo many of the beliefs of alternative practitioners. He claims that mainstream medicine, driven by politics, profits, and pharmaceutical sales, is not discussing or sufficiently researching some major factors behind cancer or researching ways of preventing those causes. Epstein asserts that a primary cause of cancer is the massive pollution of the air, water, food, and workplace. Epstein believes that the human immune system simply cannot handle all the new carcinogens that have been introduced into the environment since the 1950s. In his view, cancer represents a breakdown of the immune system. Epstein is also a critic of some conventional cancer therapies such as radiation and chemotherapy, claiming that the therapies themselves are highly carcinogenic and are often responsible for recurrent cancer. These views are in line with those held by many alternative medicine practitioners.

Symptoms

Cancer is a progressive disease and goes through several stages with varying symptoms. Some symptoms are produced early and may occur due to a tumor that is growing within an organ or a gland. As the tumor grows, it may press on the nearby nerves, organs, and blood vessels, causing **pain** and some pressure that may be the earliest warning signs of cancer. Other cancers cause general symptoms such as **fatigue** or loss of appetite. Despite the fact that there are different types of cancers with different symptoms, the ACS has established the following seven symptoms as possible warning signals of cancer:

- changes in the size, color, or shape of a wart or a mole
- a sore that does not heal
- persistent cough, hoarseness, or sore throat
- a lump or thickening in the breast or elsewhere
- unusual bleeding or discharge
- chronic indigestion or difficulty in swallowing
- persistent changes in bowel or bladder habits

Many diseases other than cancer can cause these symptoms. However, individuals with these symptoms should be checked promptly, especially if the symptoms have persisted for some time. For all types of cancer, the earlier a cancer is diagnosed and treated, the better the chance of surviving it. Many cancers, such as breast cancer, may not have any symptoms. Screening examinations conducted regularly by healthcare professionals can result in the detection of cancers of the breast, colon, rectum, cervix, prostate, testis, tongue, mouth, and skin at early stages. Some routine screening tests recommended by the ACS are sigmoidoscopy for colorectal cancer, mammography for breast cancer, Pap smear for cervical cancer, and the PSA blood test for prostate cancer. Self-examinations for cancers of the breast, testes, mouth, and skin can also help in detecting the tumors early.

Diagnosis

Diagnosis begins with a thorough physical examination and a complete medical history. The doctor observes, feels, and palpates (applies pressure by touch) different parts of the body in order to identify any variation from the normal size, shape, and texture of the organ or tissue. As part of the physical examination, the doctor inspects the mouth. Focusing a light into the mouth can reveal abnormalities in color, moisture, surface texture, or presence of any thickening or soreness in the lips, tongue, gums, the hard palate on the roof of the mouth, and the throat.

To detect thyroid cancer, the doctor palpates the front and side surfaces of the thyroid gland (located at the base of the neck) to detect any nodules or tenderness. As part of the physical examination, the doctor also palpates the lymph nodes in the neck, under the arms, and in the groin. Many illnesses and cancers cause swelling of the lymph nodes. The doctor may conduct a thorough examination of the skin to look for sores that have been present for more than three weeks and that bleed, ooze, or crust; irritated patches that may itch or hurt; and any change in the size of a wart or a mole.

Examination of the female pelvis is used to detect cancers of the ovaries, uterus, cervix, and vagina. In the visual examination, the doctor looks for abnormal discharges or the presence of sores. Then, using gloved hands the physician palpates the internal pelvic organs such as the uterus and ovaries to detect any abnormal masses. A swab is used to remove mucus and cells from the cervix (a Pap test). This sample is sent to a laboratory for microscopic examination of abnormal cells. Breast examination includes visual observation where the doctor looks for any discharge, unevenness, discoloration, or scaling. The doctor palpates both breasts for masses or lumps.

For males, inspection of the rectum and the prostate is also included in the physical examination. The doctor inserts a gloved finger into the rectum and rotates it slowly to feel for any growths, tumors, or other abnormalities. The doctor also conducts an examination of the testes, in which the doctor observes the genital area and looks for swelling or other abnormalities. The testicles are palpated to identify any lumps, thickening, or differences in the size, weight, and firmness.

If the doctor detects an abnormality on physical examination, or the patient has some symptom that could indicate cancer, the doctor may order diagnostic tests. Laboratory studies of sputum (sputum cytology), blood, urine, and stool can detect abnormalities that may indicate cancer. Sputum cytology is a test in which the phlegm that is coughed up from the lungs is microscopically examined. It is often used to detect lung cancer. A blood test that indicates certain cancers (e.g., prostate cancer) is easy to perform, relatively inexpensive, and practically risk-free. Blood tests can be either specific or non-specific. In certain cancers, the cancer cells release specific proteins (called tumor markers), and blood tests can be used to detect the presence of these markers, which indicate the presence of cancer. However, with a few exceptions, tumor markers are not used for routine screening of cancers because several non-cancerous conditions also produce

positive results. Blood tests tend to be more useful in monitoring the effectiveness of the treatment or in following the course of the disease and detecting recurrent disease.

Imaging tests such as computed tomography scans (CT scans), magnetic resonance imaging (MRI), ultrasound, and fiber optic scope examinations help doctors determine the location of the tumor even if it is deep within the body. Conventional x rays are often used for initial evaluation because they are relatively cheap, painless, and easily accessible. In order to increase the information obtained from a conventional x ray, air or a dye (such as barium or **iodine**) may be used as a contrast medium to outline or highlight parts of the body.

The most definitive diagnostic test for cancer is the biopsy, wherein a piece of tissue is surgically removed for microscope examination. Besides confirming a cancer, the biopsy provides information about the type of cancer, the stage it has reached, the aggressiveness of the cancer, and the extent of its spread. Since a biopsy provides the most accurate information, it is considered the definitive diagnostic test.

Diagnosis in alternative treatment often relies on conventional diagnostic tools for determining the type and stage of cancer but will supplement those tools with diagnostic techniques that strive to evaluate the overall mental and physical health of a person in order to treat a person holistically. For example, **Ayurvedic medicine** and **traditional Chinese medicine** place high priorities during diagnosis on the patient's emotional and psychological history, as well as considerations such as lifestyle, relationships, and the degree of social and spiritual support, in order to have insight into the cause and proper treatment of a particular cancer. These alternative practices also have highly developed diagnostic techniques for the body, including **pulse diagnosis**; methods of analyzing the tongue, eyes, skin, hair, and fingernails; palpating and finding abnormalities in various organs; and listening to the breath for clues to the internal environment.

Treatment

Choosing an alternative cancer treatment

A multitude of complementary and alternative treatments are available to help a person with cancer. Complementary treatments are usually integrated with allopathic treatments such as surgery, chemotherapy, and radiation therapy. It is estimated that only about 4% of people with cancer reject all conventional medicine and rely exclusively on alternative medicine. Chemotherapy and radiation treatments are some of the most painful and toxic of conventional treatments and often have unpredictable, although often successful, results. As a rule, alternative treatments are less invasive, nontoxic, and have minimal side effects, but their efficacy has not been rigorously studied. When used as adjuncts to conventional treatment, many alternative therapies are successful in treating symptoms caused by cancer or conventional cancer treatment (e.g., chemotherapy) but are less successful in curing cancer. Many alternative treatments have been shown to decrease pain and **nausea**, aid in the recovery process, and improve the quality of life of cancer patients.

Alternative treatment of cancer is a complicated arena, and choosing one from the many options can be daunting. When choosing alternative treatment, individuals should evaluate practitioners, therapies, and services delivered by clinics or practitioners, as well as the extent of available documentation and published literature regarding these concerns. In seeking practitioners, patients should evaluate training, credentials, and reputations in the healing community. Referrals from other patients should be requested.

Cancer patients may also consider integrating alternative and conventional therapies, and they may search for traditional and alternative healthcare professionals who are willing to work together during treatment. Such practitioners are knowledgeable and familiar with a broad spectrum of options of treating cancer, including those used by both alternative and conventional medicine. If patients choose a physician who employs and recommends conventional, allopathic methods, that physician should be willing to communicate with patients and the alternative medical provider. An effective practitioner is trustworthy, ethical, and compassionate.

Patients must also evaluate the particular therapy offered by a practitioner or clinic. They should understand how the therapy works and the principles behind it. They need to realistically know the potential risks and benefits of both conventional and alternative therapies, what literature and scientific studies exist for each therapy, and what other patients say about the treatment.

Finally, patients should evaluate the quality of service that the practitioner or clinic offers. Cost, reputation, quality of support personnel, and attention to individual needs are important considerations when evaluating the service dimension of a treatment. Patients choosing an alternative medical practitioner should discuss with their insurance provider what, if any, services are covered under their insurance plan. Many alternative therapies are not covered and must be paid for out-of-pocket.

Types of alternative treatment

Alternative medicine generally views cancer as a holistic problem. That is, cancer represents a problem with the body's overall health and immune system functioning. As such, treatment is holistic as well, striving to strengthen and heal the physical, mental, and spiritual aspects of patients. Alternative cancer treatments may emphasize different basic approaches, which include traditional medicines, psychological approaches, nutritional and dietary approaches, physical approaches, integrated approaches, and experimental programs.

TRADITIONAL MEDICINES. Traditional Chinese medicine uses **acupuncture**, **acupressure** massage, herbal remedies, and movement therapies such as t'ai chi and chi gong to treat cancer. Some traditional Chinese herbal remedies have been scientifically shown to have anticancer and immune-stimulating properties in the laboratory and in animal studies, although little controlled research has been done on human cancer patients as of 2008. In the late 2000s research continued on many of these remedies.

Ayurvedic medicine uses **detoxification**, herbal remedies, massage, exercise, **yoga**, breathing techniques, and **meditation** as part of its cancer treatment. **Panchakarma** is an extensive detoxification and strengthening program that is recommended for people with cancer and those undergoing chemotherapy or radiation. Panchakarma uses **fasting**, special vegetarian **diets**, enemas, massage, herbal medicines, and other techniques to rid the body of excess toxins and strengthen the immune system. Certain Ayurvedic herbs have been shown to have significant anticancer properties.

Naturopathy and **homeopathy** are traditional Western healing systems that use herbal medicines and various alternative techniques to strengthen the immune system and reduce the pain of cancer treatment. Bodywork therapies such as massage and **reflexology** ease muscle tension and may alleviate side effects such as nausea and **vomiting**. Homeopathy and herbal remedies may alleviate some of the side effects of radiation and chemotherapy. In the United States, the National Center for Complementary and Alternative Medicine (NCCAM) within the National Institutes of Health supervises clinical trials of many complementary and alternative cancer therapies.

PSYCHOLOGICAL APPROACHES. Psychological approaches work with the idea that the mind and emotions can influence the health of the body and diseases such as cancer. In fact, a new field of academic medicine called **psychoneuroimmunology** has developed to study the interactions between mental state and immune system functioning since many studies have indicated that mind and emotions play a role in the health of the body. Psychological approaches are used in conjunction with many conventional cancer programs. Alternative treatments that seek to help patients with the mental and spiritual challenges that cancer poses include **psychotherapy**, support groups, **guided imagery**, meditation, **biofeedback**, and hypnosis. Studies suggest that patients who approach their cancer with positive attitudes and peaceful acceptance have higher survival rates than those who react with negative emotions, such as **depression**, cynicism, or helplessness. Alternative treatments use psychological approaches to help patients overcome the mental and emotional barriers to healing.

PHYSICAL APPROACHES. Physical approaches to cancer include exercise, massage therapies, movement therapies such as t'ai chi and chi gong, breathing techniques, and **relaxation** techniques. These therapies strive to increase immune system response, promote relaxation and **stress** reduction, and reduce side effects of conventional treatments such as pain, nausea, weakness, and physical immobility.

NUTRITIONAL AND DIETARY APPROACHES. Diet is recognized as playing a major role in the risk of developing some cancers. Many nutritionists also believe that cancer patients have heightened needs for diets free of toxic chemicals and full of nutrients such as **antioxidants** that are believed to enhance immune system response. Proper diet and nutrition can improve both a cancer patient's chances for recovery and quality of life during treatment. In some laboratory studies, vitamins such as A, C, and E, as well as compounds such as isothiocyanates and dithiolthiones found in broccoli, cauliflower, and cabbage, and the antioxidant beta-carotene found in carrots, have been shown to have a protective effect against DNA damage. Additionally, **bioflavonoids** and **lycopene** found in **green tea** are thought to play a role in the prevention of cancer.

Dietary approaches to cancer include **vegetarianism**, raw food diets, macrobiotics, the Gerson diet, and the Livingston-Wheeler nutritional program. Cancer diets generally emphasize fresh fruits, vegetables, whole grains, and legumes, and restrict intake of fat, meat, dairy products, sugar, processed foods, and other foods believed to stress cancer patients. Nutritional approaches to cancer include antioxidant and vitamin supplementation and the use of many herbal extracts that have been shown to have anticancer, immune-enhancing, or symptom-reducing properties.

INTEGRATED APPROACHES. Keith Block, a conventional physician and oncologist, integrates many

alternative practices into his cancer treatment center affiliated with the Chicago Medical School in Illinois. His program seeks to provide individualized cancer treatment using conventional therapies while integrating alternative healing techniques. Block advocates a special diet (based on vegetarianism and macrobiotics), exercise, psychological support, and herbal and nutritional supplements. Block's program has received acclaim for both treatment success and satisfaction of patients. In 1998, the United States Congress established the National Center for Complementary and Alternative Medicine (NCCAM) under the auspices of the National Institutes of Health. NCCAM supports clinical trials and research into botanical products, herbalism, and other alternative therapies. As more is known and documented about the effectiveness of alternative therapies in treating cancer, an increasing number of traditional physicians are willing to follow Block's example and develop integrated programs for cancer treatment.

EXPERIMENTAL PROGRAMS. Experimental programs offer treatment options that have not been proven to the satisfaction of conventional medical practitioners. Some of these therapies may be harmful, and patients should do research on the safety and effectiveness of the program before agreeing to participate. These programs are not likely to be covered by insurance. Experimental programs are constantly being tried. A few examples are listed below.

Antineoplaston therapy was developed by Stanislaw Burzynski, a Polish physician who began practicing in Houston, Texas. Burzynski has isolated a chemical, deficient in those with cancer, which he believes stops cancer growth, and his treatment has shown some promise.

Joseph Gold, the director of the Syracuse Cancer Research Institute, discovered that the chemical hydrazine sulfate has many positive effects in cancer patients, including stopping weight loss, shrinking tumors, and increasing survival rates.

The Livingston therapy was developed by the late Virginia Livingston, an American physician. She asserted that cancer is caused by certain bacteria that she claimed are present in all tumors. She advocated a detoxification program and special diet that emphasized raw or lightly cooked and primarily vegetarian foods, with special vitamin and nutritional supplements.

The **Gerson therapy** was for years the best-known nutritional therapy for cancer. It is available in two clinics in California and Mexico. It consists of a basic vegetarian diet low in salt and fat, with high doses of particular nutrients using raw fruit and vegetable juices. The Gerson therapy also requires patients to drink raw calf's liver juice, believed to aid the liver, and it advocates frequent coffee enemas, which are claimed to help the body evacuate toxins.

Allopathic treatment

The aim of allopathic (conventional) cancer treatment is to remove all or as much of the tumor as possible and to prevent the recurrence or spread of the primary tumor. Many different conventional medical specialists work together as a team to treat cancer patients. An oncologist is a physician who specializes in cancer care. The oncologist provides chemotherapy, hormone therapy, and any other non-surgical treatment that does not involve radiation. The oncologist often serves as the primary physician and coordinates the patient's treatment plan. The radiation oncologist specializes in using radiation to treat cancer, whereas the surgical oncologist performs the operations needed to diagnose or treat cancer. Gynecologist-oncologists and pediatric-oncologists, as their titles suggest, are physicians involved with treating women's and children's cancers respectively.

Many other specialists also may be involved in the care of a cancer patient. For example, hematologists specialize in disorders of the blood and are consulted regarding blood cancers and bone marrow cancers or when the patient's blood count becomes seriously abnormal during treatment. Tissue samples that are removed for biopsy are sent to a laboratory, where a pathologist examines them to determine the type of cancer and extent of the disease. Hospice nurses tend the terminally ill in their homes or hospice settings. Only some of the specialists who are involved with cancer care have been mentioned above. There are many other specialties, and virtually any type of medical or surgical specialist may become involved with care of the cancer patient should it become necessary.

While patients and healthcare practitioners devise a conventional treatment plan for cancer, the likelihood of curing the cancer has to be weighed against the side effects of the treatment. If the cancer is very aggressive and a cure is not possible, then the treatment is aimed at relieving symptoms and controlling the cancer for as long as possible (palliative treatment). Cancer treatment can take many different forms, and it is always tailored to the individual patient. The decision about which type of treatment is the most appropriate depends on the type and location of cancer, the extent to which it has already spread, the patient's age, sex, general health status, and personal treatment preferences. The major conventional types of medical treatment are: surgery,

radiation, chemotherapy, immunotherapy, hormone therapy, and bone marrow transplantation.

Types and uses of surgery

Surgery is the removal of a tumor and some surrounding tissue under general, regional, or local anesthesia. It is the most frequently used cancer treatment. During the course of a cancer, furthermore, surgery can be used for many purposes.

TREATMENT. Treatment of cancer by surgery involves removal of the tumor to cure the disease. Surgery is most effective when a tumor is small and confined to one area of the body (a condition called "cancer in situ"). Along with the tumor, some normal surrounding tissue is also removed to help ensure that no cancer cells remain in the area. The lymphatic system carries lymph throughout the body through. Lymph is a clear fluid that contains immune system cells that fight infection. Since cancer usually spreads via the lymphatic system, adjoining lymph nodes may be examined for cancer cells and sometimes are removed as well.

PREVENTIVE SURGERY. Preventive or prophylactic surgery involves removal of an abnormal looking area that is likely to become malignant. For example, polyps are removed from the colon in people at high risk of developing colon cancer before the polyps can become malignant. The same is done for certain skin growths. Very high-risk women with a family history of breast cancer who carry the BRCA1 and BRCA2 genes may want to discuss preventative mastectomy (breast removal) with their physician. As of 2008, preventive breast surgery remained controversial.

DIAGNOSTIC PURPOSES. The most definitive tool for diagnosing cancer is a biopsy. Sometimes a biopsy can be performed by inserting a needle through the skin and drawing out a sample of cells. At other times, the only way to obtain a tissue sample for biopsy is by performing surgery.

CYTOREDUCTIVE SURGERY. Cytoreductive surgery is a procedure in which the doctor removes as much of the cancer as possible and then treats the remaining area with radiation therapy or chemotherapy or both. It is often done to relieve painful symptoms.

PALLIATIVE SURGERY. The goal of this surgery is to prolong life and to improve the quality of life rather than to cure the cancer. This surgery is performed when the tumor is so large or has spread so much that removing all the cancer is not an option. For example, a tumor in the abdomen may be large enough to press on and block a portion of the intestine, interfering with digestion and causing pain and vomiting. Debulking surgery may remove a part of the blockage and relieve the symptoms. In tumors that are dependent on hormones, removal of the organs that secrete the hormones is an option. For example, in prostate cancer, the release of testosterone by the testes stimulates the growth of cancerous prostate cells. A man may choose to undergo an orchiectomy (removal of testicles) to slow progress of the disease. Similarly, in a subtype of aggressive breast cancer, removal of the ovaries (oophorectomy) stops the synthesis of hormones by the ovaries and may slow the progression of the cancer.

Radiation

Radiation kills both malignant and normal cells. Radiation, sometimes with other non-surgical treatments, is used when surgery is not possible or desirable. More often, radiation is used in conjunction with surgery and chemotherapy, immunotherapy, and/or hormone therapy. Radiation can be used either before or after surgery and be either external or internal. In the external form, the radiation is aimed at the tumor from outside the body. In internal radiation (brachytherapy), a radioactive substance in the form of pellets or liquid is placed at the cancerous site by means of a pill, injection, or insertion in a sealed container. This procedure helps target the radiation directly to the tumor and spare healthy cells.

Chemotherapy

Chemotherapy is the use of drugs to kill cancer cells; unfortunately, chemotherapy drugs often kill or damage healthy cells, too. Chemotherapy destroys the small clusters of hard-to-detect cancer cells that have spread beyond the primary tumor or loose cancer cells circulating in the body. Chemotherapeutic drugs can be taken either by mouth or intravenously and may be given alone or in conjunction with surgery, radiation, and hormone therapy. They often have side effects that range from uncomfortable to serious.

When chemotherapy is used before surgery or radiation, it is known as primary or neoadjuvant chemotherapy. Neoadjuvant chemotherapy can be used effectively to reduce the size of a tumor before surgery. However, the toxic effects of neoadjuvant chemotherapy are severe. In addition, it may make the body less tolerant to the side effects of other treatments, such as radiation therapy, that follow the surgery.

The more common use of chemotherapy is as an adjuvant therapy that is used to supplement and enhance the effectiveness of other treatments. For example, after surgery, adjuvant chemotherapy can

be given to destroy cancerous cells that still remain in the body. Chemotherapy drugs kill both healthy and cancer cells. As of the late 2000s, researchers were working on finding new drugs that are more toxic to cancer cells and less toxic to healthy cells in order to increase the effectiveness of chemotherapy and reduce the side effects.

Immunotherapy

Immunotherapy, also called biologic therapy or biotherapy, uses substances that either stimulate the body's own immune system to destroy cancer cells or provides large quantities of man-made antibodies (disease fighting proteins). This is a type of targeted therapy. Large amounts of antibodies of a single type (called monoclonal antibodies) that react with specific receptors on cancer cells are made in the laboratory. When given to the patient, they inactivate or destroy those cells containing that specific receptor but do not react with or damage other cells. Successful immunotherapy drugs have been developed that target two types of breast cancer cells and one that inhibits the growth of blood vessels into tumors. Without a blood supply, tumors cannot increase in size. Immunotherapy is an area of active research.

Hormone therapy

Hormone therapy is standard treatment for cancers that are hormone-dependent and grow faster in the presence of particular hormones. These include cancer of the prostate, breast, and uterus. Hormone therapy involves blocking the production or action of these hormones. As a result, the growth of the tumor slows down and survival may be extended for several months or years. Tamoxifen, an anti-estrogen breast cancer drug, is the best known of several successful hormone therapy drugs.

Bone marrow transplantation

Bone marrow is the tissue within the bone cavities that contains blood-forming cells. Healthy bone marrow tissue constantly replenishes the supply of blood cells. Sometimes, cancer develops in the bone marrow, resulting in the production of malformed, nonfunctional blood cells. Other times, the drugs or radiation needed to destroy cancer cells also destroys bone marrow cells, reducing the supply of new blood cells to dangerously low levels. Replacing the bone marrow with healthy cells counteracts these effects.

A bone marrow transplant involves the removal of marrow from one person and the insertion of the blood-forming cells in someone else. When bone-marrow transplantation is used to cure certain blood marrow cancers (leukemias), chemotherapy and radiation must be used to kill all the cancer patient's bone marrow cells. After these cells die, healthy donor bone marrow cells are injected into the cancer patient. In a successful transplant, these cells take up residence in the bones and begin producing healthy blood cells. Bone-marrow transplantation is a complex, often risky, process that involves finding a donor whose cell surface proteins match as closely as possible that of the recipient. Matching is necessary so that the recipient's immune system does not attack and destroy the donor cells as foreign entities.

Cancer treatment and prevention continue to be the focus of a great deal of research. Research into new cancer therapies includes cancer-targeting gene therapy, virus therapy, and the development of drugs that stimulate destruction of cancer cells but not healthy cells. However, all new therapies take years of clinical testing and research before becoming widely available. Individuals interested in volunteering for a clinical trial of a new drug or cancer therapy can find a list of current clinical trials accepting patients at http://www.clinicaltrials.gov. There is no cost to the patient for participating in a clinical trial.

Expected results

The outcome of cancer treatment is affected by many factors, particularly the type of cancer the patient has, the stage of the cancer, the extent to which it has metastasized, and the aggressiveness of the cancer. In addition, the patient's age, general health status, and the effectiveness of the treatment being pursued are important factors. Many cancers are completely curable if detected and treated at their early stages.

To help put into perspective the future course and outcome of a cancer and the likelihood of recovery from it, doctors often use statistics. Five- or ten-year survival rates are the most common measures used. The number refers to the proportion of people with the cancer who are expected to be alive five or ten years after initial diagnosis compared with a similar population that is free of cancer. It is important to note that while statistics can give information about the average survival experience of cancer patients in a given population, they cannot be used to indicate individual prognosis because no two patients are exactly alike.

Alternative medicine rarely is able to cure cancer, but complementary treatment—using alternative therapies in conjunction with traditional medicine—can help to control symptoms and side effects, thus

KEY TERMS

Adjuvant therapy—Treatment involving radiation, chemotherapy (drug treatment), hormone therapy, biotherapeutics, or a combination of any of these given after the primary treatment in order to rid the body of residual microscopic cancer.

Antibody—A protein produced by the immune system to fight infection or rid the body of foreign material. In cancer, malignant cells are treated as foreign entities. Specific antibodies can also be made in the laboratory and used to fight cancer.

Antioxidant—A molecule that prevents oxidation. Antioxidants attach to other molecules called free radicals and prevent the free radicals from causing damage to cell walls, DNA, and other parts of the cell.

Ayurvedic medicine—A 5,000-year old system of holistic medicine developed in India. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Benign—Mild, nonmalignant, noncancerous.

Biopsy—Surgical removal and microscopic examination of living tissue for diagnostic purposes.

Bone marrow—Spongy material that fills the inner cavities of the bones. All blood cells are produced in the bone marrow.

Carcinogen—Any substance capable of causing cancer.

Chemotherapy—Use of chemicals (drugs) to treat an illness; a therapy used to treat some cancers.

Complementary medicine—Various treatments used in alternative medicine that are used specifically to supplement conventional drug and therapy treatments, rather than to replace conventional medicine.

Epithelium—The layer of cells covering the body's surface (skin) and lining internal organs such as the intestine and various glands.

Holistic—Pertaining to approaches that consider the whole system as opposed to those approaches that analyze or dissect into parts.

Hormone therapy—Treatment that inhibits the production of hormones such as testosterone and estrogen.

Immunotherapy—Treatment that stimulates the body's immune defense system.

Integrative medicine—A medical approach that brings together and uses aspects of conventional and alternative medicines.

Macrobiotics—Special vegetarian diet based on whole grains, legumes, fruits, and vegetables.

Malignant—A general term for cells that can dislodge from the original tumor, invade, and destroy other tissues and organs.

Metastasis—The spread of cancer from its initial site to elsewhere in the body.

Oncologist—Conventional medical doctor who has specialized training in cancer.

Radiation therapy—Treatment using high-energy radiation from x-ray machines, cobalt, radium, or other sources.

Toxin—A general term for something that harms or poisons the body.

Traditional Chinese medicine (TCM)—An ancient system of medicine based on maintaining a balance in vital energy or qi that controls emotions and both spiritual and physical wellbeing. Diseases and disorders result from imbalances in qi (the life force), and treatments such as massage, exercise, acupuncture, and nutritional and herbal therapy are designed to restore balance and harmony to the body.

Tumor—An abnormal growth resulting from a cell that loses its normal growth control restraints and multiplies uncontrollably.

improving the quality of life for people with cancer. Although alternative therapies have sometimes shown unexpected positive results and cures, they may be strongest as preventative or complementary measures.

Prevention

According to alternative practitioners, nutritionists, and conventional physicians, individuals can reduce the risk of developing cancer by following these guidelines:

- Eat a diet high in fruits and vegetables and low in animal fats.
- Have regular screenings for common cancers such as those of the breast, colon, and prostate.
- Exercise vigorously for at least 20 minutes every day or walk moderately for 10 hours a week.

- Keep weight within normal limits; avoid excessive weight gain.
- Avoid tobacco use (including exposure to second-hand smoke).
- Decrease or avoid consumption of animal fats and red meats.
- Avoid excessive alcohol use (more than 1 or 2 drinks per day).
- Avoid exposure to the sun during the midday hours when the sun's rays are the strongest.
- Avoid risky sexual practices such as sex with multiple partners and sex without using a condom.
- Avoid known carcinogens in the environment or work place.
- Strive to maintain sound mental and emotional health, which is believed to help prevent cancer; learn a technique such as yoga, t'ai chi, meditation, or others to reduce stress and promote relaxation; maintain healthy relationships and social support systems.

In addition, refraining from certain activities or drugs that are proven as risk factors for certain cancers can help lower one's cancer risk. For instance, while physicians have long known a small increased risk for breast cancer was linked to use of hormone replacement therapy (HRT), the extensive Women's Health Initiative study released finding in 2003 stated that even relatively short-term use of estrogen plus progestin HRT was associated with increased risk of breast cancer, diagnosis at a more advanced stage of the disease, and a higher number of abnormal mammograms. The longer a woman used HRT, the more her risk increased.

Resources

BOOKS

Bradbury, Robert H., ed. *Cancer*. New York: Springer, 2007.

Geffen, Jeremy R. *The Journey Through Cancer: Healing and Transforming the Whole Person*. New York: Three Rivers Press, 2006.

Visel, Dave. *Living with Cancer: A Practical Guide*. New Brunswick, NJ: Rutgers University Press, 2006.

Weinberg, Robert A. *The Biology of Cancer*. New York: Garland Science, 2007.

OTHER

Alternative Therapies in Health and Medicine. http://www.alternative therapies.com.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoun dation. org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Cancer Society, 1599 Clifton Rd. NE, Atlanta, GA, 30329 4251, (800) ACS 2345, http://www.cancer.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

National Cancer Institute, (800 4 CANCER), http://www.cancer.gov.

National Center for Complementary and Alternative Med icine Clearinghouse, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://dietary supplements.info.nih.gov.

Douglas Dupler
Teresa G. Odle
Tish Davidson, A. M.

Cancer, bladder *see* **Bladder cancer**

Cancer, breast *see* **Breast cancer**

Cancer, colorectal *see* **Colorectal cancer**

Cancer, ovarian *see* **Ovarian cancer**

Cancer, uterine *see* **Uterine cancer**

Cancer treatments, biological

Definition

Biological **cancer** treatments, also known as metabolic treatments, work by detoxifying and strengthening the body so that it can overcome cancer cells and metabolize them. This approach is almost always conducted nutritionally, possibly with the aid of nutritional supplements and/or herbs, or by employing **detoxification** procedures such as enemas and **colonic irrigation**.

Origins

It is thought that Paracelsus and Hippocrates cured cancer with biological cures (through food), but it is difficult to verify that they were actually treating cancer, which is commonly regarded as an affliction of modern man. Modern biological cancer therapies began to appear at the beginning of the twentieth century.

The therapy developed by Max Gerson (1881–1959) is probably foremost among the early ones, although Gerson had some equally eminent contemporaries. Gerson's therapy emphasized eating organic foods, using coffee enemas, and detoxifying the body with certain natural supplements. In addition, many alternative health practitioners specialize in the treatment of cancer, although their success rates vary.

Benefits

Biological cancer treatments are non-invasive and do not have the drawbacks associated with chemotherapy and radiation therapy. Unlike biological treatments, conventional medical treatments deplete or completely destroy the body's immune system and can leave patients in a much weakened state.

Biological treatments work by strengthening the immune system so that it can overcome any abnormal condition. A successful biological cancer treatment leaves patients feeling better than they did before they became ill, with all bodily functions effectively harmonized and energy levels raised.

Description

All biological cancer therapies focus on strengthening the human organism so that it can kill the cancer, rather than focusing on the cancer alone, as is the case with allopathic medicine. Therefore, all these therapies promote healthy lifestyle as essential to healing. In particular, this position requires abstaining from processed, denatured foods, and ensuring the absence of pollution and toxins from diet and living environment.

Natural hygiene and other alternative therapies prescribe fresh fruit and vegetables in abundance. The **Gerson therapy** uses fresh juices from organic sources. Especially in the beginning, a vital aspect of the treatment is detoxification, which is the process of encouraging, and sometimes forcing, the body to eliminate toxins stored in the body cells and gastrointestinal tract. In the case of cancer patients, this process can involve a considerable quantity of toxic waste that must be flushed out of the system.

Concurrently with the detoxification process, the treatment aims to provide the organism with plentiful supplies of fresh enzymes and nutrients that allow the body to rebuild itself and renew systems such as the endocrine system and immune system.

When treating most disorders and diseases with natural therapies, the patient is encouraged to undertake a program of **exercise** to enhance the effectiveness of the treatment. However, cancer patients may not be strong enough for such activities, and their bodies need all available strength to fight the cancer. Instead, they are advised to undertake an exercise program only once they are well enough to do so.

Practitioners

Practitioners who have been successful with the treatment of serious disease, particularly cancer, have a reputation for being very tough on their patients. When questioned, many say that unless a cancer patient is prepared to tackle the problem of detoxification seriously and follow the diet without diverting from it, there is little hope that they will be able to overcome the disease. Often patients who are in a weakened state of health need the support of a therapist who is prepared to be firm with them.

MAX GERSON. Gerson's therapy can probably be considered the original biological cancer treatment. In his book *A Cancer Therapy, Results of Fifty Cases*, Gerson documented 50 successfully treated cancer patients. He explains that the cases in his book were the most extensively documented and, therefore, most suitable for the purposes of demonstrating his cure. Gerson believed that chronic illnesses occur as a result of nutritional deficiency as well as toxicity.

To combat deficiencies, this therapy relies mainly on fresh organic juices but includes supplements and strict instructions for lifestyle. A vital aspect of this treatment is the coffee enema he devised to achieve thorough detoxification. In the United Kingdom, a University of Manchester study followed six cancer patients, all with poor prognoses, who adhered to the Gerson regime. Researchers noted that the Gerson program provided both physical and psychological support. The American Cancer Society cautions that adverse reactions may occur when using this form of therapy.

LINUS PAULING. Nobel Prize laureate, Linus Pauling (1901–1994), researched the properties of nutritional supplements in treating disease for many years, and he is generally accepted as the foremost authority on the subject. In 1979, he co-authored with Ewan Cameron the book *Cancer and Vitamin C*. Pauling advocated supplements, in particular megadoses of **vitamin C**, for the treatment of cancer and other degenerative diseases.

The Linus Pauling Institute of Science and Medicine was formed in California in 1979. In 1996, the Linus Pauling Institute at Oregon State University replaced the former organization. Research at the institute has found that diet influences genetic relationships

to cancer because certain components of diet have the ability to turn genes on or off. Researchers have also found that elements within cruciferous vegetables such as broccoli, bok choy, and brussels sprouts, contain powerful anti-cancer properties. A number of studies ongoing as of 2008 at the institute sought to expand knowledge in this area.

ANN WIGMORE. Wheatgrass juice and sprouts are the basis for regimen devised by Ann Wigmore (1909–1994). She originally devised this treatment to cure her own chronic diseases, including cancer, and was successful in helping people for decades. The **Wigmore diet** focuses primarily on live foods. Wigmore felt that raw vegetables held more **nutrition** than when cooked and were without the chemical additives that processed foods hold. Her therapy continued into the 2000s to be practiced at the Hippocrates Institute and was adopted by a number of alternative health care practitioners as the basis for their treatment. In the book, *Wheatgrass Nature's Finest Medicine: The Complete Guide to Using Grasses to Revitalize Your Health,* author Steve Meyerowitz writes that wheatgrass, "enhances and maximizes your full healing potential." According to the American Cancer Society, wheatgrass is "generally safe," with only few incidences of reactions such as **nausea**, headaches, **hives**, or swelling of the throat. If individuals experience hives or throat swelling, they should seek emergency medical care, as this may be indicative of a severe allergic reaction.

RANDOLPH STONE. Randolph Stone (1890–1981) developed a system known as **polarity therapy** during his career, which spanned 60 years. Stone believed that health should be measured by an assessment of the human energy field, which is affected, for example, by daily life, nutrition, exercise, touch, sound. Stone recommended a comprehensive regimen consisting of touch therapy (where the practitioner's hands are conduits of energy), diet (a vegetarian diet is emphasized because foods collected in a non-violent way hold more energy), and **yoga** (to tune individuals to their own body). These practices balance health, and so produce satisfactory energy fields.

MICHIO KUSHI. Microbiotics refers to a belief system which states that people are influenced by everything around them, including the environment, foods they eat, and even where they live. Promoting a positive lifestyle is also encouraged in order to keep a good outlook and mental attitude. Possibly the most famous teacher of macrobiotics in the United States, Michio Kushi, wrote *The Cancer Prevention Diet* in collaboration with Alex Jack in 1993. It is a comprehensive guide to the prevention and treatment of cancer with a **macrobiotic diet**.

Therapies

BOTANICAL MEDICINE. There are several different therapies that fit into this category, which encompasses general herbal medicine, Chinese herbalism, and several other ethnic herbal disciplines. A University of Toronto study reported that evidence supports that cancer-preventing abilities exist in botanicals such as **green tea**, Asian ginseng, tomatoes, **garlic**, and soy, and suggested that additional studies be conducted to determine the cancer treatment efficacy of **turmeric**, essiac, **evening primrose oil**, reishi, **mistletoe**, and shiitake. The scientists also suggested that **ginger** may be an effective choice when treating nausea and **vomiting** that sometimes accompanies chemotherapy.

NATURAL HYGIENE. Natural hygiene practitioners have a long history of successfully treating such serious diseases as cancer. This vegetarian diet is designed to maintain a healthy and happy outlook. Rest, fresh air, grains, fruits, and vegetables are encouraged. The American Natural Hygiene Society is a good source of information regarding treatment and practitioners.

AYURVEDIC MEDICINE. This centuries old system of natural medicine originated in India. Arvada has a concept of life force, which is similar to the Chinese chi. It aims to purge the body of undesirable matter and then rebuild it with good nutrition, while at the same time attending to all aspects of the patient's life both physical and spiritual. This system is recognized by the World Health Organization.

MACROBIOTICS. This diet consists mostly of whole grains and vegetables. It is designed in light of a unique philosophy about food that traces its origins to Japanese and Chinese theories.

In general, the charge for various clinics and practitioners varies widely, so it is essential for the patient to discuss fees with the practitioner before treatment.

Preparations

All of these practitioners advocated the use of fresh natural produce, preferably organic, for cancer patients and other people else who want to improve their health. Where herbal remedies or other supplements are prescribed, it is important to ensure that the original formula is purchased, and not a copy. Unscrupulous individuals have been known to pass off unauthentic remedies using the names of well-known practitioners.

Precautions

None of the therapies will be effective if the regimen is not followed in its entirety. No matter how good the quality of organic produce, no benefits will be felt if the patient is still being exposed to environmental pollution, or if detoxification procedures are inadequate. It is for this reason that most practitioners recommend that a cure be taken in the setting of a clinic because all of these details can then become the responsibility of the staff, freeing the patient to concentrate on the business of becoming well.

In fact, many practitioners who treat cancer take their cure so seriously, that they will refuse to treat patients who are not prepared to take all the necessary steps and truly commit themselves to becoming well. They warn that natural cures for cancer are not easy, cancer is a sign that the integrity of the body system has been seriously compromised, and nothing but the strictest regimen is likely to facilitate a return to health. Even so, these therapies remain experimental, and there are no guarantees of a cure.

Side effects

Side effects associated with natural therapies are mild compared to those commonly experienced with allopathic treatments. Cost is one of the main inhibitors of these treatments.

However, in the case of cancer treatment, a healing crisis can be an unpleasant experience. Alternative medicine practitioners believe that all illness is a result of a toxic condition in the body, and cancer, being one of the most serious conditions, is an indication of more serious levels of toxicity. The level of toxicity in the patient means that as the person takes one of these alternative treatments, the body starts to throw off these toxins, the blood system becomes overloaded and the patient experience headaches, fevers, nausea, and in some cases extreme sensitivity to stimuli such as sound and light. It is highly advisable to seek a practitioner to help with detoxification because of these side effects.

Research and general acceptance

Allopathic medicine disapproves most strongly of alternative medicine in its treatments for cancer, and these natural treatments are the subject of much adverse publicity. Alternative practitioners assert that cancer patients should at least have the option of choosing a biological cure for their illness.

Many alternative medicine practitioners recommend that patients compare statistics when deciding on the mode of treatment that is best for them and ask to see documentation.

KEY TERMS

Denatured—Food which has been processed and is no longer of benefit to the body.

Detoxification—The process of cleansing the system of accumulated toxins.

Oncologist—Cancer specialist.

Training and certification

All of the practitioners named above held advanced degrees, some of them with medical degrees, others with Ph.D.s. The organization *People Against Cancer* specializes in helping people find suitable practitioners and therapies. It also provides practical help regarding the implementation of therapies, can advise on books, and so on.

Resources

BOOKS

Gerson, Charlotte, with Beata Bishop. *Healing the Gerson Way: Defeating Cancer and Other Chronic Diseases*. Carmel, CA: Totality Books, 2007.

Gerson, Max, M.D. *A Cancer Therapy, Results of Fifty Cases*. Del Mar, CA: Totality Books, 1977.

Meyerowitz, Steve. *Wheatgrass Nature's Finest Medicine: The Complete Guide to Using Grasses to Revitalize Your Health,* 7th ed. Great Barrington, MA: Sproutman, 2006.

PERIODICALS

Molassiotis, A., and P. Peat. "Surviving Against All Odds: Analysis of 6 Case Studies of Patients with Cancer who Followed the Gerson Therapy." *Journal of Integrative Cancer Therapies* 6, no. 1 (March 2007): 80 88.

OTHER

"Epigenetics: Providing a New View of Diet and Cancer." Oregon State University News and Communication Services. July 25, 2007. http://oregonstate.edu/dept/ncs/newsarch/2007/Jul07/cancerinhibition.html. (April 6, 2008).

ORGANIZATIONS

American Cancer Society, 1599 Clifton Road NE, Atlanta, GA, 30329 4251, (800) 227 2345, http://www.cancer.org.

American Holistic Medicine Association, http://www.holisticmedicine.org/index.html.

American Natural Hygiene Society, PO Box 30630, Tampa, FL, 33630, (813) 855 6607, http://www.anhs.org/.

American Polarity Therapy Association, PO Box 19858, Boulder, CO, 80308, (303) 545 2080, http://www.polaritytherapy.org.
Kushi Institute, PO Box 7, Becket, MA, 01223, (413) 623 5741, http://www.macrobiotics.org.
Linus Pauling Institute, Oregon State University 571 Weniger Hall, Corvalis, OR, 97331 6512, (541) 737 5075, http://lpi.oregonstate.edu/.

Patricia Skinner
Rhonda Cloos, R.N.

Canker sores

Definition

Canker sores are small sores or ulcers that appear inside the mouth. They are painful and often recur from once every few years to almost continually. Canker sores are known medically as apthous ulcers or apthous stomatitis.

Description

Canker sores occur on the inside of the mouth, usually on the inside of the lips, cheeks, and/or soft palate. They can also occur on the tongue and in the throat. Often, several canker sores will appear at the same time and may be grouped in clusters. They are painful and sensitive to touch. The average canker sore is about one-quarter inch in size, although they can occasionally be larger. The sores may last for weeks at a time and leave a scar. The initial symptom is a tingling or mildly painful **itching** sensation in the area where the sore will appear. After one to several days, a small red swelling appears, which eventually becomes a grayish ulcer with a red ring of inflammation surrounding the sore. Canker sores can be very painful, especially if they are touched repeatedly (e.g., by the tongue). They last for one to three weeks.

Approximately 20% of the United States population is affected with recurring canker sores, and more women than men get them. Women are more likely to have canker sores during their premenstrual time.

Canker sores may be confused with cold sores caused by the herpes simplex virus because the appearance of both is similar. However, herpes **infections** occur most commonly on the outside of the lips, on the hard palate, and on the gums, whereas canker sores usually occur on the soft tissues inside the mouth. Unlike canker sores, herpes cold sores are infectious.

KEY TERMS

Inflammation—A localized reaction to tissue injury or damage, usually characterized by pain, swelling, and redness.

Skin lesion biopsy—A procedure in which a sliver of tissue from the skin is removed in order to examine it and establish a diagnosis.

Ulcer—A site of damage to the skin or mucous membranes characterized by the formation of pus and the death of tissue. It is frequently accompanied by inflammation.

Causes and symptoms

The exact cause of canker sores is unknown. There seems to be at least some link to immune reactions. There may also be a genetic tendency to develop canker sores. Accidental injuries to the mouth from vigorous toothbrush scrapes, poorly fitted dentures, braces, or self-inflicted **bites** may give rise to canker sores. They can also be triggered by **stress**, dietary deficiencies, hormonal changes, and food **allergies**. **Sodium** lauryl sulfate, which is an ingredient in many toothpastes, may contribute to the development of canker sores by stripping the mucous coating inside the mouth.

Diagnosis

Canker sores are diagnosed by observation of the sore. A distinction between canker sores and cold sores should be made because the latter is infectious. Other disorders of the mouth may need to be ruled out as well; a skin lesion biopsy may be required for further diagnosis.

Treatment

Many alternative therapies for canker sores try to heal the existing sores and prevent their recurrence. Several herbal remedies may be helpful in the treatment of existing sores. These include:

- calendula (*Calendula officinalis*)
- chamomile (*Matricaria recutita*)
- goldenseal (*Hydrastis canadensis*)
- licorice (*Glycyrrhiza glabra*)
- myrrh (*Commiphora molmol*)
- peppermint (*Mentha peperita*)
- slippery elm (*Ulmus fulva*)

The herbs can be made into a strong tea. Compresses soaked in the tea can be applied directly to the mouth, or the tea can be swished in the mouth for several minutes.

The deglycyrrhizinated (DGL) form of **licorice** root, *Glycyrrhiza glabra,* is soothing to the mucous membranes of the mouth and can shorten the healing time for canker sores. The powdered DGL should be mixed with warm water to make a thin paste that can be used twice daily. It should be swirled in the mouth for several minutes and then spit out.

B-complex vitamins, **folic acid**, and **iron** (taken separately or combined in a multivitamin) can help prevent recurrent outbreaks, since canker sores are often associated with deficiencies in these nutrients.

Canker sores often occur during stressful times. **Relaxation** techniques such as **meditation**, **guided imagery**, and **acupressure** may help prevent or lessen the severity of outbreaks.

Allopathic treatment

Since canker sores heal themselves in most cases, treatment usually isn't necessary. Topical anesthetics, such as lidocaine and similar remedies, may be used for **pain** relief. Corticosteroid ointments may be used to reduce inflammation and speed healing. A protective paste, like Orabase, can be used to prevent irritation of the sores by teeth, dental appliances, or fluid intake.

Severe cases may be treated with the antibiotic tetracycline. This is not recommended for children, however, because it may permanently discolor any teeth that are still forming. Chemical or physical cautery or low-powered laser treatments may also be used to decrease severe pain. Ulcers tend not to recur where a laser has been used.

Expected results

Canker sores tend to heal spontaneously. The pain usually decreases within a few days, and other symptoms resolve in one or two weeks. If symptoms last longer, if there are increasing numbers of outbreaks, or if the pain is severe, a doctor should be consulted.

Prevention

Good oral hygiene is necessary to prevent recurrent outbreaks as well as secondary bacterial infections during an outbreak. This includes regular brushing, flossing, and regular trips to the dentist. Dentures, braces, and fillings should be rechecked and possibly refitted. Toothpastes containing sodium lauryl sulfate should not be used.

Identifying food allergens and making dietary changes may help prevent outbreaks. Spicy foods should also be avoided because they may serve as irritants.

Resources

BOOKS

Larsen, D.E., ed. *Mayo Clinic Family Health Book*. New York: William Morrow, 1996.

Schlossberg, D. *Current Therapy of Infectious Disease*. St. Louis: Mosby, 1996.

OTHER

DrKoop.com. http://www.drkoop.com/conditions/ency/article/000998.htm (January 17, 2001).

The Merck Manual. http://www.merck.com/pubs/mmanual/section9/chapter105/105b.htm (January 17, 2001).

MotherNature.com. http://www.mothernature.com/ency/concern/canker_sores.asp (January 17, 2001).

Patience Paradox

Cannabis sativa see **Marijuana**

Cantharis

Description

Cantharis is a homeopathic remedy obtained from the insect *Lytta vesicatoria*; common names are Spanish fly or blister beetle. This beetle lives on **honeysuckle** and olive trees in western Asia and southern Europe. It is bright green and about 0.5 in (1.3 cm) in length. Other names for cantharis include: *Cantharis vesicator*, N.O. Insecta, and coleoptera.

The Spanish fly produces a toxic substance called cantharidin. Cantharidin is a strong poison that primarily affects the urinary tract and causes burning **pain** and **vomiting**. Cantharidian is caustic and causes skin blistering. Since **homeopathy** is based on the Law of Similars, a doctrine that says to treat a symptom with a diluted remedy that produces the same symptom in stronger amounts, this homeopathic remedy is used for illnesses that have burning pain as a symptom. Because cantharis is a member of the animal kingdom, its activity excites the passions of animals. As such, cantharis is indicated for anger that is very severe with fits of rage. Likewise, cantharis is indicated for conditions of the body that are extreme, ie. pain that is stabbing, burning, and sharp.

KEY TERMS

Cantharidin—The irritating poison produced by Spanish fly that serves as the active ingredient in cantharis. Because of cantharidin, high doses of cantharis are highly toxic.

Cystitis—Painful inflammation of the urinary bladder caused by infection, irritation, allergy, or other causes.

Homeopathy—A therapeutic system in which diseases are treated with agents that cause a similar set of symptoms in healthy persons. A "like treats like" philosophy.

General use

Homeopathic remedies are chosen based upon the specific set of symptoms and traits displayed by each patient. In general, cantharis is used to treat conditions characterized by burning pain and strong thirst but no urge to drink. Conditions for which cantharis is indicated will typically worsen rapidly.

Cantharis is primarily used to treat cystitis, which is inflammation of the urinary bladder because of infection or irritation. It is also used to treat **burns** and **blisters**. Spanish fly was traditionally used as an aphrodisiac (increases sexual desire). It was also used to remove **warts**, treat baldness, increase loss of fluids (acting as a diuretic), and for rheumatic problems (inflammation and degeneration of the joints).

Mental symptoms treated with cantharis

Homeopathy treats a person's whole being, mental and physical. The patient who needs cantharis can be confused and have odd ideas, may be maniacal and demonstrate raging fury or sexual frenzy, or may loose consciousness. The cantharis patient may be restless and excitable. He or she may be extremely thirsty but have difficulty swallowing. Also, the patient may have no appetite and a strong avoidance of food. Other mental problems that can be treated with cantharis include: excessive desire for sex (nymphomania), severe **anxiety**, screaming, querulousness (constant complaining), and insolence (being overbearing).

Physical symptoms treated with cantharis

The intense urge to urinate and burning pain are key symptoms for cantharis. Cantharis is indicated for the patient who experiences rapid and intense inflammation of the urinary system. There is lower abdominal and lower back pain. The severe burning pain associated with the urinary tract makes the patient afraid to urinate. There is a frequent and urgent need to urinate, however, only small amounts (drops) of urine are passed. The urine may contain blood. The patient may experience hydrophobia (fear of water) and, although extremely thirsty, cannot drink water or even tolerate seeing or hearing water. A severe, stabbing **headache** may be present and the patient may avoid bright light.

Cantharis is also used to treat burns or skin conditions that resemble burns. It is used for **sunburn**, blisters, skin eruptions, and insect **bites**. Symptoms associated with burns for which cantharis is indicated include blister formation, searing pain, and relief upon application of a cold compress. This remedy can relieve the pain associated with second or third degree burns. Cantharis is indicated for blisters that are burning and **itching** and feel better upon application of a cold compress.

The patient feels better at night and in the morning. Also, warmth, gentle massage, and lying flat on the back make the patient feel better. Passing **gas** and burping make the patient feel better. The patient feels worse in the afternoon, during movement, and by drinking cold water or coffee.

Other physical symptoms or conditions treated with cantharis include:

- irritation of the digestive system causing a bloated stomach
- burning diarrhea
- colitis (inflammation of the colon)
- loss of appetite
- burning feeling in the throat
- considerable thirst without the desire to drink
- pleurisy (inflammation of the membrane surrounding the lungs)
- nighttime burning feeling on the bottom of the feet
- ice-cold hands with hot, red fingernails
- swelling and rash with pus on the hands
- stings with black centers
- erysipelas (infection of lymph ducts)
- fast spreading skin infection
- eczema
- dandruff
- shingles (herpes zoster)
- eye inflammation
- tongue inflammation
- neuralgia (nerve pain)

Preparations

Homeopathic canthous is prepared from the entire beetle, dried and powdered. It is commercially available as a homeopathic liquid or tablet. Because of the toxic nature of cantharis, the tincture (an alcoholic extract) requires a doctor's prescription.

Cystitis is treated with 30C of homeopathic cantharis every half hour, with up to six doses. Minor burns are treated with 30C of cantharis every 15 minutes for four doses. Blisters are treated with 6C of cantharis four times a day until the pain disappears. Burns may be treated locally with water containing a few drops of cantharis tincture. **Shingles** may be treated with an ointment made with 3X of cantharis.

Precautions

Large doses of cantharidin (the poison produced by the Spanish fly found in cantharis) can cause a burning pain in the stomach and throat, difficulty swallowing, violent vomiting, **diarrhea**, frequent urges to urinate, and possibly convulsions and coma.

Side effects

Excessive doses of cantharis may cause symptoms of cantharidin toxicity including burning pain, vomiting, and frequent urge to urinate.

Interactions

The **belladonna**, **phosphorus**, mercurius, **sepia**, and sulphur homeopathic remedies may be used to complement the activity of cantharis. Homeopathic remedies that serve as antidotes are **aconite**, **apis**, camphora, kali nit., and **pulsatilla**. Cantharis serves as an antidote for the homeopathic remedies alcohol, camphora, and vinegar. Homeopathic coffea and cantharis are incompatible.

Resources

BOOKS

Lockie, Andrew, and Nicola Geddes. *The Complete Guide to Homeopathy: The Principles and Practice of Treatment with a Comprehensive Range of Self Help Remedies for Common Ailments*. New York: Dorling Kindersley, 1995.

Lodkie, Andrew, and Nicola Geddes. *The Women's Guide to Homeopathy: The Natural Way to a Healthier Life for Women*. New York: St. Martin's Press, 1994.

ORGANIZATIONS

American Foundation for Homeopathy. 1508 S. Garfield, Alhambra, CA 91801.

Homeopathy Educational Services. 2124B Kittredge Street, Berkeley, CA 94704. (510)649 0294. mail@homeopathic.com.

National Center for Homeopathy. 801 N. Fairfax Street, Suites 306, Alexandria, VA 22314.

OTHER

Clarke, John Henry. "Cantharis." *A Dictionary of Practical Materia Medica*. http://www.homeoint.org/clarke/c/canth.htm.

Belinda Rowland

Car sickness *see* **Motion sickness**

Carbuncles *see* **Boils**

Cardamom *see* **Grains-of-paradise fruit**

Carnitine

Description

Carnitine is an amino acid that is essential for babies and nonessential for others. In this context, essential means it must be obtained in the diet. Nonessential types of **amino acids** can be synthesized to some extent within the body. The kidney is able to form carnitine from the amino acids **lysine** and **methionine**, in addition to **iron** and vitamins B_6, **niacin**, and C. The function of carnitine is to mobilize long-chain fatty acids into the powerhouse of the cell, where they are used for energy. Carnitine is necessary for infants to grow and develop normally.

General use

The strongest indication for supplemental carnitine is a genetic defect that causes a deficiency. It may also be inadequately manufactured by babies, particularly those who are premature or have a low birth weight.

Abnormally low levels of carnitine are most commonly associated with a few rare genetic diseases. Symptoms of inadequate carnitine can include confusion, heart **pain**, muscle weakness, and **obesity**. Poor consumption of the nutrients required in order to synthesize carnitine also sometimes results in deficiency. These nutrients include lysine, methionine, **vitamin C**, iron, niacin, and vitamin B_6 (**pyridoxine**). Anyone with a protein deficient diet may have inadequate levels of the building blocks for carnitine. Lysine and methionine are likely to be lacking in a strict vegan diet, although some fortified grains are available. Those who are under severe or chronic

KEY TERMS

Amino acids—Building block units that compose proteins.

Anticoagulant— Substance that inhibits blood clotting, used therapeutically for such things as stroke prevention in susceptible people.

Atherosclerosis—Deposition of fatty plaque on the inner wall of arteries, hindering blood flow.

Vegan—A person who doesn't eat any meat or animal products, including dairy and eggs.

health **stress** are also at higher risk. People who have had surgery, severe **burns**, or wasting illnesses require higher protein levels, and might benefit from a supplement. The use of supplements containing D-carnitine has the potential to cause L-carnitine deficiency.

The heart is the most carnitine-rich organ in the body, and there are several heart or circulatory conditions that may benefit from more carnitine than is normally in the diet. Carnitine appears to help the heart, a muscle that requires a lot of energy, function better. One of the primary heart problems that can be helped by carnitine supplementation is **angina** (heart pain due to decreased oxygen because of coronary artery disease). Two studies using L-carnitine, and one using L-propionyl-carnitine, have demonstrated a reduction in symptoms of this condition. When carnitine is added to the treatment plan, it can potentially reduce some of the other medications used to control angina. However, reducing medication for angina patients should be supervised and guided by a healthcare provider.

Intermittent claudication is a condition that develops in some people with severe **atherosclerosis**. Walking becomes painful as a result of decreased blood flow to the legs. Most studies have shown significant improvement in the distance walked without pain when a supplement of L-propionyl-carnitine was used. The dose used in one study was 0.07 oz (2 g) per day.

When used along with traditionally prescribed medications, carnitine may improve survival rates after a **heart attack**. Other benefits, including lowering the heart rate, blood pressure, and lipid levels occurred in treated groups. The dose and type used in one study was 0.14 oz (4 g) per day of L-carnitine.

Most studies of carnitine used to improve athletic performance have not shown any benefit. Supplementation may have some minimal effects on Alzheimer's patients; some study groups had slightly slower rates of deterioration. These results remain questionable and further study is needed.

There is some evidence that the use of supplemental L-carnitine, at a dose of approximately 500-1000 mg three times per day, may help to lower levels of serum **cholesterol**. However, this regimen would be expensive, and there are other effective and less expensive supplements available. These include **garlic**, red yeast rice, niacin, high fiber **diets**, and soy proteins.

A condition known as **chronic fatigue syndrome** (CFS) causes a number of potentially debilitating symptoms, including severe **fatigue**, muscle pain, and **depression**. Carnitine may prove helpful in alleviating the symptoms of CFS, perhaps by increasing the efficiency of energy production. One small study used a dose of 0.1 oz (3 g) of L-carnitine per day.

Undocumented claims for the health benefits of carnitine include treatment of Down's syndrome, muscular dystrophy, some forms of male **infertility**, chronic obstructive pulmonary disease (COPD), and alcoholic fatty liver disease. Carnitine has also been said to reduce the toxicity of AZT, a medication for **AIDS**.

Preparations

Carnitine is found primarily in meats, but may also be found in avocados, breast milk, dairy products, and tempeh. In the body, it can be synthesized in the kidney from lysine and methionine. Supplements are available in capsules, but are generally quite expensive.

Several forms of oral carnitine are available, including L-carnitine, D-carnitine, and DL-carnitine. The latter two forms are often found in over-the-counter nutritional products and supplements. They are associated with more adverse effects. Products containing D-carnitine and DL-carnitine should be avoided. L-acetyl-carnitine and L-propionyl-carnitine are acceptable alternative formulations that may be recommended for specific conditions.

Precautions

Women who are pregnant or may become pregnant should not take carnitine supplements. Breast-feeding mothers should also avoid them, since they may not be safe for infants in this situation. Babies requiring a supplement due to low birth weight or preterm conditions should have it prescribed and monitored by a healthcare provider. Those with food

allergies to proteins are at risk of adverse reactions to carnitine. People who have chronic liver disease are at risk of having high carnitine levels due to their illness and should not take carnitine supplements.

Side effects

L-carnitine taken by mouth has been known to cause gastrointestinal symptoms, including **nausea**, **vomiting**, cramps, and **diarrhea**. DL-carnitine is sometimes associated with a syndrome of severe weakness and wasting of muscle, particularly in patients with kidney disease who have been on long-term hemodialysis.

Interactions

Valproic acid, a drug sometimes used to treat seizures, is more likely to cause toxicity if the patient under treatment has a carnitine deficiency. The drug may cause decreased carnitine levels. A healthcare provider should be consulted regarding the advisability of taking supplemental carnitine under those circumstances. Supplements of carnitine may increase the effects of the anticoagulant medication warfarin.

Resources

BOOKS

Balch, James, and Phyllis Balch. *Prescription for Nutritional Healing*. New York: Avery Publishing Group, 1997.

Bratman, Steven, and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The complete guide*. Arizona: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. California: Therapeutic Research Faculty, 1999.

Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha books, 1997.

Judith Turner

Carotenoids

Carotenoid	Food sources
Alpha-carotene	Carrots Collard greens Peas Plantains Pumpkin Tangerines Tomatoes, raw Winter squash
Beta-carotene	Broccoli Cantaloupe Carrot juice Carrots Dandelion greens Kale Pumpkin Spinach Turnip greens Sweet potatoes Winter squash
Beta-cryptoxanthin	Carrots Corn, yellow Nectarines Orange juice Oranges Papaya Pumpkin Red bell peppers Tangerines Watermelon
Lutein and zeaxanthin	Broccoli Brussels sprouts Collard greens Corn, yellow Dandelion greens Kale Mustard greens Peas Pumpkin Spinach Summer squash Turnip greens Winter squash
Lycopene	Baked beans, canned Catsup Grapefruit, pink Marinara sauce Sweet red peppers Tomato juice Tomato paste and puree Tomato soup Tomatoes, raw Vegetable juice cocktail Watermelon

(Illustration by GGS Information Services. Cengage Learning, Gale)

Carotenoids

Description

The term carotenoid refers to a family of about 600 different plant pigments that function as **antioxidants**. The yellow, orange, and many of the red pigments in fruits, vegetables, and plant materials are usually carotenoids. In the autumn, when deciduous trees prepare for winter and stop their chlorophyll production, the green color of the leaves fade and the orange, yellow, and red colors of the carotenoids in the leaves are revealed before the leaves die and fall to the ground. Plants appear to produce carotenoids to protect their stems and leaves from the energy of the sun.

Ultraviolet (UV) wavelengths can generate molecules called free radicals that can damage living cells. Free radicals are molecules, or fragments of molecules, that are unstable and highly reactive. Free radicals are produced as the result of a normal molecule's losing or gaining an electron. In normal, stable molecules, electrons associate in pairs. However, radiation from the sun can result in the removal of an electron from a molecule and the formation of a free radical. Carotenoids as antioxidants limit free radical damage by donating electrons to quench, or neutralize, the oxidant radicals.

In human **nutrition**, carotenoids, as antioxidants, serve to protect cells from the danger of free radicals that may be produced by the body during metabolism or by cigarette smoke, sunlight, radiation, pollutants, or even **stress**. Tens of thousands of free radicals are created in the body every second. When a free radical captures an electron from another molecule, a new free radical is created as the second molecule has a lone, unpaired electron. This new free radical seeks to capture another electron and become normal again. This continual process of forming free radicals becomes a chain reaction. Unless quenched, these free radicals can damage DNA, fats, and proteins. However, the body has a defense against free radicals. With proper nourishment, the body can make sufficient quantities of antioxidant enzymes and substrates for those enzymes that can facilitate the quenching of free radical reactions by antioxidants. These enzymes include superoxide dismutase, catalase, and **glutathione** peroxidase. In addition to these enzymes produced by the body, antioxidant nutrients taken into the body through foods or through dietary supplements also can surrender electrons to the free radicals without adding to the chain reaction, thus terminating the free radical reactions. Antioxidant nutrients include vitamins A, C, and E, **bioflavonoids**, lipoic acid, and carotenoids.

There are many other minor dietary carotenoids that most likely provide significant health benefits. A diet that includes many types of fruits and vegetables is important for supplying those nutrients and their associated health benefits.

Despite the large number of carotenoids in nature, only about 50 are present in foods that people in the United States eat, and only about 14 of those have been identified in blood, an indication of what is absorbed in the human body. All carotenoids are fat-soluble compounds, meaning that they can dissolve in fats and oils but not in water. The carotenoid family consists of smaller families of pigments called carotenes and xanthophylls. Carotenes are hydrocarbons, containing only carbon and hydrogen atoms, while xanthophylls also contain oxygen. The carotenes have been studied more than the other carotenoids. The ones of most interest in human nutrition are beta-carotene, alpha-carotene, and **lycopene**. Important xanthophylls include **lutein**, astaxanthin, zeaxanthin, and cryptoxanthin.

Five individual carotenoids (beta-carotene, alpha-carotene, lycopene, lutein, and beta-cryptoxanthin) were added to the National **Cancer** Institute's Diet History Questionnaire as a result of the increasing acceptance of the many health benefits of carotenoids. The carotenoids appear to reduce the risk of some forms of cancer, cardiovascular disease, and eye degeneration. As of 2008, continued research was anticipated to provide scientific evidence to confirm many of the health effects and to identify additional benefits of carotenoids.

Beta carotene

As one of the most common carotenoids, beta-carotene is the most well-known and well-studied carotenoid. It is found in carrots, pumpkins, peaches, and sweet potatoes. Beta-carotene is the primary precursor to **vitamin A** and is often called pro-vitamin A. With the aid of dioxygenase enzymes, the human body can split one molecule of beta-carotene into two vitamin A molecules. Vitamin A has many vital functions in the human body, including being involved in (1) the growth and repair of body tissues, (2) the formation of bones and teeth, (3) the resistance of the body to infection, and (4) the development of healthy eye tissues. Vitamin A deficiency symptoms include **night blindness**; dry eyes; dry, rough skin; impaired bone growth; and susceptibility to respiratory **infections**. Vitamin A is a fat soluble vitamin, can be stored in the body long-term, and can reach toxic levels over time if amounts above recommended levels (10,000 IU for adults and only 6,000 IU for pregnant women) are ingested. Too much vitamin A can cause headaches, vision problems, **nausea**, **vomiting**, an enlarged liver or spleen, birth defects, and even death at very high levels. Beta-carotene is a better source of vitamin A than vitamin A supplements because it is only converted to vitamin A on an as-needed basis; excess beta-carotene is stored in the body and, unlike vitamin A, is not toxic when taken in amounts in excess of body needs. Beta-carotene also improves immune function, increases lung capacity, reduces DNA damage, may provide protection from the sun, and may lessen the risks of some types of cancer. However, for people who drink and smoke excessively, beta-carotene may increase the risk of **lung cancer**.

Alpha carotene

Alpha-carotene, another common carotenoid, is typically found in the same foods as beta-carotene. It is similar to beta-carotene in structure, with one of the ring structures being beta-ionone. However, the other ring is different, so one molecule of alpha-carotene yields only one molecule of vitamin A. Alpha-carotene has been found to have powerful anticancer properties in cell-culture studies.

Lycopene

Lycopene is often the most common carotenoid in the American diet because it is found in tomato products, including pizza and spaghetti sauce. It is also present in lesser amounts in watermelon, pink grapefruit, guava, and apricots. Lycopene does not produce vitamin A. However, lycopene in tomato juice and spaghetti and pizza sauces has been associated with a lower risk of **prostate cancer** in men. Several clinical trials have shown that lycopene supplementation reduces the risk of prostate cancer as well as slows its progression. It has also been shown to reduce the risk of **osteoporosis**.

Cooked tomato sauces are associated with greater health benefits, compared to uncooked tomatoes because the lycopene in cooked tomatoes is more easily absorbed. Also, since lycopene is fat-soluble, absorption increases when it is mixed with oil in the sauces. Uncooked tomatoes also have health benefits, though to a lesser degree, especially when they are used in a salad with an oil-based dressing or in a sandwich with fat-containing meat. Lycopene may help in the prevention of other cancers as well as protect against heart attacks. In the late 2000s research continued on the potential health benefits of lycopene.

Lutein

Lutein, which is almost as common as beta-carotene in the American diet, and zeaxanthin are xanthophylls found in kale, spinach, broccoli, corn, **alfalfa**, and egg yolks. Both are components of the macula of the eye, a small area in the center of the retina responsible for detailed vision. These carotenoids may prevent and slow **macular degeneration**, a leading cause of blindness in the elderly. As antioxidants, they reduce the amount of free radical damage to the macula. Lutein may also help prevent the formation of **cataracts**, reduce the risk of **heart disease**, and protect against **breast cancer**.

Astaxanthin is a minor carotenoid that serves as a pigment in aquatic animals such as salmon, trout, and Antarctic krill (small shrimp-like crustaceans that feed on algae and that serve as a food source for other sea animals such as whales). Astaxanthin is a strong antioxidant that appears to enhance the immune system and protect against cancer. It also may protect against UVA light, a wavelength of ultraviolet light that can cause **sunburn** and **skin cancer**.

Beta-cryptoxanthin

Cryptoxanthin is a minor carotenoid found in peaches, papayas, tangerines, and oranges. Cryptoxanthin is second to beta-carotene in the amount of dietary carotene converted to vitamin A. Along with other carotenoids it forms an antioxidant barrier in the human skin. It also appears to protect women from cervical cancer.

General use

Although not classified as essential nutrients, carotenoids are important substances in human food sources, especially in fruits, vegetables, and plant greens, that provide many health benefits. In addition, some are precursors to vitamin A. A diet that includes many types of fruits and vegetables is important for supplying the essential carotenoids and their associated health benefits. The more common carotenoids also are available as dietary supplements.

Preparations

Beta-carotene, lutein, and lycopene are sold as individual carotenoid supplements. Beta-carotene is available in two forms, natural and synthetic. The natural form is preferred to the synthetic, as the natural form appears to be a stronger antioxidant. Algae are an abundant source of beta-carotene and are used to produce supplements. Their presence in a supplement is usually identified on the label as *Dunaliella salina* or as some related type of algae. *D. salina* produces 10 to 100 times more beta-carotene than carrots. It grows in areas with strong sunlight, high temperatures, and salty water, environments in which antioxidants are greatly needed for protection from free radicals. A dose for adults for beta-carotene may range up to 10 to 15 mg, or 25,000 IU, daily.

Lutein is prepared from marigold petals as either free lutein or lutein ester. Both forms are absorbed well by the body, though preliminary research showed that lutein ester may be assimilated slightly better and be retained slightly longer than free lutein. For general health, 4 to 6 mg of lutein should be satisfactory. For those at risk for macular degeneration, 30 to 40 mg daily may be useful.

Lycopene supplements are prepared from tomatoes. A typical daily dose is 4 mg, which is the amount in one large ripe tomato. Zeaxanthin is not available as a supplement. However, the body can convert some lutein to zeaxanthin. Also lutein supplements usually contain some zeaxanthin.

Mixed carotenoid supplements are available, with different formulations. For example, one typical formula contains mostly beta-carotene, with smaller amounts of lutein, zeaxanthin, and cryptoxanthin. Another type contains less beta-carotene but a higher percentage of alpha-carotene. Mixed carotenes may also be included in some multi-vitamin and multi-oxidant supplements. Labels of supplements should be read carefully to determine the types of carotenoids present and their dosages.

A person consuming the typical American diet obtains only about 1.5 mg of carotenoids per day. The Recommended Dietary Allowance (RDA), as established by the United States National Research Council for the purpose of evaluating **diets**, for vitamin A is 1,000 RE (retinol equivalents), or 6 mg of beta-carotene. The USRDA, established by the United States Food and Drug Administration as a consumer convenience for labeling purposes, is 5,000 IU of vitamin A, or 3 mg of beta-carotene. The United States Department of Agriculture and the National Cancer Institute have suggested that perhaps 5 to 6 mg of carotenoids should be a dietary target.

To enhance dietary health benefits, it may be useful to supplement a diet high in fruits and vegetables with an additional 10 to 15 mg of carotenoid supplements per day. Those with poor diets may consider supplementation with 25 mg of supplementation per day. Since it is not possible to put every beneficial carotenoid in a supplement, the best way to obtain a wide variety of carotenoids is to eat a diet containing an assortment of carotenoid-containing foods.

As of 2008 research had not answered the question of whether individuals require additional vitamin A if they are taking beta-carotene supplements. Vitamin A is only available in foods of animal origin, so vegetarians should consider using vitamin A supplements. Persons with diseases such as diabetes may not be as efficient in converting beta-carotene into vitamin A, so they may need to get some from their diet or from supplements.

Precautions

A study conducted to investigate the effects of **vitamin E** and beta-carotene on the incidence of lung cancer and other cancers in male smokers indicated that, in the subjects who were heavy smokers and also were heavy drinkers, beta-carotene supplements appeared to increase adverse health effects, including a slight increase in cancer. Another study of smokers indicated that high supplemental doses of beta-carotene and vitamin A increased the risk of lung cancer (though in former smokers, beta-carotene and vitamin A decreased the chances of developing lung cancer). Therefore, the use of beta-carotene supplements and vitamin A is not recommended for those who smoke or drink heavily. In the late 2000s, additional studies were conducted on the effects of beta-carotene supplementation.

KEY TERMS

Antioxidant—A substance that protects against the oxidative processes that may lead to cellular damage. Antioxidants are associated with a reduced risk of cancer, cardiovascular disease, and degenerative eye disease. Antioxidants include vitamin C, vitamin E, selenium, and carotenoids.

Chlorophyll—The photosynthetic pigments of higher plants.

Dioxygenase enzymes—Substances that accelerate the chemical reaction of oxygen molecules with an organic substrate.

Free radicals—Molecules, or fragments of molecules, that are unstable and highly reactive. Antioxidants appear to provide protection against free radicals.

Side effects

Ingesting high doses of beta-carotene can result in a benign orange coloration of the skin, especially on the palms of the hands and soles of the feet. This discoloration can be reversed with reduced dosage or discontinued use of beta-carotene for one month, with continued use at a lower dose thereafter.

Interactions

Carotenoids seem to work best together in a complementary and synergistic manner to provide antioxidant and other health benefits; they also seem to work well with other antioxidants. Therefore, the use of a mixed carotenoid supplement in combination with a

multi-antioxidant formula, along with a diet rich in a variety of fruits and vegetables, is most desirable.

Carotenoid supplements are readily assimilated by the body, but to optimize absorption, they should be taken with the highest fat-content meal of the day.

As of 2008, research had not determined how the consumption of one type of carotenoid as a supplement may affect the absorption of other carotenoids. One study showed that beta-carotene reduced the absorption of canthaxanthin, another showed that beta-carotene reduced the levels of lutein in the body, while other studies showed that beta-carotene actually increased levels of other carotenoids in the body. In the late 2000s, research was ongoing in the search to identify potential interactions.

Resources

BOOKS

Challem, Jack, and Marie Moneysmith. *User's Guide to Carotenoids & Flavonoids: Learn How to Harness the Health Benefits of Natural Plant Antioxidants*. North Bergen, NJ: Basic Health,2005.

Duyff, Roberta Larson. *American Dietetic Association Complete Food and Nutrition Guide*. Hoboken, NJ: Wiley, 2006.

PERIODICALS

Rao, Leticia. "More than Minerals." *Alive: Canadian Jour nal of Health & Nutrition* 298 (August 2007): 52 53.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www. amfoundation.org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agricul ture, 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov.

International Carotenoid Society, http://www.carotenoid society.org.

International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, 20036, (202) 296 6540, http://www.ific.org.

National Center for Complementary and Alternative Med icine. National Institutes of Health, 9000 Rockville Pike, Bethesda, Maryland, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Judith Sims
Teresa Norris
Angela M. Costello

Carpal tunnel syndrome

Definition

Carpal tunnel syndrome is a disorder caused by compression at the wrist of the median nerve supplying the hand, causing numbness and tingling.

Description

The carpal tunnel is an area in the wrist where the bones and ligaments create a small passageway for the median nerve. The median nerve is responsible for both sensation and movement in the hand, in particular the thumb and first three fingers. When the median nerve is compressed, an individual's hand will feel numb.

Women between the ages of 30 and 60 have the highest rates of carpal tunnel syndrome. Research has demonstrated that carpal tunnel syndrome is a significant cause of missed work days due to **pain**. A 2007 report issued by the United States Bureau of Labor Statistics indicated that that during 2006, private industry saw more than 13,000 cases of carpal tunnel syndrome involving missed work days.

Causes and symptoms

Compression of the median nerve in the wrist can occur during a number of different conditions, particularly those conditions which lead to changes in fluid accumulation throughout the body. Because the area of the wrist through which the median nerve passes is very narrow, any swelling in the area leads to pressure on the median nerve. This pressure ultimately interferes with the nerve's ability to function normally. **Pregnancy**, **obesity**, certain thyroid conditions, diabetes, and certain pituitary abnormalities all predispose

A hand with stitches after surgery for carpal tunnel syndrome. *(Chuck Goodenough / Alamy)*

a person for developing carpal tunnel syndrome. Other conditions that increase the risk for carpal tunnel syndrome include some forms of arthritis, kidney failure, and various injuries to the arm and wrist (including **fractures**, **sprains**, and dislocations). Furthermore, activities that require repeatedly bending the wrist inward toward the forearm can predispose to carpal tunnel syndrome. Certain jobs that require repeated strong wrist motions carry a relatively high risk of carpal tunnel syndrome. Injuries of this type, referred to as repetitive-motion injuries, are more frequent among secretaries who do a lot of typing, people working at computer keyboards or cash registers, factory workers, and some musicians.

Symptoms of carpal tunnel syndrome include numbness, burning, tingling, and a prickly pin-like sensation over the palm surface of the hand and into the thumb, forefinger, middle finger, and half of the ring finger. Some individuals notice a shooting pain that goes from the wrist up the arm or down into the hand and fingers. With continued median nerve compression, an individual may begin to experience muscle weakness, making it difficult to open jars and hold objects with the affected hand. Eventually, the muscles of the hand served by the median nerve may begin to grow noticeably smaller (atrophy), especially the fleshy part of the thumb. Untreated, carpal tunnel syndrome may result in permanent weakness, loss of sensation, or even paralysis of the thumb and fingers of the affected hand.

A 2008 study conducted by the National Institute of Neurological Disorders and **Stroke** examined the link between educational intervention and reduction in the number of cases of carpal tunnel syndrome.

Diagnosis

The diagnosis of carpal tunnel syndrome is made in part by checking to see whether the patient's symptoms can be brought on by holding his or her hand with the wrist bent for about a minute. Wrist x rays are often taken to rule out the possibility of a tumor causing pressure on the median nerve. A physician examining a patient suspected of having carpal tunnel syndrome performs a variety of simple tests to measure muscle strength and sensation in the affected hand and arm. Further testing might include electromyographic or nerve conduction velocity testing to determine the exact severity of nerve damage. These tests involve stimulating the median nerve with electricity and measuring the resulting speed and strength of the muscle response, as well as recording the speed of nerve transmission across the carpal tunnel. A 2002 report stated that three medical organizations had concluded that electrodiagnostic studies were the preferred methods of diagnosing carpal tunnel syndrome, offering the highest degrees of sensitivity and specificity.

Treatment

Carpal tunnel syndrome is initially treated with splints, which support the wrist and prevent it from flexing inward into the position that exacerbates median nerve compression. Some people get significant relief by wearing such splints to sleep at night, whereas others need to wear the splints all day, especially if they are performing jobs that **stress** the wrist.

The activity which caused the condition should be avoided whenever possible. Also, the actions of making a fist, holding objects, and typing should be reduced. The patient's work area should be modified to reduce stress on the body. This modification may be achieved by correct positioning and with ergonomically designed furniture. Performing hand and wrist exercises periodically throughout the day may be beneficial.

Researchers found that the carpal ligament can be lengthened or released without surgery through osteopathic manipulation and weight loading. Combining the two gives additional benefit because manipulation lengthens the ligament at one end and weight loading increases the length at the other end. Patients can be taught a stretching **exercise** for self-manipulation of the ligament.

A National Institute of Health (NIH) panel concluded that traditional **acupuncture** may be a useful alternative or complementary treatment for carpal tunnel syndrome. Studies have shown that both laser acupuncture and microamp transcutaneous electrical nerve stimulation (TENS) can significantly reduce the pain associated with carpal tunnel syndrome. Both of these therapies are painless. Greater than 90% of the patients treated reported no pain or pain that had been reduced by more than half. Patients in this study were also using Chinese herbal medicines, deep acupuncture (including needle acupuncture), **moxibustion**, and omega-3 **fish oil** capsules. All patients were able to return to work and the pain of most patients remained stable for up to two years. Persons over the age of 60 years had poorer responses.

A 1995 study conducted at the University of Pennsylvania School of Medicine concluded that **yoga** alleviated symptoms in persons suffering from carpal tunnel syndrome. A later study by Australian researchers also found that yoga was among effective non-surgical treatments. The list also included oral steroids, splints, ultrasound, and carpal bone immobilization.

Some studies have shown that persons with carpal tunnel syndrome are deficient in vitamin B_6 (**pyridoxine**) and that supplementation with this vitamin is

beneficial. Carpal tunnel syndrome should improve within two to three months by taking 100 mg three times daily. Patients should consult with their physician when taking high doses of this vitamin.

Chinese and homeopathic remedies include:

- arnica; 30c dose
- astra essence
- Rhus toxicodendron; 6c dose
- Ruta graveolens; 6c dose

Allopathic treatment

Ibuprofen or other nonsteroidal anti-inflammatory drugs may be prescribed to decrease pain and swelling. Diuretics may be used if the syndrome is related to the menstrual cycle. When carpal tunnel syndrome is more advanced, steroids may be injected into the wrist to decrease inflammation.

The most severe cases of carpal tunnel syndrome may require surgery to decrease the compression of the median nerve and restore its normal function. Such a repair involves cutting the ligament that crosses the wrist, thus allowing the median nerve more room and decreasing compression. This surgery is done almost exclusively on an outpatient basis and is often performed without the patient having to be rendered unconscious. Careful injection of numbing medicines (local anesthesia) or nerve blocks (the injection of anesthetics directly into the nerve) create sufficient numbness to allow the surgery to be performed painlessly, without the risks associated with general anesthesia. Recovery from this type of surgery is usually quick and without complications.

In 2002, researchers in the Netherlands reported that after studying about 80 patients over two years, surgery proved more successful than nighttime splints in freeing up compressed nerves of patients with carpal tunnel syndrome. Many patients in the splint group ended up choosing the surgery option after several months of wearing splints.

Expected results

Without treatment, continued pressure on the median nerve puts the patient at risk for permanent disability in the affected hand. Alternative medicines have been shown to reduce pain. Most people are able to control the symptoms of carpal tunnel syndrome with splinting and anti-inflammatory agents. For those who go on to require surgery, about 95% have complete cessation of symptoms.

KEY TERMS

Carpal tunnel—A passageway in the wrist, created by the bones and ligaments of the wrist, through which the median nerve passes.

Electromyography—A test in which a nerve's function is examined by stimulating the nerve with electricity and then measuring the speed and strength of the corresponding muscle's response.

Ergonomic—The science of correlating a person's body and the person's workplace in order to facilitate the efficient use of human energy.

Median nerve—A nerve that runs through the wrist and into the hand. It provides sensation and some movement to the hand, the thumb, the index finger, the middle finger, and half of the ring finger.

Prevention

Avoiding or reducing the repetitive motions that put the wrist into a bent position may help to prevent carpal tunnel syndrome. People who must work long hours at a computer keyboard, for example, may need to take advantage of advances in ergonomics and position the keyboard and computer components in a way that increases efficiency and decreases stress. Taking frequent breaks is important. Wearing fingerless gloves may help to maintain flexibility and warmth in the hands. Early use of a splint may also be helpful for persons whose jobs put them at risk of carpal tunnel syndrome.

Resources

BOOKS

Montgomery, Kate. *End Your Carpal Tunnel Syndrome without Surgery*. Elkhart, IN: Sports Touch, 2007.

ORGANIZATIONS

Association for Repetitive Motion Syndromes, PO Box 514, Santa Rosa, CA, 95402, (707) 571 0397, http://www.certifiedpst.com/arms/.

National Institute of Neurological Disorders and Stroke, PO Box 5801, Bethesda, MD, 20824, (800) 352 9424, (301) 496 5751, http://www.ninds.nih.gov/index.htm.

U.S. Bureau of Labor Statistics, Postal Square Building, 2 Massachusetts Ave. NE, Washington, DC, 20212 0001, http://www.bls.gov/.

Teresa G. Odle
Rhonda Cloos, RN

Cartilage supplements

Description

Cartilage is a type of dense connective tissue found in humans and other animals. Bluish-white or gray in color, the semi-opaque tissue has no nerve or blood supply of its own. Cartilage supplements come from such animal sources as cattle, sheep, sharks, and chickens. Bovine cartilage supplements are derived from the windpipes of cows, whereas the cartilage from the heads and fins of sharks is used for shark cartilage supplements.

General use

Both shark and bovine cartilage supplements have been proposed as treatments for **cancer**. In addition, a compound derived from cartilage called **chondroitin** has been publicized as a useful treatment for **osteoarthritis**. Cartilage preparations are available as pills, powders, or liquids for oral dosage. They can also be given as enemas, topical applications, or intravenous or intramuscular injections.

Bovine cartilage supplements

Beginning in the 1950s, the physician John F. Prudden noticed that bovine cartilage could enhance wound healing in animals. Prudden then injected an extract of bovine cartilage into a **breast cancer** patient whose tumor had ulcerated her skin. The patient's tumor ultimately disappeared, and she lived for 12 years before dying of other causes. In 1985, Prudden published the first of several scientific papers on the subject.

Prudden asserted that the anticancer ingredients in bovine cartilage are mucopolysaccharides, which are complex sugar molecules that help fight cancer by stimulating the patient's immune system. Prudden also stated that these large sugar molecules act on tumor cell membranes by blocking mitosis (cell division). Other proposed explanations of the effectiveness of bovine cartilage include the inhibition of protease, which is an enzyme that helps to break down proteins, and the blocking of the formation of enzymes that break down collagen proteins. Bovine cartilage is also reported to reduce the rate of new blood vessel growth in tumors, called angiogenesis. Although numerous bovine cartilage supplements have been made available for immunostimulation or to fight cancer, there is little scientific evidence of their effectiveness. Most positive reports on tumor response and the survival of cancer patients after cartilage treatment are anecdotal. As of 2008 there had been very few scientific studies on the use of bovine collagen in humans, and those that had been done had not shown it to be an effective treatment.

Shark cartilage supplements

The use of shark cartilage to treat cancer is based on the claim that it blocks angiogenesis or the development of new blood vessels that tumors need to survive. Judah Folkman, a researcher at Harvard Medical School in the 1970s, developed the theory of angiogenesis. Dr. Folkman's proposal that tumors, much like a normal organ or mass of cells, require a supply of blood to deliver nutrients for growth, later became closely linked to the treatment of cancer with shark cartilage.

In 1983, William Lane, motivated by Folkman's research, began investigating the possible link between shark cartilage and its ability to starve tumors with an antiangiogenetic mechanism. In 1993, Lane published his book *Sharks Don't Get Cancer*, making shark cartilage one of the leading alternative cancer therapies, with the vast majority of the cartilage market since that time comprised of shark cartilage.

The use of shark cartilage as an alternative treatment has been opposed by wildlife experts who say that use of the substance threatens the shark population. Estimates vary widely on the number of sharks killed each year to make cartilage products, but most put the number at greater than 100,000. Further research has also shattered the myth that sharks do not get cancer. A variety of studies on sharks since the popularization of shark cartilage as a cancer fighter have documented that sharks do, in fact, get cancer, and cases of cancer of the cartilage have even been documented.

Both shark and bovine cartilage have been used to treat a wide variety of cancers, including tumors of the breast, ovary, cervix, prostate, rectum, colon, stomach, kidney, and brain. The U.S. Food and Drug Administration (FDA) maintains that both types of cartilage can be tested as potential cancer therapy in clinical trials but must be sold strictly as dietary supplements. Dietary supplement manufacturers are also prohibited from making specific claims that the supplements can cure disease. Dietary supplements are not regulated in the same way as drugs, which means that products can vary widely in the amount of cartilage contained in the supplement and the purity of the cartilage.

While some laboratory studies have shown positive results from both bovine and shark supplements

as a treatment for cancer, continued research as of 2008 was being conducted to determine their effectiveness. Some studies indicate that the proposed antiangiogenetic effects of shark cartilage are ultimately destroyed by digestion, and the substance therefore is unlikely to be effective when taken orally as a pill. There is some evidence that a liquid shark cartilage extract called AE-941 (Neovastat) may be effective at slowing blood vessel growth. As of 2008 Neovastat was approved by the FDA as an investigational drug approved for use in clinical trials, and clinical trials were underway to test its effectiveness.

Chondroitin sulfate

Chondroitin is best known to the general public as a remedy for osteoarthritis, which is a form of arthritis caused by wearing away or degeneration of the cartilage that cushions the ends of bones. It is thought that the drying out of cartilage tissue in osteoarthritis is a major cause of tissue destruction. Chondroitin sulfate is given together with **glucosamine**, a compound that is a building block of cartilage. The chondroitin helps to attract and hold fluid within cartilage tissue. Tissue fluid keeps cartilage healthy in two ways: it acts as a shock absorber within the joints of the body, thus protecting cartilage from being worn away by the bones, and it carries nutrients to the cartilage.

The evidence for the use of chondroitin is mixed. Although many early studies showed significant positive effects on osteoarthritis, later studies, which tended to be larger and have patients with more advanced osteoarthritis, showed little to no effect. A meta-analysis published in 2007 in the *Annals of Internal Medicine* analyzed 20 previous studies and concluded that there was little or no evidence that chondroitin had a positive effect on osteoarthritis. However, the authors did not take into account studies that combine glucosamine and chondroitin, which some evidence shows may work better than chondroitin alone.

Preparations

Shark and bovine cartilage supplements are available in capsule form, while shark is also sold as a powder and liquid. Shark supplements are made from ground-up shark skeletons (mainly the fins and head), while bovine supplements are prepared from the cartilage taken from cow bones and the windpipe. Chondroitin sulfate can be taken orally as a pill, powder, or liquid. It can also be administered by injection. Oral preparations of chondroitin, by itself or in combination with glucosamine, are available in the United States as over-the-counter (OTC) dietary supplements. They can be purchased over the Internet, at pharmacies, health food stores, and many grocery stores.

The recommended dosage of shark and bovine cartilage varies depending on the person and individual need. General guidelines indicate that the recommended dose of shark cartilage is 1 g daily per kilogram of body weight—the equivalent to almost 70 g per day for a 150-pound individual. With observed shrinkage of the tumor, the dosage may be lowered. The recommended bovine cartilage dosage per day is 9 g. With both supplements, patients must keep taking the same dose and include the supplements in their **diets** for life. Because the supplements must be taken over the long term, they can be prohibitively expensive. Individuals considering taking cartilage supplements should carefully consider the long-term cost of doing so.

Precautions

While cartilage supplements do not appear to be harmful, individuals who are considering them as a cancer treatment should never use them as the only form of therapy and should consult a doctor before taking them. Individuals who are considering chondroitin as a treatment for joint **pain** should be careful not to diagnose themselves. They should check with their physician to be sure that the pain is caused by osteoarthritis. Some conditions, including **Lyme disease**, **gout**, **bursitis**, and **rheumatoid arthritis**, can also cause pain in the joints. Although chondroitin may be helpful in treating osteoarthritis, it is not useful for these other conditions. Chondroitin has not been studied in children or in pregnant or nursing women.

Side effects

Both shark and bovine cartilage supplements show little or no side effects when taken at the appropriate dosage levels. Individuals who are allergic to seafood or shellfish should not take shark cartilage supplements. Some patients have reported an allergic reaction to traces of bovine protein or other side effects that include a bad taste in the mouth, **fatigue**, and **nausea**. Shark cartilage can cause hypercalcemia (excessive amounts of **calcium** in the body) when taken at the recommended daily dose of 70 g per day. This dosage results in 14 times the amount of calcium recommended by the United States Recommended Daily Allowance (USRDA). Some patients taking

KEY TERMS

Angiogenesis—The development of new blood vessels, specifically those that supply tumors with blood and nutrients for growth.

Chondroitin—A complex carbohydrate found in human and animal cartilage that is used to treat several physical disorders, most importantly arthritis.

Glucosamine—A complex carbohydrate composed of glucose and an amino acid called glutamine. It is an important building block of cartilage and is often taken together with chondroitin as a treatment for osteoarthritis.

Mucopolysaccharide—An older term for a class of large sugar molecules that are found in cartilage and other forms of connective tissue. Mucopolysaccharides are called glycosaminoglycans.

chondroitin have been known to experience nausea and **gas** or bloating.

Interactions

Chondroitin sulfate is not known to cause any significant interactions with other medications. One researcher, however, has suggested that chondroitin might increase the effect of anticoagulant drugs and should probably not be used in combination with them. No scientific studies have been done as of 2008 to investigate possible interactions of cartilage supplements with medications and other supplements. Individuals should always consult a doctor or pharmacist before beginning to take a new supplement.

Resources

BOOKS

Bales, Peter. *Osteoarthritis: Preventing and Healing without Drugs*. Amherst, NY: Prometheus Books, 2008.

Barrow, Colin, and Fereidoon Shahidi, eds. *Marine Nutra ceuticals and Functional Foods*. Boca Raton, FL, CRC Press, 2008.

Columbus, Frank, ed. *Arthritis Research*. New York: Nova Biomedical Books, 2005.

PERIODICALS

Loprinzi, Charles L., et al. "Evaluation of Shark Cartilage in Patients with Advanced Cancer." *Cancer* 104, no. 1 (July 1, 2005): 176 183.

Reichenbach, Stephan, et al. "Meta analysis: Chondroitin for Osteoarthritis of the Knee or Hip." *Annals of Internal Medicine* 146, no. 8 (April 17, 2007): 580 590.

ORGANIZATIONS

National Cancer Institute, 6116 Executive Blvd., Room 3036A, Bethesda, MD, 20892 8322, (800) 4 CANCER, (800) 332 8615, http://www.cancer.gov.

National Center for Complementary and Alternative Medicine (NCCAM), National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, http://www.nccam. nih.gov.

Beth Kapes
Teresa G. Odle
Helen Davidson

Castor oil

Description

Castor oil is a natural plant oil obtained from the seed of the castor plant. The castor seed, or bean, is the source of numerous economically important products as one of the world's most important industrial oils, and was one of the earliest commercial products. Castor beans have been found in ancient Egyptian tombs dating back to 4000 B.C. According to the Ebers Papyrus, an Egyptian medical text from 1500 B.C., Egyptian doctors used castor oil to protect the eyes from irritation. The oil from the bean was used thousands of years ago in facial oils and in wick lamps for lighting. Castor oil has been used medicinally in the United States since the days of the pioneers. Traveling medicine men in the late 1800s peddled castor oil, often mixed with as much as 40% alcohol, as a heroic cure for everything from **constipation** to **heartburn**. It was also used to induce labor. At the present time, castor oil is used internally as a laxative and externally as a castor oil pack or poultice.

The castor plant, whose botanical name is *Ricinus communis*, is native to the Ethiopian region of east Africa. It now grows in tropical and warm temperate regions throughout the world and is becoming an abundant weed in the southwestern United States. Castor plants grow along stream banks, river beds, bottom lands, and in almost any warm area where the soil is well drained and with sufficient nutrients and moisture to sustain growth. They are annuals that can grow 6–15 ft (1.8–5 m) tall in one season with full sunlight, heat, and moisture. The tropical leaves, with five to nine pointed, finger-like lobes, may be 4–30 in (10–76 cm) across. Flowers occur on the plant (which is monoecious, meaning that there are separate male and female flowers on the same individual), during most of the year in dense terminal clusters, with female flowers

Castor oil. The castor plant (Ricinus communis) is native to the Ethiopian region of east Africa. It now grows in tropical and warm temperate regions throughout the world and is becoming an abundant weed in the southwestern United States. *(Bon Appetit / Alamy)*

just above the male flowers. Each female flower consists of a spiny ovary, which develops into the fruit or seed capsule, and a bright red structure with feathery branches (stigma lobes) to receive pollen from the male flowers. Each male flower consists of a cluster of many stamens that shed pollen that is distributed by wind. The spiny seed pod or capsule is composed of three sections, or carpels, that split apart at maturity. Each carpel contains a single seed. As the carpel dries and splits open, the seed is ejected, often with considerable force. The seeds are slightly larger than pinto beans and are covered with intricate mottled designs, none of which have exactly the same pattern due to genetic variations. At one end of the seed is a small spongy structure called the caruncle, which aids in the absorption of water when the seeds are planted.

The name "castor" was given to the plant by English traders who confused its oil with the oil of another shrub, *Vitex agnus*—Castus, which the Spanish and Portuguese in Jamaica called agno-casto. The scientific name of the plant was given by the eighteenth-century Swedish naturalist Carolus Linnaeus. *Ricinus* is the Latin word for tick; apparently Linnaeus thought the castor bean looked like a tick, especially a tick in engorged with blood, with the caruncle of the bean resembling the tick's head. *Communis* means "common" in Latin. Castor plants were already commonly naturalized in many parts of the world by the eighteenth century.

There are several cultivated varieties of the castor plant, all of which have striking foliage colorations. The castor plant grows rapidly with little care and produces lush tropical foliage. Its use as a cultivated plant should be discouraged because its seeds or beans are extremely poisonous. Children should be taught to recognize and avoid the plant and its seeds, especially in the southwestern United States where it grows wild near residential areas. Flower heads can be snipped off of castor plants as a protective measure.

The active poison in the castor bean is ricin, a deadly water-soluble protein called a lectin. The ricin is left in the meal or cake after the oil is extracted from the bean, so castor oil does not contain any of the poison. The seed is only toxic if the outer shell is broken or chewed. Humans and horses are most susceptible to ricin, although all pets and livestock should be kept away from the castor seed. It has been estimated that gram for gram, ricin is 6,000 times more deadly than cyanide and 12,000 times more deadly than rattlesnake venom. A dose of only 70 micrograms, or one two-millionth of an ounce (roughly equivalent to the weight of a single grain of table salt) is enough to kill a 160-pound person. Even small particles in open sores or in the eyes may be fatal. As few as four ingested seeds can kill an adult human. Lesser amounts may result in **vomiting**, severe abdominal **pain**, **diarrhea**, increased heart rate, profuse sweating, and convulsions. Signs of toxicity occur about 18–24 hours after ingestion. Ricin seems to cause clumping (agglutination) and breakdown (hemolysis) of red blood cells, hemorrhaging in the digestive tract, and damage to the liver and kidneys.

Ricin has attracted considerable attention as of early 2003 because of its association with terrorist groups. Although ricin cannot easily be used against large groups of people, it has been used to assassinate individuals by injection. The Centers for Disease Control and Prevention (CDC) considers ricin a "B"-list

KEY TERMS

Bioterrorism—The use of biological agents, including plant-derived toxic materials like ricin, to frighten and intimidate large populations.

Digitalis—A type of medication, originally derived from the foxglove plant, used as a heart stimulant.

Ricin—An extremely poisonous protein derived from castor beans.

bioterrorism agent, meaning that it is relatively easy to make and is considered a moderate threat to life.

On the positive side, ricin is being investigated as a tool for **cancer** treatment. A promising use is the production of an immunotoxin in which the protein ricin is joined to monoclonal antibodies. The ricin-antibody conjugate, which is produced in a test tube, should theoretically travel directly to the site of a tumor, where the ricin can destroy the tumor cells without damaging other cells in the patient.

General use

Internal uses

Castor oil is a strong and effective cathartic or purgative (laxative), with components in the oil that affect both the small and large intestines. It has been used to clear the bowels after **food poisoning** and to relieve constipation. It is sometimes used in hospitals to prepare the patient's abdomen for x rays of the colon or kidneys. Castor oil is classified as a stimulant laxative, also known as a contact laxative. This type of laxative encourages bowel movements by acting on the intestinal wall, increasing the muscle contractions that move along the stool mass. Stimulants are a popular type of laxative for self-treatment, but unfortunately are more likely to cause side effects. There are milder types of laxatives that may be more useful for inducing regularity and treating constipation. Generally laxatives should be used to provide short-term relief only, unless otherwise directed by a doctor.

Castor oil is frequently used in animal experiments to test the effects of new medications on the gastrointestinal tract.

If castor oil has been prescribed by a doctor, his or her instructions for the timing and quantity of doses should be followed. For self-treatment, users should follow the manufacturer's instructions. At least 6–8 glasses (8 oz each) of liquids should be taken each day to soften the stools. Castor oil is usually taken on an empty stomach for rapid effect. Because results usually occur within two to six hours, castor oil is not usually taken late in the day. The unpleasant taste of castor oil may be improved by chilling it in the refrigerator for at least an hour. It may then be stirred into a glass of cold orange juice. Flavored preparations of castor oil are also available.

External uses

Castor oil is also used topically to treat **corns**. The oil is applied once or twice daily directly to the corns, which are surrounded with adhesive-backed corn aperture pads made of felt to hold the oil. The corns are then covered with hypoallergenic silk tape. After soaking with the castor oil, the corns will be softened for removal with a pumice stone. Castor oil can be used in a similar manner to remove **warts**. Castor oil is also used to treat ringworm, abscesses, **bruises**, dry skin, **dermatitis**, **sunburn**, open sores, and other skin conditions. Additional less well-known uses of castor oil include hair tonics, cosmetics, and contraceptive creams and jellies.

For menstrual cramping, especially when fibroids may be present or when flows are heavy, castor oil packs may be placed on the abdomen for up to an hour. The packs are made by soaking square or rectangular pieces of cotton, cotton flannel, or undyed wool 2–4 in (5–10 cm) thick with 4–6 oz (118–177 ml) of castor oil. The pack is folded over once or twice, placed directly on the abdomen, and covered with plastic wrap. Over the pack, a water bottle or a heating pad on a low setting may be used to keep the pack warm. After use, the skin may be cleansed with a warm solution of baking soda and water (2 tsp of baking soda to 1 qt water). Some herbal therapists maintain that castor oil packs may aid in shrinking small fibroids. Castor oil packs have also been used in the treatment of many other diseases and disorders, including breast pain, digestive tract problems, abscesses, **hemorrhoids**, **wounds**, and **gallstones**.

Nonmedical uses

Castor oil and its derivatives also are used in many industrial products, including paint and varnish, fabric coatings and protective coverings, insulation, food containers, soap, ink, plastics, brake fluids, insecticidal oils, and guns. It is a primary raw material for the production of nylon and other synthetic resins and fibers, and a basic ingredient in racing motor oil for high-performance automobile and motorcycle engines. Castor oil is also used as a fuel additive for two-cycle engines, imparting a distinctive aroma to their exhaust. Even though it is malodorous and

distasteful, it is the source of several synthetic flower scents and fruit flavors.

Preparations

Castor oil for medicinal purposes is pressed from the seeds of the castor plant and is slightly yellow or colorless. It has a lingering nauseating aftertaste, even though **peppermint** or fruit juices are sometimes added as flavor enhancers in an attempt to disguise its disagreeable taste. Castor oil is available in both oil and emulsified liquid preparations.

Precautions

Castor oil should not be used by a pregnant woman, as it can cause contractions. Castor oil should not be used if a patient is hypersensitive to the castor bean; or has an intestinal obstruction, abdominal pain, cramping, bloating, soreness, **nausea**, vomiting, fecal impaction, or any signs of appendicitis or an inflamed bowel. It should not be used by anyone for more than a week unless a doctor has ordered otherwise. Overuse of a laxative may lead to dependence on it. Any sudden changes in bowel habits or function that last longer than two weeks should be checked by a doctor before using a laxative.

Children up to the age of six should not take a laxative unless prescribed by a doctor. In older adults, the use of castor oil may worsen weakness, lack of coordination, or **dizziness** and light-headedness.

External overexposure to castor oil may result in a slight local skin irritation. The irritated area should be washed with soap and water.

Side effects

Side effects of castor oil that require medical attention include:

- confusion
- irregular heartbeat
- muscle cramps
- skin rash
- unusual tiredness or weakness

There are other less serious side effects that are less common and may go away as the patient's body adjusts to the castor oil. These side effects include belching, cramping, diarrhea, and nausea. If they do continue or are bothersome, the person should check with a doctor. In addition, because castor oil causes a complete emptying of the contents of the intestine, patients should be advised that they may not have another bowel movement for two to three days after a dose of castor oil.

Interactions

Patients should not take castor oil within two hours of taking other types of medicine, because the desired effect of the other medicine may be reduced. Patients who are taking **digitalis**, digoxin, or a diuretic should consult their physician before taking castor oil, as the castor oil may intensify the effects of these drugs by causing the body to lose **potassium**.

Resources

BOOKS

McGarey, William G. *The Oil That Heals: A Physician's Successes with Castor Oil Treatments*. A.R. E. Press, 1993.

Wilson, Billie Ann, et al. *Nurses Drug Guide 1995*. Norwalk, CT: Appleton & Lange, 1995.

PERIODICALS

Layne, Marty. "Castor Oil: A Great Home Remedy for Bumps, Bruises and Cuts." *Natural Life* (July August 2002): 14 15.

Lyall, Sarah. "Arrest of Terror Suspects in London Turns Up a Deadly Toxin." *New York Times*, January 8, 2003.

Rahman, M. T., M. Alimuzzaman, S. Ahmad, et al. "Anti nociceptive and Antidiarrhoeal Activity of *Zanthoxy lum rhetsa*." *Fitoterapia* 73 (July 2002): 340 342.

Sandvig, K., and B. van Deurs. "Transport of Protein Tox ins Into Cells: Pathways Used by Ricin, Cholera Toxin and Shiga Toxin." *FEBS Letter* 529 (October 2, 2002): 49 53.

ORGANIZATIONS

Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. http://www.cdc.gov.

National Digestive Diseases Information Clearinghouse. National Institute of Diabetes and Digestive and Kid ney Disease. National Institutes of Health. 2 Informa tion Way. Bethesda, MD 20892 3570. (310) 654 3810.

Judith Sims
Rebecca J. Frey, PhD

Cataracts

Definition

A cataract is a cloudiness or opacity in the normally transparent crystalline lens of the eye. This cloudiness can cause loss of vision and may lead to eventual blindness.

Description

The human eye has several parts. The outer layer of the eyeball consists of a transparent dome-shaped cornea and an opaque white sclera, which is a fibrous membrane. The cornea and sclera help protect the eye. The next layer contains the iris, pupil, and ciliary body. The iris is the colored part of the eye; the pupil is the small dark round hole in the middle of the iris. The pupil and iris allow light into the eye. The ciliary body contains muscles that help the eye to focus. The lens lies behind the pupil and iris. It is covered by a cellophane-like capsule. The lens is normally transparent, elliptical in shape, and somewhat elastic. This elasticity allows the lens to focus on both near and far objects. The lens is attached to the ciliary body by fibers (zonules of Zinn). Muscles in the ciliary body act on the zonules, which then change the shape of the lens. This changing of shape is called accommodation. As people age, the lens hardens and accommodates less easily, which makes it harder for the person to see close objects. This hardening of the lens generally occurs around the age of 40 and continues until about age 65. The condition is called presbyopia. It is a normal condition of **aging**, generally resulting in the need for reading glasses.

The lens is made up of approximately 35% protein and 65% water. As people age, the proteins in the lens begin to degenerate. Changes in the proteins, water content, enzymes, and other chemicals may contribute to cataract formation.

The major parts of the lens are the nucleus, the cortex, and the capsule. The nucleus is in the center of the lens, the cortex surrounds the nucleus, and the capsule is the outer layer. Opaque areas can develop in any part of the lens. Cataracts, then, can be classified according to location (nuclear, cortical, or posterior subcapular cataracts). The density and location of the cataract determines the extent of vision affected. If the cataract forms in the area of the lens directly behind the pupil, the person's vision may be significantly impaired. A cataract that occurs on the outer edges or side of the lens will cause less impairment.

Cataracts in the elderly are so common that they are considered a normal part of the aging process. People between the ages of 52–64 have a 50% chance of developing a cataract, while at least 70% of those 70 and older are affected. Cataracts associated with aging (senile or age-related cataracts) most often occur in both eyes, with each cataract progressing at a different rate. At first, these cataracts may not affect vision. If the cataract remains small or at the periphery of the lens, the visual changes may be minor.

Cataracts that occur in people other than the elderly are much less common. Congenital cataracts occur very rarely in newborns. Genetic defects or an infection or disease in the mother during **pregnancy** are among the causes of congenital cataracts. One condition called blue cataracts is inheritance-linked and affects primarily Tibetans and some other Asians. Traumatic cataracts may develop after an injury or foreign body damages the lens or eye. Systemic illnesses such as diabetes may result in cataracts. Cataracts can also occur secondary to other eye diseases—for example, an inflammation of the inner layer of the eye (uveitis) or **glaucoma**. Such cataracts are called complicated cataracts. Toxic cataracts result from chemical toxicity, such as steroid use. Cataracts can also result from exposure to the sun's ultraviolet (UV) rays.

Causes and symptoms

Studies have been conducted to determine whether diet or the use of vitamins might have an effect on the formation of cataracts in older people. Although debate continues in the 2000s, several studies reported in late 2001 that a diet rich in certain **carotenoids** may protect against development of cataracts. Likewise, there has been considerable interest in the use of antioxidant supplements as a protection against cataracts. Such antioxidant vitamins as vitamins A, C, E, and beta-carotene protect body tissues against free radicals, which are byproducts of oxidation. **Vitamin C**, in particular, has shown the strongest impact on lower rates of cataracts. Some vitamins are marketed specifically for the eyes. Patients should speak to their doctors about the use of such vitamins.

Studies also have linked changes in lens proteins to cataract formation. Soluble proteins in the lens begin to condense and form clumps, leading to cataracts. Researchers have identified mutations in genes that likely lead to protein changes resulting in juvenile cataracts. The next step is to study a possible genetic relationship to formation of age-related cataracts as well.

The National Eye Institute reports a definitive link between **smoking** and cataracts, and a 2004 report from the surgeon general also indicates such a link. Alcohol intake has been implicated in cataract formation. Some studies have determined that a diet high in fat increases the likelihood of cataract formation, while eating more foods rich in **antioxidants** lowers the risk. A study conducted in the United Kingdom and reported in the literature in 2004 showed no connection between dietary intake of vitamin C and cataract reduction. More research is needed to determine if

diet, alcohol consumption, or vitamins have any connection to the formation of cataracts. Research was underway in 2008 to determine a link between sunlight exposure and cataract development.

Cataracts may have the following symptoms:

- gradual, painless onset of blurry, filmy, or fuzzy vision
- poor central vision
- frequent changes in eyeglass prescription
- changes in color vision
- increased glare from light, especially oncoming nighttime headlights
- second-sight improvement in near vision (no longer needing reading glasses), but a decrease in distance vision
- poor vision in sunlight
- the presence of a milky whiteness in the pupil as the cataract progresses

Diagnosis

Both ophthalmologists and optometrists may detect and monitor cataract growth and prescribe prescription lenses for visual deficits. Only an ophthalmologist, however, can perform cataract extraction.

Cataracts are easily diagnosed from the reporting of symptoms, a visual acuity examination using an eye chart, and by a physician or optometrist's examination of the eye. Shining a penlight into the pupil may reveal opacities or a color change of the lens even before the patient develops visual symptoms. A slit lamp, which is basically a large microscope, allows the doctor to examine the front of the eye and the lens and to determine the location of the cataract.

Some other diagnostic tests may be used to determine if cataracts are present or how much improvement the patient may have after surgery. These tests include a glare test, potential vision test, and contrast sensitivity test.

Treatment

Because free radicals have been implicated as a cause of cataracts, alternative therapies emphasize the importance of a healthful diet, nutritional supplements, and/or herbal remedies to prevent and slow down the progression of cataracts.

Nutritional therapy

A naturopathic doctor or a nutritionist may recommend the following dietary changes:

- Reduce consumption of salty or fatty foods. Diabetics should also limit their intake of milk and other dairy products.
- Increase intake of foods that are high in beta-carotene: peaches, apricots, berries, carrots, and leafy green vegetables. Beta-carotene and other antioxidants can protect against or slow down the development of cataracts.
- Stop cigarette smoking and avoid exposure to secondhand smoke.
- Eat a diet rich in fruits and vegetables with high concentrations of vitamin C. Take supplemental vitamin C (1 g three times daily) and vitamin A (25,000 IU per day).
- Take supplemental beta-carotene (25,000–100,000 IU per day) and selenium (400 mcg per day). Low selenium levels may increase the risk of cataracts.
- Increase intake of L-cysteine (400 mg per day), L-glutamine (200 mg per day), and L-glycine (200 mg per day). These three amino acids may be beneficial to some cataract patients.
- Add other supplements: zinc, lutein, riboflavin, and cod liver oil.

Herbal therapy

Two herbal remedies may help protect the eyes against cataracts:

- Bilberries (40–80 mg daily). Early research indicates that eating bilberries may halt cataract progression.
- *Hachimijiogan*. Animal studies suggest that this ancient Chinese herbal formula may protect the eyes against cataracts by increasing the glutathione content of the lens.

Allopathic treatment

Cataracts that cause no symptoms or only minor visual changes may not require any treatment. An ophthalmologist or optometrist should continue to monitor and assess the cataract at scheduled office visits. Stronger prescription eyeglasses or contact lenses may be helpful.

Cataract surgery is the only option for patients whose cataracts interfere with vision to the extent of affecting their daily lives. The most frequently performed surgery in the United States, this procedure improves vision in over 90% of patients. Some people assert that a cataract should be ripe before being removed; a ripe or mature cataract means that the lens is completely opaque. Most cataracts are removed before they reach that stage. Sometimes cataracts need to be removed so that the doctor can examine the back

of the eye more carefully. Patients with diseases that may affect the eye may require cataract surgery for this reason. Advances in cataract surgery make possible a surgical incision of as little as three millimeters in length and may require no stitches. The procedure takes only a few minutes, and patients often return to work in a few days. If cataracts are present in both eyes, only one eye at a time should be operated on. Healing occurs in the first eye before the second cataract is removed, sometimes as early as the following week. A final eyeglass prescription is usually given about four to six weeks after surgery. Patients may still need reading glasses. The overall health of the patient needs to be considered in making the decision to operate. Age alone, however, need not preclude effective surgical treatment of cataracts; people in their 90s can benefit from cataract surgery.

The natural human lens filters out blue wavelength light, which may damage the retina. The intraocular lenses utilized in the early 2000s to replace the natural lens in cataract surgery possess the ability to filter such light.

Patients are given antibiotic drops to prevent infection and steroids to reduce inflammation after surgery. An eye shield or glasses during the day protect the eye from injury while it heals. At night, the patient should wear an eye shield. The patient returns to the doctor the day after surgery for assessment, with several follow-up visits over the following two months to monitor the healing process.

Expected results

The success rate of cataract extraction is very high, with a good prognosis. Visual acuity of 20/40 or better may be achieved. If an extracapsular cataract extraction is performed, a secondary cataract may develop in the remaining back portion of the capsule one to two years after surgery. Yttrium aluminum garnet (YAG) capsulotomy is most often used to treat this type of cataract. Yttrium aluminum garnet refers to the name of the laser used for this procedure. The laser beam makes a small opening in the remaining back part of the capsule, allowing light through.

Complications occur in a small percentage (3–5%) of surgical cataract extractions. **Infections**, swelling of the cornea (**edema**), bleeding, **retinal detachment**, and the onset of glaucoma have been reported. Any haziness, redness, decrease in vision, **nausea**, or **pain** should be reported to the surgeon immediately.

KEY TERMS

Glaucoma—An eye disease characterized by increased pressure of the fluid inside the eye. Untreated, glaucoma can lead to blindness.

Hachimijiogan—A Chinese herbal formula that is thought to protect the eyes against cataracts by increasing the glutathione content of the lens.

Slit lamp—A special viewing device used by eye specialists to examine the eye for cataracts.

Ultraviolet radiation (UV)—Electromagnetic radiation that is shorter than visible light rays but longer than x rays. UV is thought to be responsible for sunburns, skin cancers, and cataract formation.

Uveitis—Inflammation of the uvea, which is a continuous layer of tissue consisting of the iris, the ciliary body, and the choroid. The uvea lies between the retina and sclera.

Yttrium aluminum garnet (YAG)—A type of laser used to perform surgery on secondary cataracts.

Prevention

Preventive measures emphasize wearing glasses with a special coating to protect against UV rays. Dark lenses alone are not sufficient. The lenses must protect against UV light (specifically, UV-A and UV-B). Antioxidants and herbal remedies may also provide some protection by reducing free radicals that can damage lens proteins. A study published in 2008 found that females who ingested a higher intake of lutein/zeaxanthin and **vitamin E** showed less risk of developing cataracts. A healthful diet rich in sources of antioxidants, including citrus fruits, sweet potatoes, carrots, green leafy vegetables, and/or vitamin supplements may be helpful. When individuals take certain medications, such as steroids, they may need more frequent eye exams. Patients should speak to their doctors to see if medications may affect their eyes.

Resources

BOOKS

Cataract and Refractive Surgery: Essentials in Ophthalmology. Edited by Thomas Kohnen and Douglas D. Koch. New York: Springer, 2006.

PERIODICALS

Christen, William G., et al. "Dietary Carotenoids, Vitamins C and E, and Risk of Cataract in Women." *Archives of Ophthalmology* 126, no. 1 (2008): 102 109.

ORGANIZATIONS

American Academy of Ophthalmology (National Eyecare Project), PO Box 429098, San Francisco, CA, 94142 9098, (800) 222 EYES, http://www.eyenet.org.

American Optometric Association, 243 North Lindbergh Blvd., St. Louis, MO, 63141, (314) 991 4100, http://www.aoanet.org.

Lighthouse, 111 East Fifty ninth St., New York, NY, 10022, (800) 334 5497, http://www.lighthouse.org.

National Eye Institute, 2020 Vision Place, Bethesda, MD, 20892 3655, (301) 496 5248, http://www.nei.nih.gov.

Prevent Blindness America, 500 East Remington Rd., Schaumburg, IL, 60173, (800) 331 2020, http://www.prevent blindness.org.

Mai Tran
Teresa Norris
Rhonda Cloos, RN

Catmint *see* **Catnip**

Catnip

Description

Catnip, or *Nepeta cataria*, is a flowering herb valued for its healing properties in a wide range of maladies. Catnip is indigenous to Europe and is now naturalized throughout the United States. It can be identified by the dozens of small white flowers with small purple spots covering its flowering, spiky top. The aromatic herb is a member of the Lamaciae or mint family; in England it is sometimes called catmint. Catnip is harvested in the summer and fall, and dried for medicinal use.

General use

Both the flowering tops and the leaves of the catnip plant are used for medicinal purposes. Catnip is used to treat a variety of symptoms and illnesses, including:

- Gastrointestinal distress. Catnip has carminative properties, which means that it is helpful in preventing gas and related nausea, colic, and diarrhea.
- Muscle cramps. The herb's antispasmodic properties promote relaxation of the gastrointestinal muscles, the uterus (for menstrual cramps), and other tight or sore muscles.
- Nervous disorders. Catnip can be used as a sedative to relieve stress, ease anxiety, relieve the symptoms of migraines and tension headaches, and promote general relaxation.

Both the flowering tops and the leaves of the catnip plant are used for medicinal purposes. Catnip is used to treat a variety of symptoms and illnesses. *(©InsideOutPix / Alamy)*

- Cold or flu with fever. Catnip is a diaphoretic, which means that it promotes sweating. This property makes it a valuable remedy in treating patients with feverish conditions, including influenza, colds, and bronchitis.
- Cuts and scrapes. Catnip is an astringent, and can be applied externally to cuts and scrapes to stop bleeding and promote healing.

Preparations

Catnip is most commonly taken as an infusion, or tea. The herb can be purchased in tea bags or in loose, dried form. Tea bag infusions can be prepared according to package directions. When using the dried form of the herb, place 10 tsp of catnip in a piece of muslin or cheesecloth, in an infuser, or loose, and submerge it in one liter of boiling water. After steeping the mixture in a covered container for ten minutes, strain the infusion before drinking. The infusion should be steeped in a covered pot to prevent the volatile oils in the catnip from escaping through evaporation.

A second method of infusion is to mix the loose catnip with cold water, bring the mixture to a boil in a covered pan or teapot, and then strain the infusion before drinking. Two to three cups of the catnip infusion can be taken daily. The remaining infusion should be stored in a well-sealed bottle and refrigerated to prevent bacteria and other micro-organisms from contaminating it.

Catnip can be mixed with such other herbs as **boneset** (*Eupatorium perfoliatum*), **elder** (*Sambucus nigra*), **yarrow** (*Achillea millefolium*), and **cayenne** (*Capsicum annuum*) in an infusion for treating colds.

KEY TERMS

Astringent—A substance that constricts or binds skin cells.

Carminative—A preparation that helps to expel gas from the stomach and bowel.

Diaphoretic—A substance or medication given to induce or promote sweating.

Diuretic—A medication or substance that increases urine output.

Infusion—A herbal preparation made by adding herbs to boiling water and then steeping the mixture to allow the medicinal herb to infuse into the water.

Tincture—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture.

Volatile oil—A component of aromatic botanicals that gives herbs their characteristic odor and may possess therapeutic properties. Volatile oils vaporize or evaporate quickly when heated and exposed to air.

Catnip is also available in tincture form to take by mouth or apply topically. A tincture is an herbal preparation made by diluting the herb in alcohol. A catnip tincture or crushed catnip can be applied to a compress to treat **cuts** and scrapes.

Loose catnip and catnip in tea bags should be stored in an airtight container in a cool location out of direct sunlight to retain potency. Careful storage also prevents the catnip from absorbing odors and moisture.

Precautions

Catnip should always be obtained from a reputable source that observes stringent quality control procedures and industry-accepted good manufacturing practices. Botanical supplements are regulated by the FDA; however, they currently do not have to undergo any approval process before reaching the consumer market. Herbs are presently classified as nutritional supplements rather than drugs. Legislation known as the Dietary Supplement Health and Education Act (DSHEA) was passed in 1994 in an effort to standardize the manufacture, labeling, composition, and safety of botanicals and supplements. In January 2000, the FDA's Center for Food Safety and Applied **Nutrition** (CFSAN) announced a ten-year plan for establishing and implementing these regulations by the year 2010.

Although there are no known side effects or health hazards associated with recommended dosages of catnip preparations, pregnant women, women who breastfeed, and individuals with chronic medical conditions should consult with their healthcare professional before taking catnip or any other herb.

Side effects

Catnip has diuretic properties, and may increase the frequency and amount of urination. It can also cause an upset stomach in some individuals.

Because of the sedative qualities of catnip, individuals taking the herb should use caution when driving or operating machinery.

Interactions

There are no reported negative interactions between catnip and other medications and herbs, although certain drugs with the same therapeutic properties as catnip may enhance its effects.

Resources

BOOKS

Hoffman, David. *The Complete Illustrated Herbal*. New York: Barnes & Noble Books, 1999.

Medical Economics Corporation. *The PDR for Herbal Medicines*. Montvale, NJ: Medical Economics Corpo ration, 1998.

ORGANIZATIONS

Office of Dietary Supplements. National Institutes of Health. Building 31, Room 1B25. 31 Center Drive, MSC 2086. Bethesda, MD 20892 2086. (301) 435 2920. Fax: (301) 480 1845. http://odp.od.nih.gov/ods/ (Includes on line access to International Bibliographic Information on Dietary Supplements (IBIDS), a data base of published international scientific literature on dietary supplements and botanicals).

Paula Ford-Martin

Cat's claw

Description

Cat's claw is a large woody vine indigenous to the Amazon rain forest of South America. The herb earns its name from the curved thorns on the vine that resemble the claws of a cat. Also known by its Spanish equivalent *uña de gato,* cat's claw has a long history of use as a folk medicine by native peoples to treat intestinal complaints, **asthma**, **wounds**, **cancer**, tumors, arthritis,

The botanical herb Cat's claw. *(© Photo Researchers, Inc. Reproduced by permission.)*

inflammations, diabetes, irregularities of the menstrual cycle, fevers, ulcers, dysentery, and rheumatism. They have also utilized the herb as a kidney cleanser, blood cleanser, and contraceptive.

Two species of cat's claw are found in the rain forest: *Uncaria tomentosa* and *Uncaria guianensis*. Although these species are similar in appearance and have been used in many of the same ways, research on *Uncaria tomentosa* has revealed it to be more valuable as a therapeutic agent.

General use

Cat's claw has been called one of the most important botanical herbs found in the rain forest and is used as a cleansing and supportive herb of the immune system, cardiovascular system, and intestinal system. Although research on cat's claw began in the 1970s, it didn't gain worldwide attention until the 1990s, when studies showed it to be a possible treatment for Acquired Immune Deficiency Syndrome (**AIDS**) and Human Immunodeficiency Virus (HIV) infection; cancer; and other ailments. Cat's claw is reported to enhance immunity and heal digestive and intestinal disorders. It has been used to treat many other ailments including **acne**, **allergies**, arthritis, asthma, candidiasis, chronic **fatigue**, chronic inflammation, **depression**, **diabetes mellitus**, environmental toxicity and poisoning, Epstein-Barr virus (EBV), **fibromyalgia**, **hemorrhoids**, herpes, **hypoglycemia**, **systemic lupus erythematosus** (SLE), menstrual disorders and hormone imbalances, parasites, **premenstrual syndrome** (PMS), tumors, upper respiratory **infections**, viral infections, and wounds.

One unfortunate effect of recent interest in and use of cat's claw has been its virtual extinction in parts of the rain forest. According to the Herb Research Foundation, the government of Peru has had to outlaw the export of all wild cat's claw plants. Almost all cat's claw root and bark used for commercial preparations as of 2003 comes from cultivated plants.

Although the stem bark of cat's claw has some medicinal activity, the root is three to four times more active than the stem bark. The strength of the active components in cat's claw is quite variable; it depends on the time of year that the plant is harvested.

KEY TERMS

Alkaloids—A group of organic compounds found in plants that possess a wide range of therapeutic properties.

Antihypertensive—A medication given to lower blood pressure.

Diuretic—A substance that increases the flow of urine. Diuretics are given to lessen the volume of liquid in the body.

Free radicals—Toxic molecules that cause cellular damage to healthy tissue. Free radicals are suspected to be a cause of conditions such as cancer, diabetes, cardiovascular disease, and strokes.

Potentiation—A type of drug interaction in which one drug or herbal preparation intensifies or increases the effects of another.

Tincture—The concentrated solution of an herbal extract, usually made with alcohol.

The active compounds in cat's claw include alkaloids, triterpenes, phytosterols, and proanthocyanidins. Researchers have isolated unique alkaloids in the bark and roots that activate the immune system by increasing white blood cell activity. Rynchophylline, one of the alkaloids isolated from cat's claw, has antihypertensive properties that may be beneficial in lowering the risk of strokes and heart attacks by reducing heart rate, lowering blood pressure, increasing circulation, and lowering blood **cholesterol** levels.

Researchers have also discovered substances in cat's claw that have antitumor, antileukemic, antioxidant, antimicrobial, antibacterial, anti-inflammatory, antiviral, and diuretic properties. Dr. Brent W. Davis has studied cat's claw for a number of years and has described it as "the opener of the way" in reference to its ability to treat many bowel, stomach, and intestinal complaints including **diverticulitis**, leaky and irritable bowel syndromes, **gastritis**, ulcers, hemorrhoids, **Crohn's disease**, and **colitis**.

Cat's claw's anti-inflammatory actions have been effective in relieving the stiffness and swelling prevalent in arthritis, rheumatism, and joint **pain**. An Austrian study published in 2002 found that cat's claw significantly reduced joint tenderness and swelling in a sample of 40 patients with **rheumatoid arthritis**, with only minor side effects and no interactions with the patients' other arthritis medications. A recent study done in Peru indicates that the anti-inflammatory effects of cat's claw are stronger in extracts made with alcohol than in water-based solutions.

Studies of the therapeutic benefits of cat's claw on cancer have produced several interesting findings. Cat's claw's immunostimulating properties have been shown to enhance the function of white blood cells to attack and digest carcinogenic substances and harmful microorganisms that may inhibit the growth of cancer cells and tumors. Used as an adjunct treatment to chemotherapy and radiation, cat's claw has shown promise in diminishing side effects such as **hair loss**, **nausea**, skin problems, infections, and weight loss.

Clinical studies have tested Krallendon, an immune-boosting extract of cat's claw, in the treatment of AIDS patients and persons who are HIV-positive, either as a single treatment or in conjunction with the AIDS drug azidothymidine (AZT). Results showed that Krallendon was able to deter the reproduction of the AIDS virus, stop growth of cancerous cells, and activate the immune system. In addition, painful side effects resulting from the AZT treatment were diminished. Cat's claw's antioxidant properties help protect cells from environmental substances such as smoke, pesticides, pollution, alcohol, x rays, gamma radiation, ultraviolet light, rancid food, and certain fats. The herb also helps prevent the spread of free radicals, protecting cells from mutating and developing into tumors.

Preparations

Cat's claw is available in health food stores and herb shops in several forms: dry extract, crushed bark, capsule, tablet, tea, and tincture.

To prepare the tea, boil 1 g (0.4 oz) of the bark in 1 cup of water for 10–15 minutes. Strain the mixture before drinking. A suggested dose is one cup of tea three times daily.

Tincture dosage: 1–2 ml up to two times daily. Children over two years of age and adults over 65 should begin use with mild doses and increase strength gradually if needed.

Precautions

Cat's claw is not recommended for pregnant or nursing women or for women who are trying to conceive. Children under the age of two should not take cat's claw. Persons with a health condition should consult a qualified herbalist before taking cat's claw.

Side effects

European studies have reported low toxicity in the use of cat's claw, even when taken in large doses. The only noted side effect was **diarrhea**. In 2001, however, one case study was reported from South America of a patient with lupus developing kidney failure after taking cat's claw extracts.

Interactions

Cat's claw should not be combined with hormonal drugs, insulin, or vaccines. It may cause the immune system to reject foreign cells, so persons who have received organ or tissue transplants should not use this herb. The dosage may need to be reduced when taken with other herbs.

Cat's claw has also been reported to potentiate, or intensify, the effects of antihypertensives (medications given to control high blood pressure). Persons taking such drugs should use cat's claw only on the advice of a physician.

Resources

BOOKS

Elkins, Rita. *Cat's Claw (Una de Gato): Miracle Herb from the Rain Forest of Peru*. Woodland Publishing, 1996.

Jones, Kenneth. *Cat's Claw: Healing Vine of Peru*. Sylvan Press, 1995.

Steinberg, Phillip N. *Cat's Claw: The Wondrous Herb from the Peruvian Rainforest*. Healing Wisdom Publications, 1996.

PERIODICALS

Aguilar, J. L., P. Rojas, A. Marcelo et al. "Anti Inflammatory Activity of Two Different Extracts of *Uncaria tomentosa* (Rubiaceae)." *Journal of Ethnopharmacology* 81 (July 2002): 271 276.

Blumenthal, Mark. "Una de Gato (Cat's Claw) Rainforest Herb Gets Scientific and Industry Attention." *Whole Foods* (October 1995): 62, 62, 66, 68, 78.

Craig, Winston J. "A Closer Look at Cat's Claw." (Herb Watch). *Vibrant Life* 18 (September October 2002): 38 39.

Mur, E., F. Hartig, G. Eibl, and M. Schirmer. "Randomized Double Blind Trial of an Extract from the Pentacyclic Alkaloid Chemotype of *Uncaria tomentosa* for the Treatment of Rheumatoid Arthritis." *Journal of Rheu matology* 29 (April 2002): 678 681.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.

Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. www.swsbm.com.

Jennifer Wurges
Rebecca J. Frey, PhD

Caveman diet *see* **Paleolithic diet**

Cayce systems

Definition

The Cayce Health System, or Cayce systems, combine an extensive and varied assortment of treatments for hundreds of physical conditions, diseases, and disabilities into a holistic approach to health and healing. The fundamental concepts are based on information provided in psychic readings by Edgar Cayce (1877–1945) for thousands of individuals with a wide array of symptoms and ailments.

Origins

Often regarded as the father of modern **holistic medicine**, Edgar Cayce was born near Hopkinsville, Kentucky on March 18, 1877. He allegedly began exhibiting paranormal abilities as a child, for example memorizing his school lessons by sleeping with his head on his textbooks. At age 24, after undergoing hypnosis during which he prescribed successful treatment for his own months-long bout of **laryngitis** that had baffled his doctors, Cayce began to dispense his readings. He gave these readings while he was in a trance-like state, leading to his designation as "The Sleeping Prophet." Over the course of his lifetime, Cayce gave readings on diverse subjects, including health, religion, dream interpretation, world affairs, and business. Although some early readings were lost, at his death in 1945 more than 14,000 separate Edgar Cayce readings on over 10,000 topics had been stenographically transcribed. Almost 9,000 readings address medical ailments.

Meditation taking place in a Cayce meditation room, Virginia Beach, Virginia. *(Photo Researchers, Inc. Reproduced by permission.)*

Benefits

Cayce's holistic approach addresses the body, mind, and spirit connection. The information offered in his readings is aimed at treating the whole person and helping people develop a self-awareness and responsibility for improving their own physical health and spiritual well-being.

Cayce's readings focus on addressing the root cause of an ailment rather than simply alleviating the symptoms. Almost all of his physical readings address diet and **nutrition**. He felt that providing the body key building materials it needs to do its work is crucial, as is **detoxification**. Poor eliminations are the most cited cause of disease in Cayce's readings. He also addresses various systemic imbalances in the nervous, circulatory, and glandular systems, and acid/alkaline imbalances. Infection, **stress**, attitudes, and emotions are also central to his disease explanations.

Recommendations comprise an extensive variety of therapies too numerous to list here. They include conventional medicines and surgeries as well as alternative therapies such as electrotherapy, **osteopathy**, and massage. Readings often recommend herbs, chemical concoctions, color and light therapies, colonics, **castor oil**, and taking on responsible, healthful attitudes and behaviors such as dietary changes and **prayer**. Cayce even developed some original appliances to deliver his prescribed treatments.

Proponents of Cayce's therapies claim healings ranging from routine to miraculous. Critics argue that many recommended therapies lack rigorous scientific research and evaluation, and attribute "cures" to factors other than Cayce's alleged psychic perception of medical needs.

Description

Cayce systems combines Cayce's insights with Cayce-oriented health practitioners, lay persons, organizations, training programs, researchers, and health products. Treatment protocols are individualized for each patient. Clinicians may follow several different treatment modalities, emphasizing the uniqueness of each individual patient and inclination of the clinician. This integration of treatment modalities is a principal concept of the Cayce approach. Establishing healthy habits and attitudes are also central. Self-responsibility such as self-care and home care modalities (e.g., dietary changes, massage, etc.) is often incorporated. Clinicians may search the Cayce readings for the case most closely matching their patient's condition or medical diagnosis. However, most readings were given for a specific individual's complaint. Interpreting the readings is not always a straightforward task, since many subjects apparently had more disorders than the one addressed in the reading. Treatment may require experimentation and the Association for Research and Enlightenment (A.R.E.) Health and Rejuvenation Research Center (HRRC) recommends that it should be undertaken and evaluated under the care of a physician trained in the Cayce approach.

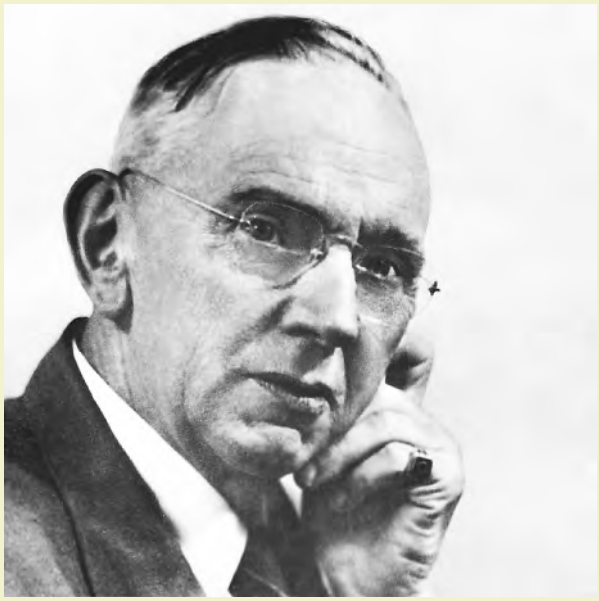
As in Cayce's original recommendations, a wide range of therapeutic tools and treatments may be used. These may generally be arranged under the following categories:

- Manual therapy is therapeutic use of hands to diagnose and treat illness. The Cayce system relies heavily on traditional osteopathic applications together with modern chiropractic, physical medicine and massage therapy.
- Electrotherapy includes several appliances and techniques such as the wet cell battery, radial appliance, violet ray appliance, ultraviolet ray lamp, sinusoidal, x-ray, and magnetic therapy.
- Diet/Nutritional therapy focuses on acid/alkaline balance and food combining with special diets for strengthening the blood, body, and nerves.
- Hydrotherapy (therapeutic use of water) includes colon therapy (irrigations), fume and steam baths, sitz baths, Epson salt baths, and various packs.
- Pharmacology relies heavily on natural remedies such as herbal medicine and dietary supplements.
- Mental therapy covers a broad range of psychological and psychosocial techniques such as cognitive-behavioral therapy, visualization, hypnosis, and environmental therapy.
- Spiritual healing includes interventions such as prayer, meditation, and laying on of hands.

Research and general acceptance

The Cayce transcripts are housed in the A.R.E. and are available for general research. The library also has a collection of circulating files on various health conditions. Numerous books organize information from the Cayce readings. As of 2000, the HRRC is conducting research projects including **energy medicine**, manual therapies, acid/alkaline balance, and the nervous system. The HRRC also offers individual research protocols enabling individuals to apply Cayce principles at home. They solicit anecdotal evidence on successful applications of Cayce modalities, invite clinicians using Cayce modalities to document outcomes, and conduct historical research on osteopathic textbooks. They also team with the Meridian

EDGAR CAYCE (1877–1945)



(Betmann/CORBIS. Reproduced by permission.)

Edgar Cayce was born on March 18, 1877, in Hopkinsville, Kentucky, the son of a businessman. He grew up in rural Kentucky and received only a limited formal education. He was a member of the Christian Church (Disciples of Christ). As an adult he began a career as a photographer.

Cayce's life took a radically different direction in 1898, after he developed a case of laryngitis. He was hypnotized by a friend and while in the trance state prescribed a cure that worked. Neighbors heard of the event and asked Cayce to do similar "readings" for them. In 1909 he did a reading in which he diagnosed and cured a homeopathic physician, Dr. Wesley Ketchum. During the next years Cayce gave occasional sittings, but primarily worked in photography.

In 1923, theosophist Arthur Lammers invited Cayce to Dayton, Ohio, to do a set of private readings. These readings were noteworthy because they involved Cayce's initial exploration of individual past lives. These readings encouraged Cayce to leave photography and become a professional. Among his early supporters was businessman Morton Blumenthal, who gave financial backing for Cayce Hospital (1928) and a school, Atlantic University (1930). Unfortunately, Blumenthal was financially destroyed by the Great Depression and both enterprises failed.

In 1932 Cayce organized the Association for Research and Enlightenment (ARE). With the resources generated by the association, complete records of all the readings for the next 12 years were made. These formed a huge body of material, and Cayce's readings were later indexed, cross referenced, and used as the basis of numerous books.

Cayce died in 1945, and his son Hugh Lynn Cayce continued the work of the association and promoted the abilities of his father. Cayce's work became known by a large audience outside the psychic community in 1967 through a biographical book by Jess Stern, *Edgar Cayce, The Sleeping Prophet.*

Institute (a non-profit organization dedicated to researching Cayce health information) to look at specific illnesses.

Training and certification

Four levels of certification are offered for Cayce systems. As described on the A.R.E. website, Cayce home health therapists help patients apply Cayce information in their home settings. Cayce physiotherapists have passed certifications in general manual therapy, **hydrotherapy**, energy medicine, and the basic Cayce diet. Cayce health case managers are certified in providing information and support services (e.g., assessment, service planning, referrals, and advocacy). Cayce physicians, in additional to being licensed by their state boards, are certified in applying Cayce system principles and techniques.

Resources

BOOKS

Bolton, Brett. *An Edgar Cayce Encyclopedia of Foods for Health and Healing*. Virginia Beach, A.R.E. Press. 1996.

Karp, Reba A. *Edgar Cayce Encyclopedia of Healing*. New York, Warner Books. 1986.

McGarey, William A. *Physician's Reference Notebook*. Virginia Beach, A.R.E. Press. 1998.

Read, Anne, Carol Ilstrup, and Margaret Gammon. *Edgar Cayce on Diet and Health*. New York, Hawthorne. 1969.

Reilly, Harold J. and Ruth Hagy Brod. *The Edgar Cayce Handbook for Health Through Drugless Therapy*. New York, Macmillan. 1975.

Stearn, Jess. *Edgar Cayce: The Sleeping Prophet*. Virginia Beach, A.R.E. Press, 1997.

Sugrue, Thomas. *There is a River*. Virginia Beach, A.R.E. Press. 1988.

ORGANIZATIONS

The Association for Research and Enlightenment, Inc. 215 67th St., Virginia Beach, VA 23451. (757) 428 3588 or (800) 333 4499. are@edgarcayce.org. http://www.are cayce.com/index.htm.

Health and Rejuvenation Research Center A division of the Association for Research and Enlightenment, Inc. 215 67th Street Virginia Beach, VA 23451 2061. (757) 428 3588 ext. 7340. hrrc@are cayce.com.

Meridian Institute 1853 Old Donation Parkway, Suite 1 Virginia Beach, VA 23454. (757) 496 6009. http:// www.meridianinstitute.com meridian@meridianinstitute.com.

Kathy Stolley

Cayenne

Description

Cayenne (*Capsicum frutescens*, *C. annum*) is a stimulating herb that is well known for its pungent taste and smell. Cayenne is a popular spice used in many different regional styles of cooking, but it has also been used medicinally for thousands of years.

The name cayenne is derived from a Tupi word, "kyinha," which means "hot pepper." The cayenne plant produces long red peppers and grows to a height of 2–6 ft (0.5–2 m). The plant is native to tropical areas of America and is cultivated throughout the world in tropic and subtropic climate zones. Most of the cayenne supply in the United States is imported from India and Africa.

Cayenne is a member of the genus *Capsicum*. Other species of this genus include Tabasco pepper, African pepper, Mexican chili pepper, bell pepper, pimento, paprika, and bird pepper. Cayenne is often referred to as chili, which is the Aztec name for cayenne pepper.

The main medicinal properties of cayenne are derived from a chemical called capsaicin. Capsaicin is the ingredient that gives peppers their heat. A pepper's capsaicin content ranges from 0–1.5%. Peppers are measured according to heat units. The degree of heat determines the pepper's value and usage. Generally, the

Cayenne pepper plants. *(©PlantaPhile, Germany. Reproduced by permission.)*

hotter the pepper, the more capsaicin it contains. In addition to adding heat to the pepper, capsaicin acts to relieve **pain** and reduce platelet stickiness. Other constituents of cayenne are vitamins C and E and **carotenoids**.

Cayenne has anti-inflammatory, antioxidant, antiseptic, diuretic, analgesic, expectorant, and diaphoretic properties. The dried ripe fruit and seeds of the plant are used for medicinal purposes. Cayenne is available in many forms, including capsules, ointments, liniments, tinctures, creams, oils, and dried powders.

Origin

Cayenne was originally grown in Central and South America in pre-Columbian times. It was cultivated in Mexico 7,000 years ago and in Peru 4,000 years ago. For 9,000 years, Native Americans have used cayenne as a food and as a medicine for stomach aches, cramping pains, **gas**, and disorders of the circulatory system. Cayenne was brought to Europe in the fifteenth century by Christopher Columbus. From Europe, cayenne was transported to tropical regions around the world, where it is now grown.

General use

Today, cayenne is used worldwide to treat a variety of health conditions, including weak digestion, chronic pain, **shingles**, **heart disease**, **sore throat**, **headache**, high **cholesterol**, poor circulation, and **toothache**.

Indian Ayurvedic, Chinese, Japanese, and Korean medicines use cayenne to treat many different conditions. One Ayurvedic remedy for pain combines cayenne and mustard seeds into a paste to be applied to the affected area. **Ayurvedic medicine** also utilizes cayenne to treat gas and poor digestion. Chinese medicine employs cayenne for digestive ailments. An ointment or tincture made from cayenne is used in China and Japan to heal **frostbite** and myalgia (muscle pain). The German Commission E has approved cayenne in the treatment of painful **muscle spasms**, arthritis, rheumatism, **neuralgia**, lumbago, and chilblains.

Digestive aid

Cayenne is used as a digestive aid throughout India, the East Indies, Africa, Mexico, and the Caribbean. When taken internally, cayenne soothes the digestive tract and stimulates the flow of saliva and stomach secretions. These secretions contain substances that help digest food.

Cayenne is also used to relieve **constipation**, as it stimulates gastric secretions, thereby activating a sluggish gastrointestinal tract.

Circulatory helper

Many people take cayenne internally to treat and prevent heart disease. The intake of cayenne has been found to have a positive effect on the circulatory system. Cayenne may reduce the risk of **heart attack**. It has been shown to lower cholesterol levels and the risk of **blood clots**. Studies have shown cayenne to lower blood pressure. A study in India showed that cayenne prevented a rise in liver and serum cholesterol levels when taken with dietary cholesterol.

Pain relief

Cayenne is a proven remedy for the temporary relief of pain, both external and internal. Its analgesic effect acts to distract sensory nerves from the irritation or pain, which results in a temporary abatement of pain. The capsaicin in cayenne depletes substance P, a chemical that sends pain signals to the brain from the local nervous system. When there is a lack of substance P, the sensation of pain diminishes because it cannot reach the brain.

Capsaicin has been approved by the United States Food and Drug Administration (FDA) for the pain of shingles, an adult disease that is caused by the virus that leads to chicken pox in children. Such over-the-counter (OTC) creams as Zostrix or Heet contain capsaicin and are applied externally to treat rheumatic and arthritic pains, cluster headaches, diabetic foot pain, **fibromyalgia**, and postherpetic nerve pain. These creams usually contain 0.025–0.075% capsaicin.

Research has helped to quantify capsaicin's pain relieving effects. Creams containing the compound lowered pain in arthritis sufferers' hands by 40% when used four times a day. Seventy-seven percent of people with pain from long-term shingles had reduced pain after using the cream for four months. Researchers also found that capsaicin-containing cream is less expensive and safer than other painkillers used for the same conditions.

Other conditions

Cayenne can be an effective remedy for relieving congestion and coughs. It thins mucus, thus improving the flow of body fluids. It is also used to boost energy and relieve stress-related **fatigue** and **depression**. Late in the 1990s, British journals reported that people taking cayenne daily increased their fat metabolism

and had decreased appetites. In addition, cayenne can be used as a treatment to prevent thumb sucking and nail biting in children.

Other uses

Research has suggested a number of other possible uses for cayenne. One study showed that the herb causes a reduction in human **prostate cancer** cells transplanted into experimental mice. Canadian researchers report that mice with a form of diabetes were cured of the disease after treatment with capsaicin.

Preparations

- Internal dosage: Cayenne should be taken internally as directed by an experienced practitioner.
- Creams: The creams should be used as directed. Generally creams must be applied three or four times per day for two to three weeks before their effects are felt.
- Oil: Cayenne oil may be rubbed on **sprains**, swelling, and sore muscles and joints to relieve pain. It should not, however, be applied to open **cuts** or broken skin.
- Tea: To ease gas and stomach cramps or to help promote digestion, a tea may be made by adding 0.25 tsp of cayenne to one cup of hot water. When taken as a hot tea, cayenne will induce sweating. Taken as a cold tea, cayenne works as a diuretic, increasing urination. Cayenne teas, however, should not be given to children.
- Toothache: Chewing on a hot pepper may provide temporary relief from toothache.
- Cold feet: Ground cayenne added to talcum powder or cornstarch can be placed inside a pair of socks. The cayenne causes the blood vessels under the skin of the feet to dilate, thus stimulating extra blood flow and providing warmth to the feet.
- Sore throat: To treat a sore throat, cayenne may be combined with **myrrh** and gargle as needed. This mixture can also be used as an antiseptic mouthwash. This treatment should not be given to children.

Precautions

To avoid irritating sensitive tissues, heating pads or hot compresses should not be placed on areas of the skin where cayenne has been applied.

Cayenne should not be applied to an area for longer than two days since the heat may cause nerve damage. It may be applied to the same location after four days have passed.

KEY TERMS

Analgesic—A pain-relieving substance.

Capsaicin—A colorless, bitter compound that is present in cayenne and provides its heat.

Chilblains—Redness and swelling of the skin caused by exposure to the cold.

Commission E—A committee formed in Germany in 1978 to evaluate the efficacy and safety of herbs used in traditional medical practice.

Diaphoretic—A substance that promotes sweating.

Diuretic—A substance that increases urination.

Expectorant—A substance that increases the coughing up of mucus.

Lumbago—Lower back pain caused by rheumatoid arthritis, muscle strain, osteoarthritis, or a ruptured spinal disk.

Cayenne should not come into contact with mucous membranes, eyes, open **wounds**, or sensitive areas.

Hands should be washed after using cayenne, or gloves should be worn when applying it externally.

Persons with an active gastrointestinal ulcer should not use cayenne internally without consulting a physician.

Side effects

Cayenne may irritate the mouth, throat, eyes, and open wounds. Drinking a glass of milk may relieve burning in the mouth and throat caused by consumption of cayenne. The protein in the milk helps to counteract the capsaicin.

Large internal doses of cayenne may produce **vomiting** and/or stomach pain.

Interactions

Asthma patients who are taking theophylline should consult a physician before taking cayenne. Cayenne may increase the amount of theophylline absorbed by the patient's system, possibly leading to toxicity.

Resources

BOOKS

De, Amit Krishna, ed. *Capsicum: The Genus Capsicum.* Boca Raton, FL: CRC Press, 2003.

McKenna, Dennis J., Kenneth Jones, and Kerry Hughes. *Botanical Medicines: The Desk Reference for Major Herbal Supplements,* 2nd edition. Binghamton, NY: Haworth Press, 2002.

PERIODICALS

Binshtok, Alexander M., Bruce P. Bean, and Clifford J. Woolf. "Inhibition of Nociceptors by TRPV1 mediated Entry of Impermeant Sodium Channel Blockers." *Nature* (October 4, 2007): 607 610.

Mori, Akio, et al. "Capsaicin, a Component of Red Peppers, Inhibits the Growth of Androgen independent, p53 Nutant Prostate Cancer Cells." *Cancer Research* (March 2006): 3222 3229.

Razavi, Rozita, et al. "TRPV1 Sensory Neurons Control ß Cell Stress and Islet Inflammation in Autoimmune Diabetes." *Cell* (December 15, 2006): 1123 1135.

Szolcsányi, J. "Forty Years in Capsaicin Research for Sen sory Pharmacology and Physiology." *Neuropeptides* (December 2004): 377 384.

Jennifer Wurges
Teresa G. Odle
David Edward Newton, Ed.D.

Ce bai ye *see* **Thuja**

Cedar, red *see* **Red cedar**

Celiac disease

Definition

Celiac disease occurs when the body reacts abnormally to gluten, a protein found in wheat, rye, barley, and oats. Gluten causes an inflammatory response in the small intestine, which damages the tissues and results in impaired ability to absorb nutrients from foods.

Description

Celiac disease—also called sprue, nontropical sprue, gluten sensitive enteropathy, celiac sprue, and adult celiac disease—may be discovered at any age. Researchers believe that a combination of genetic and environmental factors trigger the disease. Environmental events that may provoke celiac disease in those with a genetic predisposition to the disorder include surgery or a viral infection.

The disorder is more commonly found among white Europeans or those of European descent. The exact incidence of the disease is uncertain. Estimates vary from one in 5,000 to as many as one in every 300 individuals with this background. An estimated 3 million Americans have celiac disease but only about 3% of these have been diagnosed, according to the American Academy of Allergy, **Asthma**, and Immunology. An Italian study followed patients with type 1 (juvenile) diabetes and reported that celiac disease was 20 times more common among these patients than in the general population, yet often goes undetected in these children. The study authors recommended celiac disease screening programs for children recently diagnosed with type 1 diabetes.

Causes and symptoms

Celiac disease is caused by an inflammatory response of the small intestine. The exact mechanism of the disorder is not clearly understood, but it is known that both heredity and the immune system play a part. When food containing gluten reaches the small intestine, the immune system begins to attack a substance called *gliadin*, which is found in the gluten. The resulting inflammation causes damage to the delicate finger-like structures in the intestine, called *villi*, where food absorption actually takes place.

The most commonly recognized symptoms of celiac disease relate to the improper absorption of food in the gastrointestinal system. The patient has **diarrhea** and fatty, greasy, unusually foul-smelling stools. The patient may complain of excessive **gas** (flatulence), distended abdomen, weight loss, and generalized weakness.

Not all patients have these problems. Unrecognized celiac disease may cause or contribute to a variety of other conditions. The decreased ability to digest, absorb, and utilize food properly (malabsorption) may cause **anemia** from **iron** deficiency or easy bruising from a lack of **vitamin K**. Poor mineral absorption may result in **osteoporosis**, which may lead to bone **fractures**. **Vitamin D** levels may be insufficient and bring about a softening of bones (osteomalacia), which produces **pain** and bony deformities. Defects in the tooth enamel, characteristic of celiac disease, may also occur. Celiac disease may be discovered during medical tests performed to investigate failure to thrive in infants or lack of proper growth in children and adolescents. People with celiac disease may also experience lactose intolerance because they do not produce enough of the enzyme lactase, which breaks down the sugar in milk into a form the body can absorb.

A distinctive skin rash called *dermatitis herpetiformis* may be the first sign of celiac disease. Approximately 10% of patients with celiac disease have this

Gluten-free diet

Ingredients/foods to avoid	May contain gluten	Foods allowed
Barley	Baking powder	Amaranth
Bran (wheat or oat)	Beans, baked	Beans, dried, unprocessed
Bulgur	Bouillon cubes	Buckwheat
Cake meal	Candy	Cassava
Couscous	Cheese sauces and spreads	Cheese, aged
Emulsifier	Chips, potato and tortilla	Corn
Farina	Chocolate drinks and mixes	Eggs, unprocessed
Flavoring	Coffee substitutes	Fish, unprocessed
Flour, enriched, durum, graham, semolina	Cold cuts	Flax
Gluten	Communion wafers	Fruits and juices, fresh, frozen or canned
Hydrolyzed plant protein	Corn cakes, popped	Herbs and spices, pure
Kamut	Egg substitutes, dried eggs	Ketchup
Malt and malt flavoring	French fries	Legumes
Matzo meal	Fruits, dried	Meats, unprocessed
Oatmeal and oat bran	Fruit-flavored drinks	Milk
Oats, rolled	Fruit pie fillings	Millet
Rye	Gravy	Mustard
Semolina	Hot dogs and other processed meats	Nuts, unprocessed, and nut flours
Seitan	Matzo	Olives
Soy sauce or soy sauce solids	Mayonnaise	Pickles, plain
Soy	Milk drinks	Potatoes and sweet potatoes
Spelt	Nuts, dry roasted	Quinoa
Stablizer	Peanut butter	Rice, wild rice, Indian rice
Starch, modified, or modified food starch	Pudding mixes	Sago
Triticale	Rice, brown	Seeds, unprocessed
Vegetable gum	Rice crackers and cakes	Soy flour
Vegetable protein	Rice mixes	Soy sauce, gluten-free
Vinegar, malt	Salad dressings	Sorghum
Wheat	Sauces	Tapioca
Wheat berries	Seasoning mixes	Tomato paste
Wheat bran	Sour cream	Vegetables without gluten-containing additives
Wheat, cracked	Soy nuts	Vinegar, apple, cider, and distilled white
Wheat germ	Syrup	Yucca
Wheat protein and hydrolyzed wheat protein	Teas, flavored and herbal	
Wheat starch	Turkey, self-basting	
Whole wheat	Vegetables in sauces	
	Yogurt, flavored or frozen	

(Illustration by GGS Information Services. Cengage Learning, Gale)

rash, but it is estimated that 85% or more of patients with the rash have the disease.

Because of the variety of ways celiac disease can manifest itself, it is often not discovered promptly. The condition may persist without diagnosis for so long that the patient accepts a general feeling of illness as normal. This circumstance may lead to further delay in identifying and treating the disorder.

Diagnosis

About 97% of people who have celiac disease are undiagnosed. Much of this is because of incorrect diagnosis by physicians when symptoms are presented, according to Peter H. R. Green, a professor of medicine and director of Columbia University's Celiac Disease Center. Green reports that many doctors think diarrhea is always present in celiac disease when, in fact, it is only present in about half of the cases. Also, Green asserts that physicians are taught in medical school that celiac disease is a rare condition, so they often do not consider it when diagnosing a patient with its symptoms. Green made his remarks in an address at the 2007 meeting of the American Academy of Allergy, Asthma, and Immunology in San Diego.

If celiac disease is suspected, a blood test that looks for the antibodies that the immune system produces in celiac disease is ordered. Some experts advocate not just evaluating patients with symptoms, but using these blood studies as a screening test for high-risk individuals, such as those with relatives known to have the disorder. An abnormal result points towards celiac disease, but further tests are needed to confirm the diagnosis. Other tests may be ordered to look for nutritional deficiencies. For example, doctors may order a test of iron levels in the blood because low levels of iron (anemia) may accompany celiac disease.

Doctors may also order a test for fat in the stool, since celiac disease prevents the body from absorbing fat from food.

The next step is a biopsy of the small intestine. This procedure is usually performed by a gastroenterologist, a physician who specializes in diagnosing and treating bowel disorders. It is generally performed in the office or in an outpatient department in a hospital. The patient remains awake but is sedated. A narrow tube is passed through the mouth, down through the stomach, and into the small intestine. A small sample of tissue is taken and sent to the laboratory for analysis. If it shows a pattern of tissue damage characteristic of celiac disease, the diagnosis is established.

Treatment

The treatment for celiac disease is a **gluten-free diet** (GFD). This may be easy for the doctor to prescribe, but difficult for the patient to follow. Gluten is present in any product that contains wheat, rye, barley, or oats. It helps make bread rise and gives many foods a smooth, pleasing texture. In addition to the many obvious places gluten can be found in a normal diet, such as breads, cereals, and pasta, there are many hidden sources of gluten. These include ingredients added to foods to improve texture or enhance flavor and products used in food packaging. Gluten may even be present on surfaces used for food preparation or cooking.

Fresh foods that have not been artificially processed, such as fruits, vegetables, and meats, are permitted as part of a GFD. Gluten-free foods can be found in health food stores, mail-order companies, and in some supermarkets. Help in dietary planning is available from support groups for individuals with celiac disease. Many cookbooks on the market are specifically designed for those on a GFD. In the late 1990s and 2000s, an increasing number of gluten-free products came on the market, including breads, baking products, pasta, baby foods, and even gluten-free beer. However, the cost of gluten-free products can run two to three times the cost of comparable products that contain gluten. A gluten-free diet can add $100 a week to the grocery bill for a family of four, according to a 2007 estimate from the Food Institute.

Treating celiac disease with a GFD is almost always completely effective in alleviating symptoms. Secondary complications, such as anemia and osteoporosis, resolve in almost all patients. People who have experienced lactose intolerance related to their celiac disease usually see those symptoms subside as well.

Allopathic treatment

Both complementary and allopathic healthcare practitioners generally agree that a gluten-free diet is the best treatment for celiac disease. Several studies have reported that **lipase**, in combination with other pancreatic enzymes, enhances the benefits of a gluten-free diet for people with celiac disease. The enzyme lipase is used by the body to break down dietary fats (lipids), especially triglycerides, into a form that can be absorbed in the intestines. Lipase supplements usually contain other enzymes that help digest carbohydrates and protein. In the United States, the supplement pancreatin contains lipase, amylase, and proteases. A government standard is used to rate lipase supplements and is denoted as USP units. The standard government measurement for pancreatin is 25 USP units of amylase, 2 USP units of lipase, and 25 USP units of protolytic (protease) enzymes. So a lipase supplement that states on the label that it is "9X pancreatin" means that it is nine time stronger than the government standard. Lipase supplements are usually made from enzymes found in animals, although there are a few supplements that use lipase and other pancreatic enzymes derived from plants. Pancreatin supplements usually contain 6,000 LU (lipase activity units) of lipase. The recommended dosage for adults is one to two capsules or tablets three time a day. Dosages for children should be determined by a pediatrician.

A small number of patients develop a refractory type of celiac disease, for which the GFD no longer seems effective. Once the diet has been thoroughly assessed to ensure no hidden sources of gluten are causing the problem, medications may be prescribed. Steroids or immunosuppressant drugs are often used to try to control the disease.

Expected results

The physician will periodically recheck the level of antibody in the patient's blood after a diagnosis of celiac disease has been made. After several months on a GFD, the small intestine of the patient is biopsied again. If the diagnosis of celiac disease was correct, healing of the intestine will be apparent. Most experts agree that it is necessary to follow these steps in order to be sure of an accurate diagnosis.

Patients with celiac disease must keep a strict GFD as long as they live. Although the disease may have symptom-free periods, silent damage continues to occur if the diet is not followed. Patients who do not follow their **diets** run higher risks of serious complications like gastrointestinal cancers, iron–deficiency

KEY TERMS

Antibodies—Proteins that provoke the immune system to attack particular substances. In celiac disease, the immune system makes antibodies to a component of gluten.

Gluten—A protein found in wheat, rye, barley, and oats.

Lipase—An enzyme that is used by the body to break down dietary fats (lipids), especially triglycerides, into a form that can be absorbed in the intestines.

Pancreas—A large elongated glandular organ near the stomach. It secretes juices into the small intestine, and the hormones insulin, glucagon, and somatostatin into the bloodstream.

Villi—Tiny, finger-like projections that enable the small intestine to absorb nutrients from food.

anemia, and decreased bone mineral density. Celiac disease cannot be outgrown or cured, according to medical authorities.

Once the diet has been followed for several years, individuals with celiac disease have similar mortality rates to the general population. However, about 10% of people with celiac disease develop a **cancer** involving the lymphatic system (lymphoma).

Prevention

There is no way to completely prevent celiac disease. However, the key to decreasing its impact on overall health is early diagnosis and strict adherence to the prescribed diet. Interestingly, a 2002 study of Swedish children found that the gradual introduction of gluten-containing foods into an infant's diet while they are still being breast-fed can reduce the risk of celiac disease, at least in early childhood.

Resources

BOOKS

Bower, Sylvia Llewelyn. *Celiac Disease: A Guide to Living with Gluten Intolerance*. New York: Demos Medical, 2006.

Green, Peter H. R., and Rory Jones. *Celiac Disease: A Hidden Epidemic*. New York: Collins, 2008.

Libonati, Cleo J. *Recognizing Celiac Disease: Signs, Symptoms, Associated Disorders & Complications*. Ambler, PA: GFW, 2007.

PERIODICALS

Brunk, Doug. "Underdiagnosis of Celiac Disease Continues." *Internal Medicine News* (August 15, 2007): 32.

Corbet, Kelly. "The Gluten Question: What You Need to Know." *Delicious Living* (October 2007): 49(3).

Cotliar, Sharon. "No Wheat, No Worries." *People Weekly* (June 11, 2007): 143.

Johnson, Kate. "Diet Role Debated in Asymptomatic Celiac Disease." *Family Practice News* (April 1, 2007): 38.

Presutti, John R., et al. "Celiac Disease." *American Family Physician* (December 15, 2007): 1795.

Turner, Lisa. "6 Simple Tricks for Living Gluten Free: A Diagnosis of Celiac Disease or Gluten Intolerance Doesn't Mean You Have to Give Up Your Favorite Foods and Treats. Replacing Problem Ingredients and Following a Gluten Free Diet Are Easier than You Think." *Better Nutrition* (October 2007): 50(4).

ORGANIZATIONS

Canadian Celiac Association, 5170 Dixie Rd., Suite 204, Mississauga, ON, L4W 1E3, Canada, (800) 363 7296, http://www.celiac.ca.

Celiac Disease Foundation, 13251 Ventura Blvd., Suite 1, Studio City, CA, 91604 1838, (818) 990 2354, http://www.celiac.org.

National Institute of Diabetes and Digestive and Kidney Diseases, Bldg. 31, Room 9A06, 31 Center Dr., MSC 2580, Bethesda, MD, 20892, (800) 891 5390, http://www.niddk.nih.gov.

National Pancreas Foundation, 363 Boylston St., 4th Floor, Boston, MA, 02116, (866) 726 2737, http://www.pancreasfoundation.org.

Paula Ford-Martin
Ken R. Wells

Cell salt therapy

Definition

Cell salt therapies use a set of specific minerals, also known as the 12 tissue salts, to correct symptoms arising from metabolic deficiencies. They are very similar to **homeopathy**, and may be prescribed by a homeopathic doctor.

The 12 cell salts are as follows:

- *Calcarea fluor* (calcium fluoride)
- *Calcarea phos* (calcium phosphate)
- *Calcarea sulph* (calcium sulfate)
- *Ferrum phos* (iron phosphate)
- *Kali mur* (potassium chloride)
- *Kali phos* (potassium phosphate)
- *Kali sulph* (potassium sulfate)

- *Magnesia phos* (magnesium phosphate)
- *Natrum mur* (sodium chloride)
- *Natrum phos* (sodium phosphate)
- *Natrum sulph* (sodium sulfate)
- *Silicea* (silica)

Origins

Cell salt therapy was developed by a German physician, W. H. Schussler, in the 1870s. Schussler studied cremated human bodies, and found that these 12 substances made up the bulk of the remains. From this finding he theorized that these 12 so-called tissue salts are responsible for the harmonious functioning of the human organism. Disease follows when a person becomes deficient in any of the 12 salts. Schussler recommended that patients take the salts in pill form to cure a variety of disorders. He believed that the salts provided adequate **nutrition** to the cells. If cell nutrition was adequate, then cell metabolism would be normal, and the body would be healthy. However, Schussler's pills were not direct nutritional supplements as we would understand them today. He followed the principles of homeopathy, which works somewhat to the reverse of modern medicine, in that the smaller the dose, the more effective it is believed to be. Cell salts are prepared like homeopathic medicines, by a process of continued dilution and shaking or pounding (succussion).

Benefits

Practitioners of cell salt therapy believe the minerals to be effective against a variety of ailments. For example, *Calcarea fluor* is thought to be essential to vascular health; it is given to patients with circulatory diseases or such conditions as **varicose veins**, **hemorrhoids**, and hardening of the arteries. *Ferrum phos* is used to treat colds, flu, and inflammation. *Kali phos* is used to treat **body odor**, as well as mental problems. Other salts treat other disorders, from cramps to **gout** to skin problems. Some are prescribed for general healing; that is, to restore general health to a person without any overriding specific disease.

Preparations

Cell salts may be derived from inorganic sources, though they can also be derived from plants. The salts are made into pills which are extremely dilute, following the principles of homeopathy. The salts are crushed into fine particles, and the particles go through a series of dilutions, then are molded into tablets. The patient does not swallow the tablet, but allows it to dissolve on the tongue.

KEY TERMS

Placebo—A pharmacologically inactive substance given to placate a patient who supposes it to be a medicine.

Succussion—A part of the process of making homeopathic remedies, in which the medicinal substance is diluted in distilled water and then shaken vigorously.

Precautions

Though the cell salt pills are extremely dilute, practitioners believe them to be quite potent. Practitioners advise people to take cell salts only under the advice of a homeopathic physician. The cell salts are not intended to be a complete treatment, but only one part of a treatment plan devised by a knowledgeable practitioner.

Side effects

Because of the extremely dilute nature of cell salt pills, side effects are unlikely. Traditionally trained medical doctors would consider them placebos.

Research and general acceptance

Cell salt therapy, like homeopathy, is not based on scientific research but on provings. Provings are basically anecdotal evidence gathered from volunteers. This method of testing the efficacy of remedies was devised by Samuel Hahnemann, the German physician who originated homeopathy. Within the field of homeopathy, cell salt therapy is considered a sister therapy or perhaps a subset of homeopathy. Homeopaths prescribe cell salts, sometimes in conjunction with other remedies.

Training and certification

Cell salts are available as over-the-counter remedies, and patients are able to treat themselves if they wish. An understanding of cell salts can be gained from reading Schussler's work, or from comprehensive guides to homeopathy. Cell salt therapy may be administered by a homeopathic doctor. Rules governing the practice of homeopathy vary from state to state. Homeopaths in the United States can become certified through the Council for Homeopathic Certification. This requires at least 500 hours of training in homeopathy through a school or seminars, plus a written examination. Certification is also offered to

practitioners who have apprenticed for at least 2,000 hours with a certified homeopath. Other qualifications may also be necessary, such as having taken a course in CPR (cardiopulmonary resuscitation) and human anatomy.

Resources

BOOKS

Cummings, Stephen, and Ullmann, Dana. *Everybody's Guide to Homeopathic Medicines*. New York: Jeremy P. Tarcher/Putnam, 1996.

PERIODICALS

Stehlin, Isadora. "Homeopathy: Real Medicine or Empty Promise?" *FDA Consumer* (December 1996): 15.

ORGANIZATIONS

National Center for Homeopathy. 801 North Fairfax Street, Suite 306. Alexandria, VA 22314. (703) 548 7790.

Angela Woodward

Cell therapy

Definition

Cell therapy is the transplantation of human or animal cells to replace or repair damaged tissue and/or cells.

Origins

The theory behind cell therapy has existed for several hundred years. The first recorded discussion of the concept of cell therapy was written by Phillippus Aureolus Paracelsus (1493–1541), a German-Swiss physician and alchemist in his *Der grossen Wundartzney* (Great Surgery Book, 1536): "the heart heals the heart, lung heals the lung, spleen heals the spleen; like cures like." Paracelsus and many of his contemporaries agreed that the best way to treat an illness was to use living tissue to restore the ailing. In 1667, at a laboratory in the palace of Louis XIV, Jean-Baptiste Denis (1640–1704) attempted to transfuse blood from a calf into a mentally ill patient. Since blood transfusion is, in effect, a form of cell therapy, this could be the first documented case of this procedure. However, the first recorded attempt at non-blood cellular therapy occurred in 1912 when German physicians attempted to treat children with **hypothyroidism**, or an underactive thyroid, with thyroid cells.

In 1931, Paul Niehans (1882–1971), a Swiss physician, became known quite by chance as "the father of cell therapy." After a surgical accident by a colleague, Niehans attempted to transplant a patient's severely damaged parathyroid glands with those of a steer. When the patient began to rapidly deteriorate before the transplant could take place, Niehans decided to dice the steer's parathyroid gland into fine pieces, mix the pieces in a saline solution, and inject them into the dying patient. Immediately, the patient began to improve and, in fact, lived for another 30 years.

Cell therapy as alternative medicine practitioners practice it is quite different from embryonic stem cell research performed in government-regulated laboratories by traditionally trained scientists. Embryonic stem cells are cells taken from an embryo before they have differentiated (specialized) into such specific cell types as muscle cells, nerve cells, skin cells, for example. In laboratory test tube and animal experiments, stem cells often can be manipulated to differentiate into specific types of cells that have the potential to replace differentiated cells in damaged organs. For example, in early 2008, researchers at the Diabetic Research Institute at the University of Miami in Florida were able to convert embryonic stem cells into insulin-producing cells and use them to treat insulin-dependent diabetes in mice. Embryonic stem cells have great potential to treat a wide range of diseases and disorders, but they were as of 2008, for the most part, still in the test tube and animal research stage of development. Because of the ethical questions raised when embryos are destroyed by the harvesting of stem cells, the Bush administration placed restrictions on human stem cell research. As of 2008, much stem cell research was being carried out in other countries, especially Thailand, South Korea, and China, where fewer restrictions are placed on obtaining human stem cells for experimentation.

Cell therapy as it is carried out by alternative medical practitioners most often follows the "like heals like" theory and uses fully differentiated adult cells from the same type of organ that the practitioner is trying to heal. Cells may come from humans but are more likely to come from animals. Practitioners of this type of cell therapy believe that when these differentiated cells are injected into the body of an ill person, the body transports them to the site of the organ to be healed and the injected cells heal the organ. This theory challenges accepted findings about how the body's immune system attacks and destroys foreign cells.

Benefits

Alternative practitioners of cell therapy claim that it has been used successfully to rebuild damaged cartilage in joints, repair spinal cord injuries, strengthen a weakened immune system, treat autoimmune diseases

such as **AIDS**, and help patients with neurological disorders such as Alzheimer's disease, Parkinson's disease, and **epilepsy**. They further claim that the therapy has shown positive results in the treatment of a wide range of chronic conditions such as arteriosclerosis, congenital defects, and **sexual dysfunction**. The therapy also has been used to treat **cancer** patients at clinics in Tijuana, Mexico. Few of these applications have been supported by controlled human clinical studies. Some of the diseases and disorders that alternative practitioners claim to be able to cure through cell therapy are now the target of researchers doing scientifically rigorous, regulated embryonic stem cell research.

KEY TERMS

Anaphylactic shock—A severe allergic reaction that causes blood pressure drop, racing heart, swelling of the airway, rash, and possibly convulsions.

Culturing—Growing cells in a special substance, or media, in the laboratory.

Encephalitis—Inflammation of the brain.

Description

Cell therapy as practiced by alternative healers is, in effect, a type of organ transplant that has also been referred to as live cell therapy, xenotransplant therapy, cellular suspensions, glandular therapy, or fresh cell therapy. The procedure involves the injection of either whole fetal xenogenic (animal) cells (e.g., from sheep, cows, pigs, and sharks) or cell extracts from human tissue. The latter is known as autologous cell therapy if the cells are extracted from and then transplanted back into the same patient. Several different types of cells can be administered simultaneously.

In accord with Paracelsus's theory that "like cures like," the types of cells that are administered correspond in some way with the organ or tissue in the patient that is failing. No one has shown how cell therapy works as of 2008, but proponents claim that the injected cells travel to the similar organ from which they were taken to revitalize and stimulate that organ's function and regenerate its cellular structure. In other words, the cells are not species specific, but only organ specific. Supporters of cellular treatment believe that embryonic and fetal animal tissue contains active therapeutic agents distinct from vitamins, minerals, hormones, or enzymes that aid in healing.

Preparations

There are several processes to prepare cells for use. One procedure involves extracting cells from the patient and then culturing them in a laboratory setting until they multiply to the level needed for transplantation back into the same patient. Another procedure uses freshly removed fetal animal tissue that has been processed and suspended in a saline (salt water) solution. The preparation of fresh cells then may be either injected immediately into the patient or preserved by being freeze-dried or deep-frozen in liquid nitrogen before being injected. Injected cells may or may not be tested for pathogens, such as bacteria, viruses, or parasites, before use.

Precautions

Patients undergoing cell therapy treatments that use cells transplanted from animals or other humans run the risk of cell rejection, in which the body recognizes the cells as a foreign substance and uses the immune system's T-cells to attack and destroy them. There are also cases in which injection of animal cells into humans has caused an allergic reaction. In addition, there is the risk of the cell solution transmitting bacterial, viral, or fungal infection or parasites to the patient.

Many forms of legitimate stem cell therapy in the United States were still experimental procedures as of 2008. A list of FDA-approved clinical trials involving stem cells can be found at http://www.clinicaltrials.gov. Patients should approach any alternative cell therapy treatments with extreme caution, inquire about their proven efficacy and legal use in the United States, and should only accept treatment from a licensed physician. The physician should educate the patient completely on the risks and possible side effects involved with cell therapy. These same cautions apply for patients interested in participating in clinical trials of cell therapy treatments.

Side effects

Because cell therapy encompasses a wide range of treatments and applications and many of these treatments were still experimental as of 2008, the full range of possible side effects of the treatments is not yet known. Anaphylactic shock (severe allergic reaction that can result in death), immune system reactions, and encephalitis (inflammation of the brain) are just a few of the reported side effects in some patients.

PAUL NIEHANS (1882–1971)

(AP/Wide World Photos. Reproduced by permission.)

Paul Niehans was born and raised in Switzerland. His father, a doctor, was dismayed when he entered the seminary, but Niehans quickly grew dissatisfied with religious life and took up medicine after all. He first studied at Bern, then completed an internship in Zurich.

Niehans enlisted in the Swiss Army in 1912. When war erupted in the Balkans, Niehans set up a hospital in Belgrade, Yugoslavia. The war provided him the opportu nity to treat numerous patients, gaining a firsthand knowl edge of the body and its workings.

Since 1913, Niehans had been intrigued with Alexis Carrel's experiments concerning the adaptive abilities of cells, though Niehans himself specialized in glandular transplants and by 1925 was one of the leading glandular surgeons in Europe.

Niehans referred to 1931 as the birth year of cellular therapy. That year, he treated a patient suffering from tetany whose parathyroid had been erroneously removed by another physician. Too weak for a glandular transplant, the patient was given injections of the parathyroid glands of an ox, and she soon recovered. Niehans made more injections, even experimenting on himself, and reported he could cure illnesses through injections of live cells extracted from healthy animal organs. He believed adding new tissue stimulated rejuvenation and recovery.

Niehans treated Pope Pious XII with his injections and was nominated to the Vatican Academy of Science following the pope's recovery.

Niehans remained a controversial figure throughout his life. As of 2008, the Clinique Paul Niehans in Swit zerland, founded by his daughter, continued his work.

Research and general acceptance

Cell therapy as it is practiced by alternative healers is generally rejected as effective by the traditionally trained scientific community. Most of the claims made for these therapies are based on anecdotal evidence and are not backed by controlled clinical trials. Whereas some mainstream stem cell therapy procedures have shown some success in clinical studies, others were largely unproven as of 2008 including cell therapy for cancer treatment. Until large, controlled human clinical studies are performed on cell therapy procedures, they will remain fringe treatments.

Training and certification

Cell therapy should only be performed by a licensed physician with experience in prescribing and administering the treatment. Surgical cell therapy procedures, such as the arthroscopic surgery involved in chondrocyte cell therapy, should only be performed by a surgical specialist.

Resources

BOOKS

Steenblock, David, and Anthony G. Payne. *Umbilical Cord Stem Cell Therapy: The Gift of Healing from Healthy Newborns*. Laguna Beach, CA: Basic Health Publica tions, 2006.

PERIODICALS

Pollack, Andrew. "Stem Cell Therapy Controls Diabetes in Mice." *New York Times* February 21, 2007. http:// www.nytimes.com/2008/02/21/health/research/ 21stem.html (April 12, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www. amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www. holisticmedicine.org.

Center for Cell and Gene Therapy. Baylor College of Medicine, One Baylor Place N1002, Houston, TX, 77030, (713) 798 1246, http://www.bcm.edu/genetherapy.

Paula Ford-Martin
Teresa G. Odle
Tish Davidson, A. M.

Cellulite

Definition

Cellulite is a popular term to describe fat deposits under the skin. It is characterized by a dimpled or orange-peel appearance due to structural changes underneath the skin's top layer. Cellulite is a perfectly normal and harmless condition, however, it is a cosmetic concern of many people, especially women.

Description

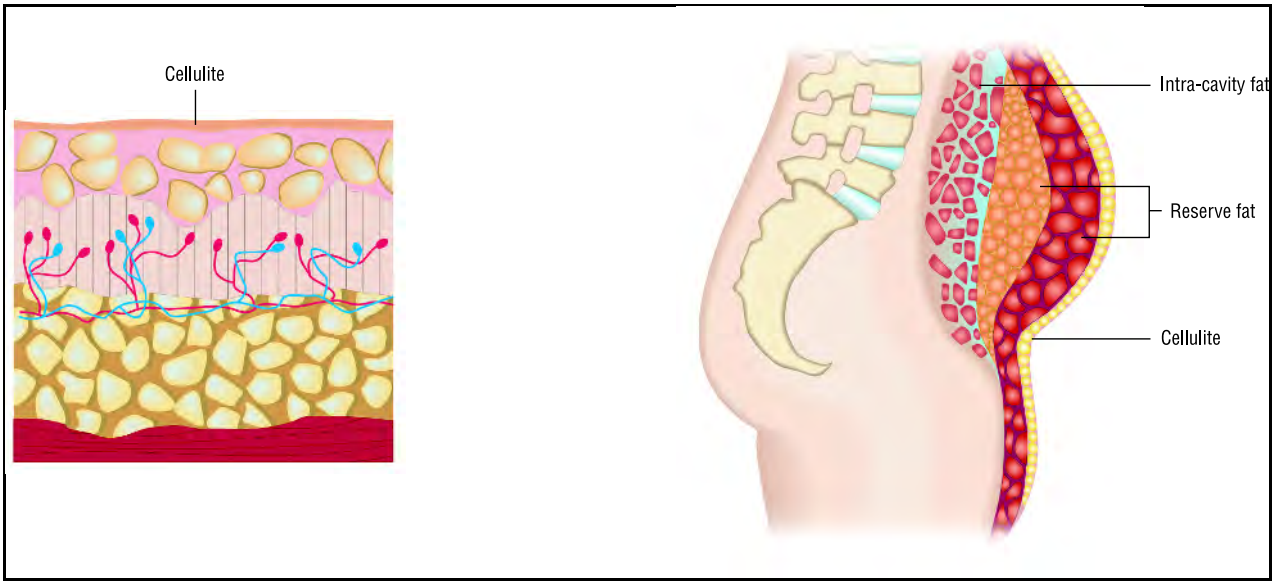
Cellulite is a normal occurrence resulting from uneven fatty deposits, mostly below the waistline. In women, fat is arranged in large chambers underneath a fairly thin layer of skin. These chambers are separated by columns of collagen fibers. In obese (overweight) persons, too much fat is being stuffed into these chambers, causing the pitting and bulging of the skin. In addition, as women age, the fibers shrink and thicken, pulling the skin downward. This results in a quilt-like appearance on the skin surface, especially in areas such as the buttocks, thighs, or hips. Most women develop cellulite as they age, regardless of their race. According to some studies, as many as 95% of women over age 30 develop some form of cellulite in their body.

Female hormones (estrogen, and to a lesser extent, progesterone) play important roles in the formation of cellulite. Estrogen stimulates the storage of fat, which is needed for **menstruation**, **pregnancy**, and lactation. In addition, during the later phases of pregnancy, estrogen also causes the breakdown of collagen fibers to relax the cervix, making it possible for a woman to deliver her baby. This collagen breakdown sets the stage for the formation of cellulite. Progesterone may also contribute to the cellulite problem by weakening veins and causing water retention and weight gain.

Cellulite is mostly a women's problem. Due to different body physiques, men tend to have lower percentages of body fat, while women have higher percentages. In addition, men tend to accumulate fat in the abdominal area while women have fat deposits mostly in the buttocks and thighs. Men have thicker skin and the chambers are smaller and more tightly-held together. Therefore, cellulite is not often found in men.

Causes and symptoms

Many scientists believe cellulite, as well as **obesity**, is mostly predetermined by the genes that the persons



A close-up of cellulite deposits found beneath the top layer of skin. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

carry. However, environmental as well as behavioral factors are also believed to have some effects on the development of cellulite.

The following factors are thought to contribute to the development of cellulite:

- Being overweight. Though cellulite also appears on thin people, excess weight makes cellulite worse.
- Pregnancy. Cellulite problems get worse with each successive pregnancy. During pregnancy, estrogen and progesterone levels are high. As a result, pregnant women have increased fatty deposits, weight gain, water retention, and weakened fiber structure. The most effective ways for women to get rid of body fat and cellulite and get back to pre-pregnancy shape are breast-feeding and exercise.
- Aging. As women age, skin sags and wrinkles. In addition, the body's energy requirement lowers, thus, there is more fat accumulation.
- Poor blood circulation. When there is impaired blood flow to the fat-storage area, collagen fibers are damaged due to lack of oxygen and accumulation of toxic wastes. The fibers shrink and thicken, resulting in the quilted appearance of the fat chambers. In addition, because oxygen is needed to burn fat for energy, fat in these poorly oxygenated areas is the last to be used. This is also why cellulite is so difficult to eliminate. Poor blood circulation is often caused by sedentary lifestyles, smoking, and high caffeine consumption.
- Poor lymph drainage. The lymphatic system acts like a sewage system, filtering out and carrying away cellular wastes and toxins. If it is impaired, toxic products accumulate and inflate these fat cells, causing cellulite.
- Lack of exercise. Cellulite may be caused by impaired blood circulation and poor muscle tone underneath the skin, which are caused by sedentary lifestyles.
- High fat and sugar consumption. This often leads to excess caloric and fat intake, which causes increases in body fat and thus, cellulite.
- Food allergy. Food allergy causes a variety of symptoms including food craving, weight gain, bloating and water retention, all of which worsen cellulite.
- Highly processed foods that contain preservatives, artificial sweeteners and other additives. Heavy consumption of prepackaged foods causes build up of these toxins in the body.
- Yo-yo dieting. Yo-yo dieting causes a woman to lose fat in the upper body while increasing fat deposits in the buttocks, thighs, and hips. Therefore, this practice tends to make cellulite problems worse than before dieting.
- Sun exposure. Prolonged exposure to the sun accelerates the skin-aging process.

Diagnosis

There are high-tech methods developed to determine the presence and extent of cellulite such as ultrasound and electrical impedance, which are expensive and unnecessary. However, a woman can determine for herself if she has cellulite using the skin-pinch and roll technique. First, a woman sets up a reference point for later comparisons. Using her fingers, a woman should gently pinch a large fold of skin in an area not known for having cellulite. Then she should do the same with skin in the buttock, thigh or hip areas. Comparing the first pinch with later experiences, she should see if there are signs of cellulite such as skin thickening, dimpling, broken veins, cold skin, and lumpiness.

Treatment

Exercise

The best solutions to cellulite problems involve reducing subcutaneous fat through diet and **exercise**. Working out for at least 30 minutes five times a week firms up the skin by increasing muscle tone and keeping connective tissue fibers healthy. Exercise also increases blood circulation to these problem areas.

Diet

Dieting has to be combined with regular exercise to be effective in controlling or reducing cellulite. The following dietary changes are recommended:

- Drinking lots of water. Water cleanses the digestive system and flushes toxins out of the body.
- Eating a low-fat, low-sugar, high-fiber diet with emphasis on fruits, vegetables, and whole grains.
- Refraining from smoking. Smoking causes poor blood circulation and contributes to premature aging of the skin.
- Avoiding highly processed foods, caffeine, and alcohol.
- Avoiding salty foods. Salty foods increase water retention and make cellulite appear worse.
- Maintaining a normal, healthy body weight. Obesity increases fatty deposits and makes cellulite much worse.

Body massage

Massage with or without anti-cellulite cream may have some limited benefits by improving blood circulation and **lymphatic drainage**. Regular massage also helps maintain smoother skin.

Herbal supplements

There are many herbal products on the market for the treatment of cellulite. Products such as Cellasene do not offer any therapeutic benefits. Cellasene is a popular herbal mixture of fucus vesiculous, **grape seed extract**, **sweet clover**, **ginkgo biloba**, borage, **lecithin**, and **fish oil**. Its manufacturer claims that the herbal combination works by increasing the rate the body **burns** fat cells for energy. Many medical experts remain doubtful of its claim of effectiveness. A recent study shows that it may be just another fad product that has no therapeutic value.

There are several products, though, such as *Centella asiatica* (**gotu kola**) and *Aesculus hippocastanum* (**horse chestnut**) that may help improve the appearance of cellulite. These herbs improve the underlying integrity of the skin by making the connective tissue fibers stronger and more elastic.

Allopathic treatment

Liposuction is the most widely used treatment for cellulite. Fat cells are removed by suctioning through a cut or excision in the buttocks or thigh. Then some of these fat cells are redeposited into areas of dimpling to smooth out the contour. While liposuction significantly reduces total amount of fat in the body immediately, it may not significantly improve skin appearance. In other words, liposuction may or may not remove the dimpling or unevenness under the skin. Nor does it make leathery, wrinkling skin look taut and young. Even when it is effective, liposuction is only a temporary quick-fix solution. As long as there is excessive caloric and fat intake, the excess energy will be stored as fat and cellulite will certainly reappear, albeit probably in other parts of the body.

Liposuction is a surgical procedure. Therefore, it does carry some potentially severe consequences and complications. **Pain** and **edema** (fluid accumulation) occur in most patients. It may take up to six months for the edema to completely go away. Skin dimpling may look even worse immediately after surgery, however, the unevenness will smooth out over time. Surgical complications such as **infections**, uncontrollable bleeding, fatal **blood clots**, and inadequate or excessive fat removal (leaving behind flabby skin folds) may also occur.

KEY TERMS

Electrical impedance—This technique uses a small electrical current passing through the body. Fat impedes or slows down electrical current. The faster the current runs through the body, the less fat there is.

Liposuction—The surgical removal of fatty tissue underneath the skin through a small incision in the skin.

Ultrasound—This medical device uses sound waves bouncing off body organs or tissues, which are reflected back as images on the screen. Ultrasound can show shape, size, and certain characteristics of the tissues.

Expected results

Liposuction is not a generally recommended treatment for cellulite because it is an invasive, potentially life-threatening procedure. It can sometimes produce satisfying results but it is not a cure for cellulite. Repeat liposuction is often required because as long as there is excess caloric or fat intake, there will be fatty deposits in the body. Unless there are significant changes in lifestyle and diet, cellulite will reappear.

A 2002 study showed that a combination of ultrasound-assisted liposuction followed by mechanical massage (endermologie) proved more effective than either technique used alone in reducing cellulite. Women with the best results also added exercise into their post-operative routine.

Fat-dissolving lotions and creams are not proven effective in treating cellulite. Herbal cellulite-dissolving products do not result in loss of body fat, as they often claim. At most, products such as Cellasene may be able to make the dimpling from cellulite become less noticeable. Further, when several ingredients are combined in these creams, it is difficult for investigators to determine which ingredient might be responsible for any reduction in the appearance of cellulite.

The most effective treatment for cellulite remains diet and exercise. Adhering to a low-fat, **high-fiber diet** and regular exercise will make the body as fit and trim as it can be. These are long-term solutions that also provide many additional health benefits including prevention of **heart disease** and **cancer** and slowing the **aging** process.

Prevention

Cellulite is a normal occurrence in the human body and predetermined by genetics. Some women will naturally have more cellulite than others. However, diet and exercise can keep the body fit and trim.

Resources

BOOKS

Dancey, Elizabeth. *The Cellulite Solution*. USA: St. Martin's Press, 1996.

Murray, Michael T., and Joseph E. Pizzorno. "Cellulite." *Encyclopedia of Natural Medicine, revised 2nd ed.* Rocklin, CA: Prima Publishing, 1998.

The Burton Goldberg Group. "Cellulite." *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

PERIODICALS

Bernstein, Gerald. "Liposuction: Liposuction of the Thigh." *Dermatologic Clinics* 17 no.4 (October 1999): 849 863.

Bolivar de Souza, Pinto E., P.J.I. Erazo, F.S.A. Prado Filho, et al. "Superficial Liposuction." *Aesthetic Plastic Surgery* 20 (1996): 111 122. In Year Book of Dermatologic Surgery, 1997.

"Dermatologists Shed Light on Treatments for Cellulite." *Obesity, Fitness & Wellness Week* (September 21, 2002): 8.

Lis Balchin M. "Parallel Placebo Controlled Clinical Study of a Mixture of Herbs Sold as a Remedy for Cellulite." *Phytother Res* 13 no.7 (Nov 1999): 627 629.

Scheck, Anne. "Dual Lipoplasty, Endermologie Approach Offers Successful Cellulite Reduction." *Cosmetic Surgery Times* (July 2002): 22.

ORGANIZATIONS

The American Society of Plastic and Reconstructive Surgeons (ASPRS). 444 East Algonquin Road, Arlington Heights, IL 60005. (800) 228 9900. http://www.plasticsurgery.org

OTHER

Srinivasan, Kalpana. "FTC Eyes Cellulite Supplement: Can Manufacturer Substantiate Claims?" *Dr. Koop.com* http://abcnews.go.com/sections/living/DailyNews/cellulitepill990527.html.

Mai Tran
Teresa G. Odle

Cerebral palsy

Definition

Cerebral palsy (CP), or static encephalopathy, is the name for a collection of movement disorders caused by brain damage that occurs before, during, or shortly after birth. A person with CP is often also affected by other conditions caused by brain damage.

Description

The affected muscles of a person with CP may become rigid or excessively loose. The person may lose control of muscles or have problems with balance and coordination. A combination of these conditions is also possible. Those with CP may be affected primarily in the legs (paraplegia or diplegia) or in the arm and leg of one side of the body (hemiplegia) or all four limbs may be involved (quadriplegia).

A person with CP may also be affected by a number of other problems, including a seizure disorder, visual deficits, hearing problems, mental retardation, learning disabilities, and **attention-deficit hyperactivity disorder**. None of these conditions is necessarily part of CP, although they may accompany the disorder.

CP affects approximately 500,000 children and adults in the United States and is diagnosed in about 10,000 newborns and young children each year. It is not an inherited disorder, and as of 2008 there was no way to predict with certainty which children would develop CP. It is not a disease and is not communicable. CP is a nonprogressive disorder, which means that symptoms neither worsen nor improve over time. However, manifestation of the symptoms may become more severe over time. For example, rigidity of muscles can lead to contractures and deformities that require a variety of interventions.

Causes and symptoms

Causes

Cerebral palsy is caused by damage to the motor control centers of the brain. When the nerve cells (neurons) in these regions die, the appropriate signals can no longer be sent to the muscles under their control. The resulting poor control of these muscles causes the symptoms of CP.

The brain damage leading to CP may be caused by lack of oxygen (asphyxia), infection, trauma, malnutrition, drugs or other chemicals, or hemorrhage. In most cases it is impossible to determine the actual cause, although premature birth is recognized as a significant risk factor. It was once thought that difficult or prolonged delivery was responsible for many cases of CP, but many researchers have come to believe that the great majority of cases result from brain damage occurring before birth. The same injury that damages the motor areas can harm other areas as

well, leading to problems commonly associated with CP.

If brain cells do not get enough oxygen because of poor circulation, they may die. Defects in circulation in the developing brain may cause CP in some cases. Asphyxia during birth is also possible, and about half of newborns known to have suffered asphyxia during birth (perinatal asphyxia) develop CP. However, asphyxia during birth is usually considered a symptom of an underlying neurological problem in a newborn, rather than its cause, and the resulting CP may be another sign of that problem. Asphyxia after birth can be caused by choking, poisoning (such as from carbon monoxide or barbiturates), or near-drowning.

The fetal brain may be damaged by an infection contracted by the mother. **Infections** correlated with CP include **rubella** (German **measles**), toxoplasmosis (often contracted from cat feces), cytomegalovirus (a herpes virus), and HIV (the virus that causes **AIDS**). Encephalitis and **meningitis**, which are infections of the brain and its coverings, can also cause CP when contracted by infants.

Physical trauma to the pregnant mother or infant may cause brain damage. Blows to the infant's head, as from a motor vehicle accident, violent shaking, or other physical abuse can damage the infant's brain. Maternal malnutrition may cause brain damage, as can the use of drugs, including cocaine or alcohol. Although these factors may cause CP, they may be more likely to cause mental retardation or other impairments.

Incompatibility between the Rh blood types of mother and child was once a major cause of athetoid CP, one type of movement impairment seen in cerebral palsy patients. In some cases, this incompatibility can cause the mother's defense (immune) system to attack and destroy the child's blood cells during **pregnancy**, a condition called erythroblastosis fetalis. High levels of a blood cell breakdown product called bilirubin in a child's circulation, leading to yellowish pigmentation of the skin caused by bile (**jaundice**), can result in brain damage. This condition is rare as of 2008 due to testing procedures that identify potential Rh incompatibility and treatment that prevents the mother's immune system from attacking the child's blood cells. Jaundice can be treated with special lights that help the breakdown of bilirubin. Blood transfusions for the child are also possible in extreme cases. Despite the virtual elimination of this cause of CP in the last part of the twentieth century, CP rates have not declined, largely because of the increase of survival of premature babies.

Prematurity is one of the most significant risk factors for CP. About 7% of babies weighing less than three pounds at birth develop CP, and the risk increases dramatically as weight falls. Prematurity may increase the risk of CP because of the increased likelihood of hemorrhaging in the brain associated with low birth weight. Brain hemorrhage is most common in babies weighing less than four pounds at birth, and the risk increases as weight decreases. The hemorrhage may destroy brain tissue, either through asphyxia or release of toxic breakdown products.

Researchers in Sweden reported in 2002 that babies conceived through in vitro fertilization (IVF) were 3.7 times more likely to have CP than babies conceived naturally. In part, this correlation can be attributed to a higher rate of twins, low birth weight, and premature births associated with IVF babies, but some single births also have higher rates of CP.

Symptoms

The symptoms of CP are usually not noticeable at birth. As children develop in the first 18 months of life, however, they progress through a predictable set of developmental milestones. Children with CP will develop these skills more slowly due to their motor impairments, and delay in reaching milestones is usually the first symptom of CP. The more severe the CP, the earlier the diagnosis is usually made.

Selected developmental milestones, and the ages at which a child typically acquires them, are given below. There is some cause for concern if the child does not acquire the skill by the age shown in parentheses:

- sits well unsupported, 6 months (8–10 months)
- babbles,6 months (8 months)
- crawls, 9 months (12 months)
- finger feeds, holds bottle, 9 months (12 months)
- walks alone, 12 months (15–18 months)
- uses one or two words other than dada/mama, 12 months (15 months)
- walks up and down steps, 24 months (24–36 months)
- turns pages in books, removes shoes and socks, 24 months (30 months)

Children do not consistently favor one hand over the other before 18 months, and doing so may be a sign that the child has difficulty using the other hand. This same preference for one side of the body may show up as an asymmetric crawling effort, or continuing to use only one leg for the work of stair climbing after age three.

It must be remembered that children normally progress at somewhat different rates, and slow initial accomplishment is often followed by normal development. There are also other causes for delay in reaching some milestones, including problems with vision or hearing. Because CP is a non-progressive disease, loss of previously acquired milestones indicates that CP is not the cause of the problem.

The impairments of CP become recognizable in early childhood. The type of motor impairment and its location are used as the basis for classification. There are five generally recognized types of impairment:

- Spastic: Muscles are rigid, posture may be abnormal, and fine motor control is impaired.
- Athetoid: Movements tend to be slow, writhing, involuntary.
- Hypotonic: Muscles are floppy, without tone.
- Ataxic: Balance and coordination are impaired.
- Dystonic: Impairment is mixed.

The location of the impairment usually falls into one of three broad categories:

- Hemiplegia: One arm and one leg on the same side of the body are involved.
- Diplegia: Both legs are involved and arms may be partially involved.
- Quadriplegia: All four extremities are involved.

A person with CP may be said to have spastic diplegia, or ataxic hemiplegia, for instance. CP is also termed mild, moderate, or severe, although these are subjective categories with no firm boundaries.

Loss of muscle control, especially of the spastic type, can cause serious orthopedic problems, including **scoliosis** (spine curvature), hip dislocation, or contractures. Contracture is shortening of a muscle, caused by an imbalance of opposing force from a neighboring muscle. Contractures begin as prolonged contractions but can become fixed or irreversible without regular range of motion exercises. A fixed contracture occurs when the contracted muscle adapts by reducing its overall length. Fixed contractures may cause postural abnormalities in the affected limbs, including clenched fists, tightly pressed or crossed thighs, or equinus. In equinus, the most common postural deformity, the foot is extended by the strong pull of the rear calf muscles, causing the toes to point. The foot is commonly pulled inward as well, a condition called equinovarus. Contractures of all kinds may be painful and may interfere with mobility and normal activities of daily living, including hygiene tasks.

As noted, the brain damage that causes CP may also cause a large number of other disorders. These may include:

- mental retardation
- learning disabilities
- attention-deficit hyperactivity disorder (AD-HD)
- seizure disorder
- visual impairment, especially strabismus (cross-eye)
- hearing loss
- speech impairment

These problems may have an even greater impact on the child's life than the physical impairment of CP, although not all children with CP are affected by other problems. About one-third of children with CP have moderate to severe mental retardation, one-third have mild mental retardation, and one-third have normal to above average intelligence.

Diagnosis

The tracking of developmental progress is the most important test the physician has in determining whether a child has cerebral palsy. Most children with CP can be confidently diagnosed by 18 months. However, diagnosing CP is not always easy because variations in child development may account for delays in achieving milestones and even children who are obviously delayed may continue to progress through the various developmental stages, attaining a normal range of skills later on. Serious or prolonged childhood illness may cause delays that are eventually recovered.

Evidence of other risk factors may aid the diagnosis. The Apgar score, evaluated immediately after birth, measures a newborn's heart rate, cry, color, muscle tone, and motor reactions. Apgar scores of less than three out of a possible 10 are associated with a highly increased indication of CP. Presence of abnormal muscle tone or movements may signal CP, as may the persistence of infantile reflexes. A child with seizures or congenital organ malformation has an increased likelihood of CP. Ultrasound examination, a diagnostic technique that creates a two-dimensional image of internal body structures, may help to identify brain abnormalities, such as enlarged ventricles (chambers containing fluid) or periventricular leukomalacia (an abnormality of the area surrounding the ventricles), which may be associated with CP.

X rays, magnetic resonance imaging (MRI) studies, and computed tomography (CT) scans are often used to look for scarring, cysts, expansion of the cerebral ventricles (hydrocephalus), or other brain

abnormalities that may indicate the cause of symptoms. Blood tests and genetic tests may be used to rule out other possible causes, including muscular dystrophy (a disease characterized by the progressive wasting of muscles), mitochondrial (cellular) disease, and other inherited disorders or infections.

Treatment

A number of people with cerebral palsy, both children and adults, have found systematic relief and enhanced quality of life from a combination of alternative and complementary treatments, including nutritional therapy, **craniosacral therapy**, bodywork, herbal therapy, **homeopathy**, and **acupuncture**.

General recommendations

Pregnant women should avoid cleaning cat litter, which may contain toxoplasma parasite. This organism causes severe brain damage or death in the unborn fetus. Unprotected sex increases risk of contracting sexually transmitted diseases such as **genital herpes**, which can infect the unborn child. Women should also be vaccinated before getting pregnant to prevent measles and rubella, which can cause severe brain damage to the fetus. They should avoid taking certain drugs, **smoking**, or drinking alcohol. Cocaine, heroine, nicotine, and alcohol are toxic to the developing fetal brain.

Nutritional therapy

The following dietary adjustments have been recommended to alleviate some symptoms in patients with cerebral palsy:

- Those with CP should avoid potential allergenic foods. Allergic foods are believed to worsen symptoms in many CP patients.
- CP patients should also avoid preservatives and food additives such as MSG (which are potentially toxic to the brain) by eating fresh and unprocessed foods such as whole grains, vegetables, beans, fruits, nuts, and seeds.
- To improve muscle tone, CP patients should supplement their diets with magnesium, thiamine, pyridoxine, vitamin C, and bioflavonoids. Alternatively, they can take daily multivitamin/mineral supplements that can provide all these helpful nutrients and make sure they are getting adequate protein in diet or supplements.

Osteopathy

Craniosacral therapy, a special form of osteopathic treatment, may be successful in preventing cerebral palsy if performed right after a difficult labor or delivery by forceps. This manipulation of bones of the newborn's skull may prevent **stress** and distortion of the child's head occurring during traumatic delivery. Craniosacral therapy is less successful, however, in established cerebral palsy in an older child.

Bodywork

Bodywork such as massage, **reflexology**, **Feldenkrais**, or **Rolfing** can help improve blood circulation and muscle tone and reduce **muscle spasms** in patients with cerebral palsy.

Other therapies

Other potentially helpful treatments include acupuncture, homeopathy and herbal therapy, and dance and **music therapy**. Although still not proven in clinical trials, hyperbaric **oxygen therapy** (HBOT) has been used to alleviate many symptoms of CP. It provides pure oxygen at higher-than-normal pressure in an enclosed chamber and is more commonly known for treating divers with compression sickness. A 2007 review of six studies on the use of HBOT to treat patients with CP found some level of improvement in motor skills but concluded that additional research was needed.

Allopathic treatment

Cerebral palsy cannot be cured, but many of the disabilities it causes can be managed through planning and timely care. Treatment for a child with CP depends on the severity, nature, and location of the impairment, as well a child's associated problems. Optimal care of a child with mild CP may involve regular interaction with only physical and occupational therapists, whereas care for a more severely affected child may include a speech-language therapist, special education teacher, adaptive sports therapist, nutritionist, orthopedic surgeon, and neurosurgeon.

Parents of a child newly diagnosed with CP are not likely to have the necessary expertise to coordinate the full range of care their child will need. Support groups for parents of physically or mentally impaired children can be significant sources of both practical advice and emotional support. Many cities have support groups that can be located through the United Cerebral Palsy Association or a local hospital or social service agency. Children with CP are also eligible for special education services. The diagnosing doctor should refer parents to the local school district for

these services. Even children aged birth to three years are eligible through early intervention programs.

Influence of CP on development

Cerebral palsy may restrict a child's ability to reach for and grasp objects, to move about, to explore the properties of toys, and to communicate with others, which are all central activities in the child's growth and development. Therefore, the disease inhibits acquisition of motor skills, knowledge of the world, and social competence. The family can do much to overcome these restrictions by adapting the child's environment to meet his or her needs and providing challenges within the child's abilities to accomplish. The advice and direction of an occupational therapist can be critical to promoting normal development of the child with CP.

Posture and mobility

Spasticity, muscle coordination, ataxia, and scoliosis are all significant impairments that affect the posture and mobility of a person with cerebral palsy. Physical therapists work with the family to maximize the child's ability to move affected limbs, to develop normal motor patterns, and to maintain posture. Adaptive equipment may be needed, including wheelchairs, walkers, shoe inserts, crutches, or braces. The need for adaptive equipment may change as the person develops or as new treatments are introduced.

SPASTICITY. Spasticity causes muscles to shorten, joints to tighten, and postures to change. Spasticity can affect the ability to walk, use a wheelchair, and sit unaided; it can prevent independent feeding, dressing, personal hygiene care, or other activities of daily living. Contracture and dislocations are common consequences of spasticity.

Mild spasticity may be treated by regular stretching of the affected muscles through their full range of motion. Such activities are conducted at least daily. Moderate spasticity may require bracing to keep a limb out of the abnormal position or serial casting to return it to its normal position. Ankle-foot braces (orthoses) made of lightweight plastic are often used to increase a child's stability and to promote proper joint alignment.

Spasticity may also be treated with muscle relaxing drugs, including diazepam (Valium), dantrolene (Dantrium), and baclofen (Lioresal). A variety of experimental surgeries have been tried for people with cerebral palsy to control spasticity. Many of these procedures have not proven effective.

Ataxia and coordination

Ataxia, or lack of balance control, is another factor affecting mobility. Physical therapy is an important tool for helping the child with CP maximize balance. Coordination can be worsened if one member of a muscle pair is overly strong; bracing or surgical transfer of the muscle to a less overpowering position may help.

SCOLIOSIS. Scoliosis, or spine curvature, can develop when the muscles that hold the spine in place become either weak or spastic, which can cause **pain** and interfere with normal posture and internal organ function. Scoliosis may be treated with a trunk brace. If this proves unsuccessful, spinal fusion surgery may be needed to join the vertebrae together, which keeps the spine straight.

Seizures

Seizures occur in 30 to 50% of children with CP. Seizures may be treated with drugs, most commonly carbamazepine (Tegretol) or ethosuximide (Zarontin). A combination of a ketogenic diet and **fasting** may also be used to control seizures. Although the need for antiseizure medication is temporary in some children, it may be required throughout life for others.

Strabismus

Strabismus, or squinting and lack of parallelism in the eyes, occurs in nearly half of all people with spastic CP. Strabismus may be treated with patching and corrective lenses. When these treatments do not work, the condition may be treated with either surgery on the eye muscles causing the problem or by injection of botulinum toxin.

Nutrition

Due to poor muscle coordination, CP children may not take in adequate **nutrition** for full growth and development, worsening the results of the disorder. Careful attention to nutritional needs and nutritional supplements is required. Poor swallowing coordination may lead to aspiration, or inhaling of food or saliva. A speech-language therapist may be able to teach the person more effective movement patterns to avoid aspiration. In severe cases, a gastrostomy tube may be required to provide adequate nutrition directly into the digestive system while preventing aspiration.

Other common medical problems

Drooling, dental caries (cavities), and **gum disease** are more common in people with CP than in the general population, partly because of reduced coordination

and increased muscle tightness in the mouth and jaw. Each of these conditions can be prevented to some degree, either through behavioral changes alone or in combination with drug therapy. **Constipation** is more common as well and may be treated through dietary changes or with enemas or suppositories when necessary.

Communication

Poor coordination of the tongue and mouth muscles can also affect speech. Children may benefit from picture boards or other communication devices that allow them to point to make their desires known. For school-age children or older persons with CP, there are a large number of augmentative communication devices, including shorthand typing programs and computer-assisted speech devices. A speech-language therapist can offer valuable advice on the types of equipment available.

Education

The school best suited for the child with CP is determined by the presence and degree of mental impairment and physical impairment, as well as the facilities available in the area. Inclusion, or mainstreaming the child in a regular public school classroom, may work well for the child with mild physical impairment. Separate classrooms or special schools may be needed for more severely impaired children. Schooling for disabled students in the United States is governed by the Individuals with Disabilities Education Act (IDEA) at the federal level and state special education rules at the local level. An educational specialist within the school system or from a community social services agency may be able to help the family navigate the various bureaucratic pathways that will ensure the best schooling available.

The process of developing an educational plan for a child with CP begins with an assessment of the child's needs. The assessment is carried out under state guidelines by a team of medical professionals. After the assessment, the school district works with the parents and others involved in the child's education and treatment to develop an Individualized Educational Plan (IEP). The IEP states the child's specific needs for special instruction and indicates what services will be provided. The special services may be as simple as allowing extra time to travel between classes or as extensive as individualized instruction, adapted classroom equipment, and special testing procedures. More information about assessments and IEPs is available through the National Information Center for Children and Youth with Disabilities. The United Cerebral Palsy Association is another resource for advocacy, information, and legal rights.

Behavioral and mental health services

The child with CP may have behavioral problems or emotional issues that affect psychological development and social interactions. These problems may require special intervention or treatment, including behavior modification programs or individual and family counseling. Attention-deficit hyperactivity disorder is common in children with CP and may require behavioral, educational, and medical intervention.

Expected results

Cerebral palsy can affect every stage of maturation, from childhood through adolescence to adulthood. At each stage, indiviuals with CP and their caregivers must strive to achieve and maintain the fullest range of experiences and education consistent with each person's abilities. The advice and intervention of professionals is invaluable for many people with CP.

Although CP is not a terminal disorder, it can affect a person's lifespan by increasing the risk of infection, especially lung infections. Poor nutrition can contribute to the likelihood of infection. People with mild cerebral palsy may have near-normal lifespans. The lifespan of those with more severe forms, especially spastic quadriplegia, is often considerably shortened. However, over 90% of infants with CP survive into adulthood.

Cerebral palsy is one of the diseases for which stem cell research holds the greatest promise. Stem cell research makes use of very primitive cells with the ability to develop into any one of the specialized cells found in the body. As of 2008, extensive research had been conducted on the production and use of stem cells, but no successful application of stem cells for any specific disease in humans had been accomplished.

Prevention

The cause of most cases of CP is unknown, but it became clear in the 1990s that birth difficulties are not to blame in most cases. Developmental problems before birth, usually unknown and generally undiagnosable, are responsible for most cases. Although the incidence of CP caused by Rh factor incompatibility has declined markedly, the incidence of CP as a consequence of prematurity has increased because of the increasing success of medical intervention in keeping premature babies alive.

The risk of CP can be decreased through good maternal nutrition, avoidance of drugs or alcohol during pregnancy, and prevention or prompt treatment of

KEY TERMS

Ataxic—A condition in which balance and coordination are impaired.

Athetoid—The type of CP that is marked by slow, writhing, involuntary muscle movements.

Attention-deficit/hyperactivity disorder—A behavioral disorder marked by inattentiveness, hyperactivity, and impulsivity.

Augmentative communication devices—Computers, picture boards, and other devices that increase the ability to communicate, either with or without speech.

Contracture—Shortening of a muscle caused by an imbalance of force between opposing muscles.

Diplegia—Paralysis of corresponding parts on both sides of the body.

Dorsal rhizotomy—A surgical procedure that cuts nerve roots to reduce spasticity in affected muscles.

Dystonic—Describes the condition dystonia, in which fine motor control is confused.

Equinovarus—A condition in which the foot is typically pulled inward.

Equinus—A common postural deformity, in which the foot is extended by the strong pull of the rear calf muscles, causing the toes to point.

Hemiplegia—Paralysis of one side of the body.

Hypotonic—Describes the condition hypotonia, in which fine motor control is floppy, without tone.

Individualized educational plan (IEP)—A plan that guides the delivery of services to a child with special education needs.

Ketogenic diet—A specialized diet designed to increase the blood levels of breakdown products known as ketone bodies. For unknown reasons, this diet aids in seizure control.

Perinatal asphyxia—Lack of oxygen that occurs before, during, or around the time of birth.

Quadriplegia—Paralysis of all four limbs.

Serial casting—A series of casts designed to gradually move a limb into a more functional position, as opposed to doing it all at once with one cast, as would be done in setting a broken bone.

Spastic—Describes a condition in which the muscles are rigid, posture may be abnormal, and fine motor control is impaired.

Tenotomy—Surgical procedure that cuts the tendon of a contractured muscle to allow lengthening.

infections. In the 2000s research suggested that **magnesium** sulfate may reduce the risk of CP in mothers taking it for the medical treatment of preeclampsia and preterm labor.

Resources

BOOKS

Hinchcliffe, Archie. *Children with Cerebral Palsy: A Manual for Therapists, Parents, and Community Workers,* 2nd ed. Thousand Oaks, CA: Sage, 2007.

Martin, Sieglinde. *Teaching Motor Skills to Children with Cerebral Palsy and Similar Movement Disorders: A Guide for Parents And Professionals*. Bethesda, MD: Woodbine House, 2006.

Miller, Freeman. *Physical Therapy of Cerebral Palsy*. New York: Springer, 2007.

Miller, Freeman, and Steven J. Bachrach. *Cerebral Palsy: A Complete Guide for Caregiving,* 2nd ed. Baltimore: Johns Hopkins University Press, 2006.

PERIODICALS

Beckung, E., et al. "The Natural History of Gross Motor Development in Children with Cerebral Palsy Aged 1 to 15 Years." *Developmental Medicine & Child Neurology* (October 2007): 751 756.

McDonagh, Marian S., et al. "Systematic Review of Hyperbaric Oxygen Therapy for Cerebral Palsy: The State of the Evidence." *Developmental Medicine & Child Neurology* (December 2007): 942 947.

"Spastic Hemiplegia." *Developmental Medicine & Child Neurology* (January 2008): 71 75.

Subasi, Feryal, et al. "Factors Affecting Oral Health Habits among Children with Cerebral Palsy: Pilot Study." *Pediatrics International* (December 2007): 853 857.

ORGANIZATIONS

National Information Center for Children and Youth with Disabilities, PO Box 1492, Washington, DC, 20013 1492, (800) 695 0285, http://www.nichcy.org/.

United Cerebral Palsy Association, 1660 L St. NW, Suite 700, Washington, DC, 20036 5602, (800) USA 5 UCP, http://www.ucpa.org.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Cerebral vascular insufficiency

Definition

Cerebral vascular insufficiency is defined as insufficient blood flow to the brain. The most common cause of decreased blood flow is **atherosclerosis** of the arteries that supply blood to the brain.

Description

Cerebral vascular insufficiency is a common condition in the older population of developed countries due to the high prevalence of atherosclerosis. The artery affected in most cases of this disease is the carotid artery, which carries most of the brain's blood supply.

Causes and symptoms

A **stroke**, caused by reduced blood and oxygen supply, may be an indication of severe blockage in the carotid artery. Less severe blockage may still cause "mini-strokes" or transient ischemic attacks (TIAs), which can cause symptoms of **dizziness**, ringing in the ears, blurred vision, and confusion. Any of these problems could indicate cerebral vascular insufficiency.

Diagnosis

Diagnosis of cerebral vascular insufficiency is based upon the presence of one or more of the following symptoms:

- blurred vision
- depression
- vertigo (dizziness)
- headache
- lack of vigilance
- senility
- short-term memory loss
- ringing in the ears (tinnitus)

The diagnosis is confirmed by using an ultrasound exam to analyze blood flow to the brain.

Treatment

EDTA chelation therapy

EDTA (ethylene-diamine-tetra-acetic acid) **chelation therapy** involves intravenous or oral administration of EDTA, a compound which pulls out plaque components and helps to break it down. EDTA can improve blood flow and relieve symptoms associated with atherosclerotic vascular disease. It may be necessary to take vitamin and mineral supplements during EDTA therapy to avoid certain deficiencies, so a health practitioner should be consulted before beginning therapy, and a qualified EDTA chelation specialist should be consulted for intravenous therapy.

Aortic glycosaminoglycans (GAGs)

A natural medicine which can be helpful is an extract of aortic glycosaminoglycans (GAGs), a mixture which is naturally present in the human aorta. Significant improvements in both symptoms of cerebral vascular insufficiency and blood flow have been noted when aortic GAGs are added to the diet. An effective dosage of aortic GAGs is 100 mg daily and should be used for at least six months after a stroke or TIA, after consultation with a health practitioner.

Ginkgo biloba

In well-designed studies, **ginkgo biloba** (*Ginkgo biloba*) extract (GBE) has displayed an ability to reduce major symptoms of cerebral vascular insufficiency, including short-term **memory loss**, vertigo, **headache**, ringing in ears, lack of vigilance, and **depression**. A consultation with a practitioner or doctor is recommended before beginning a ginkgo biloba regimen.

Properties of GBE helpful for cerebral vascular insufficiency:

- Neutralizes free radicals.
- Makes blood more available in ischemic areas through dilation.
- Inhibits platelet-activating factor (PAF) as an alternative for those allergic to aspirin.
- Increases the rate at which information is transmitted at the nerve cell level, improving vigilance and mental performance.

Coleus forskohlii

Many of the properties of **coleus** (*Coleus forskohlii*) prove helpful for this condition. Coleus is a vasodilator, an agent that widens or dilates blood vessels to allow more blood flow. The use of coleus as a treatment for high blood pressure indicates its usefulness in cerebral vascular insufficiency and resulting stroke. Its ability to retard platelet activation and accumulation indicate that it may be helpful in preventing atherosclerotic events.

Spinal manipulative therapy

In one study, some patients receiving soft tissue therapy, **trigger point therapy**, postisometric **relaxation** of spasmed muscles (a technique used for relaxation of muscle tension), and spinal manipulation to partially dislocated vertebrae experienced improvement of cerebral vascular insufficiency symptoms such as vertigo, **fatigue**, and sleep disturbances, and improved cerebral circulation. However, patients who were initially diagnosed with an early form of cerebral vascular insufficiency with vascular disturbances in the neck area or vertebral artery syndrome had their symptoms worsen during manipulative treatment.

A person with these diagnoses should not undergo spinal manipulation.

Allopathic treatment

Vasodilators help to treat the symptoms of cerebral vascular insufficiency and arteriosclerosis by increasing the blood flow in veins and arteries. *Isoxsuprine* is a vasodilator that relaxes blood vessels, making them wider and allowing blood to flow through them more easily. Other treatments that are becoming more common are carotid angioplasty (surgical repair of the arteries that pass up the neck and supply the head) and stenting. (A stent is a device that is used to keep open a tubular structure, like a blood vessel.)

If a person has severe cerebral vascular insufficiency, including frequent TIAs or past stroke and severe (about 70%) blockage, carotid endarterectomy may be necessary. This surgery involves the surgical removal of the atherosclerotic plaque from the carotid artery.

Expected results

Physicians who use EDTA chelation treatment claim great success; however EDTA chelation therapy has not been FDA approved for treatment of atherosclerosis. People considering this therapy may want to do some research and talk with their doctors or an EDTA chelation specialist.

Carotid endarterectomy is a surgery which may have serious complications, including strokes, which may cause permanent neurological damage or death. However, for people with severe cerebral vascular insufficiency this may be the best option. A person with this condition should talk with his or her doctor about the risks and benefits of surgery.

Any treatment for vascular disease caused by atherosclerosis should include an evaluation of diet and other factors to prevent re-blocking of the arteries. Improved diet and **exercise** can help a perzson's long term outlook for this condition.

Prevention

Measures taken to prevent **hypertension** and reduce **cholesterol** and atherosclerosis will also help prevent cerebral vascular insufficiency. Proper diet and lifestyle may not only protect against atherosclerosis, but may also reverse blockage in the arteries. A low-fat diet including vegetables, grains, legumes, and soybean products along with cold water fish and some poultry (no red meat) in addition to **stress** reduction techniques and exercise can reduce atherosclerosis. Other important factors are controlling high blood pressure and diabetes and avoiding tobacco. Homocysteine, an amino acid the human body produces that is related to atherosclerosis, may be reduced through dietary reform as mentioned above and supplementation of **folic acid**, B_6(pyridoxine), and B_{12}. Gingko biloba may also be taken as a supplement for its properties mentioned above.

KEY TERMS

Arteriosclerosis—Any hardening of the arteries.

Atherosclerosis—Hardening of the arteries characterized by plaque buildup.

Endarterectomy—A procedure in which the diseased inner portions of an artery, including any deposits, are removed.

Free radicals—Atoms in the body that carry an unpaired electron. Thought to promote the formation of arterial plaque in atherosclerosis.

Homocysteine—An amino acid in the blood, too much of which is related to a higher risk of vascular disease.

Ischema—Local anemia due to mechanical obstruction, mainly arterial narrowing, of the blood supply.

Vigilance—Attentiveness or alertness.

Resources

BOOKS

Goldberg, Burton. *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

ORGANIZATIONS

American College for Advancement in Medicine. 23121 Verdugo Drive, Suite 204, Laguna Hills, CA 92653. http://www.acam.org.

Life Extension Foundation. 995 SW 24th Street, Fort Lau derdale, FL 33315. (954) 766 8433, (877) 900 9073. http://www.lef.org.

National Institute of Neurological Disorders and Stroke. Bethesda, MD 20892. http://www.ninds.nih.gov/index.htm.

OTHER

Oral chelation for improved heart function. http://www.kirlian.org/life_enhancement_products/oralchelation.html. July 25, 2000.

Melissa C. McDade

Cervical dysplasia

Definition

Cervical dysplasia is a term to describe the appearance of abnormal cells on the cervix.

Description

The cervix is an organ in the female reproductive system, located at the lower end of the uterus and separating it from the vagina. When a woman is pregnant, the cervix seals off the uterus to carry the developing fetus. During **childbirth**, the cervix dilates to allow the baby to pass through. The cervix resembles a small mound with a dimple in the middle.

The cervix has two types of cells. The outer part of the cervix near the vagina is covered with squamous epithelial cells, and the cervical canal is lined with epithelial cells that secrete mucous during ovulation. The border between these two types of cells is called the transformation zone, which changes shape and position with age, especially if a woman carries a **pregnancy**. Women's health providers may closely examine the transition zone to watch for problems in both types of cells. Young women are particularly at risk for problems affecting the transition zone, because early in life the transition zone is exposed on the face of the cervix, making it more vulnerable to exposure of viruses and other agents.

The cervix is susceptible to exposure of sexually transmitted **infections** (STIs) including the human papillomavirus (HPV), as well as other problems including cervicitis, infections and **cancer**. Cervical dysplasia is considered a precancerous condition, because cells of the cervix have abnormalities. The abnormal cells are characterized as mild, moderate or severe dysplasia. Cervical dysplasia is treatable when detected early, and only a very small percentage of cases will develop into cervical cancer.

Causes and Symptoms

Cervical dysplasia is believed to be caused by a confluence of factors, the most significant of which is the presence of HPV infection. Human papillomavirus is a group of viruses that include over 120 different **strains** or types. More than 30 of these are sexually transmitted, and are further subdivided into "high–risk" and "low–risk" types. Low–risk HPV infections may cause mild abnormalities of cervical cells or **genital warts**. Infection with high–risk strains of HPV may cause abnormalities of cervical cells, and may lead to cancer of the cervix or other parts of the genitalia of both females and males. There are at least thirteen high–risk types of HPV. HPV types 16 and 18 are correlated with about 70% of invasive cervical cancer. High–risk strains are present in 93–100% of cases of cervical cancer. The low–risk strains 6 and 11 are the most common infections causing condylomata, or genital **warts**.

Infection with the human papillomavirus is extremely common. According to the United States Center for Disease Control (CDC), approximately 20 million people are infected with HPV and over 6 million acquire new infections annually. The CDC data estimates that at least 80% of women will contract a genital HPV infection by the time they are fifty years old. Prevalence of HPV infection peaks in the age group 20–24 years, age 15–19 years has the next highest prevalence. Incidence declines after age 30. HPV infections are either transient or persistent. A study of sexually active college–age women showed that 70% of newly infected women clear the infection within 12 months, and 90% cleared the infection within 24 months. Clearance in older women is 50–80%. Transient infections can cause mild abnormalities of cervical cells, whereas persistent infections cause more severe cell abnormalities.

There are several concomitant variables that increase risk of cervical dysplasia. Sexual behaviors associated with increased risk of dysplasia are: greater than three sexual partners, first intercourse under age twenty, history of other STIs, and not using barrier methods to protect against sexually transmitted infections (condoms, dental dams). HPV transmission occurs in both heterosexual and homosexual partnerings and safer sex precautions using barrier methods can reduce risk.

Another risk factor for developing cervical dysplasia is **smoking**. Women who smoke have a two–fold increased risk of developing cervical cancer. Nicotine, a known carcinogen found in cigarettes, has been found in high concentration in the cervical cells of women who smoke. The risk of smoking appears to be dose–dependent, with severity of dysplasia increasing with the number of cigarettes smoked each day. Smoking more than ten cigarettes daily increases the risk of high–grade dysplasia. Exposure to second–hand smoke is also considered an increased risk.

Additional co–factors in the development of cervical dysplasia and cervical cancer are nutrient deficiencies, oral contraceptive use for five years or longer, more than two pregnancies carried to term, and a compromised immune system. Deficiencies of **vitamin A**, **vitamin C** and **folic acid** have all been found to

correlate with cervical dysplasia. Oral contraceptives, in addition to depleting several nutrients, have been found to increase severity of abnormal cellular changes in women with high–risk HPV infection. Both the use of oral contraceptives and the number of full–term pregnancies appear to increase risk by promoting the progression of dysplasia to cervical cancer when HPV is present. Risk of cervical cancer increases slightly with each pregnancy carried to term, due to the effects that pregnancy has on the transformation zone of the cervix. A woman who has been pregnant and given birth seven times has nearly four–fold increased risk of cervical cancer. Additionally, impaired immune function will increase cervical cancer risk due to diminished immune activity needed to clear the HPV infection.

Cervical dysplasia is generally asymptomatic, which means that most women are not aware of the condition by experiencing symptoms. To detect cervical dysplasia, women must rely on diagnostic tests.

Diagnosis

The Pap test is the primary screening tool for detecting cervical dysplasia or cervical cancer. Since its development in the 1950s, screening for abnormal cervical cells with the Papanicolaou (Pap) test has reduced deaths from cervical cancer in the U.S. by over 70%. Incidence of cervical cancer has declined by at least 50% since 1960 in populations of American women who get regular Pap tests, because abnormal cell changes are detected and treated earlier.

It is recommended that women get Pap tests annually beginning at age 21, or within three years of first becoming sexually active, whichever comes first. Women should continue being tested annually until age 65, at which point their health provider can determine how frequently they should continue being screened for cervical cancer. The Pap test is performed by doctors, nurses, midwives and other clinical health care providers. To prepare for the test, a woman must avoid sexual intercourse, using contraceptive foam or jelly, douching, and using tampons or medications vaginally for one to two days. During a speculum examination, the health care provider will insert a small brush and spatula into the cervix to collect a sample of cells.

In 1996, the FDA approved the use of a liquid preparation for Pap testing that has replaced the previous slide method. The advantages of this test are increased sensitivity for abnormal cell changes, and the ability to reflexively test for the presence of high–risk HPV if abnormal cells are found. As of early 2008, there is no comparable test for HPV in males.

For definitive diagnosis of cellular changes, a colposcopic examination and biopsy may be necessary. Colposcopy is a tool for examining the cervix under magnification, often using an iodine–based solution to evaluate for abnormal cells. Biopsy of any abnormal tissue changes on the face of the cervix will be taken during the colposcopic examination, along with a sample of the cells in the endocervical canal. Cell changes on the Pap test are classified according to the grade of abnormality and correlate with different guidelines for management. The lowest category is called ASC–US, which stands for Atypical Squamous Cells of Undetermined Significance, meaning that abnormal cells were found but the significance of these findings is unclear. Of women diagnosed with ASC–US on Pap tests, 75% did have higher grades of dysplasia on further workup, but 10–20% had moderate to severe dysplasia. For ASC–US and mild cases of cervical dysplasia called Low–grade Squamous Intraepithelial Lesion (LSIL), reflex testing for high–risk HPV is often done. Practitioners may choose to monitor these patients with Pap tests every three to six months to determine if the condition will improve on its own, as these cases are usually indicative of a transient HPV effect. Women diagnosed with High–grade Squamous Intraepithelial Lesions (HSIL) may have moderate to severe dysplasia, typically caused by persistent HPV infection and more likely to progress.

Treatment

Conventional treatment guidelines are different depending on the grade of abnormal tissue. A procedure known as loop electrosurgical exicision procedure (LEEP) employs a small wire loop with electrical charge to destroy abnormal cells. An alternative surgical procedure called conization may be used, in which a surgeon removes a cone–shaped segment of the cervix. Less common treatments to destroy abnormal cells of the cervix are freezing them with cryosurgery, or burning them with trichloroacetic acid.

There are several natural therapies that can be utilized for cervical dysplasia in conjunction with conventional management. **Nutrition**, dietary supplements and **botanical medicine** can support the immune system in resolving the HPV infection and restoring health to cervical cells. Lifestyle modifications such as avoidance of smoking, alcohol, **caffeine** and sugar reduce co–factors for dysplasia that inhibit immune function. **Stress** management and **exercise**

are also important in maintaining immune system health.

Nutritional therapy for dysplasia consist of a diet predominantly vegetarian and low in fat, emphasizing whole grains, fresh fruits and vegetables, nuts and legumes. Decreasing animal proteins from meat and dairy will reduce intake of hormones and steroids that can exacerbate hormone imbalances. Further nutritional support includes the supplementation of B–complex vitamins, particularly folic acid, vitamin B6 and vitamin B12. Vitamins A, C and E are recommended, as are minerals **selenium** and **zinc**.

Because estrogen plays a role in the progression of cervical dysplasia, treatment targeting hormone balance may be helpful. Phytoestrogens like soy and flax seeds can be incorporated into the diet for hormone balance. **Green tea** extract inhibits growth of precancerous cells on the cervix and is beneficial when used both orally and topically to the cervix. Vaginal suppositories are available that combine anti–viral and immune support botanicals with potent nutrients, and have been shown to support healing of the cervical tissue in dysplasia. Botanicals such as **thuja**, ligusticum and **usnea** are used to inhibit viral proliferation, and immune modulating herbs include **Echinacea** and **goldenseal**. Cruciferous vegetable compounds indole–3–carbinol (I3C) and diindolylmethane (DIM) are indicated for cervical dysplasia because they both protect against cancer and support healthy estrogen metabolism. Supplemental I3C and DIM can be used therapeutically to help reverse cellular abnormalities of the cervix.

Prognosis

Cervical dysplasia caused by HPV infection and other co–factors often clears up completely without any medical intervention. In 50% of cases HSIL resolves without conventional treatment. Untreated HSIL may progress to non–invasive cancer known as carcinoma in situ, or to invasive cervical cancer. Invasive cervical cancer has a 92% survival rate if caught and treated early, and survival is nearly 100% for non–invasive cases of cervical cancer.

Prevention

Prevention of cervical dysplasia includes reduction of risk by using safer sex practices with barrier methods, avoiding cigarette smoke and maintaining healthy diet and lifestyle habits. Women diagnosed with dysplasia may consider avoiding use of oral contraceptives. The Pap test continues to be an important tool in prevention of severe cervical dysplasia and cervical cancer. The greatest incidence of cervical cancer is in women who had never been screened or who had not had a Pap test in the last five years.

KEY TERMS

Cervix—The lower end or "neck" of the uterus, separating the womb from the vagina.

Conization—Surgical removal of a cone shaped piece of tissue from the cervix

Dysplasia—Abnormality in the size, shape or organization of cells that may be precancerous.

Human papillomavirus—Over 120 types of viruses, about 30 of which are sexually transmitted and cause genital warts and cervical cell changes. HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 68 and 82 are considered high risk as they are associated with pre cancerous dysplasia.

Lesion—An area of abnormal tissue.

Neoplasia—The development of new, abnormal tissue.

Squamous epithelial cells—The flat cells that make up the surface layer of skin and mucous membranes.

In 2006, the FDA approved a vaccine for HPV, (Gardasil, developed by Merck & Co.) designed to protect users from four strains of HPV: low–risk strains 6 and 11, and high–risk strains 16 and 18. A bivalent vaccine for HPV 16 and 18 is also being developed (manufacturer GlaxoSmithKline). Gardasil, administered in a series of three injections within a six month period, has been approved for use in females aged 9 to 26 years. It appears that the vaccine is most effective in protecting against HPV infection in females who have not yet become sexually active. It is notable that HPV 16 and 18 correlate with approximately 70% of cases of invasive cervical cancer, and the vaccine does not confer complete protection against HPV and cervical cancer. No long–term data is available on the efficacy of the vaccine in providing ongoing protection against HPV.

As of early 2008, the vaccine is not being targeted to males, although males are carriers of HPV and are susceptible to genital warts and, rarely, genital cancers from high–risk HPV. After its placement on the market in 2006, several states moved to mandate the Gardasil vaccine for preadolescent girls, a controversial decision that has since been overturned in at least one state.

Resources

BOOKS

Hudson, Tori, N.D. *Women's Encyclopedia of Natural Medicine: Alternative Therapies and Integrative Medi cine for Total Health and Wellness*. New York: McGraw Hill, 2008.

PERIODICALS

Ahn, W.S. S.W. Huh, C.K. Kim, et al. "Protective Effects of Green Tea Extracts (Polyphenon E and EGCG) on Human Cervical Lesions." *European Journal of Cancer Prevention*. 2003;12(5):383 390.

Berek, JS. "Bethesda III, ACS, ACOG and ASCCP Guide lines for Cervical Cancer." *OBG Management* Septem ber 2003; Supplement, 16 21.

The Females United to Unilaterally Reduce Endo/Ecto cervical Disease (FUTURE II) Study Group. "Quadrivalent Vaccine against Human Papillomavi rus to Prevent High Grade Cervical Lesions." *The New England Journal of Medicine*. 2007;356(19):1915 1927.

Fey, M.C., M.W. Beal. "Role of Human Papillomavirus testing in Cervical Cancer Prevention." *Journal of Midwifery & Women's Health*.2004;49(1):4 13.

Giulian, A.R., L. Sedjo, D.J. Roe, et al. "Clearance of Oncogenic Human Papillomavirus (HPV) Infection: Effect of Smoking." *Cancer Causes and Control*. 2002;13 (9):839 846.

Mao, C. L.A. Koutsky, K.A. Ault, C.M. Wheeler, et al. "Efficacy of Human Papillomavirus 16 Vaccine to Prevent Cervical Intraepithelial Neoplasia." *Obstetrics & Gynecology* 2006;107(1):18 27.

Muller, C.Y. "The Role of HPV: Cervical Dysplasia and Cancer, DNA Testing, and Vaccine Trials." *OBG Management*. September 2003; Supplement, 9 15.

Saslow, D., C.D. Runowicz, D. Solomon, et al. "American Cancer Society Guideline for the Early Detection of Cervical Neoplasia and Cancer." *CA: Cancer Journal of Clinicians* 2002;52(6):342 362

Thorne Research, Inc. "Indole 3 Carbinol." *Alternative Medicine Review* 2005;10(4):336 342.

Zeligs, M.A. "The Cruciferous Choice: Diindolylmethane or I3C? Phytonutrient Supplements for Cancer Prevention and Health Promotion." *Chemico Biological Interac tions*. 1998;110(1 2):1 5

ORGANIZATIONS

American College of Obstetricians and Gynecologists (ACOG), 409 12th Street, SW, P.O. Box 96920, Washington, DC, 20090 6920, http://www.acog.org.

Quit Smoking, Center for Disease Control and Prevention, 1600 Clifton Road NE, Atlanta, GA, 30333, (800) 311 3435, (404) 498 1515, http://www.cdc.gov/tobacco/quit_smoking/.

Smokefree.gov, in affliliation with the National Cancer Institute, CDC, National Institutes of Health, Department of Health and Human Services, and USA.gov, 1 800 QUITNOW (1 800 784 8669), TTY 1 800 332 8615, http://www.smokefree.gov/.

Diana Christoff Quinn, ND

CFS *see* **Chronic fatigue syndrome**

Chakra balancing

Definition

Chakra balancing is based on the ancient Indian belief in a series of seven *chakras*, or energy centers. Chakra is the Sanskrit word for wheel. These energy centers are believed to be located at specific points between the base of the spine and the top of the skull. Some esoteric systems include additional chakras, said to extend beyond the physical body into the human auric field. Each chakra is believed to relate to particular organs of the body, ailments, colors, elements, and emotions. However, different systems or sources that use the idea of chakras may disagree about the details. The concept of chakras plays a key role in two ancient Indian healing systems (**ayurvedic medicine** and **yoga**) that are popular today. In recent decades, however, many modern therapies (like **polarity therapy**, **therapeutic touch**, process **acupressure**, core energetics, and **color therapy**) have also incorporated the idea of chakras into their own visions of healing. Various approaches may be used to "balance" the chakras. Chakra balancing is believed to promote health by maximizing the flow of energy in the body, much as a tune-up enables a car to operate at peak efficiency.

Origins

Yoga

Chakras are part of the ancient belief system associated with yoga. These traditions were handed down orally for thousands of years before being codified by Patanjali in his *Yoga Sutras*, several centuries before Christ.

Ayurveda

The ancient healing science of ayurveda is based on a collection of scriptures known as *vedas* (a Sanskrit word meaning knowledge or wisdom). Ayurveda literally means "life knowledge." It remained the predominant form of health care in India until the British colonial government tried to suppress it during the nineteenth century. Over the last half-century, however, a modernized form of ayurveda has gained considerable

popularity in India. More recently, traditional ayurveda has been popularized in the West by such high-profile advocates as Deepak Chopra.

Benefits

Balancing the chakras is believed to promote general health and well-being by ensuring the free flow of life energy (also known as *prana* or *qi*) throughout the body. It is believed that blockages in the flow of this vital energy will eventually result in mental, emotional, and/or physical illness. By removing such blockages and maximizing energy flow, practitioners are said to enable body, mind, and spirit to function optimally. Some alternative practitioners, such as medical intuitives, say they can "read" a patient's chakras to detect imbalances and diagnose problems. This is also sometimes done using a pendulum.

Description

Yoga

Just as the various forms of yoga attempt to mediate between the physical and spiritual realms, so the chakras are believed to operate as energy transformers. They are often shown as circles, spaced at intervals along the spine, or sometimes as funnels of energy. Specific chants or sounds associated with the different chakras are used in some yogic **meditation** practices as tools for healing and spiritual evolution.

Each of the seven chakras is said to have specific physiological and metaphysical functions that relate to both the nature of the associated blockages and to the physical problems they produce.

- Base/root chakra (muladhara). The first chakra, located at the base of the spine, is linked with basic survival and with the adrenal glands. It is associated with the color red and the earth element.
- Second chakra (svadisthana). Thought to reside in the genital region, this chakra is linked with sexuality and with the reproductive system. It is associated with the color orange and the water element.
- Third chakra (manipura). Situated near the navel, this chakra is linked with the pancreas and the solar plexus. It is associated with the color yellow, the fire element, and power in the world.
- Heart chakra (cnahata). The fourth chakra, associated with the heart and the immune system, is believed to be the seat of love and compassion. It is associated with the color green and the air element.
- Throat chakra (visuddha). The fifth chakra, situated in the throat area, is associated with the thyroid gland, the color blue, and communication.
- Brow/forehead chakra (ajna). The sixth chakra, also known as the "Third Eye," is said to reside in the forehead. It is associated with hormonal production, the color indigo, and intuition.
- Crown chakra (saha srara). The seventh chakra, located at the top of the skull, is associated with elevated spiritual consciousness, the pineal gland, and the color violet.

Precautions

In recent decades, yoga has gained widespread acceptance in the West as a tool for **relaxation**, **stress** reduction, increased flexibility and energy. However, there is no generally recognized scientific evidence for the existence of either chakras or prana.

Side effects

Although the concept of chakra balancing is harmless, any of the many contemporary therapies that include chakras may also use specific treatments or practices with potential side effects. Anyone exploring such therapies should be cautious and keep his or her healthcare provider informed of these therapies.

Research and general acceptance

Although there is a growing body of research documenting the positive effects of yoga and meditation, chakras have not been measured by scientific instruments. Support for the concept is based on anecdotal rather than scientific evidence.

Resources

BOOKS

Cassileth, Barrie R. *The Alternative Medicine Handbook*. New York: W.W. Norton & Company, 1998.

Pond, David. *Chakras for Beginners: A Guide to Balancing Your Chakra Energies*. Saint Paul: Llewellyn Publica tions, 1999.

Woodham, Anne, and David Peters. *DK Encyclopedia of Healing Therapies*. New York: DK Publishing, 1997.

Peter Gregutt

Chamomile

Description

Chamomile is a traditional medicinal herb native to western Europe, India, and western Asia. It has become abundant in the United States, where it has

A field of chamomile. *(© Scott Camazine/Photo Researchers, Inc. Reproduced by permission.)*

escaped cultivation to grow freely in pastures, cornfields, roadsides, and other sunny, well-drained areas. The generic name, chamomile, is derived from the Greek, *khamai*, meaning "on the ground," and *melon*, meaning "apple." The official medicinal chamomile is the German chamomile *Matricaria recutita*. Chamomile was revered as one of nine sacred herbs by the ancient Saxons. The Egyptians valued the herb as a cure for **malaria** and dedicated chamommile to their sun god, Ra. Two species of this sweet-scented plant, Roman chamomile and German chamomile, have been called the true chamomile because of their similar appearance and medicinal uses.

Roman chamomile *Chamaemelum nobile* is a member of the *Asteraceae*, or daisy family. It is a hardy, low-growing, perennial. Because of the creeping roots and compact, mat-like growth of this species it is sometimes called lawn chamomile. Roman chamomile releases a pleasant, apple scent when walked upon. It was used as a strewing herb during the middle ages to scent the floors and passageways in the home and to deter insects. The Spanish call the herb *manzanilla*, or "little apple." This fragrant evergreen is a garden favorite. It is also called the physician herb because of its beneficial effect on other herbs as a companion in the garden. Blossoms grow singly on long stalks attached to the erect, branching, hairy stems. The tiny, daisy-like flowers, blooming May to September, have a small, yellow, solid cone surrounded by white rays. The leaves are twice divided and have a feathery appearance. They are light green and somewhat shiny.

German chamomile *Matricaria recutita*, or *Chamomilla recutita* is a hardy, self-seeding annual herb. It has long been cultivated in Germany to maximize its medicinal properties. The hollow, bright gold cone of the blossom is ringed with numerous white rays. The herb has also been called scented mayweed, and Balder's eyelashes, after Balder, the Norse God of Light. German chamomile is also a sprawling member of the *Asteraceae* family, as it closely resembles the Roman chamomile.

Dyer's chamomile *Anthemis tinctora*, also known as yellow chamomile, or golden marquerite, is valued for its use primarily as a dye plant. This native of southern and central Europe is also found in Britain and North America, where it grows wild in many

places. It closely resembles the other species, but does not have the medicinal properties of Roman and German chamomile. This species may be biennial or perennial. Both the disk and the rays of the blossom are golden yellow, yielding a distinctive dye that varies from a bright yellow to a more brownish-yellow tint. The type of mordant used influences the color produced. Dyer's chamomile is hardy and can grow to three feet, spreading out as wide as it is high. The branched stems are erect and woolly, with leaves that can grow to three inches long.

KEY TERMS

Anodyne—A medicinal herb that relieves distress or soothes pain.

Coumarin—A chemical compound found in plants that breaks down red blood cells.

Decoction—A plant extract obtained by boiling the water in which plant parts have been soaked and then straining out the plant materials.

General use

The aromatic flower heads and herba (leaves) of both Roman and German chamomile are used medicinally. They are highly scented with volatile, aromatic oil, including the heat-sensitive Azulene, which is the blue chamomile essential oil. The phytochemical constituents in chamomile also include flavonoids, coumarins, plant acids, fatty acids, cyanogenic glycosides, **choline**, tannin, and salicylate derivatives. This bittersweet herb acts medicinally as a tonic, anodyne, antispasmodic, anti-inflammatory, antibacterial, antiallergenic, and sedative. Traditionally, a mild infusion of the herb has been safely used to calm restless children, and to ease **colic** and teething **pain** in babies. It is also effective in relieving acid **indigestion** and abdominal pain. Its carminative properties relieve intestinal **gas**, and it helps in cases of **diarrhea**, **constipation**, and peptic ulcers. The herbal tea can ease symptoms of colds and flu by relieving **headache** and reducing **fever**. The infusion is also helpful to treat **toothache**, arthritis, **gout**, and premenstrual tension. It may also be used in douche preparations, or sitz baths. As an external wash in strong infusion, or decoction, or as part of a hot compress, the herb can soothe **burns** and scalds, skin **rashes**, and sores. Chamomile can be used in a douche, as a gargle for mouth ulcers, as a soothing eye wash for **conjunctivitis**, and as a hair rinse to brighten the hair. Chamomile blossoms may also be used as an herbal aromatic treatment, providing a tonic lift with its pleasing scent. This use of chamomile is especially popular among Hispanics living in the southwestern United States, who use the herb at significantly higher levels than the rest of the population.

Preparations

Chamomile is most often prepared as an infusion of the blossoms of German chamomile, and less commonly of Roman chamomile. Traditionally the tiny blossoms are picked on midsummers' eve. The best time to harvest is on a sunny day when the mass of blossoms is at its fullness in the morning. Harvesting chamomile blossoms can be painstaking work, requiring a gardner's best patience. Pinch off the flower head, leaving the stem. Fresh or dried blossoms may be used in herbal preparations.

Blossoms to be dried for storage should be spread singly on a screen or mat and placed in a well-ventilated place, out of direct sun, with a temperature close to 95°F (35°C). The rapid drying will preserve much of the volatile oil and other medicinal properties. A few blossoms go a long way with this pleasant and safe herbal ally. Store dried blossoms in tightly sealed, glass containers, away from light. They will maintain potency for about one year. Chamomile is prolific, and the plant blossoms frequently throughout the summer. Sometimes two or three harvests can be made in one season.

Chamomile tea may be made from an infusion of blossoms prepared as a tisane, for a single, soothing cup, or in a larger quantity for use throughout the day. Chamomile combines well with mints, such as **lemon balm** (*Melissa officinalis*) or **spearmint** (*Mentha spicata*), combined in equal quantity. For a tisane, use 1 tsp of dried blossoms, or 1.5 tsp of freshly picked flowers in a warm cup. Heat water to the boiling point and pour over the blossoms in glass container. Cover, and infuse for 3–5 minutes. Let strain. Be careful not to oversteep chamomile, lest it lose its delicate flavor to a bitter edge. Standard dose is up to three cups per day. The prepared tea will keep for a day or two in the refrigerator.

To prepare a chamomile decoction, which is a stronger preparation, let the plant parts steep in a covered nonmetallic pot for at least ten minutes. The decoction may be used as a skin wash, hair rinse, mouth wash, or to bathe **wounds**.

An extract of the essential oil can be prepared by placing 2 oz (57 g) of fresh blossoms into a glass container and covering the plant with 0.5–1 pt (0.24–0.47 l) of olive oil. Place the mixture on a sunny window sill

for about one week. Strain and store in a dark container with a tight-fitting lid. The oil remains potent for up to one year. It is best when applied warm.

Precautions

Chamomile has been used over the centuries and is generally considered a safe and gentle herbal remedy that may be used daily as a calming tea. Persons who may be allergic to such pollen-bearing plants as chamomile would be wise to experiment with this herbal remedy with some caution.

Side effects

The moderate internal use of chamomile preparations has no known side effects; however, some herbalists warn that the herb, when taken internally in excessive doses, can induce **vomiting** and produce vertigo (**dizziness**). With regard to the external use of chamomile preparations, a small number of persons experience mild skin irritation.

Interactions

There are no contraindications for using this gentle, healing herb. Chamomile does combine well with other herbs that enhance its pleasant and medicinal qualities.

Resources

BOOKS

Gladstar, Rosemary. *Herbal Healing for Women*. New York: Simon & Schuster, 1993.

Hoffman, David. *The New Holistic Herbal*. Boston, MA: Element Books, Inc., 1992.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

McVicar, Jekka. *Herbs for the Home*. New York: Viking Penguin, 1995.

PERIODICALS

Rivera, J. O., M. Ortiz, M. E. Lawson, and K. M. Verma. "Evaluation of the Use of Complementary and Alter native Medicine in the Largest United States Mexico Border City." *Pharmacotherapy* 22 (February 2002): 256 264.

Schempp, C. M., E. Schopf, and J. C. Simon. "Plant Induced Toxic and Allergic Dermatitis (Phytodermati tis)." [Article in German] *Hautarzt* 53 (February 2002): 93 97.

Clare Hanrahan
Rebecca J. Frey, PhD

Charcoal, activated

Description

Activated charcoal is a fine, black, odorless, and tasteless powder. It is made from wood or other materials that have been exposed to very high temperatures in an airless environment. It is then treated, or activated, to increase its ability to adsorb by reheating with oxidizing **gas** or other chemicals to break into a very fine powder. Activated charcoal is pure carbon specially processed to make it highly adsorbent of particles and gases in the body's digestive system.

Activated charcoal has been used since ancient times to cure a variety of ailments including poisoning. Its healing effects have been well documented since as early as 1550 B.C. by the Egyptians. However, charcoal was almost forgotten until 15 years ago when it was rediscovered as a wonderful oral agent to treat most overdoses and toxins.

General use

Activated charcoal's most important use is for treatment of poisoning. It helps prevent the absorption of most poisons or drugs by the stomach and intestines. In addition to being used for most swallowed poisons in humans, charcoal has been effectively used in dogs, rabbits, rats and other animals. It can also absorb gas in the bowels and has been used for the treatment of gas or **diarrhea**. Charcoal's other uses, such as for the treatment of viruses, bacteria, bacterial toxic by-products, snake venoms and other substances by adsorption, have not been supported by clinical studies. By adding water to the powder to

Activated charcoal is pure carbon specially processed to make it highly adsorbent of particles and gases in the body's digestive system. *(julie woodhouse / Alamy)*

make a paste, activated charcoal can be used as an external application to alleviate **pain** and **itching** from **bites and stings**.

Poisons and drug overdoses

It is estimated that one million children accidentally overdose on drugs mistaken as candies or eat, drink, or inhale poisonous household products each year. In the year 2000, the American Association of Poison Control Centers said that more than 1,142,000 calls had been received in centers around the country regarding poison exposures to children under six years of age. Activated charcoal is one of the agents most commonly used for infants and toddlers exposed to poison. It can absorb large amounts of poisons quickly. In addition, it is nontoxic, may be stored for a long time, and can be conveniently administered at home. Charcoal works by binding to irritating or toxic substances in the stomach and intestines. This prevents the toxic drug or chemical from spreading throughout the body. The activated charcoal with the toxic substance bound to it is then excreted in the stool without harm to the body.

When poisoning is suspected the local poison control center should be contacted for instructions. They may recommend using activated charcoal, which should be available at home so that it can be given to the poisoned child or pet immediately. For severe poisoning, several doses of activated charcoal may be needed. A 2002 study showed that in some cases, charcoal could be administered at home sooner than in the emergency room, and was beneficial for children who had ingested poisonous mushrooms. However, the study concluded that more research was needed to be sure that home-administered doses were accurate and the best solution for other types of poisoning.

Intestinal disorders

In the past, activated charcoal was a popular remedy for gas. Even before the discovery of America by Europeans, Native Americans used powdered charcoal mixed with water to treat an upset stomach. Now charcoal is being rediscovered as an alternative treatment for this condition. Activated charcoal works like a sponge. Its huge surface area is ideal for soaking up different substances, including gas. In one study, people taking activated charcoal after eating a meal with high gas-producing foods did not produce more gas than those who did not have these foods. Charcoal has also been used to treat other intestinal disorders such as diarrhea, **constipation**, and cramps. There are few studies to support these uses and there are also concerns that frequent use of charcoal may decrease absorption of essential nutrients, especially in children.

KEY TERMS

Antidote—A remedy to counteract a poison or injury.

Adsorption—The binding of a chemical (e.g., drug or poison) to a solid material such as activated charcoal or clay.

Other uses

Besides being a general antidote for poisons or remedy for gas, activated charcoal has been used to treat other conditions. Based on its ability to adsorb, or bind to other substances, charcoal has been effectively used to clean skin **wounds** and to adsorb waste materials from the gastrointestinal tract. In addition, it has been used to adsorb snake venoms, viruses, bacteria, and harmful materials excreted by bacteria or fungi. However, because of lack of scientific studies, these uses are not recommended. Activated charcoal, when used together with other remedies such as **aloe** vera, **acidophilus**, and **psyllium**, helps to keep symptoms of ulcerative **colitis** under control. While charcoal shows some anti-aging activity in rats, it is doubtful if it can do the same for humans.

Preparations

For poisoning

Activated charcoal is available without prescription. However, in case of accidental poisoning or drug overdose an emergency poison control center, hospital emergency room, or doctor's office should be called for advice. In cases where both syrup of **ipecac** and charcoal are recommended for treatment of the poison, ipecac should be given first. Charcoal should not be given for at least 30 minutes after ipecac or until **vomiting** from ipecac stops. Activated charcoal is often mixed with a liquid before being swallowed or put into the tube leading to the stomach. Activated charcoal is available in liquid form in 30 g bottles. It is also available in 15 g container sizes, as slurry of charcoal pre-mixed in water, or in a container to which water or soda is added. Keeping activated charcoal at home is a good idea so that it can be taken immediately when needed for treatment of poisoning.

For acute poisoning, the dosage is as follows:

- Infants (under 1 year of age): 1 g/kg.
- Children (1-12 years of age): 15-30 g or 1-2 g/kg with at least 8 oz of water.
- Adults: 30-100 g or 1-2 g/kg with at least 8 oz of water.

For diarrhea or gas

A person can take charcoal tablets or capsules with water or sprinkle the content onto food. The dosage for treatment of gas or diarrhea in adults is 520 to 975 mg after each meal and up to 5 g per day.

Precautions

Parents should keep activated charcoal on hand in case of emergencies.

Charcoal should not be taken together with syrup of ipecac, as the charcoal will adsorb the ipecac. Charcoal should be taken 30 minutes after ipecac or after the vomiting from ipecac stops.

Some activated charcoal products contain sorbitol. Sorbitol is a sweetener as well as a laxative, therefore, it may cause severe diarrhea and vomiting. These products should not be used in infants.

Charcoal may interfere with the absorption of medications and nutrients such as vitamins or minerals. For uses other than for treatment of poisoning, charcoal should be taken two hours after other medications.

Charcoal should not be used to treat poisoning caused by corrosive products such as lye or other strong acids or petroleum products such as gasoline, kerosene, or cleaning fluids. Charcoal may make the condition worse and delay diagnosis and treatment. In addition, charcoal is also not effective if the poison is lithium, cyanide, **iron**, ethanol, or methanol.

Parents should not mix charcoal with chocolate syrup, sherbet, or ice cream, even though it may make charcoal taste better. These foods may prevent charcoal from working properly.

Activated charcoal may cause swelling or pain in the stomach. A doctor should be notified immediately should this occur. It has been known to cause problems in people with intestinal bleeding, blockage or those people who have had recent surgery. These patients should talk to their doctor before using this product.

Charcoal may be less effective in people with slow digestion.

Charcoal should not be given for more than three or four days for treatment of diarrhea. Continuing for longer periods may interfere with normal **nutrition**.

Charcoal should not be used in children under three years of age to treat diarrhea or gas.

Activated charcoal should be kept out of reach of children.

Side effects

Charcoal may cause constipation when taken for overdose or accidental poisoning. A laxative should be taken after the crisis is over.

Activated charcoal may cause the stool to turn black. This is to be expected.

Pain or swelling of the stomach may occur. A doctor should be consulted.

Interactions

Activated charcoal should not be mixed together with chocolate syrup, ice cream or sherbet. These foods prevent charcoal from working properly.

Resources

BOOKS

Blumenthal, Mark. *Linden Charcoal*. The Complete German Commission E Monographs, Therapeutic Guide to Herbal Medicines, American Botanical Council, Bos ton: Integrative Medicine Communications, 1998. Accessed online. http://home.mdconsult.com.

Cooney, David. *Activated Charcoal: Antidote, Remedy, and Health Aid*. Brushton, NY: TEACH Services, Inc., 1999.

Lacy Charles F., Lora L. Amstrong, Naomi B. Ingrim, and Leonard L. Lance. *Charcoal*. The Drug Information Handbook Pocket Version: 1998 1999, Hudson, OH: Lexi Comp Inc., 1998.

Roberts. *Activated Charcoal*. Clinical Procedures in Emer gency Medicine, Philadelphia, PA: W. B. Saunders Company, 1998: 726 8. Accessed online. http:// home.mdconsult.com.

Wilson, Billie A., Margaret T. Shannon, and Carolyn L. Stang. *Charcoal, Activated (Liquid Antidote)*. Nurses Drug Guide 2000, Stamford, CT: Appleton & Lange, 2000.

PERIODICALS

Bond, C. Randall. "Activated Charcoal in the Home: Help ful and Important or Simply a Distraction." *Pediatrics* (January 2002) : 145.

Mai Tran
Teresa G. Odle

Chasteberry tree

Description

The chasteberry tree, whose botanical name is *Vitex agnus castus*, belongs to the Verbenaceae family. The fruit is also called chasteberry, vitex, or monk's

Chasteberry tree (Vitex agnus castus) foliage. This plant is used in herbal medicine to treat female reproductive disorders and menstrual difficulties. *(Adrian Thomas / Photo Researchers, Inc.)*

pepper. The terms "chasteberry" and "vitex" are used interchangeably below.

The chasteberry tree can grow to a height of 22 ft (6.71 m) and can be found on wet banks of rivers in southern Europe and the Mediterranean area. It is also grown as an ornamental plant in the United States. Although the red-black berry is the most used part, the leaves contain the highest amount of flavonoids—up to 2.7%, with the blue-violet flowers a close second at 1.5%. The berries contain nearly 1% flavonoids, including casticin, kaempferol, isovitexin, orientin and quercatagetin.

Surprisingly, in spite of chasteberry's use for hormonal problems, it does not contain plant estrogen. Instead, the chasteberry tree contains:

- androstenedione, epitestosterone, hydroxyprogesterone, progesterone and testosterone in the flowers and leaves
- iridoid glycosides, such as aucubin and agnuside, in the berries
- essential oil, which includes cineol and pinene monoterpenes, as well as castine, citronellol, eucalptol, limonene, linalool and sesquiterpenes (Chasteberry's spicy aroma is derived from its essential oil.)
- vitricine, an alkaloid

General use

Chasteberry was used by the ancient Greeks and Romans as well as by medieval monks to lower sexual desire. The Greeks and Romans also used it to keep away evil. Hippocrates used chasteberry to treat injuries. Dioscorides advised its application for inflamed wombs, diseases of the spleen and lactation. European nuns used chasteberry for women's hormonal problems, and this latter application is chasteberry's main function today. It is considered a uterine tonic.

Chasteberry acts as a balancer, not only in female hormonal problems, but also with regard to libido. Therefore, chasteberry can act as both an aphrodisiac and an anaphrodisiac. It can normalize hormonal imbalances; treat **amenorrhea** or dysmenorrhoea; and act to increase or suppress lactation.

Chasteberry works by helping the pituitary gland to raise progesterone levels. Chasteberry induces the pituitary gland to free a luteinizing hormone and stop a follicle-stimulating one. Chasteberry is sometimes called a support for female hormones from **menstruation** to **menopause**.

PMS problems are usually caused by low progesterone levels in relation to the estrogen level. Taking the progesterone-laden vitex can relieve many PMS symptoms, as was shown in a 1997 double-blind clinical study. One hundred and seventy-five women randomly received daily doses of a standard vitex capsule (3.5–4.2 mg), a placebo, or two **pyridoxine** capsules (100 mg each) to measure the alleviation of such PMS symptoms as bloating, irritability, **depression**, breast tenderness, weight gain, skin problems, and digestive problems. In the efficacy part of the study, 77.1 % of subjects taking vitex reported improvement in their symptoms, compared to only 60.6% in the pyridoxine group.

Some studies show that chasteberry can both increase and decrease prolactin levels in the body. Too much prolactin is related to amenorrhea (no menstrual periods) and breast tenderness associated with PMS; too little prolactin can mean reduced milk production. In one study featuring 100 nursing mothers, those who took chasteberry had more milk than those who took a placebo. In another clinical study of PMS associated with high prolactin levels, vitex balanced not only prolactin levels but the menstrual cycle itself. According to David L. Hoffman, taking vitex after stopping birth control pills can regulate cycles and therefore increase the likelihood of **pregnancy**. Another writer has described her own situation of stopping birth control pills and having no periods for two and a half years until she started taking chasteberry. German studies also show that vitex may also help prevent a miscarriage.

Chasteberry is also used to treat fibroid cysts, especially cysts in smooth muscle. Vitex has been said to be effective in stopping the heavy bleeding of

KEY TERMS

Agnuside—The active ingredient in chasteberry.

Amenorrhea—The abnormal absence of menstrual periods.

Anaphrodisiac—A substance or medication that suppresses sexual desire.

Dopamine—A neurotransmitter that acts within certain brain cells to regulate movement and emotions.

Essential oil—Oil from a herb, obtained by steam distilling or cold pressing, then mixed with a vegetable oil or water. It has many functions, including use with massage or as an inhalant.

Extract—A concentrated form of the herb made by pressing the herb with a hydraulic press, soaking it in water or alcohol, then letting the excess water or alcohol evaporate.

Flavonoids—Plant pigments that have a variety of effects on human physiology. The casticin, kaempferol, isovitexin, orientin and quercatagetin contained in chasteberry are flavonoids.

Melatonin—A hormone secreted by the pineal gland that helps to regulate biorhythms.

Perimenopause—The time span just before a woman reaches menopause. It usually begins when a woman is in her 40s and may produce many of the symptoms associated with menopause.

Pyridoxine—Another name for vitamin B_6.

Tincture—An alcohol-based extract prepared by soaking plant parts.

perimenopause and reduce the **hot flashes** in menopause itself. It is used extensively in England for this purpose. Also, chasteberry's antiandrogenic influence can help to reduce **acne** in teenagers of either sex.

Preparations

Chasteberry may be taken as a tincture, an extract, a tea or in capsules. The usual dosage is 200 mg of the berry, with a standardized amount (0.5%) of the active ingredient agnuside. The recommended dosage varies with the ailment being treated, and should be decided upon in conjunction with a health care practitioner.

Tincture and extracts of chasteberry are mixed with water or juice, 10–30 drops per drink. They should be taken up to three times daily.

Chasteberry tea is made from 1 tsp of ripe berries to 1 cup (250 ml) of boiling water. The tea must be steeped for 10–15 min and should be drunk three times daily.

According to one naturopathic physician, the usual dosage of extract of chasteberry is 175–225 mg on a daily basis. Capsules are available in doses from 40–400 mg. The capsules are usually taken one to three a day about one hour before breakfast to increase their absorption. If taken before bedtime, chasteberry may aid in sleeping as well as increase the secretion of **melatonin** in the early morning. Because chasteberry acts slowly in the body, it can take from one to six months to see permanent results. These results should continue even after use of chasteberry is discontinued. To increase milk production, women are advised to take chasteberry the first 10 days after giving birth.

Chasteberry may be taken in conjunction with Vitamin B_6 for PMS.

Precautions

Some practitioners of alternative medicine recommend that pregnant women should abstain from taking chasteberry. German research indicates that chasteberry is safe for the first three months of pregnancy, but is unsafe after that time as it might start the flow of milk too early.

Herbal experts may also advise patients with **breast cancer**, **uterine cancer**, or pituitary tumors not to take chasteberry. It is always best to check with your health care provider first.

Because chasteberry does not contain plant estrogens, it should not be used as a substitute for hormonal replacement therapy, or HRT. Women who are concerned about the possible side effects of HRT should consider fo-ti or other herbs shown to have measurable estrogen-like activity, such as **licorice** and **hops**.

Side effects

Chasteberry rarely has side effects but a few have been reported: allergic **rashes**; minor headaches and **nausea** when first taking chasteberry; changes in the length of the menstrual period; and increased bleeding. The alcohol in chasteberry tinctures may cause some gastric irritation if taken on an empty stomach. This situation can be avoided by mixing the tincture in water, by taking half the tincture before breakfast and half after lunch, or by taking capsules.

Chasteberry, also known as monk's pepper, is recommended as an herbal treatment for premenstrual syndrome.
(© TH Foto / Alamy)

Interactions

Chasteberry should not be combined with such synthetic hormones as those contained in birth control pills or hormone replacement therapy. The latter includes Premarin and Provera.

Drugs that act on a neurotransmitter in the brain called dopamine may either affect or be affected by vitex. These include medications for **Parkinson's disease** (L-dopa, Parlodel); psychosis (Haldol); **smoking** cessation (Zyban); and depression (Wellbutrin).

Resources

BOOKS

Ali, Elvis et al. *The All In One Guide to Natural Remedies and Supplements*. AGES Publications, 2000.

Balch, James F., MD, and Phyllis A. Balch, CNC. *Pre scription for Nutritional Healing, 2nd ed.* New York: Avery Publishing Group, 1997.

Landis, Robin, with Karta Pukh Singh Khalsa. *Herbal Defense*. New York: Warner Books, Inc., 1997.

Murray, Michael, ND. *Encyclopedia of Nutritional Supple ments*. Rocklin, CA: Prima Publishing, 1996.

Murray, Michael, ND. *The Healing Power of Herbs, 2nd ed.* Rocklin, CA: Prima Publishing, 1995.

PERIODICALS

Oerter Klein, K., M. Janfaza, K. A. Wong, and R. J. Chang. "Estrogen Bioactivity in Fo Ti and Other Herbs Used for Their Estrogen Like Effects as Determined by a Recombinant Cell Bioassay." *Journal of Clinical Endo crinology and Metabolism* 88 (September 2003): 4077 4079.

ORGANIZATIONS

National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse. P.O. Box 7923, Gai thersburg, MD 20898 7923. (888) 644 6226. http:// nccam.nih.gov.

U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http:// www.fda.gov.

OTHER

Herb World News Online, Herb Research Foundation. http://www.herbs.org.

Whole Health Products. http://wholehealthproducts.com, 2000.

Sharon Crawford
Rebecca J. Frey, PhD

Chelated minerals

Description

Chelated minerals are specially formulated mineral supplements designed to improve absorption of these essential nutrients by the body. What makes a mineral a chelated compound is the bonding of the mineral to nitrogen and the ligand that surrounds the mineral and protects it from interacting with other compounds. Although some people believe that chelated minerals are absorbed more efficiently within the body, studies have shown no significant difference between chelated and nonchelated forms.

General use

The importance of minerals

Minerals are vital to health because they are the building blocks that make up muscles, tissues, and bones. They also are important components of many life-supporting systems and activities and are important to hormones, oxygen transport, and enzyme systems.

Minerals participate in the chemical reactions that occur inside the body. These nutrients may work as cofactors or helpers in enzyme reactions. As cofactors, minerals help enzymes function properly. Minerals may also work as catalysts to initiate and speed up these enzymatic reactions.

Minerals are the electrolytes that the body needs to maintain normal body fluids and the acid-base balance. As electrolytes, minerals act as gatekeepers to control nerve signal movements throughout the body. Because nerves control muscle movements, minerals also regulate muscle contraction and **relaxation**.

Many minerals, such as **zinc**, **copper**, **selenium**, and **manganese**, act as **antioxidants**. They protect the body against the damaging effects of free radicals

(reactive molecules). They scavenge or mop up these highly reactive radicals and change them into inactive, less harmful compounds. In so doing, these minerals help prevent **cancer** and many other health problems such as premature **aging**, **heart disease**, autoimmune diseases, arthritis, **cataracts**, **Alzheimer's disease**, and diabetes.

There are two kinds of minerals: major (or macro) minerals and trace minerals. Major minerals are those that the body needs in large amounts. The major minerals include **calcium**, **phosphorus**, **magnesium**, **sodium**, **potassium**, **sulfur**, and chlorine. They are needed to build muscles, blood, nerve cells, teeth, and bones. They are also essential electrolytes that the body requires to regulate blood volume and the acid-base balance.

Unlike the major minerals, trace minerals are needed only in tiny amounts. Even though they can be found in the body in exceedingly small amounts, they are also very important. These minerals participate in most chemical reactions in the body. They are also needed to manufacture important hormones. Trace minerals include **iron**, zinc, **iodine**, copper, manganese, fluorine, **chromium**, selenium, molybdenum, and **boron**.

Why supplements are used

Some studies have shown that mineral supplements are needed because most Americans do not get adequate amounts of minerals in their **diets**. In the 2000s, increasing numbers of people take chelated minerals daily to ensure that the body has enough of these nutrients to function properly. Many healthy people take minerals to boost their body's immune system and to achieve maximal levels of energy and mental alertness.

Treatment and prevention of diseases

People take individual minerals to prevent or treat certain diseases and conditions. The benefits/uses of key minerals and the optimum daily intake (ODI) of each mineral are given below. ODI is the amount most people require to function at their best level.

CALCIUM (ODI=1,000 1,500 MG). Calcium supplements are commonly used for the prevention and treatment of **osteoporosis** (a bone thinning disease). However, calcium supplements also provide other benefits as well. Studies have shown that calcium may also be effective in treating high blood pressure and relieving symptoms of leg cramps and arthritis. It may also prevent colon cancer.

Calcium supplements may be contaminated with lead, which is highly toxic. A study by the Department of Environmental Toxicology, University of California, Santa Cruz, indicates that for calcium supplements, chelation may be a bad idea. They found that non-chelated calcium supplements had lower levels of lead contamination than the chelated products.

PHOSPHORUS (ODI=200 400 MG). Phosphorus is an important mineral for humans. However, because Americans often exceed their phosphorus intake due to high consumption of sodas and meat, phosphorus supplements are neither necessary nor recommended. Excessive consumption of phosphorus accelerates bone loss leading to osteoporosis.

MAGNESIUM (ODI=500 750 MG). Magnesium supplements have been used to promote healthy teeth and bones, treat **muscle spasms**, relieve premenstrual **pain**, and lower high blood pressure in patients with low magnesium levels. Magnesium has also been used to prevent premature labor and low birth weight.

ZINC (ODI=22.5 50 MG). Zinc is one of the most frequently used supplements. A strong antioxidant, zinc protects the body against damaging free radicals and boosts the body's immune system. It helps heal **burns** and **wounds**, offers some protection against common **infections** such as colds or flu, and helps prevent cancer. It may be effective in the prevention and/or treatment of age-related **macular degeneration** (an eye disease), **infertility**, **hair loss**, **anorexia nervosa** (an eating disorder), **prostate enlargement**, and common skin problems such as **acne**.

IRON (ODI=15 25 MG FOR MEN; 18 30 MG FOR WOMEN). Iron supplements are most often prescribed to treat iron deficiency **anemia**. Iron is also used to increase energy and mental sharpness.

COPPER (ODI=0.5 2 MG). Copper deficiency is relatively rare due to the abundance of it in natural food sources and in drinking water. Because of the potential risk of severe toxicity, copper is best taken as part of a multivitamin-mineral formula.

MANGANESE (ODI=15 30 MG). Supplements of this trace mineral have been used to prevent cancer, to improve blood sugar control, and to treat arthritic symptoms.

CHROMIUM (ODI=200 600 MICROGRAMS OR MCG). This trace mineral may help prevent or treat low blood sugar levels and diabetes. It may also offer protection against heart disease by lowering blood **cholesterol** levels.

SELENIUM (ODI=50 400 MCG). A good antioxidant, selenium may help protect the body against cancer,

premature aging, and degenerative diseases such as heart disease and arthritis.

IODINE (ODI=UP TO 150 MCG). Iodine is sometimes used to prevent goiter, an iodine deficiency disease.

POTASSIUM (ODI=99 300 MG). Potassium supplements are most often prescribed to treat potassium deficiency caused by chronic diuretic use. Diuretics are products that increase the urine that is excreted.

BORON. There is no ODI for boron; however, 3 to 6 mg of boron may be helpful in preventing osteoporosis and improving symptoms of **osteoarthritis**.

Prevention of drug-induced side effects

Mineral supplements are used to prevent drug-induced mineral deficiencies. A mineral deficiency sometimes occurs after prolonged use of certain drugs. For example, patients who receive diuretics such as hydrochlorothiazide or furosemide for high blood pressure often have low potassium levels. The condition is so common that doctors routinely prescribe potassium supplements together with diuretics. Because high potassium levels are toxic to the body, patients should not take more potassium than their doctor has ordered.

Preparations

One major problem associated with mineral supplements has been poor absorption. Traditional forms of mineral supplements, the mineral salts, are very inexpensive. However, they do not absorb well into the body. Most of the minerals contained in these tablets pass right through the body rather than being absorbed into the blood.

Chelation has been used as a means of improving absorption of minerals from supplements, but the value of this method is limited at best. Generally, chelated minerals are not absorbed more than 5% more effectively than unchelated supplements. This minor benefit rarely justifies the higher prices charged for chelated products. The poor absorption of minerals is taken into account when the daily diet recommendations are developed, so that the recommended intake should be enough of the mineral to provide the levels that are actually desired.

Precautions

People should remember several guidelines when using chelated mineral supplements.

- Mineral supplements are not substitutes for a healthy diet. In addition, they are not absorbed well by a malnourished body. Therefore, it is important to adhere to a low-fat, high-fiber diet. People should eat plenty of fruits and vegetables and limit consumption of caffeine, alcohol, red meat, processed foods, and foods high in fat or sugar.
- A naturopath or a nutritionist may recommend one or several individual supplements for short-term treatment for a specific mineral deficiency. However, if continued for too long, this diet may upset the mineral balance in the body and cause deficiencies of other minerals. For general good health, it is best to use multiple vitamin and mineral supplements with the minerals in the form of chelates.
- Because of potential interactions between minerals (such as calcium, iron, or zinc) and other herbal supplements or medications, people should inform their doctor about all supplements they are taking.
- Unlike vitamins, minerals are easily overused and can have toxic effects. People should not take minerals at dosages exceeding the recommended ODI.

Side effects

The following are some of the adverse effects associated with high-dose individual mineral supplementation.

- Copper: Copper toxicity, a serious condition, causes abdominal pain, nausea, vomiting, diarrhea, dizziness, general fatigue, headache, depression, insomnia, and poor brain function.
- Fluorine: High fluorine levels in the body may cause stomach ulcers and increase the risk of bone cancer.
- Iron: Iron toxicity causes nausea, vomiting, and abdominal pain. Too much iron in the diet has been associated with increased risk of infections and cancer.
- Zinc: Excessive zinc supplementation may cause copper deficiency, nausea, and vomiting.
- Potassium: Potassium toxicity can occur if a person takes more than 18 g of supplement per day. Symptoms of potassium toxicity include irregular heart beat, muscle fatigue, and heart failure.
- Selenium: Symptoms of selenium toxicity include hair loss, brittle fingernails, skin irritation, nausea, fatigue, garlic odor on the breath, and increased risk of infections.

Interactions

Foods increase absorption of minerals. Therefore, mineral supplements should be taken with food for better absorption.

Minerals such as calcium, iron, manganese, magnesium, copper, or zinc can bind to many drugs when taken together and can decrease their effectiveness.

KEY TERMS

Chelate—A chemical compound in which a metal is bonded to one or more organic groups.

Free radical—An atom, molecule, or ion with an odd number of unbonded electrons.

Optimum daily intake (ODI)—The amount of a supplement that provides the greatest value to a person.

Therefore, mineral supplements should be taken two hours before or two hours after any of the following medications:

- ciprofloxacin
- ofloxacin
- tetracycline
- doxycycline
- erythromycin
- warfarin
- mineral oil

Resources

BOOKS

Card, David R. *12 Essential Minerals for Cellular Health: An Introduction to Cell Salts*. Prescott, AZ: Hohm Press, 2007.

Jeep, Robin, and Richard Couey. *The Super Antioxidant Diet and Nutrition Guide: A Health Plan for the Body, Mind, and Spirit*. Charlottesville, VA: Hampton Roads, 2008.

Smith, Pamela Wartian. *What You Must Know about Vita mins, Minerals, Herbs, & More: Choosing the Nutrients that Are Right for You*. Garden City Park, NY: Square One, 2008.

Vohora, S. B., and Mohammad Athar. *Mineral Drugs: Used in Ayurveda and Unani Medicine*. New Delhi: Narosa Publishing House, 2007.

PERIODICALS

Greenwald, Peter, et al. "What Is the Efficacy of Multivita min: Multimineral Supplements in Chronic Disease Prevention in the General Population of Adults?" *American Journal of Clinical Nutrition* (January 2007): 3148 3175.

ORGANIZATIONS

American Association of Naturopathic Physicians, 4435 Wisconsin Ave. NW, Suite 403, Washington, DC, 20016, (202) 237 8150, (866) 538 2267, http://www.naturopathic.org.

National Center for Complementary and Alternative Med icine, NCCAM Clearinghouse, National Institute of Health, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Samuel Uretsky, Pharm.D.
David Edward Newton, Ed.D.

Chelation therapy

Definition

Chelation therapy is an intravenous treatment designed to bind heavy metals in the body in order to treat heavy metal toxicity. Proponents claim it also treats coronary artery disease and other illnesses that may be linked to damage from free radicals (reactive molecules).

Origins

The term chelation is from the Greek root word "chele," meaning "claw." Chelating agents were originally designed for industrial applications in the early 1900s. Probably the best known of chelating agents is ethylenediamine tetraacetic acid (EDTA). During World War II the potential of chelating agents for medical therapy was realized. The initial intent was to develop antidotes to poison **gas** and radioactive contaminants. The need for widespread therapy of this nature did not materialize, but more practical uses were found for chelation. During the 1950s, EDTA chelation therapy became standard treatment for people suffering from **lead poisoning**. Patients who had received this treatment claimed to have other health improvements that could not be attributed to the lead removal only. Especially notable were comments from those who had previously suffered from intermittent claudication (**pain** in the legs accompanied by limping) and **angina**. They reported suffering less pain and **fatigue**, with improved endurance, after chelation therapy. These reports stimulated further interest in the potential benefits of chelation therapy for people suffering from **atherosclerosis** and coronary artery disease.

Benefits

The benefits of EDTA chelation for the treatment of lead poisoning and excessively high **calcium** levels are undisputed. The claims of benefits for those suffering from atherosclerosis, coronary artery disease, and other degenerative diseases are more difficult to prove. Reported uses for chelation therapy include treatment of angina, **gangrene**, arthritis, **multiple sclerosis**, **Parkinson's disease**, **psoriasis**,

and **Alzheimer's disease**. Some practitioners also claim improvement for people experiencing diminished sight, hearing, smell, coordination, and sexual potency.

Description

If the preparatory examination suggests that there is a condition that could be improved by chelation therapy, and there is no health reason why it should not be used, then the treatment can begin. The patient is generally taken to a comfortable treatment area, sometimes in a group location, and an intravenous line is started. A solution of EDTA together with vitamins and minerals tailored for the individual patient is given. Most treatments take three to four hours, as the infusion must be given slowly in order to be safe. The number of recommended treatments is usually between 20 and 40. They are given one to three times a week. Maintenance treatments can then be given at the rate of once or twice a month. Maximum benefits are reported to be attained after approximately three months after a treatment series. The cost of therapy is considerable, but it is a fraction of the cost of an expensive medical procedure such as cardiac bypass surgery. Intravenous **vitamin C** and mercury chelation therapies are also offered.

Preparations

A candidate for chelation therapy should initially provide a thorough medical history and under go a physical examination to define the type and extent of clinical problems. Laboratory tests are done to determine whether there are any conditions present that may prevent the use of chelation. Patients who have preexisting hypocalcemia, poor liver or kidney function, congestive heart failure, **hypoglycemia**, **tuberculosis**, clotting problems, or potentially allergic conditions are at higher risk for complications from chelation therapy. A Doppler ultrasound may be performed to determine the adequacy of blood flow in different regions of the body.

Precautions

It is important for people who receive chelation therapy to seek medical personnel who are experienced in the use of this treatment. Treatment should not be undertaken before a good physical, lifestyle evaluation, history, and necessary laboratory tests are performed. The staff must be forthcoming about test results and should answer all questions the patient may have. Evaluation and treatment should be individualized and involve assessment of kidney function before each treatment with chelation, since the metals bound by the EDTA are excreted through the kidneys.

Although EDTA binds harmful, toxic metals such as mercury, lead, and cadmium, it also binds some essential nutrients of the body, such as **copper**, **iron**, calcium, **zinc**, and **magnesium**. Large amounts of zinc are lost during chelation. Zinc deficiency can cause impaired immune function and other harmful effects. Supplements of zinc are generally given to patients undergoing chelation, but it was not known as of 2008 whether this is adequate to prevent deficiency. Also, chelation therapy does not replace proper **nutrition**, **exercise**, and appropriate medications or surgery for specific diseases or conditions.

Side effects

Side effects of chelation therapy are reportedly unusual but are occasionally serious. Mild reactions may include irritation at the infusion site, skin reactions, **nausea**, **headache**, **dizziness**, hypoglycemia, **fever**, leg cramps, or loose bowel movements. Some of the more serious complications reported have included hypocalcemia, kidney damage, decreased clotting ability, **anemia**, bone marrow damage, insulin shock, thrombophlebitis with embolism, and even in rare cases death. However, some doctors believe that the latter groups of complications occurred before the safer method for giving chelation therapy was developed.

Research and general acceptance

EDTA chelation is a highly controversial therapy. The treatment is approved by the United States Food and Drug Administration (FDA) for lead poisoning and seriously high calcium levels. However, for the treatment of atherosclerotic **heart disease**, EDTA chelation therapy is not endorsed by the American Heart Association (AHA), the FDA, the National Institutes of Health (NIH), or the American College of Cardiology. The AHA reports that there are no adequate, controlled, published scientific studies using currently approved scientific methods to support this therapy for the treatment of coronary artery disease. However, a pooled analysis from the results of more than 70 studies showed positive results in all but one. In 2002, the American College of Advancement in Medicine pledged its full support to a $30 million federal study aimed at determining the safety and efficacy of chelation therapy in patients with heart disease. Scheduled to begin in 2008, the five-year clinical trial was anticipated to involve more than 2,000 people at about 100 sites around the country.

KEY TERMS

Angina—Chest pain caused by reduced oxygen to the heart.

Atherosclerosis—Arterial disease characterized by fatty deposits on inner arterial walls.

Hypocalcemia—Low blood calcium.

Hypoglycemia—Low blood sugar.

Intermittent claudication—Leg pain and weakness caused by walking.

Thrombophlebitis—Inflammation of a vein together with clot formation.

Training and certification

The American Board of Chelation Therapy (ABCT) provides minimum standards for members administering chelation. Diplomates have passed written and oral tests and received supervision of treatment in order to become certified.

One professional group that makes recommendations for treatment methods is the American College for Advancement in Medicine (ACAM). If contacted, the organization will mail out a directory of doctors who are members and follow their methods. ACAM also offers chelation therapy workshops.

Resources

BOOKS

Hawken, C. M. *Chelation Therapy for Cardiovascular Health*. Chapmanville, WV: Woodland Press, 2007.

PERIODICALS

Barton, James C. "Optimal Management Strategies for Chronic Iron Overload." *Drugs* (May 2007): 685 700.

"Deaths Associated with Hypocalcemia from Chelation Therapy: Texas, Pennsylvania, and Oregon, 2003 2005." *Morbidity and Mortality Weekly Report* (March 3, 2006): 204 207.

Payne, Krista A., et al. "Clinical and Economic Burden of Infused Iron Chelation Therapy in the United States." *Transfusion* (October 2007): 1820 1829.

OTHER

"Chelation therapy." American Heart Association. [cited March 19, 2008]. http://www.americanheart.org/presenter.jhtml?identifier 4493.

Green, Saul. "Quackwatch: Chelation therapy." July 24, 2007 [cited March 19, 2008]. http://www.quackwatch.com/01QuackeryRelatedTopics/chelation.html.

ORGANIZATIONS

American College for Advancement in Medicine (ACAM), 24411 Ridge Route, Suite 115, Laguna Hills, CA, 92653, (949) 309 3520, http://www.acamnet.org/site/.

American Heart Association, National Center, 7272 Greenville Ave., Dallas, TX, 75231, (800) 242 8721, http://www.americanheart.org/.

Judith Turner
Teresa G. Odle
David Edward Newton, Ed.D.

Chelidonium

Description

Chelidonium majus is an herb of the Papaveraceae (poppy) family. Its long thin stems support yellow blooms that contain four petals measuring about 1 inch. The plant is native to Europe, Western Asia, and North Africa. It is found growing in damp areas and wild gardens along roads and other open spaces, in close proximity to human life. The entire plant is considered poisonous. However, its medicinal properties may be beneficial in the proper dosages. Isoquinoline alkaloids within the plant possess both toxic and therapeutic properties. The plant's orange juice, known as greater celandine, has been used for medicinal purposes for thousands of years.

General Use

In ancient times, the greater celandine portion of the plant was used as a treatment for eye conditions, particularly **cataracts**. Among the isoquinoline alkaloids inherent in greater celandine are allocriptine, berberine, chelidonine, and spartaine. These constituents enable the herb to serve as a mild sedative, antispasmodic, and as a muscle relaxant in the bronchial tubes, intestines, and other internal organs. Chelidonine lowers blood pressure, whereas spartaine causes blood pressure to rise.

Benefits of Chelidonium

In 1985, Germany's Commission E approved Chelidonium for the treatment of **indigestion**.

Greater celandine is used in Western and Chinese medicine for its properties as an antispasmodic, diuretic, and analgesic (**pain** reducer). It is used in the treatment of respiratory conditions such as **asthma**, **bronchitis**, and **whooping cough** (pertussis). It has also been used to treat **jaundice**, **gallstones**, and the

pain associated with gallbladder disease, although there is some controversy regarding these uses.

Cheladonium is also used in the treatment of stomach ulcers and may possess anti-cancer and anti-microbial abilities. In a study released in 2002, greater celandine showed anti-tumor properties when given in ultra-low doses to mice that had liver **cancer**.

The plant's yellow latex component is used to treat skin conditions such as **eczema**, **corns**, and **warts**. Due to its use with the latter, it was once called wartweed.

Preparations

Chelidonium must be taken under professional supervision because of the potential for liver toxicity. Under proper medical supervision, extracts standardized to 4 g of chelidonine per capsule may be taken by mouth three times a day. An alternative is the preparation of a mixture of 1–3 ml tincture and water. The liquid concoction may be sipped slowly over a 10 to 30 minute period prior to meals. The external topical preparation is made of concentrated tinctures of the yellow latex. In regards to wart treatment, herbalists suggest applying the latex to the area and allowing it to dry in place.

A semi-synthetic injectable form of chelidonium is available in Europe and Mexico under the trade name, Ukrain. As of 2008, Ukrain was not approved by the U.S. Food and Drug Administration.

Precautions

Chelidonium must be used with caution and taken only under professional direction because of its potential for toxicity to the liver. It is not to be used by women who are pregnant or breastfeeding or by children under age 12. In certain countries, restrictions ban its use. Its use should be discontinued and a healthcare professional consulted immediately if signs of an allergic reaction are present, including **itching**, redness, swelling, tightness of the chest or throat, or difficulty breathing.

At the 1998 meeting of the American Association for the Study of Liver Diseases, a German report highlighted cases of liver toxicity related to greater celandine. The following year, the final report was published, documenting 10 cases. Researchers found that the 10 patients, all taking greater celandine, acquired mild to severe **hepatitis**. Following discontinuation of the greater celandine, the individuals recovered quickly. Their liver enzymes subsequently returned to normal levels. Greater celandine was added to the list of herbs that cause acute hepatitis.

KEY TERMS

Isoquinoline alkaloid—Natural compound found in plants that may be toxic to humans and animals, but also possesses therapeutic qualities.

Side effects

Chelidonium causes the urine to take on a bright yellow color. High doses of the herb may lead to drowsiness. It may irritate the respiratory tract, causing bouts of aggressive and powerful coughing or difficulty breathing. Other potential side effects are an allergic reaction, skin irritation, and stomach upset.

Interactions

At the time of publication, *chelidonium majus* has no known drug interactions.

Resources

OTHER

PeaceHealth. Locations throughout Oregon, Washington, and Alaska. http://www.peacehealth.org.
Plants for a Future. http://www.pfaf.org/.

ORGANIZATIONS

Memorial Sloan Kettering Cancer Center, 1275 York Ave., New York, NY, 10065, (212) 639 2000, http://www.mskcc.org.
Third Age, Inc, 25 Stillman St., Suite 102. , San Francisco, CA, 94107 1309, http://www.thirdage.com.

Rhonda Cloos, RN

Chemical poisoning

Definition

Chemical poisoning is a major public health concern. Approximately 95% of all accidental or intentional poisonings are due to chemicals. Nearly 90% of these cases occur at home. Infants, toddlers, and small children are at the greatest risk for accidental (acute) poisoning. In 2006, poison control centers received about 2.5 million calls about poison exposures, more than a million of which involved children younger than age 6. Chronic exposure is chemical poisoning that occurs slowly and insidiously over a prolonged period of time. Many chronic, degenerative diseases have been linked to environmental pollution or

poisoning. The list may include **cancer**, **memory loss**, **allergies**, **multiple chemical sensitivity**, **chronic fatigue syndrome**, **infertility** in adults, learning and behavioral disorders, developmental abnormalities, and birth defects.

Description

Of the millions of natural and synthetic chemicals in existence, approximately 3,000 are known to cause significant health problems. In many cases, the type and severity of danger posed by a chemical is a matter of dispute among experts. Accidental acute chemical poisoning involving common household or garden products is easy to diagnose and treat, as long as it is recognized early enough. By contrast, chronic poisoning due to daily exposure to chemicals is more difficult to diagnose and the extent of damage is more difficult to assess. Toxic chemicals can be found everywhere—in homes, around homes on private property, at work, on the playground—even in foods and drinking water. Some result from illegal dumping. However, many chemical poisonings occur insidiously by the supposedly harmless chemicals that people bring into their homes or office to make their lives more comfortable.

Household poisons

Because of the huge amounts of toxic chemicals that can be found inside homes, scientists have come to believe the home—not the office or the freeway—is the most contaminated place of all. Any chemicals found inside the house can be accidentally ingested by small children. Daily exposure to chemicals indoors may also cause significant health risks. Major chemical poisons inside homes include volatile organic compounds, lead, radon, carbon monoxide, and the various substances in household cleaners and carpet.

VOLATILE CHEMICALS. Indoor air pollution is caused by volatile chemicals, those which evaporate at room temperature. When people use products that contain these volatile substances, the chemicals are trapped inside their homes, and they can reach levels thousands of times higher than exist outdoors in the air. Chronic exposure to polluted air may cause lung **infections**, headaches, **nausea**, mental confusion, **fatigue**, **depression**, and memory loss. In addition, it may cause damage to an unborn fetus and increase the risk of developing cancer. The following are some of the most common volatile substances found inside the home:

- trichloroethane (spray cans, insulation, spot removers)
- tetrachloroethylene (dry-cleaning solutions)
- formaldehyde (glue, foam, preservatives, plywood, fabrics, insulation)
- para-dichlorobenzene (pDCB) (mothballs, air fresheners)
- toluene (solvents, cleaning fluids, wood finishing products)
- benzene (gasoline)
- xylene (paints, finishing products)
- acetone (nail polish remover)
- styrene (foam, carpets, adhesives)
- carbon tetrachloride (dry cleaning solutions, paint removers)
- perchloroethylene (cleaning solvents)

LEAD AND OTHER HEAVY METALS. Lead is a very toxic chemical, especially to small children. **Lead poisoning** can cause learning disabilities and behavioral problems in children. Lead poisoning in pregnant mothers can cause fetal abnormalities, brain damage, and impaired motor skills in babies. Lead is found in leaded paint (in old houses) and is sometimes present in pesticides, pottery and china, artist's paint, and products used for hobbies and crafts. Also harmful are other heavy metals, such as mercury and cadmium.

RADON. Radon is an odorless **gas** produced from the radioactive decay of uranium. It is believed to be the most common cause of **lung cancer** after **smoking**. In the outdoor environment, radon gas is usually too well-dispersed to reach dangerous levels. It is far more dangerous indoors, where ventilation tends to be inadequate, in places such as basements, where radon can seep from the soil and accumulate to dangerous concentrations. Radon testing is the only way to discover if a home is contaminated.

CARBON MONOXIDE. In closed areas, carbon monoxide (CO) is the most lethal gas produced by a burning heat source. Sources of CO are gas heat, fireplaces, or idling cars. A CO detector is needed in all homes because this gas is odorless, colorless, and deadly.

CHEMICALS TRAPPED INSIDE CARPETS. Carpets contain many chemicals capable of causing nerve damage. These neurotoxic chemicals include acetone, benzene, toluene, phenol, xylene, decane, and hexane.

HOUSEHOLD CLEANERS. The following are neurotoxic chemicals commonly found in household cleaners:

- chlorine (dishwasher detergents)
- ammonia (antibacterial cleaning agents)
- petroleum (dish soaps, laundry detergents, floor waxes)

MEDICINES. Medicines are one of the most common causes of accidental and intentional (suicide) poisonings. Drugs most commonly involved are aspirin, acetaminophen, sedatives, any psychoactive drug if the patient is prone to impulsive, suicidal action (e.g., antidepressants), anti-seizure drugs, **iron** pills, vitamins/mineral supplements containing iron, and cardiac drugs, such as digoxin and quinidine.

Yard chemicals

Yard materials that can be toxic to humans and pets include:

- Insecticides. Toxic chemicals that can be found in insecticide preparations include lindane, arsenic, lead, malathion, diazinon, and nicotine.
- Rodenticides (chemicals that kill mice or rats). Rodenticides often contain very toxic chemicals, such as sodium fluoroacetate, phosphorus, thallium, barium, strychnine, methyl bromide, and cyanides.
- Herbicides (chemicals that kill weeds). Herbicides contain carbaryl and diazinon, which increase the risk of childhood brain cancer.

The regulatory status of some of these chemicals varies from country to country and state to state. Critics often call for a ban on chemicals that are especially toxic or otherwise dangerous. For example, in the late 2000s, lindane was approved for use in the United States and many other countries. However, a worldwide campaign was working to have the chemical banned because of its toxicity.

Occupational hazards

Workers are often exposed to toxic effects of various chemicals in their working environment:

- Polluted air. Workers in poorly ventilated plants that manufacture paints, insecticides, fungicides, pesticides.
- Radiation. Workers in poorly constructed nuclear chemical plants.
- Contaminated environment. Miners who labor underground.
- Obnoxious fumes. Fire fighters who are exposed to toxic fumes.
- Skin contact with toxic chemicals. Crop pickers who have exposure to sprayed insecticides.

Toxic chemicals in foods

Highly processed or prepackaged foods use various chemical additives to make these foods look more attractive, taste better, or store for longer periods of time. Harmful substances that can be found in foods include:

- Monosodium glutamate (MSG), a common flavoring agent. Excessive consumption of MSG may cause hyperactivity, memory loss, or other types of brain damage. It is often associated with the so-called Chinese restaurant syndrome characterized by headaches, nausea, vomiting, palpitations, and flushing of skin, due to the MSG content in the food.
- Artificial sweeteners, such as aspartame or saccharin. These sweeteners can cause a variety of health problems, including headaches (migraines included), dizziness, seizures, depression, nausea, and vomiting, and abdominal cramps. Their use may be associated with hyperactivity in children. Whether they increase risk of cancer was unknown as of 2008. Pregnant women should avoid using these sweeteners.
- Artificial colors. Color additives can be found in a variety of foods, including cereals, juices, candy, frozen foods, ice cream, cookies, pizza, salad dressings, and soft drinks. Children and adults alike may be exposed to cancer-causing artificial colors such as Red numbers 8, 9, 19, and 37, or Orange number 17.
- Preservatives. Many of the preservatives found in foods are very hazardous. Nitrates, common preservatives in cured and luncheon meats and canned products, are known to cause cancer. In addition, a pregnant woman who consumes large amounts of nitrates (for example, through eating hot dogs or salami) unknowingly increases risk of brain damage in her unborn child. Synthetic antioxidants are used in prepackaged foods to prevent food spoilage. Common synthetic antioxidants, such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), can be found in cereals, baking mixes, or instant potatoes. These products are known to cause brain, liver, and kidney damage, as well as respiratory problems.
- Food contaminants. Health-promoting foods such as fruits and vegetables may contain dangerous herbicide and pesticide residues on their surfaces. Fish in contaminated lakes or rivers may contain mercury, dioxin, PCBs, or other harmful chemicals. Babies of mothers who consume contaminated fish during pregnancy have lower birth weight, smaller heads, developmental delays, and lower scores on tests of baby intelligence.

Air pollution and environmental contamination

Air pollution can cause or worsen lung or heart diseases and increase risk of cancer. Chemicals that most often cause pollution in the air and water supply

include asbestos, carbon monoxide, hydrogen sulfide, lead, nitrogen oxides, halogenated hydrocarbons, and pesticides.

Causes and symptoms

Acute poisoning

The following events are possible causes for acute poisoning:

- Accidental ingestion of household products. This problem primarily affects children under the age of five.
- Medication errors. Such errors occur most often among elderly people. Sometimes hospital staff makes the error; at other times, the patient gets confused about or cannot read directions regarding the identity or dosage of drugs.
- Suicide.
- Excessive alcohol or drug abuse.

The following signs and symptoms indicate the possibility of acute chemical poisoning:

- difficulty breathing
- changes in skin color
- headaches or blurred vision
- irritated eyes, skin, or throat
- sweating
- dizziness
- breath odor: bitter almond (cyanide poisoning), garlic odor (arsenic poisoning)
- nausea, vomiting, diarrhea
- unusual behavior
- difficulty walking or standing straight

Chronic poisoning

COMMON ROUTES OF EXPOSURE TO TOXIC CHEMICALS. Individuals may accumulate toxic amounts of a chemical in their body through daily exposure to the chemical. Common routes of exposure include:

- inhalation of the poisonous gas
- consumption of contaminated food, water, or medications
- contact with toxic or caustic chemicals in the eyes, skin, or through contaminated clothing
- pregnant mother's exposure to toxic chemicals during pregnancy, especially during the first trimester

EFFECTS OF TOXIC CHEMICALS ON DEVELOPING FETUSES AND CHILDREN. Toxic chemicals can have devastating effects on developing fetuses and young children. The following diseases and conditions are linked to chronic exposure to home and environmental pollution:

- miscarriages and spontaneous abortions
- low birth weight
- premature births
- stillbirths
- birth defects
- sudden infant death syndrome (SIDS)
- developmental delays
- poor motor coordination
- attention-deficit hyperactivity disorder (ADHD)
- aggressive behavior
- learning disabilities
- speech and language problems
- autism
- sensory deficits
- allergies and chemical sensitivity in childhood and in later years
- asthma, hay fever, and sinusitis
- cancer in childhood, adulthood, and in subsequent generations
- poorly functioning organs and systems
- weakened immune system and increased risk of infections

The following chronic diseases and conditions may occur in adults as a result of cumulative chemical poisoning:

- fatigue
- headaches
- skin rashes
- aches and pains
- generalized weakness
- asthma
- increased risk of infection
- depression and irritability
- liver diseases, such as jaundice (yellowing of the skin and eyes), inflammation of the liver (hepatitis), and cirrhosis (a chronic degenerative disease of the liver)
- lung diseases
- heart diseases
- cancer
- decreased life expectancy
- sick building syndrome
- Gulf War syndrome (due to nerve agent and pesticide exposure)

Diagnosis

Acute poisoning

In many cases, the identity of the poison is known to the patient or the parents of the affected child. The role of the physician is to determine what treatment (if any) is necessary based on the type and amount of toxic substance exposure, the identity of the chemical, and patient's signs and symptoms.

Chronic poisoning

Chronic environmental poisoning is more difficult to diagnose. To find out if environmental pollution is causing an illness, a physician conducts a thorough physical exam of the patient. The doctor also obtains a thorough medical history with detailed information concerning the food and water sources, as well as the nature of the patient's work or place of residence. Laboratory tests may include blood and urine tests and hair sample analysis. In addition, liver and kidney function tests are conducted to see if these organs are affected. The doctor also inquires about other diseases the patient may have developed in the recent past.

Treatment

Alternative treatments are not appropriate for acute chemical poisoning. When an emergency poisoning occurs, especially in children, parents are encouraged to call a toll-free hotline that is staffed 24 hours a day at 1-800-222-1222. However, alternative treatments may be useful in treating chronic exposure to toxic chemicals. The specific treatment plan depends on the type of poison by which a person is affected. Generally speaking, most treatments involve identifying the offending chemical and avoiding future exposures to it. A healthy diet, nutritional supplements and/or **detoxification** therapy are also helpful. Detoxification therapy is especially effective for the liver, which is the organ that metabolizes most toxins.

Detoxification diet

Naturopaths sometimes recommend patients suspected of chronic chemical poisoning to follow a detoxification (detox) diet for at least several months. Pregnant women, small children, or very frail people should avoid taking this diet. A detox diet has the following characteristics:

- Low fat intake to increase fat mobilization (moving fat from storage to be used for energy). Limited consumption of olive oil and vegetable oils is allowed.
- Limited intake of sugar and highly processed foods and avoidance of alcohol, caffeine, and tobacco.
- High fiber consumption to absorb the toxic chemicals and eliminate them from the body.
- Limited consumption of red meat. The bulk of protein intake should come from vegetable sources, such as legumes and tofu, as well as fish from unpolluted waters.
- Strong emphasis on organic fruits and vegetables (and their juices) with detoxification effects. These include papayas, apples, pears, strawberries, dark green leafy vegetables, carrots, beets, and garlic. Antioxidant foods, such as broccoli, cauliflower, kale, yams, tomatoes, peaches, watermelon, hot peppers, green tea, red grapes, citrus fruits, soybeans, and whole grains are also recommended.
- Increased water intake to at least eight glasses of water per day to help eliminate waste from the body.
- Dietary supplementation with high potency multivitamin/mineral products.

Exercise

Exercise to the point of perspiration helps eliminate toxins from the body. Daily walking for 30 minutes is helpful and appropriate for most people.

Herbal therapy

Milk thistle (*Silybum marianum*) is a powerful antioxidant that protects the liver and assists in the detoxification process by increasing **glutathione** supply in the liver. Glutathione is the enzyme primarily involved in the detoxification of many toxic chemicals in the environment, such as solvents, pesticides, and heavy metals.

Traditional Chinese medicine

Depending on a patient's specific condition, an expert Chinese herbalist may prescribe herbal remedies that can help remove toxins from the body and improve liver function.

Homeopathy

For homeopathic therapy, patients should consult a homeopathic physician who can prescribe specific remedies based on knowledge of the underlying cause.

Fasting

Fasting is an ancient way of detoxification and is very efficient. During three-day fasting, patients take supplements and drink four glasses of juice a day to assist the cleansing process and to prevent exhaustion. Supplements recommended are those that include **antioxidants**, such as vitamins C and E, **selenium**,

zinc, and **magnesium**. For patients suspected of significant poisoning, a naturopath may also prescribe milk thistle to aid the detoxification process and provide support for the body. The patient may also consider consuming a food fast, where only food that is simple to digest is consumed. For example, ultraclear hydrolyzed rice is simple to digest and is also hypoallergenic.

Allopathic treatment

Acute poisoning

For acute poisoning, individuals should call 911, a local poison control center, or 1-800-222-1222 immediately. The toll-free number is a national hotline begun in 2002 by the American Association of Poison Control Centers to provide 24-hour poison treatment and prevention services. If a child is suspected of eating or drinking hazardous chemicals, parents should look for the container and call for instructions. Patients or parents of the poisoned child should wait for instructions before administering syrup of **ipecac**, **activated charcoal**, or anything else by mouth. Treatment of a particular poison depends on the identity of the poison and how the poison is absorbed by the body.

INHALED POISONS. Treatment of inhaled poison includes bringing the patient out and away from the area contaminated with poisonous gas. The patient should be given oxygen and other respiratory support as necessary.

SKIN AND EYE CONTAMINATION. If a person's skin comes into contact with toxic chemicals, the contaminated clothing should be removed, the chemical carefully brushed off the skin, and the body flushed with running water to dilute the poison. The **wounds**, if any, should be covered with sterile gauze or cloth and the patient transferred to the hospital for treatment of chemical burn. If toxic or caustic chemicals get in the eyes, the affected person should remove glasses or any contact lenses immediately, rinse the eyes well with clean water or normal saline solution, and go to the emergency room for further treatment or observation.

INGESTED POISONS. Depending on the specific type of ingested poisons, syrup of ipecac, activated charcoal, and/or gastric lavage can be used.

In many cases of accidental poisoning, syrup of ipecac can be used effectively. When swallowed, it irritates the stomach and induces **vomiting**. As of 2008, syrup of ipecac was considered the safest drug for treating poisoning and was often the most effective. Syrup of ipecac can be used for most ingested poisons. However, syrup of ipecac should not be used if the suspected poison is strychnine, a corrosive substance (strong acids or lye), petroleum products (gasoline, kerosene, paint thinner, or cleaning fluids), or certain prescription drugs, such as antidepressants or sustained-release theophylline. In addition, it should not be used in patients who are unconscious or seizing.

Activated charcoal is also an effective treatment for many chemical poisons. It absorbs poisons quickly and in large amounts. In addition, it is nontoxic, may be stored for a long time, and can be conveniently administered at home. Charcoal works by absorbing irritating or toxic substances in the stomach and intestines. This action prevents the toxic drug or chemical from spreading throughout the body. The toxic drug or chemical and the activated charcoal are excreted in the stools without harming the body.

If both syrup of ipecac and charcoal are recommended for treatment of the poison, ipecac should be given first. Charcoal should not be given for at least 30 minutes after ipecac or when vomiting from ipecac stops. Activated charcoal is often mixed with a liquid before being swallowed or put into the tube leading to the stomach. Activated charcoal is available in liquid form in 30 g bottles. It is also available in 15 g container sizes, as slurry of charcoal premixed in water, or in a container to which water or soda is added.

Charcoal should not be used to treat poisoning caused by corrosive products, such as lye or other strong acids or petroleum products such as gasoline, kerosene, or cleaning fluids. Charcoal may make the condition worse and delay the diagnosis and treatment. In addition, charcoal is not effective if the poison is lithium, cyanide, iron, ethanol, or methanol.

Gastric lavage may also be used to treat chemical poisoning. This procedure is performed by medical professionals in emergency rooms only. Lavage fluids (saline water or water) are given through a large tube down the patient's throat and the stomach contents are pumped out. This procedure is repeated until most of the toxic substance is removed. Then a specific antidote for the chemical or activated charcoal is given to absorb the rest.

Sometimes, antidotes are available to neutralize poison and render it harmless. The following are common antidotes:

- naloxone: for morphine, methadone, or heroin overdose
- atropine: for organophosphate (insecticide) poisoning

- acetylcysteine: for acetaminophen (Tylenol) toxicity
- digoxin immune fab (Digibind): for digoxin toxicity

Chronic chemical poisoning

Treatment of chronic chemical poisoning involves identifying and eliminating the source of poison from the patient's environment, followed by symptomatic treatment of the condition. **Chelation therapy** can be used to remove heavy metals, such as lead, iron, mercury, **copper**, nickel, zinc, cadmium, beryllium, and arsenic. This treatment uses chelating agents, such as ethylenediamine tetraacetic acid (EDTA) and dimethylsuccinate (DMSA) to bind and precipitate metals and remove them from the body.

Expected results

Depending on the severity of the poisoning, the affected person may have total or partial recovery. If the rescue effort comes too late, a patient may die of acute chemical or drug poisoning. For those affected by chronic exposure to environmental poisoning, recovery depends on the severity of the poisoning, the ability to stay away from the offending agent, and appropriate diagnosis and treatment. Total recovery can occur in many patients.

Prevention

Some strategies to avoid poisoning are:

- Avoid eating contaminated fish, especially that which comes from known contaminated areas or a lot of big fish, such as shark, swordfish, or tuna, which tend to contain higher amounts of mercury than smaller fish. Pregnant women should not consume more than 7 oz of tuna per week. Mercury can cause brain damage in the developing fetus.
- Do not paint or remodel a home while pregnant or when children are still small. Paint may contain chemicals that can harm a fetus and cause learning disabilities in small children.
- Limit use of chemicals inside the house as much as possible and instead use natural benign alternatives, such as baking soda (as cleaner, deodorizer), distilled white vinegar (as cleaner), essential oils (as fragrances), lemon juice (as cleaner), and liquid soaps (as detergents).
- Increase ventilation of the house.
- Consider installing tile or wood floors in new homes instead of new carpet.
- Have the house tested for radon.
- Eat organic foods. Otherwise, to better remove toxins, wash fruits and vegetables carefully before eating with a mild acid solution, such as diluted vinegar.

KEY TERMS

Antidote—A remedy to counteract a poison.

Cumulative—Increasing in effects or quantity by successive additions.

Detoxification—A structured program for removing stored toxins from the body.

Diazinon—A member of the organophosphate family of pesticides. This chemical causes nerve and reproductive damage.

Insecticides—Any substance used to kill insects.

Pesticides—Chemicals used to kill insects.

- Avoid toxic chemical exposure as much as possible if pregnant.
- Keep all medications, petroleum products, and cleaning products locked and away from small children. Install child-proof locks or gates to prevent children from finding poisons.
- Avoid mixing household cleaning products. Nontoxic chemicals when mixed together can release toxic gases or cause an explosion.
- Keep all chemicals in original containers, properly identified and stored away from foods.
- Only use chemicals in well-ventilated areas to avoid breathing in fumes. Use adequate skin, eye, and respiratory protection.
- Never put household chemicals in food or beverage containers.
- Avoid smoking or lighting a candle near household chemicals such as cleaning solutions, hair spray, paints or paint thinner, or pesticides.
- Dispose all hazardous chemicals properly according to the manufacturer's instructions.

Resources

BOOKS

Chapman, Anne. *Democratizing Technology: Risk, Responsibility, and the Regulation of Chemicals*. London: Earthscan Publications, 2007.

Howd, Robert A., and Anna M. Fan. *Risk Assessment for Chemicals in Drinking Water*. New York: Wiley Interscience, 2007.

Penney, David G., ed. *Carbon Monoxide Poisoning*. London: Informa Healthcare, 2007.

Stranks, Jeremy. *The A Z of Food Safety*. Abingdon, England: Thorogood, 2007.

Van Leeuwen, C. J., and T. G. Vermeire, eds. *Risk Assessment of Chemicals: An Introduction*. New York: Springer, 2007.

PERIODICALS

Cooper, Kelli, et al. "Public Health Risks from Heavy Metals and Metalloids Present in Traditional Chinese Medicines." *Journal of Toxicology and Environmental Health: Part A* (January 2007): 1694 1699.

Isman, Murray B. "Botanical Insecticides: for Richer, for Poorer." *Pest Management Science* (January 2008): 8 11.

Peter, John Victor, John L. Moran, and Petra L. Graham. "Advances in the Management of Organophosphate Poisoning." *Expert Opinion on Pharmacotherapy* (July 2007): 1451 1464.

Schier, Joshua G., et al. "Strategies for Recognizing Acute Chemical associated Foodborne Illness." *Military Medicine* (December 2006): 1174 1180.

OTHER

"Case Definitions for Chemical Poisoning." Centers for Disease Control and Prevention. [cited March 18, 2008]. http://www.bt.cdc.gov/chemical/casedef.asp.

"Chemical Poisoning and Syrup of Ipecac." University of Maryland Medical Center. January 25, 2008 [cited March 18, 2008]. http://www.umm.edu/non_trauma/chempois.htm.

ORGANIZATIONS

Agency for Toxic Substances and Disease, 1825 Century Blvd., Atlanta, GA, 30345, (800) 232 4636, http://www.atsdr.cdc.gov/.

American Academy of Environmental Medicine, 6505 E. Central Ave., #296, Wichita, KS, 67206, (316) 684 5500, http://www.aaemonline.org.

American Association of Poison Control Centers, 3201 New Mexico Ave., Suite 330, Washington, DC, 20016, (800) 222 1222, http://www.aapcc.org/.

Environmental Protection Agency, Ariel Rios Building. 1200 Pennsylvania Ave. NW, Washington, DC, 20460, (202) 260 7751, http://www.epa.gov/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Cherry bark

Description

Cherries are members of the botanical genus *Prunus*, which is a member of the *Rosaceae* (or rose) family. Cherries can be a shrub or a tree, and are believed to have originated in the Caucasus mountain region between Europe and Asia.

Cherries are divided into two broad groups: sweet (*Prunus avium*) and sour (*Prunus cerasus*). Varieties of the cherry are widely distributed throughout temperate regions of the world and have been cultivated for thousands of years. Roman historian Pliny reported that sour cherries were introduced to ancient Rome as part of a victory celebration after the defeat of the Parthians at a place called Cerasus.

From the simple division of sweet and sour cherries, classification of the various cherry types has grown increasingly complex through the years. Today, there are literally hundreds of varieties due to their long record of cultivation and crossbreeding.

Cherry trees have been used widely for their fruit, eaten fresh and used in cooking. Both the fermented fruit and the crushed pits are used in making the European liqueur, kirsch. The tree is also a source of wood used in making high-quality furniture. The stalks from some of these cherry varieties have been used medicinally as an astringent, however, it is widely accepted that the cherry tree bark used in herbal medicine comes from the wild cherry (listed now as *Prunus serotina*, but in nineteenth century herbal books is listed as *Prunus virginianus*).

The wild cherry is a native of North America. It is found in central and northern parts of the United States, as well as in cooler, nondesert parts of the Southwest. Wild cherry trees characteristically grow to a height of 50-80 ft (15.2-24.4 m), with a trunk width of 2-4 ft (0.6-1.2 m). The leaf of the wild cherry is oval, with a minutely serrated edge, and is more pointed toward the tip. Its leaves are approximately 3 in (7.6 cm) in length, dark green and shiny on top, and paler and fuzzy on the underside. Small, white, petaled flowers appear along the stems before the leaves in early spring. Pea-sized, purplish black fruits that are bitter develop and ripen by late summer.

The outer bark of the wild cherry tree is dark gray to black, very rough to the touch, and breaks away easily from the trunk. Even though the bark from the roots, trunk, and branches has medicinal properties, it is the root bark that is the most beneficial. Beneath a cherry root's dark outer covering, the interior is a dusky reddish color. It has an almond-like aroma that evaporates when dried, but re-emerges when the bark is crushed or dissolved. Its tastes astringent and bitter. Its chemical constituents include cyanogenic glycosides, starch, resin, tannin, gallic acid, fatty matter, lignin, red coloring material, as well as **calcium**, **potassium**, and **iron** salts.

Cherry bark. *(O.D. vande Veer / Alamy)*

General use

Wild cherry bark has a strong sedating effect on the **cough** reflex and is particularly useful to treat dry, nonproductive coughs in respiratory conditions. Because of its antispasmodic qualities, it has been used with other herbs to treat **asthma**. It is given for spasmodic cough to enhance **relaxation** and resting or at night to reduce cough and enhance sleep. Its astringent properties make it useful as a bitter, taken to stimulate sluggish digestion and the appetite. A cold infusion of wild cherry bark has been noted to soothe eye inflammation.

Preparations

Bark is collected in the autumn by carefully stripping away small sections. The outer wild cherry bark is then removed and the lighter colored, reddish interior cortex is dried, but not in direct sunlight. Once thoroughly dried, it must be stored in airtight containers away from light. Because it deteriorates so rapidly, it is more beneficial if used when still fresh and must be newly collected each year. The fragments of inner bark crush easily to make a powder. This powdered cherry bark can then be dissolved in either alcohol or water. A cough remedy is made by dissolving 4 oz (113 g) of the bark in 4 oz (120 ml) of water for several hours. The solution is then strained, and honey is added to sweeten to taste. Boiling cherry bark is not recommended since this decreases the medicinal properties. Cherry bark can also be used to make a tincture and lozenges.

Precautions

Coughing is a normal and helpful reaction to airway or lung irritation. It is designed to expel harmful substances (such as excess phlegm or irritants) from the lungs. Suppressing a cough, then, can actually prevent or postpone recovery. It is persistent coughing that needs treatment. It is also important for potential users to remember that a cough is merely a symptom of some other illness, as are digestive problems. Wild cherry bark preparations should not be taken for an extended period of time. They should only be used for temporary relief of symptoms. A doctor should be consulted for persistent cough or digestive problems.

KEY TERMS

Antispasmodic—An agent used to relieve muscle spasms.

Side effects

Wild cherry bark preparations can cause sedation, especially if recommended dosage is exceeded.

Interactions

None known.

Resources

BOOKS

Grieve, M., and C.F. Leyel. *A Modern Herbal: The Medical, Culinary, Costmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes and Noble Publishing, 1992.

Hoffman, David, and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. Barnes and Noble Publishing, 1999.

ORGANIZATIONS

Hobbs, Christopher. *Herbal Advisor*. http// www.AllHerb.com.

Joan Schonbeck

Cherry, wild *see* **Wild cherry**

Chest pain *see* **Angina**

Chickenpox

Definition

Chickenpox (varicella) is a common and extremely infectious childhood disease that also occasionally affects adults. It produces an itchy, blistery rash that typically lasts about a week and is sometimes accompanied by a **fever** or other symptoms.

Description

About four million Americans contract chickenpox each year, resulting in roughly 5,000-9,000 hospitalizations and 100 deaths. Chickenpox is caused by the varicella-zoster virus (a member of the herpes virus family), which is spread through the air or by direct contact with an infected person. Once someone has been infected with the virus, symptoms appear in about 10-21 days. The period during which infected people can spread the disease is believed to start one or two days before the rash appears until all the **blisters** have formed scabs, usually four to seven days after the rash breaks out. For this reason, doctors recommend keeping children with chickenpox away from school for about a week.

Child with chickenpox. *(© Janine Wiedel Photolibrary / Alamy)*

Chickenpox has been a typical part of growing up for most children in the industrialized world (although this may change because of the new varicella vaccine). The disease can strike at any age, but by ages nine or 10 about 80-90% of American children have already been infected. U.S. children living in rural areas and many foreign-born children are less likely to be immune. Because almost every case of chickenpox leads to lifelong protection, adults account for less than 5% of all cases in the United States. Study results reported by the Centers for Disease Control and Prevention (CDC) indicate that more than 90% of

American adults are immune to the chickenpox virus. Adults, however, are much more likely than children to suffer dangerous complications. More than half of all chickenpox deaths occur among adults.

Causes and symptoms

A case of chickenpox usually starts without warning or with only a mild fever and a slight feeling of unwellness. Within a few hours or days small red spots begin to appear on the scalp, neck, or upper half of the trunk. After a further 12-24 hours the spots typically become itchy, fluid-filled bumps called vesicles, which continue to appear for the next two to five days. In any area of skin, lesions of a variety of stages can be seen. These blisters can spread to cover much of the skin, and in some cases may also be found inside the mouth, nose, ears, vagina, or rectum. Some people develop only a few blisters, but in most cases the number reaches 250-500. The blisters soon begin to form scabs and fall off. Scarring usually does not occur unless the blisters have been scratched and become infected. Occasionally a minor and temporary darkening of the skin (called hyperpigmentation) is noticed around some of the blisters. The degree of itchiness can range from barely noticeable to extreme. Some chickenpox sufferers also have headaches, abdominal **pain**, or a fever. Full recovery usually takes five to 10 days after the first symptoms appear. The most severe cases of the disease tend to be found among older children and adults.

Some groups are at risk for developing complications, the most common of which are bacterial **infections** of the blisters, **pneumonia**, dehydration, encephalitis, and **hepatitis**. Immediate medical help should always be sought when anyone in these high-risk groups contracts the disease. These include:

- Infants. Complications occur much more often among children less than one year old than among older children. The threat is greatest to newborns, who are more at risk of death from chickenpox than any other group. Children born to mothers who contract chickenpox just prior to delivery face an increased possibility of dangerous consequences, including brain damage and death. If the infection occurs during early pregnancy, there is a small (less than 5%) risk of birth defects.
- Immunocompromised children. Children whose immune systems have been weakened by a genetic disorder, disease, or medical treatment usually experience the most severe symptoms of any group. They have the second-highest rate of death from chickenpox.
- Adults and children 15 and older. The typical symptoms of chickenpox tend to strike this group with greater force.

KEY TERMS

Dehydration—Excessive water loss by the body.

Immune system—A biochemical complex that protects the body against pathogenic organisms and other foreign bodies.

Immunocompromised—Having a damaged immune system.

Pus—A thick yellowish or greenish fluid containing inflammatory cells. Usually caused by bacterial infection.

Reye's syndrome—A rare but often fatal disease that involves the brain, liver, and kidneys.

Shingles—A disease (also called herpes zoster) that causes a rash and a very painful nerve inflammation.

Varicella-zoster immune globulin (VZIG)—A substance that can reduce the severity of chickenpox symptoms.

Varicella-zoster virus—The virus that causes chicken pox and shingles.

Varivax—A vaccine for the prevention of chicken pox.

Virus—A tiny particle that can cause infections by duplicating itself inside a cell using the cell's own machinery.

Diagnosis

Where children are concerned, especially those with recent exposure to the disease, diagnosis can usually be made at home, by a school nurse, or by a doctor over the telephone if the child's parent or caregiver is unsure that the disease is chickenpox. A doctor should be called immediately if:

- The child's fever goes above 102°F (38.9°C) or takes more than four days to disappear.
- The child's blisters appear infected. Signs of infection include pus drainage or excessive redness, warmth, tenderness, or swelling.
- The child seems nervous, confused, unresponsive, or unusually sleepy; complains of a stiff neck or severe headache; shows signs of poor balance or has trouble walking; finds bright lights hard to look at; is having breathing problems or is coughing a lot; is

complaining of chest pain; is vomiting repeatedly; or is having convulsions. These may be signs of Reye's syndrome or encephalitis, two rare but potentially very dangerous conditions.

Treatment

Treatment focuses on reducing symptoms of chickenpox. The patient should drink plenty of fluids and eat simple, nutritious foods. Soups (especially mung bean), herbal teas, and fruit juices are good choices.

Applying wet compresses or bathing the patient in cool or lukewarm water once a day can help the itch. Adding four to eight ounces of baking soda or one or two cups of oatmeal to the bath is helpful. Only mild soap should be used and patting, not rubbing, is recommended for drying the patient. The patient should not scratch the blisters as this can lead to infection or scarring. For babies, light mittens or socks on the hands can help guard against scratching. If mouth blisters are present, cold drinks and soft, bland foods can make eating less painful.

Supplements

Vitamin A may help to heal skin. **Vitamin C** and bioflavinoids help to reduce fever and stimulate the immune system. **Zinc** also stimulates the immune system and promotes healing, however, it can cause **nausea** and **vomiting**. **Calcium** and **magnesium** help to relieve restlessness and sleeping difficulties. Magnesium has a laxative effect at high doses.

Herbals and Chinese medicine

The following herbals are ingested to treat chickenpox:

- Echinacea and goldenseal (*Hydrastis canadensis*) support the immune system and soothe skin and mucous membranes. Echinacea is also an antiviral.
- Chamomile tea is a sleep aid.
- Chinese cucumber (*Trichosanthes kirilowii*) root tea is used to relieve symptoms of chickenpox.
- Elder flower, peppermint, and yarrow reduce fever.
- Garlic has antiviral activity.
- Mullein (*Verbascum thapsus*) treats chickenpox.
- Yin Qiao Jie Du Wan (Honeysuckle and Forsythia Pill).
- Ban Lan Gen Chong Ji (Isatis Infusion).

The following herbals are used externally to treat chickenpox:

- Aloe leaf, calendula, and plantain relieve the itching of the chickenpox rash.
- Turmeric powder mixed with lime juice treats chickenpox rash.
- Garlic clears skin infection.

Other remedies

Homeopathic remedies are selected on a case by case basis. Some common remedy choices are **apis**, aconitum, **belladonna**, **calendula**, antimonium tartaricum, pulsatilla, *Rhus toxicodendron*, and sulphur.

The **acupressure** points Four Gates, Large Intestine 11, Spleen 10, and Stomach 36 help alleviate symptoms associated with chickenpox.

Allopathic treatment

Treatment usually focuses on reducing discomfort and fever. Because chickenpox is a viral disease, antibiotics are ineffective. Antibiotics may be prescribed if the blisters become infected. Calamine lotion helps to reduce itchiness. Painful genital blisters can be treated with an anesthetic cream recommended by a doctor or pharmacist.

Fever and discomfort can be reduced by acetaminophen (Tylenol) or other medications that do not contain aspirin. *Aspirin (or any aspirin- containing medications) must not be used with chickenpox, because it increases the chances of developing Reye's syndrome*. The best idea is to consult a doctor or pharmacist if one is unsure about which medications are safe.

Immunocompromised chickenpox sufferers are sometimes given the antiviral drug acyclovir (Zovirax). Zovirax also lessens the symptoms of chickenpox in otherwise healthy children and adults.

Expected results

Most cases of chickenpox run their course within a week. The varicella-zoster virus lies dormant in the nerve cells, where it may be reactivated years later by disease or age-related weakening of the immune system. The result is **shingles** (herpes zoster), a very painful rash and nerve inflammation, that strikes about 20% of the population, particularly people 50 and older.

Prevention

A substance known as varicella-zoster immune globulin (VZIG), which reduces the severity of chickenpox symptoms, is available to treat persons at high risk of developing complications. It is administered by

injection within 96 hours of known or suspected exposure to the disease.

A vaccine for chickenpox (Varivax) has been found to prevent the disease in 70-90% of the vaccinated population, to reduce the severity of disease in the remaining cases. CDC and the American Academy of Pediatricians recommend vaccination of all children (with some exceptions) at 12-18 months of age. For older children, up to age 12, the CDC recommends vaccination when immunity cannot be confirmed. Vaccination is also recommended for any older child or adult considered susceptible to the disease, particularly those who face a greater likelihood of severe illness or transmitting infection. A single dose of the vaccine is sufficient for children up to age 12; older children and adults receive a second dose four to eight weeks later.

Resources

BOOKS

Pattishall, Evan G., III. "Chickenpox." In *Primary Pediatric Care*. edited by Robert A. Hoekelman, et al. St. Louis: Mosby, 1997.

Ying, Zhou Zhong, and Jin Hui De. "Common Diseases of Pediatrics." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Liv ingston, 1997.

PERIODICALS

Kump, Theresa. "Childhood Without Chickenpox? Why Parents Are Still Wary of This New Vaccine." *Parents*. (April 1996): 39 40.

Napoli, Maryann. "The Chickenpox Vaccine." *Mothering*. (Summer 1996): 56 61.

Shapiro, Eugene D., and Phillip S. LaRussa. "Vaccination for Varicella Just Do It!" *Journal of the American Medical Association* 278 (1997): 1529 1530.

ORGANIZATIONS

Centers for Disease Control and Prevention. National Immunization Hotline. 1600 Clifton Rd. NE, Atlanta, GA 30333. (800) 232 2522 (English). (800) 232 0233 (Spanish). http://www.cdc.gov.

OTHER

Centers for Disease Control and Prevention."Prevention of Varicella: Recommendations of the Advisory Commit tee on Immunization Practices (ACIP)." http://aepo xdv www.epo.cdc.gov/wonder/prevguid/m0042990/ M0042990.asp. (12 December 1997).

Zand, Janet. "Chickenpox." *HealthWorld Online*. http:// www.healthy.net/library/books/smart/chcknpox.htm.

Belinda Rowland

Chickweed

Description

Chickweed (*Stellaria media*) is a member of the Caryophyllaceae, or carnation, family. There are about 25 species of *Stellaria*, including some native varieties, growing abundantly in the wild in North America. Chickweed is a European native that has naturalized throughout the world in fertile, mineral-rich soil. It thrives in shady, moist locations in gardens, near human habitations, and on the edge of woods. The herb is often found growing under the shade of **oak** trees. Chickweed is a persistent annual. It self-seeds and may produce as many as five generations within one season.

The genus name *Stellaria* refers to chickweed's tiny, white, star-shaped flowers. The common name refers to the herb's appeal to birds and barnyard fowl, particularly young chickens. Other common names include Indian chickweed, stitchwort, starwort, white bird's eye, chick wittles, satin flower, adder's mouth, mouse ear, starweed, passerina, tongue grass, and winter weed. Chickweed has been used for centuries. The nutritious herb was fed to caged birds and rabbits. It was also traditionally prepared as an early spring tonic, eaten fresh or steamed, to cleanse the kidneys and liver. English physician Nicholas Culpeper described chickweed as "a fine soft pleasing herb under the dominion of the Moon."

Chickweed is a juicy, succulent, low-growing, and delicate herb which grows from a slender taproot. The straggly, weak stems may stretch along the ground for two feet or more forming dense mats only a few inches off the ground. The light-green, oval, and entire leaves grow in opposite pairs about an inch apart along the smooth and branching stem. A single line of fine white hairs grow along one side or the other of the thin stems, alternating at the node of each pair of leaves. Stems are slightly swollen at the joints. Leaves appear stalkless at the growing tip but the older leaves develop stalks at least as long as the attached leaf. At night the half-inch long leaves close in on each other to protect the developing buds. The tiny white flowers grow singly in the leaf axils of the upper leaves. The five petals are deeply incised, and smaller than the pointed green sepals. Blossoms open in the sun and close on cloudy, gray days and throughout the night hours. Minuscule seed capsules, with a barely-perceptible toothed edge, follow the blossoms. In damp weather the "teeth" swell, effectively closing the capsule to protect the ripening seed. The tiny yellow-orange seeds continue to ripen even after the herb is harvested. Chickweed self-seeds freely in cool, moist habitats.

General use

The entire chickweed plant is edible. The stems and leaves are used in medicinal preparations. Herbalists, however, disagree about the medicinal potency of chickweed. One writer, a professor of pharmacognosy, dismissed chickweed as a "worthless weed" and an "ineffective herb." Other writers and herbalists praise the diminutive herb for providing "optimum nutrition" and for its "unsurpassed" ability to cool fevers and **infections**. The English physician Nicholas Culpeper, writing in the seventeenth century, credited chickweed as beneficial for "all pains in the body that arise of heat." Taken as an infusion, chickweed acts internally to cool inflammation of the digestive and respiratory system. It has been used to treat **bronchitis**, **pleurisy**, **colitis**, **gastritis**, **asthma**, and **sore throat**. The herb's diuretic action helps eliminate toxins from the system and reduce retention of fluids. Chickweed contains mucilage, saponins, **silica**, coumarins, flavonoids (including glycoside rutin), triterpenoids, and carboxylic acids. The herb is rich in minerals, including **copper** and **iron**, and vitamins A, B, and C.

Gathered fresh, chickweed is beneficial in poultice form to ease rheumatic **pain** and to treat **boils** and abscesses. The herb can also be used to draw out splinters and the stingers of insects and to dissolve **warts**. Its vulnerary (wound-healing) action speeds the healing of **cuts** and **wounds**. Its emollient qualities soothe **itching** and irritation of **eczema** or **psoriasis**. An infusion of chickweed may be added to bath water for soothing relief of inflamed skin. Chickweed also provides relief to swollen and painful **hemorrhoids**.

Another species of chickweed, *S. dichotoma*, known as *yin chai hu* is used in Chinese medicine to stop nosebleed, to reduce heavy menstrual bleeding, and to bring down fevers. The species *S. alsine* is also used in Chinese medicine as a medicinal remedy for treating colds, snakebites, and even traumatic injury.

Preparations

Gather chickweed from young plants before or during flowering and throughout the year. Snipping the stems will encourage growth of new branches for later harvest. The freshly harvested herb will keep for several days if refrigerated. The fresh herb may be eaten in salads, or very lightly steamed as a potherb. Chickweed has a somewhat bland taste, so other edible greens may be added to the pot to enhance the flavor.

- Infusion: Place 2 oz of fresh chickweed leaves and stems in a warmed glass container. Bring 2.5 cups of fresh, nonchlorinated water to the boiling point and add it to the herbs. Cover and infuse the tea for about 10 minutes. Strain and drink warm. The prepared tea will store for about two days in a sealed container in the refrigerator. Chickweed tea may be enjoyed by the cupful up to three times a day. A strong infusion may be used as a skin wash or bath additive to soothe itching and inflamed skin.
- Poultice: Chop fresh chickweed leaves and stems in sufficient quantity to cover the area being treated. Sprinkle the herb with water and place over the area. Cover the herbal mass with a strip of wet cotton gauze to hold the poultice in place. When gathering the older, tougher plant, the herb may be simmered either in water alone or in a 50/50 mixture of water and vinegar for about five minutes. Apply to the skin after the mixture has sufficiently cooled.
- Tincture: Combine four ounces of finely-cut fresh or powdered dry herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts. Place the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly-capped, dark glass bottle. A standard dose is 1–4 ml of the tincture three times a day.

KEY TERMS

Diuretic—A substance which tends to increase the flow of urine.

Pleurisy—Inflammation of the pleura (lining of the chest cavity) usually caused by a lung infection.

Precautions

The wind-blown pollen of chickweed may aggravate **hay fever**. Chickweed is considered safe for all external applications. There was a report in 1980 of "temporary paralysis" after ingestion of large amounts of the infused herb, however there are no other documented reports of toxicity. The *PDR For Herbal Medicines* reports no health hazards when this herb is taken "with the proper administration of designated therapeutic dosages."

Side effects

None reported.

Interactions

None reported.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, Penn.: Rodale Press, 1997.
Hutchens, Alma R. *A Handbook Of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.
McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.
Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.
PDR for Herbal Medicines New Jersey: Medical Economics Co., 1998.
Polunin, Miriam, and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Com pany, 1992.
Tyler, Varro E. *Herbs of Choice, The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.
Weiss, Gaea, and Shandor Weiss. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

Clare Hanrahan

Chicory

Description

Chicory (*Cichorium intybus*) is an herb and root that has been known for its curative benefits since the first century A.D.. It is a member of the Asteraceae family. A scraggly plant with blue flower heads, chicory flourishes in the wild, as well as in gardens all over the world. It may be found in Europe, the Near East, northern and southern Africa, Australia, New Zealand, and North and South America.

The dried leaves and roots of the chicory plant are collected in autumn for medicinal purposes. When flowering, the whole plant is collected and dried. With a height that may reach up to 5 ft (1.5 m), chicory can be recognized by its oblong leaves that resemble a crosscut saw or slit, with numerous stiff hairs on the underside. Chicory, whose common names include succory, chicory root, chicory herb, blue sailors, wild chicory, or hendibeh, is well known for its bitter taste and use as a coffee substitute.

General use

The ancient Egyptians ate large amounts of chicory because it was believed that the plant could purify the blood and liver, while others have relied on the herb for its power to cure "passions of the heart." Chicory continues to be a popular herbal remedy due to its healing effects on several ailments.

KEY TERMS

Biodegradable—Capable of being broken down by the actions of living organisms. Inulin from chicory roots can be used to produce biodegradable substances used in industry.

Diuretic—A medicine or agent that increases the body's output of urine.

Infusion—A liquid extract of an herb or other plant prepared by steeping or soaking the plant material in water. Chicory can be taken at home as an infusion.

Inulin—A starchlike complex sugar obtained from chicory roots that is used to improve the texture of processed foods.

Prebiotic—A type of nondigestible substance found in chicory and some other plants that supports the growth and activity of beneficial bacteria in the colon.

Premenstrual syndrome (PMS)—A group of symptoms that occur several days prior to the beginning of menstruation, including irritability, emotional tension, anxiety, and mood changes such as depression, headache, breast tenderness with or without swelling, and water retention. Symptoms usually subside shortly after the onset of the flow.

Sedative—A drug or agent that calms or soothes. Chicory by itself has a sedative effect on the body.

Chicory is taken internally for the following disorders.

- jaundice
- spleen problems
- gallstones
- rheumatism
- gout
- loss of appetite

In addition, the leaves of chicory may also be used as compresses to be applied externally to ease skin inflammations and swellings.

According to folklore, chicory was recommended as a laxative for children, and it is also believed to increase the flow of bile. As a mild diuretic, it increases the elimination of fluid from the body, leading to its use as a treatment for rheumatism and **gout**.

Women who suffer from **premenstrual syndrome** (PMS) may find that regular use of chicory root as a bitter and a liver tonic may assist in maintaining

hormone balance and lessening the symptoms of PMS. In addition, altering the diet by eating a "bitter" salad that includes fresh **dandelion**, chicory, and sorrel is believed to strengthen the liver and discourage the growth of candida.

Chicory also supports the body's ability to absorb **calcium**, a nutrient that helps build and maintain strong teeth and bones. Raftilin inulin and raftilose oligofructose are fibers extracted from chicory root that cannot be digested by the small intestine. Instead, they are fermented by bacteria in the large intestine, leading to the increased absorption of calcium and other minerals. Oligofructose is an example of a prebiotic, or nondigestible food ingredient that benefits health by supporting the growth of one or several types of bacteria in the colon.

A study published in 2002 indicates that inulin appears to lower the risk of colon **cancer**. The precise nature of its protective effects is not yet known, however.

In addition to enhancing digestive processes, chicory helps to keep the liver healthy. The inclusion of chicory root supplements in the diet supports the proper metabolism of **cholesterol**.

Preparations

While the medicinal uses of chicory are numerous, the plant is also often used as a food additive, as a flavoring agent, and in meals. Inulin can be used to improve the texture of processed foods as well as sweeten them. It can also be used to make biodegradable nonfood substances with many industrial applications. This versatility is important to environmentalists because chicory is a renewable natural resource.

Wild and cultivated chicory leaves may be added to salads or sautéed and served alone. Moreover, the roasted and ground root of the plant is a common addition to coffee in Europe and in the United States.

Studies have shown that chicory complements coffee when it is used as a supplement due to its lactucin and lactucopicrin. These two substances are responsible for the bitter taste of chicory, and may serve to counteract the stimulating effects of **caffeine**. Chicory by itself actually has a sedative action on the central nervous system.

Chicory is available over the counter in bulk as green leaves and dried roots. To prepare the herb as a tea, also known as an infusion, for home use: steep 1 tsp (5 ml) rootstock or dried herb with 0.5 cup (4 fl oz) water and strain after 10 minutes. To treat **jaundice**, spleen problems, **gallstones**, or **gastritis**, drink 8-12 oz (225-350 ml) of chicory tea per day.

As a dietary supplement, 1 tsp (5 ml) of juice from chicory stems may be squeezed by hand and taken in milk or water three times a day.

Precautions

Chicory has shown to be safe for a variety of medicinal uses and as a food source. There are no necessary precautions to observe when including the herb in the diet.

Side effects

There are no known health hazards or side effects when chicory is added to the diet. The only possible minor side effect is skin irritation. If the hands become irritated after handling chicory, it is best to cover them with gloves and treat the affected area as needed.

Resources

BOOKS

The Editors of Time Life Books. "Chicory." *The Medical Advisor: The Complete Guide to Alternative & Conven tional Treatments*. Richmond, VA: Time Life Inc., 1996.

Fleming, Thomas. "Cichorium Intybus." *PDR for Herbal Medicines, First Edition*. Montvale, NJ: Medical Eco nomics Company Inc., 1998.

PERIODICALS

Chow, J. "Probiotics and Prebiotics: A Brief Overview." *Journal of Renal Nutrition* 12 (April 2002): 76 86.

Crawford, Sharon. "High Herbs: For Plant Medicine Go to the Mountains." *Alive* (May 31, 1997): 44 45.

Franck, A., "Technological Functionality of Inulin and Oligofructose." *British Journal of Nutrition* 87 (March 2002): Supplement 2, 287 291.

Pool Zobel, B., J. Van Loo, et al. "Experimental Evidences on the Potential of Prebiotic Fructans to Reduce the Risk of Colon Cancer." *British Journal of Nutrition* 87 (March 2002): Supplement 2, 273 281.

Stengler, Mark. "Blast Cholesterol." *Alive* (June 30, 1999): 20 21.

Stevens, C. V., A. Meriggi, and K. Booten. "Chemical Modification of Inulin, a Valuable Renewable Resource, and its Industrial Applications." *Biomacro molecules* 2 (Spring 2001): 1 16.

ORGANIZATIONS

American Botanical Council. P. O. Box 201660. Austin, TX 78720 1660.

Beth Kapes
Rebecca J. Frey, PhD

Chigong *see* **Qigong**

Childbirth

Definition

Childbirth, or parturition, is the process of labor that dilates the cervix and includes the delivery of the baby and placenta through the birth canal.

Description

Most babies are born following approximately nine calendar months of **pregnancy**. Delivery between 37–42 weeks of gestation is considered normal and full-term. A baby born prior to 37 weeks of gestation is considered premature, or preterm. After 42 weeks, a baby is considered postterm. Both preterm and postterm deliveries are considered higher risk deliveries.

Labor occurs in three stages. The first is the dilation of the cervix, the second is the delivery of the baby, and the third is the expulsion of the placenta. Approximately 25 percent of babies born in the United States, however, are surgically delivered by Caesarean section. This procedure can be necessary and even life-saving, but many medical experts believe that Caesarean sections are performed too frequently and could be reduced through better management of labor and a more informed public.

At one time, "once a Caesarean, always a Caesarean" meant a woman could not deliver vaginally after having a Caesarean, but as of 2008 that is no longer true for everyone. Part of the reason is that the Caesarean surgery is performed differently, and women can heal from it sufficiently to have a subsequent birth vaginally. In fact, more and more women choose vaginal birth after Caesarean (VBAC). Having a sympathetic, informed caregiver and preparation helps achieve this goal for some women.

The first stage of labor is the time the cervix must reach full dilation. It includes latent (early), active, and transition phases. The latent phase of labor, when the cervix progresses from being closed to 3 cm open, may last for days or longer. For some women, latent labor is not a distinguishable phase, and for others it leads immediately into active labor. The latent phase is often exciting for the mother, who wonders if her baby is finally going to be born. Contractions during this phase are not very painful. Active labor ensues around the time the cervix reaches 3 cm dilation and continues until approximately 7 cm dilation. At this stage, labor contractions are powerful and require the mother's concentration. The length of this stage is also variable and is usually longer for first-time mothers than for those having subsequent babies. Active labor is followed by transition, the shortest and most intense stage of labor, when many women express feelings of despair or not being able to continue. At the end of transition, the cervix is fully dilated to 10 cm and pushing can begin.

The second stage of labor is pushing the baby out through the vagina (birth canal). Contractions are generally less frequent than in the first stage of labor but are very strong and long lasting. Many women find it a relief to be able to push. In the unmedicated mother, pushing is reflexive and instinctual. The pressure of the baby's head on stretch receptors in the maternal pelvis triggers the urge to push. First-time mothers generally push for about 60 minutes; subsequent births require an average of only 15 minutes.

The third stage of labor is the delivery of the placenta, which often goes unnoticed by the mother who is attending to her newborn. After the baby is delivered, the uterus should continue to contract in order to push out the placenta. The placenta functioned to bring the baby nourishment from the mother throughout the pregnancy and return the child's waste products to the mother to be excreted. If contractions become sluggish or stop before the placenta is delivered, breastfeeding the baby can trigger the release of the hormone oxytocin to stimulate the uterus to contract again. Alternatively, artificial oxytocin (pitocin) can be given by injection.

Causes and symptoms

The onset of spontaneous labor may be marked by irregular contractions, not very different from the Braxton-Hicks contractions that are common throughout late pregnancy. In approximately 10 percent of spontaneous labors, rupture of membranes ("water breaking") may occur before the onset of contractions. Since prolonged rupture of membranes prior to delivery presents a risk of infection, the care provider for the mother should be contacted regardless of whether she is experiencing contractions.

Even experienced mothers sometimes have difficulty recognizing when labor begins, as prelabor may occur on and off for days or longer before settling into a regular pattern. In general, the contractions associated with labor will gradually become more frequent, more regular, longer, and stronger. Walking or changing activity will not alter them. These contractions are effective at changing the cervix, which will become appreciably lower, thinner, and more dilated. By contrast, contractions of prelabor stay about the same intensity and frequency. A change of activity will often make them disappear. These contractions may

be uncomfortable and may even cause some mild cervical changes, but they do not change on an hourly basis.

Diagnosis

For women who choose to deliver in a hospital, a diagnosis of active labor is generally made if contractions are regular and strong, and the cervix is effacing and/or dilating noticeably on an hourly basis. A woman who arrives at the hospital reporting regular contractions who has no complicating factors is generally observed for at least an hour to see whether her labor will progress. Monitors that fit around the abdomen measure the fetal heart rate and the nature of the contractions. A nurse checks the position and station of the baby, as well as the effacement, dilation, and position of the mother's cervix. Admission is generally made regardless of progress if the water has broken (rupture of membranes) or if complications exist. These may include high maternal blood pressure, more than one fetus, fetal distress, abnormal fetal presentation, or excessive bleeding. Women delivering before 37 weeks or after 42 weeks of gestation are also well-advised to deliver in a hospital.

Treatment

For a routine, uncomplicated labor and delivery, the primary treatment required is assistance with comfort measures. What each mother finds comforting is individual. At some point during the pregnancy, it is a good idea to make a list of methods to try to relieve **pain** during labor, in the event that one or two favored techniques do not work: A mother who generally enjoys massage may suddenly discover that it is distracting to be touched during active labor, or a woman who plans to rely on medication could have an epidural that does not take or be laboring too quickly for it to be allowed. Having a list of comfort measures on hand is useful and reassuring for most laboring women. Reassurance is important, as relieving **stress** during labor allows it to progress more quickly and with less pain. Many women find it helpful to employ an experienced doula, or birth assistant, to provide comfort, reassurance, and information.

Fear of the unknown can certainly contribute to increased pain. Expectant parents should learn all they can about the process of childbirth. Many good reference books are available. Taking Lamaze classes lends a personal touch, and many couples enjoy the camaraderie of sharing the learning experience with other expectant families. Even though labor can take unexpected turns, being aware of the options at each stage lends some perception of control. Making a list of birth preferences can be helpful in defining what the parents desire at the birth, but flexibility is important to avoid disappointment if every expectation is not met.

Acupuncture

A skilled acupuncturist may be able to offer some relief of labor pain, particularly for women who have previously found **acupuncture** to be helpful with other types of pain.

Massage therapy

Some women find massage or **therapeutic touch** to be quite relaxing during labor. Contractions are sometimes felt intensely in the back, and a combination of massage and counterpressure can offer relief. Foot massage may also be comforting, both during pregnancy and during labor. Laboring women report a great temptation to tense the abdomen against a contraction. The contraction will be more effective and less painful with effleurage (light stroking) of the area, and a verbal reminder to let the abdomen hang heavy and relax. The jaw area is also frequently clenched and benefits from **relaxation**. Gentle touch and massage of any area that appears tense will help to relieve stress. This is a good technique to practice before labor begins.

Music

The sounds of a favorite piece of music can be an excellent aid to relaxation. Instrumentals are generally preferable to singing. Soothing sounds or tunes that evoke happy memories are helpful. Some women enjoy tapes of nature sounds.

Hydrotherapy

A warm tub or shower may be one of the most underestimated methods of relieving the pain of labor. Warmth encourages muscle relaxation, which in turn decreases **anxiety**. The water in a tub also supports the mother's body. In a jetted tub, position and water pressure can be adjusted to soothe areas that are cramping or painful. This may be particularly comforting for back labor. In a birthing pool or large tub, the mother is free to move around and find a position that optimizes her comfort. The relaxation brought on by water can make for a shorter, more comfortable labor.

Aromatherapy

Some **essential oils** are particularly recommended during birth for those women who enjoy the scents. They can be added to a diffuser or a crock-pot of water in the birthing area, emitted from a scented candle, or concentrated drops of the scent can be placed on the pillow and bed linens. Clary **sage** and **lavender** are popular choices, but any scent that is pleasant to the mother may be used.

Visualization

The use of visualization, or **guided imagery**, can be powerful to promote relaxation and the progress of labor. One exercise that can be practiced in advance of labor is choosing a place or image that the mother associates with comfort, security, and serenity. This place can be imagined and explored at any time to help relieve stress. If the details of this visualization are shared with someone who will be present during labor, that person can help to evoke those feelings during times of pain or stress. Another popular visualization is that of a flower blooming. The cervix can be envisioned as a flower bud that gradually opens to allow the baby to descend. Other scripts for guided imagery can be practiced to relieve stress and reduce pain.

Increasingly, women (not in high-risk pregnancies) desire a more low-tech approach to labor and choose a nurse midwife to assist them rather than a physician. For thousands of years, midwives have given women support and care through the birthing process. In 2004, a nurse-midwife rather than a physician attended about 8 percent of births, which is approximately twice the number in 1989. Nurse-midwives are committed to helping meet mothers' individual needs and to give them freedom of choice during birth. They work to provide a natural childbirth and to help the woman prevent complications before, during, and after the birth. Those wishing to use midwives should check with the obstetrician and also determine if the midwife is certified (CNM). More and more obstetrician practices also employ or work with nurse-midwives.

Allopathic treatment

Modern pain relief for childbirth generally involves the use of medication. Although medication has evolved from the days of mothers being put under so-called twilight sleep for a normal vaginal birth, the use of chemical pain relief is not without risk.

One of the most common pain relief methods during labor is the epidural. This technique involves the injection of anesthetic medication through a catheter into the epidural space in the back. Epidurals often provide excellent relief of pain from contractions, episiotomy, and perineal repair. They do not impair the mother's mental alertness, although she may sleep if labor to that point has been long and arduous. The disadvantages of epidurals include possible prolonging of labor, impaired ability to push, inability to move around, possible need for bladder catheterization and accompanying risk of infection or injury, maternal low blood pressure, maternal **fever**, spinal **headache** from inadvertent injection into the subdural space, and patchy or ineffective blocks. Low blood pressure can result in **nausea** and **dizziness**, as well as fetal distress. Supplemental oxygen may be given to the mother to alleviate this effect. Allergic reactions to the anesthetic agents occur rarely. The woman who wishes to have an epidural needs to have IV access, IV fluids in advance to help prevent low blood pressure, and fetal monitoring. The woman's inability to move around and change positions because of the tubes and wires can impede the progress of labor. If labor slows, it may be augmented by the injection of pitocin. Assisted delivery via forceps or vacuum extractor may be necessary if the mother finds herself unable to push effectively.

Injectable narcotic pain medications are also available. They can be given by either intramuscular (IM) or intravenous (IV) routes. When given intravenously, the effects are felt sooner and are shorter in duration. These medications are more likely to affect the fetus and are generally not given late in labor. Some women say that their pain is not greatly diminished but that they are better able to rest between contractions. Others experience side effects, such as nausea, **vomiting**, and dizziness that they feel negate any benefit that they get from the medication.

Prevention

Techniques that are used to prevent pregnancy are known as contraception. Some methods require a prescription, including those involving hormones, diaphragms, cervical caps, or intrauterine devices (IUDs). Hormonal birth control is available as a daily pill, an injection, a patch, a vaginal ring, or an implant. Consultation with a healthcare professional will determine the appropriateness of these methods. Conditions including clotting diseases, **breast cancer**, and liver disease will preclude hormonal forms of birth control. Significant side effects may occur even in women who are good candidates for these methods. Timing of taking the daily birth control pills is important, and

KEY TERMS

Braxton-Hicks—Mild, painless contractions of prelabor.

Episiotomy—Incision into the perineum to allow for easier passage of the baby.

Gestation—Time of development in the uterus.

Parturition—Childbirth.

back-up methods should be available if doses are missed. Diaphragms and caps are barriers used next to the cervix along with a spermicide. For diaphragms and caps, the typical pregnancy rate lies between 20 and 40 percent, according to the U.S. Food and Drug Administration (FDA). If these two methods are always used correctly, the pregnancy rates fall to 6 to 26 percent. The IUD is a uniquely long-term device. It is placed by a medical professional and, depending on the type, can retain effectiveness for as long as 10 years. It is not recommended for women who have ever had **pelvic inflammatory disease** or for those who are not in a mutually monogamous relationship. The pregnancy rate for IUD users is from 0.6 to 2 percent, according to the FDA.

Several popular forms of birth control are nonprescriptive. Barrier method materials, such as condoms, foam, and spermicides are available over the counter. Condoms have the distinction of being the only type designed for males. Used correctly, they are highly effective in preventing pregnancy. They have no side effects, and latex varieties have the additional advantage of providing some protection against sexually transmitted diseases. Average pregnancy rates are around 14 percent for typical users, but fall to 3 percent when they are always used correctly, according to the FDA.

Periodic abstinence, sometimes called natural family planning, requires training and attentiveness to physical signs. A variety of methods are available and may include monitoring of cycle days, basal body temperature, cervical mucus characteristics, and other symptoms related to the timing of ovulation. Effectiveness can be as great as 99 percent, according to the FDA, but it requires significant commitment for the couple to faithfully monitor signs and abstain from intercourse for at least one week of every cycle. Women with irregular cycles or unreliable signs have the most unplanned pregnancies with these methods.

Resources

BOOKS

Dick Read, Grantly, and Michel Odent. *Childbirth Without Fear: The Principle and Practice of Natural Childbirth,* 4th rev. ed. London: Pinter & Martin, 2005.

Schwegel, Janet, ed. *Adventures in Natural Childbirth: Tales from Women on the Joys, Fears, Pleasures, and Pains of Giving Birth Naturally*. New York: Marlowe & Com pany, 2005.

ORGANIZATIONS

Association of Labor Assistants and Childbirth Educators (ALACE) (formerly Informed Birth & Parenting), PO. 390436, Cambridge, MA, 02139, (888) 222 5223, http://www.alace.org/.

International Childbirth Education Association (ICEA), PO Box 20048, Minneapolis, MN, 55420, (952) 854 8660, http://www.icea.org.

Judith Turner
Teresa Norris
Leslie Mertz, Ph.D.

Childhood nutrition

Definition

Childhood **nutrition** involves making sure that children eat healthy foods to help them grow and develop normally, as well as to prevent **obesity** and future disease.

The traditional or mainstream approach to good childhood nutrition is to follow suggestions based on dietary guidelines that are appropriate for a child's age and development level and that have been developed and recommended by government, research, and medical professionals. The guidelines include selections from different food groups to provide the vitamins and minerals young bodies need for natural growth and activity. The U.S. Department of Agriculture's (USDA's) Food Guide Pyramid recommends how many servings a day a child should eat of each food group, such as milk, vegetables, fruits, fats, and meats. The Food Guide Pyramid asserts that by sticking closely to the guidelines, parents can ensure their children get a well-balanced diet that supplies the vitamins, minerals and calories they need to support growing bodies and active lifestyles. However, in this age of what has been called "advanced medicine," there are those who seek to understand why so many among us, especially children, suffer from so much serious illness.

Minimum nutrient and calorie levels for school lunches

(school week averages)

	Preschool	Grades K–6	Grades 7–12
Calories	517	664	825
Total fat (percentage of total food energy)	*1	*1, 2	*2
Saturated fat (percentage of actual total food energy)	*1	*1, 3	*3
RDA for protein (g)	7	10	16
RDA for calcium (mg)	267	286	400
RDA for iron (mg)	3.3	3.5	4.5
RDA for vitamin A (RE)	150	224	300
RDA for vitamin C (mg)	14	15	18

*1 The Dietary Guidelines for Americans recommends that after 2 years of age, children should gradually adopt a diet, that by about 5 years of age, contains no more than 30 percent of calories from fat.

2 Not to exceed 30 percent over a school week

3 Less than 10 percent over a school week.

"RE" refers to "retinol equivalent," a measure of the vitamin A activity in foods.

(Illustration by GGS Information Services. Cengage Learning, Gale)

Origins

Humans, unlike plants, cannot manufacture the nutrients they need to function. Each culture over centuries has developed its own traditional diet. In modern-day western civilization, many of these **diets** have developed into convenient, fatty and sugary foods, leading to obesity even in children and teens.

Advice on nutritional choices predates recorded language, but the first science-based approach to a healthy diet probably began just over 100 years ago. W. O. Atwater, the first director of the Office of Experiment Stations in the U.S. Department of Agriculture (USDA) and a pioneer in the field of nutrition investigation, developed some of the components needed for a food guide. He created food tables with data on protein, fat, carbohydrate, mineral matter, and fuel value for common foods.

Food guides with food groups similar to those used today first appeared in USDA publications in 1916 and were developed by nutrition specialist Caroline L. Hunt. Interestingly, the first daily food guide was published under the title *Food for Young Children*. In the early 1930s, the Depression economic restraints on families and the USDA responded with advice on how to select affordable healthy foods. In 1941, the Food and Nutrition Board of the National Academy of Sciences released the first recommended dietary allowances (RDAs) for calories and essential nutrients. The nine nutrients included on the list were protein, **iron**, **calcium**, vitamins A, C, and D, thiamin, **riboflavin**, and **niacin**.

Throughout the years following the release of the first guidelines, recommendations were debated and revised. The new food guide was first presented in 1984 as a *food wheel*. The USDA first used a pyramid to represent the food groups in 1992 after intensive research on the most effective way to visually communicate healthy eating by portion and food choice. Although it has been modified over the years, the pyramid has continued to represent the food groups.

Annemarie Colbin was brought up on a European vegetarian diet before she came to the United States in 1961. In her search for optimum health and the ability to control how one feels by what one eats, she became a professional cook, lecturer, founder of the Natural Gourmet Cookery School in New York City, and author of best-selling books *Food and Healing, The Book of Whole Meals,* and *The Natural Gourmet,* as well as articles appearing in the *New York Times* and *Cosmopolitan*.

In Chapter One of *Food and Healing,* Colbin looks at the health of children and she points out that:

- A child born today can expect to live 26 years longer than a child born in 1900, but a person who has already reached 45 today can expect to live only four or five years longer than a person born in 1900.
- The following childhood problems that were rare in 1900 are now so prevalent that they are called "the new morbidity (an unsound, gruesome condition)": learning difficulties, behavioral disturbances, speech and hearing difficulties, faulty vision, serious dental misalignment.
- The average child loses three permanent teeth to decay by age 11, eight or nine by age 17, and 94% of adolescents have cavities in their permanent teeth.
- Among children, tuberculosis is on the rise
- By the mid-1980s, cancer as a killer of children and adolescents was surpassed by only accidents and violence.

Colbin cites statistics linking children to emotional disorders and violence, indicating that at any given time, as much as a quarter of our population is estimated to suffer from depression, **anxiety**, or other emotional disorders; that suicide is the ninth leading cause of death for all age groups; and that there may be as many as four million cases of child abuse every year, at least 2,000 of which result in death. She then states, "All this violence is no longer viewed as purely

Causes, risks, and prevention of childhood obesity

Causes

Increased consumption of sugary beverages with a decreased consumption of milk

Super-size portions in fast food restaurants

More meals eaten away from home and use of prepared foods in the home

Increased snacking between meals and fewer meals eaten together as a family

Heavy advertising of high-sugar high-fat foods to children

Decrease in children carrying their lunch to school from home

Poor eating habits such as skipping breakfast and later snacking on high fat, sugary foods

More time spent watching television or using the computer

Fewer children walking to school

Fewer physical education requirements at school and decreased recess in grades 1-5

Fear of crime, which limits outdoor activities of children

Increase in teen access to cars

Inherited tendency toward weight gain or having at least one obese parent

Eating in response to stress, boredom, and loneliness and/or poor sleeping habits

Medical conditions, such as Prader-Willi syndrome, hypothyroidism, mental illness, binge eating disorder, or taking certain medications

Risks

Type 2 diabetes

High blood pressure (hypertension)

Cardiovascular disease

Gallbladder disease

High cholesterol

Fat accumulation in the liver (fatty liver/liver disease)

Sleep apnea

Early puberty; early start of menstruation in girls

Eating disorders

Joint pain and degenerative joint disease

Sleep apnea

Depression

Increased anxiety and stress

Low self-esteem

Exposure to social prejudice and discrimination

Prevention

Serve a healthy variety of foods and keep healthy snacks on hand

Choose low-fat cooking methods such as broiling or baking

Eliminate junk snack food and sugary beverages from the house

Eat meals together as a family rather than grabbing something quick on the run

Limit visits to fast-food restaurants

Plan family activities that involve physical activity, such as hiking, biking, or swimming

Encourage children to become more active such as walking to school, biking to friends' houses, walking the dog or mowing the lawn

Limit television and computer time

Avoid using food as a reward

Pack healthy homemade lunches on school days

Encourage school officials to eliminate soda machines on campus, bake sales, and fundraising with candy and cookies

Set realistic goals for weight control and reward children's efforts

Model the eating behaviors and active lifestyle you would like your child to adopt

(Illustration by Corey Light. Cengage Learning, Gale)

Healthy snack foods for children

- Applesauce cups (unsweetened)
- Apples or pears and low-fat cheese
- Baby carrots and celery
- Bagels pizzas with tomato sauce and melted low-fat cheese
- Baked potato chips or tortilla chips with salsa
- Cereal, dry or with low-fat milk
- Cucumber or zucchini slices
- Dried fruits such as raisins, apple rings, or apricots
- Fresh fruit
- Fruit canned in juice or light syrup
- Fruit juice
- Fruit salad
- Frozen fruit bars
- Frozen grapes
- Low-fat chocolate milk
- Low-fat frozen yogurt with fresh berries
- Low-fat yogurt with fruit
- Nonfat cottage cheese with fruit
- Popcorn, air popped or low-fat microwave
- Pretzels (lightly salted or unsalted) and a glass of low-fat milk
- Raw vegetable sticks with low-fat yogurt dip, cottage cheese or hummus
- Rice cakes with peanut butter
- Smoothies with low-fat milk or yogurt and sliced bananas or strawberries
- String cheese and fruit (canned or fresh)
- Vanilla wafers, gingersnaps, graham crackers, animal crackers or fig bars and a glass of milk
- Whole-grain crackers or English muffin with peanut butter
- Whole-wheat crackers with cheese or peanut butter

(Illustration by GGS Information Services. Cengage Learning, Gale)

psychological. A growing body of research links mood, violent behavior, and even criminal behavior with various physiological imbalances: an over-active thyroid, an excess of testosterone (male hormones), **allergies**, low blood sugar. **Lead poisoning**, vitamin deficiencies, and of course alcohol and drugs all alter physiology as well as mood. Behavioral problems have even been associated with a lack of natural light, insofar as light plays a vital role in the metabolism of calcium, a mineral widely regarded as 'nature's tranquilizer.'"

Based on these statistics and many more that she cites, Colbin contends that proper nutrition plays a key role in disease prevention. She indicates that she sees three major errors in our contemporary assumptions about health and illness: the belief that physiological symptoms such as headaches, fevers, etc. are mistaken reactions of the body to normal stimuli; the belief that surgical intervention or chemical substances, natural or artificial in origin, can restore health by stopping the disease process; and the belief that dietary habits are unrelated to symptoms or illnesses. Although the last belief is slowly changing, it has a long way to go. For example, she points out, many people are still buying antacids for digestive distress without changing their diet.

Benefits

The Food Guide Pyramid and other healthy eating recommendations generally apply to children age two and older. When used as a starting point for planning family meals and snacks, applying these sensible recommendations to children's daily diets can encourage good eating habits at an early age. This will help children develop mentally and physically according to growth charts and other measurements set by pediatricians (physicians who specialize in caring for children) and will help prevent future problems with overeating or with eating disorders. Many nutritional experts agree that if children eat a balanced diet that includes all of the recommended food groups, they will not need to take vitamin/mineral supplements. Also, eating a balanced diet with a variety of foods will give children the energy they need to stay physically active, which is important to their growth and mental health, and in keeping obesity in check.

Description

In spite of recommendations, the diet quality of most children is not what it should be. The USDA surveyed American children ages two to nine in 1998 and found that up to 8% of them had a poor diet, while as many as 80% of those ages seven to nine had a diet that needed improvement. The Centers for Disease Control (CDC) defines childhood obesity at a level above the 95th percentile of body mass index for the child's age group. Body mass index (BMI) is a measurement system used to assess if a child (or adult) is underweight, overweight, or at risk for becoming overweight. Pediatricians use height and weight measurements taken at a child's regular checkup to determine his or her BMI. To help guide parents and others in making good nutritional choices, maintain a healthy BMI, and keep children healthy, the American Medical Association (AMA) suggests the following food choices for children based on the USDA guidelines.

Children two to five years of age

The AMA and USDA recommend food guidelines for young children similar to those for older children and adults, but with smaller portions. When looking at a range of portion sizes, parents and those who care for young children should choose smaller portion sizes for children age two or three, and slightly larger portions for children who are age four or five. Daily recommendations include:

- four to five servings of breads, cereals, rice, pasta
- two or more servings of vegetables
- two or more servings of fruit

- three to four servings of dairy products
- two or three servings of meat, fish, poultry, legumes (beans, lentils, peas)

After age two, a child needs less fat than an infant— about 30% of daily calories. After age three, fiber becomes more important in a child's diet and can impact future heart health.

Calcium requirements steadily increase as children get older, from 500 mg a day at age three to 800 mg a day at age four to eight. There is more calcium in the body than any other mineral. Calcium works together with **phosphorus** (two parts calcium to one part phosphorus) for healthy bones and teeth and works together with **magnesium** (two parts calcium to slightly over one part magnesium) to prevent cardiovascular (blood vessels of the heart) and other degenerative diseases. In order for calcium to be absorbed by the body, it must also have sufficient amounts of vitamins C, D and A. In addition to food sources, an hour of sunshine each day can also provide a child with his/her daily **vitamin D** requirement.

Children six to twelve years of age

By the time children reach age five or six, they begin to tell parents what foods they like. Parents and those who care for children can help select foods from each recommended group that a child will enjoy. Calorie requirements and portion sizes increase as children get older: between ages six and ten, boys and girls need between 1,600 and 2,400 calories each day. During puberty and adolescent growth between ages 10 and 12, girls need about 200 more calories a day. Boys will begin needing about 500 more calories a day after age 12. The following servings per day are recommended for children ages six to twelve:

- six to 11 servings of breads, cereals, rice, pasta
- three to five servings of vegetables
- two to four servings of fruit
- three or four servings of dairy products
- two or three servings of meat, fish, poultry, legumes

By age six, children still need only about 30% of calories from fat. Nutritionists say that by adding five to the child's age, parents can estimate the number of fiber grams a child needs each day. Calcium requirements continue to rise, from 800 mg a day at ages four to eight to 1,300 mg each day for children beginning at age nine.

Preparations

Getting children to eat the right foods is easy if they develop good eating habits at a young age and if they are offered a variety of healthy foods. Many books, magazines, and web sites offer tips on making healthy foods interesting. Some foods children like from each food group are suggested below.

- breads, cereals, and pastas including whole grain breads, unsweetened cereals, unrefined rice, whole grain crackers, cornbread, rice cakes
- vegetable servings from cooked or raw vegetables such as asparagus, beets, broccoli, carrots, corn, green and red peppers, green beans, kale, peas, pumpkin, squash, sweet potato, tomato, zucchini, or vegetable juice
- good fruit choices such as apples, applesauce, bananas, cantaloupe, apricots, peaches, unsweetened fruit cocktail, plums, grapefruit, kiwi, nectarines, strawberries, watermelon, and fresh fruit juices
- milk, low-fat yogurts and cheeses are good dairy sources, as are low-fat cottage cheese, custard, ice milk, and occasional ice cream servings
- meat, fish, poultry, and legume choices include lean meats, dried beans, peanut butter, shellfish, dried peas, lentils, tofu, and reduced-fat cold cuts

To reduce fat in a child's diet, parents can switch to low-fat or non-fat milk; remove skin from poultry or trim fat from red meat; reduce use of margarine and butter; use low-fat cooking methods such as baking, broiling, and steaming; and serve foods rich in fiber.

KEY TERMS

Anorexia—A serious and sometimes fatal eating disorder characterized by intense fear of being fat, and severe weight loss. It primarily affects young females. Sufferers may see themselves as fat even when they are underweight.

Bulimia—Sometimes called binge eating, this eating disorder consists of cravings for foods that often result in periods of continuous eating followed by purging (forced vomiting or diarrhea) and depression or food-deprivation, etc.

Gout—A metabolism defect resulting in overproduction of uric acid and pain in one or a few joints.

Hypoglycemia—A condition of abnormally low blood sugar.

Malnutrition—Any disorder of nutrition caused by insufficient or unbalanced diet that can result in impaired absorption or use of foods.

Seborrheic dermatitis—A skin condition characterized by loose, greasy, or dry white to yellowish scales with or without reddened skin.

Fresh salads can improve fiber in diet, as can adding oat or wheat bran to baked foods. Good, easy-to-assimilate sources of calcium for children, besides milk and cheeses, are tofu made with calcium sulfate; soup made with fish, fowl or beef bones and one tablespoon of wine vinegar to draw out the calcium into the broth; canned salmon and sardines with bones; sesame seeds and tahini (ground sesame seed butter); beans and nuts; calcium-fortified fresh orange juice; greens, especially broccoli, collards, kale, mustard, turnip tops, **parsley**, watercress and **dandelion**; and cooked sea vegetables if children like them.

In *Food and Healing,* Annemarie Colbin explains what sugar is and why it causes so much damage to the health of children and adults. White sugar, like white rice and white flour, goes through an industrial refining process: its juice is extracted from sugar cane, then filtered and boiled until it has been separated from all of its water, minerals, vitamins, protein and fiber, all of which the body needs to digest and metabolize the sugar. Because it lacks those nutrients, refined sugar becomes what Colbin calls a "naked carbohydrate," and so the body will draw them from other foods in the same meal or the body's tissues. Thus when refined white sugar is consumed, there is loss of stored B vitamins, calcium, phosphorus, iron, and other nutrients from the body. The loss of calcium stored in teeth weakens them and makes them more susceptible to bacterial attack/cavities. Also, this nutrient loss from refined sugar consumption can produce hunger for the missing nutrients and provoke great sugar-eating binges. On food labels, sugar is often identified as lactose, maltose, fructose, sucrose, and others. Glucose is the name of sugar found in the blood.

Colbin points out that if you eat meat, you need to digestively balance it with white sugar and vice versa, and that serious problems arise when the amount of sugar eaten is more than the amount needed to balance the meat. Sugar is as addictive as a drug because eating a small amount creates a desire for more sugar and because quitting sugar "cold turkey" brings on withdrawal symptoms that can last for an extended period of time. Typical withdrawal symptoms include strong cravings, **fatigue**, depression, mood swings, and sometimes headaches. Excessive sugar consumption is believed to be involved in such very common problems as **hypoglycemia** or hyperinsulinism, diabetes, **heart disease**, dental caries, high **cholesterol**, obesity, **indigestion**, **myopia** (nearsightedness), seborrheic **dermatitis**, **gout**, genetic narrowing of pelvic and jaw structures, crowding and malformation of teeth, hyperactivity, lack of concentration, depression, and anxiety. Colbin notes that these problems result when the sugar intake provides more "naked carbohydrates" than are needed to balance the animal protein intake. Since white flour also provides additional "naked carbohydrates," only a small amount of sugar can create an excess amount in the body.

It is important that children eat three meals a day and not skip breakfast. Studies have shown that children and teens who skip breakfast have more trouble concentrating, do not perform as well in school, and often later develop heart disease. Obesity is common in children who skip breakfast.

While the obesity problem in today's youth can be blamed on a number of factors, including larger food portions for adults and children, convenient salty and sugary snack foods, and cheap and convenient fast food, much attention has been focused on the role of the nation's schools. There are fewer physical education classes due to more emphasis on academic classes. Those gym classes that remain do not include enough activities that interest the children, say some experts. School lunches generally have not provided healthy or balanced nutrition but instead have consisted of highly refined, processed foods that are full of additives and simple carbohydrates, which do not provide good nutrition or energy. In addition, many schools also offer "snack bars" or vending machines with sodas and sugary, fatty, or salty snacks. Many children choose these snacks over prepared school lunches.

To counter this problem in schools, the Healthy Schools Summit was held in October 2002. It consisted of representatives from more than 30 national education, fitness, nutrition, and health organizations, as well as 450 school administrators, government leaders, food service directors, counselors, dietitians, nurses, and health and fitness teachers. Since that time, many school districts around the country have been working to improve their physical education programs and to remove or change the selections in vending machines and snack bars on school campuses. Parents can look into lunchtime option at their children's schools or pack healthy lunches from home with foods their children like to ensure they eat well while at school.

Children who are very active and participate in organized sports need a particularly healthy diet. For extended energy, they should eat many complex carbohydrates, such as unrefined rice, whole grain pasta and bread, and whole grain cereal. While all children need to drink plenty of water, those who participate in sports need to drink even more. Some experts say an

easy formula to remember is one cup of fluid for every one-half hour of physical activity.

At home, some parents choose convenient snack and fast foods because often, both parents work long hours. Today's youth eat bigger portions, spend more time in front of the television instead of engaged in physical activity, and are growing accustomed to less nutritional foods. Many experts say that getting children up off the couch and watching their snack choices helps. Also, many sources can help parents find healthier alternatives to fast food meals for their families. Suggestions include cooking healthy meals on weekends and freezing them for busy weekdays and looking for cookbooks or online sources of quick and healthy recipes. Simply cooking with less fat and using baking, roasting or poaching methods instead of frying makes meals healthier for everyone. Also, offering children healthy snacks to last them until mealtime will keep them from reaching for poor snack choices and make them less likely to overeat at the evening meal.

For a variety of reasons, some children follow vegetarian diets. Some people are concerned that a vegetarian diet is harmful for children, but generally, if a child aged two or older still follows the recommended Food Guide Pyramid and makes good food choices, a vegetarian diet can be healthy. In fact, 2% of children ages six to 17 never eat meat, fish, or poultry. If a vegetarian child needs a vitamin or mineral supplement, a physician or professional nutritionist can help determine the proper level of supplement needed.

Precautions

Parents are sometimes cautioned by nutritional experts not to turn mealtimes and eating into a battle of wills. Offering a variety of healthy choices allows children to select favorite foods from among those that are good for them and to balance foods containing a number of vitamins and minerals. Research in 2004 showed that taste for certain foods probably develops while people are still infants. In fact, infants in the study who had been exposed to the flavor of carrots through their mothers' breast milk later ate more of a carrot-flavored cereal that those who had not been exposed to carrots as infants. The researchers said that encouraging children to eat more fruits and vegetables as early as possible was helpful.

Many physicians and medical researchers have cautioned parents not to turn to fad diets for their children's weight problems. Many of the diets and diet products on the market have not been proven by clinical studies to be effective in the long term for adults and therefore they certainly have not been proven safe or effective as a solution to weight problems in children. The best solution for childhood obesity is a combination of activity, a balanced diet that follows the AMA/USDA guidelines for food groups and portions, and involvement of a physician, dietician, or other trained professional as needed. A further caution concerning dieting is the concern that as young children enter adolescence, too much worry about weight and appearance can cause social anxieties and lead to eating disorders such as anorexia and bulimia.

When changing a young child's diet, it should be done slowly, particularly when introducing fiber, and with the help of a physician, dietician, or nutritionist. Too much fiber can interfere with the body's absorption of vitamins and minerals.

Children who do not eat enough food and do not get enough nutrition suffer from severe undernourishment, or malnutrition. Each year, more than six million children under the age of five years die around the world as a result of hunger. Malnutrition can also make a child more susceptible to a number of diseases. Worldwide, it is estimated that food insecurity affects 815 million households, mostly in developing countries. However, in 2003, a report showed that at least 10% of U.S. households don't have enough food and about 3% report hunger at home. In this case, it is not the sort of hunger a person feels when they eat a late lunch but the kind of painful sensation someone gets from repeated or involuntary lack of food.

There are parents and health professionals, both traditional and alternative, who feel children should have vitamin/mineral supplements to stay healthy. However, there are also parents and health professionals who believe that when children eat a balanced diet of wholesome foods, they seldom need vitamin supplements; that individual vitamins and minerals should be taken, like medicine, when a deficiency has been created by a diet imbalance; and that when such a deficiency has been corrected, they should be discontinued.

If children are not eating a healthy diet and are being given a vitamin/mineral supplement, it is important to keep chewable vitamins out of reach of young children, as their appealing taste may be irresistible and dosage needs to be controlled according to directions. Children with poor appetites or erratic eating habits also may benefit from vitamins and minerals. It is best to check with a pediatrician, dietician or nutritionist for dosing.

Some parents and health professionals feel that vegetarian children may benefit from vitamin/mineral

supplementation because they may lack some iron and **zinc** normally obtained through meat products and/or fish. Other substantial sources of iron are eggs, whole-grain breads and cereals, leafy and other vegetables, potatoes, fruit and milk. Foods containing **vitamin C** (broccoli, Brussels sprouts, collards, kale, parsley, sweet peppers, strawberries, grapefruit, melons, tangerines, potatoes, and more) will increase absorption of iron in non-animal foods. Vegetarian sources of zinc are eggs, legumes, and whole grains. Zinc deficiency has been found in populations whose intake is derived solely from cereal sources, but in recent studies, vegetarians had adequate zinc levels. Those children who avoid dairy products, although it is difficult to get enough, may get calcium from broccoli, leafy green vegetables like kale, canned salmon and sardines including the bones, and soy products. If a child's physician or qualified nutritionist feels a supplement is necessary, he/she should recommend the dosage.

Children often don't recognize feelings of thirst and have to be encouraged to drink before becoming thirsty. If a child's urine is clear or the color of pale lemonade, he or she is drinking enough fluids. Dark urine the color of apple juice indicates too little fluid and the child is in danger of dehydration or heatstroke.

Side effects

Only the fat-soluble (capable of being dissolved in fat or oil) vitamins A, D, K and E have side effects that are potentially, though rarely, toxic (poisonous).

In their book *The Real Vitamin & Mineral Book,* Sheri Lieberman and Nancy Bruning state, "The facts are that only a few vitamins and minerals have any known toxicities, all of which are reversible, with the exception of vitamin D. Anything can be harmful if you take enough of it—even pure water. But vitamins and minerals are among the safest substances on earth. The amounts needed to become toxic are enormous." They add that being on medication or having a medical condition can influence vitamin/mineral requirements and indicate that when one's physician is not well-versed in nutrition, it is ideal to have him or her work with a qualified nutritionist.

With regard to vitamin D, they indicate, "According to several studies, up to 1,000 IU per day of vitamin D appears to be safe. Both the beneficial and adverse effects of exceeding this amount are controversial. Overdosing of vitamin D is *irreversible and may be fatal*. Symptoms of too much vitamin D are **nausea**, loss of appetite, **headache**, **diarrhea**, fatigue, restlessness, and calcification of the soft tissues (insoluble lime salts in tissue) of the lungs and the kidneys, as well as the bones." Vitamin D (400 IU) is usually sold with **vitamin A** (5,000 IU) in a tiny tablet or capsule.

Lieberman and Bruning say that active vitamin A from fish liver oil or synthetic palmitate is stored in the liver; that 15,000 IU would cause problems in infants; but that 100,000 IU of active vitamin A would have to be taken daily for months before any signs of toxicity (state of being poisonous) appear. Vitamin A in the form of beta-carotene can be taken without any risk of toxicity.

At doses of 800–1,200 IU per day, Lieberman and Bruning found no well-documented toxicity of **vitamin E**. At doses of over 1,200 IU per day, adverse effects such as flatulence, diarrhea, nausea, headache, heart palpitations, and fainting have been reported, but were completely reversible when dosage was reduced.

Vitamin K is easily obtained by the body from a healthy diet and deficiencies are rare, especially in children. It is given prophylactically to newborn infants to prevent hemorrhage and before surgery to people with blood-clotting problems. Lieberman and Bruning describe the major effect of too much vitamin K as an **anemia** where red blood cells die more quickly than usual and cannot be replaced by the body.

Some children have severe food allergies. It is important to watch for signs of allergies in very young children in particular, since they are eating many foods for the first time. Signs of food allergies can range from mild to severe. A child may, for instance, eat peanuts or shellfish and immediately show signs of a severe reaction, such as swelling and trouble breathing. Other food allergies may be less obvious but may occur from common foods found in many everyday products such as milk, eggs, wheat, or soy. If a child appears to have a severe reaction and has trouble breathing, the parent or caregiver should seek immediate medical attention, since the allergic reaction may be serious. If a child has ongoing problems such as **eczema** or other allergic reactions or signs of intolerance to foods, the parent may choose to seek help from a registered dietician and/or an allopathic physician who specializes in allergies. The allopathic physician may test the child first to determine the source of the allergies. The dietician will work with the family to help plan ways to meet nutritional needs while avoiding foods that cause allergic reaction or intolerance.

The parent of an allergic child can also choose to seek help from a homeopathic or naturopathic physician.

Andrew Weil, M.D., author of *Spontaneous Healing,* a *New York Times* number one bestseller that sold well over one million copies, believes that the body can heal itself and believes allergies are learned responses of the immune system to environmental agents that are not necessarily harmful. Weil says treatment should focus on calming an over-reactive immune system in order to alleviate allergy symptoms. Allergies can and are frequently "healed." However, traditional allergy medications tend to be "more or less" toxic to the body and can increase an allergic response over time.

To increase the likelihood of spontaneous healing, Dr. Weil made the following recommendations. Dietary modification to reduce allergic responses: following a low-protein diet; cutting down on animal protein in general; eliminating cow's milk and products made from it because they are known to irritate the immune system; and eating organically grown foods as much as possible to avoid agricultural chemicals that cause immune system reaction. Regular use of **quercetin**, a natural product from buckwheat and citrus fruits, that stabilizes cell membranes that release histamine, which is involved in many allergic reactions. Quercetin is a preventative and Dr. Weil recommends it be used regularly. The recommended dose is 400 mg twice a day between meals. For **hay fever**, the freeze-dried extract of the herb stinging **nettle**, one to two capsules every two to four hours as needed, he says will control symptoms with none of the toxicity of antihistamines or steroids. He also recommends a safe nasal spray, Nasalcrom, which works like quercetin. In the home, environmental methods like installing air filters can reduce allergic effects on and relieve the immune system. And finally, some allergic reactions indicate that high brain levels are involved in misdirected immune system response, and mind/body intervention is suggested.

Research and general acceptance

The AMA has based many of its food choices on the Dietary Guidelines for Americans, which were developed through research by the U.S. Department of Agriculture and the U.S. Department of Human Services. Input for the guidelines comes from a number of resources, including national surveys from the Centers for Disease Control (CDC).

As for children and the general public, accepting the importance of nutrition is another story. A 2003 study from the American Dietetic Association reported that preteens and their parents weren't concerned about preteens' weight being a health risk. Children and parents related obesity more to food than to physical activity and many overweight children said they didn't have much opportunity for physical activity.

Training and certification

Qualified dieticians and nutritionists may have a bachelor's, master's or a doctoral degree in nutrition and dietetics from an accredited college. They are also required to constantly update their knowledge with continuing education. Through the American Dietetic Association, these professionals can gain certification in their fields, including a certificate of training in childhood and adolescent weight management. Pediatricians obtain M.D. or D.O degrees and some specialize in childhood diseases and treatment. In the field of alternative medicine, parents may choose to seek treatment from naturopaths and homeopaths.

Andrew Weil, M.D. in *Spontaneous Healing* points out the benefits of **naturopathic medicine**. "Naturopathy comes from the old tradition of European health spas with their emphasis on hydro (water) therapy, massage, and nutritional and herbal treatment." Naturopaths are well trained in the sciences and have more experience with nutritional and herbal medicine than many allopathic physicians. Naturopathy is based on a general philosophy that focuses on the body's natural healing potential in an attempt to circumvent the use of drugs and surgery; however, naturopathic physicians may focus on different methods, using such therapies as **acupuncture**, bodywork, herbalism, and **homeopathy**. They are licensed in only a few states in the United States, mostly in the West. According to Dr. Weil, "Good naturopaths are worth consulting for childhood illnesses, recurrent upper respiratory **infections** and sinusitis, gynecological problems, and all ailments for which conventional doctors have only suppressive treatments. Naturopaths can be valuable as advisors to help people design healthy lifestyles." To find a naturopathic physician in their area, parents can contact the American Association of Naturopathic Physicians, 601 Valley Street, Suite 105, Seattle, Washington 98109, (206) 298-0126.

With regard to homeopathy, Dr. Weil also has positive feedback for the discipline. Homeopathy is a system that has a two hundred year old history. Homeopaths use diluted natural remedies to work on the body's energy field and encourage healing. Homeopathic physicians can be M.D.s, osteopaths, naturopaths, chiropractors, or lay persons. If a parent wishes to consult an alternative practitioner for homeopathic advice, the National Center for Homeopathy can be

contacted at 801 North Fairfax Street, Suite 306, Alexandria, Virginia 22314, (703) 548-7790.

Resources

BOOKS

Colbin, Annemarie. *Food and Healing*. New York: Ballan tine Books, 1986, 1996.

Colbin, Annemarie. *The Book of Whole Meals*. New York: Ballantine Books, 1983.

Colbin, Annemarie. *The Natural Gourmet*. New York: Ballantine Books, 1989.

Dufty, William. *Sugar Blues*. New York: Warner Books, 1978.

Estella, Mary. *Natural Foods Cookbook*. New York: Harper & Row, 1985.

Hewitt, Jean. *The New York Times Natural Foods Cookbook*. New York: Avon Books, 1972.

Kordich, Jay. *The Juiceman's Power of Juicing*. New York: Warner Books, 1993.

Lappe, Frances Moore. *Diet for a Small Planet*. New York: Ballantine Books, 1991.

Lieberman, Sheri , and Nancy Bruning. *The Real Vitamin and Mineral Book*. New York: Avery Publishing Group, Inc., 1990.

Mindell, Earl, Ph.D, R.Ph. *Vitamin Bible for the 21st Cen tury*. New York: Warner Books, 1999.

Walker, Norman W., D.Sc. *Fresh Vegetable and Fruit Juices*. Prescott, Arizona: Norwalk Press, 1970.

Weil, Andrew, M.D. *Spontaneous Healing*. New York: Ballantine Books, 1995.

PERIODICALS

Berler, Ron. "The Problem is Big: More Kids than Ever are Overweight. We'll Tell You About the Crisis, Offer Some Solutions, and Explain Why Controlling Your Weight Can Make You a Better Athlete." *Sports Illus trated for Kids* (October 1, 2003): 60.

"Food Insecurity." *Pediatrics* (February 2003): 357 358.

"Kids Don't Think Obesity is a Health Problem." *Nutrition Today* (July August 2003): 115 116.

McCook, Alison. "Food Taste Acceptance 'Programmed' in Infancy." *Reuters Health* (April 5, 2004).

ORGANIZATIONS

American Academy of Pediatrics. 141 Northwest Point Boulevard, Elk Grove Village, IL 60007 1098. (888) 227 1770. http://www.aap.org/family.

American Herbalists Guild. P.O. Box 1683. Soquel, CA 95073. 408 464 2441.

American Holistic Medical Association. 5728 Old McLean Village Drive. McLean, VA 22101 3906. (703) 556 9728.

International Food Information Council. 1100 Connecticut Avenue, NW, Suite 430, Washington, DC, 20036. (202) 296 6540. http://www.ific.org.

KidsHealth/Nemours Foundation. 4600 Touchton Road East, Building 200, Suite 500, Jacksonville, FL 32246. http://www.kidshealth.org.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (888) 878 3256. http:// www.usda.gov/FoodAndNutrition.

OTHER

BMI For Children and Teens. National Center for Chronic Disease Prevention and Health Promotion. [cited June 16, 2004]. http://www.cdc.gov/nccdphp/dnpa/bmi/bmi for age.htm.

Healthy Food Choices: Six to 12 Years. American Medical Association. [cited June 16, 2004]. http://www. medem.com.

Healthy Food Choices: Two to Five Years. American Medical Association. [cited June 16, 2004]. http://www. medem.com.

Report Card on the Diet Quality of Children Ages Two to Nine. Publication of the USDA Center for Nutrition Policy and Promotion. [cited June 16, 2004]. http:// www.cnpp.usda.gov.

Ruth Ann Carter

Chili pepper *see* **Cayenne**

Chills

Definition

Chills is the common name for a feeling of coldness accompanied by shivering and possibly **fever**.

Causes and symptoms

Chills may occur for the following reasons:

- Exposure to extremely low outside temperature.
- Insufficient protection from cold temperature or weather.
- Age, as newborns and elders are intolerant of cold temperature.
- Anemia, particularly in women who frequently complain of cold intolerance. The condition is frequently found in females of reproductive age due to significant monthly blood loss during menses.
- Stress or poor health condition.
- Malnutrition. Poor diet and/or B-complex vitamin deficiency often makes a person more sensitive to cold temperature.
- Hypothyroidism. Hypothyroidism is one of the most common reasons for cold intolerance in women.
- Diabetes.
- Poor immune function as in AIDS or cancer patients. In these patients, chills and shivering may be signs of

infections (most likely), tumors, drug-induced fever, or malnutrition.

- Infections. Chills and fever are often caused by the common cold or viral infections. However, they may also be due to something more serious such as cystitis (bladder infection), septicemia (blood infections), pneumonia, meningitis, malaria or tuberculosis.
- Medications. Certain medications such as beta interferons can cause chills as side effect.
- Unknown infections or diseases.

Diagnosis

Those suffering from chills should investigate possible causes if the symptoms persist or are accompanied by fever and/or night sweat. They may be a sign or symptom of a serious condition and may require medical attention. A doctor can make accurate diagnosis of underlying diseases through detailed questioning about the chills, accompanying symptoms if any, patient's diet, daily **stress**, and lifestyle. In addition, doctors may order blood tests for **anemia**, **hypothyroidism**, or **infections** if these conditions are suspected.

KEY TERMS

Anemia—A condition in which there is a low number of red blood cells or hemoglobin resulting in paleness and weakness.

Hypothyroidism—Deficiency of thyroid gland activity. This is often due to low production of thyroxine, an inactive iodine continuing a hormone that aids in regulating metabolism. In its severe form, it may cause obesity, loss of hair, enlargement of the tongue, thickening of the skin, and physical and mental sluggishness.

Reye's syndrome—Acute and often fatal childhood syndrome marked by encephalopathy (brain disease), hepatitis (inflammation of the liver), and fatty accumulations in the viscera (many of the soft parts and internal organs). It may start as a mild illness with respiratory and gastrointestinal symptoms for a few days, terminating in rapid brain swelling, hepatomegaly (enlargement of the liver), and convulsions, even coma.

Treatment

Alternative treatment of chills includes protecting oneself from inclement weather conditions, drinking warm teas, and making appropriate dietary changes. Ayurvedic treatment might include fomenation therapy, called *svedana*, to aggravate the fatty tissue and force excess sweat out of the body. Svedana is used to relieve bodily stiffness, heaviness, and coldness.

In **traditional Chinese medicine**, those complaining of chills should follow a diet of "warming" foods and avoid "cold" foods. Reference to cold or warming does not mean the actual temperature of the food, but its internal effect. In general, the Chinese recommend cooked rather than cold, raw foods for this condition. The Ayurvedic formula for producing internal heat is *trikodu*, made of equal parts of **ginger**, black pepper, and long pepper (pippali, native to India and Java), and alleviating coldness and stagnation in the body.

Nutritional therapy

The following dietary changes are recommended to help prevent chills and cold intolerance:

- Limiting alcohol and caffeine intake and refraining from smoking tobacco products. These chemicals increase cold intolerance.
- Drinking warm tea with or without herbs such as ginger (a warming herb used in Chinese and Native American medicine) or chamomile.
- Taking daily multiple vitamin/mineral supplement or B-complex vitamins with C. People who are deficient of B-vitamins often are sensitive to cold temperature.

Allopathic treatment

Persons should consult their doctors if cold intolerance is severe or if chills are often followed by persistent fever or night sweats. They may be signs or symptoms of serious conditions or infections. Hypothyroidism or poor thyroid function should also be ruled out in women complaining of cold sensitivity.

If cold intolerance is accompanied by other signs and symptoms of thyroid deficiency such as lethargy, **obesity**, and **depression**, persons should consult their doctor for treatment of hypothyroidism. Thyroid supplement may be necessary.

Patients should also be concerned if chills frequently occur with fever. Fever may be the body's response to infections. Persistent chills, night sweat, fever, and rapid weight loss should be brought to a doctor's attention. They may be symptoms of **cancer** or infections such as **AIDS** or **tuberculosis**. Chills and fever in immunodeficient patients are often signs of infections that can be serious in patients with weakened immune systems.

Fever and chills can often be treated with over-the-counter medication such as acetaminophen or

ibuprofen. Aspirin should not be given to a child for fear of Reye's syndrome. Patients should be given soups, fruit juices, or water to replace fluid loss due to fever. If fever is high (more than 104°F [40°]), occurs in newborns (less than three months old) or lasts longer than 48 hours, a physician should be contacted.

Prevention

Wearing appropriate clothes for the weather, eating nutritious foods, and taking dietary supplements may help prevent chills in some people.

Resources

BOOKS

The Burton Goldberg Group. "Chills." In *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medical Publishing, Inc., 1999.

Yoder, Ernest. "Disorders due to Heat and Cold." In *Cecil Textbook of Medicine*, 2nd ed. Philadelphia: W.B. Saunders Company, 2000.

ORGANIZATIONS

National Cancer Institute. Building 31, Room 10A24, 9000 Rockville Pike, Bethesda, MD 20892. (800) 422 6237.

OTHER

Strange, Carolyn J. "Fighting the (I'm) Cold War." *iVillage.com*. http://onhealth.com/women/columnist/item,46788.asp.

PDQ. "Fever, Chills and Sweats." *CBS Health Watch*. http://cbs.medscape.com.

Mai Tran

Chinese angelica *see* **Dong quai**

Chinese bupleurum *see* **Chinese thoroughwax**

Chinese foxglove root

Description

Chinese **foxglove** root is a perennial herb found in northern China. It grows 6-8 in (15-20 cm) tall and has long oval leaves that are covered with fine hairs, fluted flowers that are reddish orange tinted with purple, and a round fruit. The root is thick and reddish yellow. Chinese foxglove root is collected in the fall. Its Latin name is *Rehmannia glutinosa* and it is also called *Rehmannia chinensis*.

General use

In China, Chinese foxglove root is used as a remedy for many different ailments: blurred vision, chronic **fever**, **constipation**, heart palpitations, hearing problems, **hot flashes**, **insomnia**, light-headedness, **low back pain**, menstrual irregularity and uterine bleeding (especially after **childbirth**), night sweats, restlessness, and stiff joints. It is also used to combat the effects of **aging**. Its effectiveness in treating these ailments has not been verified.

Preparations

Chinese foxglove root is washed and dried in the sun. It is sold in large, fleshy brownish-yellow chunks and tastes sweet and moist. The root is used in two stages of preparation: dried and cooked. To make dried Chinese foxglove root, called *sheng di huang* or dry Rehmannia, the fresh root is removed from the sand, washed well, then dried in the sun during the winter. Cooked Chinese foxglove root, called *shu di huang* or cooked Rehmannia, is prepared by steaming the fresh root until it is cooked, letting it dry, then steaming and drying it again several times. Cooking Chinese foxglove root is said to enhance the herb's properties as a blood tonic. To combat the effects of aging, the root is prepared with cardamon so that it is easier to digest and use as a tonic. The raw form of the root is a cooler herb and used for symptoms of heat. The cooked root is more of a blood tonic.

Chinese medicine practitioners also make special preparations of Chinese foxglove root for specific ailments. It can be mixed with gelatin for coughing and **vomiting** blood, **nosebleeds**, and bleeding from the uterus. It can be mixed with **cornus** and **Chinese yam** or freshwater turtle shell as a remedy for symptoms such as forgetfulness, insomnia, and lightheadedness. Rehmannia is the main ingredient in the Chinese six flavor Rehmannia tonic used for ailments and discomfort such as frequent urination, **infertility**, **impotence**, and weak and painful knees.

Both cooked Chinese foxglove root and the raw version are available in Chinese pharmacies, Asian markets, and some Western health food stores. There are no formal guidelines for recommended doses of Chinese foxglove root.

Precautions

People who have digestive problems, especially those who tend to have **gas** or become bloated, should use Chinese foxglove root with care; the cooked root can swell the belly and cause loose stools. There is no

KEY TERMS

Palpitation—A heartbeat that is irregular or too fast.

information available on what happens to people who take an overdose of Chinese foxglove root.

Side effects

The use of Chinese foxglove root can cause **diarrhea**, **nausea**, and abdominal **pain**. Many Chinese herbalists include **grains-of-paradise fruit**, a kind of cardamon, in their Chinese foxglove root preparations to prevent these side effects.

Interactions

No interactions due to use of Chinese foxglove root have been reported.

Resources

BOOKS

Reid, D. *A Handbook of Chinese Healing Herbs*. Boston: Shambhala Publications, Inc., 1995.

Sifton, David W., ed. *The PDR Family Guide to Natural Medicines & Healing Therapies*. New York: Three Riv ers Pr., 1999.

OTHER

China Med.net. Traditional Chinese Medicine. "Radix Rehmanniae." Paracel@clarityconnect.com. http://www.china med.net/herb_search.html. (May 2000).

Lori De Milto

Chinese gentiana *see* **Gentiana**

Chinese massage

Definition

Chinese massage is the name for a family of massage therapies practiced within **traditional Chinese medicine**. In traditional Chinese practice, massage is one of the fundamental treatment modalities, along with dietary regulation, herbal medicine, acupuncture/moxibustion, and therapeutic **exercise**.

Origins

The history of massage as a part of Chinese medical treatment dates back about 4,000 years. Written massage textbooks began to appear as early as the fourth century B.C., along with the earliest Chinese medical texts. Massage appears to have developed alongside both therapeutic exercise (**qigong**) and **acupuncture**, as it depends on the same understanding of the meridians and the flow of qi in the human body. The type of massage known as qi healing, or curing with external qi, was developed by master teachers of qigong.

Benefits

Chinese massage is not intended to be an experience of pampering or **relaxation**. It is a form of deep tissue therapy that conveys the following benefits:

- speeding the healing of injuries and clearing bruises
- stimulating blood circulation and regulating the nervous system
- removing scar tissue
- easing emotional distress
- curing some conditions affecting the internal organs
- increasing flexibility in the joints and improving posture
- relieving chronic pain
- maintaining wellness and functioning as a form of preventive care
- improving athletic performance
- strengthening the body's resistance to disease

The fact that some forms of Chinese massage do not require extensive training and can be used at home is another benefit of this modality.

Description

Theoretical background

The techniques of Chinese massage are inseparable from the philosophical belief system that underlies traditional Chinese medicine. Chinese massage is holistic in its orientation, which means that massage is understood to affect the patient's entire being, not just his or her physical body.

Several concepts are important in understanding all the major forms of Chinese massage, including *qi*, *jing luo*, *xue*, and *jin*.

Qi, sometimes spelled chi or ki, is the basic life energy animating the universe as well as human beings. The word can be translated into English as "breath" or "air." Qi can be transferred or transmuted. In humans, the digestive tract extracts the qi from food, whereas the lungs extract it from the air. When these two forms of qi meet in the bloodstream,

they form human qi, which then circulates throughout the body.

The meridians or channels (*jing luo*) are a network of energy pathways that link and balance the various organs. The meridians have four functions: to connect the internal organs with the exterior of the body and connect the person to the environment and the universe; to harmonize the yin and yang principles within the body's organs and Five Substances; to distribute qi within the body; and to protect the body against external imbalances related to weather. When the *jing luo* are blocked so that qi and blood cannot circulate, the person experiences physical **pain**.

The acupoints (*xue*) are locations on the body where qi tends to collect and can be manipulated or redirected. They are connected to different body organs through the meridians.

The soft and connective tissues (*jin*) and the joints all affect the flow of qi along the meridians. Thus, one function of Chinese massage is to relax the patient's *jin*.

In general, Chinese massage emphasizes movement and communication. The basic purpose of massage is to restore free movement to the patient's qi and blood. Chinese massage therapists use a range of techniques to accomplish this goal: they press, knuckle-roll, squeeze, knead, dig, drag, pluck, tweak, hammer, push, stretch, vibrate, knock, and even tread on the body with their feet. Massage accomplishes its purpose in three ways: it activates the activity of qi and blood, it regulates their movement and disperses stagnation, and it removes external causes of blockage (cold and damp). Since Chinese practitioners regard massage as affecting all dimensions of the patient's being, they think of it as involving communication between the therapist's qi and the patient's qi. In *Tui na* massage, the patient is allowed or even encouraged to talk while the therapist is working. This practice often helps the patient to release stored-up feelings.

Tui na massage

Tui na massage takes its name from two Chinese words that mean "push and pull." It requires the controlled use of very deep but constantly moving pressure, repeated hundreds of times. The practitioner pushes hard with the ball of the thumb then rubs lightly around the area being treated. A therapist using this form of massage might spend as much time on one of the patient's joints or limbs as a Western therapist would spend massaging the entire body. *Tui na* is used to treat a wide variety of conditions that would require a team of physiotherapists, chiropractors, and physicians specializing in sports medicine to treat in the West. One Chinese medical book lists over 140 conditions that can be treated with *Tui na*, including disorders of the internal organs as well as **sprains**, pulled muscles, arthritis, and **sciatica**, a pain in the lower back and back of the thighs.

Chinese pediatric massage

Chinese pediatric message, or *xiao er tui na*, is a form of *Tui na* massage adapted to the special needs of children from birth to 12 years of age. The Chinese believe that a child's energy system is different from an adult's because children have fewer physical and emotional barriers in place. Their qi is therefore more accessible to treatment. The acupoints and techniques used in pediatric massage are different from those used with adults. Massage oil, typically **sesame oil**, is often used with children. The sessions are much shorter than those for adults, usually only 15 to 20 minutes, but they may be repeated several times a day for children who are seriously ill. Pediatric massage is used to treat such chronic conditions as **asthma**, **bedwetting**, and nightmares as well as teething, **colic**, **nausea**, **fever**, **constipation**, and the **common cold**. Parents often learn the basic techniques of pediatric massage as preventive health care for their children or to treat minor illnesses.

An mo massage

An mo is a type of massage used for health maintenance and to restore vitality. Its name means "press and stroke" in Chinese. It can be used at home but is also part of **martial arts**, qigong, and athletic training. *An mo* differs from *Tui na* massage in that it is a full-body balanced treatment. *An mo* combines yang techniques to break up stagnant qi and activate its flow, followed by yin techniques to soothe and calm the body. *An mo* has a set pattern of movements and techniques that the therapist follows, but these can be adjusted to the patient's needs. A session of *An mo* massage may last as long as two hours, particularly if there is a strong qi communication between the therapist and the patient.

Dian xue massage (acupressure)

Dian xue, or "point press," is familiar to many Westerners as **acupressure**. It uses the same acupoints on the body as acupuncture but relies on pressure from the fingers rather than needles. *Dian xue* can be used by massage therapists to stimulate two different acupoints, one with each hand, while the area of the body between the points is stretched or twisted to maximize the flow of qi. *Dian xue* can be given in the home and is

sometimes used by acupuncturists when needles cannot be used.

Qi healing massage

The Chinese name of this form of massage is *wai qi liao fa*, or "curing with external qi." In qi healing, a qigong master who has practiced the art for many years transmits qi directly to the patient. Qi healing massage represents one strand of Chinese traditional practice in which healers passed on their own discoveries of the healing arts only to their closest disciples.

Preparations

Chinese massage is usually given with the patient lying on one side on a couch or seated on a chair or stool. The patient typically wears thin cotton clothing, particularly if the massage is being given in a public hospital or clinic. In smaller communities, the practitioner may work directly on the patient's skin. Touching the skin directly is thought to improve communication with the patient's qi; it also allows the application of herbal preparations to the skin.

Tui na massage is preceded by taking a full case history using the traditional four examinations of Chinese medicine (verbal interview; visual observation, which includes close examination of the tongue; listening to the patient's breathing and coughing; and touching, which includes taking twelve separate pulses). The massage therapist uses the information from the four examinations to identify the root complaint, the underlying pattern causing it, and the principles that will govern the treatment.

Precautions

Apart from giving a case history prior to receiving *Tui na* massage, no special precautions are necessary.

Side effects

Side effects are usually limited to some soreness, particularly after the first session of *Tui na* massage. This discomfort usually goes away after several more sessions. Pediatric massage is said to have few or no side effects. On rare occasions, patients have experienced headaches or mild stomach upset. These side effects are attributed to the imbalance or stagnation in the patient's qi prior to treatment.

Research and general acceptance

Between 1985 and 2005, Chinese massage became widely accepted in the West. A growing number of Western practitioners studied Chinese massage and obtained their training and certification from centers of traditional Chinese medical education. As of 2008, numerous alternative treatment centers in the United States offered Chinese massage along with Western forms of bodywork. Still another indication of the wider acceptance of Chinese forms of treatment is the emergence of hybrid massage therapies that combine Chinese techniques with those derived from other Oriental traditions of massage or from Western practices.

Training and certification

In China, massage is part of the curriculum of traditional Chinese schools of medicine, since it is an important aspect of primary health care. Graduates of these schools must pass rigorous examinations and government licensing procedures before setting up their practices. In addition, it is common for Chinese physicians to visit other practitioners as patients in order to learn about specialized techniques for treating specific conditions with massage. Last, many Chinese physicians come from families that have produced several generations of healers; younger practitioners often learn the techniques of massage from older family members. The master/apprentice model of teaching is still followed in traditional Chinese medical training in the twenty-first century.

In the United States, the Accreditation Commission for Acupuncture and Oriental Medicine (ACAOM) is the national accrediting agency, recognized by the U.S. Department of Education, that accredits acupuncture and Oriental medicine master degree level programs. The ACOM represents more than 50 schools and colleges with accredited or candidacy status.

The National Certification Commission for Acupuncture and Oriental Medicine (NCCAOM) is the only nationally recognized certification program available to qualified practitioners of acupuncture and Oriental medicine. NCCAOM certification is a requirement for licensure in most states. NCCAOM certifications are offered in acupuncture, Chinese herbology, Oriental medicine and Asian bodywork therapy.

The American Organization for the Bodywork Therapies of Asia (AOBTA) and the American Association of Acupuncture Oriental Medicine (AAAOM) are professional organizations that represent practitioners of Oriental medicine. These groups support appropriate credentialing, define scope of practice and educational standards, and provide training, professional development, and networking resources to their members.

KEY TERMS

Acupoint—A point or site on the body where qi tends to accumulate. Acupoints are pressed or manipulated in Chinese massage in order to activate or redirect the patient's qi.

An mo—A form of Chinese massage that treats the whole body and emphasizes balancing yin and yang techniques in the treatment. Its name means "press and stroke" in Chinese.

Dian xue—The Chinese name for acupressure. This form of massage can be done at home as well as by a trained therapist.

Qi—The Chinese word for life energy. Since traditional Chinese medicine understands pain to be the result of blocked or stagnant qi, all forms of Chinese massage are intended to restore free movement to the patient's qi and blood.

Tui na—A form of Chinese massage that focuses on a part of the patient's body in order to treat injuries and chronic pain. Its name literally means "push and pull" in Chinese.

Resources

BOOKS

Maciocia, Giovanni. *The Foundations of Chinese Medicine: A Comprehensive Text for Acupuncturists and Herbal ists,* 2nd ed. Philadelphia: Churchill Livingstone/Elsev ier, 2005.

Yang, Jwing Ming. *Qigong Massage: Fundamental Techni ques for Health and Relaxation,* 2nd ed. Boston: YMAA Publication Center, 2005.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Acupuncture Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (916) 443 4770, http://www.aaaomonline.org.

American Organization for the Bodywork Therapies of Asia (AOBTA), Laurel Oak Corporate Center, Suite 408, 1010 Haddenfield Berlin Rd., Voorhees, NJ, 08043, (856) 782 1616, http://www.aobta.org/.

Accreditation Commission for Acupuncture and Oriental Medicine (ACAOM), Maryland Trade Center #3, 7501 Greenway Center Dr., Suite 760, Greenbelt, MD, 20770, (301) 313 0855, http://www.acaom.org.

National Center for Complementary and Alternative Med icine. National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

National Certification Commisision for Acupuncture and Oriental Medicine (NCCAOM), 76 South Laura St., Suite 1290, Jacksonville, FL, 32202, (904) 598 1005, http://www.nccaom.org/.

Rebecca Frey
Angela M. Costello

Chinese medicine *see* **Traditional Chinese medicine**

Chinese system of food cures

Definition

The Chinese system of food cures regards dietary regulation as preventive medicine as well as a corrective measure to be undertaken when one falls ill. Diet is one of four major treatment modalities in **traditional Chinese medicine**, the other three being acupuncture/moxibustion, herbal medicine, and massage, plus remedial physical **exercise**.

Origins

The selection of foods in the diet as part of a lifelong program of health maintenance and treatment of illness has been a part of Chinese medicine from its beginnings. The first extensive written Chinese medical treatises (as the West understands the term) date from the Han dynasty (206 B.C.–A.D. 220), but the use of food as preventive medicine probably goes several thousand years further back. Legends says that tribal shamans and holy men who lived as hermits in the mountains of China as early as 3500 B.C. practiced what was called the "Way of Long Life." This regimen included a diet based on herbs and other plants, **qigong** exercises, and special breathing techniques that were thought to improve vitality and life expectancy.

After the Han dynasty, the next great age of Chinese medicine was under the Tang emperors, who ruled from A.D. 608 to A.D. 906. The first Tang emperor established China's first medical school in A.D. 629. This period produced China's earliest expert on dietary therapy, Sun Simiao. He specialized in the treatment of diseases caused by malnutrition and wrote several works on diet and health. Sun Simaio's principle of using diet and lifestyle changes as the first line of treatment for illness has governed traditional Chinese practice ever since. According to Sun Simaio, only when dietary treatment is not enough to cure the

patient should the doctor turn to **acupuncture** and herbal medicines.

Benefits

The benefits of traditional Chinese dietary treatment are many years of vigorous good health. According to the *Nei Jing*, China's oldest medical classic, the metaphor is that human beings are constituted to live for a hundred years, barring accidents or violence. Diet and good digestion are considered the most important ways to maintain physical strength and vitality.

Description

Chinese food cures are based on the philosophical principles of Taoism and its teachers' observations about nature. Some of its concepts are difficult for Westerners to understand because they rely on symbols and images rather than scientific measurements and theories. In general, Chinese medicine regards the human organism as an integrated entity within itself and as linked to the family, society, and the natural order by a pattern of symbolic connections.

The cosmic and natural order

In early Chinese philosophy, the Tao, or universal first principle, generated a duality of opposing principles that underlie all the patterns of nature. These principles, yin and yang, are mutually dependent as well as polar opposites. Yin represents everything that is cold, moist, dim, responsive, slow, heavy, and moving downward or inward; while yang represents heat, dryness, brightness, activity, rapidity, lightness, and upward or outward motion. The dynamic interaction of these two principles is reflected in the cycles of the seasons, the human life cycle, and other natural phenomena.

In addition to yin and yang, Taoist teachers also believed that the Tao produced a third force, primordial energy or chi (also spelled *qi* or *ki*, the Japanese term). The interplay between yin, yang, and chi gave rise to the Five Elements of water, wood, fire, earth, and metal. These entities are all reflected in the structure and functioning of the human body.

The human being

Traditional Chinese physicians did not learn about the structures of the human body from dissection (although they did perform some animal studies) because they thought that cutting open a body insulted the person's ancestors. Instead they built up an understanding of the location and functions of the major organs over centuries of observation, and then correlated them with the principles of yin, yang, chi, and the Five Elements. Thus wood is related to the liver (yin) and the gall bladder (yang); fire to the heart (yin) and the small intestine (yang); earth to the spleen (yin) and the stomach (yang); metal to the lungs (yin) and the large intestine (yang); and water to the kidneys (yin) and the bladder (yang). The Chinese also believed that the body contains Five Essential Substances, which include blood, spirit, vital essence (a principle of growth and development produced by the body from chi and blood), fluids (all body fluids other than blood, such as saliva, spinal fluid, sweat, etc.), and chi.

A unique feature of traditional Chinese medicine is the meridian system. Chinese doctors viewed the body as regulated by a network of energy pathways called meridians that link and balance the various organs. The meridians have four functions: to connect the internal organs with the exterior of the body, and connect the person to the environment and the universe; to harmonize the yin and yang principles within the body's organs and Five Substances; to distribute chi within the body; and to protect the body against external imbalances related to weather (wind, summer heat, dampness, dryness, cold, and fire).

KEY TERMS

Chi (Qi or Ki)—The universal life-force or energy. The quality, quantity, and balance of a person's chi determines his or her state of health and longevity.

Five Elements—The five basic substances (water, wood, fire, earth, and metal) that symbolize the fundamental qualities of the universe. In Chinese food cures, the five elements are correlated with the internal organs of the body and with the five basic food tastes.

Five Substances—The basic entities in the human body that serve its development and maintenance. They include chi, vital essence, spirit, blood, and fluids.

Meridians—Pathways of subtle energy that link and regulate the various structures, organs, and substances in the human body.

Taoism—The system of thought that looked at humans in relation to the whole universe. It had a significant influence on Chinese medicine.

Yin and yang—In Chinese thought, the two primordial opposing yet interdependent cosmic forces.

The composition and use of foods

Chinese food cures operate within this system of cosmic principles, symbolic correlation of internal organs with the five elements, and the meridian system. Food serves several functions in traditional Chinese medicine. It supplies nutritional energy to the body to replenish chi. It is also used by the body to produce vital essence and blood. Lastly, foods can be chosen to regulate the balance of yin and yang and the five elements within the body and to direct the flow of chi to different parts of the body.

Chinese medicine classifies foods according to four sets of categories:

- Temperature. Foods are classified as cold or cool (yin); or warm or hot (yang).
- Taste. There are five tastes correlated with the Five Elements: sour (wood); bitter (fire); sweet (earth); pungent (metal); and salty (water).
- Direction of action. Pungent, salty, and bland foods are thought to have an ascending or floating action that redirects chi upward, while sour, bitter, and sweet foods are thought to have a descending or sinking action that moves the chi downward.
- The organ or meridian affected by the food.

Chinese medicine uses foods to keep the body in internal harmony and in a state of balance with the external environment. In giving dietary advice, the Chinese physician takes into account the weather, the season, the geography of the area, and the patient's specific imbalances (including emotional upsets) in order to select foods that will counteract excesses or supply deficient elements. Basic preventive dietary care, for example, would recommend eating yin foods in the summer, which is a yang season. In the winter, by contrast, yang foods should be eaten to counteract the yin temperatures. In the case of illness, yin symptom patterns (**fatigue**, pale complexion, weak voice) would be treated with yang foods, while yang symptoms (flushed face, loud voice, restlessness) would be treated by yin foods. In addition, cravings for specific foods or flavors point to deficiencies to be remedied. Thus someone who wants a lot of hot drinks probably has a "cold" illness, while someone who refuses beverages has a "damp" disease.

Chinese medicine also uses food as therapy in combination with exercise and herbal preparations. One aspect of a balanced diet is maintaining a proper balance of rest and activity as well as selecting the right foods for the time of year and other circumstances. If a person does not get enough exercise, the body cannot transform food into chi and vital essence. If they are hyperactive, the body consumes too much of its own substance. With respect to herbal preparations, the Chinese used tonics taken as part of a meal before they began to use them as medicines. Herbs are used in Chinese cooking to give the food specific medicinal qualities as well as to flavor it. For example, **ginger** might be added to a fish dish to counteract the cold of the fish. Food and medical treatment are closely interrelated in traditional Chinese medicine. A classical Chinese meal seeks to balance not only flavors, aromas, textures, and colors in the different courses that are served, but also the energies provided for the body by the various ingredients.

Preparations

A traditional Chinese physician will examine a patient carefully before giving advice about diet. The diagnosis is based on four types of examination: visual observation, which includes examining the shape, color, and coating of the tongue as well as observing the complexion and taking the pulse; listening to the voice and breathing; inquiring about the patient's symptoms, food preferences, emotions, bowel habits, and sleeping patterns; and palpating (feeling) the patient's abdomen and key points along the meridians. The doctor will suggest changes in diet that will return the patient to inner balance and harmony with the environment according to the patterns he detects.

Precautions

The most important precaution for Westerners who are interested in Chinese food therapy is to consult an experienced practitioner of Chinese medicine. The system is complex and based on principles that differ from Western systems of thought. These factors make self-evaluation quite difficult.

Side effects

There are no known side effects from using the Chinese system of food cures as part of a wellness program under the guidance of an experienced practitioner.

Research and general acceptance

Research in the West has been largely confined to study of the herbs used in traditional Chinese medicine as distinct from food cures. Alternative practitioners in the West, however, have shown considerable interest in incorporating Chinese food cures into other systems, including **color therapy** and women's folk medicine. One school of color therapy classifies foods as yin or yang according to their color and recommends certain color combinations to correct energy imbalances in the body.

Training and certification

In contemporary China, traditional medicine is practiced alongside Western methods of diagnosis and treatment. Some Chinese medical schools still offer courses in Chinese medicine. Practitioners of traditional medicine must pass rigorous examinations and be licensed by the government. They usually obtain their clinical experience by serving apprenticeships under experienced doctors.

Resources

BOOKS

Chiazzari, Suzy. "Color and Food." In *The Complete Book of Color*. Part 3. Boston: Element Books Inc., 1999.

Reid, Daniel P. *Chinese Herbal Medicine*. Boston: Shamb hala, 1993.

Stein, Diane. "Chinese Healing and Acupressure." In *All Women Are Healers: A Comprehensive Guide to Natural Healing*, chapter 4. Freedom, CA: The Crossing Press, 1996.

Svoboda, Robert, and Arnie Lade. *Tao and Dharma: Chi nese Medicine and Ayurveda*. Twin Lakes, WI: Lotus Press, 1995.

ORGANIZATIONS

American Foundation of Traditional Chinese Medicine (AFTCM). 505 Beach Street, San Francisco, CA 94133. (415) 776 0502. Fax: (415) 392 7003. aftcm@earthlink.net.

Rebecca Frey

Chinese tea *see* **Green tea**

Chinese thoroughwax

Description

Chinese thoroughwax is an herb that is often called bupleurum, referring to the scientific naming of the species *Bupleurum chinense* and *Bupleurum falcatum*. Another name for the herb is hare's ear, and in **traditional Chinese medicine** the herb is called chai-hu.

Chinese thoroughwax (bupleurum) is a perennial flowering plant that grows from one to three feet tall. The leaves are long and slender, and the plant has yellow flowers in the summer months. It grows naturally in China, Japan, and Korea, and in other countries in northern Asia and northern Europe. The root of the plant is pale red, and is the part that is used medicinally. It tastes slightly bitter and pungent, and is believed to have cooling properties in the body.

One of the major herbs in traditional Chinese medicine, Chinese thoroughwax is used in several traditional formulas for liver problems, fevers, and inflammation. Chinese herbalists prescribe it for conditions that are associated with stagnation of qi, or chi (life energy), in the liver. Chinese thoroughwax is a major ingredient in a widely used Oriental medicinal formula called *shosaikoto* in Japanese, which also contains **Korean ginseng**, **licorice** root, **ginger** root, and other herbs. The Chinese name for the formula is *xiao chai hu tang*. This formula is almost 2,000 years old and is used in situations when someone gets a cold or flu but never completely recovers like some kinds of **chronic fatigue syndrome**.

Bupleurum has received attention most recently by researchers in China and Japan. Several studies that have shown significant findings have been translated into English. Professor Shibata of Tokyo University isolated a substance in Chinese thoroughwax he termed *saikogenin*, which is in a class of biologically active chemicals called saponins. In laboratory tests, saikogenin has shown potent anti-inflammatory properties, which recommend it for treating skin **infections** and other disorders in which inflammation and swelling are problematic. Saikogenin has been shown to increase the effectiveness of cortisone drugs, which are pharmaceutical steroids prescribed for arthritis, **asthma**, inflammation and other conditions. Bupleurum significantly increased the action of the cortisone drug prednisone in some laboratory tests. Another benefit of bupleurum is that it has been shown to protect the adrenal glands from the damaging effects of cortisone drugs.

Bupleurum extract has been shown in human studies to improve the symptoms of **hepatitis**, or viral infection of the liver. Other studies have pointed to its effectiveness as an antipyretic (fever-reducing agent), a mild tranquilizer, an antibiotic and antiviral agent, and as an immune system stimulant. A Japanese study published in 2002 suggests that bupleurum may be effective in the treatment of gastric ulcers. Chinese thoroughwax has also been shown to increase the efficiency of the chemotherapy drug 5-FU. It should be noted that Chinese thoroughwax has been generally most effective in tests when used in conjunction with other herbs in traditional Chinese herbal formulas.

General use

Traditional Chinese medicine recommends Chinese thoroughwax for chest congestion, respiratory problems, and for **chills** and fevers, including those associated with **malaria** and blackwater **fever**. It is used to treat fevers that have associated symptoms of

KEY TERMS

Interferon—A protein produced by animal cells that have been invaded by a virus, frequently used in the treatment of hepatitis. It has been reported to cause negative interactions with bupleurum.

Qi, or chi—Universal life energy, according to traditional Chinese medicine, that is found in the body, air, food, water, and sunlight.

Saikosaponins—Chemical compounds found in bupleurum that have anti-inflammatory effects.

Traditional Chinese medicine—Ancient Chinese healing system involving acupuncture, herbal remedies, dietary therapies, and other healing techniques.

bitter taste in the mouth, irritability, **nausea**, and abdominal pains, and is sometimes prescribed for **dizziness** and vertigo that occur with chest **pain**. Chinese thoroughwax is used in tonics to strengthen the lungs and sense organs, and to tone the leg muscles. Chinese thoroughwax is used to strengthen the liver and to treat liver problems, such as hepatitis and alcohol-related liver damage (**cirrhosis**).

For women, Chinese thoroughwax is used in formulas to regulate menstrual cycles in cases of **amenorrhea** (loss of menstrual cycle), to reduce the symptoms of PMS, and as a tonic for the female reproductive system. Chinese thoroughwax can be taken as an herbal supplement with corticosteroid drugs, to reduce the risks of damage to the adrenal glands. Some Chinese medicinal formulas containing Chinese thoroughwax (including xiao chai hu tang) are used for **cancer** treatment and as herbal support during chemotherapy.

Preparations

Chinese thoroughwax is available as dried root and capsules in herb stores, health food stores, and Chinese markets. It is also available in several formulated Chinese medicines. To prepare a daily serving of tea, 3–12 g of the dried root can be simmered for over an hour in a quart of water. For more extreme cases of fever and hepatitis, two servings of the tea can be drunk daily.

Side effects

Chinese thoroughwax can cause nausea, dizziness, sweating, and intestinal discomfort when taken in excessively high dosages.

Interactions

Chinese thoroughwax is frequently prescribed with licorice root and Korean ginseng. In the traditional and often used Oriental medicine called *shosaikoto* in Japanese or *xiao chai hu tang* in Chinese, Chinese thoroughwax is blended with licorice, jujube fruit, ginger root, Korean ginseng, Chinese **skullcap** root, and half summer root (*Pinellia ternata*). Herbalists often recommend that Chinese thoroughwax be combined with lycii berries to counteract its drying effects in the body. For cases of vertigo and chest pain, and as a liver tonic, bupleurum can be taken with **white peony root**, bitter orange fruit, and licorice. For **menstruation** problems, bupleurum may be combined with white peony and mint.

Bupleurum has been reported to have negative interactions with interferon, which is a protein produced by animal cells when they are invaded by a virus. Interferon is frequently used to treat hepatitis, and patients who are receiving interferon for this disease should not take herbal formulations containing bupleurum.

Resources

BOOKS

Lu, Henry C. *Chinese Herbal Cures*. New York: Sterling, 1994.

Reid, Daniel. *Chinese Herbal Medicine*. Boston: Shambhala, 1996.

Teeguarden, Ron. *Chinese Tonic Herbs*. New York: Japan Publications, 1995.

PERIODICALS

Matsumoto, T., X. B. Sun, T. Hanawa, et al. "Effect of the Antiulcer Polysaccharide Fraction from *Bupleurum falcatum L.* on the Healing of Gastric Ulcer Induced by Acetic Acid in Rats." *Phytotherapy Research* 16 (February 2002): 91 93.

Park, K. H., J. Park, D. Koh, and Y. Lim. "Effect of Saikosaponin A, a Triterpenoid Glycoside, Isolated from *Bupleurum falcatum* on Experimental Allergic Asthma." *Phytotherapy Research* 16 (June 2002): 359 363.

ORGANIZATIONS

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. http://www.aaom.org.

Rocky Mountain Herbal Institute. P. O. Box 579, Hot Springs, MT 59845. (406) 741 3811. http://www.rmhiherbal.org.

Douglas Dupler
Rebecca J. Frey, PhD

Chinese wolfberry *see* **Lycium fruit**

Chinese yam

Description

Chinese yam (*Dioscorea opposita*) is a root that is used in **traditional Chinese medicine**. The Chinese pharmaceutical name for this herbal is *Rhizoma dioscoreae*. Other names for Chinese yam include dioscorea and shan yao. Chinese yam is native to China, Japan, Korea, and Taiwan, where it can be found growing wild on hill slopes and in valleys. It is also propagated for medicinal and dietary uses.

The genus name *Dioscorea* is dedicated to the Greek physician and naturalist, Diosorides. There are between 600 and 800 different species of *Dioscorea*, making it one of the largest genera of the plant kingdom. Many species in this genus are grown and collected for their medicinal properties. Sweet potatoes are often called yams, although they are different plants.

The Chinese yam plant is a climbing vine that supports itself by coiling around the branches of other vegetation. The plant can be 9.75 ft (3 m) high and 5 ft (1.5 m) wide. Chinese yam has heart-shaped leaves and it produces small white flowers which have a cinnamon-like aroma. Small tubers (called tubercles) form in the axials (the angles between the leaves and the stem). These pea-sized tubercles are harvested in the late summer or early fall and are used to propagate the plant.

Chinese yam plants take three or four years to reach maturity, although fairly large roots may be harvested from well developed plants after the first year. Chinese yam is a spindle-shaped, thick, hard root or tuber that is white on the inside. However, cultivated forms from China or Japan may have different root shapes. The yam may be up to 3 ft (about 1 m) in length. Chinese yam is dug up in the winter. After the rough bark is removed, the root is washed and allowed to dry in either the shade or the sun. The dried root is rehydrated in water and then cut into slices.

Chinese yam contains large amounts of mucilage. Mucilage is a thick, slimy substance produced by plants. It has a soothing effect on mucous membranes, such as the tissues that line the respiratory passages. This may explain why Chinese yam is effective at relieving **cough**.

General use

Traditional Chinese medicine classifies Chinese yam as neutral and sweet. It serves to tonify and augment the spleen and stomach; augment the lung yin and tonify the lung qi; and stabilize, tonify, and bind the kidneys. Chinese yam enters through the spleen, lung, and kidney channels (meridians). It is used as a tonic (restores tone to tissues). Chinese yam is used to treat weak digestion with **fatigue** and **diarrhea**, general weakness, frequent urination, decreased appetite, leukorrhagia (excessive vaginal discharge), premature ejaculation, the symptoms associated with diabetes, and chronic **wheezing** (whistling sound caused by breathing difficulty) and coughing.

Chinese yam should not be taken if the patient's symptoms include abdominal swelling and **pain**.

KEY TERMS

Mucilage—A thick, slimy, adhesive substance produced by certain plants. It consists of gum that is dissolved in the plant's juices.

Tonic—An agent that restores normal tone to tissues. Tonics are used to treat indigestion, general debility, and other disorders.

Traditional Chinese medicine—The medicine practiced in China since ancient times which utilizes herbal remedies, acupuncture, cupping, and other treatment modalities.

Tubercles—Small, pea-sized tubers that grow on *Dioscorea* plants in the angles between the leaves and the stem. They are used in the cultivation of Chinese yam.

Preparations

Chinese yam may be found in dried or fresh form or as a powder. It is available in Asian food stores, Chinese pharmacies, and may be found in certain health food stores.

Chinese yam is taken by mouth for all indications. A tea (infusion) may be prepared by steeping slices of the root in boiling-hot water. The dosage is 10–30 g of root or 6–10 g of powder.

Combinations

It is common in traditional Chinese medicine to mix herbs to treat specific sets of symptoms. Chinese yam may be combined with the following to treat certain symptoms as shown:

- poria and white atractylodes for loose, watery stools.
- codonopsis root for general weakness, fatigue, and poor appetite.

- Chinese foxglove root and cornus for lightheadedness, forgetfulness, insomnia, and related symptoms.
- ginseng (ren shen), white atractylodes rhizome (bai zhu), and poria (fuling) for weakness of the spleen and stomach characterized by poor appetite, lassitude (exhaustion, weakness), and diarrhea.
- white atractylodes rhizome, poria, and euryale seed (qian shi) for excessive dampness because of deficiency of the spleen characterized by white leukorrhagia and lassitude.
- phellodendron bark (huang bai) and plantain seed (che qian zi) for excessive dampness changing into heat characterized by yellow vaginal discharge.
- dogwood fruit (shan zhu yu) and dodder seed (tu si zi) for deficient kidneys characterized by lower back pain and leukorrhagia.
- astragalus root (huang qi), trichosanthes root (tian hua fen), pueraria root (ge gen), and fresh rehmannia root (sheng di huang) for the thirst, excessive drinking and eating, lassitude, and frequent urination associated with diabetes.
- dogwood fruit and prepared rehmannia root (shu di huang) for frequent nighttime urination because of deficient kidneys.
- bitter cardamon (yi zhi ren) and mantis egg case (sang piao xiao) for frequent urination because of deficient kidneys.
- glehnia root (sha shen), schisandra fruit (wu wei zi), and ophiopogon root (mai dong) for deficient lungs characterized by chronic cough

Precautions

Species of *Dioscorea* that are edible have opposite leaves (leaves on the stem are directly across from one another), whereas species that are poisonous have alternate leaves (leaves on the stem are not directly across from one another).

Women who are pregnant or lactating should consult with a physician before using Chinese yam.

Side effects

There are no side effects associated with the use of Chinese yam.

Interactions

Chinese yam should not be taken with kan-sui root. As of mid-2000, there were no indications of any interactions between Chinese yam and any drug or other herbal medicine.

Resources

BOOKS

"Chinese Yam." In *The Alternative Advisor: The Complete Guide to Natural Therapies and Alternative Treatments*. Alexandria, VA: Time Life Books, 1999.

OTHER

Decne. "Dioscorea batatas." http://www.gardenbed.com/D/1402.cfm.

"Rhizoma Dioscoreae." http://www.healthlink.us inc.com/publiclibrary/htm data/htm herb/bhp623.htm.

Belinda Rowland

Chiropractic

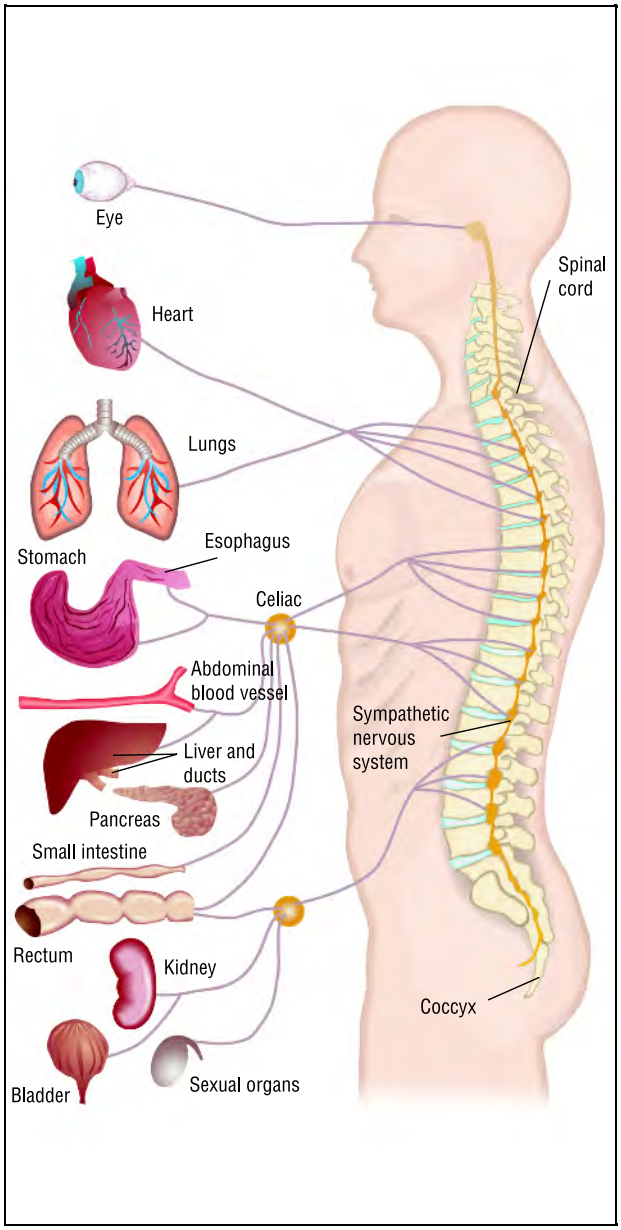
Definition

The term chiropractic is from Greek words *cheir* meaning hand and *praxis* meaning action. Chiropractic is a system of treatment grounded in the principal that the body can heal itself when the skeletal system is correctly aligned and the nervous system is functioning properly. To achieve this proper function and alignment, practitioners uses their hands or an adjusting tool to perform specific manipulations, most commonly of the spine. When the bones of the spine are not correctly articulated, resulting in a condition known as subluxation, the theory is that nerve transmission is disrupted and causes **pain** and illness manifested in the back as well as other areas of the body.

Chiropractic is one of the most popular alternative therapies currently available. According to the National Institutes of Health's National Center for Complementary and Alternative Medicine, about 20% of Americans report having used chiropractic care at least once. Chiropractic treatment is covered by many insurance plans, including Medicare. The most common reason for seeking chiropractic care is for pain in the lower back. According to the American Chiropractic Association, lower back pain accounts for about 43% of chiropractic visits. In addition, many people seek chiropractic care for a variety of other problems, including ear **infections**, dysmenorrheal, infant **colic**, migraine headaches. Patients also visit chiropractors with complaints of pain or injury to the neck, middle back, arms, or legs.

Origins

Spinal manipulation has a long history in many cultures. However, Daniel D. Palmer (1845–1913)



Points on the spine that correspond to various organs and their functions according to chiropractic medicine. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

founded modern chiropractic theory in the 1890s. A grocer and self-taught magnetic healer, Palmer applied his knowledge of the nervous system and manual therapies to unusual situations. One renowned story concerns Harvey Lillard, a janitor in the office where Palmer worked. The man had been deaf for 17 years, ever since he had sustained an injury to his upper spine. Palmer performed an adjustment on a painful vertebra in the region of the injury and Lillard's hearing was reportedly restored. Palmer theorized that all communication from the brain to the rest of the body passes through the spinal canal and areas that are poorly aligned or under **stress** can cause physical symptoms both in the spine and in other areas of the body. Thus, the body has the innate intelligence to heal itself when unencumbered by spinal irregularities causing nerve interference. After his success with Lillard, other patients began coming to Palmer for care and responded well to adjustments. This success resulted in Palmer's further study of the relationship between an optimally functional spine and normal health.

Palmer founded the first chiropractic college in 1897. His son, B. J. Palmer, continued to develop chiropractic philosophy and practice after his father's death. B. J. and other faculty members were divided over the role of subluxation in disease. B. J. saw it as the cause of all disease. The others disagreed and sought a more rational way of thinking, thus broadening the base of chiropractic education. From 1910 to 1920, many other chiropractic colleges were established. Other innovators, including John Howard, Carl Cleveland, Earl Homewood, Joseph Janse, Herbert Lee, and Claude Watkins also helped to advance the profession.

The theories first developed by the Palmers received somewhat broader interpretation in the late 2000s. Many chiropractors believe that back pain can be relieved and health restored through chiropractic treatment even in patients who do not have demonstrable subluxations. Scientific development and research of chiropractic is gaining momentum, with controlled, scientific studies of chiropractic techniques becoming increasingly common. The National Center for Complementary and Alternative Medicine has even targeted funding to help increase the number of chiropractors participating in research.

Many people besides the Palmers have contributed to the development of chiropractic theory and technique. Some have gone on to create a variety of procedures and related types of therapy that have their roots in chiropractic, including McTimoney-Corley chiropractic, craniosacral manipulation, naprapathy, and **applied kinesiology**. **Osteopathy** is a related holistic discipline that utilizes spinal and musculoskeletal manipulation as a part of treatment, but osteopathic training is more similar in scope to that of a medical doctor.

Benefits

Many people experience back pain at some time in their lives. Depending on the cause and severity of the condition, options for treatment may include physical

therapy, rest, medications, surgery, or chiropractic care. Chiropractic is not believed to carry the risks of surgical or pharmacologic treatment. Practitioners use a holistic approach to health, which is appreciated by many patients. The goal is not merely to relieve the present ailment, but to analyze the cause and recommend appropriate changes of lifestyle to prevent the problem from recurring. Chiropractors generally believe in performing a risk/benefit analysis before use of any intervention. The odds of an adverse outcome are extremely low. Chiropractic is often less expensive than many more traditional treatment methods such as outpatient physical therapy. Relief from some neuromuscular problems is immediate, although a series of treatments is likely to be required to maintain the improvement. Spinal manipulation is often considered an excellent option for acute lower back pain and may also relieve **neck pain** and other musculoskeletal pain. Although many instances of back pain subside eventually with no treatment at all, chiropractic treatment can significantly shorten the time required for improvement. Some types of **headache** can also be successfully treated by chiropractic.

Description

Initial visit

An initial chiropractic exam often includes a history and a physical. The patient is asked about the current complaint, about any chronic health problems, about family history of disease, dietary habits, medical care received, and any medications currently being taken. Further, the chiropractor asks how long the patient has had the problem, how it has progressed, and whether it resulted from an injury or occurred spontaneously. The chiropractor also asks for details of how the injury occurred. The physical exam evaluates by observation and palpation whether the painful area has evidence of inflammation or poor alignment. Range of motion may also be assessed. In the spine, either hypomobility (fixation) or hypermobility may be a problem. Laboratory analysis is helpful in some cases to rule out serious infection or other health issues that may require referral for another type of treatment. Many practitioners also take x rays during the initial evaluation

Manipulation

When spinal manipulation is employed, it is generally done with the hands, although some practitioners may use an adjusting tool. A classic adjustment involves a high velocity, low amplitude thrust that produces a usually painless popping noise and improves the range of motion of the joint that was treated. The patient may lie on a specially designed, padded table that helps the practitioner achieve the proper positions for treatment. Some adjustments involve manipulating the entire spine, or large portions of it, as a unit; others are small movements designed to affect a single joint. Stretching, traction, and slow manipulation are other techniques that can be employed to restore structural integrity and relieve nerve interference.

Length of treatment

The number of chiropractic treatments required varies depending on several factors. Generally longer-term treatment is needed for conditions that are chronic, severe, or occur in conjunction with another health problem. Patients who are not in overall good health may also have longer healing times. Some injuries will inherently require more treatments than others. Care is usually given in three stages. Initially, appointments are more frequent with the goal of relieving immediate pain. Next, the patient moves into a rehabilitative stage to continue the healing process and help to prevent a relapse. Finally, the patient may elect periodic maintenance, or wellness treatments, along with lifestyle changes if needed in order to stay in good health.

Follow-up care

Discharge and follow-up therapy are important. If an injury occurred as a result of poor fitness or health, a program of **exercise** or **nutrition** should be prescribed. Home therapy may also be recommended, involving such treatments as anti-inflammatory medication and applications of heat or ice packs. Conscious attention to posture may help some patients avoid sustaining a similar injury in the future, and the chiropractor is be able to advise the patient of any poor postural habits that require correction.

Types of practitioners

Some practitioners use spinal manipulation to the exclusion of all other modalities and are known as straight chiropractors. Others integrate various types of therapy such as massage, nutritional intervention, or treatment with vitamins, herbs, or homeopathic remedies. They may also embrace ideas from other health care traditions. This group is known as mixers. The vast majority of chiropractors, perhaps 85%, fall in this second category.

Preparations

Patients should enter the chiropractic clinic with an open mind, which will help to achieve maximum results.

Precautions

Chiropractic is not an appropriate therapy for all problems. Many diseases and conditions require medication or surgery. Although there are many conditions of the spine that are amenable to manipulative treatment, it is not appropriate for **fractures**. The chiropractor should be informed in advance if the patient is taking anticoagulants or has **osteoporosis** or any other condition that may weaken the bones. Other circumstances that contraindicate chiropractic care are detected in the history and physical exam. Down syndrome, some congenital defects, some types of **cancer**, and a variety of other diseases and conditions may preclude spinal manipulation. On rare occasions, a fracture or dislocation may occur during manipulation. There is also a risk of a **stroke** occurring as a result of spinal manipulation, although this risk is extremely low. Estimates put the risk at no more than 2.5 occurrences per one million treatments.

Side effects

It is not uncommon to have local discomfort in the form of aches, pains, or spasms for a few days following a chiropractic treatment. Some patients may also experience mild headache or **fatigue** that resolves quickly.

Research and general acceptance

As recently as the 1970s, the American Medical Association (a national group of medical doctors) was quite hostile toward chiropractic. AMA members were advised that it was unethical to be associated with chiropractors. Later that changed and as of 2008, many allopathic or traditionally trained physicians enjoyed cordial referral relationships with chiropractors. There remained, however, strong debate over which diseases and conditions can be successfully treated using chiropractic.

Although some members of the medical community continue to have reservations about chiropractic, it seems to be favored by a significant section of the general population. A study published in the October 2007 volume of the *Journal of Occupational & Environmental Medicine* found that 89% of workers experiencing occupational **low back pain** began visiting a chiropractor within 30 days after the onset of pain.

KEY TERMS

Adjustment—A specific type of manipulation of the spine designed to return it to proper structural and functional form.

Allopathic—Conventional practice of medicine generally associated with medical doctors.

Dysmenorrhea—Painful menstruation.

Osteoporosis—A condition of decreased bone density, causing increased bone fragility, which is most common in elderly women.

Subluxation—Misalignment between vertebrae that structurally and functionally impairs nerve function.

Although studies such as this one show how popular chiropractic care is with the general population, scientists and medical researchers continue to conduct studies to determine which treatments are really effective.

A July 2006 study took 235 subjects who were seeking care for low back pain and randomly assigned them to either chiropractic care or to physical therapy. The study found that, in general, those who received chiropractic care had a larger reduction in pain. The study did find, however, certain subgroups, such as those with recurrent pain, improved more with physical therapy. This type of complexity may help to explain why some studies find that chiropractic intervention has a very high success rate in treating low back pain, and other studies find that it is not effective.

In addition to treating low back pain, there is some anecdotal evidence that recommends chiropractic treatment for ailments unrelated to musculoskeletal problems, but as of 2008 there was not enough research-based data to support this. By contrast, a chiropractor may be able to treat problems and diseases unrelated to the skeletal structure by employing therapies other than spinal manipulation.

Although many chiropractors limit their practice to spine and joint problems, others claim to treat disorders that are not closely related to the back or musculoskeletal system. These include **asthma**, bedwetting, **bronchitis**, coughs, **dizziness**, **dysmenorrhea**, **earache**, fainting, headache, hyperactivity, **indigestion**, **infertility**, migraine, **pneumonia**, and issues related to **pregnancy**. There is not a significant body of scientific evidence showing that chiropractic care is successful in treating these conditions. There are, however, at least three explanations sometimes given for why chiropractic may be successful in treating these

DANIEL PALMER (1845–1913)

Chiropractic inventor, Daniel David Palmer, was born on March 7, 1845, in Toronto, Ontario. He was one of five siblings, the children of a shoemaker and his wife, Thomas and Katherine Palmer. Daniel Palmer and his older brother left Canada with a tiny cash reserve in April 1865. They immigrated to the United States on foot, walking for 30 days before arriving in Buffalo, New York. They traveled by boat through the St. Lawrence Seaway to Detroit, Michigan. There they survived by working odd jobs and sleeping on the dock. Daniel Palmer settled in What Cheer, Iowa, where he supported himself and his first wife as a grocer and fish peddler in the early 1880s. He later moved to Davenport, Iowa, where he raised three daughters and one son.

Palmer was a man of high curiosity. He investigated a variety of disciplines of medical science during his life time, many of which were in their infancy. He was intrigued by phrenology and assorted spiritual cults, and for nine years he investigated the relationship between magnetism and disease. Palmer felt that there was one thing that caused disease. He was intent upon discovering this one thing, or as he called it: the great secret.

In September 1895, Palmer purported to have cured a deaf man by placing pressure on the man's displaced vertebra. Shortly afterward Palmer claimed to cure another patient of heart trouble, again by adjusting a displaced vertebra. The double coincidence led Palmer to theorize that human disease might be the result of dislocated or luxated bones, as Palmer called them. That same year he established the Palmer School of Chiropractic where he taught a three month course in the simple fundamentals of medicine and spinal adjustment.

Palmer, who was married six times during his life, died in California in 1913; he was destitute. His son, Bartlett Joshua Palmer, successfully commercialized the practice of chiropractic.

conditions. One is that the problem could be linked to a nerve impingement, as may be possible with bed-wetting, dizziness, fainting, and headache. In a second group, chiropractic treatment may offer some relief from complicating pain and spasms caused by the disease process, as with asthma, bronchitis, coughs, and pneumonia. The discomforts of pregnancy may also be relieved with gentle chiropractic therapy. A third possibility is that manipulation or use of soft-tissue techniques may directly promote improvement of some conditions. One particular procedure, known as the endonasal technique, is thought to help the eustachian tube to open and thus improve drainage of the middle ear. The tube is sometimes blocked off due to exudates or inflammatory processes, which can cause earaches. Some headaches also fall in this category, as skilled use of soft tissue techniques and adjustment may relieve the muscle tension that may initiate some headaches.

Dysmenorrhea, hyperactivity, indigestion, and infertility are said to be relieved as a result of improved flow of blood and nerve energy following treatment. Evidence for this is anecdotal at best, but manipulation is unlikely to be harmful if causes treatable by other modalities have been ruled out.

For conditions such as cancer, fractures, infectious diseases, neurological disease processes, and any condition that may cause increased orthopedic fragility, chiropractic treatment alone is not an effective therapy and may even be harmful in some cases. Chiropractic treatment should never be sought to the complete exclusion of traditional medical therapies. Those who have known circulatory problems, especially with a history of thrombosis, should not have spinal manipulation.

Training and certification

Chiropractors are licensed by the state in which they practice. Matriculation at a certified school of chiropractic requires at least two years of science-based undergraduate work, and most applicants have completed a bachelor's degree. Chiropractic college is an additional four-year program and graduates receive a DC (doctor of chiropractic) degree. Chiropractic education emphasizes anatomy, physiology, diagnostic skills, neurology, and radiology. As of the year 2008, there were 18 chiropractic colleges in the United States. Following graduation, the doctors must pass both national board and state board exams in order to be licensed. A minimum number of continuing education hours per year may be required in some states to maintain licensure. Practitioners may also opt for a program to become a diplomate of a more specialized group. Requirements for these groups vary considerably, from a program similar to a traditional residency down to some that require a minimal number of hours of continuing education. Some of the specialties offered are radiology, orthopedics, sports injuries, nutrition, neurology, and internal medicine. Most chiropractors do not specialize.

Resources

BOOKS

Gatterman, Meridel I., and Ron Kirk. *Chiropractic, Health Promotion, and Wellness*. Sudbury, MA: Jones & Bartlett, 2007.

Haldeman, Scott, et al., eds. *Principles and Practice of Chi ropractic*. New York: McGraw Hill Medical, 2005.

Kanan, Joseph. *Living Pain Free through Chiropractic and Trigger Point Therapy*. Apple Valley, MN: Center Path, 2006.

Weintraub, Michael I., Ravinder Mamtani, and Marc S. Micozzi, eds. *Complementary and Integrative Medicine in Pain Management*. New York: Springer, 2008.

PERIODICALS

Bronfort, Gert, et al. "Evidence Informed Management of Chronic Low Back Pain with Spinal Manipulation and Mobilization." *Spine Journal* 8, no. 1 (January/February 2008): 213 226.

Klotter, Julie. "Chiropractic and Migraines." *Townsend Letter: The Examiner of Alternative Medicine* 292 (November 2007): 37.

Stevens, Gerald L. "Behavioral and Access Barriers to Seeking Chiropractic Care: A Study of 3 New York Clinics." *Journal of Manipulative and Physiological Therapeutics* 30, no. 8 (October 2007): 566 573.

ORGANIZATIONS

American Chiropractic Association, 1701 Clarendon Blvd., Arlington, VA, 22209, (703) 276 8800, http://www.amerchiro.org/.

Judith Turner
Teresa G. Odle
Helen Davidson

Chlamydia

Definition

Chlamydia is the most common sexually transmitted disease in the United States. More than a million new cases of the diseases were reported in 2007, the most ever for a sexually transmitted disease in the United States. The disease is caused by a bacterium called *Chlamydia trachomatis*. The following areas in the body can be affected:

- cervix
- fallopian tubes, which carry ova (eggs) from the ovaries to the uterus
- urethra, which carries urine from the bladder to outside the body
- epididymis, a small organ attached to the testicles that is responsible for sperm production
- prostate gland, a gland at the base of the penis that provides nutrients for sperm
- anus
- throat
- eyes

In addition, *Chlamydia trachomatis* also causes lung and eye **infections** in newborns whose mothers have a chlamydial infection during the last part of their **pregnancy**.

Description

Chlamydia is most often found in sexually active adolescents aged 15 to 19. Data gathered by the Centers for Disease Control (CDC) suggest that sexually active girls in this age group may account for up to 40% of chlamydial infections.

According to the CDC, approximately 40% of women infected with chlamydia develop **pelvic inflammatory disease** (PID). If untreated, 18% of women with PID have chronic inflammatory **pain**. In addition, chlamydia may cause extensive damage to the fallopian tubes. Scarring can block the tube and prevent the egg from being fertilized. As a result, one of every five women with PID is unable to conceive. Tube scarring may also cause the fertilized egg to be trapped inside the tube, unable to reach the uterus. When the fertilized egg develops inside the tube rather than in the uterus, the condition is called tubal pregnancy. The condition is potentially fatal if the tube ruptures. In the United States, tubal pregnancy is the number one cause of death of women in early pregnancy.

Causes and symptoms

Cause

Chlamydia is caused by a bacterial parasite called *Chlamydia trachomatis*. The organism lives inside humans, who act as hosts. It is dependent on humans for energy because it is unable to produce energy for itself. *C. trachomatis* often causes genital and urinary tract infections in sexually active men and women.

Mode of transmission

A person can become infected with *C. trachomatis* in the following ways:

- having sex (oral, genital, or anal) with an infected partner
- sharing infected sex toys

- passing through the infected birth canal of a mother who has chlamydia
- experiencing an episode of sexual abuse (in children)

Risk factors

The following are risk factors for contracting chlamydia infections:

- Age. Young sexually active people aged 15 to 19 are most frequently affected.
- Race. Blacks contract this disease more often than whites or Hispanics.
- Marital status. Chlamydia is most often found in single women. Married women have the lowest risk.
- Behavioral factors. Douching increases risk of chlamydial infections. Smoking also increases one's risk of contracting this disease. Those who have sex with many different partners or with strangers are at high risk. Also at increased risk are those who have unprotected sex with partners of unknown disease status. Previous induced abortions also increase a woman's chance of getting this disease.
- Socio-economic status. Poor, uneducated women living in big cities are more often affected by this disease.
- Postpartum period. Increased risk of contracting chlamydia is observed during the period immediately after giving birth or undergoing an induced abortion. This risk arises because the cervix is not entirely closed, allowing a greater chance for infection.

Symptoms

Approximately 75% of women do not have symptoms. If a woman has symptoms, they typically develop one to three weeks after she is infected. Her symptoms may include:

- burning pain during urination
- more frequent urination
- abnormal vaginal discharge
- dull pelvic pain
- bleeding between periods and after sexual intercourse
- menstrual bleeding that is heavier than usual
- more painful periods

Chlamydia infection in men may develop in the urethra, epididymis, and/or the prostate. Approximately 50% of infected men do not have any symptoms. If a man has symptoms, they tend to develop one to three weeks after he is infected. His symptoms may include:

- burning pain during urination
- more frequent urination
- white or yellow discharge from the penis
- redness at the tip of the penis
- itchy or irritated urethra (urethritis)
- pain and swelling in the testicles (epididymitis)
- pain between the scrotum and anal area and difficult and frequent urination (prostatitis)

On rare occasions, chlamydia infection in men and women can develop outside the genital areas. These patients may have infections at the following sites:

- eyes (due to a contaminated hand touching the eyes): itching, redness and itching of the eyelids
- throat (following oral sex with infected men): throat irritation or no symptoms
- anus (following anal intercourse with infected men): rectal bleeding, mucous rectal discharge, diarrhea, and pain with bowel movement.

Diagnosis

Diagnosis is based on patients' history, laboratory testing for *C. trachomatis*, and physical examination for men and pelvic examination for women to determine if the patient is infected and/or the extent of infection.

There are several tests available for chlamydial infection. They often require swipes from the infected site or urine samples. Tests for chlamydia include:

- Cell culture test. This old test is reliable but requires 48 to 72 hours to complete. In the early 2000s, it was being replaced by faster and more convenient tests. In 2001, the U.S. Food and Drug Administration (FDA) recommended routine screening for chlamydia among sexually active young women. One year later, the administration approved a test called ThinPrep, a new type of Pap smear that allows doctors to screen for chlamydia, gonorrhea, and the human papillomavirus at the same time women have annual pap exams for cervical cancer.
- Direct fluorescent antibody (DFA) staining. This test is faster than the traditional culture test.
- Enzyme immunoassay (EIA). This test is easy to perform and faster than the traditional culture test but is not as accurate.
- DNA probe. This test is expensive but is more specific and convenient than culture, EIA, or DFA tests. Genital swipe samples are not necessary. Urine tests can provide accurate results.
- Nucleic acid amplification (PCR and LCR) tests. These tests look for genetic material of the organism. These are the tests of choice because they are the

most sensitive (more than 90% accurate) and the most specific. They are also convenient because they can be performed on urine samples and do not require a pelvic exam.

Treatment

Alternative therapy should be complementary to antibiotic therapy. Because of the potentially serious nature of this disease, patients should first consult an allopathic physician to start antibiotic treatment for infections. Traditional medicine is better equipped to quickly eradicate the infection while alternative treatments can help the body fight the disease and relieve symptoms associated with this disease. Some alternative treatments include nutritional therapy, herbal remedies, **traditional Chinese medicine**, and **homeopathy**.

Nutritional therapy

The following dietary changes may be helpful:

- Following a low-fat, high-fiber diet. The diet should include a variety of fresh fruits and vegetables. These foods contain high amounts of phytonutrients and essential vitamins that help keep the body strong and stimulate the immune system to fight infections.
- Limited intake of fat, sugar, highly processed foods, caffeine, and alcohol, which depresses the immune function.
- Taking a multivitamin/mineral supplement daily.
- Drinking cranberry juice. Cranberry juice helps prevent urinary tract infections.
- Taking acidophilus pills to prevent yeast infections while on antibiotics.
- Eating fresh garlic or taking garlic pills to help fight infection.

Herbal treatment

Echinacea and berberine-containing herbs such as **saw palmetto** (*Serenoa repens*) and **goldenseal** are natural antibiotics. These herbs can assist the action of prescription antibiotics.

Traditional Chinese medicine

An experienced Chinese herbalist typically prepares an herbal mixture based on a patient's specific condition and symptoms.

Homeopathy

A homeopathic practitioner may prescribe a patient-specific remedy to help reduce some of the symptoms associated with disease. Remedies for chlamydial symptoms include *Cannabis sativa*, *Cantharis*, and *Salidago virga*.

Allopathic treatment

Once detected, chlamydia can be easily treated with antibiotics. However, if not detected early enough, scarring of fallopian tubes (and resulting **infertility**) may not be preventable. The two most commonly used drugs are azithromycin and doxycycline. Azithromycin is more expensive but much more convenient to administer. Only one dose is needed to treat the disease. Doxycycline is cheaper but needs to be taken twice a day for more than seven days. Because patients tend to stop taking drugs after a few days, doxycycline is not as effective as azithromycin. Therefore, many doctors prefer to give azithromycin. Patients are advised to refrain from sex for a full week after taking azithromycin or until they finish doxycycline treatment.

An infected person should contact all partners within the last two months so that they can be tested for chlamydia.

Infected pregnant women should be given erythromycin for seven days, instead of other drugs, because this drug is safer during pregnancy.

Follow-up testing is done four weeks after drug treatment to see if the infection is eradicated. If tests continue to be positive, the patient is given another course of antibiotics.

Expected results

A woman's prognosis depends on the duration of infection, whether the infection has spread through the uterus and the fallopian tubes, and the number of previous chlamydial infections. If detected early, the disease can be completely cured with antibiotic treatment in seven days. However, if left untreated, chlamydia can spread through the uterus to the fallopian tubes and cause chronic pelvic inflammatory disease. Infertility may occur as a result of serious damage to the female reproductive tract. Potentially fatal tubal pregnancy is also a risk.

Prevention

Prevention is the most important means of stopping the spread of this disease. The following practices are recommended to prevent the spread of this and other sexually transmitted diseases:

- Abstinence. Abstinence is the only sure way to prevent chlamydia and other STD infections.

KEY TERMS

Abstinence—Choosing not to engage in a certain action, such as sex.

Infertility—Inability to have children, which may occur as a result of pelvic infections.

Nongonococcal urethritis (NGU)—A sexually transmitted urethral infection that is not gonorrhea.

Pelvic Inflammatory Disease (PID)—An infection of the uterus, fallopian tubes, and/or ovaries.

Tubal pregnancy—A fertilized egg that implants in the fallopian tube instead of inside the uterus, which often occurs as a result of sexually transmitted infections such as Chlamydia; also known as ectopic pregnancy.

- Monogamy. Having a mutually monogamous relationship with an uninfected partner reduces the chance of getting STD infections.
- Avoiding a sexual relationship with an unknown partner or a partner whose infection status is unknown.
- In having sex with an unknown partner, using a barrier contraceptive such as a condom (for men) or diaphragm (for women) is recommended. However, condoms (or diaphragms) are not 100% effective against chlamydia or other STDs.
- Refraining from douching.
- Avoiding sex soon after giving birth or undergoing an induced abortion.
- Getting tested for chlamydia at yearly pelvic examinations.

Resources

BOOKS

Aral, Sevgi O., and John M. Douglas, eds. *Behavioral Interventions for Prevention and Control of Sexually Transmitted Diseases*. New York: Springer, 2007.

Brequet, Amy. *Chlamydia*. New York: Rosen, 2006.

Holmes, King K., et al. *Sexually Transmitted Diseases*. New York: McGraw Hill Professional, 2007.

Marr, Lisa. *Sexually Transmitted Diseases*, 2nd ed. Baltimore: Johns Hopkins University Press, 2007.

PERIODICALS

Bissell, Mary. "Chlamydia Screening Programs: A Review of the Literature. Part 2: Testing Procedures and Educational Interventions for Primary Care Physicians." *Canadian Journal of Human Sexuality* (March 2006): 13 22.

Hafner, Louise M., and Celia McNeilly. "Vaccines for Chlamydia Infections of the Female Genital Tract." *Future Microbiology* (February 2008): 67 77.

McKay, Alexander. "Chlamydia Screening Programs: A Review of the Literature. Part 1: Issues in the Promotion of Chlamydia Testing of Youth by Primary Care Physicians." *Canadian Journal of Human Sexuality* (March 2006): 1 10.

Skidmore, Sue, Sarah Randall, and Harry Mallinson. "Testing for Chlamydia Trachomatis: Self test or Laboratory based Diagnosis?" *Journal of Family Planning and Reproductive Health Care* (October 2007): 231 232.

OTHER

"Chlamydia." Womenshealth.gov. May 2005 [cited March 18, 2008]. http://www.4women.gov/faq/stdchlam.htm.

"Chlamydia: CDC Fact Sheet." Centers for Disease Control and Prevention. [cited February 3, 2008]. http://www.cdc.gov/std/Chlamydia/STDFact Chlamydia.htm.

ORGANIZATIONS

CDC National STDs Hotline, (800) 227 8922, (800) 342 2437

NIH National Institute of Allergy and Infectious Diseases, NIAID Office of Communications, 31 Center Dr. (MSC 2520), Building 31, Room 7A50, Bethesda, MD, 20892 2520, http://www.cdc.gov/nchhstp/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Chlorella

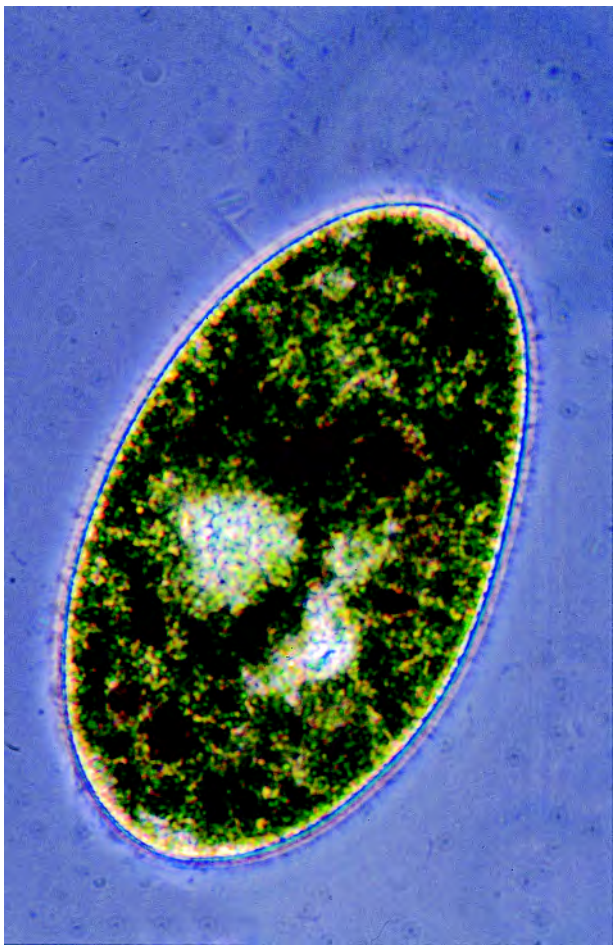
Description

Chlorella is a type of single-cell green algae. It is a major component of phytoplankton, which are very small free-floating aquatic plants found in plankton. Chlorella is a popular food supplement, especially in Japan, and is sold as a nutritional supplement in the United States, Canada, and other parts of the world. There are several species of chlorella, but those most commonly found in supplements are *Chlorella vulgaris* and *Chlorella pyrenoidosa*.

General use

Chlorella contains high levels of chlorophyll, protein, **iron**, vitamins C and B_{12}, **beta carotene**, and 19 **amino acids**.

Several studies have indicated that chlorella may be effective in treating some types of **cancer**, high **cholesterol**, **hypertension** (high blood pressure), and **fibromyalgia** syndrome, and in boosting the immune



This ciliate protozoan Paramecium bursaria, a green slipper animalcule, gets its color from symbiotic algae Chlorella. *(PHOTOTAKE Inc. / Alamy)*

system and detoxifying the body. As is often the case with alternative therapies, there are several studies that dispute the effectiveness of chlorella in treating these medical conditions.

The ability of chlorella to fight cancer cells has been shown in several scientific studies, although the exact mechanisms by which it works were not known as of 2008. Several scientists believe chlorella stimulates the activity of T-cells—important components of the immune system—and macrophages, which are large cells that protect against infection by removing waste products, harmful microorganisms, and other toxins from the bloodstream. Increasing the production of T-cells and macrophages increases interferon levels in the body, enhancing the immune system's ability to fight invading substances such as viruses, bacteria, and chemicals. Interferon is an immune-related protein produced by the body that performs antiviral and anti-tumor activities.

Studies in laboratory animals suggest some substances in chlorella may reduce bone marrow suppression in patients taking the anticancer drug fluorouracil. In this interaction, chlorella may increase the white blood cell and platelet counts, which reduces the risk of infection and bleeding, respectively.

Studies have also shown chlorella can significantly reduce cholesterol levels in laboratory animals. As of 2008 studies were underway to determine if chlorella has the same effect on human cholesterol levels.

Chlorella may help reduce blood pressure in some people with hypertension (high blood pressure). A study reported in the March 2003 issue of *Original Internist* indicated that treatment with 10 grams of chlorella daily for three months significantly improved blood pressure in 25% of the patients involved.

In a 2000 study, patients with fibromyalgia syndrome (a disorder that causes muscle aches, **fatigue**, and **sleep disorders**) were treated with high doses of chlorella. After two months, the study found significant benefits from chlorella treatment.

Clinical studies of laboratory animals have also shown that chlorella can protect against gamma radiation and other toxic drugs and chemicals, including dioxin. In the intestines, it can deactivate heavy metals such as cadmium, lead, and mercury.

The benefits of chlorella have been disputed. According to an equivocal article about chlorella on the American Cancer Society Web site, there is no scientific evidence showing chlorella's effectiveness against cancer or any other disease. Limited laboratory and animal research suggests that the algae may have some anticancer properties. One investigation concluded that a protein extract from one type of chlorella prevented the spread of cancer cells in mice. Another study of mice suggested that the extract decreased the side effects of chemotherapy treatment without affecting the potency of anticancer medications.

Preparations

Chlorella is available in various forms, including capsule, tablet, softgel, powder, and liquid. It is found as a supplement alone or in a combination with other green food extracts such as wheat grass, **barley grass**, and **spirulina** (a nutritionally rich microorganism). Capsules and tablets are available in doses of 200 to 500 milligrams (mg). There is no standard dosage, but some herbalists recommend 3 grams (g) per day.

KEY TERMS

Algae—A mainly waterborne organism that produces energy from light and chlorophyll.

Amino acids—A group of organic compounds that are vital to living cells.

Cadmium—A heavy metal.

Chlorophyll—A green plant pigment found in plants, algae, and some bacteria. Chlorophyll is responsible for capturing the light energy needed for photosynthesis.

Cholesterol—A compound found in animal tissue, blood, and fats, high levels of which in the blood are linked to clogged arteries, heart disease, and gallstones.

Diabetes—A metabolic disorder in which the body produces insufficient insulin or is unable to effectively use normal amounts because of insulin resistance. Type 1 diabetes typically manifests in children as a pancreatic deficiency; Type 2 (adult onset diabetes) is usually a consequence of chronic blood sugar dysregulation.

Dioxin—A toxic chemical produced in the manufacture of some pesticides and herbicides.

Fibromyalgia syndrome—Also called fibromyalgia, a disorder that causes muscle aches, fatigue, and sleep disorders.

Fluorouracil—An anticancer drug.

Gamma radiation—High energy electromagnetic waves emitted in some nuclear reactions.

Hypertension—High blood pressure.

Insulin—A hormone that helps muscle and fat cells take up and sugars, starches, and other foods for conversion into energy the body needs.

Interferon—An immune protein produced by cells in the body to fight viral infections.

Macrophages—Large cells that protect against infection by removing waste products, harmful microorganisms, and other toxins from the bloodstream.

Phytoplankton—Very small free-floating aquatic plants found in plankton.

Plankton—A mass of tiny animals and plants floating in the sea or in lakes, usually near the surface.

Platelet—The smallest kind of blood cell, usually found in large quantities, that plays an important part in blood clotting. Also called thrombocytes.

Spirulina—A nutritionally valuable organism that is rich in vitamins, minerals, essential fatty acids, and antioxidants.

T-cells—A type of white blood cell that plays an important role in the immune system and in combating viral infections and cancers.

Ulcerative colitis—An inflammation in the walls of the bowel that causes internal sores, called ulcers, on the lining of the bowel.

Warfarin—A blood-thinning drug, known by the brand name Coumadin.

Precautions

Pregnant and breastfeeding women are advised to use caution and follow the advice of their healthcare professional, since the effects of chlorella have not been studied for these two groups. Caution may also be advised for persons known to be sensitive or allergic to **iodine**.

Side effects

Although chlorella appears to be safe, no research as of 2008 in humans had been conducted to determine if the supplement causes any negative side effects. Also, no studies had been done regarding the consequences of long-term use. Mild side effects that have been reported include bloating and **nausea**, which usually disappear after a few days of use. Some people using chlorella have had allergic reactions and adverse reactions to sunlight. Allergic reaction symptoms include difficulty breathing, chest **pain**, **hives**, rash, and itchy or swollen skin. If any of these reactions occurs, the person should seek medical care immediately.

Interactions

Persons taking the blood-thinning drug warfarin (Coumadin) are advised to completely avoid chlorella or use caution and follow the advice of their healthcare professional because some chlorella supplements contain high amounts of **vitamin K** that may affect the inhibition of **blood clots**.

Resources

BOOKS

McCauley, Bob. *Achieving Great Health: How Spirulina, Chlorella, Raw Foods, and Ionized Water Can Make You Healthier than You Have Ever Imagined.* Lansing, MI: Watershed Wellness Center, 2005.

Sandoval, David. *The Green Foods Bible: Everything You Need to Know About Barley Grass, Wheatgrass, Kamut, Chlorella, Spirulina, and More*. Topanga, CA: Freedom Press, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Ken R. Wells
David Edward Newton, Ed.D.

Cholecalciferol *see* **Vitamin D**

Cholesterol

Definition

Cholesterol, a fatty substance found in animal tissue, is an important component of the human body. It is manufactured in the liver and carried throughout the body in the bloodstream. Problems can occur when excess cholesterol causes accumulation of plaque on blood vessel walls, which impedes blood flow to the heart and other organs. The highest cholesterol content is found in meat, poultry, shellfish, and dairy products.

Description

Cholesterol has both good effects and bad effects. It is necessary for digesting fats, making hormones, building cell walls, and it participates in other processes for maintaining a healthy body. The body contains two forms of cholesterol: high-density cholesterol (HDL), the so-called good cholesterol, and low-density cholesterol (LDL), the so-called bad cholesterol. The total amount of HDL and LDL is called the total cholesterol. A third type of fatty material found in the body, triglycerides, is a simple form of fat with health effects related to those of cholesterol.

The American Heart Association estimated in 2008 that 106.7 million American adults, roughly one-half of the adult population, have elevated cholesterol levels. High LDL is a major contributing factor for **heart disease**. The cholesterol forms plaque in the heart's blood vessels that restricts or blocks the supply of blood to the heart and causes **atherosclerosis**, which can lead to a **heart attack**, resulting in damage to the heart and possibly death.

The U.S. population as a whole is at some risk of developing high LDL cholesterol. Specific risk factors include a family history of high cholesterol, **obesity**, heart attack or **stroke**, **alcoholism**, and lack of regular **exercise**. The chances of developing high cholesterol increase after the age of 45. One of the primary causes of high LDL cholesterol is too much fat or sugar in the diet, a problem especially prevalent in the United States. Cholesterol is also produced naturally in the liver and overproduction may occur even in people who limit their intake of high cholesterol food. Low HDL and high triglyceride levels also are risk factors for atherosclerosis.

Types of cholesterol

Types	Levels (mg/dl)
Total cholesterol:	
Desirable	<200
Borderline	200 to 240
Undesirable	>240
HDL cholesterol:	
Desirable	>45
Borderline	35 to 45
Undesirable	<35
LDL cholesterol:	
Desirable	<130
Borderline	130 to 160
Undesirable	>160
Ratio of total cholesterol to HDL cholesterol:	
Desirable	<3
Borderline	3 to 4
Undesirable	>4

(Illustration by Corey Light. Cengage Learning, Gale)

Dietary cholesterol

Food	Cholesterol (mg)
Beef liver, cooked, 3 oz	331
Beef sweetbreads, cooked, 3 oz.	250
Squid, cooked, 3 oz.	227
Egg, whole, large	212
Shrimp, cooked, 3 oz.	166
Ice cream, gourmet, 1 cup	90
Salmon, baked, 3.5 oz.	87
Lamb chop, cooked, 3 oz.	75
Chicken breast, cooked, 3 oz.	72
Beef, round, cooked, 3 oz.	71
Beef, sirloin, cooked, 3 oz.	71
Pork chop, cooked, 3 oz.	71
Chicken, dark meat, cooked, 3 oz.	70
Beef, rib eye, cooked, 3 oz.	65
Ham, regular, cooked, 3 oz.	50
Tuna, water packed, drained, 3.5 oz.	42
Milk, whole, 1 cup	33
Butter, 1 tbsp.	31
Ice cream, light, 1 cup	31
Cheese, cheddar, 1 oz.	30
Scallops, cooked, 3 oz.	27
Hot dog, beef, 1 frank	24
Cheese, reduced fat, 1 oz.	6
Yogurt, part skim, 1 cup	6

(Illustration by GGS Information Services. Cengage Learning, Gale)

Causes and symptoms

There are no readily apparent symptoms that indicate high LDL or triglycerides, or low HDL. A simple blood test can reveal a problem. However, one general indication of high cholesterol is obesity. Another is a high-fat diet. Research has shown that both genetic factors and diet contribute to cholesterol levels.

Diagnosis

High cholesterol is often diagnosed and treated by general practitioners or family practice physicians. In some cases, the condition is treated by an endocrinologist or cardiologist. Total cholesterol, LDL, HDL, and triglyceride levels as well as the cholesterol to HDL ratio are measured by a blood test called a lipid panel. The cost of a lipid panel is typically covered by health insurance and HMO plans, including Medicare, providing there is an appropriate reason for the test. Home cholesterol testing kits are available over the counter, but these test only for total cholesterol. The results should be used only as a guide, and if the total cholesterol level is high or low, a lipid panel should be performed by a physician. In most adults the recommended levels, measured by milligrams per deciliter (mg/dL) of blood, are: total cholesterol, less than 200; LDL, less than 130; HDL, more than 40; triglycerides, less than 200; and cholesterol to HDL ratio, four to one. However, the recommended cholesterol levels may vary, depending on other risk factors such as **hypertension**, a family history of heart disease, diabetes, age, alcoholism, and **smoking**.

Doctors wonder why some people develop heart disease whereas others with identical HDL and LDL levels do not. Some studies indicate it may be due to the size of the cholesterol particles in the bloodstream. A test called a nuclear magnetic resonance (NMR) LipoProfile exposes a blood sample to a magnetic field to determine the size of the cholesterol particles. Particle size also can be determined by a centrifugation test, in which blood samples are spun to allow particles to separate and move at different distances. The smaller the particles, the greater the chance of developing heart disease. This test allows physicians to treat patients who have normal or close to normal results from a lipid panel but abnormal particle size.

Treatment

U.S. guidelines in the late 2000s for management of cholesterol levels were established in a 2004 report of the National Cholesterol Education Program of the National Heart, Lung, and Blood Institute, American College of Cardiology Foundation, and American Heart Association. According to that report, the primary goal of cholesterol treatment is to lower LDL to under 160 mg/dL in people without heart disease and who are at lower risk of developing it. The goal in people with higher risk factors for heart disease is less than 130 mg/dL. In patients who already have heart disease, the goal is under 100 mg/dL. Also, since low HDL levels increase the risks of heart disease, the goal for all patients is an HDL level of more than 35 mg/dL.

In both alternative and conventional treatment of high cholesterol, the first-line treatment options are exercise, diet, weight loss, and stopping smoking. Other alternative treatments include high doses of **niacin**, **soy protein**, **garlic**, algae, and the Chinese medicine supplement Cholestin (a red yeast fermented with rice).

Diet and exercise

Since a large number of people with high cholesterol are overweight, a healthy diet and regular exercise are probably the most beneficial natural ways to control cholesterol levels. In general, the goal is to substantially reduce or eliminate foods high in animal fat. These foods include meat, shellfish, eggs, and dairy products. Several specific diet options are

beneficial. One is the vegetarian diet. Vegetarians typically get up to 100% more fiber and up to 50% less cholesterol from their food than non-vegetarians. The vegetarian low-cholesterol diet consists of at least six servings of whole grain foods, three or more servings of green leafy vegetables, two to four servings of fruit, two to four servings of legumes, and one or two servings of non-fat dairy products daily.

A second diet is the Asian diet, with brown rice being the staple food. Other permitted foods include fish; vegetables, such as bok choy and bean sprouts; and black beans. This diet includes one weekly serving of meat and very few dairy products. The food is flavored with traditional Asian spices and condiments, such as **ginger**, chilies, **turmeric**, and soy sauce.

Another regimen is the low glycemic or diabetic diet, which may raise the HDL (good cholesterol) level by as much as 20% in three weeks. Low glycemic foods promote a slow but steady rise in blood sugar levels following a meal, which increases the level of HDL. They also lower total cholesterol and triglycerides. Low glycemic foods include certain fruits, vegetables, beans, and whole grains. Processed and refined foods and sugars are avoided.

Exercise is an extremely important part of lowering bad cholesterol and raising good cholesterol. It should consist of 20 to 30 minutes of vigorous aerobic exercise at least three times a week. Exercises that cause the heart to beat faster include fast walking, bicycling, jogging, roller skating, swimming, and walking up stairs. Various aerobic programs are available at gyms or on videocassette.

Garlic

A number of clinical studies have indicated that garlic can offer modest reductions in cholesterol. A 2006 summary of those studies concluded that garlic appears to have the potential for reducing the level of substances such as LDL associated with heart disease but that further studies were needed to confirm this relationship.

Cholestin

Cholestin first became available in the over-the-counter market in 1997 as a cholesterol-lowering dietary supplement. It is a processed form of red yeast fermented with rice, a traditional herbal remedy used for centuries by the Chinese. Two studies released in 1998 showed Cholestin lowered LDL cholesterol by 20 to 30%. It also appeared to raise HDL and lower triglyceride levels. Although the supplement contains hundreds of compounds, the major active LDL-lowering ingredient is lovastatin, a chemical also found in the prescription drug Mevacor. The FDA banned Cholestin in early 1998 but a federal district court judge lifted the ban a year later, ruling the product was a dietary supplement, not a drug. As of 2008, it remained unclear how the substance works. Patients may want to consult with their physician before taking Cholestin. No serious side effects have been reported, but minor side effects, including bloating and **heartburn**, have been reported. As of 2008, the FDA had not approved the use of Cholestin for any disease, and many questions remained about its efficacy in treating coronary problems.

Other treatments

A study released in 1999 indicated that blue-green algae contains polyunsaturated fatty acids that lower cholesterol levels. The algae, known as alga *Aphanizomenon flos-aquae* (AFA) is available as an over-the-counter dietary supplement. As of 2008, only one study had confirmed the results of the initial 1999 research, and questions remained as to the value of AFA in treating cholesterol problems. Niacin, also known as nicotinic acid or vitamin B_3, has been shown to reduce LDL levels by 10 to 20% and to raise HDL levels by 15 to 35%. It can also reduce triglyceride levels. But because an extremely high dose of niacin (2–3 grams) is needed to treat cholesterol problems, it should be taken only under a doctor's supervision so that in monitoring use, he or she can watch for possible toxic side effects. Niacin can also cause flushing when taken in high doses. Soy protein with high levels of isoflavones has been shown to reduce bad cholesterol by up to 10%. A daily diet that contains 62 mg of isoflavones in soy protein is recommended and can be incorporated into other diet regimens, including vegetarian, Asian, and low glycemic.

Allopathic treatment

Various prescription medicines are available to treat cholesterol problems. These include statins such as lovastatin (Mevacor), fluvastatin (Lescol), pravastatin (Pravachol), simvastatin (Zocor), cervastatin (Baycol), and atorvastatin (Lipitor) to lower LDL. A group of drugs called fibric acid derivatives are used to lower triglycerides and raise HDL. These include gemfibrozil (Lopid), clofibrate (Atromid-S), and fenofibrate (Tricor).

A new class of drugs was identified late in 2001 that work differently from the statin drugs. These drugs rely on compounds that bind to a sterol that regulates protein (called SCAP) and speeds up removal of cholesterol from the plasma (the fluid

KEY TERMS

Atherosclerosis—A buildup of fatty substances in the inner layers of the arteries.

Estrogen—A hormone that stimulates development of female secondary sex characteristics.

Glycemic—The presence of glucose in the blood.

Hypertension—Abnormally high blood pressure.

Legumes—A family of plants that bear edible seeds in pods, including beans and peas.

Lipid—Any of a variety of substances that, along with proteins and carbohydrates, make up the main structural components of living cells.

Polyunsaturated fats—Non-animal oils or fatty acids rich in unsaturated chemical bonds not associated with the formation of cholesterol in the blood.

part of the blood). Doctors decide which drug to use based on the severity of the cholesterol problem, side effects, and cost.

Expected results

High cholesterol is one of the key risk factors for heart disease. Left untreated, too much bad cholesterol can clog the blood vessels, leading to chest **pain** (**angina**), **blood clots**, and heart attacks. Heart disease is the number one killer of men and women in the United States. By reducing LDL, people with heart disease can prevent further heart attacks and strokes, prolong and improve the quality of their lives, and slow or reverse cholesterol buildup in the arteries. In people without heart disease, lowering LDL can decrease the risk of a first heart attack or stroke.

Prevention

The best way to prevent cholesterol problems is through a combination of healthy lifestyle activities, a primarily low-fat and **high-fiber diet**, regular aerobic exercise, not smoking, and maintaining an optimal weight. But for people with high risk factors for heart disease, such as a family history of heart disease, diabetes, and being over the age of 45, these measures may not be enough to prevent high cholesterol. In the late 2000s research continued on the effectiveness of existing anti-cholesterol drugs for controlling cholesterol levels in people who do not meet the criteria for high cholesterol, but no definitive results were yet available.

Resources

BOOKS

American Heart Association's Low Fat, Low Cholesterol Cookbook: Delicious Recipes to Help Lower Your Cho lesterol, 4th ed. New York: Clarkson Potter, 2008.

O'Neil, Edward T. *High Blood Cholesterol: Description and Bibliography*. Hauppauge, NY: Nova Science, 2007.

Rinzler, Carol Ann, and Martin W. Graf. *Controlling Cho lesterol for Dummies,* 2nd ed. Indianapolis, IN: For Dummies, 2008.

Rubin, Jordan. *The Great Physician's Rx for High Choles terol*. Nashville, TN: Thomas Nelson, 2007.

Steinberg, Daniel. *The Cholesterol Wars: The Cholesterol Skeptics vs. the Preponderance of Evidence*. Burlington, MA: Academic Press, 2007.

PERIODICALS

Das, Undurti N. "Beneficial Actions of Polyunsaturated Fatty Acids in Cardiovascular Diseases: But How and Why?" *Current Nutrition & Food Science* (February 2008): 2 31.

"New Study Identifies Genes Involved in Regulating Cho lesterol Levels." *Pharmacogenomics* (February 2008): 137 139.

Rahman, K., and G. M. Lowe. "Garlic and Cardiovascular Disease: A Critical Review." *Journal of Nutrition* (March 2006): 736S 740S.

Suryadevara, Ramya S., Richard H. Karas, and Jeffrey T. Kuvin. "Use of Extended release Niacin in Clinical Practice." *Future Lipidology* (February 2008): 9 16.

ORGANIZATIONS

National Cholesterol Education Program, NHLBI Infor mation Center, PO. Box 30105, Bethesda, MD, 20824 0105, (301) 592 8573, http://www.nhlbi.nih.gov.

Ken R. Wells
Teresa G. Odle
David Edward Newton, Ed.D.

Choline

Description

Choline is an organic compound that functions as an important nutrient. It is found in many animal tissues, either by itself or combined with **lecithin**. In 1998, the United States Food and **Nutrition** board, a part of the Institute of Medicine, declared choline an essential nutrient. Choline is found naturally in meats, egg yolks, dairy foods, and soy products. Lecithin is a source of choline.

A study published by the United States Department of Agriculture in 2001 found that the human

body needs both folate and choline in order to continue to produce sufficient quantities of choline. A balanced diet rich in meats and vegetable products is recommended to help obtain sufficient amounts of choline.

General use

Choline has multiple important roles in the body. Choline is used to treat high **cholesterol**, improve memory, and safeguard the liver. It aids in the absorption and use of fats. Without choline, fat accumulates within the liver, damaging the organ. Choline also serves as an essential component in the making of acetylcholine. The latter is necessary for muscle control, storage of memory, and other neurological activities. Choline has gained popularity among body builders and athletes. According to a 2003 article in *Psychology Today*, choline reduced **fatigue** in long-distance runners and improved speed in a 20-mile run.

In 2003, scientists from the Massachusetts Institute of Technology released a study showing the positive effect of choline on boosting memory when laboratory rats took in a CDP-choline supplement. Choline is also important in the formation of DNA and other genetic compounds. A study released in 2006 found that a diet deficient in choline was linked with DNA damage. Choline is involved in the conversion of homocystine into **methionine**. This is an important physiological function because an accumulation of homocystine can increase risk for **heart disease** or **stroke**.

In 1999, the National Institutes for Health estimated that one percent of the United States population suffered from a genetic disorder that resulted in a fishy **body odor** due to a build-up of trimethylamine. A diet restricted in choline was suggested as a potential aide for these individuals.

Newborns require large amounts of choline to help their tiny organs undergo rapid growth and to achieve membrane biosynthesis. Choline and compounds containing choline are found in human breast milk and, in varying degrees, in infant formula.

A study released in 2007 found that supplements containing choline were beneficial for children with cystic fibrosis. A 2001 study involving rats found that pre- and postnatal supplementary choline prevented a loss of memory function associated with status epilepticus. As of 2008 more study in this area was needed.

Preparations

The recommended dose of choline, set by the Food and Nutrition Board of the National Academies of Science, is 425 mg per day for women and 550 mg per day for men. Choline is available in capsules, tablets, and liquid form.

KEY TERMS

Biosynthesis—A process that produces chemical compounds from simpler components.

Folate—A vitamin used to treat a number of medical conditions.

Homocysteine—An amino acid found in the body. High levels raise the risk for heart disease and stroke.

Lecithin—A fatty substance found in plant and animal material, particularly egg yolk.

Methionine—An amino acid that provides benefits for the liver, as well as for conditions such as osteoarthritis, depression, fibromyalgia, and a host of other medical issues.

Trimethylamine—A product of decomposition associated with a fishy odor. Its build-up can result from excessive choline.

Precautions

Prior to taking choline, individuals should inform their physician if they are pregnant, breastfeeding, or if they have a chronic illness. A study released in 2007 found a potential link between ingestion of choline and increased risk of colon polyps in women. Its role in the formation of such polyps may be related to its ability to help form the outer shell of the polyps. However, researchers noted that other factors in the study, such as intake of red meat, may also be related to the rise in colon polyps. Scientists cautioned that more information is needed before conclusions can be drawn about choline intake and the development of colon polyps. A study involving men was planned.

Side Effects

In general, choline is considered to be a well tolerated supplement. Individuals who experience the following side effects should stop taking choline and report right away to their physician because they may be experiencing an allergic reaction:

- Problems breathing or tightness in the throat or chest
- Pain in the chest
- Rash, hives, itchiness, or swelling of the skin

Other side effects include:

- Stomach pains or upset stomach
- Increased saliva

- Decreased appetite
- Sweating
- A fishy body odor

Interactions

As of 2008, there were no known negative interactions. Choline works in conjunction with other compounds, such as folate. Choline is a precursor to *betaine*.

Resources

BOOKS

Gaby, Alan R., (ed.) *The A Z Guide to Vitamin Drug Herb Interactions: How to Improve Your Health and Avoid Problems When Using Common Medications and Natu ral Supplements Together* (2nd ed.). New York: Three Rivers Press, 2006.

PERIODICALS

Da Kosta, Kerry Ann, et al. "Choline Deficiency Increases Lymphocyte Apoptosis and DNA Damage in Humans." *American Journal of Clinical Nutrition* 84, no. 1 (July 2006): 88 94.

Innes, Sheila M., et al. "Choline related Supplements Improve Abnormal Plasma Methionine Homocysteine Metabolites and Glutathione Status in Children with Cystic Fibrosis." *American Journal of Clinical Nutrition* 85, no. 3 (March 2007): 702 708.

OTHER

Gangula, Ishani. "Choline May Increase Risk of Colon Polyps: Study." *Reuters* August 7, 2007. http://www.reuters.com.

PDRHealth. *Physicians' Desktop Reference*. http://www.pdrhealth.com.

ORGANIZATIONS

Institute of Medicine of the National Academies, 500 Fifth St. NW, Washington, DC, 20001, (202) 234 2352, http://www.iom.edu.

United States Department of Agriculture Research Service, Jamie L. Whitten Building. 1400 Independence Ave. SW, Washington, DC, 20250, http://www.ars.usda.gov.

Rhonda Cloos, RN

Chondroitin

Description

Chondroitin is a substance found in human and animal cartilage that is used to treat several physical disorders, most importantly arthritis, **psoriasis**, and **cancer**. It is the most plentiful type of glycosaminoglycan (GAG) found in cartilage. Glycosaminoglycans (GAGs) are complex carbohydrates that are found in the various types of connective tissue in the body. GAGs account for 5–20% of cartilage tissue. Chondroitin occurs in connective tissue as a sulfate composed of repeating disaccharide units; the first unit is either **glucosamine** or galactosamine; the other unit is glucuronic acid.

General use

Chondroitin has been studied in humans since about 1975 as a treatment for psoriasis, cancer, and arthritis. It is also used by veterinarians to treat animals for arthritis. These different applications are derived from different properties of chondroitin. In the early 2000s, chondroitin has been used in conjunction with another dietary supplement called glucosamine to help treat joint **pain** caused by **osteoarthritis** and to help stop cartilage loss in patients with the disease.

Psoriasis

Studies have been conducted in the United States since 1990 to determine whether chondroitin from shark cartilage can speed wound healing in psoriasis and related conditions. No conclusive findings had been reported as of early 2008.

Cancer

The use of cartilage products to treat cancer is based on the popular belief that cartilaginous fish (sharks, skates, and rays) do not get cancer. Samples of these fish indicate, however, that they do in fact develop a variety of tumors, mostly soft-tissue cancers.

There are several theories as to why chondroitin and cartilage products containing it may be useful in treating cancer. One theory is that they slow or stop the formation of blood vessels that supply the cancer with oxygen and nutrients. Another theory is that chondroitin blocks the formation of certain enzymes that tumors produce to invade surrounding tissue. The third theory suggests that cartilage products stimulate the immune system. As of late 1999 the National Cancer Institute was conducting a multicenter clinical trial of liquid cartilage extract.

Osteoarthritis

An estimated 20 million Americans suffer from joint-related disease and about 15 million of these people suffer from osteoarthritis. Chondroitin is best known to the general public as a remedy for osteoarthritis, which is a form of arthritis caused by wearing

away or degeneration of the cartilage that cushions the ends of bones. In particular, it is thought that the drying of cartilage tissue in osteoarthritis is a major cause of tissue destruction. Chondroitin sulfate is given together with glucosamine, a building block of GAGs. The chondroitin helps to attract and hold fluid within cartilage tissue. Tissue fluid keeps cartilage healthy in two ways: it acts as a shock absorber within the joints of the body, thus protecting cartilage from being worn away by the bones; and it carries nutrients to the cartilage. The cartilage in the joints of the human body has no blood vessels, so it must receive its nutrients from tissue fluid.

In addition to drawing tissue fluid into cartilage, chondroitin is also thought to protect cartilage in the following ways:

- Acting as an anti-inflammatory activity.
- Inhibiting the activity of enzymes that break down cartilage.
- Counteracting enzymes that interfere with the transport of nutrients to the cartilage.
- Stimulating the production of proteoglycans, glycosaminoglycans, and collagen. These complex molecules are the building blocks of new cartilage.

Results of several European studies demonstrated that oral as well as injected chondroitin helps to increase joint mobility and reduce pain. A landmark 2001 study showed that combining glucosamine and chondroitin worked better than either worked alone in preventing cartilage damage and that both supplements worked well when taken orally. However, the Glucosamine/chondroitin Arthritis Intervention Trial reported in 2006 that glucosamine and chondroitin did not effectively reduce pain in people with osteoarthritis of the knee. Nearly 1,600 patients with osteoarthritis of the knee took part in the study conducted at 16 centers across the United States. Not all of the news from the study was discouraging, however. Among study participants who reported moderate to severe pain, as opposed to mild pain, 79% reported significant pain reduction when taking glucosamine and chondroitin supplementation. The study lasted for six months and a majority of the participants said they suffered from mild osteoarthritis of the knee. An ancillary study lasting an additional 18 months was conducted to see if glucosamine and chondroitin can reduce overall osteoarthritis pain if taken longer than six months. The results were expected in early 2008.

Preparations

The normal (non-vegetarian) adult diet already contains a certain amount of chondroitin; it is found in most animal tissues, particularly the gristle attached to bones.

Chondroitin sulfate can be taken orally as a pill, powder, or liquid. It can also be administered by injection. Oral preparations of chondroitin, alone or in combination with glucosamine, are available in the United States as over-the-counter (OTC) dietary supplements. They can be purchased over the Internet, at pharmacies, health food stores, and some grocery stores. Because they are marketed as dietary supplements, they do not require testing or approval by the Food and Drug Administration (FDA). As of 2008, there were no specific quality control requirements or clear manufacturing process (GMP) standards for these products.

There are, as of 2008, no standard patterns for administration of chondroitin as a treatment for psoriasis or cancer. When chondroitin is used together with glucosamine as a treatment for osteoarthritis, the daily dosage is based on the patient's weight. Suggested dosages are: 1,000 mg glucosamine + 800 mg chondroitin sulfate for 120 lbs or less; 1,500 mg glucosamine + 1,200 mg chondroitin sulfate for 120-200 lbs; and 2,000 mg glucosamine + 1,600 mg chondroitin sulfate for heavier than 200 lbs.

For maximum effectiveness, patients are advised to divide their daily dosage into 2 to 4 doses and take them throughout the day with food. They are also encouraged to take **vitamin C** and **manganese** supplements since these substances appear to increase the effectiveness of the chondroitin.

Precautions

There are two important precautions regarding chondroitin as a dietary supplement for osteoarthritis. The first is to avoid self-diagnosing and self-medicating. Persons with stiff or sore joints should consult a medical doctor (M.D.), osteopathic physician (D.O.), or naturopathic physician (N.D.) for an evaluation to determine if the problem is indeed osteoarthritis. **Gout**, **bursitis**, **rheumatoid arthritis**, **fibromyalgia**, and several other conditions can also cause pain and stiffness in the joints. These conditions are not helped by chondroitin. The supplement has not been studied in children or in pregnant or nursing women.

The second precaution is to purchase chondroitin made by a reliable manufacturer. The lack of government regulation of products sold as dietary supplements means that that there is no guarantee that claims made on the label are accurate. Thus a product that claims to contain chondroitin may not actually contain it, may not contain the amount that it claims

KEY TERMS

Cartilage—A firm, whitish elastic connective tissue found in humans and other animals. Chondroitin is an important component of cartilage.

Glucosamine—A complex carbohydrate composed of glucose and an amino acid called glutamine. It is an important building block of cartilage and is often taken together with chondroitin as a treatment for osteoarthritis.

Osteoarthritis—A degenerative disease of the joints, characterized by pain and stiffness related to loss or destruction of the cartilage in the joints.

Psoriasis—An inflammatory disorder of the skin characterized by scaly patches. Chondroitin may be a possible treatment for psoriasis.

to, or may not be free from contamination and safe to use. One helpful guideline is to look for the words *pharmaceutical grade* on the label. This standard ensures that the product is pure and that it contains the stated amount of chondroitin.

With regard to potential overdose problems, chondroitin sulfate appears to be nontoxic. One six-year study of people taking doses of 1.5-10 grams per day of chondroitin found no toxicity in the subjects.

Side effects

Chondroitin sulfate has no known significant side effects. Some people report having a bad taste in the mouth or mild **nausea** when taking large doses of oral chondroitin on an empty stomach. **Gas** or bloating has also been reported. A few people who have received chondroitin by injection report a mild soreness around the injection site.

Interactions

Chondroitin sulfate is not known to cause any significant interactions with other medications. A paper presented at the 1999 annual meeting of the American Academy of Orthopaedic Surgeons, however, stated that because the chondroitin sulfate molecule is similar to the heparin molecule, its use together with anticoagulant drugs is questionable.

Resources

BOOKS

Elkins, Rita. *Glucosamine and Chondroitin*. Orem, UT: Woodland, 2007.

Foltz Gray, Dorothy. *The Arthritis Foundation's Guide to Good Living with Osteoarthritis,* 2nd ed. Atlanta, GA: Arthritis Foundation, 2006.

PERIODICALS

Band, Philip A. "Several Meta Analyses Have Analyzed Its Safety and Effectiveness Chondroitin Sulfate for Osteoarthritis: Interpreting Divergent Evidence." *Jour nal of Musculoskeletal Medicine* (October 1, 2007): 422.

Child, Rob. "Joint Pain and Supplements: The Recent GAIT Study on Glucosamine and Chondroitin for Chronic Joint Disease Sent Shock Waves Throughout the Industry, But What Did It Really Say about Their Effectiveness?" *Functional Foods and Neutraceuticals* (May 2006): 40.

Fox, Beth Anne, et al. "Glucosamine and Chondroitin for Osteoarthritis." *American Family Physician* (April 1, 2006): 1245.

Marshall, Peter D., and Elizabeth M. Tweed. "Do Glucos amine and Chondroitin Worsen Blood Sugar Control in Diabetes?" *Journal of Family Practice* (December 2006): 1091(3).

Schardt, David. "Arthritis Fighters: Do Glucosamine and Chondroitin Work?" *Nutrition Action Healthletter* (September 2006): 9(3).

Walsh, Nancy. "Chondroitin Reduces Joint Space Narrow ing in OA." *Internal Medicine News* (January 1, 2007): 24.

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http:// www.homeopathyusa.org.

Arthritis Foundation, PO Box 7669, Atlanta, GA, 30357, (800) 283 7800, http://www.arthritis.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Med icine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, http://www. ods.od.nih.gov.

Rebecca Frey
Ken R. Wells

Christian Science healing

Definition

Christian Science healing is a method of spiritual healing based on the beliefs of the Christian Science, or Church of Christ, Scientist, church. The church's

KEY TERMS

Psychosomatic illness—A condition in which unresolved emotional distress manifests as physical symptoms of illness.

healing practices are based on the divine healing work of Jesus. Adherents hold that the material world is a false reality and that health is a condition of mind, God, and truth. Thus, Christian scientists believe that ill health can be cured by spiritual education, understanding of the truth, and **prayer**.

Origins

Mary Baker Eddy, the founder of Christian Science, was born Mary Baker in Bow, New Hampshire, on July 16, 1821, into a family of strict Christian practice and Puritan values. Baker was ill for much of her childhood and early adult life. She explored medical therapies popular in her time, including **homeopathy**, and found no relief for her chronic illness.

Between 1862 and 1865 Baker was a patient of a charismatic healer named Phineas Parkhurst Quimby. A former hypnotist, Quimby developed a philosophy of mental healing based on the belief that he had rediscovered the secret of Jesus' ability to heal the sick. It is thought that Quimby's ideas may have influenced Baker in the development of her philosophy of Christian Science healing, although she herself denied it.

In 1866, the same year that Phineas Quimby died, Baker suffered a spinal injury from a fall. This proved to be a critical turning point in her life. Seeking strength in the Bible to sustain her through the injury, Baker read a New Testament account of Jesus' healing. While she was reading, she experienced a sudden insight into how Jesus' healing was accomplished, and as she read, she found herself suddenly released from her injury and restored to health.

This transformation inspired Baker to spend the next three years studying the scriptures and codifying her discoveries about healing. She called her discoveries Christian Science, and believed that she had found the one and only "truth." She put her principles into action by healing others, including those who had illnesses declared by medical practitioners of the day to be incurable.

As Baker studied the Bible and practiced healing, she came to believe that she could teach others to heal following God's truth as she had discovered it. In 1870 in Lynn, Massachusetts, she taught her first class and began to develop a following that shared her belief in Christian Science healing.

In 1875, while still living in Lynn, Mary Baker published *Science and Health*, later renamed *Science and Health with Key to the Scriptures*. This book, revised by Baker Eddy over the next 35 years, is the fundamental document explaining the doctrine of Christian Science healing.

In 1877 Mary Baker married fellow Christian Scientist Asa Gilbert Eddy and by 1879 had established enough of a following to found the first Church of Christ, Scientist in Boston, Massachusetts. This church became her headquarters and is known as the Mother Church. The regulatory structure of the denomination was set forth in her book *The Manual of the Mother Church* published in 1895.

Throughout the late 1800s, Christian Science continued to attract converts. Most of these conversions were brought about by demonstrations of Christian Science healing. Eddy also established the Massachusetts Metaphysical College to teach Christian Science healing. It is estimated that by 1895 there were about 250 Christian Science congregations, mainly in New England.

Mary Baker Eddy died on December 3, 1910. At the time of her death, there were about 1,200 Christian Scientist congregations in the United States. By the 1930s the number had increased to about 2,400. The United States Bureau of the Census in 1936 estimated church membership in the United States at about 269,000. Meanwhile congregations were also being established overseas.

After World War II, the number of Christian Science congregations began to decline. Beginning in the 1980s the church had to deal with negative publicity from court cases alleging that the failure of Christian Science parents to seek conventional medical treatment for children who had illnesses considered treatable by mainstream medicine constituted child endangerment. Convictions, many of which were overturned on appeal, further hurt church membership. The number of Christian Scientist practitioners, as those people whom the Church of Christ, Scientist officially recognizes as spiritual healers are called, dropped from about 8,000 in 1960 to about 2,000 in 1998.

Today Mary Baker Eddy is recognized both as a mind-body healer and as a pioneer in the area of equality for women. In the Church of Christ, Scientist, men and women function equally as leaders and

healers, an idea that was revolutionary in Eddy's lifetime. In 1995 she was elected to the National Women's Hall of Fame in recognition of being the only American woman to found an internationally established religion.

In addition to its practices of spiritual healing, Christian Science is best known today for its publishing activities, spearheaded by the international newspaper the *Christian Science Monitor* founded by Eddy in 1908. Each congregation also provides a public Christian Science Reading Room where the public may read Christian Science literature and ponder spiritual matters.

Benefits

For believers, Christian Science healing brings both spiritual and physical well being to those who are ill. Its healing practices make no distinction among different types of illnesses. It uses no material methods or laying on of hands to restore people to health and can be practiced in almost any setting.

Description

To understand Christian Science healing one must also understand Christian Science theology, because the two are inextricably linked. On the first page of *Science and Health with Key to the Scriptures* Eddy writes, "The prayer that reforms the sinner and heals the sick is an absolute faith that all things are possible to God . . . and a spiritual understanding of Him, an unselfed love . . . Prayer, watching, and working, combined with self-immolation, are God's gracious means for accomplishing whatever has been successfully done for the Christianization and health of mankind."

Christian Science teaches that the ordinary physical world that we perceive is a misconception. Matter is not created by God, but appears because of man's limited perception. Jesus, Eddy explains, was able to heal the sick, the blind, and the lame, because he saw beyond their material form and saw the spirit essence of the person.

In writing on the human body in *Science and Health with Key to the Scriptures*, Eddy states, "To measure intellectual capacity by the size of the brain and strength by the **exercise** of muscle, is to subjugate intelligence, to make the mind mortal, and to place this so-called mind at the mercy of material organization and non-intelligent matter. Obedience to the so-called physical laws of health has not checked sickness. Diseases have multiplied since man-made material theories took the place of spiritual truth. You say that **indigestion**, **fatigue**, sleeplessness, cause distressed stomachs and aching heads. Then you consult your brain in order to remember what has hurt you, when your remedy lies in forgetting the whole thing; for matter has no sensation of its own and the human mind is all that can produce pain."

For believers, Christian Science healing is the triumph of mind over matter and the spiritual over the material world. Ill health is simply an illusion. Good health occurs when the mind achieves awareness of itself, which is synonymous with awareness of God. The goal of healing is not to remove physical suffering, but to lead the ill person to Christ and transform the consciousness into a more pure and spiritual state that knows God. Healing is seen as a measure of the depth of one's sincerity and belief.

Since health does not reside in the body, and is not controlled by physical laws, Christian Science healing cannot occur when a person is in a state of moral sinfulness or lack of belief. The basis of disease is fear, ignorance, or sin. Health is a spiritual fact to be demonstrated.

Christian Science teaches that all believers can be taught to heal. Those people officially sanctioned as healers by the Church of Christ, Scientist are called Christian Science practitioners. Practitioners may be either male or female. These people must pledge to devote themselves to the practice of healing full time. They may be paid by their patients for their work. In 2000 there were about 2,000 officially recognized Christian Science practitioners in the United States, and that number is declining.

Practitioners do not use any material props or even touch to heal their patients; only prayer is used. The practitioner approaches the patient with a clear conviction of the omnipotence of God and the firm belief that God is good and produces only good things. Practitioners who hold false beliefs, or error, even unwitting error, blended with the truth, have weak healing abilities and may be guilty of malpractice. If the healer realizes the truth, it will free his patient from symptoms of disease, discord, and disharmony and lead the patient to Christ. This is said to leave the patient feeling calm, refreshed, and healthy.

Many converts come to Christian Science through the demonstration of its power to heal. Traditionally, Wednesday night meetings are given over to healing testimony and witnessing of the healing power of God's truth.

Preparations

The purpose of Christian Science healing is not to free the body from disease, but to lead the patient to a

higher spiritual understanding of God. Patients are best served if they are receptive to Christian Science beliefs and practices prior to the start of a healing session.

Precautions

There are no reasons other than disbelief or spiritual unreadiness not to participate in Christian Science healing. However, patients that do this must understand that they may be exacerbating their health problems by denying themselves access to traditional medical care.

Side effects

No side effects are reported from practicing Christian Science healing. There is, as noted above, danger posed by replacing traditional medical care with Christian Science practices in the case of serious illness.

Research and general acceptance

Christian Science healing is seen by the traditional medical community as quackery, since it denies any relationship between the physical universe and illness. It rejects the concepts of germs, contagion, and healing through the application of drugs.

All "proof" of the effectiveness of Christian Science healing is anecdotal. Many physicians believe that in certain cases of psychosomatic illness Christian Science healing may indeed bring about improvement in symptoms, but in diseases with a clear physical origin, it is ineffective.

Training and certification

The Church of Christ, Scientist recognizes some of its healers as official practitioners whose full-time job is healing. About 2,000 were in practice in the United States in 2000.

Resources

BOOKS

Eddy, Mary Baker. *Science and Health with Key to the Scriptures*. Boston: Christian Science Publishing Company, 1875 (reprinted 1994).

PERIODICALS

Sheler, Jeffrey L. "Mrs. Eddys House." *U.S. News Online* February 16, 1998. http://www.usnews.com/usnews/issue980216/16eddy.htm.

ORGANIZATIONS

Church of Christ, Scientist. http://www.ChristianScience.org.

OTHER

The Mary Baker Eddy Library for the Betterment of Humanity. *http://www.marybakereddy.org:86/*.

Virtual Christian Science Reading Room. http://www.mtn.org.

Tish Davidson

Chromium

Description

Chromium is a mineral that is essential to humans. It is found naturally in a variety of foods, and supplements are available in capsules or tablets. Supplements are prepared using a number of formulas, including chromium (III), chromium aspartate, chromium chloride, chromium citrate, chromium nicotinate, chromium picolinate, GTF chromium, and trivalent chromium.

General use

Chromium supports the normal function of insulin, which is a hormone secreted by the pancreas. Insulin helps transport glucose from the bloodstream into liver, muscle, and fat cells. Once it is inside these cells, the sugar is metabolized into a source of energy. Insulin is also involved in regulating protein, fat, and catalytic enzyme processes. People with diabetes do not produce insulin (or produce very little) or their bodies cannot properly use the insulin that is produced. As a result, sugar builds up in the bloodstream, causing serious health effects. Numerous scientific studies have shown that chromium is useful in treating **insulin resistance** (metabolic syndrome) and diabetes. Diabetic **peripheral neuropathy**, a form of nerve damage that is a direct result of diabetes, is indirectly related to a lack of sufficient chromium.

Several studies have shown that chromium supplements may improve insulin sensitivity and lower blood glucose and elevated body fat. In February 2004, the University of Pennsylvania School of Medicine began a comprehensive study of chromium as a therapy for insulin resistance. This condition occurs when the body fails to respond properly to the insulin it already produces. People who are insulin resistant may have the ability to overcome this problem by producing more insulin. However, if the body cannot produce sufficient amounts of insulin, glucose levels in the bloodstream rise, and type 2 diabetes ultimately occurs. It is estimated that up to 80 million Americans have insulin resistance.

Adequate intake of chromium

Age	mcg/day
Children 0-6 mos.	0.2
Children 7-12 mos.	5.5
Children 1-3 yrs.	11
Children 4-8 yrs.	15
Boys 9-13 yrs.	25
Girls 9-13 yrs.	21
Boys 14-18 yrs.	35
Girls 14-18 yrs.	24
Men 19-50 yrs.	35
Women 19-50 yrs.	25
Men > 50 yrs.	30
Women > 50 yrs.	20
Pregnant women ≤ 18 yrs.	29
Breastfeeding women ≤ 18 yrs.	44
Pregnant women ≥ 19 yrs.	30
Breastfeeding women ≥ 19 yrs.	45

Foods that contain chromium	mcg
Broccoli, 1/2 cup	11
Grape juice, 1 cup	8
English muffin, whole wheat, 1	4
Garlic, dried, 1 tsp.	3
Potatoes, mashed, 1 cup	3
Basil, dried, 1 tbsp.	2
Beef cubes, 3 oz.	2
Orange juice, 1 cup	2
Turkey breast, 3 oz.	2
Whole wheat bread, 2 slices	2
Red wine, 5 oz.	1-13
Apple, unpeeled, 1 med.	1
Banana, 1 med.	1
Green beans, 1/2 cup	1

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

A study conducted by Isala Clinics and University Hospital Groningen in the Netherlands, released in 2003, showed that a daily dose of 1,000 micrograms of chromium significantly reduced blood sugar levels in people with poorly controlled type 2 diabetes who use insulin. However, a subsequent study, conducted by Louisiana State University in Baton Rouge, indicated that the response to chromium supplementation by diabetics may be in part genetically mediated, so not all patients respond to chromium.

Chromium has also been used as an effective treatment for polycystic ovarian syndrome (PCOS), a hormonal condition affecting about two million American women. The condition can lead to **infertility** if untreated and is associated with insulin resistance and type 2 diabetes. A study released in 2003 by the State University of New York at Stony Brook showed that insulin sensitivity increased an average of 35 percent after two months of daily treatment with 1,000 micrograms (mcg) of chromium.

Through its involvement with insulin function, chromium plays an indirect role in lowering blood lipids. Studies suggest, but as of the early 2000s had not proven, that chromium supplementation can reduce the risk of cardiovascular (heart) disease in men and may decrease total **cholesterol** and triglyceride levels. However, several studies contradict these claims. Studies in animals suggest chromium supplementation may reduce **hypertension** (high blood pressure). Lipid reduction is secondary to insulin regulation and control; therefore, persons whose insulin is well regulated and controlled may not achieve reduced **heart disease** risk by taking chromium supplements.

Chromium supplements in high doses—1,000 mcg or more a day—are sometimes used in weight loss and muscle development. However, a number of scientific studies have found that chromium supplements are not effective in these areas. In fact, precautions warn against chromium doses exceeding 1,000 mcg per day. Weight loss and muscle development are secondary to insulin regulation and control. Therefore, when insulin is well regulated and controlled, chromium may not impact weight loss or muscle development. A controlled study by the United States Department of Agriculture in which 83 women were fed a controlled diet but received either chromium piccolinate, piccolinic acid, or placebo, failed to demonstrate any changes in body composition between the three groups.

Preparations

A complete lack of chromium is rare, and the United States Food and Drug Administration (FDA) has not established recommended dietary allowances (RDA) for the mineral. However, national statistics on the prevalence of diabetes, heart disease, and **obesity** suggest that chromium deficiencies may be common. Chromium occurs naturally in meat, seafood, dairy products, eggs, whole grains, black pepper, and almonds. According to *The PDR Family Guide to Natural Medicines and Healing Therapies*, the usual chromium supplement dose for children ages seven and older and adults is 50–200 mcg a day in tablets or capsules. For persons with type 2 diabetes who are not taking insulin, doses from 200–1,000 mcg daily may be taken. However, persons should only take doses at these levels after consulting with a physician. Chromium should not be taken in doses exceeding

KEY TERMS

Calcium carbonate—A salt that is used in many antacids.

Diabetes—Several metabolic disorders in which the body produces insufficient insulin.

Glucose—Sugar.

Hypertension—High blood pressure, which, if untreated, can lead to heart disease and stroke.

Insomnia—The inability to sleep.

Insulin—A hormone that helps liver, muscle, and fat cells take up sugars, starches, and other foods for conversion into energy the body needs.

Insulin resistance—Also called metabolic syndrome, a condition in which the body fails to properly respond to the insulin it produces.

Polycystic ovarian syndrome—PCOS, a hormonal condition in women that if untreated can lead to the inability to have children.

1,000 mcg a day. The cost of a bottle of 100 tablets or capsules (200 mcg) of chromium piccolinate ranges from $5 to $10 for a generic or house brand preparation.

Precautions

Doses of 200–1,000 mcg of chromium should be taken only after consultation with a physician. Pregnant or breastfeeding women are advised to consult a physician before taking chromium supplements. Chromium should not be taken in doses exceeding 1,000 mcg a day. Increased dietary sugar may be associated with higher urinary excretion of chromium.

Side effects

Several studies have noted occasional reports of irregular heartbeats with chromium use. Infrequently, chromium has been reported to cause such sleep pattern changes as **insomnia** and increased dream activity. Irritability has also been reported. In rare instances, persons may be allergic to a chromium formula. The symptoms of an allergic reaction include difficulty breathing, chest **pain**, **hives**, rash, and itchy or swollen skin. If any of these symptoms occur, the patient is advised to seek medical care immediately. High doses may also cause liver and kidney damage or gastric irritation, although these side effects are rare.

Interactions

Persons who are taking antacids are advised to talk with a physician before taking chromium supplements. Studies in animals suggest that antacids, especially those containing **calcium** carbonate, may reduce the body's ability to absorb chromium. Studies have shown that chromium may enhance the effectiveness of drugs taken by people who have type 2 diabetes or insulin resistance. These drugs include glimepiride, glipizide, glyburide, insulin, and metformin. Individuals taking these drugs should discuss chromium supplementation with a physician because improved insulin function may necessitate medication dosage changes.

Resources

PERIODICALS

Lukaski H. C., W. A. Siders, and J. G. Penland. "Chromium Picolinate Supplementation in Women: Effects On Body Weight, Composition, and Iron Status." *Nutrition* (March 23, 2007): 187 95.

Ken R. Wells
Sam Uretsky, PharmD

Chronic fatigue syndrome

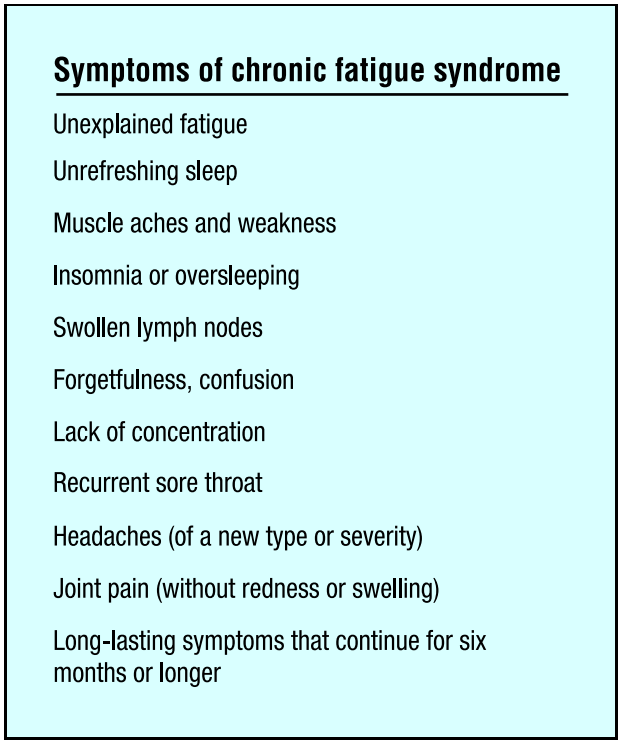
Definition

Chronic **fatigue** syndrome (CFS) is a condition that causes extreme tiredness. People with CFS have debilitating fatigue that lasts for six months or longer. CFS does not have a known cause, but it appears to result from a combination of factors.

Description

CFS is the most common name for this disorder, but it also has been called chronic fatigue and immune disorder syndrome (CFIDS), myalgic encephalomyelitis, low natural killer cell disease, post-viral fatigue syndrome, Epstein-Barr disease, and yuppie flu. Reports of a CFS-like syndrome called neurasthenia date back to 1869. Subsequently, people with similar symptoms were said to have **fibromyalgia** because one of the main symptoms is myalgia, or muscle **pain**. Because of the similarity of symptoms, fibromyalgia and CFS are considered to be overlapping syndromes.

In the early to mid-1980s, there were outbreaks of CFS in some areas of the United States. Although many CFS patients had high levels of antibodies to



(Illustration by Corey Light. Cengage Learning, Gale)

the Epstein-Barr virus (EBV), which causes **mononucleosis**, many healthy people also had high levels of EBV antibodies. Scientists also found high levels of other viral antibodies in the blood of CFS patients. These findings led many scientists to believe that a virus or combination of viruses may trigger CFS.

Although CFS can affect people of any gender, age, race, or socioeconomic group, most patients diagnosed with CFS are 25 to 45 years old and female. Estimates of how many people are afflicted with CFS vary due to the similarity of CFS symptoms to other diseases and the difficulty in identifying it. The Centers for Disease Control and Prevention (CDC) has estimated that about one million people in the United States have CFS.

Causes and symptoms

There is no single known cause for CFS. Studies have pointed to several different conditions that might be responsible. These include:

- viral infections
- chemical toxins
- allergies
- immune abnormalities
- psychological disorders

Many doctors and researchers think that CFS may not be a single illness but a group of symptoms caused by several conditions. One theory is that a microorganism, such as a virus, or a chemical injures the body and damages the immune system, allowing dormant viruses to become active. When these viruses start growing again, the immune system may overreact and produce chemicals called cytokines that can cause flu-like symptoms. Immune abnormalities have been found in studies of people with CFS, although the same abnormalities are also found in people with **allergies**, autoimmune diseases, **cancer**, and other disorders.

In late 2001, a panel of experts concluded that a virus or bacteria acting on the immune system may indeed cause CFS; the experts agreed that the published evidence was substantial enough to prove that the immune system is involved in CFS. They stated that **infections** may also play a role in the condition, but they did not identify one single agent common to all patients with CFS. Further research was recommended. The panel also concluded that reproductive hormones may play a role in the condition, which might explain the higher prevalence among women. In spite of these findings, the CDC continued as of 2008 to report that the causes for CFS had yet to be identified.

The role of psychological problems in CFS is controversial. Because many people with CFS are diagnosed with **depression** and other psychiatric disorders, some experts concluded that the symptoms of CFS are psychological. However, many people with CFS do not have psychological disorders before getting the illness. Many doctors think that patients become depressed or anxious because of the effects of the symptoms of their CFS. One study concluded that depression was the result of CFS, not its cause.

People with CFS have severe fatigue that keeps them from performing their normal daily activities. They may have sleep disturbances that keep them from getting enough rest or they may sleep too much. When they **exercise** or try to be active in spite of their fatigue, people with CFS experience debilitating exhaustion that can confine them to bed for days.

Other symptoms of CFS include:

- muscle pain (myalgia)
- joint pain (arthralgia)
- sore throat
- headache
- fever and chills
- tender lymph nodes
- trouble concentrating
- memory loss

One study at Johns Hopkins University found an abnormality in blood pressure regulation in 22 of 23 patients with CFS. This abnormality, called neurally mediated hypotension, causes a sudden drop in blood pressure when a person has been standing, exercising, or exposed to heat for a while. When this response occurs, patients feel lightheaded and may faint. They often are exhausted for hours to days after one of these episodes. When treated with salt and medications to stabilize blood pressure, many patients in the study had marked improvements in their CFS symptoms. Follow-up research on this topic was limited as of 2008.

Diagnosis

CFS is diagnosed by evaluating symptoms and eliminating other causes of fatigue. Doctors carefully question patients about their symptoms, any other illnesses they have had, and medications they are taking. They also conduct a physical examination, neurological examination, and laboratory tests to identify any underlying disorders or other diseases that cause fatigue. In the United States, many doctors use the CDC case definition to determine if a patient has CFS.

To be diagnosed with CFS, patients must meet both of the following criteria:

- Unexplained continuing or recurring chronic fatigue for at least six months that is of new or definite onset, is not the result of ongoing exertion, and is not mainly relieved by rest, and causes occupational, educational, social, or personal activities to be greatly reduced.
- Four or more of the following symptoms: loss of short-term memory or ability to concentrate; sore throat; tender lymph nodes; muscle pain; multijoint pain without swelling or redness; headaches of a new type, pattern, or severity; nonrefreshing sleep; and post-exertional malaise (a vague feeling of discomfort or tiredness following exercise or other physical or mental activity) lasting more than 24 hours. These symptoms must have continued or recurred during six or more consecutive months of illness and must not have started before the fatigue began.

Treatment

There is no specific cure for CFS, but many treatments are available to help relieve the symptoms. Treatments usually are individualized to each person's particular symptoms and needs. The first treatment recommended is a combination of rest, exercise, and a balanced diet. Prioritizing activities, avoiding overexertion, and resting when needed are key to maintaining existing energy reserves. Treatment of airborne allergies is an important facet in the treatment of CFS.

Diet

Drinking eight to 12 glasses of water daily helps fight fatigue. Food allergies can worsen CFS symptoms. Common food allergies include milk, wheat, eggs, citrus, alcohol, chocolate, and coffee. An extract from shiitake mushrooms (LEM) has been shown in Japanese studies to benefit CFS patients.

Ayurvedic medicine stresses that energy is derived from food. Energy-producing foods include: fresh fruits and vegetables, whole milk, wheat and wheat products, rice, barley, honey, olive oil, mung bean soup, raisins, dates, figs, almonds, clarified butter, and yogurt. Foods that deplete energy include: red meat, aged or fermented foods, onions, **garlic**, mushrooms, potatoes, sugar, alcohol, and coffee.

Ayurvedic medicine dictates that complete digestion of food is necessary to obtain the maximum amount of energy. The following measures can be taken to optimize digestion:

- eating in a quiet place
- following established mealtimes
- sitting while eating
- not eating while upset
- eating only until satiety (fullness)
- avoiding ice cold foods and drinks
- not talking while chewing
- eating at a moderate pace

Supplements

The following supplements have been used in treating CFS.

- Vitamin B_{12} deficiency causes fatigue, muscle aches, confusion, poor memory, and arm and leg numbness.
- Magnesium helps muscles to relax. Persons with kidney or heart disease should not take magnesium.
- Iron treats anemia, which can cause tiredness and improve mental clarity. This supplement should be taken only if a physician has diagnosed an iron deficiency.
- Manganese works with the supplements above to relieve CFS symptoms.
- Copper deficiency can cause inflammation. Maximum recommended daily dose for adults is 2 to 3

mg. Pregnant women should consult a physician before taking copper supplements.

- Zinc may boost the immune system.
- Coenzyme Q10 can increase immune health.
- NADH may lead to improvement in energy, cognitive ability, sleep patterns, headaches, and depression.
- Carnitine helps to better utilize fats for energy production. The recommended daily dose is 500 to 3,000 mg.
- Alpha lipoic acid enhances energy.
- 5-HTP helps to regulate sleep patterns.
- DHEA deficiency causes fatigue in females and low sex drive in males. It should be taken only under the direction of a physician.

Fluoride is a potentially toxic substance and should be avoided.

Other treatment options

Chinese medicine, including **acupuncture** and **cupping**, works to bring the body back into balance. Herbals that may help relieve symptoms of CFS include:

- astragalus (huang chi) to increase energy
- licorice (gan t'sao) for stomach and liver problems, adrenal exhaustion, and blood pressure warming
- ginger root for digestion
- turmeric for inflammation
- linden flowers for the heart
- echinacea for stimulating the immune system but taken for no more than 10 to 14 consecutive days
- Siberian ginseng (*Eleutherococcus senticosus*) to increase resistance to stress and boost the immune system
- ginkgo to increase blood flow through the brain but also thin the blood
- evening primrose (*Oenothera biennis*) oil to increase energy levels
- borage seed (*Borago officinales*) oil
- quercetin
- flaxseed oil

Some CFS patients use **fasting** only under the direction of a healthcare practitioner. **Probiotics** using *Lactobacillus acidophilus* can restore a normal balance to the intestinal bacterial.

Chiropractic adjustments may help relieve symptoms of CFS. **Osteopathy** helps some CFS patients. Osteopaths developed the craniosacral method that involves manipulation of the bones and membrane attachments of the head. Naturopathic physicians routinely treat CFS patients. Components of Ayurvedic treatment of CFS include **stress** reduction, daily oil massage, improving sleep, improving bowel function, and light to moderate exercise.

Psychological and spiritual counseling are important facets of CFS treatment. Cognitive behavior therapy helps patients manage activity levels to reduce fatigue. The type of **psychotherapy** employed is less important than having good rapport with the therapist.

For patients who are employed, modifications to the workplace are essential to maintaining good health. Vocational rehabilitation counseling allows the patient to maximize his or her work potential.

Exercise and physical therapy can have a dramatic impact on the health of CFS patients. Stretching exercises and moderate aerobic activity are beneficial. Too much exercise can worsen fatigue and other CFS symptoms. Exercise programs such as physical therapy, **t'ai chi**, **yoga**, chi kung, the **Alexander technique**, and muscle balance and function development (MBF) are all options.

There is a lengthy list of therapies used by CFS patients to find relief. These are not cures, and many have not been tested in clinical studies. CFS patients may find relief, if only temporarily, in the following:

- sessions with a spiritual healer
- yoga
- reflexology
- hydrotherapy
- sound therapy
- chocolate therapy
- magnet therapy
- meditation
- visualization
- spiritual cleansing rituals
- biofeedback

A 2002 report noted a study that showed some results from **homeopathy** for CFS patients. For the study, patients underwent six months of treatment chosen by one of four homeopaths and changed as needed. Sixty-five percent of patients reported some improvement, feeling fitter, more rested, and less tired. A 2002 review of research on the effectiveness of homeopathy in the treatment of CFS found mixed results, however. Authors of the review pointed out that the studies they examined were often poorly done, producing results that were difficult to interpret.

KEY TERMS

Alexander technique—A movement therapy that identifies and changes poor physical habits that may cause fatigue. The body is put into a state of relaxation and balance through the use of simple movements.

Arthralgia—Joint pain.

Depression—A psychological condition, with feelings of sadness, sleep disturbance, fatigue, and inability to concentrate.

Epstein-Barr virus (EBV)—A virus in the herpes family that causes mononucleosis.

Fibromyalgia—A disorder closely related to CFS. Symptoms include pain, tenderness, and muscle stiffness.

Lymphocytes—White blood cells that are involved in the immune system.

Mononucleosis—A flu-like illness caused by the Epstein-Barr virus.

Muscle balance and function development (MBF)—A movement therapy that strives to realign body posture through a series of exercises.

Myalgia—Muscle pain.

Natural killer (NK) cell—A lymphocyte that acts as a primary immune defense against infection.

Neurally mediated hypotension—A rapid fall in blood pressure that causes dizziness, blurred vision, and fainting, and is often followed by prolonged fatigue.

Neurasthenia—Nervous exhaustion. A disorder with symptoms of irritability and weakness, commonly diagnosed in the late 1800s.

Allopathic treatment

Drugs

Nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen and naproxen, may be used to relieve pain and reduce **fever**. Another medication that is prescribed to relieve pain and **muscle spasms** is cyclobenzaprine (Flexeril).

Many doctors prescribe low dosages of antidepressants for their sedative effects and to relieve symptoms of depression. Antianxiety drugs, such as benzodiazepines or buspirone, may be prescribed for excessive **anxiety** that has lasted for at least six months.

Other medications that have been tested or were being tested as of 2008 for treatment of CFS are:

- Fludrocortisone (Florinef), a synthetic steroid, has helped some CFS patients who have neurally mediated hypotension.
- Beta-adrenergic blocking drugs, including atenolol (Tenoretic, Tenormin) and propranolol (Inderal), are sometimes prescribed for neurally mediated hypotension.
- Gamma globulin, which contains human antibodies, has been used experimentally to boost immune function in CFS patients.
- Ampligen, a drug which stimulates the immune system and has antiviral activity, improved mental function in some CFS patients.

Expected results

The course of CFS varies widely for different people. Some get progressively worse over time, while others gradually improve. Some persons have periods of illness that alternate with periods of good health. While some people with CFS do fully regain their health, those who do not find relief from symptoms and adapt to the demands of the disorder by carefully following a treatment plan combining adequate rest, **nutrition**, exercise, and other therapies.

Prevention

Because the cause of CFS is not known, there are no recommendations for preventing the disorder.

Resources

BOOKS

Bassman, Lynette. *The Feel Good Guide to Fibromyalgia & Chronic Fatigue Syndrome: A Comprehensive Resource for Recovery*. Oakland, CA: New Harbinger Publications, 2007.

Bested, Alison C., and Alan C. Logan. *Hope and Help for Chronic Fatigue Syndrome and Fibromyalgia*. Nashville, TN: Cumberland House, 2006.

Bharadvaj, Daivati. *Natural Treatments for Chronic Fatigue Syndrome*. Westport, CT: Praeger Press, 2007.

Skelly, Mari, and Helen Walker. *Alternative Treatments for Fibromyalgia and Chronic Fatigue Syndrome,* 2nd ed. Alameda, CA: Hunter House, 2006.

PERIODICALS

Burley, Lucy, Diane L. Cox, and Leslie J. Findley. "Severe Chronic Fatigue Syndrome (CFS/ME): Recovery Is Possible." *British Journal of Occupational Therapy* (August 2007): 339 344.

Gray, Suzanne Elizabeth, and D. R. Rutter. "Illness Representations in Young People with Chronic Fatigue Syndrome Title." *Psychology and Health* (February 2007): 159 174.

Jason, Leonard A., Karine Corradi, and Susan Torres Harding. "Toward an Empirical Case Definition of CFS." *Journal of Social Service Research* (December 2007): 43 54.

Matthews, Rosalind, and Anthony Komaroff. "Changes in Functional Status in Chronic Fatigue Syndrome Over a Decade: Do Age and Gender Matter?" *Journal of Chronic Fatigue Syndrome* (May 2007): 33 42.

Smith, Cath, and Leigh Hale. "The Effects of Non phar macological Interventions on Fatigue in Four Chronic Illness Conditions: A Critical Review." *Physical Ther apy Review* (December 2007): 324 334.

Staud, Roland. "Treatment of Fibromyalgia and Its Symp toms." *Expert Opinion on Pharmacotherpy* (August 2007): 1629 1642.

OTHER

"Chronic Fatigue Syndrome." Centers for Disease Control and Prevention. [cited March 19, 2008]. http://www.cdc.gov/cfs/.

ORGANIZATIONS

CFIDS Association. Community Health Services, PO Box 220398, Charlotte, NC, 28222 0398, (704) 362 2343, http://www.cfids.org/.

National CFIDS Foundation, 103 Aletha Rd., Needham, MA, 02192, (781) 449 3535, http://www.ncf net.org/index.html.

National Chronic Fatigue Syndrome and Fibromyalgia Association, PO Box 18426, Kansas City, MO, 64133, (913) 321 2278, http://www.ncfsfa.org/.

Belinda Rowland
Teresa G. Odle
David Edward Newton, Ed.D.

Chronic pain *see* **Pain**

Chrysanthemum flower

Description

The chrysanthemum, of which there are many varieties, has been known by a host of common names throughout history. Some of the chrysanthemum's common names include pellitory, **feverfew**, ox-eye daisy, and sunflower among others. It is a flower that has grown in gardens all around the world as far back as any records can tell, and seems to have been employed everywhere at some time or another as a cure for a host of complaints.

Chinese chrysanthemum flower

The Latin name for Chinese chrysanthemum flower is *Chrysanthemum indicum*, and it is known in China as Ju Jua. The plant grows profusely throughout China and is both an emblem to the Chinese and greatly prized for its medicinal properties, particularly as an anti-inflammatory.

The best flowers for medicinal purposes are considered to be the yellow fragrant ones. They are classified as being acrid, bitter, and slightly cold in the Chinese pharmacopoeia. Traditionally, they are harvested in the fall, when they are in full bloom.

The herb is taken internally for headaches, **dizziness**, and hearing disorders. It is also useful as a treatment for high blood pressure (**hypertension**). It is used as a compress or eye wash for inflammation of the eyes and for other eye problems such as dry-eye, blurred vision, and spots before the eyes. The herb can also be taken internally as an infusion and is combined with **honeysuckle** for the treatment of colds, the flu, and infected sores. It has a calming effect and can also be good for **stress**. Chrysanthemum is known to be a powerful antiseptic and antibiotic. However, people suffering from **diarrhea** should take it with caution.

Dalmatian pellitory

There are many plants that go by the name of pellitory, but this one is also a member of the chrysanthemum family. Its botanical name is *Chrysanthemum cinerariafolium*, and it originated in Dalmatia. It is cultivated in both Dalmatia and California. Previously, Persian pellitory was the most widely used, but it has been superceded by Dalmatian pellitory in practical use due to ease of cultivation.

Feverfew

The variety of chrysanthemum that is perhaps the most useful as far as herbal medicine is concerned, is feverfew, or *Chrysanthemum parthenium*. Most species of chrysanthemum are tall daisy-like flowers and feverfew is no exception. It is commonly found in England and the United States, and is similar to **chamomile** in appearance. Feverfew differs from chamomile in that it is larger and the white petals are arranged around a flat yellow center, as opposed to conical, which is the case with chamomile. The hairy stems of feverfew grow to about 2 ft (61 cm) tall, and the leaves are serrated and downy. Feverfew is also known by other common names, including featherfew, featherfoil, flirtwort, bachelor's buttons, and wild chamomile.

KEY TERMS

Decoction—These are made to be taken immediately (not for storage): simmer herbs for half an hour and strain, in the same way as for syrup, but sweetened to taste only.

Fluid extract—Made by simmering a plant and reducing the water until the mixture is thickened. This resulting liquid has a concentrated form of the active constituents of a plant. Alcohol, glycerin, or tincture of Benzoin may be added as a preservative.

Infusion—This is made in the same way that one would make tea, i.e., adding boiling water to the dried herb and allowing it to stand for a while.

Syrup—An herbal preparation that is made generally by boiling the herb with water, adding sugar as a preservative, and boiling until it thickens. The syrup may be stored.

Tincture—Herbs that are not soluble in water are bruised and steeped in alcohol. This liquid is placed in a bottle and may be filtered with coffee filters. The same procedure may be followed using vinegar instead of alcohol.

Ox-eye daisy

The botanical name for the ox-eye daisy is *Chrysanthemum leucanthemum*. It is a common sight in Britain, where it is known as dun daisy or maudlinwort. It is common throughout Europe, Russia, and Asia. Again, it is a yellow-centered flower with white petals. It grows to a height of 1-2 ft (30-61 cm) and has small leaves with serrated edges.

Sunflower

The sunflower is a native of Mexico and Peru, and is commonly grown in the United States and many other areas of the world. This is the largest of the chrysanthemum family, and there are several subspecies, varying slightly in size. Generally it grows to a height of 3-12 ft (91-366 cm), with flower heads that may measure more than 6 in (15 cm) across. The leaves are serrated and rough.

General use

The Flower Essence Society (FES) of California has a chrysanthemum essence that they recommend for those seeking spiritual growth.

According to many herbalists, species of chrysanthemum have many medicinal uses.

Dalmatian pellitory

This is commonly known as insect powder due to its insecticide properties. An advantage is that the powder is completely harmless to humans, and so does not have side effects (as is the case with all chemical insecticides), and can be used as a lotion and applied to the skin as an insect repellant. If the flowers are burned, the smoke that is given off can be valuable in exterminating insects.

Feverfew

Feverfew is chiefly regarded for its ability to treat fevers, reduce swelling, and for its analgesic properties; it is an excellent cure for a **headache** or any other **pain**. It is also used to promote menstrual flow, as an antidote to **depression** and nervous disorders, and as a general tonic. In addition, feverfew can be used to help in cases of difficult breathing, particularly associated with **asthma**, and chest **infections**. It has been used as a treatment for insect **bites** and even rat bites. In the past, feverfew was recommended for planting around dwellings because of its antiseptic properties. It wards off disease and prevents pests and diseases from attacking other plants. Similar to Dalmatian pellitory, it also has a repellant effect on insects. It can be used externally for flatulence and **colic**.

Ox-eye daisy

The herb has a soothing effect and is recommended for night sweats, especially those associated with **tuberculosis**. It is recommended for use in cases of **whooping cough**, asthma, and nervous tension. Generally its action can be compared to that of chamomile. It is useful for relieving chronic coughs and bronchial catarrh. Externally, it can be used as a lotion for **wounds**, **bruises**, and some skin conditions. In this regard, some herbalists recommend it as an ointment for treating swellings and it is also known for treating **gout**. Others recommend it for treating **jaundice** and also as a diuretic and tonic.

Sunflower

The sunflower is chiefly grown for its seeds which produce an oil, similar to olive oil, that is both cheap to produce and a valuable source of fatty acids. In many parts of the world, the sunflower provides much needed **nutrition** in poorer areas. The seeds can be used medicinally for treatment of bronchial complaints. A tincture of the seed has been used successfully in areas such as Russia, Turkey, and Persia for fevers (even **malaria**), where it has been found to be

free of the complications sometimes associated with the use of quinine.

Preparations

Dalmatian pellitory

PARTS USED: FLOWERS. The chief use for Dalmatian pellitory is as an insecticide, or as an ointment to ward off insects. It is mainly dried and ground to a powder to this end.

Feverfew

PARTS USED: BARK, FLOWERS, AND LEAVES. For coughs it is generally made up into a syrup (decoction) with sugar or honey. The herb, when bruised and added to a little oil, can be used as an external application for flatulence and colic. For swellings and bites, it can be made up into a tincture, two teaspoonfuls of which should be mixed with half a pint of cold water and applied. As an infusion, made with boiling water and allowed to cool, feverfew will soothe pain of any kind, (muscular, nerve-related, rheumatic or intestinal). Chewing the leaves (one to four per day) can be effective in the case of migraine. It has also been used in this way to treat cases of **worms**.

Ox-eye daisy

PARTS USED: FLOWERS, ROOTS, AND LEAVES. This plant is mainly employed as an infusion. But in the case of tuberculosis, 15–60 drops of the fluid-extract should be taken in water. The flowers boiled with the leaves and stalks and sweetened with a little honey are a treatment for chest complaints.

Sunflower

PARTS USED: SEEDS AND LEAVES. Chest complaints: boil two ounces of the seeds in one quart of water until the water is reduced to 12 oz. Strain and add six ounces of Holland gin and six ounces of sugar. The dose is one to two teaspoonfuls of the mixture three times a day. Roasting the seeds and making an infusion is recommended for whooping **cough**.

Precautions

As with any herbal preparations, all of the above should be used with care and preferably under the supervision of an herbal practitioner.

Side effects

Feverfew should not be used for migraine that is a result of some kind of deficiency in the body (whether nutritional or otherwise). It is possible that feverfew may cause **dermatitis**, allergic reactions, or sores in the mouth in susceptible individuals. It should not be taken by pregnant women due to its ability to stimulate the uterus.

Interactions

Feverfew has been known to interfere with blood-clotting ability, and so a doctor should be consulted before it is used in conjunction with anticoagulants.

Resources

BOOKS

Buchman, Dian Dincin. *Herbal Medicine*. London: Tiger Books International, 1993.

Culpeper, Nicholas. *Culpeper's Complete Herbal*. London: Bloomsbury Books, 1992.

Grieve, Mrs. M. *A Modern Herbal*. London: Tiger Books International, 1992.

ORGANIZATIONS

Flower Essence Society. P.O. Box 459, Nevada City, CA 95959. (800) 736 9222. mail@flowersociety.org. http://www.flowersociety.org.

Patricia Skinner

Chymotrypsin

Description

Chymotrypsin is a digestive enzyme that breaks down proteins (i.e., it is a proteolytic enzyme; it can also be referred to as a protease). It is naturally produced by the pancreas in the human body. However, it can also be taken as an enzyme supplement to improve health and digestion and aid in the treatment of various diseases.

The pancreas, which produces chymotrypsin and other **digestive enzymes**, is a digestive organ in the abdomen that is located just below the stomach. Its primary job is to produce enzymes required for the digestion and absorption of food. Each day the pancreas secrets about 1.5 qt (1.4 L) of pancreatic juice, consisting of enzymes, water, and electrolytes (primarily bicarbonate) into the small intestine. The enzymes are secreted in an inactive form (as proenzymes) so that they will not digest the pancreas. The pancreas secretes an inhibitor to ensure that the enzymes are not activated too early. When the pancreatic juice reaches the small intestine, the enzymes become activated. The small intestine is not digested because it contains a protective mucous lining. However, self-digestion

can occur if the pancreatic duct becomes blocked or if the pancreas is damaged. The proenzymes can overwhelm the inhibitor, causing the enzymes to become active while in the pancreas. This condition, called acute **pancreatitis**, can result in a lifetime of pancreatic insufficiency.

The enzymes secreted by the pancreas break down food by breaking the chemical bonds that hold food molecules together. Enzymes secreted include **lipase**, which, along with bile, digests fat; amylases, which break down starch molecules into smaller sugars; and protease, which breaks protein molecules into dipeptides and some single **amino acids**. In addition to chymotrypsin, other protease enzymes secreted by the pancreas include trypsin and carboxypeptidase.

Chymotrypsin, as a hydrolase type of enzyme (which means it adds a water molecule during the breakdown process) acts by catalyzing the hydrolysis of peptide bonds of proteins in the small intestine. It is selective for peptide bonds with aromatic or large hydrophobic side chains on the carboxyl side of this bond. Chymotrypsin also catalyzes the hydrolysis of ester bonds. Chymotrypsin does not digest blood proteins because of protective factors in the blood that block the enzyme.

KEY TERMS

Ecchymosis (plural, ecchymoses)—The medical term for a bruise, or skin discoloration caused by blood seeping from broken capillaries under the skin.

Enzyme—Any of a group of complex proteins that originate in living cells and help to break down organic compounds into simpler molecules.

Enzyme therapy—An alternative approach to the treatment of digestive disorders and other illnesses related to nutritional problems. Enzyme therapy emphasizes the use of animal- or plant-derived digestive enzymes as dietary supplements.

Pancreas—A tongue-shaped gland located in the upper abdomen behind the stomach. It secretes digestive enzymes into the small intestine, and glucagon and insulin into the bloodstream.

Scleroderma—A chronic autoimmune disorder in which connective tissue anywhere in the body becomes hard and rigid.

General use

Generally, the primary uses of chymotrypsin are as a digestive aid and as an anti-inflammatory agent. The presence and amount of chymotrypsin in a person's stool is sometimes measured for diagnostic purposes as a test of pancreatic function. Testing for fecal chymotrypsin is noninvasive, unlike some other tests of pancreatic function.

Chymotrypsin, along with the other pancreatic enzymes, is most often used in the treatment of pancreatic insufficiency. Pancreatic insufficiency is characterized by impaired digestion, malabsorption and passing of undigested food into the stool, nutrient deficiencies, **gas**, and abdominal bloating and discomfort. Pancreatic deficiency also occurs in persons with cystic fibrosis, a rare inherited disorder. It may also occur in those with chronic pancreatitis, as well as in the elderly. Other conditions that could result in chymotrypsin deficiency include physical injuries, chemotherapy, and chronic **stress**.

Starch and fat digestion can be accomplished without the help of pancreatic enzymes; however, the protease enzymes (i.e., chymotrypsin, trypsin, and carboxypeptidase) are required for proper protein digestion. Incomplete digestion of proteins may result in the development of **allergies** and the formation of toxic substances produced by putrefaction, the breakdown of protein materials by bacteria. Protease enzymes and other intestinal secretions are also required to keep the small intestine free from parasites such as bacteria, yeast, protozoa, and intestinal **worms**. A laboratory analysis of a stool sample along with physical symptoms are used to assess pancreatic function.

As an anti-inflammatory agent, the chymotrypsin and the other protease enzymes prevent tissue damage during inflammation and the formation of fibrin clots. Protease enzymes participate in the breakdown of fibrin in a process called fibrinolysis. Fibrin causes a wall to form around an area of inflammation, resulting in the blockage of blood and lymph vessels, which leads to swelling. Fibrin can also cause the development of **blood clots**. In autoimmune diseases, the protease enzymes aid in the breakdown of immune complexes, which are antibodies produced by the immune system associated with the compounds they bind to (antigens). High levels of immune complexes in the blood are associated with autoimmune diseases.

Specifically, chymotrypsin is used to:

- Aid in digestion.
- Treat inflammation and reduce swelling (i.e., soft tissue injuries, acute traumatic injuries, sprains, contusions, hematomas, ecchymoses, infections, edema

of the eyelids and genitalia, muscle cramps, and sports injuries).
- Treat arthritis and such other autoimmune diseases as lupus, scleroderma, and multiple sclerosis.
- Treat ulcerations and abscesses.
- Liquefy mucus secretions.
- Treat enterozoic worms and other parasites in the digestive tract.
- Treat cancer (a controversial use that requires much more scientific study, though chymotrypsin may be helpful in alleviating effects of radiation treatment or chemotherapy).
- Treat shingles and acne.
- Decrease effects of sun damage and age spots.

Preparations

Chymotrypsin is produced from fresh hog, beef, or oxen pancreas. It can be taken orally, topically, or by injection (by injection only by a physician in severe life-threatening situations), but is commonly taken orally in tablet form. As a tablet, it may be uncoated, microencapsulated, or enterically coated (to prevent digestion in the stomach so that the enzyme will be released in the small intestine). Other forms include coated granules, powder, capsules, and liquids. Creams and ointments are used to break down proteins and debride dead tissue resulting from **burns**, **wounds**, and abscesses. The enzyme preparation should be stored in a tight container with a moisture-proof liner in a dry, cool place. An opened container stored properly should maintain enzyme activity for about two to three months.

Usually chymotrypsin is included in a combination with other enzymes. A typical formulation may include: chymotrypsin (0.5–1 mg), **bromelain** (a plant protease) (25–45 mg), pancreatin (a mixture of many pancreatic enzymes) (100 mg), papain (a plant protease similar in action to chymotrypsin) (25–60 mg), and trypsin (a pancreatic protease) (24 mg). Formulations may also include vitamins, herbs, phytochemicals, and other nutrients to enhance the activity of the enzyme supplement.

Enzyme activity should be considered when a supplement is selected. Activity is usually indicated in units; however there is no one standard for enzyme activity level. Recognized guidelines for measuring enzyme activity include Food Chemicals Codex (FCC), United States Pharmacopoeia (USP), Federation Internationale du Pharmaceutiques (FIP), British Pharmacopoeia (BP), and Japanese Pharmacopoeia (JP). For example, the United States Pharmacopoeia has set a strict definition for level of activity that must be reported in a enzyme supplement. A 1X chymotrypsin product must contain not less than 25 USP units for chymotrypsin activity. A preparation of higher potency is given a whole number multiple indicating its strength. For example, a full-strength undiluted extract that is 10 times stronger than the USP standard would be referred to as 10X USP. A consumer can compare enzyme activity levels among enzyme products within a single guideline system, but unfortunately the information is not interchangeable among guideline systems.

The dose required will vary on the quantity (amount in mg) and the quality (activity level) of the enzyme in the preparation, which is usually tablet form. The dose will also depend on the condition being treated. In most cases, for oral ingestion and for topical application, the directions on the bottle or tube label can be followed. Enterically coated tablets should be swallowed and not chewed or ground up. Tablets should also be taken with at least 8 oz of water to help activate the enzyme. Chymotrypsin taken to enhance digestion is usually taken just before, during, or just after meals, or before going to bed at night. With proper dosages, improvements in digestion should be noted within a few hours.

For inflammatory or chronic conditions, chymotrypsin should be taken on an empty stomach, either one hour before meals or at least two hours after meals. When chymotrypsin is taken for an inflammatory condition, some improvement may be noted within three to seven days. Those with chronic conditions such as arthritis may require one to three months or more to notice a change in conditions.

Precautions

Chymotrypsin is generally well tolerated and not associated with any significant side effects. However, since a safe dose has not been established, it should only be used when there is apparent need.

People who should not use **enzyme therapy** include those with hereditary clotting disorders such as hemophilia, those suffering from coagulation disturbances, those who are just about to or have undergone surgery, those on anticoagulant therapy, anyone suffering from protein allergies, and pregnant women or those breast-feeding. Since there is not much known about the effects of enzyme therapy on children, it would be prudent to avoid giving enzyme supplements to children.

When protective mechanisms against self-digestion in the body break down, chymotrypsin should not be

used. For example, if a patient has stomach ulcers, chymotrypsin therapy should be discontinued.

Side effects

There do not appear to be any long-term side effects from chymotrypsin therapy if precautions for its use are followed. Studies have shown that at recommended doses, enzymes cannot be detected in blood analysis after 24–48 hours. Temporary side effects that may occur (but that should disappear when therapy is discontinued or dosage is reduced) include changes in the color, consistency, and odor of the stool. Some individuals may experience gastrointestinal disturbances, such as flatulence, a feeling of fullness, **diarrhea**, **constipation**, or **nausea**. With high doses, minor allergic reactions such as reddening of the skin may occur.

Interactions

Chymotrypsin is most often used in combination with other enzymes to enhance its treatment potential. In addition, a well-balanced diet or the use of vitamin and mineral supplements are recommended to stimulate chymotrypsin activity.

Some types of seeds, including jojoba and wild soja seeds, have been found to contain proteins that inhibit the activity of chymotrypsin. These proteins can be inactivated by boiling the seeds.

Chymotrypsin should not be used together with acetylcysteine, a drug used to thin mucus in the lungs. It should also not be used together with anticoagulant (blood thinning) drugs, as it increases their effects. Chloramphenicol, a medication used to treat eye **infections**, may counteract the effectiveness of chymotrypsin ophthalmic solutions.

Resources

BOOKS

Bland, Jeffrey. *Digestive Enzymes*. New Canaan, CT: Keats Publishing, Inc., 1993.

Cichoke, Anthony J. *The Complete Book of Enzyme Ther apy*. Garden City Park, NY: Avery Publishing Group, 1999.

PERIODICALS

Deshimaru, M., R. Hanamoto, C. Kusano, et al. "Purifica tion and Characterization of Proteinase Inhibitors from Wild Soja (Glycine Soja) Seeds." *Bioscience, Biotech nology, and Biochemistry* 66 (September 2002): 1897 1903.

Fujino, H., T. Aoki, and H. Watabe. "A Highly Sensitive Assay for Proteases Using Staphylococcal Protein Fused with Enhanced Green Fluorescent Protein." *Bioscience, Biotechnology, and Biochemistry* 66 (July 2002): 1601 1604.

Shrestha, M. K., I. Peri, P. Smirnoff, et al. "Jojoba Seed Meal Proteins Associated with Proteolytic and Protease Inhibitory Activities." *Journal of Agricultural and Food Chemistry* 50 (September 25, 2002): 5670 5675.

Zintl, A., C. Westbrook, H. E. Skerrett, et al. "Chymotryp sin and Neuraminidase Treatment Inhibits Host Cell Invasion by *Babesia divergens* (Phylum Apicomplexa)." *Parasitology* 125 (July 2002): 45 50.

ORGANIZATIONS

American Dietetic Association (ADA). 216 West Jackson Blvd., Suite 800, Chicago, IL 60606. (312) 899 0040. http://www.eatright.org.

Digestive Disease National Coalition (DDNC). 711 Second Street NE, Suite 200, Washington, DC 20002. (202) 544 7497. http://www.ddnc.org.

National Digestive Diseases Information Clearinghouse, National Institute of Diabetes and Digestive and Kidney Disease, and National Institutes of Health. 2 Information Way, Bethesda, MD 20892 3570. (310) 654 3810.

Judith Sims
Rebecca J. Frey, PhD

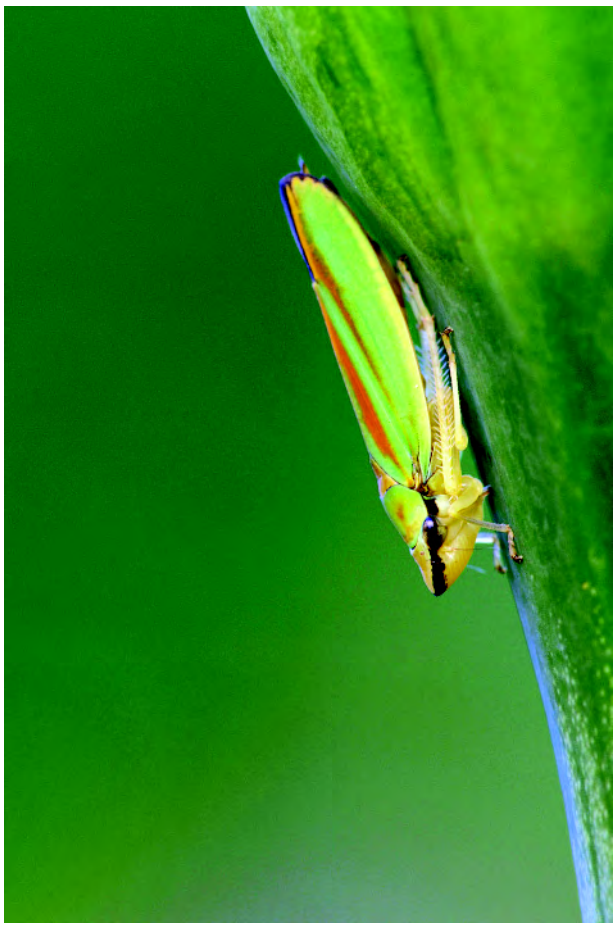
Cicada

Description

Cicada is an animal-derived substance used in **traditional Chinese medicine** (TCM). It is extracted from or prepared by grinding the empty shell shed every seven years by the cicada, (*Cryptotympana atrata* or *Cryptotympana pustulata*), which is a winged insect that makes a distinctive chirping sound and belongs to the Cicadidae family.

Cicadas are commonly found in mainland China, Taiwan, and Japan. They had religious significance in ancient China and symbolized reincarnation or immortality, as the Chinese compared the cicada's periodic molting of its shell with a person's leaving the physical body behind at the time of death. Bronze vessels as old as 1500 B.C. ornamented with cicadas have been found in Chinese tombs, along with white pottery and jewelry featuring cicada designs. During the Han dynasty (202 B.C. to A.D. 220), the Chinese carved small cicadas out of precious jade and placed them in the mouths of the dead.

The pharmaceutical name of the substance made from this insect is *Periostracum cicadae*, or *chan tui* in Chinese. It is prepared from the exuvium, or cast-off



Cicada is an animal-derived substance used in traditional Chinese medicine extracted from or prepared by grinding the empty shell shed every seven years by the cicada, shown here. *(© Arco Images / Alamy)*

shell of the nymph form of the insect. The empty shell is shiny, translucent, and yellow-brown in color. As it would appear in a living cicada, the shell has three portions: head (with two eyes), chest (with wings and a crossed gap), and abdomen (with three pairs of feet).

General use

The medicinal uses of cicada include treatment of **fever** and associated seizures; skin **rashes**; and such eye disorders as **conjunctivitis**, **cataracts**, and blurred vision.

Due to its antipyretic effect, cicada-containing preparations are often used to treat high fevers, such as those associated with the **common cold** or **influenza**. Western news media reported in April 2003 that the Chinese were using combinations of cicada and silkworm droppings to treat the fever associated with SARS. In addition to reducing fever, cicada is also used in TCM to treat other symptoms of colds and flu, including **laryngitis**, **headache**, restless sleep, or nightmares.

Cicada is said to be effective in relieving itchy rashes and **eczema**. Its special use is for the treatment of rashes or skin eruptions that occur in the early stages of **measles** or chicken pox. According to traditional Chinese medicine, the sooner the rashes appear, the shorter and less severe these diseases will be. Therefore, a Chinese herbalist may suggest cicada preparations to hasten the eruption of the rash.

Cicada is said to prevent or reduce **muscle spasms** by reducing the tension of the striated muscles. It may also delay transmission of nerve signals at the neuromuscular junction, thereby reducing muscle spasms. Its actions may be similar to those of Western barbiturates, sedatives, and anticonvulsants (antiseizure medications).

Cicada has also been used in TCM to treat eye diseases associated with wind and heat, including blurred vision and conjunctivitis (inflammation of the membrane that lines the eyelids). It is usually mixed with chrysanthemum flowers (*Chrysanthemum morifolium*, or *ju hua* in Chinese) when used to treat cataracts.

Preparations

The usual dosage of cicada when taken alone is 3–9 grams per day. As of 2004, whole cicadas cost about 10 cents per gram when purchased in bulk from suppliers of Chinese medicinal herbs. Cicada may be prepared as a decoction, which means that the insect

KEY TERMS

Anticonvulsant—A medication given to prevent or treat seizures.

Antipyretic—A medication or preparation given to bring down fever. Cicada is thought to have antipyretic properties.

Decoction—A medicine or herbal preparation prepared by boiling. Cicada is usually taken in the form of a decoction.

Exuvium—A cast-off shell of an insect or crustacean. Cicada in traditional Chinese medicine is made from the molted shell of a cicada.

Febrile—Characteristic of fever.

Qi—The Chinese term for life force or vital energy. It is sometimes spelled *chi* or *ki*.

shells are boiled down to a concentrated broth or tea to be taken internally. Other forms of cicada preparations include ground powder and water and alcohol extracts.

Precautions

A general precaution when using herbs or other alternative medicines is to purchase them only from reputable sources. In the case of traditional Chinese remedies, this precaution is particularly important because many of them are imported from countries without strict production or labeling standards. In the case of cicada, the United States Food and Drug Administration (FDA) reported in June 2003 that a shipment described as "Cicada Molting Herbal Food Supplement" from Taiwan was refused entry into the United States and considered dangerous. In this instance, the FDA defined "dangerous" in these terms: "The article appears to be dangerous to health when used in the dosage or manner, or with the frequency or duration, prescribed, recommended, or suggested in the labeling thereof."

Practitioners of TCM state that pregnant women should not use cicada because of the risk of miscarriage.

Side effects

No side effects from cicada preparations have been reported in the United States as of early 2008.

Interactions

As of 2008, cicada decoctions have not been reported to interact with any Western prescription medications.

Resources

BOOKS

Bensky, Dan, and Andrew Gamble. *Chinese Herbal Medicine: Materia Medica*. rev. ed. Seattle: Eastland Press, 1993.

Kang Ying, Wong, and Martha Dahlen. "Cicada." In *Streetwise Guide to Chinese Herbal Medicine*. San Francisco: China Bks. & Periodicals, Inc., 1996.

Molony, David. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: The Philip Lief Group, 1998.

Reid, Daniel P. *Chinese Herbal Medicine*. Boston: Shambhala, 1993.

Williams, Tom. *The Complete Illustrated Guide to Chinese Medicine: A Comprehensive System for Health and Fitness*. Boston: Element Books, Inc., 1996.

PERIODICALS

Hsieh, M.T., W.H. Peng, F.T. Yeh, et al. "Studies of the Anticonvulsive, Sedative and Hypothermic effects of Periostracum Cicadae Extracts." *Journal of Ethnopharmacology* 35 (January 1991): 83 90.

Riegel, Garland. "Cicada in Chinese Folklore." *Cultural Entomology Digest* 3 (November 1994). http://www.insects.org/ced3/cicada_chfolk.html.

ORGANIZATIONS

American Foundation of Traditional Chinese Medicine. 505 Beach Street, San Francisco, CA 94133. (415) 776 0502.

American Herbal Products Association. 8484 Georgia Ave., Suite 370, Silver Spring, MD 20910. (301) 588 1174. http://www.ahpa.org.

Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov.

National Center for Complementary and Alternative Medicine. NCCAM Clearinghouse, National Institute of Health, P.O. Box 8218, Silver Spring, MD 20907 8218. (888) 644 6226. Fax: (301) 495 4957. http://nccam.nih.gov.

National Oriental Medicine Accreditation Agency (NOMAA). 3445 Pacific Coast Highway, Suite 300, Torrance, CA 90505. (213) 820 2045. http://www.nomaaa.org.

OTHER

Food and Drug Administration (FDA). "Refusal Actions by FDA as Recorded in OASIS (Organization for the Advancement of Structured Information Standards), Taiwan, Republic of China." Rockville, MD: FDA, June 2003. http://www.fda.gov/ora/oasis/6/ora_oasis_c_tw.html.

Rebecca Frey

Cimicifuga racemosa see **Black cohosh**

Cinnamon bark

Description

Cinnamon bark (*Cinnamomum verum, C. zeylanicum, C. cassica*) is harvested from a variety of evergreen tree that is native to Sri Lanka, China, and India. The tree has thick, reddish brown bark, small yellow flowers, and its leathery leaves have a spicy smell. It grows to a height of approximately 20–60 ft (8–18 m) and is found primarily in tropical forests. Cinnamon bark belongs to the Lauraceae family. Related species are *Cinnamomum cassia* and *Cinnamomum saigonicum* (Saigon Cinnamon).

Cinnamon bark is cultivated in such tropical regions as the Philippines and the West Indies. It is not grown in the United States. Every two years the trees are cut to just above ground level. The bark is harvested from the new shoots, then dried. The outer bark is stripped away, leaving the inner bark, which is the main medicinal part of the herb.

The use of cinnamon dates back thousands of years to at least 2700 B.C. Chinese herbals from that time mentioned it as a treatment for **fever**, **diarrhea**, and menstrual problems. Indian Ayurvedic healers used it in a similar manner. Cinnamon was introduced around 500 B.C. to the Egyptians, who then added it to their embalming mixtures. Hebrews, Greeks, and Romans used it as a spice, perfume, and for **indigestion**. Moses is said to have included cinnamon in an anointing oil that he used. By the seventeenth century, cinnamon was considered a culinary spice by Europeans. American nineteenth-century physicians prescribed cinnamon as a treatment for stomach cramps, **nausea**, **vomiting**, diarrhea, **colic**, and uterine problems.

General use

Cinnamon bark is a common ingredient in many products such as toothpaste, mouthwash, perfume, soap, lipstick, chewing gum, **cough** syrup, nasal sprays, and cola drinks. A popular food flavoring, it is valued as one of the world's most important spices. It is also valuable in the treatment of various ailments. Modern herbalists prescribe cinnamon bark as a remedy for nausea, vomiting, diarrhea, and indigestion. Chinese herbalists recommend it for **asthma** brought on by cold, some digestive problems, backache, and menstrual problems.

The medicinal value of the herb is attributed to the oil extracted from the inner bark and leaves. The cinnamon bark harvested from the young branches is primarily used for culinary purposes. In fact, the cinnamon sticks commonly used in cooking are actually pieces of rolled outer bark.

The active ingredients of the bark have antibacterial, antiseptic, antiviral, antispasmodic, and antifungal properties. A study published in 2002 indicated that oil from cinnamon bark inhibits the production of listeriolysin, a protein released by *Listeria* bacteria that destroys healthy cells. Japanese research has shown cinnamaldehyde, one of the constituents of cinnamon bark, to be a sedative and analgesic. Eugenol, another component, contains pain-relieving qualities.

Cinnamon bark is helpful in strengthening and supporting a weak digestive system. Research indicates that cinnamon bark breaks down fats in the digestive system, making it a valuable digestive aid. It is used to treat nausea, vomiting, diarrhea, stomach ulcers, acid indigestion, **heartburn**, lack of appetite, and abdominal disorders.

A traditional stimulant in Chinese medicine, cinnamon bark has a warming effect on the body and is used for conditions caused by coldness. The twigs of cinnamon enhance circulation, especially to the fingers and toes.

Cinnamon bark contains antiseptic properties that help to prevent infection by killing decay-causing bacteria, fungi, and viruses. One German study showed that the use of cinnamon bark suppressed the cause of most urinary tract **infections** and the fungus responsible for vaginal yeast infections. It is also helpful in relieving **athlete's foot**.

Cinnamon bark is a frequent ingredient in toothpaste, mouthwash, and other oral hygiene products because it helps kill the bacteria that causes tooth decay and **gum disease**. Inflammations of the throat and pharynx may be relieved through its use.

Cinnamon bark is also known to control blood sugar levels in diabetics. United States Department of Agriculture (USDA) researchers found that cinnamon bark may reduce the amount of insulin required for glucose metabolism. A dose of 1/8 to 1/4 tsp of ground cinnamon per meal for diabetic patients may help to regulate their blood sugar levels. Several studies in the early 2000s produced mixed results on the effectiveness of cinnamon in treating type 1 and type 2 diabetes. All of the studies were on small groups of participants.

Cinnamon is believed to have strong antioxidant properties and to enhance the activity of insulin in diabetics. A 2003 study in Pakistan, published in the December 2003 issue of *Diabetes Care*, reported that daily consumption of 1, 3, or 6 grams of cinnamon significantly reduced blood glucose, LDL (bad) **cholesterol**, total cholesterol, and triglycerides in people with type 2 diabetes. A study by the University of Connecticut School of Pharmacy, published in the January 2008 issue of *Diabetes Care*, analyzed five previous studies and concluded that cinnamon did not significantly improve A1C, **fasting** blood glucose, or cholesterol levels in patients with type 1 or type 2 diabetes. A1C is a test that measures a diabetic's average blood sugar (glucose) levels over two to three months. The Connecticut study is contrasted by a 2007 European study that reported 3 grams of cinnamon extract taken daily lowered fasting blood sugar levels by 10% among diabetics after four months.

The spice has also garnered quite a reputation as an aphrodisiac. A study at the Smell and Taste Research Foundation in Chicago tested medical students' reactions to various aromas by attaching measurement devices to the students' penises. The smell of hot cinnamon buns generated the most blood flow of all the scents.

Cinnamon bark promotes **menstruation**. It has been used to treat menstrual **pain** and **infertility**. Women in India take it as a contraceptive after **childbirth**.

Other conditions in which cinnamon bark may be helpful include fevers and colds, coughs and **bronchitis**, infection and wound healing, some forms of asthma, and blood pressure reduction.

Cinnamon bark has been shown to be an effective natural snake repellent that is safer to use than synthetic pest management chemicals.

KEY TERMS

A1C—A test that measures a diabetic's average blood sugar (glucose) levels over two to three months.

Analgesic—A pain-relieving substance.

Antispasmodic—A substance that relieves muscle spasms or cramping.

Aphrodisiac—A drug or other substance that arouses or is thought to arouse sexual desire.

Essential oil—A concentrated oil that has been distilled from a plant.

Sedative—A drug or herb that has a calming and relaxing effect. Sedatives are used to aid sleep and ease pain and are often given as mild tranquilizers.

Preparations

Cinnamon bark is available in several forms from Chinese pharmacists, Asian grocery stores, and health food stores: fresh or dried bulk, pill, tincture, and as an essential oil.

Dosage

In Chinese medicine, cinnamon is usually taken in combination with other herbs. Below are some typical dosages for cinnamon alone.

- Tincture: Take up to 4 ml with water three times daily.
- Tea: Take 1 cup 2–3 times daily at mealtimes.
- Crushed: Take 1/2 tsp (2–4 g) daily.

Precautions

- Cinnamon bark may cause an allergic reaction in some individuals.
- Cinnamon bark is not recommended for pregnant or nursing women.
- Essential oil of cinnamon bark ought not to be taken internally unless under professional supervision. Internal ingestion may cause nausea, vomiting, and possible kidney damage.
- Essential oil of cinnamon bark is one of the most hazardous essential oils and should not be used on the skin. External application of the oil may cause redness and burning of skin.
- Cinnamon bark should not be given to children under two years of age.
- Cinnamon bark is considered toxic if taken in excess.
- Cinnamon bark should not be given to persons with inflammatory liver disease; in large quantities, it can irritate the liver.

Side effects

Mild side effects include stomach upset, sweating, and diarrhea. Large doses can cause changes in breathing, dilation of blood vessels, sleepiness, **depression**, or convulsions. Excessive use of cinnamon bark may cause red, tender gums; mouth ulcers; inflamed taste buds; and a severe burning sensation in the mouth.

Interactions

Some interactions with other medications have been reported. Cinnamon oil may cause skin irritation if applied to the skin together with **acne** medications that contain retinoic acid. Cinnamon bark has also been reported to intensify the effects of medications given to lower blood pressure. Persons taking cinnamon bark should discontinue its use two weeks before any surgery requiring general anesthesia because of the herb's tendency to lower blood pressure.

Resources

BOOKS

Teuscher, Eberhard. *Medicinal Spices*. Stuttgart, Germany: MedPharm Scientific Publishers, 2005.

PERIODICALS

Baker, William L., et al. "Effect of Cinnamon on Glucose Control and Lipid Parameters." *Diabetes Care* (Janu ary 2008): 41 43.

Blevins, Steve M., et al. "Effect of Cinnamon on Glucose and Lipid Levels in Non Insulin Dependent Type 2 Diabetes." *Diabetes Care* (September 2007): 2236 2237.

Chase, Celtina K., et al. "Cinnamon in Diabetes Mellitus." *American Journal of Health System Pharmacy* (May 15, 2007): 1033(3).

Gray, Lisa Waterman. "Cinnamon: Common Spice, One of a Kind Remedy: Can Cinnamon Ease Diabetic and Cardiovascular Symptoms as It Flavors Your Food? This Sweet Spice Has Been Used for Centuries for Its Health Enhancing Powers." *Better Nutrition* (April 2007): 18.

Sego, Sherril. "Cinnamon." *Clinical Advisor* (May 2007): 152(2).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www. homeopathyusa.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Med icine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Jennifer Wurges
Ken R. Wells

Cirrhosis

Definition

Cirrhosis refers to various types of chronic degenerative disease of the liver in which normal liver cells are damaged and then replaced by scar tissue.

Description

Cirrhosis changes the structure of the liver and the blood vessels that nourish it. The disease reduces the liver's ability to manufacture proteins, complex carbohydrates, fats, **cholesterol**, and to process hormones, nutrients, medications, and poisons. Cirrhosis worsens over time and can be life-threatening.

Cirrhosis is the seventh leading cause of disease-related death in the United States. It is the third most common cause of death in adults between the ages of 45 and 65. It is twice as common in men as in women. The disease occurs in more than half of all malnourished chronic alcoholics. Some authorities estimate that cirrhosis and related complications are responsible for the deaths of more than 40,000 people a year in the United States with direct healthcare costs of more than $1 billion. In Asia and Africa, however, most deaths from cirrhosis are due to chronic **hepatitis** B.

Types of cirrhosis

There are several typs of cirrhosis:

- Portal, or nutritional cirrhosis, the most common form of the disease in the United States. About 30 to 50% of all cases of cirrhosis are this type. Nine out of every 10 people who have nutritional cirrhosis have a history of alcoholism. Portal cirrhosis is also called Laënnec's cirrhosis.
- Biliary cirrhosis, caused by liver bile-duct diseases that impede bile flow. Bile is formed in the liver and carried via ducts to the intestines. Bile then helps digest fats in the intestines. Biliary cirrhosis can result in the scarring or blockage of these ducts. It accounts for 15 to 20% of all cases of cirrhosis.
- Postnecrotic cirrhosis. Caused by chronic infections, this form of the disease affects up to 40% of all patients who have cirrhosis.
- Pigment cirrhosis (hemochromatosis). Disorders such as the inability to metabolize iron and similar disorders may cause pigment cirrhosis, which accounts for 5 to 10% of all instances of the disease.

Causes and symptoms

Causes and risk factors

Long-term **alcoholism** is the primary cause of cirrhosis in the United States. Men and women respond differently to alcohol. Although most men can safely consume two to five drinks a day, one to two drinks a day can cause liver damage in women. Individual tolerance to alcohol varies, but people who drink more and drink more often have a higher risk of developing cirrhosis. In some people, one drink a day can eventually cause liver scarring.

Chronic liver **infections**, such as hepatitis B and particularly hepatitis C, are commonly linked to cirrhosis. People at high risk of contracting hepatitis B include those exposed to the virus through contact with blood and body fluids. This group includes healthcare workers and intravenous (IV) drug users. In the past, people have contracted hepatitis C through blood transfusions. As of 2003, cirrhosis resulting from chronic hepatitis has emerged as a

leading cause of death among HIV-positive patients; in Europe, about 30% of HIV-positive patients are coinfected with a hepatitis virus.

Liver injury, reactions to prescription medications, certain autoimmune disorders, exposure to toxic substances, and repeated episodes of heart failure with liver congestion can cause cirrhosis. A family history of diseases can genetically predispose a person to develop cirrhosis. These genetic problems include:

- a lack of a specific liver enzyme (alpha$_1$-antitrypsin deficiency)
- the absence of a milk-digesting enzyme (galactosemia)
- an inability to convert sugars to energy (glycogen storage disease)
- an absorption deficit in which excess iron is deposited in the liver, pancreas, heart, and other organs
- a disorder characterized by accumulations of copper in the liver, brain, kidneys, and corneas (Wilson's disease)

In the 2000s **obesity** was recognized as a risk factor in nonalcoholic hepatitis and cirrhosis. Some surgeons recommend that patients scheduled for weight-reduction surgery have a liver biopsy to evaluate the possibility of liver damage.

Symptoms

Symptoms of cirrhosis are usually caused by the loss of functioning liver cells or organ swelling due to scarring. The liver enlarges during the early stages of illness. Patients may experience one or more of the following symptoms:

- anemia
- bleeding gums
- constipation
- decreased interest in sex
- diarrhea
- dull abdominal pain
- extremely dry skin and intense itching
- fatigue
- fever
- fluid in the lungs
- hallucinations
- indigestion
- lethargy
- lightheadedness
- loss of appetite
- muscle weakness
- musty breath
- nausea
- painful nerve inflammation (neuritis)
- portal hypertension (This type of hypertension can be life threatening; it can cause veins to enlarge in the stomach and esophagus; the enlarged veins, called varices, can rupture and bleed massively.)
- redness of the palms of the hands
- slurred speech
- tremors
- dark yellow or brown urine and black or bloody stools
- vomiting
- weakness
- weight loss
- yellowish whites of the eyes and skin, indicating the development of jaundice

As the disease progresses, other symptoms usually appear:

- spleen enlarges and fluid collects in the abdomen (ascites) and legs (edema)
- spider-like blood vessels appear on the chest and shoulders and bruising becomes common
- men sometimes lose chest hair; their breasts may grow and their testicles may shrink
- women may have menstrual irregularities

If the liver loses its ability to remove toxins from the brain, the patient may have additional symptoms. The patient may become forgetful and unresponsive, neglect personal care, have trouble concentrating, and acquire new sleeping habits. These symptoms are related to ammonia intoxication and the failure of the liver to convert ammonia to urea. High protein intake in these patients can also lead to these symptoms.

Cirrhosis worsens over time and can become potentially life-threatening. This disease can cause:

- excessive bleeding (hemorrhage)
- impotence
- liver cancer
- coma due to accumulated ammonia and body wastes (liver failure)
- sepsis (blood poisoning)
- death

Diagnosis

A patient's medical history can reveal illnesses or a lifestyle likely to lead to cirrhosis. Liver changes can be seen during a physical examination. A doctor who suspects cirrhosis may order blood and urine tests to measure liver function. Because only a small number

of healthy cells are needed to carry out essential liver functions, test results may be normal even when cirrhosis is present.

In about 10% of all patients, the cause of cirrhosis cannot be determined. Many people who have cirrhosis do not have any symptoms (often called compensated cirrhosis). Their disease is detected during a routine physical examination or when tests for an unrelated medical problem are performed. This type of cirrhosis can also be detected when complications occur (decompensated cirrhosis).

Computed tomography scans (CT), ultrasound, and other imaging techniques can be used during diagnosis. They can help determine the size of the liver, indicate healthy and scarred areas of the organ, and detect **gallstones**. Cirrhosis is sometimes diagnosed during surgery or by examining the liver with a laparoscope. This viewing device is inserted into the patient's body through a tiny incision in the abdomen.

Liver biopsy is usually needed to confirm a diagnosis of cirrhosis. In this procedure, a tissue sample is removed from the liver and examined under a microscope in order to learn more about the organ's condition and to properly diagnose any liver disease.

A newer and less invasive test involves the measurement of hyaluronic acid in the patient's blood serum. As of 2008 the test was often used to monitor the progress of liver disease and to indicate when a liver biopsy may be necessary. The test for hyaluronic acid was not anticipated to completely replace liver biopsy in the diagnosis of cirrhosis.

Treatment

Before starting on any alternative treatment program, patients should consult their doctor regarding monitoring side effects and estimating effectiveness of treatment. Any nutritional changes should be discussed with the primary care provider. Alternative treatments that may be of help to cirrhotic patients include nutritional and juice therapy, Western herbal therapy, **traditional Chinese medicine**, and **homeopathy**.

Nutritional therapy

To support liver function and slow disease progression, a naturopath may recommend the following:

- Avoid liver toxins. Cirrhotic patients must completely avoid alcohol. Alcohol accelerates liver failure and hastens death in cirrhotic patients. In addition, even over-the-counter drugs, such as acetaminophen (Tylenol), should be avoided because they can be toxic in cirrhotic patients.
- Juice therapy helps the liver detoxify the body. Patients should mix one part of pure juice with one part of water before drinking.
- Eat smaller meals. To avoid overworking the liver, five or six smaller, lighter meals per day are recommended.
- Avoid fatty foods, especially those prepared with animal fats or hydrogenated oils and all processed foods. These types of foods put additional demands on the liver.
- Eat only meals containing lean proteins (containing no fats) and in limited amounts. Vegetable proteins, such as those found in legumes or tofu, and whole grains are preferred. High protein intake causes increases in ammonia levels in the blood, possibly resulting in mental confusion, and in severe cases, coma. However, individuals ought not to limit severely their protein intake, as this may cause protein deficiency and impair the healing process.
- Increase consumption of fruits and steamed vegetables. Fruits and vegetables are easy to digest, thus less work for the liver. In addition, they are good sources of vitamins, minerals, and antioxidants that help the liver detoxify and heal.
- Practice intermittent fasting.
- Take supplements that can improve digestion and help the liver heal and prevent further injury to the liver. These include pancreatic enzymes, milk thistle (*Silybum marianum*), lipotropic agents such as vitamin B_6, vitamin B_{12}, folic acid, choline, alpha lipoic acid, betaine, and methionine.

Many health practitioners have long recommended the use of **milk thistle** in treating cirrhosis and other liver diseases. The active component in milk thistle, silymarin, promotes liver protein synthesis. The National Center for Complementary and Alternative Medicine (NCCAM) selected milk thistle as one of the alternative treatments to study in more detail. As of 2008, the center had found mixed results from the studies it had reviewed and inconclusive evidence to support claims for milk thistle use. In 2008 NCCAM was supporting research on the possible health benefits of using milk thistle to treat liver diseases, **cancer**, and HIV disease.

Other therapies

Other types of therapies the patient may want to consider are naturopathic **hydrotherapy** and treatments that may improve immune function, including **stress** reduction, **guided imagery**, and massage.

Traditional Chinese medicine

Depending on a patient's specific condition, an expert Chinese herbalist may prescribe herbal remedies that may help improve liver function. Animal studies have shown that the following Chinese herbs may have protective effects on the liver:

- Propolis
- *Bupleurum chinense,* a frequently used herb for a variety of liver diseases
- *Phellodendron wilsonii*
- *Clementis chinensis*
- *Solanum incanum*
- *Ixeris chinensis*
- *Gardenia jasminoides*

Western herbal therapy

Patients should consult an experienced herbalist for specific herbal treatments.

Homeopathy

For homeopathic therapy, patients should consult a homeopathic physician who may prescribe specific remedies based on knowledge of the underlying cause.

Allopathic treatment

The goal of treatment is to cure or reduce the condition causing cirrhosis, prevent or delay disease progression, and prevent or treat complications.

Salt and fluid intake is often limited, and physical activity is encouraged. A diet high in calories and moderately high in protein can benefit some patients. Tube feedings or vitamin supplements may be prescribed if the liver continues to deteriorate. Patients must not consume alcohol.

Medication

Iron supplements, diuretics, and antibiotics may be used for **anemia**, fluid retention, and ammonia accumulation associated with cirrhosis. Vasoconstrictors are sometimes needed to stop internal bleeding and antiemetics may be prescribed to control **nausea**.

Laxatives help the body absorb toxins and accelerate their removal from the digestive tract. Beta-blockers may be prescribed to control cirrhosis-induced portal **hypertension**. Interferon medicines may be used by patients with chronic hepatitis B and hepatitis C to prevent post-hepatic cirrhosis.

Surgery

Medication that causes scarring can be injected directly into veins to control bleeding from varices in the stomach or esophagus. Varices may require a special surgical procedure called balloon tamponade ligation to stop the bleeding. Surgery may be required to repair disease-related throat damage. It is sometimes necessary to remove diseased portions of the spleen and other organs.

In the 2000s the incidence of liver cancer related to cirrhosis in the United States had increased 75% since the early 1990s. Partial surgical removal of the liver in patients with early-stage cancer of the liver appeared to be as successful as transplantation, in terms of the 5-year survival rate.

Liver transplants can benefit patients with advanced cirrhosis. However, the new liver will eventually become diseased unless the underlying cause of cirrhosis (such as alcoholism) is removed.

Supportive measures

A balanced diet promotes regeneration of healthy liver cells. Eating five or six small meals throughout the day should prevent the sick or bloated feeling patients with cirrhosis often have after eating. Alcohol and **caffeine**, which destroy liver cells, should be avoided, as should any other foods that upset the stomach. Patients with brain disease associated with cirrhosis should avoid excessive amounts of protein in the diet.

A patient can keep a food diary that describes what was eaten, when it was eaten, and how the patient felt afterwards. This diary can be useful in identifying foods that are hard to digest and in scheduling meals to coincide with the times the patient is most hungry.

Patients who have cirrhosis should weigh themselves every day and notify their doctor of a sudden gain of 5 lb (2 kg) or more within a one to two week period. A doctor should also be notified if symptoms of cirrhosis appear in anyone who has not been diagnosed with the disease. A doctor should be notified if a patient diagnosed with cirrhosis experiences the following:

- vomits blood
- passes black stools
- seems confused or unresponsive
- shows signs of infection (redness, swelling, tenderness, pain)

KEY TERMS

Compensated cirrhosis—Asymptomatic cirrhosis of the liver.

Edema—An excessive accumulation of fluid in body tissue.

Portal hypertension—A type of hypertension that can be life threatening; veins enlarge in the stomach and esophagus, and the enlarged veins, called varices, can rupture and bleed massively.

Sepsis—Blood poisoning.

Expected results

Cirrhosis-related liver damage cannot be reversed, but further damage can be prevented by patients who do the following:

- eat properly
- get enough rest
- do not consume alcohol
- remain free of infection

If the underlying cause of cirrhosis cannot be corrected or removed, scarring will continue. As scarring continues, the liver will fail, and the patient will probably die within five years. Patients who stop drinking after being diagnosed with cirrhosis can increase their likelihood of living more than a few years from 40% to 60-70%.

Prevention

Eliminating alcohol abuse could prevent 75 to 80% of all cases of cirrhosis.

Other preventive measures include:

- maintaining a healthy diet that includes whole foods and grains, vegetable, and fruits
- obtaining counseling or other treatment for alcoholism
- taking precautions (practicing safe sex, avoiding dirty needles) to prevent hepatitis
- getting immunizations against hepatitis if a person is in a high-risk group
- receiving appropriate medical treatment quickly when diagnosed with hepatitis B or hepatitis C
- having blood drawn at regular intervals to rid the body of excess iron from hemochromatosis
- using medicines (chelating agents) to rid the body of excess copper from Wilson's disease
- wearing protective clothing and following product directions when using toxic chemicals at work, at home, or in the garden

Resources

BOOKS

Chen, T. M., ed. *Liver Cirrhosis: New Research*. Hauppauge, NY: Nova Biomedical Books, 2005.

Dickerson, James L. *The First Year: Cirrhosis: An Essential Guide for the Newly Diagnosed*. New York: Marlowe & Company, 2006.

Dillon, Kevin H., ed. *Trends in Liver Cirrhosis Research*. Hauppauge, NY: Nova Biomedical Books, 2006.

The Official Patient's Sourcebook on Cirrhosis of the Liver: A Directory for the Internet Age. San Diego, CA: ICON Health Publications, 2005.

PERIODICALS

Fourcher, J., et al. "Diagnosis of Cirrhosis by Transient Elastography (FibroScan): A Prospective Study." *Gut* (March 2006): 403 408.

Klatsky, A. L., et al. "Coffee, Cirrhosis, and Transaminase Enzymes." *Archives of Internal Medicine* (May 2007): 980 982.

Méndez Sánchez, Nahum, et al. "Treating Nonalcoholic Fatty Liver Disease." *Liver International* (November 2007): 1157 1165.

Villa, Erica. "Role of Estrogen in Liver Cancer." *Women's Health* (January 2008): 41 50.

ORGANIZATIONS

American Liver Foundation, 75 Maiden Lane, Suite 603, New York, NY, 10038 4810, (800) GO LIVER (465 4837), http://www.liverfoundation.org.

United Network for Organ Sharing, PO Box 2484, Rich mond, VA, 23218, (888) 894 6361, http://www.unos.org.

Mai Tran
Teresa Norris
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Clap *see* **Gonorrhea**

Clinical ecology *see* **Environmental therapy**

Club moss

Definition

Club moss is the common name for the approximately 200 species of plants that make up the genus *Lycopodium*. This genus is a member of the order Lycopodiales, the only extant order of the class Lycopodiopsida in the plant kingdom. A second order, Drepanophycales, is now extinct, having flourished during the late Silurian to late Devonian periods (about 450 million to 350 million years ago). Members of the two orders are very different from each other,

Club moss. *(© tbkmedia.de / Alamy)*

with the earlier plants growing to the size of trees with stems several millimeters to centimeters in diameter. Their decayed remains have become constituents of coal deposits found throughout the world.

Description

Modern club mosses look like true mosses, but are structurally very different in that they are vascular plants. They tend to be epiphytic (that is, subsisting on other plants without causing them harm) or terrestrial with extended, creeping stems. They are lacking in flowers and have abundant masses of tiny scale- or needle-like leaves. They produce sexually in two stages, one of which occurs beneath ground, by the production and distribution of spores.

Uses

Yellow spores collected from certain species of club moss, especially *Lycopodium clavatum*, are used for a variety of purposes, including fingerprint identification, fireworks displays, and coatings for pills. Spore preparations are commonly known as **lycopodium** powder or vegetable **sulfur**. In **traditional Chinese medicine**, the spores have been dried and ground into a powder for use in the treatment of **fever** and inflammation. In this form the material is usually called Chinese club moss, or *qian ceng ta*.

Recent research has focused on one of the components of qian ceng ta, the alkaloid known as huperzine A. The substance has been found to be effective in treating the **dementia** associated with a number of neurological disorders, such as **Alzheimer's disease**. Huperzine A apparently interferes with the enzyme acetylcholinesterase, which breaks down the neurotransmitter acetylcholine in the central nervous system. Reduced levels of acetylcholine are thought to be related to the development of dementia. Other studies have suggested that huperzine A may be effective in treating the symptoms of myasthenia gravis and poisoning from a class of compounds known as the organophosphates. Results are preliminary, however, and experts point out that further studies are needed to confirm the therapeutic effects of huperzine A.

Some researchers suggest that the beneficial effects of club moss for the treatment of fever and **pain** may be the consequence of its dehydrative effects on cells. As cells lose water, they tend to contract, causing less pressure on nerves with which they may be associated. Definitive evidence for this hypothesis is, however, not yet available.

Side effects

The most serious side effect of using Chinese club moss is arrhythmia, irregular heart beat. With people who have a history of seizure, arrhythmia may increase the likelihood of additional, more serious seizures. Less serious side effects associated with use of the drug include:

- nausea
- diarrhea
- dizziness
- drooling
- excessive sweating
- blurred vision
- stomach cramps

Interactions

Chinese club moss and related drugs may interact with a variety of prescription drugs that inhibit the

KEY TERMS

Acetylcholine—A neurotransmitter that operates in the central nervous system.

Acetylcholinesterase—An enzyme that interferes with the function of acetylcholine.

Neurotransmitter—A chemical that carries a message between two neurons (nerve cells) in the body

Spore—A reproductive cell produced by simple organisms, such as fungi and ferns.

action of acetylcholine, so-called anticholinergic drugs, such as:

- atropine
- propantheline
- glycopyrrolate
- dicyclomine (Bentyl®)
- hyoscyamine sulfate (Levsin®)
- scopolamine (Transderm Scop®)

Resources

BOOKS

Fan, Warner J. W. *Manual of Chinese Herbal Medicine: Principles and Practice for Easy Reference*. Boston: Shambhala Publications, 2003.

PERIODICALS

Orhan, L., et al. "Appraisal of Anti inflammatory Potential of the Clubmoss, Lycopodium Clavatum." *Journal of Ethnopharmacology* (July 2006): 146 150.

Fu, X. C., et al. "Preparation and in Vivo Evaluation of Huperzine A loaded PLGA Microspheres." *Archives of Pharmaceutical Research* (September 2005): 1092 1096.

Gordon, R. K., et al. "Oral Administration of Pyridostig mine Bromide and Huperzine A Protects Human Whole Blood Cholinesterases from ex Vivo Exposure to Soman." *Chemico Biological Interactions* (December 2005): 239 246.

Liu, W. H., et al. "Preparation and in Vitro and in Vivo Release Studies of Huperzine A Loaded Microspheres for the Treatment of Alzheimer's Disease." *Journal of Controlled Release* (October 2005): 417 427.

OTHER

Drug Digest. "Chinese Club Moss." ExpressScripts. http://www.drugdigest.org/DD/DVH/HerbsWho/0,3923,552633%7CChinese%2BClub%2BMoss,00.html (February 6, 2008).

Wikipedia. "Lycopodiopsida." http://en.wikipedia.org/wiki/Clubmoss (February 6, 2008).

David Edward Newton, Ed.D

Cnidium seeds

Description

A variety of carrot unknown to most Americans, *Cnidium monnieri* is a leafy annual with flowers that grow in clusters. The herb has been a popular remedy in Asian folk medicine for millennia, being first described about 2,000 years ago in the Chinese herbal classic *Shen Nong Ben Cao Jing*. Cnidium's reputation for treating itchy skin conditions persists to this day. Only the seeds and essential oil of *Cnidium monnieri*, which belongs to the Apiaceae family, are used as a drug.

The seeds, which are also referred as *she chuang zi* or *she chuang dze*, are somewhat yellow in color and have a sweet smell. They are believed to have several important therapeutic properties, including antibacterial, antifungal, and astringent effects. Some of these claims have been supported by animal and laboratory studies. In one test tube investigation, published in the Chinese journal *Chung Kuo Chung Yao Tsa Chih* in 1991, researchers demonstrated that *Cnidium monnieri* was effective against several **strains** of bacteria and fungi. *Cnidium monnieri* also appears to have antipruritic activity, meaning that the herb may help to alleviate **itching**. In a study of mice, published in the Japanese journal *Biological & Pharmaceutical Bulletin* in 2000, cnidium was shown to significantly reduce the itch-scratch response in rodents.

In the somewhat ethereal parlance of Chinese folk medicine—in which diseases are often believed to occur due to disruptions in the flow of bodily energy—cnidium seeds are considered warm, bitter, and acrid. The **essential oils** derived from the seeds include camphene, borneol, pinene, and terpineol.

General use

While not approved by the FDA, cnidium seeds have been reported to have several beneficial effects. Because the seeds have not been extensively studied in people, their effectiveness is based mainly on animal studies and their ancient reputation as a folk remedy in China. In modern times, the herb is primarily used to treat skin conditions such as **scabies**, **eczema**, ringworm, and itchy, oozing skin lesions. It is also thought to be helpful in the treatment of **vaginitis** and vaginal discharge. Cnidium is used externally for all the purposes mentioned above. The seeds may also be taken internally to treat **impotence** as well as **infertility** in both sexes.

KEY TERMS

Astringent—An agent that helps to contract tissue and prevent the secretion of internal body fluids such as blood or mucus. Astringents are typically used to treat external wounds or to prevent bleeding from the nose or throat.

Eczema—A condition characterized by inflamed, itchy skin. Eczema may also involve oozing, crusting, and scaling.

Essential oil—A term describing a wide variety of concentrated plant-derived oils. They are often used to make soaps and perfumes, as well as being used extensively in natural medical remedies.

Osteoporosis—An age-related disease in which bones become fragile and prone to debilitating fractures.

Ringworm—A fungal skin infection that predominantly affects children. The condition is characterized by reddish, scaly rings on the skin.

Scabies—A contagious rash caused by the *Sarcoptes scabiei* mite, which burrows into the upper layer of the skin in order to lay eggs. Scabies is characterized by intense itching.

Vaginitis—An inflammation of the mucous membrane that lines the interior of the vagina. It often results from a *Candida* or other fungal infection, and is accompanied by pain, itching, and discharge.

Cnidium has shown some intriguing activity against **asthma** and **osteoporosis** in animal studies, though the clinical implications of these findings are not yet known. In one investigation, published in the Chinese journal *Chung-kuo Chung Ya Yao Tsa Chih* in 1990, chemicals in *Cnidium monnieri* called coumarins appeared to protect guinea pigs from the effects of bronchial asthma, which the animals experienced after inhaling histamine. The researchers also demonstrated that the coumarins can relax the tracheal muscles of guinea pigs in test tube experiments. A possible link between cnidium and osteoporosis was examined in two rodent studies published in the Chinese journal *Chung-kuo Yao Li Hsueh Pao* in 1994 and 1997. Both studies suggest that cnidium can help to prevent osteoporosis induced by glucocorticoid drugs.

Preparations

The optimum dosage of cnidium seeds has not been established with any certainty. Dosage may range from 3-12 g. Because cnidium seeds have been recommended for a variety of purposes, and can be used internally and externally, consumers are advised to consult a doctor experienced in the use of alternative remedies or Chinese medicine to determine proper dosage.

To treat skin conditions, the herb is usually applied to the skin in the form of a solution or ointment. Vaginitis and vaginal discharge are treated with a douche prepared from the seeds.

In Chinese folk medicine, cnidium seeds are often combined with other herbs or minerals. When used externally, the seeds may be mixed with stemona and sophora for itchy, oozing skin lesions or with calomel for scabies and eczema (including genital eczema). Taken internally, cnidium seeds are often combined with **schisandra** or **cuscuta** to treat impotence or infertility.

Cnidium seeds are generally available in bulk or in combination products (such as powders or pills) that contain several different herbs.

Precautions

Cnidium seeds are not known to be harmful when taken in recommended dosages, though it is important to remember that the long-term effects of taking the seeds (in any amount) have not been investigated. Due to lack of sufficient medical study, cnidium seeds should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

Cnidium seeds should not be applied to skin that is hot, dry, and sore.

Do not confuse cnidium seeds with the essential oil derived from them. While the seeds may be taken internally, the essential oil should not be ingested except under the supervision of a doctor.

While cnidium has shown some activity against bronchial asthma and osteoporosis in animal studies, it is not yet recommended for either of these conditions. Both diseases are potentially serious and require a doctor's care.

Side effects

When taken in recommended dosages, cnidium seeds are not associated with any bothersome or significant side effects.

Interactions

Cnidium seeds should not be used at the same time as croton seeds, **fritillaria**, or peony root, according to

practitioners of Chinese folk medicine. When used externally, cnidium seeds have been combined with stemona, sophora, and calomel without apparent harm. When used internally, the seeds have been safely mixed with schisandra and cuscuta.

Resources

BOOKS

Editors of Time Life Books. *The Drug and Natural Medicine Advisor*. Alexandria, VA: Time Life Books, 1997.

PERIODICALS

Cai, J., B. Yu , G. Xu, et al. "Studies on the quality of fructus Cnidii comparison of antibacterial action." *Chung Kuo Chung Yao Tsa Chih* 16, no. 8 (1991): 451 453, 510.

Chen, Z. and X. Duan. "Mechanism of the antiasthmatic effect of total coumarins in the fruit of *Cnidium mon nieri (L.) Cuss*." *Chung Kuo Chung Yao Tsa Chih* 15, no. 5 (1990): 304 305, 320.

Liao, J. M., Q. A. Zhu, H. J. Lu, et al. "Effects of total coumarins of Cnidium monnieri on bone density and biomechanics of glucocorticoids induced osteoporosis in rats." *Chung Kuo Yao Li Hsueh Pao* 18, no. 6 (1997): 519 521.

Tohda, C., Y. Kakihara, K. Komatsu, et al. "Inhibitory effects of methanol extracts of herbal medicines on substance P induced itch scratch response." *Biol Pharm Bull* 23, no. 5 (2000): 599 601.

Xie, H., Q. N. Li, L. F. Huang, et al. "Effect of total coumarins from dried fruits of *Cnidium monnieri* on glucocorticoid induced osteoporosis in rats." *Chung Kuo Yao Li Hsueh Pao* 15, no. 4 (1994): 341 344.

ORGANIZATIONS

American Botanical Council. P.O. Box 144345, Austin, TX 78714 4345.

OTHER

OnHealth. http://www.onhealth.com.

MEDLINE. http://igm.nlm.nih.gov.

Greg Annussek

Cobalain *see* **Vitamin B_{12}**

Cocklebur *see* **Burdock root**

Codonopsis root

Description

Codonopsis is the fresh or dried root of the plant *Codonopsis pilosula*. Codonopsis is a small perennial native to Asia. It is especially abundant in the Shanxi and Szechuan provinces of China. Codonopsis grows to a height of about 5 ft (1.5 m) in dense brushy thickets and at the edges of woods where the soil remains moist. Codonopsis is well known in Chinese herbalism. Its Chinese name is *tang shen*. The plant is also cultivated in many other parts of the world, including the United States, because of its distinctive bell-shaped greenish-purple flowers. Other names for codonopsis include bastard ginseng and bonnet bellflower.

General use

Codonopsis, or *tang shen*, has been used in China for more than 2,000 years. It is one of the best-known and most widely used herbs in Chinese medicine. In the Chinese system of health, the *yin* aspects of nature, which have to do with cold, moisture, dark, and passivity, must be kept in balance with the *yang* aspects, which have to do with heat, dryness, light, and activity. Ill health occurs when the energies and elements of the body are out of balance with nature or in interior disharmony. Health is restored by taking herbs and treatments that restore this balance. In **traditional Chinese medicine**, codonopsis is said to have a neutral nature and a sweet taste. It is used as a tonic for the lungs and spleen and to strengthen and nourish the blood and balance metabolic function.

Like ginseng, codonopsis is an adaptogen. Adaptogens are substances that non-specifically enhance and regulate the body's ability to withstand **stress**. They increase the body's general performance in ways that help the whole body resist disease. Codonopsis is thought to benefit the entire body by boosting strength, increasing stamina and alertness, rejuvenating the body, strengthening the immune system, aiding recovery from chronic illness, reducing stress, and stimulating the appetite. It belongs to a class of herbs called stomachics, which means that they tonify the stomach to improve digestive functions.

Codonopsis is sometimes called the "poor man's ginseng." It is often substituted in Chinese herbal formulas for ginseng, although it has a milder action that lasts for a shorter time. Scientists have shown that the actions of ginseng and codonopsis, although similar, are caused by very different chemical compounds. This type of substitution based on function rather than chemical structure, however, is considered acceptable in Chinese medicine.

In addition to the whole-body effects of codonopsis, the herb is used for a number of other specific conditions. It can be taken internally, in various combinations with other herbs, for **anemia**; **asthma**; **cancer**; **diarrhea**; headaches, especially tension

KEY TERMS

Adaptogen—A substance that regulates a body system, either stimulating or suppressing it to bring it back within its normal range.

Decoction—An extract of a plant made by boiling it, then straining the solid material out. The resulting liquid is the decoction.

Galactogogue—A substance or medication that increases the flow of breast milk in nursing mothers.

Stomachic—A substance or medication that tonifies the stomach to improve digestive functions.

Tincture—A plant extract prepared in a solution of alcohol and water.

Yang aspects—In traditional Chinese medicine, yang aspects are qualities of nature such as warmth, activity, light, and dryness.

Yin aspects—Yin aspects are the opposite of yang aspects and are represented by qualities such as cold, moisture, darkness, and passivity.

headaches; **hemorrhoids**; high blood pressure; mucus in the lungs and shortness of breath; **nausea** and **vomiting**; neck tension; and a prolapsed (collapsed) uterus. Codonopsis can also be taken internally as a galactogogue, which means that it increases the supply of breast milk in nursing mothers.

University and medical researchers only became interested in codonopsis in the 1980s. Most of the research work has been done in China. Overall research findings suggest that codonopsis is relatively effective and safe. Most of this work has been done in test tubes and on small laboratory animals. Large-scale controlled human studies have yet to be done.

In many studies, scientists have found that extract of codonopsis root helps mice withstand stress, whether that stress comes from swimming, high temperatures, or oxygen deprivation. Other studies show that codonopsis boosts the immune system. In research done in China in 1997, codonopsis was shown to protect laboratory animals against gastric ulcers.

Other research has shown that codonopsis can increase the number of red blood cells and hemoglobin in animals. It also improves the production of antibodies. Studies are being done to determine if codonopsis would be useful in treating HIV infection; such autoimmune diseases as **systemic lupus erythematosus** (SLE), or immune systems that have been weakened by chemotherapy. Although the results are promising, definitive answers cannot be obtained until controlled studies on humans are performed.

Preparations

Codonopsis root comes in different grades. Roots at least three years old are harvested in the autumn after the leaves of the plant have died back. The best quality roots are large, clean, and dry on the surface, but moist inside when chewed. Codonopsis has a pleasant taste when eaten raw. Poor quality codonopsis is almost tasteless and may be dry and dirty.

Although codonopsis is sometimes eaten raw, the dried root is usually made into a decoction, which is an extract of the plant made by boiling. Tinctures, which are solutions of alcohol and water containing plant matter, are used in the West but not in traditional Chinese medicine. Commercially produced tablets, capsules, and tinctures of codonopsis are available. Dosage varies with the condition being treated. Codonopsis is often used in Chinese preparations, and may replace ginseng in almost any formula.

Precautions

Years of use in China suggest that codonopsis is not toxic and can be used by almost everyone. In China, babies are sometimes given pieces of codonopsis root to teethe on. It is given to children to help them grow strong, and breast-feeding women use it as a tonic to increase the quantity of milk they produce.

Side effects

No unwanted side effects are reported with the use of codonopsis.

Interactions

There are few, if any, studies of how codonopsis interacts with traditional Western medicines. It has been used for many years in combination with other Chinese herbs without incident.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

Molony, David. *Complete Guide to Chinese Herbal Medicine*. New York: Berkeley Books, 1998.

Teegarden, Ron. *The Ancient Wisdom of the Chinese Tonic Herbs*. New York: Warner Books, 1998.

ORGANIZATIONS

American Association of Oriental Medicine (AAOM). 433 Front Street, Catasauqua, PA 18032. (610) 266 2433. http://www.aaaomonline.org.

Tish Davidson

Coenzyme Q_{10}

Description

Coenzyme Q_{10} is a fat-soluble nutrient also known as CoQ_{10}, vitamin Q_{10}, ubidecarenone, or ubiquinone. It is a natural product of the human body that is primarily found in the mitochondria, which are the cellular organelles that produce energy. It occurs in most tissues of the human body; however, the highest concentrations are found in the heart, liver, kidneys, and pancreas. Ubiquinone takes its name from a combination of the word ubiquitous, meaning something that is found everywhere, and quinone 10. Quinones are substances found in all plants and animals. The variety found in humans has a 10-unit side chain in its molecular structure. Apart from the important process that provides energy, CoQ_{10} also stabilizes cell membranes and acts as an antioxidant. In this capacity, it destroys free radicals, which are unstable molecules that can damage normal cells.

KEY TERMS

Angina—Symptoms of pressure or burning in the chest that result from inadequate oxygen in the heart, generally due to coronary artery spasm or blockage.

Antioxidant—An enzyme or other substance that is capable of countering the damaging effects of oxidation in the body's tissues. Coenzyme Q_{10} performs antioxidant activity.

Cardiomyopathy—A condition of damaged, diseased, thickened, or stretched heart muscle, resulting in weakness of the heart. Cardiomyopathy often occurs following heart attacks due to scarring, but may also have an infectious or nutritional origin.

Friedreich's ataxia—An inherited disease that usually manifests in childhood or adolescence, characterized by loss of muscular coordination (ataxia), curvature of the spine, impaired speech, and cardiomyopathy.

Huntington's disease—A fatal inherited disorder characterized by progressive neurologic symptoms including loss of motor and cognitive function.

General use

CoQ_{10} is used extensively in Canada, Western Europe, Japan, and Russia to treat congestive heart failure. It is available as a prescription medication almost everywhere it is sold, although it is sold over-the-counter as a nutritional supplement in the United States. Some studies have shown it to be effective for as many as 70% of patients with congestive heart failure. It appears to improve patient health and well-being, and to increase cardiac efficiency. The dosage generally recommended for this condition is 100–300 mg a day, preferably in divided doses. According to Dr. Karl Folkers in *Prevention's Healing with Vitamins*, it takes one to three months to achieve desired results from supplementation, and as long as six months to attain maximum benefit.

CoQ_{10} may also help people with some forms of cardiomyopathy. Patients should consult their physician about the possible benefits of supplementation for this condition.

The usefulness of CoQ_{10} in lowering blood pressure is not well documented. One study suggests that the supplement is helpful for **hypertension**, but the results are in question as it was not a double-blind, controlled research project. The dose recommended is 200–250 mg a day, with results taking several months to appear. It is possible that some patients with essential hypertension who are initially low in CoQ_{10} may eventually be able to decrease the amount of their other blood pressure medications. This must be done under the care of a health care provider.

Oral supplementation of CoQ_{10} has been shown to improve periodontal disease, as it decreases the size of abnormally deep pockets in the gums, and also reduces the extent of bacterial contamination. Other possible benefits of CoQ_{10} are to decrease **angina** symptoms, improve immune function in patients with **AIDS** and other immune deficiencies, improve control of blood sugar, lower **cholesterol**, improve physical stamina, and help people with muscular dystrophy and Huntington's disease. A group of researchers at the University of California at San Diego reported in 2002 that coenzyme Q_{10} appears to slow the progress of **Parkinson's disease**, Friedreich's ataxia, and other conditions marked by degeneration of the central nervous system. The supplement can also reduce the toxicity of some types of chemotherapy. Doxorubicin, a chemotherapeutic agent, is known to sometimes damage the heart. Concomitant supplementation seems to reduce this toxic effect. The possible benefits of CoQ_{10} should be discussed with a nutritionally-oriented health care provider.

Since 1961, when it was first noticed that **cancer** patients in Sweden and the United States had low levels of the enzyme, coenzyme Q_{10} has been studied

as a possible cancer treatment. Researchers believe that coenzyme Q_{10} may protect against cancer by stimulating the immune system, and functioning as an antioxidant. Although animal studies have been conducted, as of 2008 no report of a randomized clinical trial involving human subjects whose survival times were lengthened by using coenzyme Q_{10} in addition to a traditional cancer treatment has been reported in a peer-reviewed medical journal.

Deficiency

Patients with certain conditions tend to have lower levels of CoQ_{10}, and may benefit from supplements. Some diseases that are associated with decreased amounts of this nutrient are AIDS, chronic **fatigue**, congestive heart failure, cardiomyopathy, and inflammatory **gum disease**. Levels of CoQ_{10} tend to decrease with age; tests for its presence in the body are not widely available. Adverse effects from this supplement are rare and mild, so anyone suffering from one of the listed conditions should consider discussing supplementation with a health care provider.

Preparations

Natural sources

Food products are a good source of CoQ_{10}, and provide approximately half of the body's requirement. Cold-water fish such as mackerel, salmon, sardines, and tuna are particularly high in CoQ_{10}. Vegetable oils and meats also provide good sources. The liver manufactures adequate amounts to fulfill the need not met in the diet. People who are deficient in B vitamins, **selenium**, **vitamin C**, and **vitamin E** may not be able to make as much CoQ_{10} as they need because these nutrients are required for production. Consumption of foods rich in CoQ_{10} and production of the nutrient in the liver will not provide the amounts needed to treat heart failure and other conditions that may contribute to a deficiency of this nutrient. In those cases, supplements are required.

Supplemental sources

Supplements of CoQ_{10} are widely available; however, its cost varies considerably. In 2004, it was available in the United States, ranging in price from $7.79 for a bottle of 40 30-mg capsules to $38.95 for a bottle of 60 100-mg capsules. It is found in various forms including capsules, gelcaps, liquids, and tablets. The latter may be the best choice, as this form generally includes a source of fat that improves absorption. Vitamin E is a helpful stabilizing additive as well. Most of the CoQ_{10} products currently available on the market are manufactured in Japan. Like other supplements, Co_{10} is best kept in a cool, dry place, out of direct light, and out of the reach of children.

Precautions

As of 2008, the safety of CoQ_{10} for pregnant or breast-feeding women has not been established, and its use is not recommended under these conditions. It is also not recommended for young children. People diagnosed with heart failure, diabetes, kidney problems, or liver disease should use particular care with this supplement, as the dosage of other medications may require adjustment. These individuals should consult a physician before taking coenzyme Q_{10}.

Side effects

Reported adverse effects related to supplemental CoQ_{10} use include **diarrhea**, irritation of the stomach, poor appetite, and **nausea**. These effects are rarely reported and are mild. CoQ_{10} is considered extremely safe for most people. If doses over 300 mg per day are taken, liver enzyme levels may be affected, and may need monitoring.

Interactions

It is possible that CoQ_{10} decreases the action of **sodium** warfarin (known by the brand name, Coumadin), which is prescribed to prevent the formation of **blood clots** in patients at risk of **heart attack** or **stroke**. Some oral diabetes medications may also interfere with the action of CoQ_{10}. Cholesterol-lowering drugs in the statin group may have this effect as well.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Roseville, CA: Prima Publishing, 2000.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. Tucson, AZ: Fisher Books, 2000.

Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*., 2nd ed. Indianapolis: Macmillan General Reference, 2000.

Therapeutic Research Faculty Staff. *Natural Medicines Comprehensive Database*. Stockton, CA: Therapeutic Research Faculty, 1999.

PERIODICALS

Baker, S. K., and M. A. Tarnopolsky. "Targeting Cellular Energy Production in Neurological Disorders." *Expert Opinion on Investigational Drugs* 12 (October 2003): 1655 79.

Naini, A., V., J. Lewis, M. Hirano, and S. DiMauro. "Primary Coenzyme Q_{10} and the Brain." *Biofactors* 18 (2003): 145 52.
Shults, C. W. "Coenzyme Q_{10} in Neurodegenerative Diseases." *Current Medical Chemistry* 10 (October 2003): 1917 21.
Shults, C. W., D. Oakes, K. Kieburtz, et al. "Effects of Coenzyme Q_{10} in Early Parkinson's Disease: Evidence of Slowing of the Functional Decline." *Archives of Neurology* 59 (October 2002): 1541 50.
Vedanarayanan, V. V. "Mitochondrial Disorders and Ataxia." *Seminars in Pediatric Neurology* 10 (September 2003): 200 9.

ORGANIZATIONS

Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov.
National Cancer Institute (NCI). http://www.nci.nih.gov.
National Center for Complementary and Alternative Medicine (NCCAM) Clearinghouse. P. O. Box 7923, Gaithersburg, MD 20898 7923. (888) 644 6226. Fax: (866) 464 3615. http://nccam.nih.gov.

OTHER

National Cancer Institute (NCI). *Complementary and Alternative Medicine (CAM) Information Summary: Coenzyme Q_{10}*. Bethesda, MD: NCI, 2003. [cited June 3, 2004]. http://www.nci.nih.gov/cancerinfo/pdq/cam/coenzymeQ10.
National Institute of Neurological Disorders and Stroke (NINDS). "Study Suggests Coenzyme Q_{10} Slows Functional Decline in Parkinson's Disease." NINDS press release, 14 October 2002. [cited June 3, 2004]. http://www.ninds.nih.gov/news_and_events/pressrelease_parkinsons_coenzymeq10_10140.

Rebecca Frey

Coix

Description

Coix is a grain plant whose botanical name is *Coix lacryma-jobi*. It belongs to the Gramineae (or Poaceae) family. Coix is used in **traditional Chinese medicine**, where it is called *yi yi ren*. In English it is also known as Job's tears. Coix is also a food. In addition, the seeds are used to make jewelry and items such as rosaries and **prayer** beads.

Coix is an annual plant that grows wild to a height of about 3 ft (1 m) in sunny but moist grasslands. It is also cultivated in many parts of Asia. Coix may have originated in East Asia, but it is now found throughout East India, China, Japan, the Philippines, northern Africa, the Caribbean, Central America, northern South America, and the United States. The plant has narrow, ribbon-like leaves. The seed with the husk removed is used medicinally. In some areas, coix is cultivated as a food grain. The seeds contain about 52% starch, 18% protein, and 7% fat, giving them a higher protein-to-carbohydrate ratio than other cereal grains.

General use

Coix is used as both a healing herb and a food. It was used in folk medicine to treat conditions ranging from arthritis and **halitosis** (bad breath) to rheumatism and **worms**. The seeds, with the husks removed, are important in traditional Chinese medicine. These are said to have a cool nature and a sweet, bland taste. In traditional Chinese medicine, coix seed is used to treat internal dampness and damp-heat conditions, especially disorders of the spleen, stomach, lungs, and large intestine.

Chinese herbalists use coix to improve water flow through the body. It is used to promote urination and as a diuretic to treat **edema**. It can be used to reduce **pain** and spasms in the legs when there is also swelling of the legs. Coix is also used to treat such conditions of the gastrointestinal system as **diarrhea**, poor digestion, and abdominal bloating.

Other claims are also made for coix seed. It is said that a tea made from the boiled seeds will help to cure **warts**. Coix is thought to be beneficial for the skin, helping to nourish and soften it so that skin looks smooth and healthy.

Coix is often used in formulas that treat arthritis and rheumatism, conditions believed to be caused by excess dampness according to traditional Chinese medicine. Chinese herbalists also use it to treat appendicitis, lung disease, lung abscesses, beriberi, and **cancer**.

The seeds of coix are said to have anti-inflammatory, antiseptic, and fever-reducing properties. It is claimed that they can prevent spasms, lower blood sugar, and act as a sedative. The coix root has been used to treat menstrual disorders.

There is no doubt that coix also has value as a food grain, although the seed coat is hard to remove, making it difficult to produce flour. Coix can be cooked like barley or rice, however, and the flour can be used to make bread. Parched coix seeds are used to make tea, and a coffee substitute can be made from the roasted seeds of some Chinese subspecies.

With so many claims made for coix, scientific interest in the plant was quite high in the 2000s.

Coix (Coix lacryma-jobi). *(© blickwinkel / Alamy)*

Agricultural scientists were investigating the genetics of coix with an eye toward growing it as a food crop, and medical researchers were looking at its healing properties. Kanglaite, a compound obtained from the coix seed, had been studied in Asia as a treatment for conditions, including cancer. As of 2008, research included Phase II clinical trials studying people with non-small-cell **lung cancer**, according to the University of Texas M. D. Anderson Cancer Center.

Although coix may be proven effective in treating medical conditions, the American Cancer Society cautioned that many studies involving Chinese herbs were written in Chinese. Some journal articles about clinical trials did not include details such as how studies were conducted, information needed to compare the results with research performed in the United States.

The society's assessment paralleled the results of a February 2008 review of publications accessed through *PubMed* (http://www.ncbi.nlm.nih.gov/PubMed), an online service of the U.S. National Library of Medicine and the National Institutes of Health. A literature search for studies of kanglaite (KLT) produced five English-language abstracts (summaries) of articles originally written in Chinese or Russian.

The October 2005 issue of *Zhongguo Zhongyao Zazhi* (*China Journal of Chinese Materia Medica*) contained an article titled "Effect of Kanglaite Injection Oncyclooxygenase Activity in Lung Carcinoma A549 Cell." Few details were provided in the article, which was written in Chinese.

An article in the November 2004 issue of *Hepatobiliary and Pancreatic Diseases International* described a study involving 40 rats. Although KLT appeared to be effective in the treatment of liver tumors, researchers concluded that it was less effective than ethanol in terms of liver function, according to the article titled, "Efficacy of Intra-Tumor Injection of Kang-Lai-Te in Treating Transplanted Hepatoma in Rats."

Preparations

Coix seeds are harvested when the plant ripens in the autumn. The husks are removed and the seed is used fresh, boiled, roasted, or fermented. In traditional Chinese medicine, liquor fermented from coix seeds may be given for rheumatism. Coix is also used

in combination with other herbs in rheumatism and arthritis formulas such as ginseng and **atractylodes** formula. When coix is used for medicinal purposes, the usual daily dose is 10–30 g.

Combination treatments include a remedy for arthritis. The combination consists of 30 g of coix combined with cinnamon twig tea. The mixture is cooked with rice and consumed.

Coix may be eaten as nourishment. That makes it different from other herbs, which are given in limited doses. Puffed coix, similar to puffed wheat or puffed rice cereals, is sold in health food stores and in markets that sell Asian food.

Precautions

Traditional Chinese herbalists suggest that pregnant women not use coix.

Furthermore, the United States Food and Drug Administration does not regulate herbal remedies such as coix, which means that the remedies have not proven to be safe or effective. The safety of coix has not been established for use by children, pregnant women, and nursing mothers. In addition, ingredients are not standardized to comply with federal regulations.

As of 2008, there was limited information about research claims into the effectiveness of coix as a remedy. The lack of information raises questions such as how coix would interact with other medications and herbs. In addition, the lack of detailed information about product ingredients drew cautions from organizations, including the American Cancer Society. After the California Department of Health tested Chinese herbal remedies, the tests revealed that close to 33% contained prescription drugs or were contaminated with toxic metals such as mercury, arsenic, and lead, according to the society.

Side effects

In traditional Chinese medicine, coix has been used without any undesirable side effects. Although there were no known side effects as of 2008, there were indications that people who eat large amounts of coix as a food may become dehydrated.

Interactions

Coix has been used for thousands of years in conjunction with other herbs with no reported interactions. Since coix is used almost exclusively in Chinese medicine, there were no studies of its interactions with Western pharmaceuticals as of 2008.

KEY TERMS

Beriberi—A serious disease caused by a deficiency in vitamin B1 and characterized by a slow degeneration of the nerves of the digestive system and heart.

Diuretic—Any substance that increases the production of urine.

Edema—Water retention in the body that often causes swelling of the hands and feet.

Resources

OTHER

"Chinese Herbal Medicine." American Cancer Society, June 26, 2007. http://www.cancer.org/docroot/ETO/content/ETO_5_3x_Chinese_Herbal_Medicine.asp (February 23, 2008).

"Coix lacryma jobi." Plants for a Future. http://www.pfaf.org (February 23, 2008).

"Traditional Chinese Medicine: Overview of Herbal Medicines." University of Texas M. D. Anderson Cancer Center. http://www.mdanderson.org/departments/cimer/display.cfm?id 1b608136 f1c3 43b5 a3e14b864d2d14c6 &method displayfull&pn 6eb86a59 ebd9 11d4 810100508b603a14 (February 23, 2008).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaom.org.

American Botanical Council, 6200 Manor Rd., Austin, TX, 78723, (512) 926 4900, http://abc.herbalgram.org.

Herb Research Foundation, 4140 Fifteenth St., Boulder, CO, 80304, (303) 449 2265, http://www.herbs.org.

National Center for Complementary and Alternative Medicine, National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Tish Davidson
Liz Swain

Cola nut *see* **Kola nut**

Colchicum

Definition

Colchicum is a genus of flowering plant consisting of about sixty species, perhaps the best known of which is *Colchicum autumnale*. *C. autumnale* is also known as "naked lady," "meadow saffron," or "autumn

Colchicum (Colchicum autumnale). *(Nature's Images / Photo Researchers, Inc.)*

crocus." The first of these names derives from the fact that the plant develops beautiful pink, purple, or white flowers before leaves appear. The plant is "naked," therefore, in regard to its lack of leaves although flowers have already appeared. In 2008, Botanic Gardens Conservation International, a program dedicated to the conservation of threatened and endangered plant species, declared that the best known form of colchicum, *C. autumnale*, was at risk of extinction. The primary reason for this situation, as with other plants of medicinal value, was overharvesting by commercial operators.

Description

Colchicum is usually an annual (less commonly, perennial) plant that grows best in rich soils. It is found in western Asia, along the Mediterranean coast, in England, and throughout many parts of Europe and the United States. The plant's name derives from the region of Colchis, near present-day Georgia and Turkey. In addition to its colorful flower, the plant has somewhat broad (about an inch), longish (about a foot) dark green leaves.

The leaves, seeds, and corms of the plant contain the alkaloid colchicine, which is very toxic. It is the colchicine, taken in moderate doses, that provides the plant's medicinal value. Herbalists use the corm as the primary source of colchicine for their medical preparations.

The first mention of the use of colchicum for medical purposes appears to be a treatise by the Greek physician Pedanius Dioscorides (c. 40 A.D - c. 90 A.D) in his work *De Materia Medica*. Colchicine was first isolated from the colchicum plant by French chemists P. S. Pelletier and J. Caventon in 1820.

Medical Use

Historically, the primary use for colchicum has been in the treatment of **gout**, first mentioned by Dioscorides in the first century A.D. That application continues to be the most popular today. In addition, colchicum has been recommended for use with rheumatism, **gonorrhea**, **neuralgia**, enlarged prostate, pericarditis, dropsy (**edema**), **hepatitis**, **cirrhosis**, and inflammatory conditions. Research is currently being conducted on its possible use as an anti-cancer agent. In the United States, colchicine has been approved by the Food and Drug Administration (FDA) for use in the treatment of gout, familial Mediterranean **fever**, secondary amyloidosis, scleroderma, and Behçet's disease. Researchers have found that the basis of colchicine's action is its tendency to bind to tubulin, a chemical compound found in microtubules, basic components of cell structure. The presence of colchicine interferes with the process of mitosis (cell division), slowing down or interrupting the continued growth of cells. It is this property that makes colchicine a candidate as an anti–cancer agent since an essential characteristic of **cancer** cells is the rapid rate at which they reproduce.

Preparation

Medicinal extracts of colchicum are prepared from the plant's seeds or corm. If the later, the corm is harvested during and just following the plant's flowering. The bulb is dried whole or after first having been cut into thin slices. The dried product is then used to make an extract, tincture, or wine for medical use.

Side Effects

Colchicum has a relatively low therapeutic index. Therapeutic index is the ratio of a drug's potential benefits to its risks. Drugs with low therapeutic index must be carefully monitored since even a modest increase in the amount of drug ingested can cause serious side effects. Among the less serious side effects of colchicum are the following:

- nausea
- loss of appetite
- diarrhea
- hair loss

A number of more serious side effects may occur, requiring medical attention. These effects include:

- skin rash and/or itching
- stomach pain
- blood in the urine

KEY TERMS

Alkaloid—A nitrogen containing compound found in plants.

Corm—A small, underground bulb or stem that holds food for the development of a young plants.

Extract—A concentrated solution of a liquid made by removing water from the original solution.

Therapeutic index—The ratio of the benefits to be obtained from a drug compared to the risks of using that drug.

Tincture—An alcoholic solution of a substance, usually a naturally occurring plant material.

- muscle weakness
- numbness or tingling in the hands or feet
- fever or chills
- swelling of the mouth or face
- pain or difficulty in urinating

Interactions

As of 2008, the International Programme on Chemical Safety has reported no interactions of colchicum with other herbal medications or drugs.

Resources

PERIODICALS

Brvar, Miran, et al. "Case Report: Fatal Poisoning with Colchicum Autumnale." *Critical Care* (January 2004): R56 R59.

Kumar, Andras, Saban Elitok, and Ralph Kettritz. "Col chicum ad Nauseum." *Nephrology Dialysis Transplan tation* (October 2003): 2197 2198.

Morris, I., G. Varughese, and P. Mattingly. "Colchicine in Acute Gout." *BMJ* (November 2003): 1275 1276.

Ong, Michael, et al. "Safety of Colchicine Therapy during Pregnancy." *Canadian Family Physician* (August 2003): 967 969.

Ting, Joseph Yuk Sang. "Acute Pancreatitis Related to Therapeutic Dosing with Colchicine: A Case Report." *Journal of Medical Case Reports* (August 2007): 64.

OTHER

Dowd, Matthew J. "Colchicine." http://www.phc.vcu.edu/Feature/oldfeature/colchicine/colchicine.html (Febru ary 6, 2008).

Henriette's Herbal Homepage. "Colchicum." http://www.henriettesherbal.com/eclectic/kings/colchicum autu. html (February 6, 2008).

"Pharmacology of Colchicine." http://biotech.icmb.utexas.edu/botany/colch.html (February 6, 2008).

David Edward Newton, Ed.D.

Cold, common *see* **Common cold**

Cold sore

Definition

A cold sore is a fluid-filled blister that usually appears at the edge of the lips. Cold sores are caused by a herpes simplex virus infection.

Description

A cold sore is a fluid-filled, painful blister that is usually on or around the lips. Other names for cold sores are **feverblisters**, oral herpes, labial herpes, herpes labialis, and herpes febrilis. Cold sores most often occur on the lips, distinguishing them from the common canker sore that is usually located inside the mouth. Cold sores do not usually occur inside the mouth except during the initial episode. **Canker sores** usually form either on the tongue or inside the cheeks.

Cold sores are caused by a herpes virus. There are eight different kinds of human herpes viruses. Only two of these, herpes simplex, types 1 and 2, can cause cold sores. It is commonly believed that herpes simplex virus type 1 infects above the waist and herpes simplex virus type 2 infects below the waist. This is not completely true. Both herpes virus type 1 and type 2 can cause herpes lesions on the lips or genitals but recurrent cold sores are almost always type 1.

Oral herpes is very common. More than 60% of Americans have had a cold sore and almost 25% of those infected experience recurrent outbreaks. Most of these persons became infected before age 10. Anyone can become infected by herpes virus and once infected, the virus remains latent for life. Herpes viruses are spread from person to person by direct skin-to-skin contact. The highest risk for spreading the virus is the time period beginning with the appearance of blisters and ending with scab formation. However, infected persons need not have visible blisters to spread the infection to others since the virus may be present in the saliva without obvious oral lesions.

Viruses are different from bacteria. While bacteria are independent and can reproduce on their own, viruses enter human cells and force them to make

KEY TERMS

Latent—A nonactive virus in a dormant state within a cell. Herpes virus is latent in the nervous system.

Prodrome—Symptoms that warn of the beginning of disease. The herpes prodrome consists of pain, burning, tingling, or itching at a site before blisters are visible.

Recurrence—The return of an active infection following a period of latency.

more virus. The infected human cell is usually killed and releases thousands of new viruses. The cell death and resulting tissue damage causes the actual cold sores. In addition, herpes virus can infect a cell and instead of making the cell produce new viruses, it hides inside the cell and waits. Herpes virus hides in the nervous system. This is called "latency." A latent virus can wait inside the nervous system for days, months, or even years. At some future time, the virus "awakens" and causes the cell to produce thousands of new viruses which causes an active infection.

This process of latency and active infection is best understood by considering the cold sore cycle. An active infection is obvious because cold sores are present. The first infection is called the "primary" infection. This active infection is then controlled by the body's immune system and the sores heal. In between active **infections** the virus is latent. At some point in the future, latent viruses become activated and once again cause sores. These are called "recurrent" infections. Although it is unknown what triggers a latent virus to activate, several conditions seem to bring on infections. These include **stress**, illness, **fatigue**, exposure to sunlight, **menstruation**, fever, and diet.

Causes and symptoms

While anyone can be infected by herpes virus, not everyone will show symptoms. The first symptoms of herpes occur within two to 20 days after contact with an infected person. Symptoms of the primary infection are usually more severe than those of recurrent infections. The primary infection can cause symptoms like other viral infections including fatigue, **headache**, fever, and swollen lymph nodes in the neck.

Typically, 50–80% of persons with oral herpes experience a prodrome (symptoms of oncoming disease) of **pain**, burning, **itching**, or tingling at the site where blisters will form. This prodrome stage may last anywhere from a few hours, to one or two days. The herpes infection prodrome occurs in both the primary infection and recurrent infections.

In 95% of patients with cold sores, the blisters occur at the outer edge of the lips which is called the "vermilion border." Less often, blisters form on the nose, chin, or cheek. Following the prodrome, the disease process is rapid. First, small red bumps appear, which quickly form fluid-filled blisters. The painful blisters may either burst and form a scab or dry up and form a scab. Within two days of the first red bumps, all the blisters have formed scabs. The skin heals completely and without scarring within six to 10 days.

Some children have a very serious primary (first episode) herpes infection called gingivostomatitis. This causes fever, swollen lymph glands, and numerous blisters inside the mouth and on the lips and tongue, which may form large, open sores. These painful sores may last up to three weeks and can make eating and drinking difficult. Because of this, young children with gingivostomatitis are at risk for dehydration (excessive loss of water from the body).

Most people experience fewer than two recurrent outbreaks of cold sores each year. Some people never experience outbreaks while others have more frequent occurrences. In most people, the blisters form in the same area each time and are triggered by the same factors (such as stress, sun exposure, etc.).

Diagnosis

Because oral herpes is so common, it is diagnosed primarily by symptoms. It can be diagnosed and treated by the family doctor, dermatologists (doctors who specialize in skin diseases) and infectious disease specialists. Laboratory tests may be performed to look for the virus. Because healing sores do not shed much virus, a sample from an open sore is taken for viral culture. A sterile cotton swab is wiped over open sores and the sample used to infect human cells in culture. Cells that are killed by herpes virus have a certain appearance under microscopic examination. The results of this test are available within two to 10 days.

Oral herpes may resemble a bacterial infection called **impetigo**. This skin infection is most commonly seen in children and causes herpes-like blisters around the mouth and nose. Also, because oral herpes can occur inside the mouth, the blisters could be mistaken for common canker sores. Therefore, doctors need to determine whether the blisters are oral herpes, canker sores, or impetigo. The diagnosis and treatment of herpes infections should be covered by most insurance providers.

Treatment

There is no cure for cold sores but many alternative treatments can reduce outbreaks and shorten healing time. During an outbreak of cold sores, salty foods, citrus foods (oranges etc.), and other foods that irritate the sores should be avoided. Wash the sores once or twice a day with a warm, saline solution and pat gently to dry. Application of ice or a cold wet teabag for 10 minutes four or five times a day can relieve the itching and burning.

Supplements

Vitamin and mineral supplements and diet may have an effect on the recurrence and duration of cold sores. In general, cold sore sufferers should eat a healthy diet of unprocessed foods such as vegetables, fruits, and whole grains. Alcohol, **caffeine**, chocolate, nuts, and sugar should be avoided.

An imbalance in the **amino acids lysine** and **arginine** is thought to be a contributing factor in herpes virus outbreaks. A diet that is rich in the amino acid lysine may help prevent recurrences of cold sores. Foods that contain high levels of lysine include most vegetables, legumes, fish, turkey, and chicken. In one study, patients taking lysine supplements had milder symptoms during an outbreak, a shorter healing time, and had fewer outbreaks than patients who did not take lysine. Patients should take 1,000 mg of lysine three times a day during a cold sore outbreak and 500 mg daily on an ongoing basis to prevent recurrences. The effectiveness of lysine supplementation in treating herpes infections is controversial. Intake of the amino acid arginine should be reduced. Foods rich in arginine that should be avoided are chocolate, peanuts, almonds, and other nuts and seeds.

Vitamin C and **bioflavonoids** (a substance in fruits that helps the body to absorb and use vitamin C) have been shown to reduce the duration of a cold sore outbreak and reduce the number of sores. The **vitamin B complex** includes important vitamins that support the nervous system where herpes viruses are dormant. B complex vitamins also can help manage stress, an important contributing factor to the outbreak of herpes viruses. Some studies have shown that correcting **iron**, folate, vitamin C, or **vitamin B_{12}** deficiencies improves cold sores. **Vitamin E** speeds healing and reduces pain. Squeeze the oil from a vitamin E capsule onto a cotton ball and apply to the sore for 30 minutes to one hour.

Herbals

Mints are effective antivirals. **Lemon balm** or Melissa (*Melissa officinalis*) is comparable to the antiviral acyclovir in the treatment of cold sores. Apply lemon balm cream to the sore several times a day. Alternatively, prepare lemon balm tea, drink the tea and apply the dregs to the sore for one or two hours. The patient may also drink several strong cups of teas prepared from **hyssop**, oregano, **rosemary**, **thyme**, and **sage**. **Licorice** may be added to the tea.

Licorice (*Glycyrrhiza glabra*) is an antiviral and immune system stimulant. Licorice is available as a capsule or an ointment. Gradually take up to 300 mg a day. Apply ointment that contains glycyrrhetinic or glycyrrhizic acid directly to the sore as necessary. Ingestion of licorice may cause loose stools and high blood pressure.

Chinese medicine

Treatment with Qing Dai San (Natural Indigo Powder) mixed with cold boiled water and applied to the sore is generally all that is needed. For recurrent cold sores, the following oral preparations can be taken:

- Yin Huang Kou Fu Yi (Honeysuckle and Scutellaria Fluid): one ampule three times daily
- Yin Qiao Jie Du Pian (Honeysuckle and Forsythia Tablet to Resolve Toxin): two to four tablets three times daily
- Huang Lian Shang Qing Wan (Coptis Pill to Clear Heat of Upper Jiao): 5 g, two to three times daily

Other treatments for cold sores include:

- Pepto-Bismol. Rub liquid into cold sore.
- Laser therapy. Ten daily treatments with low-intensity laser significantly lowered the incidence of oral herpes outbreaks as compared to placebo.
- Mild electric current. Preliminary studies of a small device that delivers a mild electric current to the cold sore site have shown shorter duration of pain and blisters.

Allopathic treatment

There is no cure for herpes virus infections. There are antiviral drugs available which have some effect in lessening the symptoms and decreasing the length of herpes outbreaks. There is evidence that some may also prevent future outbreaks. These antiviral drugs are most effective when taken as early in the infection process as possible. For the best results, drug treatment should begin during the prodrome stage before blisters are visible.

Acyclovir (Zovirax) has been the drug of choice for herpes infection and can be given intravenously or

taken by mouth. It can be applied directly to sores as an ointment but is not very useful in this form. A liquid form for children is also available. Acyclovir is effective in treating both the primary infection and recurrent outbreaks. When taken by mouth to prevent an outbreak, acyclovir reduces the frequency of herpes outbreaks. In 2001, a report showed that use of high-dose acyclovir during primary infection will reduce the extent of latent infection. The use of penciclovir (Denavir) cream as soon as the prodrome symptoms appear speeds healing.

Over-the-counter lip products which contain the chemical phenol (such as Blistex Medicated Lip Ointment) and numbing ointments (Anbesol) help to relieve cold sores. Pharmacists also recommend the over-the-counter medicine Abreva, the only cold sore medicine approved by the U.S. Food and Drug Administration (FDA) to shorten healing time. Acetaminophen (Tylenol) or ibuprofen (Motrin, Advil) may be taken if necessary to reduce pain and fever.

Expected results

Oral herpes can be painful and embarrassing but it is not a serious infection. There is no cure for oral herpes but outbreaks usually occur less frequently after age 35. Alternative medicines can reduce the pain, prevent outbreaks, and shorten the course of cold sores. The spread of herpes virus to the eyes is very serious. Herpes virus can infect the cells in the cornea and cause scarring that may impair vision.

Prevention

The only way to prevent oral herpes is to avoid contact with infected persons. This is not an easy solution because many people are not aware that they are infected and can easily infect others. As of 2008 there were no known herpes vaccines available, although vaccines are being tested.

Several practices can reduce the occurrence of cold sores and the spread of virus to other body locations or people. These practices are:

- Avoidance of sun exposure to the face. Before getting prolonged exposure to the sun, apply sunscreen to the face and especially to the lips. Wearing a hat with a large brim is also helpful.
- Avoid touching cold sores. Squeezing, picking, or pinching blisters can allow the virus to spread to other parts of the lips or face and infect those sites.
- Wash hands frequently. Persons with oral herpes should wash their hands carefully before touching others. An infected person can spread the virus to others even when he or she has no obvious blisters.
- Avoid contact with others during active infection. Infected persons should avoid kissing or sexual contact with others until after the cold sores have healed.
- Wear gloves when applying ointment to a child's sore.
- Be especially careful with infants. Never kiss the eyes or lips of a baby who is under six months old.
- Be watchful of infected children. Do not allow infected children to share toys that may be put into the mouth. Toys that have been mouthed should be disinfected before other children play with them.
- Maintain good general health. A healthy diet, plenty of sleep, and exercise help to minimize the chance of getting a cold or the flu, which are known to bring on cold sores. Also, good general health keeps the immune system strong which helps to keep the virus in check and prevent outbreaks.
- Participate in a stress reduction program. Yoga, massage, aromatherapy, meditation, hypnosis, or biofeedback can relieve stress which may reduce outbreaks.

Resources

BOOKS

Gorbach, Sherman, John Bartlett, and Neil Blacklow, eds. *Infectious Diseases*. Philadelphia: W. B. Saunders Co., 1998.

Ying, Zhou Zhong, and Jin Hui De. "Herpes Zoster and Herpes Simplex." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Liv ingston, 1997.

PERIODICALS

"Abreva Recommended Most by Pharmacists for Cold Sores." *Virus Weekly* (November 13, 2001): 12.

Khalsa, Karta Purkh Singh. "Simple Solutions for Cold Sores." *Let's Live* 67 (May 1999): 66+.

Nash, Karen. "Cold Sore Treatment: Take Whatever Works, Including Placebos." *Dermatology Times* 19 (July 1998): 37+.

Sawtell, N. M. "Early Intervention with High Dose Acy clovir Treatment During Primary Herpes Simplex Virus Infection Reduces Latency and Subsequent Reactiva tion in the Nervous System in Vivo." *The Journal of the American Medical Association* 286, no. 23 (December 19, 2001): 2922.

Schindl, Andreas, and Reinhard Neumann. "Low Intensity Laser Therapy is an Effective Treatment for Recurrent Herpes Simplex Infection. Results from a Randomized Double Blind Placebo Controlled Study." *The Journal of Investigative Dermatology* 113 (1999): 221 223.

OTHER

MayoClinic.com. [cited October 2002]. http://www.mayoclinic.com.

Belinda Rowland
Teresa Norris

Coleus

Description

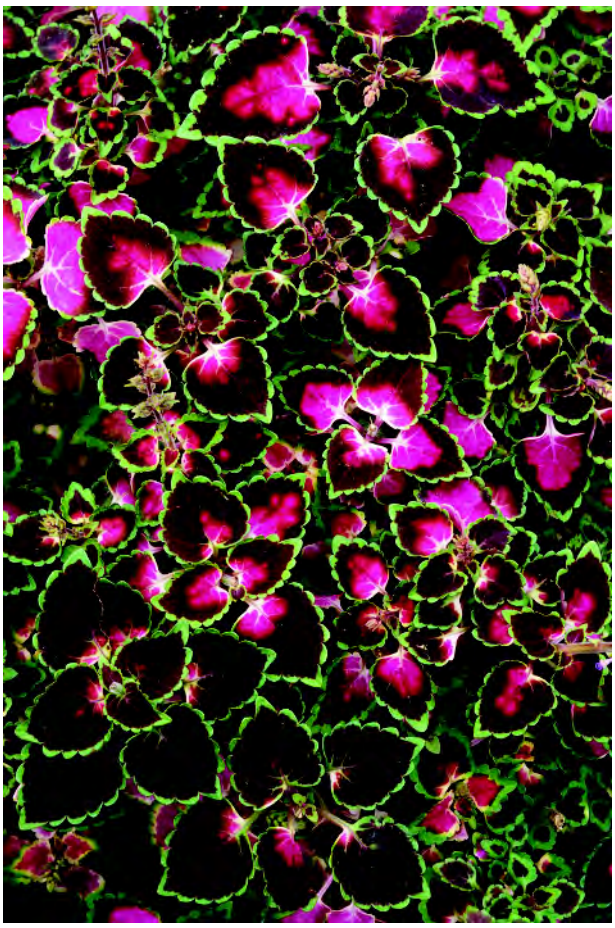
Coleus forskohlii is a perennial plant in the mint family with a strong, camphor-like odor. It is native to areas of India, Myanmar, Nepal, and Sri Lanka and grows well in warm temperate or subtropical areas. Coleus has long been used in traditional Indian (Ayurvedic) medicine, but it gained popularity when forskolin, a chemical extract of the root, demonstrated properties that make it a potential treatment for **asthma**, **bronchitis**, **glaucoma**, congestive heart failure, and other conditions. Forskolin was first identified by Western researchers in the 1970s, but as of 2008 the effects of the whole coleus plant and its extracts had not been as well studied.

Another species of coleus, *Coleus kilimandschari*, is found in parts of Africa and has been used in Rwandan folk medicine to treat **infections** and autoimmune diseases. Some studies of Rwandan coleus indicate that it is effective against a variety of disorders involving destruction of red blood cells. As of 2008, however, Rwandan coleus had not been studied as intensively as *Coleus forskohlii*, and its extracts awaited further analysis.

General use

Forskolin increases the levels of a cell-regulating compound called cyclic adenosine monophosphate (cAMP). This property allows it to stabilize mast cells that contain histamine and other inflammatory substances. Mast cells are one type of cell responsible for allergic response. Preventing the release of these compounds could make forskolin valuable in the treatment of diseases with an allergic component, such as asthma and **eczema**.

Another benefit of the increase of cAMP is forskolin's ability to relax smooth muscles. The bronchioles, uterus, arteries, gastrointestinal tract, and bladder all contain smooth muscle that is responsive to the antispasmodic effects of forskolin. As an antispasmodic, forskolin has potential, as yet unproven in humans, to treat conditions that involve cramping or smooth muscle contraction. These include asthma, painful menstrual periods, **angina**, **irritable bowel syndrome**, bladder infections, and high blood pressure.



Coleus. *(© John Glover / Alamy)*

People with asthma may benefit from the use of forskolin in its capacity as an antispasmodic. During an asthma attack, the smooth muscle within small passageways of the lungs (bronchioles) constricts and makes breathing difficult. The action of forskolin is similar to that of some standard inhalers containing such medications as albuterol, a beta agonist bronchodilator. Both substances relax the smooth muscle and improve the person's breathing ability. Studies of forskolin for the treatment of asthma have shown positive results in both oral and inhaled preparations. By 2008, several small studies had shown that coleus extract and forskolin effectively relax smooth muscle in human airways.

Other allergic conditions, including eczema, may also respond well to forskolin. Levels of cAMP are

reduced in the bronchioles and skin of people suffering from asthma and eczema. The lack of cAMP causes histamine release and subsequent allergic symptoms, including bronchoconstriction and local reaction. Forskolin may be able to prevent the onset of symptoms in susceptible people by increasing cAMP levels. It can theoretically be helpful for any condition that is caused, wholly or partially, by an allergic reaction. Professional help should be sought regarding the use forskolin for this indication, particularly because of potential interactions with other medications used for asthma.

Psoriasis can be treated by taking forskolin supplements. In this condition, skin cells multiply at a rate much greater than normal. Itchy, silvery patches are formed on the skin. This condition may be due to an imbalance of cell regulating chemicals, including cAMP, that can be normalized by forskolin.

Cardiovascular diseases, such as congestive heart failure, angina, and high blood pressure, have the potential to be treated by forskolin. As of 2008, several small studies suggest that the extract appears to relax the smooth muscles in the walls of the arteries. The **relaxation** of the arteries decreases blood pressure, **pain** due to angina, and strain on the heart. Maximum benefit may be achieved in conjunction with other botanicals or medications, such as dobutamine. Cardiovascular effects of forskolin are an active area of research.

Blood vessels in the brain are dilated by forskolin, which could have clinical applications for patients who are at risk of, or recovering from, **stroke**. Forskolin also decreases the risk of abnormal blood clotting. This is another desirable effect for stroke patients and those with other cardiovascular conditions that cause, or result from, increased susceptibility to **blood clots**. However, as of 2008, these effects had not been well studied in humans.

The high pressure inside the eye that occurs with glaucoma has been reduced with forskolin in some small studies in humans. No safety data are available about this use, nor has the effectiveness of forskolin been compared to other products that are available to reduce pressure within the eye.

A 2007 study at Duke University found that forskolin extract injected into mice was effective in treating bladder infections. As of 2008, no research had been done to determine if this benefit carries over to humans taking oral supplements of forskolin.

An infusion of the leaves of *Coleus forskohlii* has traditionally been used in Indian medicine for the treatment of **gas**, bloating, abdominal pain, and menstrual cramps. Other unproven uses include treatment on melanoma (an aggressive **skin cancer**), **AIDS**, **hypothyroidism**, **insomnia**, irritable bowel disease, **schizophrenia**, diabetes, erectile dysfunction, **depression**, **cancer** metastasis, immune dysfunction, and parasites. As of 2008, there was no accepted scientific evidence to indicate coleus/forskolin is effective in treating any of these diseases.

As of 2008, dietary supplements containing forskolin were heavily promoted as an aid to weight loss and building lean body mass. There was no scientific evidence in humans, however, that forskolin is effective in this capacity.

Preparations

Crude preparations of *Coleus forskohlii* may not contain enough forskolin to exert a clinical effect. Forskolin extracts are available. One recommended dose is 50 mg two or three times daily of a preparation containing 18% forskolin. A healthcare provider knowledgeable in the clinical use of botanicals should be consulted before undertaking treatment with this extract.

Precautions

Forskolin can be a powerful medication and has effects on many systems of the body. It has been described as a central nervous system depressant that can cause sedation. It should not be taken without a person being aware of potential effects on other parts of the body. For this reason, professional supervision is recommended.

People with low blood pressure or gastric ulcers may wish to avoid forskolin due to potential exacerbation of these conditions. Children and women who are pregnant or breastfeeding should also avoid this substance. There is some evidence that use of forskolin by pregnant women delays fetal development. Those individuals who have chronic liver or kidney disease should use great caution in taking this medication, particularly if other herbs or medications are being used due to the current lack of data about potential risks.

Side effects

Forskolin does not appear to be toxic based on studies done on animals; however, it has been reported by veterinarians to lower the blood pressure of cats and dogs. As of 2008, the most common side effect reported for coleus leaves is **contact dermatitis** (skin rash) in people who are allergic to the plant. The

KEY TERMS

Angina—Symptoms of pressure or burning in the chest that result from inadequate oxygen in the heart, generally due to coronary artery spasm or blockage.

Antispasmodic—Any substance that relieves or prevents muscle spasm, particularly in smooth muscle.

Ayurvedic medicine—A 5,000-year-old system of holistic medicine developed on the Indian subcontinent. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Beta agonist—Class of substances that relieve bronchoconstriction, among other effects.

Bronchioles—Small tubes in the lungs leading to the alveoli, where gas exchange occurs.

Forskolin—Chemical compound extracted from coleus root that appears to be effective in treating asthma, eczema, colic, and other conditions.

Histamine—A substance released from cells that causes some of the symptoms of an allergic reaction.

overall safety and side effects of forskolin, however, had not yet received in-depth analysis as of 2008.

Interactions

Forskolin may intensify the effects of other medications taken concurrently. Caution should be used when taking any botanical or prescription medication. Forskolin should not be taken in conjunction with anti-asthmatic, anticoagulant, or antihypertensive medications without the supervision of a health care provider.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Yarnell, Eric and Karen Abascal. *Clinical Botanical Medicine,* 2nd rev. ed. Larchmont, NY: Mary Ann Liebert, 2008.

OTHER

"Coleus (*Coleus forskohlii, Lamiaceae*) and Forsklin (Coleonol, HL, 362)." *Intelihealth.com* May 3, 2005. http://www.intelihealth.com/. (April 12, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

National Institute of Ayurvedic Medicine, 375 Fifth Ave., Fifth Floor, New York, NY, 10016, (212) 685 8600, http://niam.com/corp web/index.htm.

Judith Turner
Tish Davidson, A. M.

Colic

Definition

Colic is persistent, unexplained crying and discomfort in an otherwise healthy baby between the ages of two weeks and about five months.

Description

Colic affects 10-20% of all infants. It is more common in boys than in girls and most common in a family's first child. Symptoms of colic usually appear when a baby is 14-21 days old, reach a peak at the age of three months, and disappear within the next eight weeks.

Causes and symptoms

Some babies who have colic are simply fussy. Others cry so hard that their faces turn red, then pale. Episodes may occur frequently but intermittently, usually beginning with prolonged periods of crying in the late afternoon or evening. Crying may intensify, taper off, and then get even louder. It can last for just a few minutes or continue for several hours. During a colicky episode, babies' bellies often look swollen, feel hard, and make a rumbling sound. Many babies grow rigid, clench their fists, curl their toes, and draw their legs toward their body. A burp or a bowel movement can end an attack. Most babies who have colic do not seem to be in **pain** between attacks.

One cause of colic may be the swallowing of large amounts of air, especially during feeding time. Air may then become trapped in the digestive tract and cause discomfort. Other possible causes include:

- immaturity of the digestive system
- food intolerances

- too little or too much food
- lack of sleep
- loneliness
- overheated formula
- overstimulation resulting from too much noise, light, or activity
- stress and tension on the part of the mother and other caregivers
- foods the mother eats, if breast-feeding, which are allergens or irritants for the baby

Diagnosis

Colic is suspected in an infant who:

- has cried loudly for at least three hours a day at least three times a week for three weeks or longer
- is not hungry but cries for several hours between dinnertime and midnight
- demonstrates the clenched fists, rigidity, and other physical traits associated with colic

The baby's medical history and a parent's description of eating, sleeping, and crying patterns are used to confirm the diagnosis of colic. Physical examination and laboratory tests are used to rule out infection, intestinal blockage, and other conditions that can cause abdominal pain and other colic symptoms.

Treatment

Parents should consult their healthcare practitioner before giving any herbal or allopathic medications to very young children. Teas made with **chamomile** (*Matricaria recutita*), **lemon balm** (*Melissa officinalis*), **peppermint** (*Mentha piperita*), **catnip** (*Nepeta cataria*), or dill (*Anethum graveolens*) can lessen bowel inflammation and reduce **gas**. **Slippery elm** powder (*Ulmus fulva*) is soothing and healing for the digestive system. Homeopathic remedies that may be effective for colic include *Bryonia* 30c every five minutes as needed, and *Chamomilla* 6c every five minutes for up to an hour. A homeopath can be further consulted for remedies to help strengthen the child's entire constitution. In addition, it is helpful to give the Bach flower essence called **Rescue Remedy** to the infant and to the caregivers. This will help to calm both baby and caregivers.

Hands-on treatments are often helpful in treating colic. Squeezing the **acupressure** point at the webbing between the thumb and index finger of either hand can calm a crying child. Gently massaging the abdomen with a circular motion can also be soothing. Applying warm compresses over the child's abdomen can also relieve cramping.

Soothing movements may help to calm the baby. Colicky babies cry less when they are soothed by the motion of a swing, a car ride, or being carried in a parent's arms. Taking the infant for a walk may also be soothing and encourage sleep. Rocking the baby in a quiet, darkened room can reduce overstimulation as well.

Giving small, frequent feedings rather than a few large feedings will be easier on digestion for a bottle-fed baby. For those who breastfeed, food allergens can be transmitted through the milk of the mother. Therefore, foods that cause problems in the infant should be removed from the mother's diet. These are most often likely to be coffee, tea, chocolate, citrus fruit, peanuts, wheat, and vegetables belonging to the cabbage family, including broccoli.

Allopathic treatment

Medications do not cure colic. Doctors sometimes recommend simethicone (Mylicon drops) to relieve gas pain. Generally, parents are advised to take a practical approach, using home remedies. However, a doctor should be notified if a baby with colic:

- develops a rectal fever higher than 101°F (38.3°C)
- cries for more than four hours without relief
- vomits
- has diarrhea or stools that are black or bloody
- continually loses weight
- continually eats less than normal

Expected results

Colic is distressing, but it is not dangerous. Symptoms almost always disappear before a child is six months old.

Prevention

To help prevent air from being swallowed during feedings, the infant's back can be gently massaged to release trapped gas bubbles. Keeping the infant in a sitting position while feeding is also helpful. Bottle-fed babies can swallow air if the nipple holes in the bottle are either too large or too small. This can be checked by filling the bottle with formula, turning it upside down, and counting the number of drops released as the bottle is being shaken or squeezed. The hole should allow the release of formula at the rate of one drop per second. Alternatively, a different style of nipple may

improve nursing. A pharmacy should be consulted for additional guidance.

Cow's milk can often be disruptive to an infant's digestion. When cow's milk is the source of the symptoms, bottle-fed babies should be switched to a **soy protein** formula. (Regular soymilk should not be used, as it is not formulated for the nutritional needs of a nursing infant.) Goat's milk is easier to digest than cow's milk, and is also an acceptable substitute. Alternately, a tablespoon of **acidophilus** liquid or powder can be added to eight ounces of the infant's formula. A tablespoon of yogurt can also be used for this purpose. If an intolerance to cow's milk is suspected in a breastfed infant, the mother should eliminate dairy products from her diet, gradually reintroduce after seven days, and monitor the baby's symptoms. This should be done with any suspected allergen or irritating foods.

Resources

BOOKS

Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative & Conventional Treat ments*. Alexandria, VA: Time Life Books, 1996.

Taylor, Robert, ed. *Family Medicine Principles and Practice*. New York: Springer Verlag, 1994.

Weed, Susun. *Wise Woman Herbal for the Childbearing Year*. New York: Ash Tree Publishing, 1986.

ORGANIZATIONS

American Academy of Family Physicians. 880 Ward Park way, Kansas City, MO 64114. http://www.aafp.org.

Patience Paradox

Colitis

Definition

Colitis, also called ulcerative colitis, is an **inflammatory bowel disease** closely related to Crohn's disease. In individuals with colitis, the lining of the colon (large intestine) becomes inflamed, cells lining the wall die, and ulcers form on the colon wall.

General Description

Colitis is an inflammatory bowel disease of uncertain origin. In this disease, the lining of the colon and rectum become inflamed and develop sores (ulcers) that produce pus and mucus. In mild cases, only the lining of the intestine is affected, but in severe cases, these ulcers may penetrate deeper layers of the colon or even perforate (break through) the colon wall. In ulcerative colitis, the inflamed area is continuous and develops only in the rectum and colon. This condition contrasts with Crohn's disease in which the inflamed area develops in patches and can occur in multiple places in the digestive system from the mouth to the rectum.

About 2 million Americans have ulcerative colitis, which is a lifelong disease. The disease develops most often before the individual reaches age 30, although it can develop as late as age 60. People of European ancestry and those of Jewish ethnicity are more likely to develop ulcerative colitis. There is no cure, although treatment can bring symptoms under control or cause them to go into remission (disappear) for long periods.

Causes and symptoms

The cause of colitis is unclear. As of 2008, scientists believed that persons who develop colitis carry an inherited susceptibility to developing the disease. Research has shown that people who have a parent or sibling with colitis are more likely to develop the disease, and identical twins are both highly likely to be affected. However, inheritance does not completely predict who will develop colitis. Researchers believe that when a person with an inherited susceptibility to the disease is exposed to an outside agent, an inappropriate autoimmune reaction is triggered. As a result, the immune system attacks the body's own cells lining the intestine. No single outside trigger agent has been isolated. Suspect agents are bacteria, viruses, and environmental toxins. In the past, it was thought that food **allergies** could trigger colitis. Practitioners of conventional medicine subsequently suspected that this was not the cause, although some alternative medical practitioners continued to accept the food allergy theory.

Symptoms associated with colitis include abdominal **pain** and cramps; frequent, urgent bowel movements; **diarrhea** and blood, pus, and mucus in the stool; and **fever**. Other signs of colitis occur because the disease interferes with the ability of the digestive system to absorb nutrients. These symptoms include **fatigue**, loss of appetite, weight loss, dehydration, and in severe cases, electrolyte imbalance. Because the immune system responds inappropriately, other parts of the body may be affected. The individual may develop joint pain, liver, kidney, and eye problems, and skin **rashes**. Although colitis is not caused by **stress** or food allergies, stress and certain foods tend to worsen symptoms.

Diagnosis

Symptoms of colitis mimic those of several other bowel diseases. Colitis is often diagnosed after extensive testing has ruled out other causes. After a health history and physical examination, the physician will order additional tests, including blood tests and a stool sample. The stool sample is examined for blood and parasites. Imaging tests include a barium enema and x rays of the intestine. By cleansing the intestine and filling it with barium, a white, chalky, non-toxic substance, abnormalities of the bowel are more easily seen on the x-ray film. Ultrasound and computed tomography, two non-invasive imaging techniques, may also be done. A definitive diagnosis is usually obtained by a colonoscopy, an invasive procedure that allows the physician to examine the colon lining for the entire length of the colon.

Treatment

The goal of colitis treatment is to control symptoms. As of 2008, there was no cure for the disease. Treatment is individualized and depends on the severity of the disease, but usually conventional pharmaceuticals are needed. Nevertheless, complementary treatments listed below often help relieve symptoms and improve quality of life when used with conventional treatment. Patients should discuss the use of complementary treatments with their physician before beginning any treatment.

Diet

Certain foods seem to worsen symptoms of colitis in many people. Individuals must determine their own problem foods and learn to avoid them. General suggestions for dietary changes that help many people include the following:

- Drink 8–10 glasses of water or clear fluids daily to prevent dehydration, which is especially important for people who have frequent watery bowel movements.
- Avoid high fiber foods. If symptoms are under control, some high-fiber foods may gradually be added back into the diet.
- Experiment with whether dairy products worsen symptoms; many people find that milk and cheese seem to exacerbate their symptoms.
- Avoid caffeine because it stimulates the digestive tract.
- Avoid drinking alcohol.
- Eat a low-fat diet.
- Eat smaller, more frequent meals.

Herbs

Certain herbal remedies have been shown to improve symptoms for some people. These include the following:

- Psyllium. Recommended by both alternative and conventional physicians, psyllium absorbs water and adds bulk to the stool.
- Boswellia resin (*Boswellia sacra*.) is thought to have anti-inflammatory properties. In a small study, when taken with sulfasalazine (a pharmaceutical drug), it increased the number of patients whose symptoms went into remission.
- Aloe (*Aloe vera*) juice or oral gel is thought to improve the chance of remission.
- Turmeric *Curcuma longa* is thought to have useful anti-inflammatory properties.

Supplements

Many people with moderate to severe symptoms develop vitamin and mineral deficiencies that need to be corrected with supplements and/or a multivitamin. Alternative practitioners also recommend a wide range of supplements that have shown mixed results in small trials. Some of these are:

- Probiotics. Probiotics are beneficial living organisms, usually bacteria that supplement the beneficial bacteria normally found in the intestines. Some studies have found that a non-disease producing strain of *Escherichia coli* helps some people with ulcerative colitis remain in remission. Probiotics and their effects on digestive diseases were active areas of research in 2008. Several Food and Drug Administration approved clinical trials of probiotics were being conducted in the United States for people with colitis. Information on trials enrolling participants is available at the Clinical Trials Web site (http://www.clinicaltrials.gov). There is no cost to the patients who participate.
- Fish oil. Some studies have found that fish oil supplements increased weight gain and decreased the need for anti-inflammatory drugs, while others found fish oil was ineffective in patients with ulcerative colitis.
- Folic acid (Vitamin B-9). Sulfasalazine inhibits the absorption of folic acid, so people taking this drug may need supplementation. However, taking folic acid supplements can mask a vitamin B-12 deficiency, so people taking folic acid may also need to take B-12.
- Dehydroepiandrosterone (DHEA). This natural steroid hormone is produced in small amounts by the body. Improvement was seen only with large

supplement doses with a high likelihood of undesirable side effects.

- Iron. People who have a lot of blood in their stool are at risk of becoming iron deficient.

Stress reduction

Although stress does not cause colitis, it often worsens symptoms, so stress reduction techniques should be incorporated into the daily routine.

- Exercise. Mild to moderate exercise can help stabilize bowel function and improve mood.
- Yoga helps to relax the body and relieve tension.
- Meditation calms the body and mind.
- Biofeedback training helps individuals have more control over their body and allows individuals to consciously enter a relaxed state.
- Support groups allow people to share tips and frustrations in an atmosphere of mutual understanding.

Allopathic treatment

Conventional medicine treats the symptoms of ulcerative colitis primarily with pharmaceutical drugs, although many conventional practitioners also recommend some of the complementary therapies suggested above.

Medications used to treat diarrhea symptoms include diphenoxylate (Lomotil, Lofene), and loperamide (Imodium, Kaopectate). Anticholinergic drugs, which block the communication between nerves and muscles and thus reduce contraction of the intestine, include Anaspaz, Cystospaz, and Bentyl.

Anti-inflammatory drugs are at the heart of conventional medical treatment for ulcerative colitis. Sulfasalazine is the most common anti-inflammatory drug used because patients can take it for long maintenance periods, and it can be given with other drugs. Other anti-inflammatories include Asacol and Pentasa. If these drugs do not provide adequate symptom relief, patients may be given corticosteroids such as prednisone. Corticosteroid drugs have substantial side effects and can be taken only for a short time during symptom flare-ups.

People with severe symptoms and complications beyond the digestive system may be hospitalized and given intravenous (IV) steroid drugs or drugs that suppress the immune system. Since colitis is suspected of being caused by an inappropriate immune system response, suppressing the activity of the immune system should reduce symptoms. Once a flare-up is controlled, the patient continues on a maintenance dose of some combination of diarrhea-control, anti-inflammatory, and immunosuppressant drugs.

KEY TERMS

Colonoscopy—A procedure in which the colon is cleansed and the a lighted fiber optic instrument is inserted through the anus to allow the physician to view the entire length of the colon and detect abnormalities in the colon lining, including polyps and ulcers.

Electrolyte—Ions in the body that participate in metabolic reactions. The major human electrolytes are sodium (Na+), potassium (K+), calcium (Ca 2+), magnesium (Mg2+), chloride (Cl-), phosphate (HPO4 2-), bicarbonate (HCO3-), and sulfate (SO4 2-).

Rectum—The last few inches of the large intestine that store waste until it is eliminated from the body through the anus.

Steroid—A family of compounds that share a similar chemical structure. This family includes estrogen and testosterone, vitamin D, cholesterol, and the drugs cortisone and prednisone.

Between 25% and 40% of people with ulcerative colitis develop symptoms so severe that they eventually need surgery to remove their colon. When the colon is removed, the final portion of the small intestine is connected to a hole (stoma) in the abdomen. The individual wears a bag outside the body to collect waste. The bag must be emptied at regular intervals. Alternately, if part of the rectum is left intact the small intestine may be connected directly to the rectum after the colon is removed. Waste leaves the body through the anus in the regular manner. Bowel movements are more frequent and watery, as fluid that would normally be absorbed in the colon now passes out of the body.

Expected results

Colitis cannot be cured. Most people go though periods of remission followed by periods of flare-ups when symptoms worsen. Remission can last from months to years depending on the individual.

Prevention

Ulcerative colitis cannot be prevented. About 5% of people who have ulcerative colitis later develop colon **cancer**. Regular yearly colonoscopies can detect colon cancer early when it can be easily treated.

Resources

BOOKS

Harper, Virginia. *Controlling Crohn's Disease: The Natural Way*. New York: Kensington, 2002.

OTHER

"Colitis." *eMedicineHealth.com* October 4, 2005. [cited April 6, 2008]. http://www.emedicinehealth.com/colitis/article_em.htm.

"Ulcerative Colitis." *Mayo Clinic* August 17, 2007 [cited April 6, 2008]. http://www.mayoclinic.com/health/ulcerative colitis/DS00598.

"Ulcerative Colitis." *PeaceHealth.org* September 1, 2007 [cited April 6, 2008]. http://www.peacehealth.org/KBASE/cam/hn 1282001.htm.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

Crohn's & Colitis Foundation of America, 386 Park Avenue South, New York, NY, 10016, (800) 932 2423, http://www.ccfa.org.

National Digestive Diseases Information Clearinghouse (NDDIC), 2 Information Way, Bethesda, MD, 20892 3570, (800) 891 5389, http://digestive.niddk.nih.gov.

Tish Davidson, A. M.

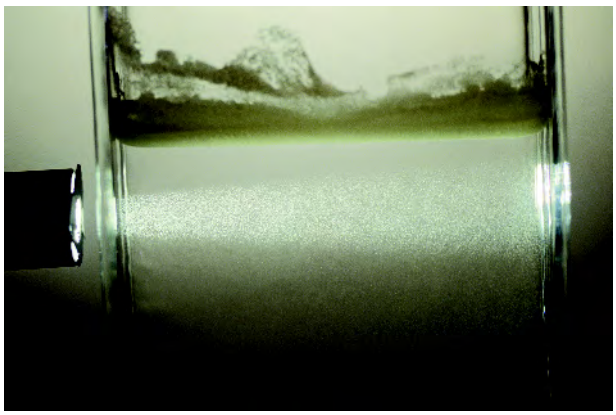
Colloidal silver

Description

A colloid is a suspension of submicroscopic particles in a medium of a different material. Colloidal silver is metallic silver suspended in water.

Some minerals are required in the diet for optimum health. These are known as essential minerals. Contrary to claims by some manufacturers of colloidal products, silver is not an essential mineral.

On the other hand, silver undoubtedly has antimicrobial properties, as do some other metals such as **copper**. Historically, coins or other items made of silver were used to help keep water from becoming contaminated and to keep milk fresh for longer periods when refrigeration was not available. This method may still be used today in some remote areas of the world. Silver is also impregnated into some water filtration systems used both for swimming pools and for drinking water.



Light shines through a colloidal solution. *(Charles D. Winters / Photo Researchers, Inc.)*

Despite the proven antibacterial, antiviral, and antifungal properties of silver in vitro, it is unclear whether it can exert the same effects when taken into the body. It is unclear what concentration of silver reaches the area where the infection is occurring before being bound, disseminated, or excreted. Another question is whether the ingested silver would have an adequate time of contact with the target organisms to produce the desired effect. Silver has a greater chance of benefiting a patient with local and topical **infections**.

Colloidal silver products are often touted as the answer to the problem of microbial resistance to antibiotics. While it is certainly true that antibiotics are overused, leading to antibiotic-resistant bacteria, substantive evidence that colloidal silver is a safe and effective replacement for antibiotics does not yet exist.

General use

Silver is already used in some compounds that are commonly used against infections. Silvadine is a frequently used agent to prevent infection in burn patients. Silver nitrate was used in the eyes of newborns for years to prevent blindness caused by contracting **gonorrhea**, a sexually transmitted disease (STD), during the passage through the birth canal. The medication was not, however, effective against **chlamydia**, another STD that causes neonatal **conjunctivitis**. Silver nitrate can also be very irritating to the tissues of the eye. Erythromycin and tetracycline are now more frequently used in the United States for neonatal prophylaxis.

The claims made for colloidal silver are innumerable. Silver has been said to be effective against hundreds of **strains** of bacteria, and to be supportive in the treatment of colds and flu, **hepatitis**, Epstein-Barr

KEY TERMS

Antimicrobial—A substance that destroys or inhibits the growth of disease-causing organisms.

Epstein-Barr—A virus in the herpes family that causes mononucleosis and other diseases.

In vitro—An artificial environment; not in a living organism.

virus, **pneumonia**, **bronchitis**, and yeast infections. It has also been recommended for topical use in the mouth, eyes, ears, nose, sinuses, and for a wide variety of skin conditions. It is difficult to determine which of the claims, if any of them, have merit because substantive research data are lacking. Most of the reported effects are based on in vitro or anecdotal evidence. Extrapolations from such testimonials would be challenging due to the variability in particle size, concentration, quality of the preparation, and total dose.

Preparations

Silver colloid is created by grinding, wave method (such as ultrasonic), liquid, chemical, or electrical modes of manufacture. Methods vary according to how large the particles of silver are that are produced, and whether they carry an electrical charge. Particles that are very small and charged repel each other enough that they tend to remain in a suspended state for a longer time rather than settling. Currently, the electrocolloidal process is the most used, and considered to be the best at creating very small, charged particles.

Colloidal silver may be purchased ready for use, but products have been found to be inconsistent in content, varying from 15–120% of the silver concentration they are labeled to contain. Commercially produced products vary greatly in particle size, potency, stability, and contents. Some contain stabilizers or trace elements in addition to silver, which are considered undesirable. Others have been found to have bacterial contaminants.

The Food and Drug Administration (FDA) at one time considered it a medication that was exempted from the standard regulations as a result of being used and marketed prior to 1938. Since that time, the exemption has been revoked. In the United States, silver is now considered a dietary supplement as opposed to an over-the-counter medication. As such, specific claims to benefit or treat medical conditions cannot be made.

As an alternative to manufactured colloidal silver products, assorted kits are available to make colloidal silver for personal use. These kits generally use an electrical current to disperse particulate silver into the carrier. Important factors for producing colloidal silver at home are the purity of the silver, the purity of the water, and proper timing to form the desired concentration. Stability of the colloid is variable, and the silver will tend to gradually settle as the charge on the particles dissipates.

Precautions

The deposition of silver under the skin can cause a condition called argyria. This condition is not common, but the skin of those who are affected is permanently stained a blue or gray color. The type of silver compound, length of treatment, concentration, and total dose required to cause argyria is a matter of some debate. There seems to be a great individual variation in susceptibility. Proponents claim that the true colloidal form of silver cannot cause the condition, but for safety purposes, all silver consumed should be considered a potential contributor to argyria. Some colloidal silver products include this warning on the label.

Extremely large doses of silver, much beyond what is recommended by proponents for therapeutic use, may cause neurologic signs or organ damage. Most of the studies of toxicity have been performed using salts of silver, such as silver nitrate, which have a higher silver concentration and greater toxicity than colloidal forms. The latter are generally in the range of 5–10 parts per million (PPM), which is equal to a 0.0005–0.001% solution.

Side effects

There are no reported side effects.

Interactions

Interaction of colloidal silver with foods, medications, or herbs are not documented.

Resources

BOOKS

Baranowski, Zane. *Colloidal Silver: The Natural Antibiotic Alternative*. New York: Healing Wisdom Publications, 1995.

OTHER

Barrett, Stephen. *Colloidal Silver: Risk Without Benefit*. http://www.quackwatch.com/01QuackeryRelatedTopics/PhonyAds/silverad.html. 1999.

Hill, John. *A Brief History of Silver and Silver Colloids in Medicine*. http://www.clspress.com/history.html. 1998.
Weil, Andrew. *Charmed by Colloidal Minerals?* http://www.pathfinder.com/drweil/qa_answer/0,3189,252,00.html. 1997.
Weil, Andrew. *Colloidal Silver: Better than Antibiotics?* http://www.pathfinder.com/drweil/qa_answer/0,3189,1665,00.html. 1999.

Judith Turner

Colonic irrigation

Definition

Colonic irrigation is also known as **hydrotherapy** of the colon, high colonic, entero-lavage, or simply colonic. It is the process of cleansing the colon by passing several gallons of water through it with the use of special equipment. It is similar to an enema but treats the whole colon, not just the lower bowel. This has the effect of flushing out impacted fecal matter, toxins, mucous, and even parasites, which often build up over the passage of time. It is a procedure that should only be undertaken by a qualified practitioner.

Practitioner massaging a patient's lower abdomen during colonic irrigation, a procedure in which the colon is flushed out with water or another liquid. *(Annabella Bluesky / Margie Finchell / Photo Researchers, Inc.)*

Origins

Cleansing the colon with the use of hydrotherapy is not a new concept. Forms of colonic irrigation have been used successfully for decades to relieve chronic toxicity and even acute cases of toxemia.

Benefits

Anyone suffering from **gas**, bloating, cramping pains, **acne** and other skin complaints, arthritis, and a list of bowel complaints such as **diverticulitis** and irritable bowel etc., may benefit from colonic irrigation. In particular, **cancer** patients are often advised to undertake a course of colonic irrigation sessions as an essential part of their treatment. When a biological cancer therapy begins to enable the body to breakdown a cancerous mass, it is essential that speedy and effective elimination of the resulting toxins is achieved.

Colon and bowel cancer remain among the leading causes of death in the United States, and alternative practitioners suggest that it can be prevented by efficient hygiene procedures. Providing that care is taken to replace the natural organisms that flourish in the bowel, many health benefits can be expected from colonic irrigation. In general, alternative practitioners maintain that an ill-functioning bowel is the source of all disease, and therefore keeping it clean will be an effective protection against disease.

Removing large amounts of toxic matter relieves the patient and can lead to the alleviation of symptoms such as arthritis, **chronic fatigue syndrome**, candidiasis, and a host of other illnesses. Properly executed, colonic irrigation can help restore normal peristaltic action to a sluggish bowel, thus reducing the need for more hydrotherapy treatments over time. In addition, removing the layer of fecal matter which coats the intestines in many individuals allows improved assimilation of the nutrients from foods and can alleviate symptoms of vitamin and other nutrient deficiencies. Many alternative health practitioners consider some form of hydrotherapy for the bowel to be essential in the treatment of degenerative diseases.

KEY TERMS

Dysbiosis—The condition that results when the natural flora of the gut are thrown out of balance, such as when antibiotics are taken.

Peristalsis—The natural wave-like action of a healthy bowel that transports matter from one end of the bowel to the other.

Probiotics—Supplements of beneficial microorganisms that normally colonize the gut.

Toxemia—Poisoning of the blood.

Description

Over time, many people develop a thick layer of fecal matter that coats their colon. It hardens and becomes impacted, reducing the efficiency of the bowel, and in some cases completely obstructs normal elimination of waste matter from the body. It is quite common for people to only have one bowel movement per day, some as few as one or two per week.

Alternative practitioners advise that we probably should have one bowel movement for every meal that we eat. If not, then we are not eliminating wastes completely, and if input exceeds output, then we will surely suffer the consequences at some point.

Incomplete elimination of body wastes may result in the following, depending on where the deposits end up:

- sluggish system
- joint pain and arthritis
- irritable bowel syndrome
- diverticulitis
- Crohn's disease
- leaky gut syndrome
- heart problem
- migraine
- allergies
- bad breath
- acne and other skin problems such as psoriasis
- asthma
- early senility and Alzheimer's disease
- chronic fatigue syndrome
- cancer, particularly of the bowel
- multiple sclerosis

During colonic irrigation, a small speculum is passed into the patient's bowel through the rectum. This is attached to a tube, which leads to a machine that pumps temperature-controlled water into the colon at a controlled rate (to be controlled by either the practitioner or the patient). The temperature of the water should ideally be kept as close to body temperature as possible.

The patient will temporarily be filled with water up to the level of the entire colon. Patients say they can feel the water up under their ribs but that the process, although sometimes uncomfortable, is not painful. The amount of water will vary but will generally be in the region of between two and six liters (or quarts) at any one time. This triggers peristaltic action and the patient will begin to expel the water along with fecal matter back through the tube and into the machine.

The fecal matter is flushed out through a viewing tube, so that what is eliminated may be monitored. Quite often, unsuspected parasites are expelled, along with very old fecal material, very dark in color, which may have been in the colon for years. Some therapists comment that it looks like **aging** rubber.

During the treatment, the therapist will gently massage the patient's abdomen to help dislodge impacted fecal matter. In addition to massage, sometimes **acupressure**, **reflexology**, or **lymphatic drainage** techniques may be used to loosen deposits and stimulate the bowel. It is important that the right amount of water is used, as too much will cause discomfort and too little will be ineffective. If correctly done, colonic irrigation is not painful at all and some patients claim to sleep through their treatment.

Sanitation is vital to this process. The tubes and speculums used are generally disposable, but other parts of the machine, such as the viewing tube, must be sterilized after each patient.

Normally, a series of treatments will be required to achieve desired results regarding the elimination of impacted, decaying matter, and restoration of bowel regularity. Initially only gas and recent fecal matter may be expelled. The residue attached to the colon wall is usually the result of years of neglect, and therapists say that one cannot expect complete relief in only one session.

Impacted fecal matter can cause an imbalance of the natural organisms that normally populate the bowel, causing what is known as dysbiosis. Under ideal conditions, the bowel is populated by a variety of naturally occurring organisms. It seems that the enzymes occurring in fresh fruit and vegetables encourage these beneficial organisms. One of the results of eating processed denatured foods is that this natural

balance is upset, and food may begin to rot in the bowel instead of being processed.

Decomposing matter can cause a toxic condition and may lead to many health problems, as **constipation** causes backed up pollution of the body cells. The process of repair and elimination of wastes enters a downward spiral which at best will cause **fatigue**, lack of energy and premature aging, and at worst can cause degenerative diseases, among them **allergies**, and even cancer and **Alzheimer's disease**.

The cost of colonic irrigation treatments varies, but is generally between $35-70 per session, which may last from 45 minutes to one hour. The cost of the machine itself ranges from $4,000-12,000, but again, it should be noted that only qualified therapists should conduct sessions.

Preparations

Most practitioners prefer that distilled or purified water is used for colonic irrigation, but others use sterilized tap water.

Precautions

It may be advisable to use a probiotic pessary after colonic irrigation, to ensure replacement of desirable natural flora. There are certain conditions that either partly or completely preclude the use of colonic irrigation, such as an active attack of **Crohn's disease**, bleeding ulcers, and hyperacidosis. If in doubt, a qualified practitioner should be consulted. Anyone suffering from these conditions should always notify the practitioner when receiving colonic irrigation treatments.

Side effects

Some allopathic practitioners claim that colonic irrigation flushes out essential electrolytes and friendly bacteria from the bowel and that it can be dangerous. Practitioners counter that this can easily be remedied with the use of **probiotics**, and that in any case, these possible disadvantages are easily offset by the benefits of having large amounts of putrefying matter, harmful organisms, and parasites removed from the system.

Research and general acceptance

Although many alternative health care practitioners swear by colonic irrigation, there is a large allopathic lobby that claims that there are no benefits to be had, and that there are dangers involved. However, there are many decades of records and research from the alternative health care community that indicate that this therapy may have a valuable place in the treatment of degenerative diseases and toxic conditions.

Training and certification

Trained technicians should conduct colonic irrigation sessions.

Resources

BOOKS

Bonk, Melinda, ed. *Alternative Medicine Yellow Pages*. Tiburon, CA: Future Medicine Publishing, Inc., 1994.

ORGANIZATIONS

California Colon Hygienist Society. 333 Miller Ave., Suite 1, Mill Valley, CA 94941. (415) 383 7224.

Intestinal Health Institute. 4427 East Fifth St., Tucson, AZ 85711. (520) 325 9686. info@sheilas.com. http://www.sheilas.com.

Patricia Skinner
Teresa G. Odle

Color therapy

Definition

Color therapy, also known as chromatherapy, is based on the premise that certain colors are infused with healing energies. The therapy uses the seven colors of the rainbow to promote balance and healing in the mind and body.

Origins

Color therapy is rooted in Ayurveda, an ancient form of medicine practiced in India for thousands of years. Ayurveda is based on the idea that every individual contains the five basic elements of the universe: earth, water, air, fire, and ether (space). These elements are present in specific proportions unique to an individual's personality and constitution. When these elements are thrown out of balance through unhealthy living habits or outside forces, illness results. **Ayurvedic medicine** uses the energies inherent in the colors of the spectrum to restore this balance.

Color therapy was also used in ancient Egypt and China. In **traditional Chinese medicine** (TCM), each organ is associated with a color. In **qigong**, healing sounds are also associated with a color, which in turn corresponds to a specific organ and emotion.

KEY TERMS

Aromatherapy—The therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological well-being.

Hydrotherapy—Water therapy; the use of water (hot, cold, steam, or ice) to relieve discomfort and promote physical well-being.

Yoga—An Indian philosophical and health movement that strives to achieve balance through relaxation, meditation, breathing exercises, and body movements.

Benefits

Each of the seven colors of the spectrum are associated with specific healing properties.

Violet

Violet promotes enlightenment, revelation, and spiritual awakening. Holistic healthcare providers use violet to soothe organs, relax muscles, and calm the nervous system.

Indigo

Indigo is also sedative and calming. It is said to promote intuition. Indigo may be useful in controlling bleeding and abscesses.

Blue

Blue promotes communication and knowledge. It eliminates toxins, and is used to treat liver disorders and **jaundice**.

Green

Because it is located in the middle of the color spectrum, green is associated with balance. Green is calming, and is used by Ayurvedic practitioners to promote healing of ulcers. It is said to have antiseptic, germicide, and antibacterial properties and is sometimes used by holistic color therapists to treat bacterial **infections**.

Yellow

Yellow is a sensory stimulant associated with wisdom and clarity. Yellow is thought to have decongestant and antibacterial properties, and is useful in stimulating both the digestive system and the lymphatic system.

Orange

Orange promotes pleasure, enthusiasm, and sexual stimulation. Ayurvedic practitioners believe it has antibacterial properties and may be useful in easing digestive system discomforts (e.g., flatulence, cramps).

Red

Red promotes energy, empowerment, and stimulation. Physically, it is thought to improve circulation and stimulate red blood cell production.

Description

The color spectrum is composed of different frequencies and wavelengths of light energy. Ayurvedic medicine uses the energy of colors to promote harmony and healing. The colors are said to be imbued with certain healing properties (i.e., red is energizing, blue is calming) and the vibrations generated by each color balance the individual.

Holistic healthcare providers who practice color therapy often relate the seven colors of the color spectrum to specific areas of the body known as the *chakras*. In **yoga**, the chakras are specific spiritual energy centers of the body. The therapeutic action of colors is related to the chakra they represent:

- first (root; or base of spine): red
- second (sacral; or pelvis/groin area): orange
- third (solar plexus) chakra: yellow
- fourth (heart) chakra: green
- fifth (throat) chakra: blue
- sixth (brow) chakra: indigo
- seventh (crown) chakra: violet

Therapeutic color can be administered in a number of ways. Practitioners of Ayurvedic medicine wrap their patients in colored cloth chosen for its therapeutic hue. Patients suffering from **depression** may be wrapped in reds and oranges chosen for their uplifting and energizing properties. Patients may also be bathed in light from a color-filtered light source to enhance the healing effects of the treatment.

Another method of color therapy treatment recommended in Ayurvedic medicine is to treat water with color and then drink the water for its purported healing properties. This is achieved by placing translucent colored paper or colored plastic wrap over and around a glass of water and placing the glass in direct sunlight so the water can soak up the healing properties and vibrations of the color.

Color may also be used environmentally to achieve certain calming or healing effects. Paint, wall

and window treatments, furniture, and decorative accessories may all be selected in specific color families. Clothing may be chosen in specific colors for its healing properties.

Color therapy can be used in conjunction with both **hydrotherapy** and **aromatherapy** to heighten the therapeutic effect. Spas and holistic healthcare providers may recommend color baths or soaks, which combine the benefits of a warm or hot water soak with healing **essential oils** and the bright hues used in color therapy.

Because color is composed of different light frequencies, certain types of music and **sound therapy** are sometimes used as a companion to the treatment by holistic healthcare providers. One such method, known as the 49th Vibrational Technique, uses a mathematical formula to translate the inaudible vibrations produced in the color spectrum to their audible counterparts. Red is associated with the musical note G, orange is A, yellow is A#, green is C, blue is D, indigo is D#, and violet is E. By combining both visual colors and their audible frequency counterparts, the therapeutic value of the color frequency is thought to be enhanced.

Preparations

Before administering any treatment, practitioners of Ayurvedic medicine will perform a thorough examination of and interview with the patient to determine his *prakriti*, or constitution. In Ayurveda, an individual's prakriti is determined at conception and remains unchanged during his or her lifetime. Treatment colors will be chosen based on the prakriti and the individual's specific imbalance of *doshas*, or energies. There are three doshas—vata, pitta, and kapha—that correspond to a person's temperament and body type. Most are a combination of the three (tridosha) with one predominating.

In some cases, holistic providers may take a photographic image of the patient's aura, or individual energy field, using a special camera that reads electrical impulses from the patient's hands. The camera produces an image of the patient with bands of color(s) around the body. The colors are then analyzed to determine the patient's unique aura energy pattern, and to decide what type of color therapy would be complementary to that aura.

Precautions

While color therapy may be an effective treatment for promoting **relaxation** and overall well-being, and as an adjunct, or complementary therapy in treating some disorders and illnesses, individuals with serious chronic or acute health problems should not rely solely on the therapy for treatment. Anyone with a chronic or acute health concern should seek the advice of a qualified medical practitioner.

Side effects

There are no known side effects to common practices of color therapy.

Research and general acceptance

Ayurvedic medicine has been a firmly entrenched practice of medicine in India for thousands of years. However, it is largely regarded as a complementary practice in the United States, although its popularity has grown in recent years as Ayurvedic spas and medical practices have grown in number. The benefits of color therapy have not been researched extensively and it is still considered a fringe therapy by the allopathic medical community.

Training and certification

Individuals practicing as color therapists and/or practitioners of Ayurvedic medicine do not require special certification or licensing.

Resources

BOOKS

Klotsche, Charles. *Color Medicine: The secrets of color/vibrational healing*. Sedona, AZ: Light Technology Publishing.

Lad, Vasant. *The Complete Book of Ayurvedic Home Remedies*. New York: Three Rivers Press, 1998.

PERIODICALS

Sandroff, Ronni. "Color Me Healthy." *Vegetarian Times* (June 1999): 46 48.

Paula Ford-Martin

Colorectal cancer

Definition

Colorectal **cancer** is a malignancy of the colon (bowel) and/or rectum. Excluding skin cancers, colorectal cancer is the third most common cancer diagnosed in men and in women in the United States. The American Cancer Society reported that about 112,000 new cases of colon cancer (55,000 men and 57,000 women) and 41,500 new cases of rectal cancer

(24,000 men and 17,500 women) were diagnosed in 2007. Colorectal cancer is the second leading cause of cancer-related deaths in the United States and is expected to have caused about 52,000 deaths (26,000 men and 26,000 women) in 2008.

Description

Colorectal cancer occurs in either the last 6 ft (1.8 m) of intestine, known as the large bowel or colon, and/or in the rectum, where the colon terminates and waste (feces) leaves the body. The majority of malignancies that occur in colorectal cancers are called *adenocarcinomas*. When an individual develops colorectal adenocarcinomas, malignant cancer cells grow inside the colon and/or the rectum. Large clusters of these cells form structures known as tumors.

Causes and symptoms

Causes and risk factors

The exact cause of colorectal cancer is unknown. However, there are a number of known risk factors that increase the odds for developing the disease. They include:

- Family history. Individuals who have one or more close relatives who were diagnosed with colorectal cancer may be at increased risk for the disease. In 2003, research showed that about 5% of colorectal cancer patients had inherited syndromes.
- History of bowel disease and/or colon polyps. Certain types of colon polyps, which are tumor-like, benign outgrowths of tissue within the colon, may act as an early warning sign of or a precursor to colorectal cancer. They may develop into malignancies later in life. Colon diseases that cause inflammation and irritation of the bowel, such as Crohn's disease and inflammatory bowel disease, also can increase an individual's risk of developing a colorectal malignancy.
- Obesity. Overweight individuals, especially those with an apple-shaped body type (where fat is concentrated around the waist) as opposed to a pear-shaped body (where fat is stored in the hips and thighs), are at an increased risk for colorectal cancer. A high fat diet also increases an individual's chance of developing colorectal cancer.
- Age. Individuals over age 50 are at an increased risk for colorectal cancer.
- Sedentary lifestyle. A moderate exercise program is thought to have a preventive effect against cancer.
- Night work. A 2003 study showed that working the night shift actually may increase risk of colorectal cancer in women. Exposure to light at night suppresses the body's natural production of melatonin, a hormone that helps keep certain intestinal cancers from proliferating.

Symptoms

Symptoms of colorectal cancer include:

- blood on the rectum or in the stool
- feelings of fecal urgency (feeling as if one has to have a bowel movement all the time)
- stomach and/or abdominal pain
- changes in bowel habits, including constipation, diarrhea, and/or pencil-thin stools
- extreme fatigue
- decreased appetite

Diagnosis

Early diagnosis is critical in successfully treating colorectal cancer. The simplest screening tests for colorectal cancer are a digital rectal exam and a fecal occult blood test (FOBT). In the digital rectal exam, a physician inserts a gloved finger into the rectum and feels for any irregularities. In the FOBT, stool samples are tested for traces of blood. The test can be done at home and sent to a lab for analysis. FOBT can reduce the death rate by about 33%. Unfortunately, in the United States, less than 35% of the population has received a FOBT.

A flexible sigmoidoscopy and/or a colonoscopy may be performed to view the interior of the colon. The former examines the rectum and lower colon for cancer, and the latter examines the full length of the colon. During these procedures, a doctor passes a flexible tube with a tiny, fiber-optic camera device (an endoscope) through the rectum and into the colon. The doctor can carefully examine the lining of the intestine for signs of cancer. Also, if a polyp is found during the examination, it is removed, usually by severing it with a sharp wire loop attached to the device. Since all polyps are removed, it prevents nonmalignant ones from developing into cancer. A tissue sample (a biopsy) of the colon is usually taken through the endoscope to examine under a microscope for evidence of malignancy. Both tests can cause discomfort and may be done under a local anesthetic if desired.

A lower GI (gastrointestinal) x-ray series can be helpful in determining how much of the intestine is involved in the disease. A chalky solution called barium, which acts as a contrast agent to illuminate the gastrointestinal tract on x-ray film, is administered

in enema form to the patient. In some cases, air also is pumped into the rectum to provide a clearer view of the large intestine. This is called a double-contrast barium enema. The pressure in the patient's abdomen from the air and barium contrast likely will cause some discomfort.

As of 2007, researchers were developing alternative screening methods that caused less or no discomfort compared to an endoscope. An x-ray technique using computed tomographic scanning (a CT scan) called virtual colonoscopy was in limited use as of 2007. Other methods being developed would use feces or blood samples to screen for cancer.

Several reasons are given for the low percentage of people over the age of 50 who get screened for colorectal cancer. One is that the procedure is uncomfortable and time-consuming. Another disincentive is the laxative preparation usually required prior to a colonoscopy. It is hoped that newer, less invasive detection techniques will increase the percentage of people who get tested.

For most people, a colonoscopy or sigmoidoscopy is recommended starting at age 50 and then repeated every 10 years for a colonoscopy and every five years for a sigmoidoscopy. Colonoscopies were first used in 1969.

After colorectal cancer is diagnosed, further testing is required to determine how far the cancer has spread. This procedure is known as staging. There are five different stages of colorectal cancer:

- Stage 0 (carcinoma in situ). The earliest stage of colorectal cancer indicates that cancerous cells have not spread beyond the colon lining.
- Stage I. The cancer has spread to the second and third layers of the inside wall of the colon but is still contained within the colon.
- Stage II. The cancer has spread beyond the colon but has not spread to the lymph nodes.
- Stage III. The cancer has spread to a nearby lymph node but has not spread throughout the body.
- Stage IV. The cancer has spread throughout the body.

There is a sixth subtype of cancer, called recurrent, which is used to classify colorectal cancer that was treated, seemed to resolve, and later recurs either in the colon or in another part of the body.

Treatment

The best chance for successful treatment is to detect colorectal cancer early. Colorectal cancer is a life-threatening disease, and a correct diagnosis and appropriate treatment with surgery, chemotherapy, and/or radiation is critical to controlling the illness.

Acupuncture and **guided imagery** may be useful tools in treating **pain** symptoms and improving immune function associated with colorectal cancer. Acupuncture involves the placement of a series of thin needles into the skin at targeted locations on the body, known as acupoints, in order to harmonize the energy flow within the human body.

Guided imagery involves creating a visual mental image of pain as a means of **relaxation**. Once the pain can be visualized, patients can adjust the image to make it more pleasing, and thus more manageable to them.

Movement therapies, such as **yoga**, t'ai chi, and **qigong** can aid recovering patients. These therapies may lessen pain symptoms and help individuals to relax and reduce **stress**.

A number of herbal remedies also are available to lessen pain symptoms and promote relaxation and healing. However, cancer patients should consult with their healthcare professional before taking them. Depending on the preparation and the type of herb, these remedies may interact with or enhance the effects of other prescribed medications. Herbs that promote healing of the digestive tract include **slippery elm** bark (*Ulmus rubra*), **marsh mallow** root (*Althaea officinalis*), and **goldenseal** (*Hydrastis canadensis*).

An analysis of five previous studies of nearly 1,500 participants reported that getting the recommended daily dosage of **vitamin D** can greatly reduce the risk of getting colorectal cancer. The study projected a two-thirds reduction in the risk of getting colorectal cancer for people who took 2,000 IU of vitamin D daily. As of 2007, the U.S. Food and Drug Administration (FDA) recommended that adults ages 50–70 should have a daily intake of 400 IU of vitamin D. The maximum safe daily intake set by the FDA of vitamin D is 2,000 IU.

Allopathic treatment

Treatment options include surgery, chemotherapy, and radiation. Colorectal cancer is treated in two ways, locally to eliminate tumor cells from the colon by surgery and radiation, and to systemically destroy cancer cells that have traveled to other parts of the body. Systemic therapy includes the use of chemotherapy drugs.

Surgery

The extent of surgery depends on the type of colorectal cancer, whether the disease has spread,

and the patient's age and health. A surgical procedure known as a bowel resection is performed for colon cancers, where the length of colon containing the cancerous cells is removed, along with nearby tissues and lymph nodes. The two ends of the remaining colon are then sewn back together.

For cancer affecting the rectum, several other surgical methods may be employed, including local excision of the cancer (where cancerous cells and nearby tissues are cut out of the rectum) and transanal resection, where invasive cancerous tissue is removed along with normal anal tissue.

Depending on the stage of the cancer and the degree of surgery required, some patients may need to have a colostomy. A colostomy involves surgically attaching the bowel to an opening in the abdominal wall where waste is eliminated into an attached bag.

The presence of cancer cells in the lymph nodes may require more extensive surgery. If the cancer has spread to the nodes, the patient will need either radiation, chemotherapy, hormone therapy, or a combination of all three after surgery. This is called "adjuvant therapy."

Radiation

Once the cancer has been removed, the doctor may recommend radiation treatment to destroy any remaining cancer cells. In cases where the cancer is located in hard to reach areas, radiation may be used to shrink the cancer growth or tumor. Radiation stops the cancer cells from dividing. It works especially well on fast-growing tumors. Unfortunately, it also stops some types of healthy cells from dividing. Healthy cells that divide quickly, like those of the skin and hair, are affected the most. For this reason, radiation can cause **fatigue**, skin problems, and **hair loss**.

Radiation therapy can be internal, where particles of radioactive materials are implanted into a tumor, or external, where energy rays (radiation) are directed at the cancer from outside the body. External radiation, the most common type of treatment for colorectal cancer, is usually administered five days a week for several weeks. Some studies indicate that radiation therapy decreases the likelihood of local recurrence of colorectal cancer by a significant margin. Some clinicians argue that the therapy is most effective when given before surgery rather than after. No definitive clinical trials proved the most effective timing as of late 2001.

Chemotherapy

Colorectal cancer surgery may be followed by chemotherapy in even the earliest stages. Chemotherapy is administered either orally or by injection into a blood vessel. It is usually given in cycles, followed by a period of time for recovery, followed by another course of drugs. Treatment time may range between four and nine months. In the fall of 2001, the Food and Drug Administration (FDA) approved trials for a new vaccine to help treat colorectal cancer. Investigators planned to give the vaccine in conjunction with chemotherapy to help prevent recurrence of the disease. In 2003, the FDA approved a new chemotherapy drug called Avastin to help fight metastatic spread of colorectal cancer.

Some types of chemotherapy produce significant side effects, including **nausea** and **vomiting**, temporary hair loss, mouth sores, skin **rashes**, fatigue, a weakened immune system, and **infertility**. However, most side effects are temporary and disappear once treatment has ended.

Expected results

The death rate for the disease has declined steadily over the last several decades of the 20th century, and since 1985, annual deaths due to colorectal cancer have declined at an average rate of 1.6% per year. Early detection is key to improved survival; patients with colorectal cancers detected early (at stage I) have a 96% survival rate. In comparison, patients who are diagnosed with stage IV colorectal cancer only have a 5% survival rate.

Prevention

Proper diet and **exercise** have been shown to help prevent many types of cancers, including colorectal cancer. Research published in 2003 confirmed the benefits of physical activity in reducing risk of colon and rectal cancers. A well-balanced diet consisting of a minimum of five servings of fruits and vegetables and six servings of food from other plant sources (i.e., cereals, grains, pastas) is recommended by the American Cancer Society. Additionally, patients may opt for a diet of whole foods. A number of fruits and vegetables have been shown to have antioxidant properties and may be useful in preventing cancer. These include **carotenoids**, which are found in fruit pigments; flavenoids found in vegetable pigments; and particularly **lycopene**, which is found in tomato juice.

Some clinical studies also have indicated that regular use of **green tea** (produced from the *Camellia sinensis* plant) may reduce the risk of certain types of cancer, including colorectal cancers. Green tea contains polyphenols, an antioxidant substance that also may inhibit the growth of existing cancer cells. In some

KEY TERMS

Adjuvant therapy—Treatment involving radiation, chemotherapy (drug treatment), hormone therapy, or a combination of all three.

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with disease processes such as cancer.

Lymph nodes—Small, bean-shaped masses of tissue scattered along the lymphatic system that act as filters, removing fluids, bacteria, or cancer cells that travel through the lymph system. Cancer cells in the lymph nodes are a sign that the cancer has spread.

Malignant—Cancerous.

Polyp—A benign, tumor-like outgrowth.

animal studies, injections of tea extracts reduced the size of cancerous tumors. The antioxidant effects of green tea need to be studied further to more clearly define the role of the herb in cancer treatment and prevention.

Because early detection is so critical to recovery from colorectal cancer, patients considered at risk for the disease due to genetic, lifestyle, or environmental factors should undergo regular screening after age 50 (and possibly before, depending on the individual's personal and medical history). The American Cancer Society recommends the following screening tests:

- an annual FOBT plus a flexible sigmoidoscopy every five years; or
- a colonoscopy every 10 years; or
- a double contrast barium enema every five to 10 years.

A digital rectal exam also is recommended during each screening session.

Resources

BOOKS

Alschuler, Lise N., and Karolyn A. Gazella, eds. *Alternative Medicine Magazine's Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing*. San Francisco: Celestial Arts, 2007.

American Cancer Society. *American Cancer Society's Complete Guide to Colorectal Cancer*. Atlanta, GA: American Cancer Society, 2007.

Lange, Vladimir. *Be A Survivor: Colorectal Cancer Treatment Guide*. Los Angeles: Lange Productions, 2006.

Tovey, Philip. *Complementary and Alternative Medicine in Cancer Care*. London: Routledge, 2007.

PERIODICALS

Beebe, Timothy J., et al. "Assessing Attitudes Toward Laxative Preparation in Colorectal Cancer Screening and Effects on Future Testing: Potential Receptivity to Computed Tomographic Colonography." *Mayo Clinic Proceedings* (June 2007): 666(6).

Harder, Ben. "The Screen Team: Less Unpleasant Colon Exams Might Catch More Cancers."*Science News* (August 19, 2006): 122(3).

Mahoney, Diana. "Exercise May Help Cut Colon Cancer Risk in Men." *Family Practice News* (January 1, 2007): 40.

McCarty, Mark. "Physicians Seek Better Tools to Diagnose, Treat Colon Cancer." *Diagnostic Update* (May 31, 2007): NA.

Meyerhardt, Jeffrey A. "Preventing and Treating Colon Cancer." *Harvard Special Health Report* (July 2006): 34(2).

"Vitamin D May Reduce Your Risk of Colorectal Cancer: Maintaining the Recommended Vitamin D Blood Level Could Cut Your Risk in Half." *Healthy Years* (April 2007): 4.

ORGANIZATIONS

American Cancer Society, 250 Williams St., Atlanta, GA, (800)227 2345, http://www.cancer.org.

British Association for Cancer Research. Institute of Cancer Research, McElwain Laboratories, Cotswold Road, Sutton, SM2 5NG, U.K., (44) 020 8722 4208, http://www.bacr.org.uk.

Canadian Cancer Society, 10 Alcorn Ave., Suite 200, Toronto, ON, M4V 3B1, Canada, (416) 961 7223, http://www.cancer.ca.

Colon Cancer Alliance, 5411 North University Dr., Suite 202, Coral Gables, FL, 33067, (877) 422 2030, http://www.ccalliance.org.

National Cancer Institute, 6116 Executive Blvd., Room 3036A, Bethesda, MD, 20892, (800) 422 6237, http://www.cancer.gov.

Paula Ford-Martin
Ken R. Wells

Colostrum

Description

Colostrum is a thick yellow fluid, rich in protein, growth factors, and immune factors. It is secreted by the mammary glands of all female mammals during the first few days of lactation. It also contains essential nutrients and protease inhibitors that keep it from

being destroyed by the processes of digestion. Humans produce relatively small amounts of colostrum in the first two days after giving birth, but cows produce about 9 gallons (36 L) of colostrum. Bovine colostrum can be transferred to all other mammals, and is four times richer in immune factors than human colostrum.

Although colostrum has received widespread attention as a dietary supplement only since the late 1990s, it has a lengthy history of medicinal use. Ayurvedic physicians in India have used colostrum as a treatment for thousands of years. In the United States, mainstream medical practitioners recommended colostrum as a natural antibiotic before the discovery of penilcillin and sulfa drugs. In the 1950s, colostrum was used to treat **rheumatoid arthritis** (RA). Dr. Albert Sabin, the researcher who developed the first oral vaccine for poliomyelitis, found that colostrum contains antibodies against polio. He recommended colostrum as a dietary supplement for children who were vulnerable to polio.

The major components of colostrum include the following substances:

- Immunoglobulins. Immunoglobulins are globulin proteins that function as antibodies. They are the most plentiful immune factors found in colostrum. Immunoglobulin G (IgG) counteracts bacteria and toxins in the blood and lymphatic system; immunoglobulin M (IgM) seeks out and attaches itself to viruses in the circulatory system; immunoglobulins D and E (IgD and IdE) remove foreign substances from the bloodstream and activate allergic reactions. High-quality colostrum is certified to contain a minimum of 16% immunoglobulins.
- Lactoferrin. Lactoferrin is a protein that transports iron to red blood cells and helps to deprive viruses and harmful bacteria of iron.
- Proline-rich polypeptide (PRP). PRP is a hormone that regulates the thymus gland, helping to calm a hyperactive immune system or stimulate an underactive immune system.
- Growth factors. The growth factors in bovine colostrum include insulin-like growth factors (IgF-1 and IgF-2), an epithelial growth factor (EgF), transforming growth factors (TgF-A and TgF-B), and a platelet-derived growth factor (PDGF). Growth factors stimulate normal growth as well as the healing and repair of aged or injured skin, muscle, and other tissues. In addition, growth factors help the body to burn fat instead of muscle for fuel when a person is dieting or fasting.
- Growth hormone. Growth hormone slows some of the signs of aging.
- Leukocytes. Leukocytes are white cells that stimulate production of interferon, a protein that inhibits viruses from reproducing.
- Enzymes. Colostrum contains three enzymes that oxidize bacteria.
- Cytokines and lymphokines. These are substances that regulate the body's immune response, stimulate the production of immunoglobulins, and affect cell growth and repair.
- Vitamins. Colostrum contains small amounts of vitamins A, B_{12}, and E.
- Glycoproteins. Glycoproteins, or protease inhibitors, are complex proteins that protect immune factors and growth factors from being broken down by the acids in the digestive tract.
- Sulfur. Sulfur is a mineral that is an important building block of proteins.

General use

Colostrum is presently used to treat a variety of diseases and disorders. Applications that have been investigated in clinical trials include the following:

Bacterial and viral infections

A number of recent clinical studies have shown that colostrum is effective in reversing the inflammation of the digestive tract in HIV/AIDS patients caused by opportunistic **infections**. The antiviral, antifungal, and antibacterial properties of colostrum enable it to kill such pathogens as *E. coli*, *Candida albicans*, rotaviruses, and *Cryptosporidium*.

In 1980, a British researcher showed that a large proportion of the antibodies and immunoglobulins in colostrum are not absorbed by the body but remain in the digestive tract. There they attack food- and water-borne organisms that cause disease. More recent clinical studies have demonstrated that colostrum is effective in preventing intestinal infections by first keeping the bacteria from attaching themselves to the intestinal wall, and second by killing the bacteria themselves. Colostrum has proved to be capable of killing *Campylobacter*, *Helicobacter pylori*, *Listeria*, *Salmonella*, *Shigellosis*, and five types of streptococci.

Allergies and autoimmune diseases

The PRP in colostrum has been demonstrated to reduce or eliminate the **pain**, swelling, and inflammation associated with **allergies** and autoimmune diseases (**multiple sclerosis**, rheumatoid arthritis, lupus, myasthenia gravis). These effects are related to PRP's

KEY TERMS

Cytokines—Substances of low molecular weight that affect cell growth and repair, tissue inflammation, and immunity to diseases.

Glycoproteins—Complex proteins that protect immune factors and growth factors from being broken down by stomach acids. Glycoproteins are also called protease inhibitors.

Immunoglobulins—A group of globulin proteins that function as antibodies.

Lactoferrin—A protein found in colostrum that carries iron to red blood cells and appears to have anti-cancer activity.

Lymphocyte—A type of white blood cell that is important in the production of antibodies.

Opportunistic infection—A type of infection caused only under certain circumstances, as when a person's immune system is impaired.

Proline-rich polypeptide (PRP)—A hormone found in colostrum that regulates the thymus gland and the immune system. It helps to make colostrum an effective treatment for autoimmune disorders and possibly heart disease. Proline is an amino acid.

T cell—A type of lymphocyte that develops in the thymus gland, circulates in the blood and lymph, and regulates the body's immune response to infected or malignant cells.

ability to inhibit the overproduction of lymphocytes (white blood cells) and T-cells.

Heart disease

Recent research suggests that cardiovascular disease may be caused in part by alterations in the patient's immune system. One study indicated that 79% of patients with heart diseases had a certain type of *Chlamydia* (an intracellular parasite closely related to certain bacteria) associated with the formation of plaque in their arteries. The PRP in colostrum may be able to reverse **heart disease** in the same way it counteracts allergies and autoimmune diseases. In addition, the growth factors and growth hormone in colostrum appear to lower the blood levels of "bad" **cholesterol** while raising the blood levels of "good" cholesterol. These growth factors also repair damage to heart muscle and support the growth of new blood vessels in the part of the circulatory system that surrounds the heart.

Cancer

Since 1985, the cytokines contained in colostrum have been a major area of research in seeking a cure for **cancer**. Researchers have found that the lactoferrin in colostrum has some anti-cancer activity. In addition, the combination of immune factors and growth factors in colostrum appears to inhibit the growth of cancers.

Weight loss

The growth factor called IgF-1 that is contained in colostrum is needed by the body in order to metabolize fat. As humans grow older, their bodies produce less IgF-1. These lower levels of growth factor are associated with a higher rate of type 2 diabetes in older adults and with increased difficulty losing weight in spite of **exercise** and careful attention to diet. While colostrum by itself will not cause weight loss, it appears to be a useful part of a weight reduction program because of its IgF-1 content.

Sports medicine

The immune factors in colostrum appear to be helpful in protecting athletes from infections caused by the physical and emotional **stress** of competition. Using colostrum as a dietary supplement also increases the efficiency of the digestive tract for athletes in training. The intestines are able to make more nutrients available to the muscle cells and the body's vital organs. A 2002 report stated that cyclists taking 20 to 60 grams of bovine colostrums supplements per day showed significant performance improvements following a two-hour ride.

Open wounds

The growth factors in colostrum have been found to stimulate the growth of new skin and to repair tissues damaged by ulcers, injuries, **burns**, surgery, or inflammation. They are able to do this through their direct action on the cells' DNA and RNA. Powdered colostrum has been used in topical preparations for **gum disease**, sensitive teeth, mouth ulcers, **cuts**, and burns.

Other

Colostrum has been used outside clinical research to treat a variety of other conditions. Satisfied individuals have reported that colostrum has successfully treated skin disorders, **emphysema**, baldness in males, anger outbursts, **feverblisters**, **shingles**, **tendinitis**, thyroid disorders, **gout**, insect **bites**, vaginal yeast infections, and **anemia**.

Preparations

Colostrum is presently available in a variety of forms, including tablets, liquids, powders, and encapsulated powders. In general, the powdered forms are recommended as preferable to liquids or tablets, on the grounds that liquid colostrum has a short shelf life and the processing necessary to produce tablets destroys much of colostrum's biological activity. The recommended dose for adults with disease symptoms is 1,000–2,000 mg of powdered colostrum in capsules, taken twice daily with 8–12 oz of water. Preventive doses are left to the patient's choice. Children can be given colostrum but require less than adults.

In the United States, colostrum is taken from dairy cows within 24 hours after the birth of a calf. Only dairy cows that meet USDA health standards and have been raised on a feed supplemented with nutrients are used to supply colostrum. The calf needs four gallons of the nine that the cow produces. The remaining five gallons are collected by a USDA-certified dairy. The colostrum is frozen and kept at a temperature of 17°F (-8.3°C). After the frozen colostrum is taken to a processing plant, it is carefully thawed and evaluated for quality and immunoglobulin content. About 30% is rejected at this stage. The fat is then removed from the remaining colostrum, after which the colostrum is spray-dried at low heat. The colostrum is repeatedly tested during processing for freedom from bacterial contamination.

Precautions

Persons who are using colostrum as a dietary supplement in the United States should obtain it from a source licensed by the USDA.

Side effects

With the exception of allergic reactions in persons who are known to be allergic to cow's milk, colostrum does not produce any major side effects at any level of consumption. Mild flu-like symptoms that disappear with continued use of colostrum have been reported in children.

Interactions

No significant drug interactions between colostrum and standard pharmaceuticals have been reported.

Resources

PERIODICALS

Coombes, Jeff S., et al. "Dose Effects of Oral Bovine Colostrum on Physical Work Capacity in Cyclists." *Medicine and Science in Sports and Exercise* (July 2002): 1184.

ORGANIZATIONS

National Association of Alternative Medicines (NAAM). P. O. Box 35189, Chicago, IL 60707 0189. (708) 453 0080. Fax: (708) 453 0083.

OTHER

Health/Link: Alternative Health Directory. http://www.selene.com/healthlink/bovine.html.

Rebecca Frey, Ph.D.
Teresa G. Odle

Coltsfoot

Description

Coltsfoot is the plant *Tussilago farfara*, a member of the daisy family (Asteraceae). Coltsfoot is a perennial herb that grows to a height of 4-10 inches (10-25 cm). The stem is covered with white, downy fibers. Its leaves are hoof-shaped, and the flowers are yellow. The leaves, flowers, and occasionally the root are used medicinally.

Coltsfoot is a tough, invasive plant that lives in marginal soil, wasteland, roadsides, and sand dunes. In some areas coltsfoot is considered an undesirable weed. Although native to Europe, coltsfoot grows wild in North America and the temperate parts of China. Other names for coltsfoot are **cough** wort, horsefoot, horsehoof, bull's foot, ass's foot, foal's foot, British tobacco, butterbur, field hove, and flower velure. In Chinese it is called *kuan dong hua*.

General use

Coltsfoot has been used as a cough remedy in both **Western herbalism** and **traditional Chinese medicine** for at least 2,500 years. Coltsfoot was such a well-known and well-respected herb in eighteenth century France that apothecary shops advertised their presence by painting a picture of the herb on their signs. Chinese herbalists prefer to use the flower and flower buds, while Western herbalists most often choose to use the leaves.

Coltsfoot is recommended to treat:

- asthma
- bronchitis
- dry, hacking cough
- laryngitis and hoarseness

Coltsfoot has been used as a cough remedy in both Western herbalism and traditional Chinese medicine for at least 2,500 years. *(© Arco Images / Alamy)*

- lung cancer symptoms
- mouth and throat irritations
- sore throat
- wheezing

A decoction (boiling the herb down to a concentrated broth or tea to be taken internally) of coltsfoot root is sometimes used to induce sweating. Externally, a poultice of flowers is sometimes applied to the skin to treat **eczema**, **stings**, **bites**, and skin inflammations. Sometimes coltsfoot leaves are smoked to relieve cough.

Modern scientific investigation shows that coltsfoot contains a substance called mucilage (about 8%) that coats and soothes the throat. It is the presence of this substance that appears to make coltsfoot so effective in treating coughs and respiratory problems. Coltsfoot tea also appears to help clear the airways of mucus in some animal studies. **Smoking** coltsfoot will probably do more to irritate the throat than to soothe it.

Inhaling steam from a pot of boiling coltsfoot leaves is likely to produce little effect because so little of the medicinal material will reach the throat. The German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, has approved the use of fresh or dried coltsfoot leaf in products to treat dry cough, hoarseness, and mild throat or mouth inflammations.

Despite evidence that coltsfoot does generally work, it is not without its problems. The leaves, and to a greater degree the buds and flowers, contain compounds called pyrrolizidine alkaloids. These compounds are known to damage the liver. They can cause liver **cancer** with extended exposure and may also cause the blood vessels of the liver to narrow dangerously. In one laboratory study, rats fed a diet of coltsfoot flower developed a high rate of cancerous liver tumors.

In the United States, the Food and Drug Administration (FDA) has labeled coltsfoot an herb of "undefined safety." Coltsfoot leaf also falls under some legal restrictions in Austria. German authorities, however, simply recommend that preparations containing coltsfoot leaf should not be taken for more than four to six weeks each year. There is, however, fairly unanimous agreement that the level of pyrrolizidine alkaloids in coltsfoot flowers is much higher than the level found in the leaves, and that medicinal preparations that use the flower or flower bud should be avoided. Some American herbalists are recommending that the internal use of coltsfoot be discontinued as a precaution until further research clarifies the risks involved.

Preparations

Coltsfoot leaves are harvested in early summer and can be used fresh or dried. In China, the flower heads are dug up in winter, before they emerge from the ground. When the root is used, it is harvested in the autumn.

Coltsfoot is most commonly prepared as a tea. It can also be made into a cough syrup when combined with **licorice**, **thyme**, or black cherry. Commercial preparations are also available.

Precautions

The safest course is to avoid the internal use of coltsfoot. Pregnant and nursing women and children

under the age of six should not be given coltsfoot. People who choose to use coltsfoot should avoid ingesting more than 1 gram of pyrrolizidine alkaloids daily. However, accurate measurement of pyrrolizidine alkaloids is difficult and this information is not easily available to many consumers.

Side effects

Coltsfoot is believed to increase the incidence of liver damage and cancerous liver tumors in both laboratory animals and humans.

Interactions

There are no studies of the interactions of coltsfoot with conventional pharmaceuticals or other herbal remedies.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1999.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

Weiner, Michael and Janet Weiner. *Herbs that Heal*. Mill Valley, CA: Quantum Books, 1999.

OTHER

Plants for a Future "Tussilago farfara." http://www.pfaf.org.

Tish Davidson

Comfrey

Description

Comfrey (*Symphytum officinale*), or common comfrey, has been known by many names, including **boneset**, knitbone, bruisewort, black wort, salsify, ass ear, wall wort, slippery root, gum plant, healing herb, consound, or knit back. This distinctive herb, considered by the English herbalist Culpeper to be "under the dominion of the moon," is a member of the Boraginaceae family. The genus name *Symphytum* is from the Greek word *sympho* meaning to unite. The common name comfrey is from the Latin *confirmare* meaning to join together. The herb is named after its traditional folk use in compress and poultice preparations to speed the healing of **fractures**, broken bones, **bruises**, and **burns**. Comfrey is a perennial native of Europe and Asia and has been naturalized throughout North America. There are about 25 species of the herb, including prickly comfrey (*S. asperum*) and Russian comfrey (*S.* × *uplandicum*, known as okopnik). In Russian medicine, the herb is considered poisonous when used excessively.

Comfrey grows well in rich, moist, low meadows, or along ponds and river banks, where it may reach a height of 4 ft (1.2 m). Comfrey root is large, branching, and black on the outside with a creamy white interior containing a slimy mucilage. Hollow, erect stems, also containing mucilage, are covered with bristly hairs that cause **itching** when in contact with the skin. The thick, somewhat succulent, veined leaves are covered with rough hairs. They are alternate and lance shaped, with lower leaves as large as 10 in (25 cm) in length, and dark green on top and light green on the underside. Small, bell-shaped flowers grow from the axils of the smaller, upper leaves on red stalks. Flowers are mauve to violet and form in dense, hanging clusters, blooming in summer. The cup-like fruits each contain four small, black seeds.

General use

Comfrey root and other parts of the herb have been valued medicinally for more than 2,000 years. The specific name *officinale* designates its inclusion in early lists of official medicinal herbs. Comfrey has been prepared as a poultice or compress with healing properties for blunt injuries, fractures, swollen bruises, **boils**, carbuncles, varicose ulcers, and burns. The external application of comfrey preparations may minimize the formation of scar tissue. Poultices were also applied to ease breast **pain** in breast-feeding women. Comfrey, taken internally as a tea or expressed juice, has been used to soothe ulcers, hernias, **colitis**, and to stop internal bleeding. As a gargle it has been used to treat mouth sores and bleeding gums. The herbal tea has also been used to treat nasal congestion and inflammation, **diarrhea**, and to quiet coughing. The hot, pulped root, applied externally, was used to treat **bronchitis**, **pleurisy**, and to reduce pain and inflammation of **sprains**.

The herb is thought to loosen congestion, soothe irritated membranes and skin, reduce bleeding, tighten tissues, and heal **wounds**. The allantoin in comfrey, found most abundantly in the flowering tops, has been identified as the source of much of the herb's healing actions. Comfrey, applied externally to superficial wounds, promotes the healing of connective tissue, bones, and cartilage. Other constituents found in comfrey include tannins, resin, essential oil, gum, carotene, rosmarinic acid, **choline**, glycosides, sugars, beteasitosterol, and steroidal saponins.

KEY TERMS

Carbuncle—A skin infection creating deep, pus-filled boils.

Pleurisy—Inflammation of the pleura, the membranes enclosing the lungs and lining the chest cavity.

Comfrey contains vitamins A and B_{12}, and is high in **calcium**, **potassium**, and **phosphorus**. The herb has long been used as a cooked green vegetable in early spring, and the fresh, young leaves have been added to salads. The widespread suffering caused by the Irish potato famine of the 1840s motivated Henry Doubleday, an Englishman, to fund research into comfrey's potential as a nutritional food crop. Farmers have valued comfrey as a nutritious fodder for cattle. When the leaves are soaked in rainwater for a few weeks, they will produce a valuable fertilizer for the garden, especially beneficial to tomatoes and potatoes.

Modern herbalists, however, disagree strongly about comfrey's safety, particularly when herbal preparations are taken internally. A Japanese study in 1968 implicated comfrey constituents (known as pyrrolizidine alkaloids) as being toxic to the liver even when taken in small amounts. The study involved large amounts of comfrey extract rather than the whole herb. The most toxic of these pyrrolizidine alkaloids, according to Varro Tyler of the Purdue University School of Pharmacy, is echimidine. This alkaloid is found primarily in Russian comfrey and prickly comfrey rather than the common comfrey. However, Tyler cautions that other alkaloids toxic to the liver are present in common comfrey, and commercial preparations may not distinguish between the types of comfrey contained in the products offered for sale. Herbal products containing echimidine are prohibited for sale in Canada as medicines. In fact, all comfrey products made from the root, which contains a higher concentration of pyrrolizidine alkaloids, are restricted in Canada.

A 1978 Australian study reported that rats fed a large diet of comfrey leaf developed liver **cancer**. The research literature has reported some cases of liver toxicity attributed to long-term, internal use of comfrey. However, some Japanese doctors still continue to recommend a vinegar extract of comfrey to treat cases of **cirrhosis** of the liver, despite these previous research findings of the hazards associated with internal use. The research on the safety and effectiveness of comfrey as a medicine continues with some conflicting research results. In Germany, where standardized comfrey remedies are commercially available, the allowed dosage and duration of treatment is regulated. In the United States, however, commercial preparations may not be standardized to meet these dosage restrictions.

Preparations

Ointments, salves, and oil extracts of comfrey are available for external treatment. The crushed or powdered root and extracted juice of the herb are used to make poultices for external applications. Comfrey extract is an ingredient in commercially prepared medicines for chest congestion, coughs, and pain relief.

Precautions

Comfrey should not be used, either externally or internally, by pregnant or breast-feeding women. Many herbalists caution against internal use of comfrey. This caution is due to the dangers of the pyrrolizidine alkaloids that are toxic to the liver and may have cancer-causing effects, even in small amounts. Consumers should avoid external use of comfrey on deep wounds because the herb may promote premature healing of surface tissue before the deeper damage has been healed. Wounds must be thoroughly cleaned before application of comfrey remedies to avoid tissue forming over dirt particles. Comfrey preparations should not be used for more than four weeks. Gathering comfrey in the wild may be dangerous for the novice herbalist because the early spring leaves somewhat resemble the deadly ones of nightshade and, in some reported cases, ingesting comfrey in preparations contaminated with deadly nightshade has led to poisoning.

Side effects

No side effects are known with proper preparation and administration of *Symphytum officinale* in external, therapeutic applications. Internal use of herbal preparations should be avoided pending further research.

Interactions

None reported.

Resources

BOOKS

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.
Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.
PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company, 1998.
Polunin, Miriam, and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Company, 1992.
Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Clare Hanrahan

Common cold

Definition

The common cold is a viral infection of the upper respiratory system, which includes the nose, throat, sinuses, eustachian tubes, trachea, larynx, and bronchial tubes. Although more than 200 different viruses can cause a cold, 30 to 50% are caused by a group known as rhinoviruses. Almost all colds clear up in less than two weeks without complications.

Description

Colds, sometimes called rhinovirus or coronavirus **infections**, are the most common illness to strike any part of the body. Repeated exposure to viruses causing colds creates partial immunity. Although most colds resolve on their own without complications, they are a leading cause of visits to the doctor and of time lost from work and school. Treating symptoms of the common cold has given rise to a multi-million dollar industry in over-the-counter medications, yet none of these medications is actually anti-viral to the rhinovirus.

Cold season in the United States begins in early autumn and extends through early spring. It is unclear why colds occur more frequently in winter. Although it is not true that getting wet or being in a draft causes a cold (a person has to come in contact with the virus to catch a cold), certain conditions may lead to increased susceptibility. These include:

- fatigue and overwork
- emotional stress
- poor nutrition
- smoking
- inadequate rest or sleep
- living or working in crowded conditions

Colds make the upper respiratory system less resistant to secondary bacterial infection. Secondary bacterial infection may lead to a number of other complications, including middle **ear infection**, **bronchitis**, **pneumonia**, **sinus infection**, or **strep throat**. People with chronic lung disease, **asthma**, diabetes, or a weakened immune system are more likely to develop these complications.

Demographics

It is estimated that the average person has more than 50 colds during a lifetime. Anyone can get a cold, although preschool and grade school children catch them more frequently than adolescents and adults (five to seven episodes per year in preschool children compared with two to three episodes per year in adulthood). Among employed adults, colds cause an estimated 40 percent of all time lost from jobs.

According to a telephone survey published in the *Archives of Internal Medicine* in 2003, about 500 million non-influenza viral respiratory infections occur annually, with direct costs of $17 billion and indirect costs of $22.5 billion.

Causes and symptoms

Colds are caused by more than 200 different viruses. The most common groups include rhinoviruses and coronaviruses. Different groups of viruses are more infectious at different seasons of the year, but knowing the exact virus causing the cold is not important in treatment.

People with colds are contagious during the first two to four days of the onset of symptoms. Colds pass from person to person in several ways. When an infected person coughs, sneezes, or speaks, tiny fluid droplets containing the virus are expelled. If these are breathed in by other people, the virus may establish itself in their noses and airways.

Colds may also be passed through direct contact. For example, if a person with a cold touches his runny nose or watery eyes, then shakes hands with another person, some of the virus is transferred to the uninfected person. If that person then touches his mouth, nose, or eyes, the virus is transferred to an environment where it can reproduce and cause a cold.

Finally, cold viruses can be spread through inanimate objects (door knobs, telephones, toys) that become contaminated with the virus, a common method of transmission in child care centers. Another vector of transmission is air travel, due to closed air circulation.

Once acquired, the cold virus attaches itself to the lining of the nasal passages and sinuses, which causes the infected cells to release a chemical called histamine. Histamine increases the blood flow to the infected cells, causing swelling, congestion, and increased mucus production. Within one to three days, the infected person begins to show cold symptoms.

The first cold symptoms are usually a tickle in the throat, runny nose, and **sneezing**. The initial discharge from the nose is clear and thin. Later, it may change to a thick yellow or greenish discharge. Most adults do not develop a **fever** when they catch a cold. Young children may develop a low fever of up to 102°F (38.9°C).

Other symptoms of a cold include coughing, sneezing, nasal congestion, **headache**, muscle ache, **chills**, **sore throat**, hoarseness, watery eyes, **fatigue**, dull hearing and blocked eustachian tube (a danger when flying), and lack of appetite. The **cough** that accompanies a cold is usually intermittent and dry.

Most people begin to feel better four to five days after their cold symptoms become noticeable. All symptoms are generally gone within 10 days, except for a dry cough that may linger for up to three weeks.

Colds make people more susceptible to secondary bacterial infections such as strep throat, middle ear infections, and sinus infections. A person should consult with a doctor if the cold does not begin to improve within a week. A doctor should also be consulted if the individual experiences chest **pain**, fever for more than a few days, difficulty breathing, bluish lips or fingernails, a cough that brings up greenish-yellow or grayish sputum, skin rash, swollen glands, or whitish spots on the tonsils or throat. These may be signs of a secondary bacterial infection that needs to be treated with an antibiotic.

People who have **emphysema**, chronic lung disease, diabetes, or a weakened immune system—either from diseases such as **AIDS** or **leukemia** or as the result of medications (corticosteroids, chemotherapy drugs)—should consult their doctor if they get a cold. People with these health problems are more likely to develop a secondary infection.

Diagnosis

Colds are diagnosed by observing a person's symptoms and symptom history. There are no laboratory tests as of 2008 for detecting the cold virus. However, a doctor may perform a throat or nasal culture or blood test to rule out a secondary infection.

Influenza is sometimes confused with a cold, but the flu causes much more severe symptoms and is generally accompanied by a fever. **Allergies** to molds or pollens also can cause a runny nose and eyes. Allergies are usually more persistent than the common cold. An allergist or a physician can perform tests to determine if the cold-like symptoms are being caused by an allergic reaction. Also, some people get a runny nose when they go outside in winter and breathe cold air. This type of runny nose, however, is not a symptom of a cold.

Treatment

Patients should drink plenty of fluids and eat nutritious foods. In fact, the old adage, "Feed a cold, starve a fever," was scientifically proven true in 2002. Dutch scientists found that cold-fighting immune responses rose after consuming a full meal, while **fasting** increased those that combat most fevers. Chicken soup with **ginger**, scallions, and rice noodles is nutritious and has properties that help people recover. Rest, to allow the body to fight infection, is very important. Gargling with salt water (half teaspoon salt in one cup of water) helps to soothe a sore throat. A vaporizer also will make sufferers feel more comfortable. Rubbing petroleum jelly or some other lubricant under the nose will prevent irritation from frequent nose blowing. For babies, nasal mucus should be suctioned gently with an infant nasal aspirator. It may be necessary to soften the mucus first with a few drops of salt water.

Herbals

Herbals can be taken to stimulate the immune system, for antiviral activity, and to relieve symptoms. The following herbs are used to treat colds:

- Ginger (*Zingiber officinale*) reduces fever and pain, has a sedative effect, settles the stomach, and suppresses cough.
- Forsythia (*Forsythia suspensa*) fruit can be taken as a tea for its anti-inflammatory, fever reducing, and antimicrobial properties.
- Honeysuckle (*Lonicera japonica*) flower can be taken as a tea for its anti-inflammatory, fever reducing, and antimicrobial properties.
- Aniseed (*Pimpinella anisum*) can be added to tea to expel phlegm, induce sweating, ease nausea, and ease stomach gas.
- Slippery elm powdered bark (*Ulmus fulva*) can be taken as a tea or slurry or capsules to soothe sore throat, to ease cough, and to thin mucous.

- Echinacea (*Echinacea purpurea*, *augustifolia*), or *pallida*) may relieve cold symptoms and reduce the severity of symptoms and duration of colds, but as of 2008 further clinical studies were needed to demonstrate its effects on the common cold. The usual dosage is 500 mg of crude powdered root or plant thrice on the first day, then 250 mg four times daily thereafter. Echinacea may also be taken as a tincture. (*Andrographis*, also known as Indian echinacea, is another form of echinacea that has been shown to reduce the symptoms of colds as well as increase resistance to colds. However, echinacea does not appear to be effective in children.)
- Garlic may reduce the severity of cold symptoms and the duration of colds. A 2007 study published in *Molecular Nutrition & Food Research* showed that participants who received garlic were almost two-thirds less likely to develop a cold than those receiving placebo, and those who did have a cold recovered about one day faster in the garlic group as compared to the placebo group.
- Goldenseal (*Hydrastis canadensis*) has fever reducing, antibacterial, anti-inflammatory, and antitussive properties. The usual dose is 125 mg three to four times daily. Goldenseal should not be taken for more than one week. Goldenseal may also be prepared as a tincture.
- Astragalus (*Astragalus membranaceus*) boosts the immune system and improves the body's response to stress. The common dose is 250 mg of extract four times daily.
- Cordyceps (*Cordyceps sinensis*) modulates and boosts the immune system and improves respiration. The usual dose is 500 mg two to three times daily.
- Elder (*Sambucus*) has antiviral activity, increases sweating, decreases inflammation, and decreases nasal discharge. The usual dose is 500 mg of extract thrice daily.
- American ginseng (*Panax quinquefolius*) can help prevent colds and reduce the severity and duration of cold symptoms. In seniors, American ginseng may help prevent flu-like illnesses. The usual dose is 400 mg once daily.
- Stinging nettle (*Urtica dioica*) has antihistamine and anti-inflammatory properties. The common dose is 300 mg four times daily.
- Schisandra (*Schisandra chinensis*) helps the body fight disease and increases endurance.
- Grape (*Vitis vinifera*) seed extract has antihistamine and anti-inflammatory properties. The usual dose is 50 mg three times daily.
- Eucalyptus (*Eucalyptus globulus*) or peppermint (*Mentha piperita*) essential oils added to a steam vaporizer may help clear chest and nasal congestion and disinfect room air.
- Boneset infusion (*Eupatroium perfoliatum*) relieves aches and fever.
- Yarrow (*Achillea millefolium*) is a diaphoretic.
- Supplemental larch from the inner bark of the western larch tree has been shown in some clinical trials to fight persistent colds and ear aches.

Chinese medicines

Chinese herbal treatments are based on the specific symptoms of colds and include a variety of *Radix*, *Rhizoma*, *Semen*, and *Herba* species. Chinese patent medicines for cold include:

- Wu Shi Cha (Noon tea): once or twice daily.
- Yin Qiao Jie Du Pian (Honeysuckle and Forsythia Tablet to Overcome Toxins): four to six, twice daily.
- Sang Ju Gan Mao (Mulberry Leaf and Chrysanthemum to Treat Common Cold): one packet of infusion or four to eight tablets, twice or thrice daily.
- Ling Yang Gan Mao Pian (Atelopis Tablet for Common Cold): four to six, twice daily.
- Ban Lan Gen Chong Ji (Isatidis Infusion): one packet twice or thrice daily.
- Huo Xiang Zheng Qi (Agastache to Rectify Qi): 6 g or four to six tablets.

Other remedies

Exercise of moderate intensity, over a period of one year, has been shown to decrease the incidence of self-reported colds. However, further research was needed as of 2008 to define the specific effects of exercise on the common cold.

Ayurvedic medicine practitioners recommend gargling with a mixture of water, salt, and **turmeric** powder or astringents such as alum, sumac, **sage**, and **bayberry** to ease a sore throat.

Homeopaths recommend microdoses of Viscue album, Natrum muriaticum, **Allium cepa**, or Nux vomica.

VITAMIN C. Vitamin C supplements, at a daily dose of 1,000 mg, can help to slightly reduce the symptoms and duration of colds when taken throughout the cold season. Vitamin C supplementation at the onset of cold symptoms is not effective in reducing the symptoms or duration of a cold, and it does not prevent colds.

VITAMIN E. **Vitamin E** supplements, at a daily dose of 200 IU, can help to slightly reduce the incidence of colds when taken throughout the cold season. Further studies were needed as of 2008 to evaluate the effects of vitamin E supplementation on the common cold.

ZINC. The effectiveness of **zinc** in nasal gels or throat lozenges for preventing or treating the common cold, as well as reducing the severity and duration of cold symptoms, continued to be investigated in the late 2000s. Numerous studies have generated inconsistent, although generally positive, results. For example, one study of over 100 employees of the Cleveland Clinic who used zinc lozenges immediately after the onset of cold symptoms showed the duration of colds decreased by one-half, although there were no differences in duration of fevers or level of muscle aches. It has been suggested that the effectiveness of the zinc lozenge is dependant on its formulation. For example, certain flavoring agents, including citric acid and tartaric acid, and the sweetener glycine in some lozenge formulations may bind zinc and reduce effectiveness. The recommended dosage is to suck on one lozenge every two hours while awake, beginning at the first cold symptoms. Side effects are bad taste, **nausea**, and **vomiting**. The results of studies using zinc nasal gel are more controversial because side effects such as nasal pain and loss of smell may override potential benefits. Further research was needed in the late 2000s to determine the effects of zinc compounds on the common cold.

Allopathic treatment

As of 2008, there were no known medicines proven to prevent or cure the common cold. Antibiotics are useless against a cold and can enhance bacterial resistance, if used carelessly. Nonprescription products to relieve cold symptoms include ipratropium bromide, cromolyn **sodium**, antihistamines, antitiussives (cough suppressants), expectorants, decongestants, and/or pain relievers, but none has been found to shorten the duration of a cold. Over-the-counter cold remedies should not be given to infants without consulting a doctor first. Care should be taken not to exceed the recommended dosages, especially when combination medications or nasal sprays are taken. Aspirin should not be given to children with a cold because of its association with a risk of Reye's syndrome, a serious disease.

Ipratropium bromide, delivered via nasal spray, has been shown to improve symptoms of runny nose and sneezing, although side effects of nasal dryness and blood-tinged mucus can occur. Cromolyn sodium is a type of asthma medication—delivered via nasal spray, powder-filled inhalation capsules, or an aerosol via a metered dose inhaler—that has been shown to reduce the duration of cold symptoms.

Antihistamines are taken to relieve the symptoms of sneezing, runny nose, itchy eyes, and congestion. Side effects include **dry mouth** and drowsiness, especially with the first few doses. Some people have allergic reactions to antihistamines. Common over-the-counter antihistamines include Chlor-Trimeton, Dimetapp, Tavist, and Actifed. The generic name for two common antihistamines are chlorpheniramine and diphenhydramine.

Antitussives (cough suppressants), such as dextromethorphan and benzonatate, block the cough reflex and can be used to relieve symptoms of a non-productive cough. However, these medications are not recommended by the American College of Chest Physicians for treatment of cough associated with upper respiratory infections. Common brand names of over-the-counter dextromethorphan antitussives include Benylin, Delsym, Drixoral, Pertussin, and Robitussin. Tessalon is a common brand of benzonatate antitussive.

Expectorants, such as guaifenesin, help thin mucus so that coughing can remove secretions from the airway. Over-the-counter expectorant brands include Guiatuss, Robitussin, and Tusibron.

Decongestants reduce congestion and open inflamed nasal passages, making breathing easier. Decongestants can make people feel jittery or keep them from sleeping. They should not be used by people with **heart disease**, high blood pressure, or **glaucoma**. Some common decongestants are Neo-Synepherine, Novafed, and Sudafed. The generic names of common decongestants include pseudoephedrine and phenylephrine and in nasal sprays naphazoline, oxymetazoline, and xylometazoline. Nasal sprays and nose drop decongestants can act more quickly and effectively than decongestants found in pills or liquids because they are applied directly in the nose. Congestion returns after a few hours. Persons can become dependent on nasal sprays and nose drops, so they should not be used for more than a few days.

Many over-the-counter medications are combinations of both antihistamines and decongestants; an ache and pain reliever, such as acetaminophen (Datril, Tylenol, Panadol) or ibuprofen (Advil, Nuprin, Motrin, Medipren); and a cough suppressant (dextromethorphan). Common combination medications include Tylenol Cold and Flu, Triaminic, Sudafed Plus, and Tavist D.

Expected results

Given time, the body will make antibodies to cure itself of a cold. Most colds last seven to 10 days. Most

KEY TERMS

Ayurvedic treatment—A holistic system of medicine from India that focuses on using physical, psychological, and spiritual therapies to achieve a mind-body balance and optimal health.

Bronchial tubes—The major airways from the back of the throat to the lungs and their main branches.

Coronavirus—A genus of viruses that causes respiratory disease and gastroenteritis.

Corticosteroids—A group of hormones produced naturally by the adrenal gland or manufactured synthetically. They are often used to treat inflammation. Examples include cortisone and prednisone.

Eustachian tube—A thin tube between the middle ear and the pharynx. Its purpose is to equalize pressure on either side of the ear drum.

Homepathy—The treatment of illness according to a theory that "like cures like" which stimulates the body to heal itself.

Rhinovirus—A virus that infects the upper respiratory system and causes the common cold.

people start feeling better within four or five days. Occasionally, a cold will lead to a secondary bacterial infection that causes strep throat, bronchitis, pneumonia, sinus infection, or a middle ear infection.

Prevention

Prevention focuses on strengthening the immune system by eating a healthy diet low in sugars and high in fresh fruits and vegetables, practicing **meditation** to reduce **stress**, getting adequate sleep, and getting regular moderate exercise. Some steps persons can take to prevent catching a cold and to reduce their spread include:

- washing hands well and frequently
- covering the mouth and nose when sneezing
- avoiding close contact with someone who has a cold during the first two to four days of their infection
- not sharing food, eating utensils, or cups
- avoiding crowded places where cold viruses can spread
- keeping hands away from the face
- avoiding cigarette smoke
- taking Echinacea; 250 mg up to four times daily for three weeks on, one week off
- taking astragalus; 250 mg to 500 mg daily
- taking a multivitamin with zinc
- taking vitamin C; 1,000 mg
- taking *Anas barbariae hepatis*; one dose weekly

Research has shown that transmission of the rhinovirus may be prevented through the use of antiseptic skin cleansers containing salicylic acid or pyroglutamic acid. The cleansers have properties that can kill the viruses and help prevent hand-to-hand transmission, but further research on their effectiveness remained to be done in the late 2000s.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines,* 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

Judd, Sandra J., ed. *Complementary & Alternative Medicine Sourcebook (Health Reference Series)*. Detroit, MI: Omnigraphics, 2006.

PERIODICALS

Pittler, Max H., and Edzard Ernst. "Clinical Effectiveness of Garlic *(Allium sativum)*." *Molecular Nutrition & Food Research* 51, no. 11 (November 2007): 1382 1385.

Simasek, Madeline, and David A. Blandino. "Treatment of the Common Cold." *American Family Physician* 75, no. 4 (February 15, 2007): 515.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www. amfoundation.org.

National Center for Complementary and Alternative Medicine, National Institutes of Health, 9000 Rock ville Pike, Bethesda., MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Belinda Rowland
Teresa G. Odle
Angela M. Costello

Coneflower *see* **Echinacea**

Conjunctivitis

Definition

Conjunctivitis is an inflammation of the transparent membrane lining of the conjunctiva, which covers the white part of the eye and the underside of the eyelid. Conjunctivitis can be caused by viral or bacterial infection, allergic reaction, or less commonly by

physical agents such as chemicals splashed into the eye or exposure of the eye to infrared or ultraviolet light. Conjunctivitis is also known as pink eye.

Description

Conjunctivitis is a common eye problem because the conjunctivae are continually exposed to microorganisms and environmental agents that can cause **infections** or allergic reactions. Conjunctivitis can be acute (short term) or chronic (long term) depending upon how long the condition lasts, the severity of symptoms, and the type of organism or agent involved. It can affect one or both eyes. Viral and bacterial conjunctivitis is highly contagious; physical transfer can easily spread it to others. Bacterial conjunctivitis is particularly likely to spread among children in childcare centers or schools.

Causes and symptoms

Conjunctivitis may be caused by a viral infection, such as a cold, acute respiratory infection, **measles**, herpes simplex, or herpes zoster. Symptoms include mild to severe discomfort in one or both eyes, redness, swelling of the eyelids, and a watery, yellow, or greenish discharge. The symptoms may last several days to several weeks. Infection with an adenovirus may cause a significant amount of pus-like discharge and a scratchy sensation in the eye. These symptoms may be accompanied by swelling and tenderness of the lymph nodes near the ear.

Bacterial conjunctivitis occurs in adults or children but is more common in children. It is caused by such organisms as *Staphylococcus*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*. Symptoms of bacterial conjunctivitis include a pus-like discharge and crusty eyelids upon awakening. Redness of the conjunctivae can be mild to severe and may be accompanied by swelling. In people who are sexually active, conjunctivitis may be caused by **chlamydia** or the bacteria that cause **gonorrhea**. In these cases, there may be large amounts of pus-like discharge. Other symptoms may include hypersensitivity to light (photophobia), a watery mucous discharge, and tenderness in the lymph nodes near the ear that may persist for up to three months.

Non-contagious conjunctivitis can be caused by such environmental hazards as wind, smoke, dust, and allergic reactions caused by pollen, dust, or grass. Symptoms range from **itching** and redness to a mucous discharge. Persons who wear contact lenses may develop allergic conjunctivitis caused by the various lens solutions and foreign proteins contained in them.

Other less common causes of conjunctivitis include looking at the sun, sun lamps, plant lamps, or the electrical arcs used during welding. Accidental chemical splashes in the eye can also cause non-contagious conjunctivitis, as can blocked tear ducts in newborns.

Diagnosis

Although inflammation of the eye is often obvious, accurate diagnosis of the cause of conjunctivitis requires taking the patient's history to learn when symptoms began, how long the condition has existed, and the specific symptoms experienced. Diagnostic tests may include an eye examination and culture of the eye discharge to determine the organism responsible for causing the condition. Obtaining samples for culturing is relatively painless.

Treatment

Conjunctivitis caused by bacteria and gonococcal or chlamydial infection usually requires prescription antibiotics. Immune system enhancement with dietary supplements can aid in the resolution of allergic and viral conjunctivitis. Removal of the allergic agent is an essential step in treating allergic conjunctivitis. If home care brings no improvement within 48 to 72 hours, a physician should be consulted.

Nutritional therapy

The following dietary changes may be helpful in managing conjunctivitis by supporting and strengthening the immune system:

- Taking 25,000 IU (international units) of beta-carotene twice daily for 7 days. However, taking megadoses of beta-carotene for an extended time has been shown to increase the risk of developing lung cancer in smokers but not in non-smokers.
- Taking 500–1000 mg of vitamin C three times daily for 7 days.
- Taking 25 mg of zinc with meals three times daily for 7 days.

Homeopathy

A number of homeopathic remedies are designed to treat acute conjunctivitis. These include *Argentum nitricum* (silver nitrate), **pulsatilla** (windflower), **belladonna**, *Arsenicum album* (arsenic trioxide), sulphur (elemental sulphur) and **eyebright** (*Euphrasia officinalis*). Eye drops prepared with homeopathic remedies may be a substitute for pharmaceutical eye drops.

Herbal therapy

Herbal eyewashes made with eyebright (1 tsp dried herb steeped in 1 cup of boiling water for 10

minutes, then strained and used at once) or **chamomile** (*Matricaria recutita*; 2–3 tsp in 1 pint of boiling water) may be helpful. Eyewashes should be strained and cooled before use. They should be discarded promptly after use, as old infusions may become contaminated (non-sterile).

Other home remedies may help relieve the discomfort associated with conjunctivitis. A boric acid eyewash (1 tsp boric acid in 1 cup of water) can be used to clean and soothe the eyes. A warm compress applied to the eyes for 5 to 10 minutes three times a day can help relieve the discomfort of bacterial and viral conjunctivitis and may help open a blocked tear duct. A clean washcloth soaked in warm water can be used as a warm compress. The patient should close both eyes and apply the compress to the affected eye. A cool compress or cool, damp tea bags placed on the eyes can ease the discomfort and itching of conjunctivitis.

Allopathic treatment

The treatment of conjunctivitis depends on what agent caused the condition. In all cases, warm compresses applied to the affected eye several times a day may help to reduce discomfort.

Conjunctivitis due to a viral infection is usually treated by applying warm compresses to the eye. Viral conjunctivitis is not treatable by antibiotic eye drops or ointment. Usually symptoms of viral conjunctivitis worsen for three to five days then begin to improve, and the disease clears on its own. If there is no improvement, a doctor should be consulted.

In cases of bacterial conjunctivitis, a physician usually prescribes an antibiotic eye ointment or eye drops containing **sodium** sulfacetamide (Sulamyd) to be applied daily for 7 to 14 days. As with all antibiotics, it is important to complete the entire course of treatment and not stop using the medicine simply because symptoms improve. Patients should contact their doctor if the eyes fail to improve after 72 hours.

Antibiotic eye drops are instilled (put in drop by drop) into the eye by having the patient tilt the head back and pulling down the lower eyelid. The patient is asked to look upward while the medication is instilled into the conjunctival sac. The dropper should not touch the skin to prevent discharge from the eye from contaminating the eye drop solution. After the drops have been instilled, the patient should gently close the eyes for one minute in order not to squeeze out any of the medication.

For cases of conjunctivitis caused by a gonococcus (the bacteria that causes gonorrhea), a physician may prescribe an injection of ceftriaxone (Rocephin) and a topical antibiotic ointment containing erythromycin or bactracin to be applied four times daily for two to three weeks. For chlamydial infections, a topical antibiotic ointment containing erythromycin (Ilotycin) may be prescribed to be applied one or two times daily.

To apply an antibiotic ointment, the eye should be gently wiped with a sterile cotton ball moistened with sterile water to remove any discharge. Then, the lower eyelid can be pulled down and a thin ribbon of ointment applied in the lower conjunctival sac. If possible, single-dose dispensers of ointment should be used as a protection against contamination of the medication. The eyelids can be closed and massaged gently to distribute the ointment. Patients may find that their vision is blurry for a few minutes after the ointment is applied, but this is a normal side effect. In addition to topical antibiotics, oral erythromycin or tetracycline therapy may be indicated for three to four weeks. Sexual partners should also be treated.

Allergic conjunctivitis is treated by removing the allergic substance from a person's environment, if possible, applying cool compresses to the eye, and by administering eye drops four to six times daily for four days. Also, the antihistamine diphenhydramine hydrochloride (Benadryl) may help to relieve itchy eyes. Some doctors may prescribe ophthalmic steroids, but they are often unnecessary and have the potential to cause complications in some patients.

Expected results

Conjunctivitis caused by an allergic reaction should clear up once the allergen is removed. Allergic conjunctivitis, however, is likely to recur if the individual again comes into contact with the particular allergen. Conjunctivitis caused by a bacterium or a virus, if treated properly, usually resolves in about ten days. If there is no relief of symptoms in 48 to 72 hours or if there is moderate to severe eye **pain** or changes in vision, a physician should be notified immediately. If untreated or treated inappropriately, conjunctivitis may cause vision impairment by spreading to other parts of the eye such as the cornea.

Prevention

Many states require that children with conjunctivitis remain at home until the eye redness is gone in order to prevent spreading this highly contagious disease. Conjunctivitis sometimes can be prevented or the course of the disease shortened by following some simple practices:

KEY TERMS

Adenovirus—A virus that affects the upper respiratory tract.

Chlamydia—A common sexually transmitted disease in the United States that often accompanies gonorrhea. It is caused by a rickettsia called *Chlamydia trachomatis*.

Gonococcus—The bacterium *Neisseria gonorrheae* , which causes gonorrhea, a sexually transmitted infection of the genitals and urinary tract that may occasionally affect the eye, causing blindness if not treated.

Herpes simplex virus—A virus that can cause fever and blistering on the skin, mucous membranes, or genitalia.

Herpes zoster virus—Acute inflammatory virus attacking the nerve cells on the root of each spinal nerve with skin eruptions along a sensory nerve ending.

Inflammation—The body's response to tissue damage, with symptoms of warmth, swelling, redness, and pain in the affected part.

Staphylococcus—A genus of bacteria, which resembles a cluster of grapes, that can infect various body systems.

- Washing hands frequently using antiseptic soap and using single-use towels during the disease to prevent spreading the infection
- Avoiding sharing towels and wash cloths
- Avoiding chemical irritants and known allergens
- In areas where welding occurs, using the proper protective eye wear and screens to prevent damaging the eyes
- Using a clean tissue to remove discharge from eyes and washing hands to prevent the spread of infection
- If medication is prescribed, finishing the course of antibiotics as directed to make sure that the infection is cleared up and does not recur
- Avoiding wearing eye makeup or contact lenses during the infection and do not share eye makeup with others

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

Weil, Andrew, *Natural Health, Natural Medicine,* rev. ed. New York: Houghton Mifflin, 2004.

OTHER

"Conjunctivitis." *American Optometric Association*. [cited April 20, 2008]. http://www.aoa.org/conjunctivitis.xml.

"Conjunctivitis (Pink Eye)." *MedicineNet.com* December 7, 2007 [cited April 20, 2008]. http://www.medicinenet.com/pink_eye/article.htm.

"Pink eye (Conjunctivitis)." *Mayo Clinic* May 25, 2006 [cited April 20, 2008]. http://www.mayoclinic.com/health/pink eye/DS00258.

Silverman, Michael. "Conjunctivitis." *eMedicine.com* May 8, 2007 [cited April 20, 2008]. http://www.emedicine.com/emerg/topic110.htm.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Academy of Family Physicians, PO Box 11210, Shawnee Mission, KS, 66207, (913) 906 6000, http://www.aafp.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://homeopathyusa.org.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http://www.homeopathic.org/contact.htm.

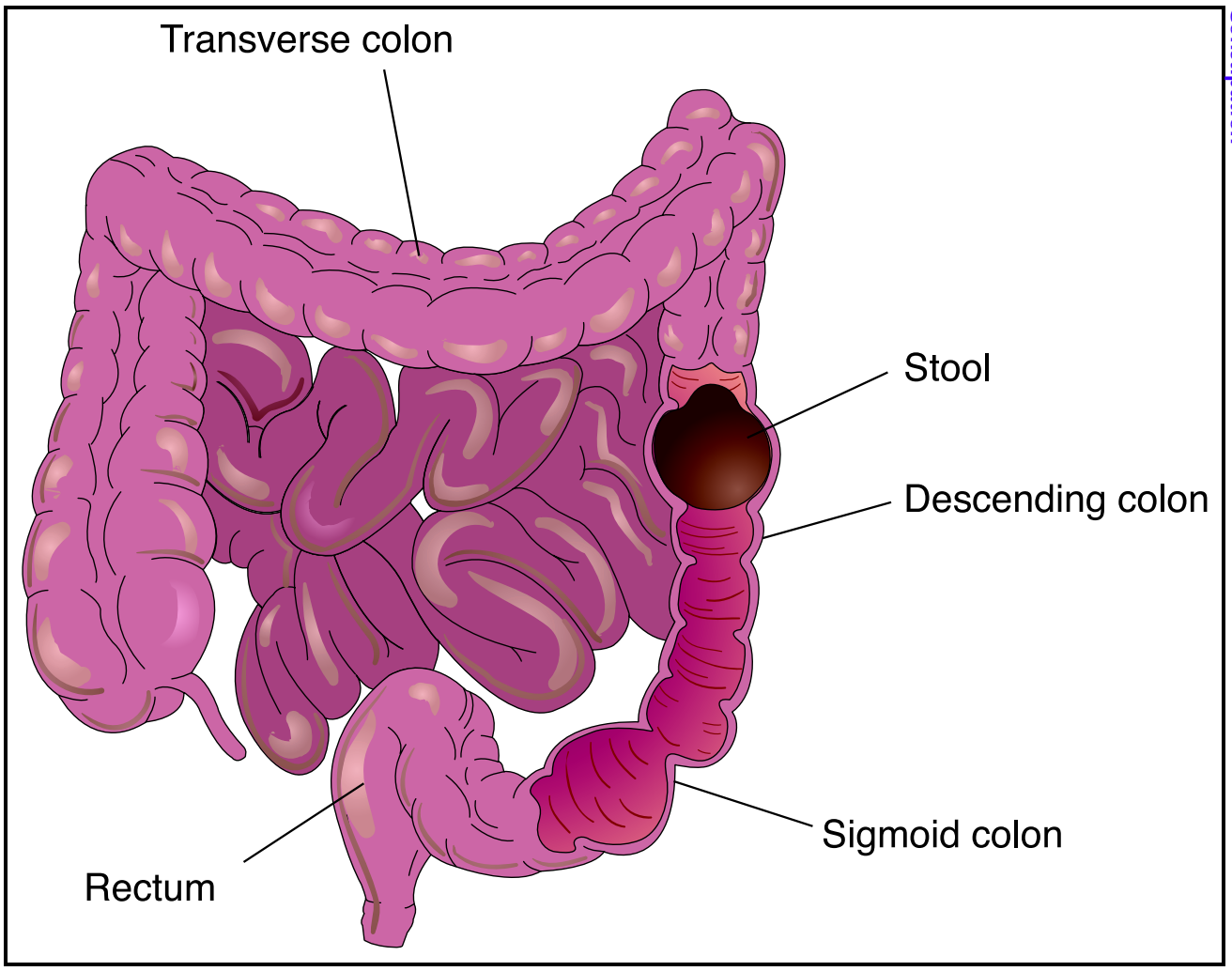
National Eye Institute, 2020 Vision Place, Bethesda, MD, 20892 3655, (301) 496 5248, http://www.nei.nih.gov.

Mai Tran
Teresa G. Odle
Tish Davidson, A. M.

Constipation

Definition

Constipation is an acute or chronic condition in which bowel movements occur less often than usual or consist of hard, dry stools that are painful or difficult to pass. Bowel habits vary, but an adult who has not had a bowel movement in three days or a child who has not had a bowel movement in four days is considered constipated.



Constipation is an acute or chronic condition in which bowel movements occur less often than usual or consist of hard, dry stools that are painful or difficult to pass. *(Illustration by Electronic Illustrators Group. Cengage Learning, Gale)*

Description

Constipation is one of the most common medical complaints in the United States. Estimates show that chronic constipation affects between 2% and 28% of adults. In the United States, constipation results in more than 2.5 million visits to physicians and 92,000 hospitalizations each year, according to an article in the October 1, 2007 issue of *Family Practice News*. Studies have shown chronic constipation is two to three times more common in women than men. The highest rates per age group are in people aged 65 years or older. However, it can occur at any age and is more common among individuals who resist the urge to move their bowels at the body's signal. This often happens when children start school or enter daycare and feel shy about asking permission to use the bathroom.

Although this condition is rarely serious, it can lead to the following:

- bowel obstruction
- chronic constipation
- hemorrhoids (a mass of dilated veins in swollen tissue around the anus)
- hernia (a protrusion of an organ through a tear in the muscle wall)
- spastic colitis (irritable bowel syndrome, a condition characterized by alternating periods of diarrhea and constipation)
- laxative dependency

Chronic constipation may be a symptom of **colorectal cancer**, **depression**, diabetes, diverticulosis (small pouches in the muscles of the large intestine), **lead**

poisoning, or **Parkinson's disease**. An opioid overdose (as in excessive codeine from **cough** suppressants or heroin addiction) also may result in constipation.

In someone who is elderly or disabled, constipation may be a symptom of bowel impaction, a more serious condition in which feces are trapped in the lower part of the large intestine. A doctor should be called if an elderly or disabled person is constipated for more than a week or if a child seems to be constipated.

A doctor should be notified whenever constipation occurs after starting a new prescription, vitamin, or mineral supplement or is accompanied by blood in the stools, changes in bowel patterns, **fever**, or abdominal **pain**.

Causes and symptoms

Constipation usually results from not getting enough **exercise**, not drinking enough water or clear fluids, or from a diet that does not include an adequate amount of fiber-rich foods such as beans, bran cereals, fruits, raw vegetables, rice, and whole-grain breads.

Other causes of constipation include anal fissure (a tear or crack in the lining of the anus), chronic kidney failure, colon or rectal **cancer**, depression, hypercalcemia (abnormally high levels of **calcium** in the blood), **hypothyroidism** (underactive thyroid gland), illness requiring complete bed rest, **irritable bowel syndrome**, imbalanced bowel from food and flora **allergies**, and **stress**.

Constipation can also be a side effect of the following:

- aluminum salts in antacids
- antihistamines
- antipsychotic drugs
- aspirin
- belladonna (*Atopa belladonna,* source of atropine, a medication used to relieve spasms and dilate the pupils of the eye)
- beta blockers (medications used to stabilize irregular heartbeat, lower high blood pressure, reduce chest pain)
- blood pressure medications
- calcium channel blockers (medication prescribed to treat high blood pressure, chest pain, some types of irregular heartbeat and stroke, some non-cardiac diseases)
- codeine or opioids
- diuretics (drugs that promote the formation and secretion of urine)
- iron or calcium supplements
- narcotics (potentially addictive drugs that relieve pain and cause mood changes)
- tricyclic antidepressants (medications prescribed to treat chronic pain, depression, headaches, and other illnesses)

An adult who is constipated may feel bloated, have a **headache**, swollen abdomen, pass rock-like feces, or strain, bleed, or feel pain during bowel movements. A constipated baby may strain, cry, draw the legs toward the abdomen, or arch the back when having a bowel movement.

Diagnosis

Everyone becomes constipated once in a while, but a doctor should be notified if significant changes in bowel patterns last for more than a week or if symptoms continue more than three weeks after increasing activity and fiber and fluid intake.

The patient's observations and medical history help a primary care physician diagnose constipation. The doctor uses his fingers to see if there is a hardened mass in the abdomen and may perform a rectal examination. Other diagnostic procedures include a barium enema, which may reveal a blockage inside the intestine; laboratory analysis of blood and stool samples for internal bleeding or other symptoms of systemic disease; and a sigmoidoscopy (examination of the sigmoid area of the colon with a flexible tube equipped with a magnifying lens).

Physical and psychological assessments and a detailed history of bowel habits are especially important when an elderly person complains of constipation.

Treatment

Initially, alternative practitioners suggest that the patient drink an adequate amount of water each day (six to eight glasses), exercise on a regular basis, and eat a diet high in soluble and insoluble fibers. Soluble fibers include pectin, flax, and gums. Insoluble fibers include **psyllium** and bran from grains such as wheat and oats. Fresh fruits and vegetables contain both soluble and insoluble fibers, and since constipation is aggravated by folate, calcium, and **magnesium** deficiencies, sources of these nutrients, such as asparagus, spinach, **parsley**, and other dark green leafy vegetables, should be part of the daily diet. Various fruit juices can also help maintain normal bowel function: Sorbitol, the natural sugar found in apple juice, has known laxative properties. **Castor oil**, applied topically to the abdomen and covered by a heat source (a heating pad or hot water bottle), can help relieve constipation when used nightly for 20–30 minutes. For

babies, about 1 tablespoon of corn syrup mixed with warm water might help relieve constipation.

Acupressure

This form of needleless **acupuncture** is said to relax the abdomen, ease discomfort, and stimulate regular bowel movements when diet and exercise fail to do so. After lying down, patients close their eyes and take deep breaths. For two minutes, the practitioner applies gentle fingertip pressure to a point about two inches below the navel. **Acupressure** can also be applied to the outer edges of one elbow crease and maintained for 30 seconds before pressing the crease of the other elbow. This should be done three times a day to relieve constipation.

Aromatherapy

Six drops of **rosemary** (*Rosmarinus officinalis*) and six drops of **thyme** (*Thymus spp.*) diluted by one ounce of almond oil, olive oil, or another carrier oil can relieve constipation when used to massage the abdomen. A circular motion for massage is recommended, beginning up the right side of the abdomen, coming across the top, and down the left side. Massaging the leg from knee to hip in the morning, at night, and before trying to move the bowels is said to relieve constipation.

Herbal therapy

A variety of herbal therapies can be useful in the treatment of constipation. Several herbs, including **chamomile** (*Matricaria recutita*), **dandelion** root (*Taraxacum officinale*), and burdock (*Arctium lappa*), act as **bitters** which stimulate the movement of the digestive and excretory systems. There are also laxative herbs that assist with bowel movement. Two of these are **senna** and **buckthorn**. These laxative herbs are stronger acting on elimination than bitters and can sometimes cause cramping (mixing them with a calming herb like **fennel** or caraway can help reduce cramping). Both senna and buckthorn are powerful herbs that are best used with direction from an experienced practitioner, since they can have adverse side effects and the patient may become dependent on them. In fact, practitioners caution that senna can cause severe cramping.

Yoga

The knee-chest position, said to relieve **gas** and stimulate abdominal organs, involves the following moves:

- standing straight with arms at the sides
- lifting the right knee toward the chest
- grasping the right ankle with the left hand
- pulling the leg as close to the chest as possible
- holding the position for about eight seconds
- repeating these steps with the left leg

The cobra position, which can be repeated as many as four times a day, involves the following moves:

- lying on the stomach with legs together
- placing the palms just below the shoulders, holding elbows close to the body
- inhaling, then lifting the head (face forward) and chest off the floor
- keeping the navel in contact with the floor
- looking as far upward as possible
- holding this position for three to six seconds
- exhaling and lowering the chest

The spinal twist is another pose that is recommended for daily use in relieving constipation. Practicing **relaxation** and **meditation** can also have a powerful effect on the digestive system. Slow, steady music can relieve tension that leads to constipation.

Allopathic treatment

If changes in diet and activity fail to relieve occasional constipation, an over-the-counter laxative may be used for a few days. Preparations that soften stools or add bulk (bran, psyllium, ducosate **sodium**) work more slowly but are safer than Epsom salts and other harsh laxatives or herbal laxatives containing senna (*Cassia senna*) or buckthorn (*Rhamnus purshianna*), which, if used long term, can harm the nerves and lining of the colon because they are stimulants that cause waves of involuntary muscle contractions in the intestines.

A woman who is pregnant should never use a laxative. She can use **flaxseed**, bran, ducosate sodium, prunes, or oatmeal. Anyone who is experiencing abdominal pain, **nausea**, or **vomiting** should also avoid laxatives. A warm-water or mineral oil enema can relieve constipation, and a non-digestible sugar (lactulose) or special electrolyte solution is recommended for adults and older children with stubborn symptoms. If a patient has an impacted bowel, the doctor may insert a gloved finger into the rectum and gently dislodge the hardened feces.

One study compared a non-toxic food ingredient called polyethylene glycol to lactulose for relieving constipation in children. It showed that it may work faster, prove easier to administer, and be just as safe and effective. However, more research was suggested

before recommending the substance over lactulose. A small-scale study of children with chronic constipation reported in 2006 that an intake for four weeks of a cocoa husk supplement produced beneficial results.

In 2007, the anti-constipation prescription drug tegaserod (Zelnorm) was removed from the market after an analysis of previous studies (meta-analysis) of more than 18,000 people showed it increased the risk of cardiovascular events, including **heart attack**, **stroke**, and unstable **angina**. The risk was small but considered significant. The drug was used to treat people with irritable bowel syndrome who had constipation or chronic constipation. There was no proof the drug itself caused the cardiovascular events since all 13 people in the studies who reported cardiovascular events had pre-existing heart problems or had risk factors for **heart disease**.

Expected results

Changes in diet and exercise usually eliminate the problem of constipation.

Prevention

Most Americans consume between 11–18 grams of fiber a day. Consumption of 30 grams of fiber and between 6–8 glasses of water each day can generally prevent constipation, and 35 grams of fiber a day (an amount equal to five servings of fruits and vegetables, and a large bowl of high-fiber cereal) can relieve constipation. Fiber supplements containing psyllium (*Plantago psyllium*) usually become effective within about two days and can be used every day without causing dependency. Powdered flaxseed (*Linium usitatissimum*) works the same way. Insoluble fiber, such as wheat or oat bran, is as effective as psyllium but may give the patient gas at first.

Daily use of 500 mg **vitamin C** and 400 mg magnesium can prevent constipation. If symptoms do occur, each dosage can be increased by 100 mg a day, up to a maximum of 5,000 mg vitamin C and 1,000 mg magnesium. Use of preventive doses should be resumed after relief occurs. If the patient develops **diarrhea**, the vitamin C should be decreased. Calcium is also important. Children over five can take up to 1,300 mg and adults ages 19–50 can take up to 2,000 mg.

Sitting on the toilet for 10 minutes at the same time every day, preferably after a meal, can induce regular bowel movements. This may not become effective for a few months, and it is important to defecate whenever necessary.

Resources

BOOKS

Dhingra, Anand. *Constipation Causes & Cure*. Charleston, SC: BookSurge, 2006.

Gauss, Harry. *So You Feel Sluggish Today: The Causes and Treatment of Constipation*. Whitefish, MT: Kessinger, 2007.

PERIODICALS

Castillejo, Gemma, et al. "A Controlled, Randomized, Double Blind Trial to Evaluate the Effect of a Supplement of Cocoa Husk that Is Rich in Dietary Fiber on Colonic Transit in Constipated Pediatric Patients." *Pediatrics* (September 2006): 1229 1230.

Drost, Jennifer, and Lucinda A. Harris. "Diagnosis and Management of Chronic Constipation: Diagnosis Is a Challenge Because Patients and Clinicians Often Define Constipation Differently. The History, Physical Examination, and Appropriate Diagnostic Procedures Are Key." *Journal of the American Academy of Physicians Assistants* (November 2006): 24(6).

Gaby, Alan R. "Food Allergy as a Cause of Chronic Constipation." *Townsend Letter: The Examiner of Alternative Medicine* (April 2007): 64.

Harrington, Kendra L., and Esther M. Haskvitz. "Managing a Patient's Constipation with Physical Therapy." *Physical Therapy* (November 2006): 1151(9).

Lembo, Anthony J. "Best Practices In: Chronic Constipation in the Elderly." *Family Practice News* (October 1, 2007): 10.

Wendling, Patrice. "Enemas Fail to Improve Intractable Constipation." *Pediatric News* (July 2007): 49.

OTHER

Jaeck, Brenda. "Constipation" (CD ROM). *Seeds to Change,* 2007. http://seedstochange.com/ (February 25, 2008).

ORGANIZATIONS

Association of Gastrointestinal Motility Disorders, 12 Roberts Dr., Bedford, MA, 01730, (781) 275 1300, http://www.agmd gimotility.org.

Irritable Bowel Syndrome Association, 1440 Whalley Ave., Suite 145, New Haven, CT, http://www.ibsassociation.org.

National Center for Alternative and Complementary Medicine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

National Digestive Disease Information Clearinghouse, 2 Information Way, Bethesda, MD, 20892 3570, (800) 891 5389, http://www.digestive.niddk.nih.gov.

Kathleen Wright
Ken R. Wells

Constitutional homeopathic remedies *see* **Homeopathy, constitutional prescribing**

Consumption *see* **Tuberculosis**

Contact dermatitis

Definition

Contact **dermatitis** is the name given to any skin inflammation that results from surface contact. There are two kinds of contact dermatitis, irritant and allergic.

Description

Thousands of natural and synthetic substances can cause contact dermatitis, which is the most common skin condition requiring medical attention, and the foremost source of work-related disease. Florists, domestic workers, hairdressers, food preparers, and employees in heavy industry, construction, carpentry, dry cleaning, farming, health care, and the military are the people most at risk of contracting work-related contact dermatitis. Americans spend roughly $300 million a year in their quest for relief from contact dermatitis, not counting the considerable sums devoted by governments and businesses to regulating and policing the use of skin-threatening chemicals in the workplace. But exactly how many people suffer from contact dermatitis remains unclear; a 1997 article in the *Journal of the American Medical Association* notes that figures ranging from 1–15% have been put forward for Western industrial nations.

Causes and symptoms

Irritant contact dermatitis (ICD) is the more commonly reported of the two types of contact dermatitis, accounting for about 80% of cases. It can be caused by soaps, detergents, solvents, adhesives, fiberglass, and other substances that are able to directly injure the skin. Most attacks are mild and confined to the hands and forearms, but can affect any part of the body that comes in contact with the irritating substance. The symptoms can take many forms: redness, **itching**, crusting, swelling, blistering, oozing, dryness, scaliness, thickening of the skin, and a feeling of warmth at the site of contact. In extreme cases severe blistering can occur and open sores can form. Occupations that require frequent skin exposure to water, such as hairdressing and food preparation, can make the skin more susceptible to ICD.

Allergic contact dermatitis (ACD) results when repeated exposure to an allergen (an allergy-causing substance) triggers an immune response that inflames the skin. Tens of thousands of drugs, pesticides, cosmetics, food additives, commercial chemicals, and other substances have been identified as potential allergens. Fewer than 30, however, are responsible the majority of ACD cases. Common culprits include poison ivy, poison **oak**, and poison sumac; fragrances and preservatives in cosmetics and personal care products; latex items, including gloves and condoms; and formaldehyde. Many people find that they are allergic to the nickel in inexpensive costume jewelry. ACD is usually confined to the area of skin that comes in contact with the allergen, typically the hands or face. Symptoms range from mild to severe and resemble those of ICD. A patch test may be needed to determine which kind of contact dermatitis a person is suffering from.

KEY TERMS

Antibiotics—Substances used against microorganisms that cause infection.

Corticosteroids—A group of anti-inflammatory substances often used to treat skin conditions.

Immune response—The protective reaction by the immune system against foreign antigens (substances that the body perceives as potentially dangerous). The immune system combats disease by neutralizing or destroying antigens.

Diagnosis

Diagnosis begins with a physical examination and asking the patient questions about his or her health and daily activities. When contact dermatitis is suspected, the doctor attempts to learn as much as possible about the patient's hobbies, workplace duties, use of medications and cosmetics, etc.—anything that might shed light on the source of the disease. In some cases an examination of the home or workplace is undertaken. If the dermatitis is mild, responds well to treatment, and does not recur, ordinarily the investigation is at an end. More difficult cases require patch testing to identify the specific allergen.

Two methods of patch testing are currently used. The most widely used method, the Finn chamber method, employs a multiwell aluminum patch. Each well is filled with a small amount of the allergen being tested and the patch is taped to normal skin on the patient's upper back. After 48 hours the patch is removed and an initial reading is taken. A second reading is made a few days later. The second method of patch testing involves applying a small amount of the test substance directly to normal skin and covering it with a dressing that keeps air out and keeps the test

substance in (occlusive dressing). After 48 hours the dressing is taken off to see if a reaction has occurred. Identifying the allergen may require repeated testing, can take weeks or months, and is not always successful. Moreover, patch testing works only with ACD, though it is considered an essential step in ruling out ICD.

Treatment

Herbal therapy

Herbal remedies have been used for centuries to treat skin disorders, including contact dermatitis. An experienced herbalist or naturopathic doctor can recommend the remedies that will be most effective for a person's condition. Among the herbs often recommended are:

- Burdock (*Arctium lappa*). Burdock is taken internally as a tea or tincture.
- Calendula (*Calendula officinalis*). Calendula is a natural antiseptic and anti-inflammatory agent. It is applied topically in a lotion, ointment, or oil to the affected area.
- Aloe (*Aloe barbadensis*). Aloes soothes skin irritations. Its gel is applied topically to the affected area.

Poison ivy, poison oak, and poison sumac are common culprits in cases of allergic contact dermatitis. Following exposure to these plants, the development of the characteristic rash may be prevented by washing the area with soap and water within 15 minutes of exposure. The leaves of jewelweed (*Impatiens* spp.), which often grows near poison ivy, may neutralize the poison ivy allergen if rubbed on the skin right after contact. Several topical herbal remedies may help relieve the itching associated with allergic contact dermatitis, including the juice of **plantain** leaves (*Plantago major*); a paste made of equal parts of green clay and **goldenseal** root (*Hydrastis canadensis*); a paste made of salt, water, clay, and **peppermint** (*Mentha piperita*) oil; and calamine lotion.

Homeopathy

A homeopath treating a patient with contact dermatitis will do a thorough investigation of the individual's history and exposures before prescribing a remedy. Common homeopathic remedies include:

- Rhus toxicodendron
- Croton tiglium
- ledum
- anacardium
- graphites
- sulfur

Allopathic treatment

The best treatment for contact dermatitis is to identify the allergen or irritating substance and avoid further contact with it. If the culprit is, for instance, a cosmetic, avoidance is a simple matter, but in some situations, such as an allergy to an essential workplace chemical for which no substitute can be found, avoidance may be impossible or force the sufferer to find new work or make other drastic changes in his or her life. Barrier creams and such protective clothing as gloves, masks, and long-sleeved shirts are ways of coping with contact dermatitis when avoidance is impossible, though they are not always effective.

For the symptoms themselves, treatments in mild cases include cool compresses and nonprescription lotions and ointments. When the symptoms are severe, corticosteroids applied to the skin or taken orally are used. Contact dermatitis that leads to a bacterial skin infection is treated with antibiotics.

Expected results

If the offending substance is promptly identified and avoided, the chances of a quick and complete recovery are excellent. Otherwise, symptom management—not cure—is the best that medical treatment can offer. For some people, contact dermatitis becomes a chronic and disabling condition that can have a profound effect on employability and quality of life.

Prevention

Avoidance of known or suspected allergens or irritating substances is the best prevention. If avoidance is difficult, barrier creams and protective clothing can be tried. Skin that comes in contact with an offending substance should be thoroughly washed, the sooner the better.

Resources

BOOKS

Swerlick, Robert A., and Thomas J. Lawley. "Eczema, Psoriasis, Cutaneous Infections, Acne, and Other Common Skin Disorders." In *Harrison's Principles of Internal Medicine*. Anthony S. Fauci, et al., eds. New York: McGraw Hill, 1998.

Ullman, Dana. *The Consumer's Guide to Homeopathy: The Definitive Resources for Understanding Homeopathic Medicine and Making It Work for You*. New York: G.P. Putnam's Sons, 1995.

Wolf, John E., Jr. "Contact Dermatitis." In *Conn's Current Therapy*. Robert E. Rakel, ed. Philadelphia: W.B. Saunders, 1998.

PERIODICALS

Leung, Donald Y. M., et al. "Allergic and Immunologic Skin Disorders." *Journal of the American Medical Association* 278 (1997): 1914+.

Rietschel, Robert L. "Occupational Contact Dermatitis." *Lancet* 349 (1997): 1093+.

Mai Tran

Copper

Description

Copper is an essential mineral that plays an important role in **iron** absorption and transport. It is considered a trace mineral because it is needed in very small amounts. Only 70 to 80 mg of copper are found in the body of a normal healthy person. Even though the body needs very little copper, it is an important nutrient that has many vital physiological functions.

Copper is essential for normal development of the body because it functions in the following ways:

- Participates in a wide variety of important enzymatic reactions in the body.
- Is a component of or a cofactor for approximately 50 different enzymes. These enzymes need copper to function properly.
- Is essential for iron absorption and transport. Iron is needed to make hemoglobin, a main component of red blood cells. Therefore, copper deficiency is often linked to iron-deficiency anemia.
- Is required to build elastin and collagen, which are important components of bones and connective tissues. Therefore, copper is believed to protect the bones and joints against degeneration and osteoporosis.
- Is required for melanin production. People with copper deficiency may have pale skin and hair.
- Is a key mineral for the immune system. Copper promotes wound healing. Studies show that premature infants or children with genetic copper defects are at high risk of getting infections and significantly improve with copper supplementation.
- Attacks free radicals. A strong antioxidant, copper works by attaching itself to the enzyme superoxide dismutase (SOD). Copper also binds to a protein to form ceruloplasmin, which is an antioxidant.
- Helps the body produce energy. Copper participates in many oxidative reactions that break down fats in fat tissue to produce much needed energy. Copper deficiency has been associated with high cholesterol levels.
- Is necessary for normal functioning of insulin. Copper deficiency is also associated with poor blood glucose control.
- Is needed for normal functioning of the cardiovascular system.
- Protects the structure and function of the nervous system, including the brain. Copper protects nerve fiber by maintaining myelin, the insulating sheath that surrounds nerve cells. It also aids the transmission of nerve signals in the brains.

Adequate intake of copper

Age	mcg/day
Children 0-6 mos.	200 (AI)
Children 7-12 mos.	220
Children 1-3 yrs.	340
Children 4-8 yrs.	440
Children 9-13 yrs.	700
Children 14-18 yrs.	890
Adults ≥ 19 yrs.	900
Pregnant women	1,000
Breastfeeding women	1,300

Foods that contain copper	mcg
Beef, liver, 3 oz.	1,240
Oysters, cooked, 6 med.	374
Chocolate, semisweet, 1 cup	176
Mushrooms, shiitake, cooked, 1 cup	130
Cashews, dry roasted, 1 oz.	70
Peas, black-eyed, cooked, 1/2 cup	70
Soybeans, boiled, 1 cup	70
Beans, white, canned, 1 cup	60
Sunflower seeds, 1/4 cup	59
Chickpeas, cooked, 1 cup	57
Baked beans, with pork, 1 cup	54
Lentils, cooked, 1 cup	50
V-8 juice, canned, 1 cup	48
Potato skin, baked, 1	47
Raisins, seedless, 1 cup	46
Salmon, baked, 3 oz.	30

AI = Adequate Intake
mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

General use

Copper supplements may be beneficial in treating or preventing copper deficiency. Copper deficiency

used to be relatively rare because the body requires so little of it, only about 2 mg per day. In addition, it is available naturally in a variety of foods such as whole grains, shellfish, nuts, beans, and leafy vegetables. Additional sources of copper are the copper water pipes that run through homes or the copper cookware in the kitchen. These sources leach copper into the water we drink and the food we eat. The level of copper in drinking water is sometimes so high that it becomes a public concern. However, scientists now realize that copper deficiency, especially borderline cases, is more common than once thought. Copper deficiency is currently on the rise due to a decrease of whole foods in the diet and high consumption of fatty and processed foods.

Studies have showed that vegetarian **diets** generally contain more copper than diets of omnivores but that the absorption efficiency is lower for lacto-ovo vegetarians than for nonvegetarians. Since vegetarians ingest more copper, however, the lower efficiency is not a problem in the diet of vegetarians.

Besides dietary causes, certain diseases or conditions may reduce copper absorption, transport, or increase its requirements, resulting in abnormally low copper blood levels. Increased copper intake through diet or supplementation may be necessary in the following conditions:

- premature infants fed only cow's milk
- pregnant women
- malnutrition
- celiac disease, sprue, cystic fibrosis, or short-bowel syndrome (these diseases cause poor absorption of dietary copper)
- kidney disease
- high consumption of zinc or iron (these minerals interfere with copper absorption)
- highly processed foods (copper is stripped away during food processing)
- Menkes syndrome (copper deficiency caused by genetic defects of copper transport). Menkes syndrome patients cannot efficiently use copper supplied by the diet.

Symptoms of copper deficiency include:

- anemia
- malnourished infants
- prominently dilated veins
- pale hair or skin
- poorly formed bones
- nervous system disorders
- high cholesterol levels
- heart disease
- loss of taste
- increased susceptibility to infections
- infertility
- birth defects

Exceeding the daily requirement of copper is dangerous, however, because copper toxicity tends to occur. Copper toxicity is a very serious medical problem. Acute toxicity due to ingestion of too much supplement, for example, may cause **nausea**, **vomiting**, abdominal **pain**, **diarrhea**, **dizziness**, **headache**, and a metallic taste in the mouth. Chronic toxicity is often caused by genetic defects of copper metabolism, such as Wilson's disease. In this disease, copper is not eliminated properly and accumulates to toxic levels. Copper is, therefore, present at high concentration where it should not be, such as in the liver, the lens of the eye, kidneys, and brain.

Disease prevention

Copper is a good antioxidant. It works together with an antioxidant enzyme, superoxide dismutase (SOD), to protect cell membranes from being destroyed by free radicals. Free radicals are any molecules that are missing one electron. Because this is an unbalanced and unstable state, a radical acts in such a way as to complete its electron pair. Therefore, it reacts with any nearby molecules to either steal an electron or give away the unpaired electron. In the process, free radicals initiate chain reactions that destroy cell structures. Like other **antioxidants**, copper scavenges or reacts with these highly reactive radicals and changes them into inactive, less harmful forms. Therefore, it can help prevent **cancer**. In 2001, a study reported that concentrations of copper sulfate and ascorbate may inhibit **breast cancer** growth. With further study, the combination may even prove useful as a chemotherapy agent for certain breast cancer patients.

Copper may also help prevent degenerative diseases or conditions such as premature **aging**, **heart disease**, autoimmune diseases, arthritis, **cataracts**, **Alzheimer's disease**, or diabetes.

Osteoporosis

Copper may play a role in preventing **osteoporosis**. **Calcium** and **vitamin D** have long been considered the mainstay of osteoporosis treatment and prevention. However, one study has shown that they can be even more effective in increasing bone density and preventing osteoporosis if they are used in

combination with copper and two other trace minerals, **zinc** and **manganese**.

Rheumatoid arthritis

Copper has been a folklore remedy for **rheumatoid arthritis** since 1500 B.C. in ancient Egypt. Some people believe that wearing jewelry made of copper may relieve arthritic symptoms. Some researchers have attempted to verify the use of copper bracelets as a treatment for rheumatoid arthritis, but without success. Most studies show no effect at all, and the few that do were so poorly designed as to be of little use.

Preparations

Copper is contained in many multivitamin/mineral preparations. It is also available as a single ingredient in the form of tablets. These tablets should be swallowed whole with a cup of water, preferably with meals, to avoid stomach upset. A person may choose any of the following preparations: copper gluconate, copper sulfate, or copper citrate. However, copper gluconate may be the least irritating to the stomach.

Zinc and copper compete with each other for absorption in the gastrointestinal tract. As a result, excessive copper intake may cause zinc deficiency and vice versa. Therefore, a person should take zinc and copper supplements together in ratios of 10:1 or 15:1.

Precautions

Individuals who add copper supplements to their diets should consider the following precautions:

- Informing their doctors in order to gain proper instruction and monitoring of side effects. Copper toxicity due to excessive doses of copper supplements has been reported.
- Considering that recommended daily allowance (RDA) for copper varies with age and sex. It ranges from about 200 mcg/day for infants under the age of one year to 900 mcg/day for adult males and females. The RDA for pregnant and lactating women is 1,000 mcg/day and 1,300 mcg/day, respectively. Nausea and vomiting may occur in persons taking more than 20 mg of copper daily.
- It is not known if copper supplementation may harm a fetus. However, as with any drugs, pregnant or nursing women should not take copper or any other supplements or drugs without first consulting their doctors.
- In certain areas, drinking water may contain high levels of copper. Periodic checks of copper levels in drinking water may be necessary.

KEY TERMS

Antioxidants—Nutrients that deactivate reactive molecules (free radicals) and prevent harmful chain reactions.

Lacto-ovo vegetarian—People who do not eat meat, but do consume dairy products and eggs.

Minerals—Chemical elements that are found in plants and animals and are essential for life. There are two types of minerals: major minerals, which the body requires in large amounts, and trace elements, which the body needs only in minute amounts.

- Because individual antioxidants often work together to defend the body against free radicals, the balance among copper, zinc, and iron must be maintained. Excessive intake of one nutrient might result in a deficiency of other minerals and decreased resistance to infections and increased risk of heart disease, diabetes, arthritis, and other diseases.

Side effects

A person should stop taking copper supplements and seek medical help immediately if any of the following signs or symptoms occurs:

- anemia
- nausea
- vomiting
- abdominal pain

Interactions

Factors that increase copper concentrations

Certain disorders have been known to increase copper levels. Persons with these conditions should not take copper supplements as they may cause copper toxicity.

- recent heart attacks
- lupus erythematosus
- cirrhosis of the liver
- schizophrenia
- leukemia and some other forms of cancer
- viral infections
- ulcerative colitis (This inflammatory bowel disease may cause accumulation of copper in the body. Excessive amount of copper may worsen many

symptoms of this disease by increasing susceptibility to infections and inhibiting wound healing.)

- Wilson's disease (This disease causes accumulation of copper in the tissues. As a result, patients have liver disease, mental retardation, tremor, and poor muscle coordination. They also have copper deposits in the cornea of the eye. To manage this disease, patients are put on a low-copper diet and given penicillamine, a drug that attaches itself to copper and increases its excretion.)

Resources

BOOKS

Haas, Elson M., and Buck Levin. *Staying Healthy with Nutrition, 21st Century Edition: The Complete Guide to Diet & Nutritional Medicine*. Berkeley, CA: Celestial Arts, 2006.

Kirschmann, John D. *Nutrition Almanac*. New York: McGraw Hill, 2006.

PERIODICALS

Ferrari, Carlos K. B. "Minerals: From Basic Aspects to Newly Discovered Physiological and Nutritional Actions." *Evidence Based Integrative Medicine* 2, no. 3 (2005): 123 131.

Lamb, David J., et al. "Dietary Copper Supplements Mod ulate Aortic Superoxide Dismutase, Nitric Oxide, and Atherosclerosis." *International Journal of Experimental Pathology* (August 2005): 247 255.

Lynes, Michael A., et al. "Heavy Metal Ions in Normal Physiology, Toxic Stress, and Cytoprotection." *Annals of the New York Academy of Sciences* (October 2007): 159 172.

Qureshi, G. Ali, et al. "The Emerging Role of Iron, Zinc, Copper, Magnesium, and Selenium and Oxidative Stress in Health and Diseases." *Biogenic Amines* (Sep tember 2005): 147 169.

Stern, Bonnie Ransom, et al. "Copper and Human Health: Biochemistry, Genetics, and Strategies for Modeling Dose response Relationships." *Journal of Toxicology and Environmental Health, Part B: Critical Reviews* (April 2007): 157 222.

Mai Tran
Teresa Norris
David Edward Newton, Ed.D.

Coptis

Description

Coptis is the underground stem (rhizome) or root of the plant *Coptis chinensis*. It is used in **traditional Chinese medicine** as a stomachic (a medication to improve digestive functions) and an antiseptic. Other related species are also called coptis and used in similar ways in other parts of the world. *Coptis anemonaefolia* is used in Japan. *Coptis trifolia* is used in North America, and *Coptis teeta* grows in India and is used in **Ayurvedic medicine**.

Coptis is used in traditional Chinese medicine as a stomachic (a medication to improve digestive functions) and an antiseptic. *(© Ross Frid / Alamy)*

Coptis is a low, creeping perennial evergreen that grows in damp boggy spots in woods. The plant produces a mass of thread-like golden rhizomes that are used in healing. *C. chinensis* is native to the cooler parts of Asia and is extensively cultivated in Szechwan province in China. *C. trifolia* is native to eastern North America as far south as the mountains of Tennessee. Other names for the various species of coptis used in healing include goldthread, Chinese goldthread mouth root, cankerroot, yellowroot, coptidis, mishmi bitter, and chonlin. The Chinese name for *C. chinensis* is *huang lian*.

General use

Coptis, or *huang lian*, has a long history of use in China. In traditional Chinese medicine (TCM), coptis is used to treat conditions associated with excess dampness and excess heat, such as **insomnia** and irritability. Heat in TCM means excessive activity, not high temperature, although the diseased part of the body could be red or inflamed. Coptis is said to have a cold nature and a bitter taste. In TCM, coptis is considered one of the 50 fundamental herbs. It is associated with the heart, liver, stomach, and large intestine.

More specifically, coptis is used to treat such gastrointestinal problems as **diarrhea**, **vomiting**, and bacterial dysentery. It is also used to treat chronic gall bladder inflammations. Other gastrointestinal

KEY TERMS

Berberine—A white or yellow water-soluble alkaloid with antibacterial properties. Coptis, goldenseal, and barberry are all plants that contain berberine.

Hemostatic—A type of medication that is given to stop bleeding.

Rhizome—A rootlike underground plant stem that typically produces new shoots from its upper surface and new roots from the lower one. Coptis rhizomes are the parts of the plant most commonly used for medicinal purposes.

Stomachic—A type of medication that is given to tonify the stomach or improve digestive functions.

Tincture—An alcohol-based extract prepared by soaking plant parts.

conditions treated with coptis include abdominal cramps, acid reflux (**heartburn**), ineffective or painful bowel movements, and bloody stools. Coptis is effective as a hemostatic, which means that it can be used to stop bleeding.

Chinese herbalists also use preparations made from coptis to relieve high **fever** and delirium. These preparations can be used as a gargle to relieve sore throats. Externally coptis can be used as a mouthwash to treat all kinds of mouth sores, including **canker sores**, tongue ulcers, and swollen gums. As an eyewash it is used for **conjunctivitis** (pink eye). On the skin it is used topically to treat **acne**, **boils**, carbuncles, **burns**, and infected **cuts**.

C. triflora is used in North America in some similar ways. In an interesting parallel, some Native American tribes used their native species of coptis as a wash for eye and mouth problems in much the same way as the Chinese. It was also used as a gargle for sore throats. Although it is not as popular in North America as in China, modern North American herbalists use coptis to treat **indigestion**. It is also used externally as a douche to treat vaginal **infections**. The herb is used in similar ways in India.

Modern scientific research supports many of the traditional uses of coptis. All species of this herb contain the compound berberine, which is a white or yellow water-soluble alkaloid. Berberine is known to have strong antibiotic effects. In test tube studies, berberine was shown to inhibit the growth of streptococcal bacteria responsible for some forms of **pneumonia**. This antibacterial activity supports the use of coptis to treat skin, mouth, eye, and vaginal infections.

Berberine also is known to stimulate the production of saliva, gastric juice, pancreatic juice, and bile, suggesting that there is a chemical basis for the traditional use of coptis in treating gastrointestinal disorders. Berberine is also found in such other healing plants as **goldenseal**, **barberry**, and Oregon grape. Preliminary test tube studies of berberine suggest that it may also be effective against **fungal infections**, some viruses, and certain intestinal parasites. The high level of interest in berberine in the research community means that more studies of coptis may soon be available.

Preparations

The rhizomes and roots of coptis are harvested in the autumn and are used either dried or fresh. The herb is available powdered or as a tincture. The dosage varies according to the condition being treated. The actions of coptis are similar to the actions of goldenseal (*Hydrastis canadensis*), and it is sometimes substituted for goldenseal in herbal remedies.

In Chinese herbalism, coptis is rarely used alone, but can be found as an ingredient in many formulas. These include hoelen and polyphorus, leonoris and achyranthes, tang gui and **gardenia**, and at least half a dozen other formulas.

Precautions

Berberine is known to cause contractions of the uterus in laboratory animals. For this reason, it is recommended that pregnant women not take coptis or any other herb containing berberine.

Side effects

No unwanted side effects have been reported when coptis is used in the amounts recommended by herbalists.

Interactions

Coptis is has been used for thousands of years in China in conjunction with other herbs with no reported interactions. Since coptis is used most extensively in Asian medicine, there are no studies of its interactions with Western pharmaceuticals.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

Molony, David. *Complete Guide to Chinese Herbal Medicine*. New York: Berkeley Books, 1998.
PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company, 1999.

ORGANIZATIONS

American Association of Oriental Medicine (AAOM). 433 Front Street, Catasauqua, PA 18032. (610) 266 2433.

OTHER

"Coptis chinensis." Plants for a Future. http://www.pfaf.org.

Tish Davidson

Cordyceps

Description

Cordyceps sinensis, also called Chinese caterpillar fungus, Cs-4, *Dong Chong Xia Caoor*, or *semitake*, is a fungus native to the Tibetan plateau in China. The fungus is parasitic and grows in the moth caterpillar. Spores enter the host, germinate, and ultimately kill the larva. Although species of cordyceps are seen in Europe and the Americas, only the Chinese form has been used medically.

KEY TERMS

Fungus—A plant that lacks both leaves and flowers, and lives on decaying matter. The fungi may be single-celled or grow quite large. The group of fungi includes molds, yeasts, smuts, and mushrooms.

Lupus nephritis—Kidney damage associated with Systemic lupus erythematosis, an autoimmune disease. The kidney damage is gradual, but leads to complete kidney failure.

Parasitic—Behaving like a parasite; an organism that lives on, with, or in another organism. It draws its energy from the host, without providing any benefit to the host.

Standardized—To cause to conform to a standard. In medicine and pharmacy, this means that a given weight of an herb will contain a standardized percentage or weight of the active principle.

General use

Cordyceps has a long history of use in Chinese medicine. Its traditional roles have been restorative; improving the quality of life, and increasing energy and longevity.

Traditional uses of the thousand year "rejuvenation" herb include the following:

- impotence treatment
- increase fertility
- stimulate immune system
- improve resistance to bacteria
- increase resistance to viruses
- relieve fatigue
- vitality tonic for mind and body, especially in aging men

While most of the cordyceps research has been conducted in China, published studies in Europe and elsewhere indicate that the fungus may have many potentially useful properties. A Korean study of a related species of cordyceps indicates that it has components that may inhibit coagulation, making it potentially beneficial in **stroke** and **heart attack** prevention. A hot water extract of the fungus appeared to stimulate the immune system. This immune modulation effect is seen in other studies, which have reported that cordyceps may be useful in treating **Hepatitis** B. A study from Thailand reported that *Cordyceps nipponica* may have value in the treatment of **malaria**. Additional studies have indicated its possible benefit in preventing a recurrence of Lupus nephritis. However, another study that looked at herbs used as performance enhancers (to improve **exercise** and athletic performance), was unable to validate cordyceps' value for this purpose.

Another review concluded that cordyceps may be promising as a possible aid for **fatigue**, **stress**, heart health, lung function, and toxin exposure.

Cordyceps has physiological properties and benefits if used over time as a tonic, but taking it for a specific disease or problem remains an area needing further human studies and research. The traditional use of cordyceps was as an ongoing daily tonic, beginning in mid-life.

Preparations

Cordyceps capsules are available in varying strengths (400 mg, 450 mg, 615 mg, and 800 mg). The liquid preparation is sold in 1 gram per 1.5 ml strength.

Precautions

Cordyceps appears to be an exceptionally safe product with no established toxic dose. In 1996, there

were two reports of cordyceps products contaminated with lead, but this does not appear to be an ongoing problem.

There is a risk of allergic reaction to either the fungus or other ingredients in the formulation.

Formulations of cordyceps are not standardized. Products are labeled in terms of the quantity of dried fungus contained, but there is no way to determine the amount of active components in any product. Because of this, activity may vary between brands and between individual samples from the same company.

Side effects

Side effects appear to be mild. Patients have reported stomach upset, **dry mouth**, and **nausea**.

Interactions

At this time, the only established interaction is due to the anticoagulant effects of the fungus, which may increase the risk of bleeding in patients taking warfarin (commonly known by the brand name Coumadin) or other anticoagulant drugs.

Because of the many different activities that have been attributed to cordyceps, it seems likely that other drug interactions will be reported in the future.

Resources

BOOKS

Jones, K. *Cordyceps: Tonic Food of Ancient China*. New Mexico: Sylvan, 1997.

PERIODICALS

Bucci, L. R. "Selected Herbals and Human Exercise Per formance." *American Journal of Clinical Nutrition* (August 2000): 624S 36S.

Chen, Y. J., M. S. Shiao, S. S. Lee, and S. Y. Wang. "Effect of Cordyceps sinensis on the Proliferation and Differ entiation of Human Leukemic U937 Cells." *Life Sci ence* (1997): 2349 59.

Der Marderosian, A., Beutler, et al., editors. "Review of Natural Products." *Facts & Comparisons* (February 2004).

Isaka, M., M. Tanticharoen, P. Kongsaeree, and Y. Thebt aranonth. "Structures of Cordypyridones A D, Anti malarial N hydroxy and N methoxy 2 pyridones from the Insect Pathogenic Fungus Cordyceps nipponica." *Journal of Organic Chemistry* (July 13, 2001): 4803 8.

Pegler, D. N., Y. J. Yao, and Y. Li. "The Chinese Caterpillar Fungus." *Mycologist* (February 8, 1994).

Wu, T. N., K. Yang, C. M. Wang, J. S. Lai, K. N. Ko, P. Y. Chang, and S. H. Liou. "Lead Poisoning Caused by Contaminated Cordyceps, a Chinese Herbal Medicine: Two Case Reports." *Science of the Total Environment* (April 5, 1996): 193 5.

Yu, K. W., K. M. Kim, and H. J. Suh. "Pharmacological Activities of Stromata of Cordyceps Scarabaecola." *Phytother Res* (March 17, 2003): 244 9.

Samuel Uretsky, Pharm.D.

Corns and calluses

Definition

A corn is an overgrowth of skin on a bony prominence, usually occurring on the feet and toes. It manifests as a rough and painful bump. A callus is a rough, thickened lump of dead skin that is usually painless. It may be found on the feet, the hands, or anywhere else there is repeated friction and pressure.

Description

Corns and calluses affect about 5% of the population of the United States. Women have corns more often than men, probably due to wearing ill-fitted shoes more often. Although calluses may form anywhere on the body, they are generally found on the heels and balls of the feet, the knees, and the palms of the hands. Calluses are usually larger than corns—they may measure more than an inch (2.5 cm) wide. Calluses usually only hurt if pressure is applied to them.

Causes and symptoms

Corns and calluses form to prevent injury to skin that is repeatedly pinched, rubbed, or irritated. Hereditary calluses may develop where there is no apparent friction. This condition runs in families and occurs most often in children.

The most common causes of the formation of corns and calluses are:

- shoes that have very high heels and shoes that do not fit properly
- tight socks or stockings
- deformities of the toes
- walking or standing on a hard surface for an extended time
- jobs or hobbies that cause steady or recurring pressure on the same spot

Corns may be extremely sore and surrounded by inflamed, swollen skin. A sharp **pain** will probably occur whenever downward pressure is applied, and a dull ache may be felt at other times.

KEY TERMS

Bursitis—An inflammation of the tissue sac, called a bursa, which surrounds and helps lubricate the joints.

Orthopedist—A specialist who is concerned with the bones, muscles, and joints and their points of interaction.

Pumice stone—A volcanic rock that can be used to remove overgrowths and smooth the skin.

Wart—A small, fleshy skin growth caused by a virus.

Diagnosis

Corns can be recognized on sight. They are sometimes mistaken for **warts**. However, if the lesion is a wart, it will bleed when scraped with a sharp implement. A callus will not bleed, but will shed a layer of dead skin. This can provide the basis of a general diagnosis.

Treatment

Standing and walking correctly can sometimes eliminate excess foot pressure and minimize the development and recurrence of corns and calluses. Bodywork systems such as **Aston-Patterning**, the **Feldenkrais** method, and **rolfing**, may help to correct body imbalances that lead to corns and calluses.

Two or three daily applications of **calendula** (*Calendula officinalis*) salve can soften skin and prevent inflammation. A mixture of one teaspoon of lemon juice, one teaspoon of dried **chamomile** (*Martricaria recutita*), and one crushed **garlic** clove (*Allium sativa*) can be applied directly to dissolve thickened skin.

A recommended Ayurvedic remedy is the nightly application of a paste made by combining one teaspoon of **aloe** vera gel with one half teaspoon of **turmeric** (*Curcuma longa*). The corn or callus should be covered with the paste and bandaged overnight. It should be soaked in warm water for 10 minutes every morning, and given a daily massage with mustard oil (*Brassica cruciferae*).

Allopathic treatment

The attention of a physician may be required if there is numbness, reduced feeling, or severe pain. Occasionally, an orthopedist may have to perform surgery to correct toe deformities or remove bits of bone that may be causing corns or calluses to develop. Medical attention is not usually required unless **diabetes mellitus**, poor circulation, or other problems make self-care difficult. The first step in home care of corns and calluses is to identify and eliminate sources of pressure and friction. Doughnut-shaped pads, wads of cotton, lamb's wool, or other kinds of inserts can be used to cushion affected areas. Soaking the feet in a solution of Epsom salts, or using hydrocortisone creams, petroleum jelly, or lanolin lotions can soften calluses. After which, they can be reduced or removed by rubbing the area with a pumice stone. This is not recommended for corns, however, as rubbing just makes them more painful.

It is important to consult with a healthcare provider if there is broken skin because it may become infected. In the case of an infection, affected layers of skin need to be removed, and pus may need to be drained. Oral antibiotics may be given to eliminate the infection. Cortisone may be injected into the affected area to decrease pain or inflammation.

Expected results

Most corns and calluses disappear within three weeks after the pressure that caused them is eliminated. However, if the causes of the condition are not remedied completely, or are allowed to recur, the corns and calluses may return. If there is continual pain associated with corns, it can change the way a person stands or walks. Such changes may eventually cause pain and dysfunction in the ankles, back, hips, or knees.

If a corn develops near a toe joint, **bursitis** may result, causing severe pain and inflammation. If cracks or other breaks in the skin develop, a staph infection may result. This is especially serious for people who have diabetes or poor circulation, as **gangrene** may develop from a resistant infection.

Prevention

Corns and calluses can usually be prevented by wearing shoes that fit properly. Feet should be measured, while standing, whenever buying new shoes. It is best to shop for shoes late in the day, when feet are likely to be swollen. It is also important to buy shoes with toe-wiggling room and to try new shoes on both feet. Pointy-toed shoes and high heels should be avoided. Worn down or uneven shoe soles and heels should be replaced or repaired. Corrective footwear or special insoles may be necessary. Socks and stockings should also be fitted appropriately at the feet. Gloves, kneepads, and other protective gear should be worn as needed to prevent rubbing and friction, especially

when engaging in heavy work or sports activities. Cutting or paring dead skin should be avoided, as it may lead to further injury or infection.

Resources

BOOKS

Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life, 1996.

Gottlieb, Bill, ed. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, 1995.

ORGANIZATIONS

American Podiatric Medical Association. 9312 Old Geor getown Road, Bethesda, MD 20814 1698. http://www.apma.org.

Patience Paradox

Cornsilk

Description

Cornsilk (*Zea mays*) is an herbal remedy made from stigmas, the yellowish thread-like strands found inside the husks of corn. The stigmas are found on the female flower of corn, a grain that is also known as maize and is a member of the grass family (Gramineae or Poaceae). The stigmas measure 4–8 in (10–20 cm) long and are collected for medicinal use before the plant is pollinated. Cornsilk can also be removed from corn cobs for use as a remedy.

If fertilized, the stigmas dry and become brown. Then yellow corn kernels develop. Corn is native to North America and now grows around the world in warm climates.

Cornsilk is also known as mother's hair, Indian corn, maize jagnog, Turkish corn, yu mi xu, and stigmata maydis.

General use

Some historians believe that corn has grown for more than 7,000 years in North America. About the time that Christopher Columbus brought the first corn to Europe, the grain grew throughout North and South America. The venerable plant's stigmas have long been used in folk medicine to treat urinary conditions including inflammation of the bladder and painful urination.

Cornsilk also served as a remedy for heart trouble, **jaundice**, **malaria**, and **obesity**. Cornsilk is rich in **vitamin K**, making it useful in controlling bleeding during **childbirth**. It has also been used to treat **gonorrhea**.

Cornsilk. *(Emilio Ereza / Alamy)*

For more than a century, cornsilk has been a remedy for urinary conditions such as acute and inflamed bladders and painful urination. It was also used to treat the prostate. Some of those uses have continued into modern times; cornsilk is a contemporary remedy for all conditions of the urinary passage.

Drinking cornsilk tea is a remedy to help children stop wetting their beds, a condition known as enuresis. It is also a remedy for urinary conditions experienced by the elderly.

Cornsilk is used to treat urinary tract **infections** and **kidney stones** in adults. Cornsilk is regarded as a soothing diuretic and useful for irritation in the urinary system. This gives it added importance, since today, physicians are more concerned about the increased use of antibiotics to treat infections, especially in children. Eventually, overuse can lead to drug-resistant bacteria. Also, these drugs can cause complications in children.

Furthermore, cornsilk is used in combination with other herbs to treat conditions such as cystitis (inflammation of the urinary bladder), urethritis (inflammation of the urethra), and parostitis (**mumps**).

Cornsilk is said to prevent and remedy infections of the bladder and kidney. The tea is also believed to diminish prostate inflammation and the accompanying **pain** when urinating.

Since cornsilk is used as a kidney remedy and in the regulation of fluids, the herb is believed to be helpful in treating high blood pressure and water retention. Cornsilk is also used as a remedy for **edema** (the abnormal accumulation of fluids).

Cornsilk is used to treat urinary conditions in countries including the United Sates, China, Haiti, Turkey, and Trinidad. Furthermore, in China, cornsilk as a component in an herbal formula is used to treat diabetes.

In addition, cornsilk has some nonmedical uses. Cornsilk is an ingredient in cosmetic face powder. The herb used for centuries to treat urinary conditions acquired another modern-day use. Cornsilk is among the ingredients in a product advertised to help people pass their drug tests.

Preparations

Some herbalists say that cornsilk is best used when fresh, but it is also available in dried form. Cornsilk can be collected from the female flower or from corn cobs. In addition, cornsilk is available commercially in powdered and capsule form and as an extract. Cornsilk is usually brewed as a tea, a beverage that is said to be soothing.

Cornsilk tea or infusion can be made by pouring 1 cup (240 ml) of boiling water over 2 tsp (2.5 g) of dried cornsilk. The mixture is covered and steeped for 10–15 minutes. The tea should be consumed three times daily.

In addition, a tincture of 1 tsp (3-6 ml) of cornsilk can be taken three times daily. Tincture can be purchased over the counter, or made at home by mixing the herb with water or alcohol at a ratio of 1:5 or 1:10.

Cornsilk is also available in capsule form. The usual dosage for 400-mg capsules is two capsules. These are taken with meals three times daily.

A remedy for bedwetting

Herbal remedies can be part of the treatment when children wet their beds. Methods of stopping this behavior include having the child **exercise** during the day, drink fewer beverages in the evening, and drink a cup of cornsilk tea one hour before bedtime. Cornsilk could be the only ingredient in the tea. However, cornsilk can be part of an herbal combination if **bedwetting** is caused by lack of nervous control of the bladder.

Cornsilk combinations

Cornsilk combines well with other herbs to remedy a range of urinary conditions. One remedy for a bed-wetting tea is to combine one part of cornsilk, **St. John's wort**, **horsetail**, **wild oat**, and **lemon balm**.

An herbal practitioner can recommend other combination remedies to treat more complicated conditions. For example, when a person has cystitis, cornsilk can be combined with **yarrow**, **buchu**, couchgrass, or bearberry.

Furthermore, cornsilk may be an ingredient in a commercial remedy taken to maintain the urinary tract system. Other ingredients could include yarrow and **marsh mallow**.

Precautions

Cornsilk is safe when taken in proper dosages, according to sources including *PDR (Physician's Desk Reference) for Herbal Medicines*, the 1998 book based on the findings of Germany's Commission E. The commission published its findings about herbal remedies in a 1997 monograph.

Before beginning herbal treatment, people should consult a physician, practitioner, or herbalist. Herbs like cornsilk are not regulated by the U.S. Food and Drug Administration (FDA), a process that involves research and testing.

If a person decides to collect fresh cornsilk, attention should be paid to whether the plants were sprayed with pesticides.

Side effects

There are no known side effects when cornsilk is taken in designated therapeutic dosages.

Interactions

Information is not available about whether there is an interaction when cornsilk is taken with medication. People taking medications should first check with their doctor or health practitioner before using cornsilk.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

Medical Economics Staff. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics Company, 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

PERIODICALS

Edney, Mark T, et al. "Putting Antimicrobials to Best Use in Pediatric Urology." *Contemporary Urology* (July 2002): 35 39.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX 78720. (512) 331 8868. http://www.herbalgram.org/.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

HealthWorld Online. http://www.healthy.net (January 17, 2001).

Holistic Online. http://www.holisticonine.com (January 17, 2001).

Liz Swain
Teresa G. Odle

Cornus

Description

Cornus (*Cornus officinalis*) is a tree of the dogwood family used in Chinese medicine. Its Chinese name is *shan zhu yu*. Cornus grows to a height of 30 ft (10 m) in the woodland regions of East Asia from China to Korea. The fruit is used in healing. It is harvested when ripe, then dried for future use. The small fruits can also be eaten as food, either raw or cooked. They contain about 8.6% sugar and have a slightly astringent taste. The bark from the stem is also used as an anti-malarial tonic.

Chinese cornus should not be confused with the North American tree *Cornus florida*, better known as dogwood or American boxwood. Dogwood and Chinese cornus are in the same plant family but have somewhat different healing properties. The bark of *Cornus florida* is used in Western herbal healing.

General use

Cornus has been used in China for more than 2,000 years. In the Chinese system of health, yin aspects must be kept in balance with yang aspects. Ill health occurs when the energies and elements of the body are out of balance or in disharmony. Health is restored by taking herbs and treatments that restore this balance.

Cornus is strongly associated with the kidneys, the reproductive system, and, to a lesser extent, the liver. It is made into a slightly warm yin tonic and classified as having a sour taste. In Chinese medicine sour herbs are believed to help control body fluids and conditions such as bed-wetting, excessive sweating, heavy or prolonged **menstruation**, and premature ejaculation.

Cornus is rarely used alone. It is an ingredient in many herbal formulas where it is used to stabilize and bind. It has astringent properties that are thought to boost the power of other herbs. Cornus can be combined with both yin and yang herbs to remedy deficiencies in either area because it conserves *jing*, the essence of life. In Chinese medicine jing, when referring to a man, means sperm. The ability to conserve jing is a result of the stabilizing and binding properties and the ability to control body fluids.

Although the results are not completely clear, some studies have shown that the fruit of cornus has antibacterial and antifungal properties. In some studies extracts of the fruit inhibited the growth of some **strains** of *Staphylococcus* bacteria. It may also be effective against *Salmonella* and *Shigella*, both bacteria that cause gastrointestinal disturbances. Chinese researchers also claim that cornus reduces the blood sugar level in animals, enhances immune system response, and increases sperm motility. Few scientific studies have been done on this herb outside of China.

Cornus fruit is also used in formulas that strengthen the back and knees, both areas associated with kidney jing. It is also used in formulas that control body fluids and treat excessive sweating, urine leakage, sperm leakage (spermatorrhea), and heavy, prolonged menstruation. Cornus is also an ingredient in formulas that treat ringing of the ears (**tinnitus**), poor hearing, **dizziness**, extreme shock, and a wide range of other conditions. The bark is boiled, and the resulting astringent decoction is used in formulas that treat fevers and as an anti-malarial. Interestingly, in **Western herbalism** the bark of dogwood, cornus's cousin, is also used against **malaria**. Cornus is also used to treat diabetes, arthritis, and **impotence**.

Preparations

Both cornus fruit and bark usually are prepared as a decoction that can be added to other tonics and healing formulas. They can also be prepared as a tincture. The dosage varies depending on the formula.

Some formulas that contain cornus include:

- eight immortal long life pill
- phellodendron
- supreme creation
- Buddha's yang
- dragon jing
- endocrine health
- essence restorative

KEY TERMS

Decoction—Decoctions are made by boiling an herb, then straining the solid material out. The resulting liquid is the decoction.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Yang—Yang aspects are qualities such as warmth, activity, light, and activity.

Yin—Yin aspects are the opposite of yang aspects and are represented by qualities such as cold, stillness, darkness, and passiveness.

Precautions

People experiencing painful or difficult urination should not use cornus.

Side effects

Since cornus is rarely used alone, it is difficult to separate any side effects it may cause from those caused by other herbs in the formula. No side effects specifically attributable to cornus have been reported.

Interactions

Cornus is has been used for thousands of years in conjunction with other herbs with no reported interactions. Since cornus is used almost exclusively in Chinese medicine, there are no studies of its interactions with Western pharmaceuticals, although it should not be used while taking a diuretic since cornus is an antidiuretic.

Resources

BOOKS

Bensky, Dan, et al.*Chinese Herbal Medicine: Materia Medica,* 3rd ed. Seattle, WA: Eastland Press, 2004.

PERIODICALS

Zhang YaJun and YunYan Goa. "Chemical Constituents of Asiatic Cornelian Cherry (*Cornus officinalis*) and Its Pharmaceutical Functions." *Chinese Journal of Information on Traditional Chinese Medicine* 9 no. 10 (2000): 81 82. http://www.cababstractsplus.org/google/abstract.asp?AcNo 20053161779.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Potomac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

American Association of Oriental Medicine. PO Box 162340, Sacramento, CA 95816. (866) 455 7999 or (914) 443 4770 http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER). http://www.cieer.org.

OTHER

"Cornus officinalis." *Plants for a Future*. [cited February 17, 2008]. http://www.pfaf.org/database/plants.php?Cornus+officinalis.

Tish Davidson, A. M.

Coronary artery disease *see* **Heart disease**

Coronary thrombosis *see* **Heart attack**

Corydalis

Description

Corydalis is the name of a group of herbs used in different parts of the world to relieve **pain**. *Corydalis yanhusuo* is a species used primarily in Chinese herbal medicine. *C. gariana*, native to the Himalayas, is used medicinally in India. A related species, *Corydalis cava*, is used in European herbalism. Another closely related species, is *Corydalis canadensis* (also called *Dicentra canadensis*) and known by the common name corydalis or turkey corn, is found in North America. There are other species of *Corydalis* found throughout the world. Although the names are somewhat confusing, many are used by herbal therapists in similar ways and are included under the umbrella label corydalis.

C. yanhusuo is a small herb that grows in mixed sun and shade at the edge of woodlands. It is native to Siberia, northern China, and Japan, but is cultivated in other cool parts of China. *C. yanhusuo* grows to about 8 in (20 cm) in height and has narrow leaves and pink flowers. The rhizome (underground stem) is used in healing. *C. yanhusuo* is called *yan hu suo* in Chinese. Some sources suggest that *C. yanhusuo* is used interchangeably with the related species *C. solida*, which is called by the same Chinese name.

C. cava is a perennial that grows in shady forests. It is native to southern Europe and has spread throughout the continent. *C. cava* grows to a height of about 11 in (30 cm). Its flowers range in color from red to yellowish to white, with occasional lilac, brownish-red, or dark blue flowers. The tubers (knobby, fleshy underground stems) are used medicinally. Alternative names for the North American species of corydalis include turkey corn, squirrel corn, and early fumitory.

KEY TERMS

Corydaline—An alkaloid derived from corydalis that has some effectiveness as a pain reliever.

Decoction—A liquid made by simmering an herb in water and then straining it.

Diuretic—A substance or medication that increases the production of urine.

Qi—In traditional Chinese medicine, the vital life force or energy that permeates the body.

Tincture—An alcohol-based extract prepared by soaking plant parts.

General use

In **traditional Chinese medicine** (TCM), *C. yanhusuo* is said to have a warm nature and a pungent, bitter taste. It is associated with the heart, liver, and spleen. *C. yanhusuo* is used to relieve pain resulting from almost any cause. It is especially used to treat menstrual cramps, chest pains, and abdominal pain. Corydalis is also the preferred herb in treating pain from traumatic injuries. Some herbalists report that frying corydalis in vinegar enhances its ability to ease pain.

Along with its ability to relieve pain, *C. yanhusuo* is used as a general aid to blood circulation and to promote the circulation of *qi*, or vital energy. Some Chinese herbalists also report using corydalis as a sedative and to lower blood pressure. The herb is frequently found in combination with other plants in Chinese formulas that treat stabbing pain sensations, painful periods, and the like.

In Western medicine, the various corydalis species are used to treat shaking and involuntary tremors. They can be used to treat people with **Parkinson's disease**. Corydalis is also used as a painkiller; a diuretic; a sedative that slows the pulse and depresses the central nervous system; and a tonic that invigorates the circulation. Occasionally it is used to treat mild forms of **depression**. In fact, the uses of the various corydalis species are surprisingly similar around the world.

Research scientists have isolated several potent alkaloid compounds from corydalis. The strongest of these is corydaline. It has the ability to block certain receptors in the brain associated with the sensation of pain. There is good evidence from Chinese studies that corydalis is effective in relieving pain and menstrual cramps. Evidence for the other uses of corydalis is limited to test tube and animal studies. One 1999 study at the University of Maryland Dental School found that an extract of *C. yanhusuo* was successful in reducing artificially induced inflammation in the paws of rats, although it was less successful than some other TCM herbs that were tested.

Preparations

Corydalis tubers and rhizomes are dug either in the spring or fall, before or after the leaves are actively growing. They are dried and kept in a cool place before use. Corydalis can be made into a tea, a tincture, or a decoction. Commercial extracts are also available.

Corydalis is usually combined with other herbs. One popular treatment for menstrual pain is a decoction of corydalis and cinnamon. In traditional Chinese medicine, corydalis is found in almost all formulas to treat menstrual pain, other pain formulas, and formulas to improve the circulation.

Precautions

Chinese herbalists report that pregnant women should not take corydalis. Since corydalis contains a compound that depresses the central nervous system, it should be used cautiously when using other central nervous system depressant drugs or alcohol. This herb should be taken under the supervision of a trained herbalist.

Side effects

Although no poisonings from corydalis have been reported, overdose is likely to produce shaking and tremors.

Interactions

Some Western herbalists report that corydalis is incompatible with tannic acid and vegetable astringents. Corydalis has been used in many Asian formulas without any reported interactions. Few, if any, scientific studies have been done on its interactions with Western pharmaceuticals.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1999.

ORGANIZATIONS

American Association of Oriental Medicine (AAOM). 433 Front Street, Catasauqua, PA 18032. (610) 266 2433.

OTHER

"Corydalis." *Plants for a Future*. http://www.pfaf.org.

Tish Davidson

Cotton root bark

Description

Cotton root and the cotton plant are known as *Gossypium herbaceum*. Cotton is a member of the mallow or Malvaceae family. The cotton plant is an evergreen shrub that is native to Asia and Africa. It is also grown in the southern United States, Egypt, and countries along the Mediterranean Sea. The plant was cultivated to produce cotton fiber for clothing. Cotton root bark, the inner bark, and cotton seeds are all used as herbal remedies. While the seeds also served as a food, cotton root bark has been known for centuries as a "female medicine."

The herbal remedy is known as cotton root bark, *Gossypium herbaceum*, and cotton.

General use

Gossypium is the Latin word for cotton-producing plant, and this evergreen shrub has been cultivated for thousands of years in India. That form of cultivation was brought to China and Egypt in approximately 500 B.C. Europeans brought cotton cultivation to the New World in 1774.

Traditional uses

While *Gossypium herbaceum* was grown to produce cotton fiber, other parts of the plant served as medical remedies and food products. Cotton root bark was used as a folk remedy for numerous female conditions ranging from nonmenstrual bleeding from the uterus to inducing labor contractions. While it was used to make **childbirth** easier, cotton root bark was also taken as an abortifacient (to induce miscarriages).

Cotton root bark was not just a woman's remedy. Chewing on the roots was said to stimulate the sexual organs, giving cotton root the reputation of being an aphrodisiac. The root also had uses not related to reproduction. Cotton was also a remedy for conditions including snake bite, dysentery, and **fever**. Furthermore, cotton seed was once a food product and a remedy. A seed oil emulsion was given as an intravenous treatment for people with nutritional deficiencies.

Some of cotton root bark's remedial uses came to North America with the Africans enslaved by Europeans. Women used cotton bark root to stimulate menstrual flow and for help with difficulties during childbirth. Cotton had a different use when slave owners raped women; they drank cotton root tea to induce abortions.

KEY TERMS

Abortifacient—A drug or substance that induces an abortion.

Aphrodisiac—A drug or other agent that is reputed to arouse sexual desire.

Gossypol—A chemical found in cotton seed oil that is thought to immobilize sperm.

Contemporary uses

Contemporary uses of cotton root bark cover nearly every aspect of the female reproductive system. Generally, a tea made from this herb is consumed to produce a normal menstrual cycle. Numerous other uses are listed in such sources as the *PDR (Physician's Desk Reference) for Herbal Medicines*, the 1998 book based on the findings of Germany's Commission E. The European group's findings about herbal remedies were published in a 1997 monograph.

Cotton root bark is used as an aid during childbirth and as a remedy for the absence of **menstruation**, irregular menstruation, and painful menstruation. Pregnant women take cotton root bark to increase uterine contractions, to expel the afterbirth, and to help with the secretion of milk. Cotton root bark is also taken for difficulties experienced during **menopause**.

Furthermore, cotton root bark is currently used as a male contraceptive in China because it is said to immobilize the sperm. Cotton root bark supposedly blocks production of sperm without affecting a man's potency. In June 2000, clinical trials were underway regarding this use of cotton root bark.

In addition, cotton root bark still has a reputation as an aphrodisiac. Evidence of this property of the herb, however, is anecdotal. No clinical research or studies have proven that cotton root bark stimulates or increases sexual desire.

In addition to the medicinal uses of cotton root, oil from cotton seed is currently used in soap and in the production of margarine, shortening, cooking oil, and salad oil.

Preparations

While cotton root bark was taken as a tea in folk medicine, other forms of the herb are used in contemporary alternative medicine. Cotton root bark is currently used as a liquid extract or a tincture. The dosage

for both the tincture and liquid extract is 0.5–1 tsp (2–4 ml) of either solution. This amount can be divided into two daily doses; a single dose consists of 20–40 drops (0.25–0.5 tsp). The extract or tincture can be added to a small amount of water.

Cotton root bark can be combined with **goldenseal** (*Hydrastis canadensis*) in herbal preparations.

Precautions

Cotton root bark has varied uses, and opinions are varied about whether this remedy is safe to use. According to the *PDR for Herbal Medicines*, cotton root bark is safe when taken in therapeutic doses. Other herbalists state that no part of *Gossypium herbaceum* should be taken internally without first consulting with a doctor or health practitioner. This precaution is particularly important for pregnant women. Although cotton root bark is a remedy for conditions related to childbirth, manufacturers of herbal products advise women to seek medical advice before using it.

Although health risks have not been reported, poisonings have occurred when animals ate cottonseed cakes over a long period of time. Some of those cases were fatal.

In addition, gossypol is a chemical found in cottonseed oil that is believed to immobilize sperm. Men who cook with this oil may find themselves temporarily infertile.

Side effects

Cotton root bark has not been identified as producing side effects.

Interactions

There are no identified interactions associated with taking cotton root bark.

Resources

BOOKS

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Co., 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org/.

Herb Research Foundation. 1007 Pearl St., Suite 200. Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

Health Mall Online. http://www.healthmall.com.

Liz Swain

Cough

Definition

A cough is a forceful release of air from the lungs that can be heard. Coughing protects the respiratory system by clearing it of irritants and secretions.

Description

While people can generally cough at will, a cough is usually a reflex triggered when an irritant stimulates one or more of the cough receptors found at different points in the respiratory system. These receptors then send a message to the cough center in the brain, which in turn tells the body to cough. A cough begins with a deep breath in, at which point the opening between the vocal cords at the upper part of the larynx (glottis) shuts, trapping the air in the lungs. As the diaphragm and other muscles involved in breathing press against the lungs, the glottis suddenly opens, producing an explosive outflow of air at speeds greater than 100 mi (160 km) per hour.

In normal situations, most people cough once or twice an hour during the day to clear the airway of irritants. However, when the level of irritants in the air is high or when the respiratory system becomes infected, coughing may become frequent and prolonged. It may interfere with **exercise** or sleep, and it may also cause distress if accompanied by **dizziness**, chest **pain**, or breathlessness. In the majority of cases, frequent coughing lasts one to two weeks and tapers off as the irritant or infection subsides. If a cough lasts more than three weeks, it is considered a chronic cough, and physicians will try to determine a cause beyond an acute infection or irritant.

Coughs are generally described as either dry or productive. A dry cough does not bring up a mixture of mucus, irritants, and other substances from the lungs (sputum), while a productive cough does. In the case of a bacterial infection, the sputum brought up in a productive cough may be greenish, gray, or brown. In the case of an allergy or viral infection it

KEY TERMS

Antitussives—Drugs used to suppress coughing.

Expectorant—Drug used to thin mucus.

Gastroesophageal reflux—Condition in which stomach acid backs up into the esophagus.

Glottis—The opening between the vocal cords at the upper part of the larynx.

Larynx—A part of the respiratory tract between the pharynx and the trachea, having walls of cartilage and muscle, and containing the vocal cords.

Sputum—The mixture of mucus, irritants, and other substances expelled from the lungs by coughing.

may be clear or white. In the most serious conditions, the sputum may contain blood.

Causes and symptoms

In the majority of cases, coughs are caused by respiratory **infections**, including:

- colds or influenza, the most common causes of coughs
- bronchitis, an inflammation of the mucous membranes of the bronchial tubes
- croup, a viral inflammation of the larynx, windpipe, and bronchial passages that produces a bark-like cough in children
- whooping cough, a bacterial infection accompanied by the high-pitched cough for which it is named
- pneumonia, a potentially serious bacterial infection that produces discolored or bloody mucus
- tuberculosis, another serious bacterial infection that produces bloody sputum
- fungal infections, such as aspergillosis, histoplasmosis, and cryptococcoses

Environmental pollutants, such as cigarette smoke, dust, or smog, can also cause a cough. In the case of cigarette smokers, the nicotine present in the smoke paralyzes the hairs (cilia) that regularly flush mucus from the respiratory system. The mucus then builds up, forcing the body to removed it by coughing. Post-nasal drip, the irritating trickle of mucus from the nasal passages into the throat caused by **allergies** or sinusitis, can also result in a cough. Some chronic conditions, such as **asthma**, chronic **bronchitis**, **emphysema**, and cystic fibrosis, are characterized in part by a cough. A condition in which stomach acid backs up into the esophagus (gastroesophageal reflux) can cause coughing, especially when a person is lying down. A cough can also be a side effect of medications that are administered via an inhaler. It can also be a side effect of beta-blockers and ACE inhibitors, which are drugs used for treating high blood pressure.

Diagnosis

To determine the cause of a cough, a physician should take an exact medical history and perform an exam. Information regarding the duration of the cough, what other symptoms may accompany it, and what environmental factors may influence it aid the doctor in his or her diagnosis. The appearance of the sputum will also help determine what type of infection, if any, may be involved. The doctor may even observe the sputum microscopically for the presence of bacteria and white blood cells. Chest x rays may help indicate the presence and extent of such infections as **pneumonia** or **tuberculosis**. If these actions are not enough to determine the cause of the cough, a bronchoscopy or laryngoscopy may be ordered. These tests use slender tubular instruments to inspect the interior of the bronchi and larynx.

Treatment

Coughs due to bacterial or viral upper respiratory infections may be effectively treated with complementary therapies. The choice of remedy will vary and be specific to the type of cough the patient has. Lingering coughs or coughing up blood should be treated by a trained practitioner.

Nutrition & diet

Many health practitioners advise increasing fluid intake and breathing in warm, humidified air as ways of loosening chest congestion. Avoiding mucous-producing foods can be effective in healing a cough condition. These mucous-producing foods can vary, based on individual intolerance, but dairy products are a major mucous-producing food for most people. Other foods to avoid are sugar and foods high in **sodium**. Others recommend hot tea flavored with honey as a temporary home remedy for coughs caused by colds or flu.

Various vitamins may be helpful in preventing or treating conditions (including colds and flu) that lead to coughs. They include **vitamin C**, **vitamin E**, **zinc**, **vitamin A**, and **folic acid**.

Herbal medicine

There are many Western herbs, as well as herbs used in **traditional Chinese medicine** (TCM), that

soothe the throat, quiet coughs, and act as expectorants. Some include:

- marsh mallow
- licorice
- aniseed
- fritillaria
- loquat

Homeopathic remedies

Depending on the type of cough and its duration, several homeopathic remedies include:

- Aconite for dry coughs with fever
- Antimonium tartaricum for productive coughs
- Bryonia for intense, dry coughs accompanied by thirst
- Drosera for violent coughing
- Rumex crispus for tickling coughs

Allopathic treatment

Treatment of a cough generally involves addressing the condition causing it. An acute infection such as pneumonia may require antibiotics, an asthma-induced cough may be treated with the use of bronchodialators, or an antihistamine may be administered in the case of an allergy. Cough medicines may be given if the patient cannot rest because of the cough or if the cough is not productive, as is the case with most coughs associated with colds or flu. The two types of drugs used to treat coughs are antitussives and expectorants.

Expected results

Because the majority of coughs are related to the **common cold** or **influenza**, most will end in 7-21 days. The outcome of coughs due to a more serious underlying disease depends on the pathology of that disease.

Prevention

It is important to identify and treat the underlying disease and origin of the cough. Avoid **smoking** and coming in direct contact with people experiencing cold or flu symptoms. Wash hands frequently during episodes of upper-respiratory illnesses.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing Inc., 1995.

Chandrasoma, Parakrama, and Clive R. Taylor. *Concise Pathology*. East Norwalk, CT: Appleton and Lange, 1991.

Schumann, Lorna. "Alterations in Respiratory Function." In *Perspectives on Pathophysiology*. Lee Ellen Copstead, ed. Philadelphia: W.B. Saunders, 1994.

Time Life Books Editors. *The Alternative Advisor*. Alexandria, VA: Time Life Books, 1997.

PERIODICALS

Philp, Elizabeth B. "Chronic Cough." *American Family Physician* 56 (October 1, 1997).

ORGANIZATIONS

National Heart, Lung, and Blood Institute Information Center. P.O. Box 30105, Bethesda, MD 20824. (301)251 1222.

Coughwort *see* **Coltsfoot**

Crab lice *see* **Lice infestation**

Cradle cap

Definition

Cradle cap is a form of seborrheic **dermatitis**, a minor inflammatory disease of the scalp, face, and occasionally other areas of the body. It is a common scalp problem in infants and younger children.

Description

Cradle cap appears as thick, oily yellowish or brownish patches on the skin, particularly the scalp. It is also often found around the eyebrows, around the nose, behind the ears, and in the genital area. The skin itself often appears to be red, flaky, and irritated underneath the oily patches. It most often affects children who are between two weeks and two years old. Although cradle cap may be unsightly, it is usually not harmful to the child.

Causes and symptoms

During infancy and early childhood, the glands that produce sweat and oil are in a highly reactive state. Cradle cap is most likely due to a buildup of sweat and oil produced by these overactive glands. This buildup may also cause an irritation of the skin. Sometimes an overgrowth of the yeast called *Pityrosporum ovale* may also contribute to the condition. Occasionally, cradle cap is a symptom of more serious problems.

Newborn infant suffering from cradle cap, a form of seborrheic dermatitis, an itchy, flaky rash. *(Ian Boddy / Photo Researchers, Inc.)*

Diagnosis

Cradle cap is easily recognizable, and usually it requires no further diagnosis. However, if the rash seems to be very itchy or irritating, it may be necessary to rule out **eczema**. If there are additional symptoms, a healthcare provider should be consulted for a physical exam and possible testing.

Treatment

Most remedies for cradle cap can be applied directly to the oily patches on the skin. Tannins, for example, can help to slow down oil production, as well as clear away the cradle cap. Warm caffeinated tea, German **chamomile** tea (*Matricaria recutita*), burdock tea (*Arctium lappa*), or diluted **witch hazel** extract (*Hamamelis virginiana,*) can be rubbed into the skin with a cloth several times per day.

A **comfrey** rinse can also be used. It should be rubbed onto the affected area with a washcloth. The rinse can be used after shampooing or bathing, or it can be applied to dry skin. This treatment can be given nightly for up to ten days until the symptoms are gone. The comfrey rinse can be made by boiling two ounces (about 57 grams) of comfrey root, *Symphytum officinale,* in one quart (or one liter) of water. The tea should be simmered for 20 minutes and then allowed to cool. A batch of the comfrey rinse can be used and stored in the refrigerator for up to four days.

A rule of thumb in science is that like dissolves like; therefore, any type of food grade oil can be used to dissolve the oily buildup found in cradle cap. Olive oil, **wheat germ** oil, and **sesame oil** are particularly favored. **Aromatherapy** may be used by adding in 1-2 drops of the essential oil of **lavender**, *Lavandula angustifolia*. The oil should be applied to the skin and left overnight. It can then be removed gently and slowly with a baby brush or a fine-tooth comb. The area should be washed or shampooed afterwards with a very mild soap.

Slippery elm (*Ulmus fulva*) is useful in soothing a variety of skin problems, and can be applied to affected areas several times per day. The herb can also be misted liberally with water or used as a tea. Ointments containing *Calendula officinalis* or **plantain** (*Plantago major*) are also appropriate to use on areas of cradle cap. These herbs can often clear up an outbreak in as little as four days.

Internal remedies for cradle cap can be quite effective. These include tincture of **burdock root**, which can help to balance oil and sweat production. Burdock is also a good general tonic to take to keep the skin healthy. Burdock should be given for at least three weeks for full effect. A tincture of the wild pansy flower, *Viola tricolor,* can also be given. **Biotin**, a B vitamin, works well for cradle cap and can be given at dosages of 10 micrograms (mcg) for age 0-6 months; 15 mcg for age 6-12 months, and 20 mcg for age one to three years.

Allopathic treatment

Generally, cradle cap does not need to be treated medically. If the condition is resistant to treatment or it starts spreading, however, an over-the-counter **dandruff** shampoo may be used once per day until the cradle cap has improved. Shampoos containing coal tar derivatives may be highly irritating and are not recommended for use on children under two.

A 0.5% or 1% hydrocortisone cream is available over-the-counter and can be applied two or three times per day to stubborn cases of cradle cap. If a *Pityrosporum ovale* infection is suspected, a dermatologist may prescribe ketoconazole (Nizoral) cream or shampoo.

These medications are strong and should be used for as short a time as possible.

If crusting, pus, redness, or **pain** are present, a physician should be consulted. There may be an underlying infection caused by the infant's scratching, which can introduce bacteria into the skin. Antibiotics may have to be prescribed. Other symptoms, such as poor growth or **diarrhea** may point to immune system problems requiring medical assessment and treatment.

Expected results

Usually cradle cap will eventually resolve with no aftereffects, even without treatment. However, it can take quite some time to clear. Most home remedies should clear up cradle cap in a few weeks or months.

Prevention

Washing the hair more often than two or three times per week may dry the skin out, making it more vulnerable to cradle cap, so limited hair washing is recommended.

Resources

BOOKS

Foley, Denise, et al. *The Doctors Book of Home Remedies for Children: From Allergies and Animal Bites to Toothache and TV Addiction, Hundreds of Doctor Proven Techni ques and Tips to Care for Your Kid*. Emmaus, PA: Rodale Press, 1999.

Kemper, Kathi J., M.D. *The Holistic Pediatrician*. New York: HarperPerennial, 1996.

OTHER

DermaMed Pharmaceutical Incorporated. http://www.der mamed.com/aboutscalp.htm (January 17, 2001).

Health World Online. http://www.healthy.net/asp/templates/ book.asp?PageType Book&ID 787 (January 17, 2001).

Patience Paradox

Cramp bark

Description

Cramp bark (*Viburnum opulus*) is a deciduous tree or shrub that is native to Europe and the eastern United States. It is a member of the Caprifoliaceae family. It is also cultivated for use as an ornamental tree or shrub. Other names for cramp bark include guelder rose, snowball tree, king's crown, high **cranberry**, rose **elder**, water elder, Whitsun rose, May rose, dog rowan tree, Whitsun bosses, silver bells, and gaiter berries.

Dried cramp bark of the Viburnum opulus plant can be used to relieve menstrual, muscle and stomach cramps. *(Geoff Kidd / Photo Researchers, Inc.)*

Cramp bark grows in low grounds, woodlands, thickets, and hedges. This large shrub grows 5-10 ft (1.5-3 m) tall. The flowers, which appear in spring and summer, are large (3-5 in [8-13 cm] across), flat-topped clusters of snow-white florets. The inner florets are very small, complete flowers while the florets along the outer edge of the cluster are large and showy but cannot produce fruit. The fruits, which appear in August, are drooping clusters of bright red oval shiny, translucent berries. Cramp bark berries are edible, but have a very bitter taste. The leaves of cramp bark are lobed and turn a rich purple color in the fall. The bark is grayish-brown, faintly cracked lengthwise, and has scattered brown-colored **warts**. The bark has a strong odor and a bitter, astringent taste.

Constituents and bioactivities

Cramp bark contains a wide variety of biologically active compounds. The constituents of cramp

bark are very similar to those of a close relative called **black haw** (*Viburnum prunifolium*). Cramp bark and black haw may be used interchangeably under certain conditions but should not be considered interchangeable in the strict sense. The constituents of cramp bark include:

- acid compounds (acetic, baldrianic, capric, chlorogenic, cinnamic, citric, malic, ursolic, and valerianic)
- amyrins (alpha-amyrin and beta-amyrin)
- astragalin
- beta-sitosterol
- coumarins (scopoletin and scopoline)
- elements (aluminum, calcium, chromium, cobalt, iron, magnesium, manganese, phosphorus, potassium, selenium, silicon, sodium, tin, and zinc)
- esculetin
- glucosides (viburnine)
- glycosides (quercetin)
- hydroquinones (arbutin, methylarbutin, and free hydroquinone)
- myricyl alcohol
- paeoniside
- pectin
- protein
- resin
- tannins (catechin and epicatechin)
- viopudial

Cramp bark has antispasmodic (relieves **muscle spasms**), anti-inflammatory (relieves inflammation), nervine (calms and soothes the nerves), hypotensive (lowers blood pressure), astringent (causes local contraction), emmenagogic (induces **menstruation**), and sedative (reduces activity and excitement) properties. The berries of cramp bark have antiscorbutic (effective against scurvy) properties due to their **vitamin C** content.

General use

Historically, the Native American Meskwaki people used cramp bark to treat cramps and pains located anywhere in the body, whereas the Penobscot people used cramp bark to treat **mumps** and swollen glands. Cramp bark was named for its primary medicinal use—to relieve **muscle cramps** and other conditions caused by muscle overcontraction.

Cramp bark is presently used to relieve any overly tense muscle or muscle spasm of the body. This includes the muscles of the uterus, air passages, intestines, arms, legs, and back. In addition, it can be used to prevent muscle tension and **pain**. Cramp bark is also used to treat symptoms that are associated with excess muscle tension, including menstrual pain (**dysmenorrhea**) caused by uterine muscle contractions, and breathing difficulties associated with **asthma**. **Colic**, spastic **constipation**, **irritable bowel syndrome**, and the physical indications of nervous tension are also treated with cramp bark.

Cramp bark has also been used to treat hysteria, nervous complaints, debility, convulsions, fits, lockjaw, heart palpitation, tension headaches, spasmodic stricture (narrowing of a passage), bladder muscle spasms, high blood pressure, rheumatism, circulatory problems, and **heart disease**. It is effective in treating cases of arthritis in which joint pain and weakness have led to severe muscle contractions. Cramp bark relaxes the muscles, allowing improvement in blood circulation that can return normal function to the arthritic joints.

Cramp bark is used to treat excessive blood loss during menstruation and **menopause**, and to induce menstruation in women with light or delayed periods. A woman may treat dysmenorrhea prophylactically (before symptoms appear) by taking cramp bark the day before painful menstruation is expected. Cramp bark is also used to treat **endometriosis** and threatened miscarriage.

In addition to its medicinal uses, cramp bark has a few culinary applications. Cramp bark berries have been used to make jelly and alcoholic beverages, and they are used in certain food dishes.

KEY TERMS

Antiscorbutic—An agent that is effective against scurvy, like the vitamin C found in cramp bark.

Astringent—A substance that constricts or binds skin cells.

Emmenagogue—A substance or medication given to bring on a woman's menstrual period.

Prophylactic—Use of a treatment to prevent a disease or condition before symptoms appear.

Sedative—A substance or medication used to soothe or reduce nervous irritation or overstimulation.

Tincture—An alcoholic solution prepared from herbal medicinal agents.

Preparations

The bark of cramp bark is peeled off the tree during the spring and summer months. The bark

should be peeled off in strips carefully in order not to kill the tree. The bark is chopped up and dried. Cramp bark can be made into a decoction (a water extract), a tincture (an alcoholic extract), or a lotion. Liquid preparations of cramp bark have a reddish-brown color, a slight odor, and an astringent taste.

The decoction is prepared by adding 2 tsp of the dried bark to 1 cup water. The mixture is brought to a boil, the heat is reduced, and the decoction is simmered gently for 10–15 minutes.

Although the recommended doses of the decoction are variable, it is safe to drink up to three cups daily. The dose of decoction for menstrual pain is 0.5 cup every three hours.

Tinctures are more concentrated and act faster (within 30 minutes) than teas or decoctions. The tincture may be taken for long-term conditions caused by muscular tension such as irritable bowel syndrome. Again, the recommended doses vary somewhat, but up to 8 ml may be taken three times a day. The suggested dose of tincture for irritable bowel syndrome is 0.5 tsp in hot water twice a day. The suggested dose of tincture for menstrual cramps is 1 tsp in water three times a day.

A lotion prepared from cramp bark may be rubbed into the skin to relieve painful muscles.

To relieve cramping and back pain at night, cramp bark may be mixed with **lobelia** (*Lobelia inflata*). Cramp bark may also be used with **Mexican yam** (*Dioscorea villosa*) for ailments of the gastrointestinal and genitourinary systems.

Precautions

Some sources state that the berries of cramp bark are toxic and should not be eaten.

Side effects

Cramp bark is safe for both short- and long-term use. In 2008, there were no indications that cramp bark causes any side effects. Pregnant women and women who are lactating (breast-feeding), however, should not use any herbal medicines without first consulting a physician.

Interactions

As of 2008, there were no indications of any interactions between cramp bark and any other drug or herbal medicine.

Resources

BOOKS

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants.* New York: DK Publishing, Inc., 1996.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org/.
Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

Alternative Medicine Foundation. *HerbMed.* http://www.am foundation.org/herbmed.htm.
"Cramp bark." Planet Botanic. http://www.planetbotanic.com/cramp.htm.

Belinda Rowland

Cranberry

Description

The cranberry plant, a familiar source of berries used in juices and relishes in the United States, has been in existence since the Iron Age. The Romans were the first to recognize its medicinal uses by the local inhabitants of what is now England. Herbalist Henry Lyte documented its healing effects in 1578. Since then, the cranberry plant has been a popular folk remedy for a variety of illnesses, including **gout**, rheumatism, **diarrhea**, **constipation**, scurvy, fevers, skin **infections** and other skin problems such as **eczema**. Cranberries are well known as a treatment for such women's health problems as cystitis, and urinary and genital infections.

Currently, there are approximately 150 species of cranberry. The best known and most popular is the American cranberry (*Vaccinium macrocarpon*), because of the size and juiciness of its fruit. It is a member of the Heath (*Ericaceae*) family. *Vaccinium macrocarpon* is a low-lying fruit plant grown commercially in North America. The shrub bears beautiful pink flowers that grow into rounded reddish-black berries. The berries are harvested early in the fall, and made into juices, jellies, or relishes. Juice made from cranberries is a popular, tart fruit drink. The United States presently produces about 98% of the world's cranberries.

Scientists have learned that the chemical composition of cranberries includes many substances that promote healing, such as:

- Proanthocyanidins and anthocyanins. These bioflavenoids make up the pigment of the leaves, and produce the color of the berries. More importantly, proanthocyanidins are responsible for cranberry's best-known medicinal effect, preventing bladder and urinary tract infections by inhibiting bacterial colonization. They may also help relieve diarrheal symptoms.
- Organic acids, including quinic, malic, and citric acids. Quinic acid is considered the most important among these organic acids. These compounds, which are responsible for the sour taste of cranberries, acidify the urine and prevent kidney stones.
- Vitamins and minerals. Cranberries are rich sources of vitamins including vitamin A, carotene, thiamine, riboflavin, niacin, and vitamin C. They also contain many essential minerals such as sodium, potassium, calcium, magnesium, phosphorus, copper, sulfur, iron, and iodide. These vitamins and minerals are strong antioxidants that enable cranberries to help protect the body against such infections as colds or influenza. Because of their high vitamin C content, cranberries were used in the past to prevent a vitamin C deficiency known as scurvy.
- Fiber. Like many other fruits, cranberries are a good source of fiber.

General use

Prevention and treatment of urinary tract infections

Urinary tract infections (UTIs) are extremely common in women, affecting one of every two females during their lifetime. Men have urinary infections as well, but less frequently than women. A woman contracts a urinary tract infection when bacteria gets into the relatively short female urethra and moves up to the bladder. Once in the bladder, the bacteria grow and spread to other parts of the urinary tract. If left untreated, UTIs can cause serious **kidney infections** that may require hospitalization. The disease is relatively easy to treat, but tends to recur.

In the United States, urinary tract infections result in more than five million medical treatment visits each year. The most frequently prescribed treatment for urinary tract infections is antibiotics. There are also simple self-protective measures that women can take against UTIs. These include:

- Drinking a lot of fluid, which increases the amount of urine produced and helps to flush out infectious microorganisms.

KEY TERMS

Antioxidants—A substance that is capable of countering the damaging effects of oxidation in the body's tissues. Ingredients in the cranberry perform antioxidant functions in the body.

Astringent—Any acidic substance that draws together and constricts tissue.

Bioflavenoids—Plant substances that have a wide range of properties, including anti-inflammatory, anti-carcinogenic, and antioxidant.

Proanthocyanidins—Bioflavenoids found in cranberries, responsible for the fruit's effectiveness in preventing urinary tract infections.

Vulvovaginal candidiasis—A yeast-like fungal infection of the vulva and vagina, which can be related to regular consumption of cranberry.

- Emptying the bladder immediately after having intercourse.
- Using oral contraceptives rather than a diaphragm, which tends to put pressure on or irritate the urethra.
- Drinking cranberry juice as a preventive measure for women. As early as the 1840s, German physicians observed that cranberry juice prevented urinary tract infections. This effect was attributed to the cranberry's high acidity.

Recent research has confirmed the effectiveness of cranberries in preventing UTIs. Two studies in the mid-1990s, one involving women 65 years or older and the other with younger women between the ages of 18 and 45, showed that cranberries are effective in preventing bladder infections. Regardless of age, women can significantly reduce their risk of urinary tract infections by consuming 10 ounces of cranberry juice daily. Scientists, however, have learned that the effectiveness of cranberry juice is not related to its acidity, as was previously believed. Researchers found that the cranberry's antibacterial properties come from its proanthocyanidins (or condensed tannins). Proanthocyanidins inhibit *chia coli* bacteria from attaching to the inside walls of the bladder, allowing them to be easily flushed out with urine before they multiply and cause infections.

A careful review of all studies involving the cranberry's role in preventing UTIs concluded that cranberry juice or concentrate is beneficial in preventing infections in women, but its benefits have not been proven in children or males. The reviewers also noted

that many women did not complete the full one-year study period.

Prevention of kidney stones

Kidney stones are most often caused by high levels of ionized **calcium** (as in calcium salts) in the urine. Cranberries can help prevent this condition because they are rich in quinic acid, which increases the acidity of the urine. As a result, the levels of ionized calcium in the urine are lowered.

A person needs to drink 16 ounces of unsweetened cranberry juice (two glasses) daily to effectively prevent kidney stones. Cranberry capsules or powdered concentrates are also available. It is important not to consume too much cranberry, because very high acidity in the urine actually increases the risk of kidney stones. A person would need to drink at least one liter of cranberry juice per day for a prolonged period of time for this to occur.

Prevention of colds and influenza

A daily glass of cranberry juice is a good source of **vitamin C** and **antioxidants**. These nutrients help support the body's immune function and prevent **cancer** as well as such common infections as colds or **influenza**.

Other uses

Cranberries may serve as a digestive aid. Because of their high acidity, they help to digest fatty foods and to increase the appetite.

Some early laboratory studies suggest that cranberries may help to prevent gingivitis (**gum disease**) and coronary (heart) disease. These studies have not yet been confirmed by clinical research in humans.

Cranberry has been a folk remedy for diarrhea. Proponents of this use suggest that the proanthocyanidins in cranberries, in addition to having antibacterial activity, also act as astringents. They cause proteins to clump together to form rigid cakes that prevent bacteria from using the proteins for food. However, the effectiveness of cranberries in the treatment of diarrhea remains unproven.

Various cranberry preparations have also been used to treat skin disorders such as **acne**, **dermatitis**, and **psoriasis**; bed-wetting; **burns** and **wounds**; and **stress** and **depression**. There is currently insufficient scientific evidence to support these uses.

A recent study suggests that cranberry juice may inhibit the formation of dental plaque by preventing bacteria from collecting (coaggregating) on the tooth film formed by proteins in the saliva. These preliminary findings await further testing.

Preparations

There are many types of cranberry preparations available, partly because cranberry products are among the top 10 best sellers in the health food market. They include:

- Cranberry juice. For prevention of urinary tract infections and kidney stones, recommended products include those containing pure cranberry juice rather than mixtures that are only 25–27% cranberry juice. Four to six ounces of unadulterated cranberry juice daily is recommended for the prevention of UTIs. Some herbalists advocate the use of cranberry for treatment of mild urinary tract infections; dosages of 10–32 oz (0.3–1 kg) daily have been used. Cranberry juice may not be effective, however, for established infections. It should be taken only as a complementary measure rather than as an alternative to antibiotics in the treatment of active UTIs. If a woman experiences such symptoms of cystitis as chills, fever, fatigue, and burning pain during urination, she should contact her doctor immediately for antibiotic treatment.
- Dried cranberry powder capsules (475–500 mg). Because most commercial cranberry juice contains high levels of sugar, these capsules may be a better alternative for diabetic patients or dieters. Each capsule equals 0.5 ounces of cranberry juice. Nine to 15 capsules daily is the recommended dosage for the prevention of urinary tract infections.
- Powdered concentrates. These forms of cranberry are available in different strengths. Women should follow the dosages recommended by manufacturers.
- Fresh or dried cranberries. Dried untreated cranberries can be found in health food stores. They can be stored up to a year. Cranberries are also available fresh or frozen in most grocery stores or supermarkets. Because of their tartness, most people may find it difficult to consume them in sufficient quantity to obtain their therapeutic benefits.
- Cranberry herbal teas. These products can be obtained from health food stores or via the Internet.

Precautions

Cranberries should be used with care or modification in patients with certain diseases, including:

- Active urinary tract infections. Cranberries should not be substituted for antibiotic treatment, but used only as a supplementary therapy.

- Irritable bowel syndrome (IBS). Large quantities of cranberry juice or capsules may cause diarrhea in IBS patients.
- Diabetes. Patients with diabetes should use sugar-free cranberry juice, or take capsules or powdered concentrates.

Side effects

The most common side effects associated with excessive cranberry consumption are diarrhea and an increased risk of developing kidney stones.

Regular cranberry consumption by women trying to prevent UTIs may result in *vulvovaginal candidiasis*. Alterations in the normal vaginal bacteria may lead to increased fungal growth.

Interactions

There are no identified drug interactions associated with cranberry consumption.

Resources

BOOKS

Davies, Jill Rosemary. *Healing Herbs In a Nutshell: CRANBERRY*. Boston: Element Books, Inc., 2000.

Fetrow, Charles W., and Juan R. Avila. *The Complete Guide to Herbal Medicines*. Springhouse, PA: Springhouse Corporation, 2000.

McCaleb, Robert, Evelyn Leigh, and Krista Morien. *The Encyclopedia of Popular Herbs: Your Complete Guide to the Leading Medicinal Plants*. Rocklin, CA: Prima Health, 2000.

Murray, Michael, and Joseph Pizzorno. *Encyclopedia of Natural Medicine*. Rocklin, CA: Prima Health, 1998.

PERIODICALS

Avorn J., M. Monane, J.H. Gurwitz, et al. "Reduction of Bacteriuria and Pyuria after Ingestion of Cranberry Juice." *Journal of the American Medical Association (JAMA)* 271 (1994): 751 4.

Jepson R., L. Mihaljevic, and J. Craig. "Cranberries for preventing urinary tract infection." *Cochrane Database Syst Rev* (2004).

Patel, D.A., B. Gillespie, J.D. Sobel, et al. "Risk factors for recurrent vulvovaginal candidiasis in women receiving maintenance antifungal therapy: Results of a prospec tive cohort study." *American Journal of Obstetrics and Gynecology* March (2004): 644 53.

Weiss, E.I., A. Kozlovsky, D. Steinberg, R., et al. "A high molecular mass cranberry constituent reduces mutans streptococci level in saliva and inhibits in vitro adhesion to hydroxyapatite." *FEMS Microbiol Lett* (March 2004): 89 92.

ORGANIZATIONS

American Association of Naturopathic Physicians. 601 Valley St., Suite 105, Seattle, WA 98109. (206) 298 0126. Fax: (206) 298 0129. http://www.naturopathic.org.

American Herbal Products Association. 8484 Georgia Ave., Suite 370, Silver Spring, MD 20910. (301) 588 1174. http://www.ahpa.org.

National Center for Complementary and Alternative Med icine (NCCAM). NCCAM Clearinghouse, PO Box 8218, Silver Spring, MD 20907 8218. (888) 644 6226. Fax: (301) 495 4957. http://nccam.nih.gov.

Samuel Uretsky, Pharm.D.

Cranial manipulation *see* **Craniosacral therapy**

Craniosacral therapy

Definition

Craniosacral therapy is a holistic healing practice that uses very light touching to balance the craniosacral system in the body, which includes the bones, nerves, fluids, and connective tissues of the cranium and spinal area.

Origins

The first written reference to the movement of the spinal nerves and its importance in life, clarity, and "bringing quiet to the heart" is found in a 4,000-year-old text from China. Craniosacral work was referred to as "the art of listening." Bone setters in the Middle Ages also sensed the subtle movements of the body. They used these movements to help reset **fractures** and dislocations and to treat headaches.

In the early 1900s, the research of Dr. William Sutherland, an American osteopathic physician, detailed the movement of the cranium and pelvis. Before his research it was believed that the cranium was a solid immovable mass. Sutherland reported that the skull is actually made up of 22 separate and movable bones that are connected by layers of tissue. He called his work cranial **osteopathy**. Nephi Cotton, an American chiropractor and contemporary of Sutherland, called this approach craniology. The graduates of these two disciplines have refined and enhanced these original approaches and renamed their work as sacro-occipital technique, cranial **movement therapy**, or craniosacral therapy.

Dr. John Upledger, an osteopathic physician, and others at the Department of Biomechanics at Michigan State University, College of Osteopathic Medicine learned of Sutherland's research and developed it further. He researched the clinical observations of various osteopathic physicians. This research provided the basis for Upledger's work which he named craniosacral therapy.

Benefits

According to Upledger, craniosacral therapy is ideally suited for **attention-deficit hyperactivity disorder**, headaches, chronic middle **ear infection**, **pain**, and general health maintenance. It is recommended for **autism**, **fibromyalgia**, **heart disease**, **osteoarthritis**, **pneumonia**, **rheumatoid arthritis**, chronic sinus **infections**, and **gastroenteritis** (inflammation of the lining of the stomach or small intestine). It is also used with other therapies to treat **chronic fatigue syndrome**, back pain, and menstrual irregularity. In addition, other craniosacral practitioners have reported benefits for eye dysfunction, **dyslexia**, **depression**, motor coordination difficulties, temporomandibular joint dysfunction (TMD), hyperactivity, **colic**, **asthma** in babies, floppy baby syndrome, whiplash, **cerebral palsy**, certain birth defects, and other central nervous system disorders.

Description

Craniosacral therapy addresses the craniosacral system. This system includes the cranium, spine, and sacrum which are connected by a continuous membrane of connective tissue deep inside the body, called the dura mater. The dura mater also encloses the brain and the central nervous system. Sutherland noticed that cerebral spinal fluid rises and falls within the compartment of the dura mata. He called this movement the primary respiratory impulse; today it is known as the craniosacral rhythm (CSR) or the cranial wave.

Craniosacral therapists can most easily feel the CSR in the body by lightly touching the base of the skull or the sacrum. During a session they feel for disturbances in the rate, amplitude, symmetry, and quality of flow of the CSR. A therapist uses very gentle touch to balance the flow of the CSR. Once the cerebrospinal fluid moves freely, the body's natural healing responses can function.

A craniosacral session generally lasts 30–90 minutes. The client remains fully clothed and lays down on a massage table while the therapist gently assesses the flow of the CSR. Upledger describes several techniques which may be used in a craniosacral therapy session. The first is energy cyst release. "This technique is a hands-on method of releasing foreign or disruptive energies from the patient's body. Energy cysts may cause the disruption of the tissues and organs were they are located." The therapist feels these cysts in the client's body and gently releases the blockage of energy.

Sutherland first wrote about a second practice called direction of energy. In this technique the therapist intends energy to pass from one of his hands, through the patient, into the other hand.

The third technique is called myofascial release. This is a manipulative form of bodywork that releases tension in the fascia or connective tissue of the body. This form of bodywork uses stronger touch.

Upledger's fourth technique is position of release. This involves following the client's body into the positions in which an injury occurred and holding it there. When the rhythm of the CSR suddenly stops the therapist knows that the trauma has been released.

The last technique is somatoemotional release. This technique was developed by Upledger and is an offshoot of craniosacral therapy. It is used to release the mind and body of the residual effects of trauma and injury that are "locked in the tissues."

The cost of a session varies due to the length of time needed and the qualifications of the therapist. The cost may be covered by insurance when the therapy is performed or prescribed by a licensed health care provider.

Precautions

This gentle approach is extremely safe in most cases. However, craniosacral therapy is not recommended in cases of acute systemic infections, recent skull fracture, intracranial hemorrhage or aneurysm, or herniation of the medulla oblongata (brain stem). Craniosacral therapy does not preclude the use of other medical approaches.

Side effects

Some people may experience mild discomfort after a treatment. This may be due to re-experiencing a trauma or injury or a previously numb area may come back to life and be more sensitive. These side effects are temporary.

Research and general acceptance

More than 40 scientific papers have been published that document the various effects of craniosacral

WILLIAM SUTHERLAND (1873–1954)

William Garner Sutherland studied osteopathy under its founder, Andrew Taylor Still. Dr. Sutherland made his own important discovery while examining the sutures of cranial bones the skull bones that protect the brain. What he noticed is that the sutures were designed for motion. Sutherland termed this motion the *Breath of Life.* Through his experi ments and research he determined that primary respiration was essential to all other physiological functions.

When Sutherland developed his techniques for cra niosacral therapy, he wanted it to serve as a vehicle for listening to the body's rhythmic motions, and treat the patterns of inertia, when those motions become congested. He believed that the stresses any physical or emotional trauma created an imbalance in the body that needed correction to restore it to full health. The therapy is a hands on method so that the therapist can feel the subtle ties of the patterns of movement and inertia. Sutherland felt that this was the way to encourage self healing and resto ration of the body's own mechanisms, taking a holistic approach to creating optimal health.

The Craniosacral Therapy Educational Trust, based on Sutherland's pioneering work is located at 10 Normington Close, Leigham Court Road, London SW16 2QS, United Kingdom. The phone number is 07000 785778.

therapy. There are also 10 authoritative textbooks on this therapy. The most notable scientific papers include Viola M. Fryman's work documenting the successful treatment of 1,250 newborn children with birth defects. Edna Lay and Stephen Blood showed the effects on TMD, and John Wood documented results with psychiatric disorders. The American Dental Association has found craniosacral therapy to be an effective adjunct to orthodontic work. However, the conventional medical community has not endorsed these techniques.

Training and certification

Craniosacral therapy is offered as part of the standard training in osteopathy, **chiropractic**, and **rolfing**. Massage therapists, nurses, dentists, physical therapists, and other health care practitioners can receive training through a series of workshops and seminars. The Upledger Institute offers two levels of national certification, involving a rigorous three part exam process of written, oral, and hands-on testing. The Milne Institute certifies practitioners through a two year training program that covers anatomy, physiology, symptomatology, psychology, **meditation** practice, and training in sensitivity, perception and intuition. Today there are around 40,000 practitioners certified to practice crainiosacral therapy.

Resources

BOOKS

Knaster, Mirka. *Discovering the Body's Wisdom*. New York: Bantam Books, 1996.

Milne, Hugh. *Heart of Listening: A Visionary Approach to Craniosacral Work: Anatomy. Technique, Transcendence*. 2nd ed. Berkeley, CA: North Atlantic Books, 1998.

Upledger, John E. "CranioSacral Therapy." In *Clinician's Complete Reference to Complementary and Alternative Medicine*. Donald Novey, ed. St. Louis, MO: 2000.

Upledger, John E. *Your Inner Physician and You: Cranio Sacral Therapy Somatoemotional Release*. Berkeley, CA: North Atlantic Books, 1991.

Upledger, John E., and John Vredevoogd. *Craniosacral Therapy*. Seattle: Eastland Press, 1983.

ORGANIZATIONS

Milne Institute Inc. P.O. Box 2716, Monterey, CA 93942 2716. (831) 649 1825. Fax: (831) 649 1826. http://www.milneinstitute.com. milneinst@aol.com.

Upledger Institute. 11211 Prosperity Farms Road, Palm Beach Gardens, FL 33410. (800) 233 5880. Fax: (561) 622 4771. http://www.upledger.com.

OTHER

Milne, Hugh. *A Client's Introduction to Craniosacral Work*. Pamphlet. Milne Institute.

Linda Chrisman

Creatine

Definition

Creatine is a nitrogenous organic acid that occurs in vertebrates. Its molecular formula is $C_4H_9N_3O_2$.

Description

With its promises of bigger muscles and improved athletic performance, creatine has generated more interest and controversy than almost any other dietary supplement in the 2000s. It is widely used by body builders and athletes at all levels, from famous baseball sluggers to high school jocks. Even without taking supplements, all people have a small amount of this compound in their bodies. Some of it comes from

food, especially meat and fish, while the rest is made by the body from **amino acids**. No one disputes the fact that creatine plays an important role in converting food into energy. The real question is whether taking extra amounts of creatine can make muscles bigger, boost athletic performance, or improve the health of people with muscle or nerve disease.

Creatine is considered important because it can increase the amount of energy available to working muscles. The compound is used by the body to make a chemical compound called adenosine triphosphate (ATP), the immediate fuel source used by muscles during short but intense bursts of activity. Through its conversion into phosphocreatine, a related substance, creatine appears to delay muscle **fatigue** by re-supplying muscles with ATP. Because creatine can be stored for later use by cells, consuming extra amounts of the substance may create a deeper energy reserve for muscles and other tissues. Excess creatine is eliminated by the kidneys, which means that creatine supplements may be of little value to people who have sufficient levels of the compound, since the kidneys automatically remove extra amounts.

A significant amount of research was required as of 2008 to determine the long-term effects of taking creatine, proper dosage, and whether age, gender, or the presence of existing diseases can affect use of the supplements. As of 2008, a review of research on 12 proposed uses of the drug reported by the National Institutes of Health found, in all cases, inconclusive scientific evidence for the suggested application. The 12 uses were as follows:

- Congestive heart failure
- Enhanced athletic performance and endurance
- Enhanced muscle mass/strength
- GAMT (guanidinoacetate methyltransferase) deficiency
- Heart muscle protection during heart surgery
- High cholesterol
- Huntington's disease
- Hyperornithinemia
- McArdle's disease
- Muscular dystrophy
- Myocardial infarction
- Neuromuscular disorders

General use

Creatine supplements are generally used by weight lifters and athletes who wish to optimize their workouts or enhance athletic performance. It is important to distinguish fact from myth regarding the possible benefits of creatine. The scientific evidence suggests that creatine may not have much usefulness as a muscle-enhancing agent, although it does appear to moderately improve performance in exercises or sports that require short, repeated bursts of high-energy activity. For example, creatine may provide a slight energy boost to the muscles of a weight lifter during extended repetitions or a basketball player who makes yet another drive to the hoop. However, creatine does not appear to increase aerobic capacity or improve performance in endurance-type activities such as marathon running. Apart from its uses in body building and athletics, creatine may prove beneficial in the treatment of certain diseases involving the muscles or nerves.

As of 2008, more than 3,200 research studies on creatine had been conducted in the preceding three decades. Many of those studies investigated the effects of creatine on athletic performance in a wide variety of sports, including short- and long-distance running, rugby, weight-lifting, swimming, hockey, and tennis. In September 2007, the National Library for Health (NLH) conducted a study of research on the use of creatine for enhancing athletic performance. It focused first on two research reviews carried out in 2005. One study of all the research conducted since 1999 found activities involving jumping, sprinting, or cycling generally benefited from the ingestion of creatine. For other types of athletic activity, the results were contradictory. The second report covered more than 500 studies on the use of creatine for the enhancement of athletic performance. The report found that 70% of the studies reviewed reported statistically significant improvement in at least some types of athletic performance.

The NLH also reviewed four studies that had been completed in the two preceding years. It found that three of the four placebo-controlled studies found no relationship between the use of creatine supplements and improved athletic performance among ice hockey players, tennis players, sprinters, and other types of runners.

In addition to its possible use in sports, creatine has been recommended for the treatment of a number of other diseases affecting the muscles or nerves, including Huntington's disease, **Lou Gehrig's disease** (ALS, amyotrophic lateral sclerosis), and congestive heart failure. Creatine is not considered a cure for these diseases but may help to alleviate symptoms (such as muscle weakness and fatigue) or possibly extend survival. Most research reported as of 2008 suggested that patients with neuromuscular disorders tolerate creatine therapy satisfactorily, but they do not appear to benefit significantly from the therapy.

Preparations

Dosage of creatine usually consists of a loading dose of 10 to 30 g a day (divided into several doses) for four to six days, followed by a maintenance dose of 2 to 5 g a day. It is not clear if the high loading dosage is actually necessary. Smaller dosages (3 g a day) may achieve the same effects if taken for several weeks.

Even without taking supplements, most people get about 1 g of creatine from food. Some authorities believe it is safer for people to avoid creatine supplements altogether in favor of eating foods that contain creatine. The best sources of creatine are meat, poultry, and fish. Getting too much dietary creatine is not considered a significant risk because only small amounts of the substance are present in food.

Precautions

Creatine supplements are not known to be harmful when taken in recommended dosages, although some precautions should be observed. People with kidney disease should not use creatine without medical supervision. Due to lack of sufficient medical study, creatine should be used with caution in children under age 16, women who are pregnant or breast-feeding, and people with liver disease.

The long-term health risks associated with taking creatine were unknown as of 2008. Surprisingly, though, use of the supplement was increasing in the late 2000s, even among children and adolescents. Some adults have used the drug on a long-term basis without knowing the effects of long-term use.

Side effects

A slight weight gain due to water retention is probably the most common side effect. **Nausea**, cramping, dehydration, **diarrhea**, and increased blood pressure have also been reported.

To avoid possible side effects, individuals ought not to take creatine immediately before or during **exercise**.

Individuals ought to drink plenty of fluids (six to eight glasses a day) while using creatine in order to prevent dehydration.

Interactions

Taking creatine with large amounts of carbohydrates may increase its effectiveness. **Caffeine** may decrease the effects of the supplement.

The international review group Natural Standard suggests that interactions are possible between creatine and a number of drugs and herbs, including diuretics such as hydrochlorothiazide and furosemide; drugs that may damage the kidneys, such as trimethoprim and cimetidine; anti-inflammatory drugs, such as ibuprofen, cyclosporine, amikacin, gentamicin, and tobramycin; cholesterol-lowering medications, such as lovastatin; and two herbal preparations, **bitter melon** *(Momordica charantia)* and red yeast *(Monascus purpureus)*.

KEY TERMS

Amino acids—The building blocks of protein.

Meta-analysis—An analysis of previous medical studies.

Resources

BOOKS

Appleton, Jeremy. *Creatine*. Chapmanville, WV: Woodland Press, 2008.

Paterson, Ellen R., compiler. *Anabolic Steroids and Sports, Testing, Creatine, Androstenedione, and Other Ergo genic Aids: Spring 1998 spring 2005: An Annotated Bibliography*. Albany, NY: Whitston, 2006.

Stout, Jeffrey R., Jose Antonio, and Douglas Kalman, eds. *Essentials of Creatine in Sports and Health*. Totowa, NJ: Humana Press, 2007.

PERIODICALS

Bemben, Michael G., and Hugh S. Lamont. "Creatine Sup plementation and Exercise Performance: Recent Find ings." *Sports Medicine* (February 2005): 107 125.

Buford, Thomas W. "International Society of Sports Nutrition Position Stand: Creatine Supplementation and Exercise." *Journal of the International Society of Sports Nutrition* (August 2007): 4 9.

Glaister, M., et al. "Creatine Supplementation and Multiple Sprint Running Performance." *Journal of Strength and Conditioning Research* (May 2006): 273 277.

Matich, Andrea Jensen. "Performance enhancing Drugs and Supplements in Women and Girls." *Current Sports Medicine Reports* (December 2007): 387 391.

ORGANIZATIONS

American College of Sports Medicine, 401 W. Michigan St., Indianapolis, IN, 46202 3233, (317) 637 9200, http://www.acsm.org.

Grand Forks Human Nutrition Research Center, 2420 Second Ave. N, Grand Forks, ND, 58202, http://www. gfhnrc.ars.usda.gov.

Greg Annussek
Teresa G. Odle
David Edward Newton, Ed.D.

Crohn's disease

Definition

Crohn's disease is a type of **inflammatory bowel disease** (IBD), resulting in swelling and dysfunction of the intestinal tract.

Description

Crohn's disease involves swelling, redness, and loss of function of the intestine, especially the small intestine. Research suggests that this inflammation is caused by an error in the immune system, which attacks the body itself instead of attacking foreign invaders, such as viruses or bacteria. The inflammation of Crohn's disease most commonly occurs in the last part of the ileum (a section of the small intestine), and often includes the large intestine (the colon). However, inflammation may also occur in other areas of the gastrointestinal tract, including the mouth, esophagus, or stomach. Crohn's disease differs from ulcerative **colitis**, the other major type of IBD, in two important ways:

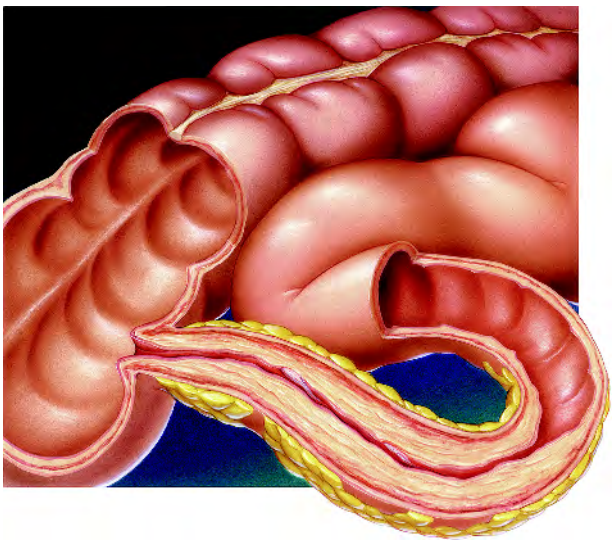
- The inflammation of Crohn's disease may be discontinuous, meaning that areas of involvement in the intestine may be separated by normal, unaffected segments of intestine. The affected areas are called regional enteritis, whereas the normal areas are called skip areas.
- The inflammation of Crohn's disease affects all the layers of the intestinal wall, while ulcerative colitis affects only the lining of the intestine.

Also, ulcerative colitis does not usually involve the small intestine; in rare cases it involves the terminal ileum (so-called backwash ileitis).

In addition to inflammation, Crohn's disease causes ulcerations, or irritated pits, in the intestinal wall. These pits occur because the inflammation has made areas of tissue shed away.

While Crohn's disease and ulcerative colitis are similar, they are also very different. Although it can be difficult to determine whether a patient has Crohn's disease or ulcerative colitis, it is important to make every effort to distinguish between these two diseases. Because the long-term complications of the diseases are different, treatment depends on careful diagnosis of the specific IBD present.

Crohn's disease may be diagnosed at any age, although most diagnoses are made between the ages of 15 to 35. About 20 to 40 people out of 10,000 suffer from this disorder, with men and women having an equal chance of being stricken. Caucasians are more frequently affected than other racial groups, and people of Jewish origin appear three to six times as likely to suffer from IBD. IBD runs in families; an IBD patient has a 20% chance of having relatives who are fellow sufferers.



Crohn's disease, inflammation of the ileum, the terminal portion of the small intestine, and characterized by abdominal pain and deep ulceration. *(Brian Evans / Photo Researchers, Inc.)*

Crohn's disease is a chronic disorder. While the symptoms can be improved, there is no known cure for the underlying disease as of the late 2000s.

Causes and symptoms

The cause of Crohn's disease is unknown. No infectious agent (virus, bacteria, or fungi) has been identified as the etiologic agent. Still, some researchers have theorized that some type of infection may have originally been responsible for triggering the immune system, resulting in the continuing and out-of-control cycle of inflammation that occurs in Crohn's disease. Other evidence for a disorder of the immune system includes the high incidence of other immune disorders that may occur along with Crohn's disease.

The first symptoms of Crohn's disease may include **diarrhea**, **fever**, abdominal **pain**, inability to eat, weight loss, and **fatigue**. Some patients experience severe pain that mimics appendicitis. It is rare, however, for patients to notice blood in their bowel movements. Because Crohn's disease severely limits the ability of the affected intestine to absorb the nutrients from food, a patient with Crohn's disease can have

signs of malnutrition, depending on the amount of intestine affected and the duration of the disease.

The combination of severe inflammation, ulceration, and scarring that occurs in Crohn's disease can result in serious complications, including obstruction, **abscess** formation, and fistula formation.

An obstruction is a blockage in the intestine. This obstruction prevents the intestinal contents from passing beyond the point of the blockage. The intestinal contents back up, resulting in **constipation**, **vomiting**, and intense pain. Although rare in Crohn's disease (because of the increased thickness of the intestinal wall due to swelling and scarring), a severe bowel obstruction can result in an intestinal wall perforation (a hole in the intestine). Such a hole in the intestinal wall allows the intestinal contents, usually containing bacteria, to enter the abdomen. This complication can result in a severe, life-threatening infection.

Abscess formation is the development of a walled-off pocket of infection. A patient with an abscess has bouts of fever, increased abdominal pain, and, in some cases, a lump or mass that can be felt through the wall of the abdomen.

Fistula formation is the formation of abnormal channels between tissues. These channels may connect one area of the intestine to another neighboring section of intestine. Fistulas may join an area of the intestine to the vagina or bladder, or they may drain an area of the intestine through the skin. Abscesses and fistulas commonly affect the area around the anus and rectum (the very last portions of the colon where waste leaves the body). These abnormal connections allow bacteria that normally live in the intestine to enter other areas of the body, causing potentially serious **infections**.

Patients suffering from Crohn's disease also have a significant chance of experiencing other disorders. Some of these may relate specifically to the intestinal disease, and others appear to have some relationship to the imbalanced immune system. The faulty absorption state of the bowel can result in **gallstones** and **kidney stones**. Inflamed areas in the abdomen may press on the tube that drains urine from the kidney to the bladder (the urethra). Urethra compression can cause urine to back up into the kidney, enlarge the urethra and kidney, and can potentially lead to kidney damage. Patients with Crohn's disease also frequently suffer from the following:

- arthritis (inflammation of the joints)
- spondylitis (inflammation of the vertebrae, the bones of the spine)
- ulcers of the mouth and skin
- painful, red bumps on the skin
- inflammation of several eye areas
- inflammation of the liver, gallbladder, and/or the channels (ducts) that carry bile between and within the liver, gallbladder, and intestine

The chance of developing **cancer** of the intestine is greater than normal among patients with Crohn's disease, although this chance is not as high as among those patients with ulcerative colitis.

Diagnosis

Diagnosis is first based upon a patient's symptoms. Blood tests may reveal an increase in certain types of white blood cells, an indication that some type of inflammation or infection is occurring in the body. Blood tests may also reveal **anemia** and other signs of malnutrition due to malabsorption (low blood protein; variations in the amount of **calcium**, **potassium**, and **magnesium** present in the blood; and changes in certain markers of liver function). Stool samples may be examined to make sure that no infectious agent is causing the diarrhea, and to see if the waste contains blood.

A colonoscopy may be performed to view the interior of the colon. During colonoscopy, a doctor passes a flexible tube with a tiny, fiber-optic camera device (an endoscope) through the rectum and into the colon. The doctor can then carefully examine the lining of the intestine for signs of inflammation and ulceration that might suggest Crohn's disease. A tissue sample (biopsy) of the intestine can also be taken through the endoscope to examine under a microscope for evidence of Crohn's disease.

Both an upper and lower GI (gastrointestinal) x-ray series can be helpful in determining how much of the intestine is involved in the disease. In the upper GI (also called a small bowel series), the patient drinks a chalky solution consisting of a salt of barium, which acts as a contrast agent to illuminate the gastrointestinal tract on x-ray film. After the barium is ingested, x rays are taken at specific time intervals as the barium passes through the stomach and into and through the small intestine. The lower GI series provides an x-ray study of the large intestine. The patient is given an enema containing a barium salt, and in some cases, air is also pumped into the rectum to provide a clearer view of the large intestine. This procedure is called a double-contrast barium enema.

Treatment

Crohn's disease is a chronic, often progressive, illness. A correct diagnosis and appropriate treatment with anti-inflammatory medications is critical to controlling the disease.

Some Crohn's patients find that certain foods are hard to digest, including milk, large quantities of fiber, and spicy foods. Dietary adjustments are usually necessary to minimize pain, diarrhea, and other symptoms.

Acupuncture and **guided imagery** may be useful tools in treating pain associated with Crohn's disease. Acupuncture involves the placement of thin needles into the skin at targeted locations on the body known as acupoints in order to harmonize the energy flow within the human body. To treat chronic pain, such as that involved with Crohn's disease, an acupuncturist frequently places the acupuncture needles along what is known as the large intestine meridian.

Guided imagery involves creating a visual mental image of one's pain in one's mind. Once the pain can be visualized, the patient can adjust the image to make it more pleasing and, thus, more manageable.

Several herbal remedies are also available to lessen pain symptoms and promote **relaxation** and healing. These include **peppermint** oil, **slippery elm** (*Ulmus rubra*), **marsh mallow** (*Althaea officinalis*), and Chinese herbs. However, Crohn's patients should consult with their healthcare professional before taking them. Depending on the preparation and the type of herb, these remedies may aggravate the digestive tract or interact with prescription drugs that are being taken to control the inflammation of Crohn's disease.

Allopathic treatment

Allopathic treatments for Crohn's disease try to reduce the underlying inflammation, the resulting malabsorption/malnutrition, the uncomfortable symptoms of cramping abdominal pain and diarrhea, and any possible complications (obstruction, abscesses, and fistulas).

Inflammation can be treated with a drug called sulfasalazine. Sulfasalazine is made up of two parts. One part is related to the sulfa antibiotics; the other part is a form of the anti-inflammatory chemical, salicylic acid. Sulfasalazine is not well-absorbed from the intestine, so it stays mostly within the intestine, where it is broken down into its components. It is believed that the salicylic acid component actively treats Crohn's disease by reducing inflammation. Some patients do not respond to sulfasalazine, particularly those with more severe disease. These patients require steroid medications (such as prednisone). Steroids, however, must be used carefully to avoid the complications of these drugs, including increased risk of infection and weakening of bones (**osteoporosis**).

In 2001, the Food and Drug Administration (FDA) approved use of budesonide capsules for mild and moderate cases of Crohn's disease involving the small and large intestines. Although a steroid, budesonide allows the drug to release into the intestines, where it can be mostly metabolized. As a result, less of the drug enters the patient's system, meaning fewer undesirable side effects may occur. Some potent immunosuppressive drugs that interfere with the products of the immune system and hopefully decrease inflammation may be used for those patients who do not improve on steroids. One addition to the various drugs used to treat Crohn's disease is natalizumab (Tysabri), originally developed and approved for the treatment of **multiple sclerosis**. The U.S. Food and Drug Administration (FDA) approved natalizumab in January 2008 for use with moderate to severe cases of Crohn's disease.

Serious cases of malabsorption/malnutrition may need to be treated by providing nutritional supplements. These supplements must be in a form that can be absorbed from the damaged, inflamed intestine. When patients are suffering from an obstruction, or during periods of time when symptoms of the disease are most acute, they may need to drink specially formulated, high-calorie liquid supplements. Those patients who are severely ill may need to receive their **nutrition** through a needle inserted intravenously.

A number of medications are available to help decrease the cramping and pain associated with Crohn's disease: loperamide, tincture of opium, and codeine. Some fiber preparations (methylcellulose or **psyllium**) may be helpful, although some patients do not tolerate them well.

The first step in treating an obstruction involves general attempts to decrease inflammation with sulfasalazine, steroids, or immunosuppressive drugs. A patient with a severe obstruction must stop taking all food and drink by mouth, allowing the bowel to rest. Abscesses and other infections require antibiotics. Surgery may be required to repair an obstruction that does not resolve on its own, to remove an abscess, or to repair a fistula. Such surgery may involve the removal of a section of the small intestine. In extremely severe cases of Crohn's disease of the colon that do not respond to treatment, a patient may need to have the entire large intestine removed (an operation called a

KEY TERMS

Abscess—A walled-off pocket of pus caused by infection.

Endoscope—A medical instrument that can be passed into an area of the body (e.g., the bladder or intestine) to allow examination of that area. The endoscope usually has a fiber-optic camera, which allows a greatly magnified image to be shown on a television screen viewed by the operator. Many endoscopes also allow the operator to retrieve a small sample (biopsy) of the area being examined.

Fistula—An abnormal channel that creates an open passageway between two structures that do not normally connect.

Gastrointestinal tract—The entire length of the digestive system, including the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus.

Immune system—The body system responsible for producing various cells and chemicals that fight infection by viruses, bacteria, fungi, and other foreign invaders. In autoimmune disease, these cells and chemicals turn against the body itself.

Inflammation—The result of the body's attempts to fight off and wall off an area that is infected. Inflammation results in the classic signs of redness, heat, swelling, and loss of function.

Obstruction—A blockage.

Ulceration—A pitted area or break in the continuity of a surface, such as the skin or mucous membrane.

colectomy). In this case, a piece of the remaining small intestine is pulled through an opening in the abdomen. This bit of intestine is fashioned surgically to allow a special bag to be placed over it. This bag catches the body's waste, which no longer can be passed through the large intestine and out through the anus. This opening, which remains in place for life, is called an ileostomy. However, as an alternative to ileostomy, small intestines are often shaped into substitute rectal pouches, and the patient may not always need the ileostomy.

Expected results

Crohn's disease is a lifelong illness. The severity of the disease can vary, and patients can experience periods when the disease is not active and they are symptom free. However, the complications and risks of Crohn's disease tend to increase over time. Well over 60% of all patients with Crohn's disease require surgery, and about half of these patients require more than one operation over time. About 5 to 10% of all Crohn's patients die of their disease, primarily due to massive infection.

Prevention

Crohn's disease is a chronic, lifelong disorder for which there is no prevention as of 2008. Some drugs, including azathioprine (Imuran, Azasan), 6-mercaptopurine (Purinethol), and methotrexate may help keep the disease in remission, although each drug has some potentially serious side effects also.

Resources

BOOKS

Dahlman, David. *Why Doesn't My Doctor Know This? Conquering Irritable Bowel Syndrome, Inflammatory Bowel Disease, Crohn's Disease, and Colitis*. Garden City, NY: Morgan James, 2008.

Parker, Philip M. *Crohn's Disease: A Bibliography and Dictionary for Physicians, Patients, and Genome Researchers*. San Diego, CA: ICON Group International, 2007.

Warner, Andrew S., and Amy E. Barto. *100 Questions & Answers About Crohn's Disease and Ulcerative Colitis: A Lahey Clinic Guide*. Sudbury, MA: Jones & Bartlett, 2007.

PERIODICALS

Bernard, André. "A Systematic Review of Patient Inflammatory Bowel Disease Information Resources on the World Wide Web." *American Journal of Gastroenterology* (September 2007): 2070 2077.

Clark, M., et al. "American Gastroenterological Association Consensus Development Conference on the Use of Biologics in the Treatment of Inflammatory Bowel Disease." *Gastroenterology* (July 2007): 312 339.

Feagan, Brian G., et al. "Health Related Quality of Life During Natalizumab Maintenance Therapy for Crohn's Disease." *American Journal of Gastroenterology* (December 2007): 2737 2746.

Van Kruiningen, Herbert J., et al. "Search for Evidence of Recurring or Persistent Viruses in Crohn's Disease." *Apmis* (August 2007): 962 968.

Van Limbergen, Johan, et al. "The Genetics of Inflammatory Bowel Disease." *American Journal of Gastroenterology* (December 2007): 2820 2831.

ORGANIZATIONS

Crohn's & Colitis Foundation of America, 386 Park Ave. S., 17th Floor, New York, NY, 10016 8804, (800) 932 2423, http://www.ccfa.org/.

Paula Ford-Martin
Teresa G. Norris
David Edward Newton, Ed.D.

Croup

Definition

Croup is a common ailment of early childhood involving inflammation of the larynx, trachea, bronchial tubes, and lungs. The condition is characterized by a harsh, barking **cough**, **wheezing**, and difficulty in breathing.

Description

Croup is most likely to be found in children between the ages of three months to six years. Most incidences occur during the cold weather seasons.

Spasmodic croup is usually mild and may be due to bacterial infection or **allergies**. For the most part, the child will not have a **fever**. Viral croup, also called laryngotracheobronchitis, is more severe and is often accompanied by fever. Both types follow a very similar course, which depends on the severity of the illness.

In many instances, a child may have had a cold or the flu just before the onset of croup symptoms. These symptoms tend to come on very suddenly. It is not uncommon for a child with croup to waken in the middle of the night coughing violently and gasping for breath. In fact, the croup symptoms will usually be worse at night and get better during the day.

Causes and symptoms

During the immune system response to an infection or an allergic reaction, the respiratory passages become swollen, and they are congested with mucus and fluid. They also become more and more irritated. There is a great deal of coughing, and the child may become hoarse. The airways are narrowed, and the breathing is difficult and noisy. This leads to the characteristic symptom of stridor, or noisy aspiration, as the child attempts to draw in air through narrowed passages. The constriction of these airways is usually accompanied by a high-pitched cough, often described as sounding like the bark of a seal.

Diagnosis

Diagnosis of croup is primarily based on a good history taken by the health care provider, including the physical symptoms of the illness, the presentation of the illness, and its progression. If a physical exam is performed, it will probably include listening with a stethoscope for the breathing sounds which are characteristic of croup. When the symptoms appear to be severe, or the history suggests it, x rays may be taken to rule out epiglottitis (infection of the epiglottis) or aspiration of a foreign body, which are emergency situations.

KEY TERMS

Aspiration—Accidental inhaling of an object such as food into the airway passages. This is dangerous, in that it may cause obstruction and difficulty breathing.

Corticosteroid—A hormonal drug that acts on the immune system to control inflammation and swelling.

Epiglottitis—A serious bacterial infection that can develop rapidly and lead to airway obstruction.

Epinephrine—A hormonal drug used chiefly to stimulate to the heart

Inflammation—Reaction by body tissues to infection or injury. Usually the area will be hot, red, painful, and swollen due to the immune response.

Intravenous fluids—In cases of immediate need for hydration, nourishment, or medicine, a needle with tubing is inserted directly into the vein.

Intubation—A procedure in which a flexible tube is carefully passed down the throat to keep the breathing passage open.

Stridor—A noisy wheezing sound during breathing that may indicate an airway obstruction.

Treatment

Supportive measures

Most treatment can be done at home, using relaxing and supportive measures to relieve symptoms. Steam inhalation is quite helpful in this respect. A cool-mist humidifier is recommended, as a hot vaporizer is often hazardous, especially around young children.

One of the best ways to produce a lot of moist air in a short time is to make use of the bathroom shower. The procedure is to close the bathroom door and turn on the cool water shower faucet full blast. Then the child can be a held while seated on a chair or the closed commode, breathing in steam as it fills the room. This can be done for up to 15 minutes, and often brings instant relief from congestion.

Cool air seems to relax and soothe the respiratory system. Therefore, taking a car ride with the window down will sometimes effect good results in reducing the coughing associated with croup.

There is a strong possibility of dehydration due to the illness. Increasing fluid intake as much as possible and insuring plenty of rest will enhance immune functioning, helping the body to help itself. In addition, **smoking** should be prohibited within the house.

Herbs

Respiratory herbs can be used to soothe swollen and irritated tissues, reduce inflammation, and gently loosen and expel mucus. The following herbs should be given three times per day diluted in water or other liquids until symptoms are gone:

- *Grindelia* spp., gum weed, 1-2 ml
- *Sambucus nigra,* elder flowers, 2-4 ml
- *Glycyrrhiza glabra,* licorice root, 1-3 ml
- *Verbascum thapsus,* mullein, 2-4ml
- *Astragalus senticocosus,* 2-4 ml (This herb is an immune system stimulant and should be given as a preventative for those who have chronic bouts of croup.)

Slippery elm bark can also be taken, as it is soothing to the throat.

Homeopathy

Aconite is the most favored remedy to use for croup. If it does not work, Spongia can be tried, especially if the breathing sounds as if wood were being sawed. Alternately, try Hepar sulphuris, indicated by a mucus-filled cough. Give a dosage of 12X or 30C every 30 minutes until the child is able to fall asleep.

Allopathic treatment

In most cases, croup can be easily and successfully treated at home. However, if the symptoms become severe, the child will need to be seen by a physician. Prompt medical attention is needed if:

- The child's fever goes up to 104°F (39.9°C).
- The child seems pale or bluish around the mouth or fingernails.
- The child refuses all liquids or can't swallow.
- The child is drooling a great deal.
- The child's breathing becomes increasingly rapid or difficult.

Severe cases may warrant the use of inhalants, such as epinephrine, to reduce swelling and ease the child's breathing. Inhalants have limited effectiveness over time, and care must be taken to avoid undesirable side effects. Oxygen may also be administered in more severe cases. Corticosteroids are given to decrease **pain** and swelling.

If a child is hospitalized for further observation or treatment, intravenous (IV) fluids may be given to reduce dehydration. In a few very severe cases, a tube has to be inserted through the nose or mouth (intubation) to keep the airway passage open for breathing. There is a slight risk of injury to the respiratory system during the introduction and the removal of the tube.

Expected results

Croup ordinarily lasts three to seven days. Most cases are mild and gradually improve with care. Some children have recurring bouts with croup, but they usually outgrow this by seven years of age.

It is important to monitor a child with croup throughout the night. An adult should probably consider sleeping or resting nearby. If the child is having a serious struggle with breathing, emergency services should be contacted immediately. This means either calling 911 or making a trip to the nearest emergency room. Hospital visits are necessary in about one to 15% of the reported cases of croup.

Prevention

Croup is generally the result of an infectious disease. Avoiding exposure to others with respiratory **infections** is the best way to avoid getting croup. Children should be taught to maintain good hygiene practices such as not eating food from the silverware or dishes of others and washing their hands. Care should be taken with colds and the flu so that there is no progression to symptoms of croup.

In general, an adequate intake of vitamins A and C, **bioflavonoids**, and **zinc** can help to prevent the respiratory infections and allergic reactions that lead to croup.

Resources

BOOKS

Bunch, Bryan, ed. *The Family Encyclopedia of Diseases: a Complete and Concise Guide to Illnesses and Symptoms*. New York: Scientific Publishing, Inc., 1999.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treat ments*. Alexandria, VA: Time Life, Inc., 1997.

OTHER

"Childhood Infections" The Nemours Foundation. http://kidshealth.org. (1999).

"The Common Cold" Natural Medicine Online. http://www.nat med.com. (2000).

"Croup" Merck & Co., Inc. http://www.merck.com.

"Croup and Your Young Child" American Academy of Pediatrics. http://www.aap.org. (2000).

Patience Paradox

Crystal healing

Definition

A crystal is a mineral that is nearly transparent and colorless or has a slight color. Practitioners of crystal healing believe that crystals, particularly quartz crystals such as amethyst or clear quartz, contain energy that enhances healing of both body and mind. They believe that crystals can be "charged" with this healing energy, in a manner similar to the charging of a flashlight battery. The charged crystal can then be used to alter the energy patterns in the person receiving treatment. Some crystal healers also say that arrowheads and other stones can be used to diagnose illness.

Origins

Aboriginal, shamanistic cultures throughout the world, including Native Americans and the Inuit of northern Canada, have long believed in the healing properties of semiprecious and precious stones. These views were further developed and widely popularized during the late twentieth century by New Age healers.

Benefits

Crystal healing is used to enhance healing of a wide range of physical and mental ailments. For example, amethyst is said to be useful against **acne**, atacamite against venereal diseases, agate against ulcers, and lapis lazuli against **stroke** symptoms. Crystals may also be used to counter environmental hazards such as electromagnetic radiation, food additives, and polluted air and water. They are thought by some to minimize the detrimental effects of **caffeine**, tobacco, and alcohol. In addition, some practitioners use crystals before and after surgery to minimize trauma.

Description

Although its effectiveness is disputed, crystal healing is generally safe and inexpensive. Crystals are used in a wide variety of ways. The best results are said to occur when both the patient and the healer are holding crystals. The healer may hold a stone in one hand while using the other to touch the body part in need of healing. Crystals may also be worn as pendants (this is said to be particularly effective in treating thymus gland problems). Appropriate stones can be selected, healers say, by simply picking up various crystals and determining which ones seem to harmonize with the frequencies of the patient's body. This may be indicated by a feeling of warmth or tingling. Some healers work solely with crystals while others combine them with aura or chakra work.

KEY TERMS

Aura—A person's vital energy field; the energies are said to be seen as colors and represent states of being. Halos have been considered a type of aura.

Chakra—A theoretical rotating wheel of energy within the body, believed to cause illness when out of alignment.

Placebo effect—The tendency of an ineffective therapy to benefit a patient who believes in the healing ability of the therapy.

Preparations

Numerous techniques are used to prepare crystals before therapeutic use. One such technique is clearing, which involves using an invocation to remove negative emotional energy from the stone. Another method is cleansing, which is said to maintain the crystal's existing energy level but converts negative energy to positive. This may be accomplished by immersing the stone for a minimum of 24 hours in dry salt or saline solution. Crystals can also be charged, like a battery, by exposing them to running water, magnets, sunlight, moonlight, pyramids, fire, laser light, or living animals, birds, fish, or plants.

Some practitioners attempt to charge stones by putting them near a mother who is giving birth, or someone who is dying. Crystals have been wrapped in a newborn's placenta, then given to the child seven years later. Gem stones that have been near meteorite fragments, earthquakes, volcanoes, or trees struck by lightening are also highly valued for healing properties.

Some healers believe that healing crystals can be programmed with human thoughts. This may be done by placing a crystal against the forehead, then visualizing a desired outcome.

Precautions

Crystal healing is largely viewed as an enhancement to other therapies. It should not be used exclusively in cases of serious illness.

Side effects

There are few, if any, proven side effects to crystal healing.

Research and general acceptance

Medical professionals place little credence in crystal therapy, attributing any observed benefits to **placebo effect**. Their skepticism stems from a lack of

scientific evidence for the healing effects of crystals, and from differences of opinion among practitioners about how the therapy actually works.

Training and certification

Practitioners of crystal healing tend to be New Age spiritual healers. A number of schools in Europe and North America offer courses in crystal therapy, but the field is largely unregulated. Many individuals use crystals for self-healing.

Resources

BOOKS

Elsbeth, Marguerite. *Crystal Medicine*. St. Paul: Llewellyn Publications, 1997.

ORGANIZATIONS

The International Association of Crystal Healing Therapists. P.O. Box 344, Manchester, M60 2EZ, United Kingdom. Telephone: (UK) 01200 426061. Fax: (UK) 01200 444776. info@iacht.co.uk. http://www.iacht. co.uk/.

David Helwig

Cupping

Definition

Cupping is a technique used in **traditional Chinese medicine** (TCM) for certain health conditions. Glass or bamboo cups are placed on the skin with suction, which is believed to influence the flow of energy and blood in the body. Cupping should not be confused with the percussive technique in **Swedish massage** called "cupping" or "clapping."

Origins

Cupping was originally called "horn therapy" in ancient China, but variations of it have been used in Turkey, Greece, France, Italy, and Eastern Europe. Cupping has a long history of use in **acupuncture** practice and has been combined with bloodletting, but it is a therapy in its own right. There are specialist cupping practitioners in Japan.

Cupping therapy on woman's back. *(© Photo Researchers, Inc. Reproduced by permission.)*

KEY TERMS

Meridian—Subtle channel in the body where qi flows.

Qi—Universal life energy present in air, food, water, sunlight, and the body.

Traditional Chinese medicine—System of healing originating in ancient China using acupuncture, herbal remedies, and other methods.

Benefits

Cupping is a safe, non-invasive, and inexpensive technique. It is used by practitioners of Chinese medicine to treat colds, lung **infections**, and problems in the internal organs. It is also used to treat muscle and joint **pain** and spasms, particularly in the back. Cupping can be used on people for whom the injection of acupuncture needles poses a problem or risk. Cupping therapy is thought to stimulate blood circulation.

Description

Practitioners of traditional Chinese medicine begin treatment by diagnosing a patient through interviews, close examinations of the pulse, tongue and other parts of the body, and other methods. TCM strives to balance and improve the flow of *qi*, or life energy, which travels throughout the body in channels called meridians. According to traditional Chinese medicine, illness is caused when qi does not move properly in the body. Acupuncturists are trained to determine where qi is stagnated, weak, or out of balance.

Acupuncturists use cupping for specific problems in the flow of qi. Cupping disperses and moves qi by exerting suction and pressure. Cupping is used when the qi is blocked at certain points, or when qi needs to be drawn to the surface of the body from deep within. For instance, cupping is used to treat lung infections and colds, because it is believed that the suction disperses and energizes the qi that has become blocked and stagnated in the lungs. Cups can also pull out "wind-cold" that in Chinese medicine is believed to cause lung infections.

Patients usually lie down for a cupping treatment. Cups are made of bamboo or strong glass. To create a vacuum, a flame from a lighter or a burning cotton ball is placed in an upside-down cup. When the oxygen in the cup is burned off, the cup is placed directly on the skin, where it is held in place by a surprisingly strong suction. Often, the skin inside the cup visibly rises. There are also cups available that use pumps instead of burning to create the proper suction. Cupping is generally a painless procedure.

Multiple cups may be used at a time to cover an area thoroughly. Cups may be left in the same place for several minutes, or removed quickly and placed elsewhere. Cups are sometimes placed over acupuncture needles that have been inserted. Moving cupping may also be performed, by first rubbing the skin with a small amount of oil to allow the cups to slide around. After cupping, patients may remain lying down for several minutes. When cups are used to treat colds and lung infections, patients are advised to wrap up in blankets to stay warm after treatment. Acupuncturists may also prescribe herbal remedies, dietary changes, and other health recommendations.

Precautions

Cupping should be performed by experienced professionals. Although it is a simple treatment, people should not attempt it on themselves. Improper glass vessels can shatter and cause injury, and cupping may cause bruising.

Side effects

Cupping causes blood to be drawn to the surface of the skin, which can cause red marks, swelling, and bruising.

Resources

BOOKS

Fleischman, Dr. Gary F. *Acupuncture: Everything You Ever Wanted to Know*. Barrytown, NY: Station Hill, 1998.

Williams, Tom, Ph.D. *The Complete Illustrated Guide to Chinese Medicine*. Rockport, MA: Element, 1996.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine. 433 Front St., Catasaugua, PA 18032. (610) 266 1433.

Douglas Dupler

Curanderismo

Definition

Curanderismo is a holistic system of Latin American folk medicine. This type of folk medicine has characteristics specific to the area where it is practiced (Guatemala, Nicaragua, Honduras, Argentina, Mexico, the southwestern region of the United States, etc.).

Curanderismo blends religious beliefs, faith, and **prayer** with the use of herbs, massage, and other traditional methods of healing. Curanderismo can be defined as a set of traditional beliefs, rituals, and practices that address the physical, spiritual, psychological, and social needs of the people who use it.

The Spanish verb *curar* means to heal. Therefore, curanderismo is translated as a system of healing. The goal of curanderismo is to create a balance between the patient and his or her environment, thereby sustaining health.

The healer who practices curanderismo is referred to as a *curandero* (male healer) or *curandera* (female healer). Healing terms vary with the language and culture of the area in which the system is practiced. For example, a female healer in Argentina is called a *remedieras*.

Origins

Curanderismo in Mexico is based on Aztec, Mayan, and Spanish influences. The ancient native cultures believed that a delicate balance existed between health, nature, and religion. Illness occurred when one of these areas was out of balance.

The use of nature's resources was very important to the native cultures. In the fifteenth century, the Huaxtepec garden was developed by the Aztec leader Montezuma I. This garden was a collection of several thousand medicinal plants. The Aztec priests used this garden to perform research on the medicinal properties of the plants.

When the Spanish conquistadors came to Mexico in the sixteenth century, they destroyed the garden and all of the priests' research because the Catholic Church considered these "sciences" to be blasphemous. Although the written knowledge was destroyed, the plant wisdom was remembered, passed down by the native peoples, and became an integral part of curanderismo.

The Spanish missionaries who were sent to the New World introduced the native peoples to the Catholic religion and European healing philosophies. Prayers to Catholic saints were soon integrated into healing rituals. Another doctrine that was passed on to the native peoples by the Europeans was their belief in witchcraft, sorcery, and other superstitions, and the philosophy that illness is often caused by supernatural forces.

As the native and Spanish cultures intermingled over the centuries, a new culture was formed, as was the folk medicine of curanderismo.

KEY TERMS

Anthropology—The study of the origin and physical, social, and cultural development and behavior of groups of people.

Benefits

Curanderismo is used to treat ailments arising from physical, psychological, spiritual, or social conditions. Illness is said to be caused by either natural or supernatural forces.

Naturally caused illness is treated with herbal medicine, massage, and prayer. Much of this illness is thought to be brought about by intense emotions caused by trauma or a specific event. Susto, for example, is an illness that is caused by fright. A startling event such as a fire, earthquake, dog attack, car accident, or death may cause the patient to become ill. Symptoms of susto are **insomnia**, **diarrhea**, extreme nervousness, sadness, **depression**, loss of appetite, loss of brilliance in the eyes, and lack of dreams. The events are thought to dislodge a person's spirit from the body.

Bilis is an ailment that is the result of excessive emotional **stress**. Bilis is caused by prolonged anger and fear. The ailment is thought to occur when excessive bile is trapped in the system and causes tension, irritability, and loss of appetite.

Empacho and **colic** are ailments treated by massage and herbs. Empacho is a blocked intestine disease where the intestines are plugged by something indigestible such as chewing gum or unbaked dough. To treat this condition, the curandera performs a massage in which she pulls on the skin of the back just above the coccyx (tailbone). When the skin makes a snapping noise the food has been loosened. Herbal tea is also given to complement the massage.

Colic is caused by excessive coldness of the stomach, and mint is used for such digestive problems.

Supernaturally caused illnesses or conditions are initiated by witchcraft, sorcery, or hexes. Physical symptoms might manifest as nervous breakdowns, paranoia, **schizophrenia**, depression, or excessive worrying. Supernatural forces can also create social problems. A person who has a streak of continued bad luck, or who suffers from marital problems, the loss of a job, or car troubles will deem the problem to be caused by a supernatural force. To heal these ailments

and remove the hex or problem, the curandera uses rituals, spiritual cleansings, herbs, and prayer.

Description

Prayer is the foundation of curanderismo. Curanderas have strong religious faith and believe that they were given the ability to heal as a gift from God. Curanderas pray to spirits and/or Catholic saints for help in healing their patients, often praying to specific saints for particular conditions.

A traditional healing session may include one or more of the following: spiritual cleansing (*limpia*), ritual, massage, and/or herbal therapy. Curanderas use a variety of objects in their healing sessions, including herbs and spices, eggs, lemons, flowers, fruits, holy water, pictures of saints, crucifixes, candles, incense, and oils. Each object has a specific purpose.

Holy water is used for protection from negativity or evil spirits. Eggs and lemons are patted on the patient's body to absorb negative energies. **Rosemary**, basil, and rue branches are brushed on the body to remove negativity.

Candles are burned to absorb negative energy and create a healing environment. Different colored candles are burned for different reasons: red for strength, blue for harmony, pink for good will. Incense is used to purify the room, while **garlic** and oils are used as protection from negativity and bad spirits.

Research and general acceptance

Although much of the Hispanic community is currently devoted to the practice of curanderismo, many people fear that it will be lost from lack of interest on the part of the younger generation or reliance on mainstream medical procedures. There is a great deal of research on curanderismo in the field of anthropology.

Training and certification

Curanderas are generally trained informally. The information is passed from generation to generation (i.e., mother to daughter). Often the curandera starts out as an apprentice to a more experienced curandera.

Resources

BOOKS

Perrone, Bobette, Henrietta H. Stockel, and Victoria Kruger. *Medicine Women, Curanderas, and Women Doctors*. Norman, OK: University of Oklahoma Press, 1989.

Sandoval, Annette. *Homegrown Healing: Traditional Remedies From Mexico*. New York: Berkley Books, 1998.

Trotter, Robert T., II, and Juan Antonio Chavira. *Curanderismo: Mexican American Folk Healing*. 2nd ed. Athens, GA: The University of Georgia Press, 1997.

Jennifer Wurges

Curcumin

Definition

Curcumin is a biologically active phytochemical compound found in the root and rhizome of **turmeric** (*Curcuma longa L.*). Turmeric is native to India and cultivated throughout China, Southeast Asia, and in other tropical climates. It is a perennial species in the **ginger** (Zingaberaceae) family of flowering plants. Curcumin (diferuloyl methane), Demethoxycurcumin and Bisdemethoxycurcumin, collectively called curcuminoids, are polyphenolic pigments extracted from the orange-gold colored root of turmeric. Curcumin is the most abundant curcuminoid found in the turmeric root, providing about 75 percent of the total curcuminoids, which together comprise less than 10 percent of turmeric.

General use

The aromatic, pungent, and spicy-flavored turmeric root is one of the key ingredients in many Indian curries, imparting its distinctive color. This tropical herb is a staple dietary spice throughout Asia and India. It has been used for centuries as a food preservative, fabric dye, cosmetic, and ritual herb. More recently turmeric was used as a non-toxic food coloring agent in mustards and other foods. In scientific laboratories, turmeric paper, made by soaking paper in a tincture of turmeric, is used to detect alkaloids and boric acid.

Chinese and Ayurveda medicine

The wide range of therapeutic benefits of curcumin-rich turmeric root have long been recognized in Chinese herbal medicine, where the herb is known as *jianghuang*. In Ayurveda, India's ancient system of medicine, turmeric is called *haldi* and is valued as the internal healer. Turmeric has proven effective in the extensive clinical practice of eastern medicine for treatment of inflammation, **pain**, gastrointestinal, pulmonary and liver disorders, and numerous other conditions.

Curcumin acts to promote digestion, stimulate the gall bladder and the flow of bile, aid in nutrient absorption, check **diarrhea**, prevent **blood clots**,

lower **cholesterol**, regulate menses, and treat **premenstrual syndrome** (PMS). Curcumin's pain relieving qualities are helpful with arthritis, **toothache**, **colic** and chest and abdominal pain, among other traditional uses.

For external treatments, the antibiotic, astringent, and antiseptic turmeric root is prepared as an ointment or poultice to treat **bruises**, **cuts** and abrasions, **scabies** (combined with **neem** *(Azadirachta indical)*, **boils** and other infected areas of the skin, and as a remedy for ailments of the eyes, including **conjunctivitis**. The volatile oils of turmeric root also act as a mosquito repellant and prevent bacterial infection in **wounds**. In India a common folk tonic for new mothers is a beverage made of turmeric and ginger root powder added to warm milk and honey. A paste of turmeric is sometimes applied to the skin to protect against sun damage.

Western medicine

Extensive scientific research was underway in the late 2000s to validate in western terms the traditional uses in Eastern medicine for the remarkably diverse turmeric root and its constituent curcumin. Many studies of curcumin have been in laboratory or animal research. Animal studies, however, do not always prove as successful in human clinical trials. Curcumin extract has been investigated with both *in vivo* and *in vitro* research. Numerous studies have demonstrated curcumin to be an effective treatment for a wide range of medical conditions, including the following:

- Alzheimer's disease
- Cardiovascular risks
- Crohn's disease
- Digestive disorders
- Herpes simplex
- Melanoma and other cancers
- Rheumatoid arthritis
- Gallbladder disease
- Type II diabetes

Research

Laboratory and animal research has demonstrated the anti-inflammatory, antioxidant, and anticancer properties of turmeric and its constituent curcumin. Scientists have demonstrated curcumin's action to induce apoptosis, a naturally occurring form of cell death that eliminates damaged or diseased cells in cases of lymphoma and melanoma. Additional research is needed with humans to further verify the health benefits of a turmeric-rich diet and dietary supplements of curcumin extract.

In laboratory tests in the 1990s, researchers at Harvard Medical School and elsewhere reported curcumin as active against both acutely and chronically infected HIV cells. However, later clinical trials called into question the efficacy of curcumin extract in treatment of HIV.

A study published in 2006 in the *Journal of Alzheimer's Disease* reported that curcumin extract may protect against progression of Alzheimer's because of its action to inhibit the build-up of amyloid plaques in the brain. Curcumin can cross the blood-brain barrier and bind to the amyloid plaques that cause Alzheimer's, aiding in their removal from the system. In a 2006 study of non-demented elderly Asians who consumed a regular diet of turmeric-rich curry, cognitive function was found to be higher than in individuals who did not consume dietary turmeric.

Toronto scientists, reporting in the *Journal of Clinical Investigation* in 2008, found that curcumin could prevent and reverse hypertrophy, restore heart function, and reduce scar formation in mice with enlarged hearts. Additional studies have demonstrated the heart-healthy action of curcumin and its ability to protect against **heart disease** by lowering high blood cholesterol levels and preventing blood clotting.

One clinical trial in patients with **rheumatoid arthritis** compared curcumin to phenylbutazone, a nonsteroidal anti-inflammatory drug (NSAID) prescribed to alleviate arthritic pain. Patients receiving the curcumin extract showed significant improvement with therapeutic effects comparable to those obtained with phenylbutazone, though without the risk of possible serious side effects of the prescription drug.

A 2008 study at Michigan State University demonstrated that curcumin in low concentrations acted to interfere with replication of *Herpes simplex* virus. Scientists began testing curcumin as a possible treatment for skin, breast, and colon **cancer**.

Curcumin extract helps to stimulate the production of bile and break down fats and has been shown in animals to reduce secretion of stomach acid. Curcumin, taken orally, has been shown to have activity against Crohn's disease. Curcumin's use as a digestive aid has been approved by the German Commission E, formed by the German government to evaluate the safety and efficacy of herbs and herb combinations. The official monographs of the Commission, available through the American Botanical Council, provide "approved uses, contraindications, side effects, dosage, drug interactions and other therapeutic information

essential for the responsible use of herbs and phytomedicines," according to the council.

Preparations

Turmeric root

Turmeric root is traditionally collected in winter when the aerial part is dying off. The root is washed, boiled or steamed thoroughly, dried and then ground into a powder just prior to use.

Curcumin extract

Curcumin is commercially available as a fluid extract, capsule, or tincture. For maximum effectiveness, curcumin must be taken with a meal. Researchers have discovered that curcumin undergoes a chemical transformation during absorption from the intestine. Although the phytochemical is almost totally insoluble in water, it is completely soluble in fat. In India, raw turmeric juice is mixed with warm milk and taken as a morning drink to purify blood, relieve bronchial **asthma**, or as a general tonic. The digestive enzyme **bromelain**, extracted from the stem and the fruit of the pineapple plant *(Ananas comosus)*, is sometimes taken in combination with curcumin. The medical benefit depends upon the chemical content and biological activity of the curcumin supplements.

Recommended doses for adults range from 250 to 500 mg of turmeric extract capsules standardized at 90 to 95%; curcumin, three times daily, with a meal. The root, sliced or ground, can be taken in amounts up to 3,000 mg per day. The tincture can be taken in dosages up to 30 drops, four times daily. If taken on an empty stomach, curcumin may cause gastric irritation and ulceration.

KEY TERMS

Amyloid plaques—Protein fragments produced normally in the body that accumulate and form hard, insoluble plaques between the nerve cells in the brain and interfere with neural activity.

Apoptosis—Structural changes within cells of a multi-cell organism leading to controlled and regulated cell death, also called programmed cell death (PCD); a natural means to eliminate unnecessary and unhealthy cells.

Crohn's disease—A chronic, recurrent inflammation of the intestine and digestive tract; an inflammatory bowel disease (IBD) that most commonly affects the small intestine.

in vivo—A Latin term meaning living. In science, the term denotes those experiments conducted on or within living organisms.

in vitro—A Latin term meaning glass. In science the term denotes those experiments conducted in a laboratory, but not with living organisms.

Phytochemicals—Beneficial chemical substances found in plants and fruits and thought to work synergistically in whole foods to provide disease protection and promote health.

Polyphenols—A group of phytonutrient compounds present in various foods, including onions, apples, grapes, berries, certain nuts, green tea and red wine. Polyphenolic compounds include tannins, lignins, and flavonoids and are an abundant source of dietary antioxidants.

Precautions

Turmeric root has been demonstrated in numerous human trials to be safe in amounts up to 2,500 mg per day. It is traditionally used freely as a food spice with no significant adverse effects. Curcumin has been shown to stimulate the production of bile and to facilitate the emptying of the gallbladder, so persons with gastrointestinal disorders, ulcer, **gallstones**, or bile duct obstructions should not take curcumin. The safety of curcumin extract for use by very young children or pregnant or nursing women has not been established.

Drug interactions

People should not take curcumin while taking certain blood thinning medicines. **Breast cancer** patients undergoing chemotherapy are advised to limit intake of dietary turmeric and avoid use of the curcumin extract as it may inhibit the anti-tumor action of cyclophosphamide, a chemical used in treating breast cancer.

Side effects

No side effects have been reported other than risk of stomach upset in very high dosages and if taken on an empty stomach.

Resources

BOOKS

Mateljan, George. *The World's Healthiest Foods: Essential Guide to the Healthiest Way of Eating*. Seattle, WA: George Mateljan Foundation, 2006.

Advances in Experimental Medicine and Biology, Vol. 595: The Molecular Targets and Therapeutic Uses of Curcumin in Health and Disease. New York: Springer US, 2007.

PERIODICALS

Brown, Donald. "Curcumin Helps Maintain Remission in Patient with Ulcerative Colitis." *Original Internist* (June 1, 2007).

Funk, J. L., et al. "Turmeric Extracts Containing Curcumi noids Prevent Experimental Rheumatoid Arthritis." *Journal of Natural Products* 69, no.3 (2006): 351 355.

Ng, T. P., C. P. Chiam, T. Lee, et al. "Curry Consumption and Cognitive Function in the Elderly." *American Journal of Epidemiology* 164, n. 9 (2006).

Siwak, D., et al. "Curcumin induced Antiproliferative and Proapoptotic Effects in Melanoma Cells Are Associ ated with Suppression of 1kB Kinase and Nuclear Factor kB Activity and Are Independent of the B Raf/ Mitogen Activated/Extracellular Signal regulated Pro tein Kinase Pathway and the Akt Pathway." *Cancer* 104, no. 4 (2005): 879 890.

"Spicing Up Your Life: Can Turmeric, the Spice that Adds Color and Flavor to Asian Foods, Play a Role in Pre venting Alzheimer's Disease? Scientists Are Trying to Find Out." *Saturday Evening Post* 277, no. 3 (May 1, 2005): 70.

Uddin, S., et al. "Curcumin Suppresses Growth and Induces Apoptosis in Primary Effusion Lymphoma." *Oncogene* (2005): 1 9.

OTHER

"Chemical Found in Curry May Help Immune System Clear Amyloid Plaques Found in Alzheimer's Disease." *Sci ence Daily,* October 3, 2006. http://www.sciencedaily. com/releases/2006/10/061003143643.htm. (March 2, 2008).

Dharmananda, Subhuti. "Turmeric: What's in an Herb Name? How Turmeric (Jianghuang) and Curcuma (Yujin) Became Confused." Institute for Traditional Medicine. http://www.itmonline.org. (March 1, 2008).

Higdon, Jane. "Curcumin." Linus Pauling Institute, Micro nutrient Information Center, Oregon State University. http://lpi.oregonstate.edu/infocenter/phytochemicals/ curcumin/. (February 28, 2008).

Li, Hong Liang. "Curcumin Prevents and Reverses Murine Cardiac Hypertrophy." *Journal of Clinical Investigation,* 2008. http://www.pubmedcentral.nih.gov/articlerender. fcgi?artid 2248327. (March 1, 2008).

Pandeya, N. K. "Old Wives' Tales: Modern Miracles Turmeric as Traditional Medicine in India." *Trees for Life Journal* 1 (2005): 3. http://www.tfljournal.org/ article.php/20051201122521970. (March 5, 2008).

"Turmeric Prevents Experimental Rheumatoid Arthritis and Bone Loss." *UA News,* University of Arizona, October 23, 2006. http://uanews.org/node/12838. (March 2, 2008).

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (512) 926 4900, http://abc.herbalgram.org.

Clare Hanrahan

Cuscuta

Description

Cuscuta is the name of a group of plants in the morning glory family, of which the species *Cuscuta epithymum* is most commonly used in healing. A member of the Cuscutaceae family, species of cuscuta are found almost everywhere in the world, although cuscuta is more often called Chinese dodder in English-speaking countries. Other names are hellweed, devil's gut, beggarweed, strangle tare, scaldweed, dodder of **thyme**, greater dodder, and lesser dodder. In Chinese, cuscuta seeds are called *tu si zi*.

Cuscuta is a parasitic plant. It has no chlorophyll and cannot make its own food by photosynthesis. Instead, it grows on other plants, using their nutrients for its growth and weakening the host plant. Agriculturalists consider cuscuta a destructive weed and attempt to eradicate it. It parasitizes wild and cultivated plants and is especially destructive to such commercially valuable

Cuscuta. *(© Frank Blackburn / Alamy)*

crops as flax, **alfalfa**, beans, and potatoes. It also grows on such common ornamentals as English ivy, petunias, dahlias, and chrysanthemums. For medicinal purposes, herbalists prefer *C. epithymum* that grows on thyme.

Cuscuta is a leafless plant with branching stems ranging in thickness from thread-like filaments to heavy cords. The seeds germinate like other seeds. The stems begin to grow and attach themselves to nearby host plants. Once they are firmly attached to a host, the cuscuta root withers away. The mature plant lives its entire life without attachment to the ground. The stems of cuscuta are used in **Western herbalism**, and the seeds are used in **traditional Chinese medicine** (TCM). Cuscuta is used as an individual remedy and in combination with other herbs.

General use

Despite the fact that cuscuta is unpopular with farmers, it has a long history of folk use. In Western herbalism, cuscuta was traditionally used to treat liver, spleen, and gallbladder disorders such as **jaundice**. It was also used to support liver function. It is still used, although rarely, in that way by modern herbalists. It is also a mild laxative. Other traditional Western claims for cuscuta are that it is a mild diuretic and that it can be used to treat **sciatica** and scurvy. Externally, it can be gathered fresh and applied to the skin to treat scrofuladerma. Extracts of the herb have a very bitter taste.

In traditional Chinese medicine, the seeds of cuscuta, called *tu si zi*, have been used for thousands of years. In the Chinese understanding of health, *yin* aspects inside the person and outside in the environment must be kept in balance with *yang* aspects. Ill health occurs when the energies and elements of the body are out of balance or in disharmony with nature. Health is restored by taking herbs and treatments that restore internal and external balance.

According to traditional Chinese healers, cuscuta seeds have a neutral nature and a pungent, sweet taste. They are associated with the liver and kidneys and are used in formulas that help both yin and yang deficiencies, depending on the patient's condition and the other herbs in the formula. Cuscuta was considered both an aphrodisiac and a longevity herb because it slowed down the loss of fluids from the body.

Contemporary Chinese herbalists use cuscuta in formulas to treat a range of conditions, including the following:

- impotence
- premature ejaculation
- sperm leakage
- frequent urination
- ringing in the ears
- lower back pain
- sore knees
- white discharge from the vagina (leucorrhea)
- dry eyes
- blurred vision
- tired eyes

Cuscuta is also used in the Indian system of Ayurvedic healing to treat jaundice, muscle **pain**, coughs, and problems with urination.

Cuscuta in combinations

Cuscuta is one of nine herbs included in the manufacture of two Chinese herbal remedies, Astra Essence and Equiguard. Each contains eight other similar ingredients according to package ingredients listed in 2008.

Astra Essence, a product of Health Concerns, contains the following herbs:

- Herba Epimedii (stem and leaves)
- Fructus Rosae Laevigatae (fruit)
- Fructus Rubi (fruit)
- Fructus Psoraleae (fruit)
- Radix Morindae Officinalis (root)
- Fructus Schisandrae (fruit)
- Fructus Ligustri Lucidi (fruit)
- Semen Cuscutae (seed)
- Radix Astragali (root)

The uses of Astra Essence include a tonic for **infertility**, **impotence**, balanced kidney tonfication, and to reduce the frequency of urination. Other uses are a preventative for **hair loss** and to balance blood glucose in diabetes. The formula is said to help slow **aging** and prevent adverse effects caused by premature aging and the kidney deficiency caused by a fast-paced lifestyle. These include the loss of memory and hearing. Furthermore, Astra Essence is said to help with the side effects of chemotherapy and radiation.

Equiguard, a product of Integrated Chinese Herbal Nutraceuticals, contains the following herbs:

- Herba Epimedii, Fructus
- Rosae Laevigatae
- Fructus Rubi, Fructus
- Psoraleae, Radix
- Morindae Officinalis
- Fructus Schisandrae

- Fructus Schisandrae
- Fructus Ligustri Lucidi
- Semen Cuscutae, Radix
- Astragali, Hydroxypropyl Methylcellulose

Equiguard is marketed as a natural blend of Chinese herbs that helps kidney and prostate disorders. Men age 50 and older may experience prostrate-related difficulties such as difficulty urinating, frequent urination, and discomfort when urinating. Equiguard is said to promote healthy kidney function, support prostate health, and normalize urination, according to the Web site maintained by Equiguard.

Cuscuta research

As of 2008, little scientific research had been performed in the West on cuscuta. A purgative compound had been isolated from the herb, however, that supports its traditional use as a liver and gallbladder tonic. Other research done at Asian universities indicated that cuscuta seeds contain a complex carbohydrate that stimulates the immune system and that it has some antioxidant properties as well. Research into the antioxidant properties of cuscuta included a study described in the April 2007 issue of the *Journal of Ethnopharmacology*. Researchers at Kaohsiung University in Taiwan studied the effect of cuscuta on rats and concluded that data suggested that cuscuta could prevent hepatic (affecting the liver) injuries and that this was probably done through cuscuta's **antioxidant** activities.

Equiguard research

Research performed at New York Medical College indicates that the combination of ingredients in Equiguard may be effective in the treatment of **prostate cancer**. The preparation inhibited the growth of **cancer** cells, increased the rate of self-destruction (apoptosis) of cancer cells, and prevented the surviving cells from forming colonies.

Preparations

In Western herbalism, the entire thread-like stems of cuscuta are used. They are boiled in water along with such herbs as **ginger** and allspice to make a decoction. In Chinese herbalism, only the seeds are used. They are almost always used in combination with other herbs, as in concha marguerita and ligastrum formulas.

Cuscuta is available in capsule and tablet form. Herbal combinations containing cuscuta are also available in tablet and capsule forms. The dosage depends on the strength of the remedy and the condition being treated.

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue.

Diuretic—Any substance that increases the production of urine.

Sciatica—Pain in the lower back, buttocks, hips, and thigh caused pressure on the sciatic nerve.

Scrofuloderma—Abscesses on the skin associated with tuberculosis and caused by mycobacteria.

Scurvy—A disease caused by the absence of vitamin C in the diet.

Yang aspects—Yang aspects, in nature and in the human body, include such qualities as warmth, activity, light, and forcefulness.

Yin aspects—Yin aspects are the opposite of yang aspects and are represented by such qualities as cold, stillness, darkness, and passivity.

Precautions

The United States Food and Drug Administration does not regulate herbal remedies such as cuscuta, which means that the remedies have not proven to be safe or effective. In addition, ingredients are not standardized to comply with federal regulations.

Women who are pregnant, nursing mothers, and children should not take cuscuta as a single herb or in combination products. No special precautions are necessary when cuscuta is used in the doses normally prescribed by herbalists.

Side effects

As of 2008, no side effects had been reported when cuscuta is used in doses prescribed by herbalists.

Interactions

Cuscuta has been used for centuries with other Chinese herbs without any reported interactions. There were no known interactions between cuscuta and Western pharmaceuticals, as of 2008.

Resources

PERIODICALS

Yen, F.L., T. H. Wu, L. T. Lin, C. C. Lin. "Hepatoprotective and Antioxidant Effects of Cuscuta Chinensis Against Acetaminophen Induced Hepatotoxicity in Rats." *Journal of Ethnopharmacology* (April 2007): 123 128.

OTHER

"Cuscuta epithymum." *Plants for a Future*. http://www.pfaf.org. (February 27, 2008).

Equiguard Online. http://equiguardonline.com. (February 27, 2008).

"Learn About Prostate Cancer." American Cancer Society. http://www.cancer.org/docroot/LRN/LRN_0.asp?dt 36. (February 27, 2008).

"Study Finds Many Prostate Cancer Patients Use Complementary and Alternative Methods." American Cancer Society. http://www.cancer.org/docroot/NWS/content/NWS_1_1x_Many_Prostate_Cancer_Patients_Use_Complementary_and_Alternative_Methods.asp. (February 27, 2008).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaom.org.

American Botanical Council, 6200 Manor Rd., Austin, TX, 78723, (512) 926 4900, http://abc.herbalgram.org.

Herb Research Foundation, 4140 Fifteenth St., Boulder, CO, 80304, (303) 449 2265, http://www.herbs.org.

National Center for Complementary and Alternative Medicine, National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Tish Davidson
Rebecca J. Frey, PhD
Liz Swain

Cuts and scratches

Definition

Cuts are **wounds** that break through the skin and sometimes reach the underlying tissue. Scratches are usually superficial wounds where the skin is scraped by a sharp object.

Description

The skin is a barrier between the environment and the rest of the body. Usually it offers protection from the invasion of infective organisms. If the skin is broken by cutting or scratching, there is an increased possibility of infection, along with **pain** and blood loss. Most cuts and scratches are relatively minor and respond well to home remedies. Deep cuts may require medical help and repairing the skin with stitches to heal properly.

KEY TERMS

Ghee—Butter heated to remove the fat, used in Ayurvedic foods and remedies.

Keloids—An excessive overgrowth of collagen scar tissue, often found in young women and African Americans.

Lymph nodes—Structures that form white blood cells and help fight infection in the body.

Poultice—Fresh chopped herbs applied to an injured part of the body, and often covered with a cloth, for healing pains, diseases, and infections.

Causes and symptoms

A cut or scratch is often due to an accidental injury or intentional violence. Age-related changes may be a contributing factor, because the skin becomes more thin and fragile with age, and thus, more susceptible to cuts and scratches. Infection is a primary concern in dealing with cuts and scratches. Signs of infection include redness, pain or tenderness, local swelling, warmth, a discharge from the wound site, **fever**, swollen lymph nodes, and red streaks spreading out from the wound site.

Diagnosis

Minor cuts and scratches do not usually require diagnosis. However, if an infection sets in, the wound may need to be assessed by a healthcare provider taking a history of the injury and performing a physical exam.

Treatment

Homeopathic topical preparations can be useful in treating cuts and scratches. Calendula and *Hypericum perforatum* are herbs that can be applied topically as a cream, gel, or ointment. Hypericum 30c can be taken internally, as well. It is particularly indicated if the cut is very painful. Staphysagria 30c is indicated for deep cuts and stab wounds. **Aconite** 30c may be given every 30 minutes for up to three to five doses if a person is very anxious as well as injured.

Ayurvedic medicine recommends several simple applications for minor cuts and scratches. These

include fresh **aloe** vera gel, plain ghee, and coconut oil. **Licorice** (*Glycirrhiza glabra*) and **turmeric** (*Curcuma longa*) can be added to any of these to make a paste that will help the skin heal.

Western herbal remedies that promote the healing of cuts and scratches include a strong tea made from *Calendula officinale* flowers, which can be used as a soak or a wash for wounds; distilled **witch hazel** (*Hamamelis virginiana*) which may also stop bleeding; **goldenseal** (*Hydrastis canadesis*) powder or salve, a specific for skin healing; a poultice of crushed **plantain** leaves (*Plantago* spp.); and **comfrey** root salve (*Symphytum officinale*). Raw honey can also be directly applied to help disinfect superficial wounds and to promote healing. *Echinacea* spp. tincture can also be used as a disinfectant or antimicrobial to the affected site. The alcohol in the tincture may cause the wound to sting. Topical applications should not be used on a deep wound until some initial healing has occurred.

According to **aromatherapy**, a spray of diluted **essential oils** can be used as an antiseptic. They may also repair skin damage and encourage new cell growth. Tea tree, **lavender**, **myrrh**, benzoin, bergamot, **chamomile**, tea tree, **eucalyptus**, **juniper**, **rosemary**, helichrysum, eucalyptus, rose geranium, and sandalwood are all appropriate to use on cuts and scratches. About 10 drops of the full-strength oil should be added, singularly or blended, to two ounces of distilled water and one half ounce of goldenseal tincture or alcohol. The essential oil mixture should be shaken well before each use, and it can then be sprayed on two or three times per day.

Vitamins E and A are necessary for the skin to heal well and quickly. These vitamin oils can be squeezed directly from their capsules onto the affected areas several times per day. They can be taken orally, as well, along with a multivitamin containing vitamins A, C, E, and B complex. Healing following an injury is also speeded up by supplementation with the **amino acidsarginine** and glycine. **Bromelain**, the digestive enzyme from pineapple, can be taken between meals as needed to reduce inflammation.

Allopathic treatment

Most cuts and scratches are minor and can be handled at home. A physician should be consulted if:

- The cut is very large or deep.
- There is uncontrolled bleeding.
- There is damage to muscles, nerves, or other deep tissues.
- The wound edges are very jagged or do not seem to join together for healing.
- The wound site is very dirty or contains difficult-to-remove foreign material, such as gravel.
- There is weakness or numbness below the injury.
- The cut is on the face, chest, fingers, genitals, back, stomach, palm of the hand, or over a joint.
- There are signs of infection.
- The lymph nodes become swollen.
- The injured person has a history of diabetes, poor circulation, mitral valve prolapse, an artificial heart valve, or an artificial hip.

A cut or scratch should be washed with a mild soap and water. Tweezers that have been disinfected by washing in hot, soapy water and soaking in rubbing alcohol can be used to remove any dirt, glass, or gravel remaining in the wound. Pressure can be applied directly to wound with clean gauze pad until bleeding has stopped. The wound can be protected while it heals by covering it with an adhesive bandage. The use of an antibiotic or antiseptic ointment is optional. The use of rubbing alcohol and hydrogen peroxide are not recommended for minor cuts and scratches, as they can cause irritation of the wound.

Aspirin, acetaminophen, or nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, naproxen, or ketoprofen can be taken to reduce pain. If there is a lot of bleeding, however, aspirin and NSAIDs should be avoided because they may interfere with blood clotting. Keeping the edges of the wound together can help keep dirt out, speeds healing, and decreases scarring. Stitches are helpful in this regard, but they, too, can cause scarring. Butterfly bandages or steri-strips may also be used to keep the wound closed. If a cut is more than 0.5 in (1.25 cm) deep, stitches will usually be needed.

Expected results

Most cuts and scratches are superficial, and heal within a few days. Sometimes keloids form, and these painless scars become gradually less prominent and visible over a period of months to years. Deep cuts may result in permanent decrease in function. Serious damage may also result if an infected wound is left untreated.

Prevention

It is especially easy to get cuts and scratches while working outdoors. Protective clothing and gloves are therefore recommended for any kind of manual labor outside the house. Using a moisturizer on the skin

ensures that it will not become dried out. Dry skin is much more susceptible to cuts, scratches, and cracking than moist skin. Care should be taken to avoid accidents in the home. The safety of problem areas should be addressed. For example, hardwood floors and stairs are often slippery, as are loose rugs and broken steps or floorboards. Also, the shower can be a major site of home injuries. Furniture may have to be moved if there are repeated accidents. Overexposure to the sun's rays should be avoided, as it is a major cause of fragile skin leading to injury. In addition, a **tetanus** booster shot is recommended every 10 years.

Resources

BOOKS

Dollemore, Doug and Prevention Health Books for Seniors Staff. *The Doctors Book of Home Remedies for Seniors*. Emmaus, PA: Rodale Press, Inc., 2000.

Kirchheimer, Sid and Prevention Magazine Health Book Editors. *The Doctors Book of Home Remedies II: Over 1,200 New Doctor Tested Tips and Techniques Anyone Can Use to Heal Hundreds of Everyday Health Prob lems*. Emmaus, PA: Rodale Press, Inc., 1993.

OTHER

Alternative Medicine.com. http://www.alternativemedicine.com
MotherNature.com. http://www.mothernature.com.

Patience Paradox

Cyanocobalamin *see* **Vitamin B_{12}**

Cymatic therapy

Definition

Cymatic therapy is a form of **sound therapy** that is not applied through hearing, but by instruments that send audible sound waves directly into the body through the skin. This process is said to promote a healing environment in the body. The process may be known as Cymatherapy, which is a trademarked name for an organization that sells instruments and provides cymatic training.

Origins

Sound, particularly in the form of music, drumbeats, or chanting, was used for healing purposes in numerous ancient traditions. The physiological effects of different types of music on blood pressure and other bodily indicators were first noticed during the late 1800s. Eighteenth-century German scientist Ernst Chladni demonstrated the relationship between sound and matter. Chladni, who came to be known as the "Father of Accoustics," discovered that when he moved a violin bow around a plate containing sand that the action caused the grains of sand to form geometric patterns. During the twentieth century, Hans Jenny, a Swiss scientist elaborated on that research.

Jenny studied the effect of sound on metal plates containing material such as sand, liquid, and powder. He discovered that the sound caused the formation of elaborate patterns in the materials. He coined the word "cymatics," deriving it from the Greek word *kyma* (a great wave). Jenny published his findings in a 1967 book titled *Cymatics: A Study of Wave Phenomena & Vibration,* which discussed the structure, dynamics, and effects of sound vibrations and featured photographs of his research on sound patterns. Jenny's book was republished in 2001.

Cymatic therapy was largely developed during the 1960s by Sir Peter Guy Manners, an English medical doctor and osteopath. He believed that everything vibrated to its own frequency and that when a frequency changed, so did its form. Manners maintained that conditions such as illness represented an imbalance in the sound or harmonic frequency of cells. If **cancer** waves affected a kidney, the person could be treated by exposure to the frequency of a healthy kidney. The application of the healthy frequency to the skin over time would restore a healthy balance to the kidney, according to Manners. He created a therapeutic cymatic instrument that was said to emit more than 800 controlled audible frequencies.

Benefits

Practitioners of cymatic therapy believe that sound is capable of rearranging the structure of molecules and, therefore, has unlimited potential as a tool for healing. They claim to have successfully treated otherwise incurable and terminal diseases. At the same time, they acknowledge that some patients seem to be unaffected by sound therapy. The treatment has been used on patients with tumors, internal **bruises**, calcified joints, bacterial or viral **infections**, blood diseases, and other problems.

Description

Sound consists of mechanical vibrations that travel through a medium such as air, water, or in the case of cymatic therapy, the body. Sound healers believe that all parts of the body vibrate and thus produce sound, either at a healthy, harmonious frequency, or at an inharmonious, unhealthy frequency. Using a computerized instrument, cymatic therapists direct healing

frequencies into the body to restore resonance and harmony. The healing frequencies are related to those emitted by a healthy organ or body part. In this way, cymatic healers say, the immune system and other natural regulatory functions are stimulated. Frequencies may be applied directly or transmitted along **acupuncture** meridians.

Cymatic therapy does not directly heal, practitioners say. Rather, it creates a near-optimal environment for organs or cells. In such an environment, they say, the body can heal itself without drugs or surgical intervention. The therapy may also be delivered without such equipment, with the use of instruments such as tuning forks.

Products marketed by Cymatherapy in February 2008 included the Cyma 1000, an instrument registered with the United States Food and Drug Administration (FDA) as a therapeutic massager. The instrument was described as "an electrically powered device intended for medical purposes, such as to relieve minor muscle aches and pains," according to the registration that was revised on April 1, 2006. The registration as a Class 1 Device did not mean that the product was approved by the FDA, only that the registration was filed with the federal agency.

The Cyma 1000 is marketed on the Cymatherapy Web site as "simply an acoustic massager that emits relaxing tones" and not a product "intended to diagnose, treat, cure, or prevent any disease." The machine provided more than 500 "commuations (harmonious combinations of five frequencies)." It sold for $9,950 in 2008.

Precautions

Patients with cardiac pacemakers are advised to avoid this therapy. Because of the controversial nature of cymatic treatment, people with pre-existing medical conditions should consult a physician before beginning cymatic therapy treatment.

The FDA does not approve Class 1 devices such as cymatic therapy instruments, which means the instruments have not been rigorously tested for safety and effectiveness. In addition, the American Cancer Society cautioned that claims that sound waves could promote a healing environment were not scientifically proven. The society warned people not to rely solely on cymatic therapy or delay seeking conventional treatment for cancer.

Side effects

Cymatic therapy was thought to be generally free of adverse side effects, as of February 2008.

Research and general acceptance

The variability with which different body tissues absorb and reflect sound is universally acknowledged. It is this variability that makes ultrasound scanning a useful form of medical imaging. However, few physicians are convinced that healing can be facilitated by tuning a sound device to a patient's cellular vibrations. Hence, medical doctors tend to be highly skeptical about cymatic therapy. There were no large studies of the effectiveness of cymatic therapy as of February 2008.

Training and certification

Cymatic devices are used by a variety of alternative practitioners, including osteopaths, acupuncturists, and chiropractors. Specific training is needed to operate the machines. This can be obtained through books, tapes, seminars, and correspondence courses. In most jurisdictions, the field is unregulated and patients must, therefore, take care to ensure the competence of their healer.

Cymatherapy offered a certification course that consisted of 200 credit hours and cost $2,000 in February 2008, according to the Web site. Training as a certified cymatherapist included 182 hours of course credit and a three-day workshop. The topics studied included anatomy, psychology, and technology of sound (cymatics).

Resources

OTHER

"Cymatic Therapy." American Cancer Society, March 26, 2007. http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Cymatic_Therapy.asp?sitearea ETO. (February 26, 2008).

Manners, Peter Guy. "Vibrational Therapy." http://www.soundhealersassociation.org/sha/peter_guy_manners.html. (February 28, 2008).

ORGANIZATIONS

Cymatherapy International, (866) 909 0099, http://cymatherapy.com.

Sound Healers Association, PO Box 2240, Boulder, CO, (800) 246 9764, http://www.soundhealersassociation.org.

David Helwig
Liz Swain

Cyperus

Description

Cyperus refers to a family of marsh-dwelling grass-like plants known as sedges. Perhaps the best-known member of this family is the reed, which ancient Egyptians used to make papyrus. However, many other members of this family have proven useful as food and medicine. *Cyperus articulatus* and *Cyperus rotundus* are the two species most often associated with healing.

C. articulatus, also called adrue or Guinea rush, is a tall sedge that mainly grows in Jamaica, Turkey, and along the Nile River in Egypt. The medicinal part of the plant is its root or tuber. This part is blackish in color and shaped like a top. Tubers are usually about 0.7–1 in (1.1–2.5 cm) long and about 0.5–0.7 in (1.3–1.7 cm) in diameter. The tubers may be connected in groups of two or three by underground stems. They are harvested and dried for healing. The herb is bitter in taste and aromatic, similar to **lavender**.

C. rotundus is used primarily in Asia and Africa, but it also grows in Australia, Europe, and North America. It is an invasive plant that grows in low, damp places near water. Like *C. articulatus*, the tuber is the part of the plant used in healing. Its Chinese name is *xiang fu*, and it has been used in **traditional Chinese medicine** for thousands of years. *C. rotundus* is also called tiririca, nutsedge, nutgrass, musta, mutha, and a host of other local names.

General use

C. articulatus is used mainly for digestive disorders. It is an antiemetic, meaning that it suppresses **vomiting**. This is useful in reducing the symptoms of **morning sickness** during **pregnancy**. Because it gives the body a general feeling of warmth, *C. articulatus* is sometimes used as a sedative, generally in connection with suppressing **nausea**. Cyperus is also used to relieve **gas** in the stomach and intestines. In the Peruvian Amazon, native people use the herb to treat infection, and in Africa it is used to treat **epilepsy**.

There are few scientific studies of *C. articulatus*. An Argentinean study conducted in 1995 looked at the bacteria-killing properties of the herb. It concluded that decoctions of *C. articulatus* completely inhibited the growth of one species of *Staphylococcus* bacteria and partially inhibited the growth in one species of *Pseudominas* bacteria. Both of these bacteria **strains** are capable of causing severe, and sometimes fatal, **infections**. It was ineffective in tests against five other infection-causing organisms.

Cyperus rotundis flower spike. *(Nigel Cattlin / Photo Researchers, Inc.)*

Another study published in the *Journal of Ethnopharmacology* in 1996 by Swiss investigators found that extracts of *C. articulatus* reduced certain types of spontaneous neuron firings in the brains of rats. These scientists suggested that this suppression might be the basis for the effectiveness of *C. articulatus* in treating **headache** and epilepsy. In the early 2000s, no studies on *C. articulatus* were published in scholarly, peer-reviewed journals.

C. rotundus is used in Chinese medicine and Japanese Kampo formulations. It is rarely used alone and can be found in formulas that relieve **pain**, especially pain associated with **menstruation**. It is also used in formulas for stomachache and **diarrhea**, to improve menstrual function, to treat **impotence** or heighten sexual potency, to treat bacterial infections, dry or tired eyes, and in tonics for general wellness. In other Asian and African countries, *C. rotundus* is also used as a diuretic and to treat high blood pressure. It is also spread on the skin as a bactericide and a fungicide to prevent infection of **wounds**. A study published in 2007 supported the idea that *C. rotundus* has antibacterial properties. Researchers found that an extract of *C. rotundus* substantially reduced the growth of *Streptococcus mutans*, a bacteria responsible for the formation of dental plaque and tooth decay (dental caries).

Preparations

C. articulatus is usually prepared as a decoction or liquid extract to be taken internally. *C. rotundus* may

Cyperus. *(© blickwinkel / Alamy)*

be prepared two different ways. It can be boiled to make a liquid to be mixed with other herbs. The tubers can also be ground into a paste with or without other herbs. The paste can either be formed into pills to be taken internally or applied externally to wounds or skin **rashes**. This paste is also sometimes applied directly to the temples to treat headaches.

Precautions

As of early 2008, no particular precautions had been reported as being necessary in using cyperus.

Side effects

As of the early 2000s, no side effects had been reported in using cyperus. This herb has a long tradition of folk use, but its effects on humans had not been studied in any structured way.

Interactions

Cyperus is often used in conjunction with other herbs in Chinese formulations with no reported interactions. Cyperus is, however, reported to be mixed with hallucinogenic plants by certain tribes living in the Brazilian rain forest, in order to prolong the action of the hallucinogens. As of 2008, there were no studies of interactions between cyperus and standard Western pharmaceuticals. One Korean report on several compounds isolated from cyperus, however, indicated that it inhibits the action of benzodiazepine tranquilizers and modifies the effectiveness of several neurotransmitters in the central nervous system.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

PERIODICALS

Yu, H. H., D. H. Lee, S. J. Seo, and Y. O. You. "Anticar iogenic Properties of the Extract of *Cyperus rotundus*." *American Journal of Chinese Medicine*. 35 no. 3 (2007): 497 505.

OTHER

Dharmananda, Subhuti. "Cyperus: Primary Qi Regulating Herb of Chinese Medicine." Institute for Traditional Medicine, March 2005. http://www.itmonline.org/arts/cyperus.htm (February 10, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999 or (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

Tish Davidson, A. M.
Rebecca J. Frey

KEY TERMS

Antiemetic—A preparation or medication given to stop vomiting.

Antimalarial—Any substance that reduces the effects of the tropical disease malaria.

Bactericide—A substance that kills bacteria.

Decoction—A preparation made by boiling an herb, then straining the liquid to remove solid material. The liquid is then taken internally as a drink.

Diuretic—Any substance that increases the production of urine.

Fungicide—A substance that kills fungi.

Kampo—Traditional Japanese system of herbal medicine.

Neuron—A nerve cell that transmits electrical impulses.

Cystitis *see* **Bladder infection**

Cysts, ovarian *see* **Ovarian cysts**

D

Damiana

Description

Damiana, a member of the Turneraceae family, is an aromatic shrub with small yellow flowers that grows on dry, sunny, rocky hillsides in south Texas, Southern California, Mexico, and Central America. The two species used in herbal healing, both of which are referred to as damiana, are *Turnera aphrodisiaca* and *Turnera diffusa*. Damiana usually grows to a height of about 24 in (60 cm). Its pale green leaves, which turn yellow-brown when dried, are 0.5–1 in (15–25 mm) long and quite narrow. They have serrated (jagged) edges. The leaves and sometimes the stems of the plant have medicinal uses. Other names for damiana include old woman's broom, Mexican damiana, pastorata, hierba del venado, oreganello, and the bourrique.

General use

Damiana affects primarily the urinary and reproductive systems. It has been used as an aphrodisiac and to boost sexual potency in men by the native peoples of Mexico, including the Mayan Indians, for thousands of years. It is said to act as a sexual stimulant and produce a feeling of general well being. Damiana is sometimes used in men to treat spermatorrhea, premature ejaculation, sexual sluggishness, and prostate complaints. It is often used in combination with other herbs to treat **impotence**.

During the twentieth century, damiana shifted from being primarily a male sexual remedy to also being prescribed for women. In women it is used to treat painful **menstruation**, **menopause** disorders, and headaches caused by menstruation.

Both men and women use damiana to relieve **anxiety**, nervousness, and mild **depression**, especially if these symptoms have a sexual component. The herb is also used as a general tonic to improve wellness. As a general tonic it is said to act as a stimulant, improve circulation, and regulate hormonal activity. Some herbal practitioners use it as a diuretic. Damiana tonic should be used moderately and not be taken on a long-term basis.

Damiana has been used traditionally to improve digestion and to treat **constipation**, as in large doses it has a mild laxative effect. Other uses include treatment of **asthma**, **cough** and flu, and nephritis. During the 1960s, damiana was touted as a recreational drug. Some users claimed that damiana produced a mild "high" or hallucinogenic effect similar to **marijuana** that lasts an hour to an hour and a half.

In addition to its medicinal uses, damiana is used in Mexico to flavor liqueurs, tea, and other beverages and foods. It tastes slightly bitter, and the leaves have a strong resinous aroma when crushed.

Despite its long history and frequent use in many different cultures, scientists as of 2008 were unable to isolate any active ingredients that would account for damiana's aphrodisiac, stimulant, or hallucinogenic properties. The herb contains a volatile oil that may mildly irritate the genitourinary system. This volatile oil may be at the root of damiana's reputation as an aphrodisiac.

The German Federal Health Agency's Commission E, which was established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, found no proof that damiana acts either as a sexual stimulant or as a hallucinogen. That said, they found no proof that damiana is likely to cause harm. A 1999 study on rats conducted in Italy found that extracts of *Turnera diffusa* had no effect on sexually potent rats, but it did increase the performance of sexually sluggish or impotent rats. There have been no clinical trials involving humans. As of 2008, the safety and efficacy of this herb had not been evaluated by the United States Food and Drug Administration (FDA).

Damiana has been used as an aphrodisiac and to boost sexual potency in men by the native peoples of Mexico, including the Mayan Indians, for thousands of years. *(© Geoffrey Kidd / Alamy)*

KEY TERMS

Aphrodisiac—Anything that arouses or increases sexual desire.

Diuretic—Any substance that increases the production of urine.

Hallucinogen—A substance that causes the perception of a stimulus or object when it is not really present.

Nephritis—An inflammation or irritation of the kidney.

Spermatorrhea—Involuntary discharge of semen without an orgasm occurring; sperm leakage.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Preparations

The leaves and occasionally the stems of damiana are used medicinally. They are normally harvested while the plant is in flower and then are dried. Dried leaves turn a yellow-brown color and may be powdered, used in capsules, or steeped in water or alcohol. Damiana is always used internally, never topically.

Traditionally, damiana has been prepared as a tea or infusion. Although folk recipes vary, generally about 1 cup (250 ml) of boiling water is added to 1/2 cup (1 g) of dried leaves, and allowed to steep about 15 minutes. One cup of this infusion is drunk two to three times daily. This infusion is slightly bitter and has an astringent quality.

Damiana is also available as a tincture of which 1–3 ml is taken two or three times a day. If taken in capsule or tablet form, 3–8 g twice a day may be taken. Damiana is also available in concentrated drops. Damiana is often used in conjunction with other herbs having similar properties, and it is often found as an ingredient in herbal mixtures or formulas. Their manufacture and purity is not regulated by the FDA.

Precautions

Scientific evidence indicates that damiana is one of the safest substances commonly taken for sexual enhancement. It has a long history of traditional medicinal and food use with no harmful consequences reported. It is believed to be unlikely to cause harm or have negative side effects when taken in the designated doses. However, individuals who have diabetes, a history of **breast cancer**, **bipolar disorder**, **schizophrenia**, Alzheimer's disease, or Parkinson's disease should consult a physician before taking this herb. No rigorous scientific studies as of 2008 have examined the effects of long-term use of damiana.

Side effects

Large doses of damiana may cause loose stools because of the herb's laxative properties. Occasional allergic reactions have been reported, but otherwise, no unwanted side effects have been documented.

Interactions

People who are taking pharmaceutical drugs to control blood sugar levels should consult their healthcare provider before starting damiana, since the herb may interact with these drugs. Damiana is often used in combination with other herbs without any negative effects.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960. http://www.amfoundation.org.

Centre for International Ethnomedicinal Education and Research (CIEER) http://www.cieer.org.

Tish Davidson, A. M.

Dance therapy

Definition

Dance therapy is a type of **psychotherapy** that uses movement to further the social, cognitive, emotional, and physical development of the individual. Dance therapists work with people who have many kinds of emotional problems, intellectual deficits, and life-threatening illnesses. They are employed in psychiatric hospitals, day care centers, mental health centers, prisons, special schools, and private practice. They work with people of all ages in both group and individual therapy. Some also engage in research.

Dance therapists try to help people develop communication skills, a positive self-image, and emotional stability.

Origins

Dance therapy began as a profession in the 1940s with the work of Marian Chace. A modern dancer, she began teaching dance after ending her career with the Denishawn Dance Company in 1930. In her classes, she noticed that some of her students were more interested in the emotions they expressed while dancing (loneliness, shyness, fear, etc.) than the mechanics of the moves. She began encouraging them by emphasizing more freedom of movement rather than technique.

In time, doctors in the community started sending her patients. They included antisocial children, people with movement problems, and those with psychiatric illnesses. Eventually, Chace became part of the staff of the Red Cross at St. Elizabeth's Hospital. She was the first dance therapist employed in a formal position by the federal government. Chace worked with the emotionally troubled patients at St. Elizabeth's and tried to get them to reach out to others through dance. Some of them were schizophrenics and others were former servicemen suffering from **post-traumatic stress disorder**. Success for these patients meant being able to participate with their class in moving to rhythmic music. "This rhythmic action in unison with others results in a feeling of well-being, **relaxation**, and good fellowship," Chace said.

Dance therapy in a mental health unit. *(© Photo Researchers, Inc. Reproduced by permission.)*

KEY TERMS

Authentic movement—A type of movement that is influenced heavily by Jungian analysis, and works by analyzing the internal images of the patient. Patients are also urged to dance only when they feel the "impulse" to move.

Freudian analysis—A type of psychological treatment where the therapist seeks to help the patient resolve conflicts and traumas buried in the subconscious.

Jungian analysis—A method of psychological treatment where the patient strives to understand the internal, often mythic images in his or her thoughts and dreams.

Psychotherapy—A medical treatment that seeks to resolve psychological traumas and conflicts, often by discussing them and emotionally reliving difficult events in the past.

Test anxiety—A name for the stress and anxiousness that commonly occur in students before they take exams.

Chace eventually studied at the Washington School of Psychiatry and began making treatment decisions about her patients along with other members of the St. Elizabeth's medical team. Her work attracted many followers and the first dance therapy interns began learning and teaching dance therapy at St. Elizabeth's in the 1950s.

Other dancers also began using dance therapy in the 1940s to help people feel more comfortable with themselves and their bodies. These dancers included Trudi Schoop and Mary Whitehouse. Whitehouse later became a Jungian analyst and an influential member of the dance therapy community. She developed a process called "movement in-depth," an extension of her understanding of dance, movement, and depth psychology. She helped found the contemporary movement practice called "authentic movement." In this type of movement, founded on the principles of Jungian analysis, patients dance out their feelings about an internal image, often one that can help them understand their past or their current life struggles. One of Whitehead's students, Janet Alder furthered Whitehead's work in authentic movement by establishing the Mary Starks Whitehouse Institute in 1981.

In 1966, dance therapy became formally organized and recognized when the American Dance Therapy Association (ADTA) was formed.

Benefits

Dance therapy can be helpful to a wide range of patients—from psychiatric patients to those with **cancer** to lonely elderly people. Dance therapy is often an easy way for a person to express emotions, even when his or her experience is so traumatic he or she can not talk about it. It is frequently used with rape victims and survivors of sexual abuse and incest. It can also help people with physical deficits improve their self-esteem and learn balance and coordination.

Dance therapists also work with people who have chronic illnesses and life-threatening diseases to help them deal with **pain**, fear of death, and changes in their body image. Many people with such illnesses find dance therapy classes to be a way to relax, get away from their pain and emotional difficulties for a while, and express feelings about taboo subjects (such as impending death).

Dance therapy is suitable even for people who are not accomplished dancers, and may even be good for those who are clumsy on the dance floor. The emphasis in dance therapy is on free movement, not restrictive steps, and expressing one's true emotions. Children who cannot master difficult dances or can not sit still for traditional psychotherapy often benefit from free-flowing dance therapy. Even older people who cannot move well or are confined to wheelchairs can participate in dance therapy. All they need to do is move in some way to the rhythm of the music.

Dance therapy can be useful in a one-on-one situation, where the therapist works with only one patient to provide a safe place to express emotions. Group classes can help provide emotional support, enhanced communication skills, and appropriate physical boundaries (a skill that is vital for sexual abuse victims).

Description

There are currently more than 1,200 dance therapists in 46 states in the United Sates and in 29 foreign countries. Like other mental health professionals, they use a wide range of techniques to help their patients. Some of the major "schools of thought" in dance therapy include the Freudian approach, Jungian technique, and object relations orientation. Many therapists, however, do not ascribe to just one school, but use techniques from various types of dance therapy.

The authentic movement technique is derived from the Jungian method of analysis in which people work with recurring images in their thoughts or dreams to derive meaning in their life. Instead of asking the patient to dance out certain emotions, the therapist

instructs the patient to move when he or she feels "the inner impulse." The moves are directed by the patient and the therapist is a noncritical witness to the movement. The moves are supposed to emerge from a deep level within the patient.

In Freudian technique, dance therapists work with patients to uncover feelings hidden deep in the subconscious by expressing those feelings through dance.

In object relations technique, the therapist often helps the patient examine problems in his or her life by considering the primary initial relationship with the parents. Emotions are expressed in a concrete, physical way. For instance, a patient would work out his fears of abandonment by repeatedly coming close to and dancing at a distance from the therapist.

Dance therapists sometimes use other types of therapy along with dance, such as art or drama. Therapists also discuss what happens during a dancing session by spending time in "talk therapy." Dance therapists use visualizations during sessions, too. For example, the therapist might instruct patients to imagine they are on a beautiful, peaceful beach as they dance.

In one frequently used technique, the therapist mirrors the movements of the patient as he or she expresses important emotions. This is especially powerful in private one-on-one therapy. It is thought that this device provides a sense of safety and validates the patient's emotions.

The underlying premise of dance therapy is that when people dance, they are expressing highly significant emotions. A fist thrust out in anger into the air or a head bent in shame has deep significance to a dance therapist. Through dance therapy, the theory goes, patients are able to more easily express painful, frightening emotions, and can progress from there. After experiencing dance therapy, they can talk about their feelings more freely and tear down the barriers they have erected between themselves and other people. The hope is that eventually they can go on to live more psychologically healthy lives.

Preparations

People who want to use dance therapy should find a qualified therapist. The ADTA provides lists of qualified therapists. The person should begin dance therapy with an open mind and a willingness to participate so he or she can get the most benefit.

Precautions

A qualified dance therapist should have completed a graduate program in dance therapy approved by the ADTA and should be registered with the ADTA. He or she should not just be a dancer, but should also have extensive training in psychology.

Side effects

No known side effects.

Research and general acceptance

Dance therapy was once dismissed as simply an ineffective, "feel good" treatment, but it is now more respected. Many research studies have proven that dance therapy can be an effective tool to help people overcome psychological problems.

In a 1993 study, older people with cognitive deficits showed that dance therapy could significantly increase their functional abilities. Patients improved their balance, rhythmic discrimination, mood, and social interaction.

In 1999, a pilot study of 21 university students showed that those who took a series of four to five group dance therapy sessions in a period of two weeks significantly reduced their test **anxiety** as measured by a well-known exam called the Test Anxiety Inventory. Afterwards, the subjects reported that their dance movement experience was positive and provided them with psychological insight. The researchers concluded that dance therapy could be a viable method of treatment for students who have overwhelming test anxiety, and should be researched further.

In another 1999 study presented at the ADTA national conference in November 1999, dance therapist Donna Newman-Bluestein reported success in using techniques of dance therapy with cardiac patients. In a **stress** reduction class, health professionals used dance therapy methods to teach body awareness, relaxation, self-expression, creativity, and empathy. According to Newman-Bluestein, the dance therapy techniques helped the patients deal with such stressful emotions as anger, increased their self-awareness, made them more relaxed, and helped them adjust emotionally to having **heart disease**.

Training and certification

Dance therapists should have dance experience and a liberal arts background with coursework in psychology for their undergraduate degree. Professional dance therapy training takes place on the graduate level. A qualified dance therapist has received a graduate degree from a school approved by the ADTA, or has a master's degree in dance or psychology and has taken additional dance therapy credits.

After graduation, dance therapists can become registered with the ADTA, meaning that they are qualified to practice. After two years they may receive an additional recognition when they become an Academy of Dance Therapist Registered. They can then teach dance therapy and supervise interns.

Dance therapists can also obtain psychological credentials by taking a test and becoming registered by the National Board for Certified Counselors, Inc.

Resources

BOOKS

Halprin, Anna. *Dance as a Healing Art: Returning to Health Through Movement and Imagery*. Mendocino, CA: LifeRhythm, 2000.

Levy, Fran J., ed. *Dance and Other Expressive Art Therapies: When Words Are Not Enough*. New York: Routledge, 1995.

Pallaro, Patrizia, ed. *Authentic Movement: Essays by Mary Starks Whitehouse, Jane Adler and Joan Chodorow*. London: Jessica Kingsley Publishers, 1999.

PERIODICALS

Brody, Jane. "Dancing Shoes Replace the Therapist's Couch." *New York Times* (10 October 1995): C13.

"Dance/Movement Therapy Opens Communication Pathways." *Brown University Long Term Quality Advisor* (July 15, 1996).

Erwin Grabner, et al. "Effectiveness of Dance/Movement Therapy on Reducing Test Anxiety." *American Journal of Dance Therapy* 21, no. 1 (Spring/Summer 1999).

ORGANIZATIONS

American Dance Therapy Association. (410) 997 4040. info@adta.org. http://www.adta.org.

OTHER

Newman Bluestein, Donna. "You Gotta Have Heart: Integrating Dance Therapy into Cardiac Rehabilitation Stress Management." Presented at the ADTA National Conference. (November 1999).

Barbara Boughton

Dandelion

Description

Dandelion (*Taraxacum officinale*) is a common meadow herb of the Asteraceae or sunflower family. There are about 100 species of dandelion, and all are beneficial. This sun-loving beauty is a native of Greece, naturalized in temperate regions throughout the world, and familiar to nearly everyone. The perennial dandelion grows freely wherever it can find a bit of earth and a place in the sun. Dandelion's nutritive and medicinal qualities have been known for centuries.

Dandelion's common name is derived from the French *dent de lion*, a reference to the irregular and jagged margins of the lance-shaped leaves. There are numerous folk names for this widely-used herb. They include pissabed, Irish daisy, blow ball, lion's tooth, bitterwort, wild endive, priest's crown, doonhead-clock, yellow gowan, puffball, clock flower, swine snort, fortune-teller, and cankerwort. The generic name is thought to be derived from the Greek words *taraxos*, meaning disorder, and *akos*, meaning remedy. Another possible derivation is from the Persian *tark hashgun*, meaning wild endive, one of dandelion's common names. The specific designation *officinale* indicates that this herb was officially listed as a medicinal. Dandelion held a place in the United States *National Formulary* from 1888 until 1965, and the dried root of dandelion is listed in the *United States Pharmacopoeia* (USP).

Dandelion may be distinguished from other similar-looking herbs by the hollow, leafless flower stems that contain a bitter milky-white liquid also found in the root and leaves. The dark green dandelion leaves, with their irregular, deeply jagged margins, have a distinctive hairless mid-rib. The leaves are arranged in a rosette pattern, and may grow to 1.5 ft (45.7 cm) in length. They have a lovely magenta tint that extends up along the inner rib of the stalkless leaf. When the plant is used as a dye, it yields this purple hue. Dandelion blossoms are singular and round, with compact golden-yellow petals. They bloom from early spring until well into autumn atop hollow stalks that may reach from 4–8 in (10.2–20.3 cm) tall. The golden blossoms yield a pale yellow dye for wool. After flowering, dandelion develops a round cluster of achenes, or seed cases. As many as 200 of these narrow seed cases, each with a single seed, form the characteristic puffball. Each achene is topped with a white, feathery tuft to carry it on the breeze. Dandelion's tap root may grow fat, and reach as deep as 1.5 ft (45.7 cm) in loose soil. The root has numerous hairy rootlets. Dandelion is a hardy herb and will regrow from root parts left in the ground during harvest.

General use

Dandelion has a long history of folk use. Early colonists brought the herb to North America. The native people soon recognized the value of the herb and sought it out for its medical and nutritious benefits. The entire plant is important as a general tonic, particularly as a liver tonic. It may be taken as an infusion of the leaf, a juice extraction, a root decoction, or a tincture. Fresh

KEY TERMS

Achene—Any small, dry, hard seed case or fruit that does not split open at maturity to discharge the seed. Dandelion seeds are held inside achenes.

Cholagogue—A substance that stimulates the flow of bile.

Infusion—The most potent form of extraction of an herb into water. Infusions are steeped for a longer period of time than teas.

Tincture—The extraction of a herb into an alcohol solution for either internal or external use.

leaves may be added to salads or cooked as a potherb. The juice extracted from the stem and leaf is the most potent part of the plant for medicinal purposes. It has been used to eradicate **warts** and soothe **calluses**, bee **stings**, or sores. Infusions of dandelion blossoms have been used as a beautifying facial, refreshing the skin.

Dandelion is a nutritive herb rich in **potassium**, calicum, and **lecithin**, with **iron**, **magnesium**, **niacin**, **phosphorus**, proteins, silicon, **boron**, and **zinc**. Dandelion provides several B vitamins along with vitamins C and E as well as vitamin P. Chemical constituents in the leaf include bitter glycosides, **carotenoids**, terpenoids, **choline**, potassium salts, iron, and other minerals. The root also has bitter glycosides, tannins, triterpenes, sterols, volatile oil, choline, asparagin, and inulin.

Many herbalists regard the dandelion as an effective treatment for liver disease, useful even in such extreme cases as **cirrhosis**. It cleanses the bloodstream and increases bile production, and is a good remedy for gall bladder problems as well. The herb is also a boon to such other internal organs as the pancreas, kidneys, stomach, and spleen. The dried leaf, taken as a tea, is used as a mild laxative to relieve **constipation**. Dandelion leaf is also a good natural source of potassium, and will replenish any potassium that may be lost due to the herb's diuretic action on the kidneys. This characteristic makes dandelion a safe diuretic in cases of water retention due to heart problems.The herb is useful in cases of **anemia** and **hepatitis**, and may lower elevated blood pressure. Dandelion may also provide relief for rheumatism and arthritis. Dandelion therapy, consisting of therapeutic doses of dandelion preparations taken over time, may help reduce stiffness and increase mobility in situations of chronic degenerative joint disease. The root, dried and minced, can be used as a coffee substitute, sometimes combined with roasted acorns and rye.

Preparations

All parts of the dandelion have culinary and medicinal value. It is best to harvest fresh young dandelion leaves in the spring. The small, young leaves are less bitter, and may be eaten uncooked in salads. Larger leaves can be lightly steamed to reduce bitterness. Leaves gathered in the fall are naturally less bitter. Dandelion blossoms, traditionally used in wine making, may be gathered throughout the flowering season. The deep, fleshy taproot should be gathered in the fall. It takes careful digging and loosening to extract the root intact, although any root parts left in the soil will eventually produce another plant. The root should be washed. Thicker roots should be sliced down their length to facilitate drying. The pieces should be spread out on a paper-lined tray in a light, airy room out of direct sunlight and stored in tightly sealed dark glass containers. Dried dandelion root may be somewhat less potent than the fresh root.

Leaf infusion: Place 2 oz of fresh dandelion leaf, less if dried, in a warmed glass container. Bring 2.5 cups of fresh nonchlorinated water to the boiling point and add it to the herbs. Cover the mixture and steep for 15–20 minutes, then strain. Drink the infusion warm or cold throughout the day, up to three cups per day. The prepared tea can be kept for about two days in the refrigerator.

Tincture: Combine 4 oz of finely-cut fresh dandelion root and leaf (or 2 oz of dry powdered herb) with 1 pt of brandy, gin, or vodka in a glass container. The alcohol should be enough to cover the plant parts and have a 50/50 ratio of alcohol to water. Cover and store the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped dark glass bottle. A standard dose is 10–15 drops of the tincture in water, up to three times a day.

Precautions

Dandelion acts as a cholagogue, which means that it increases the flow of bile. It should not be used by persons with closure of the biliary ducts and other biliary ailments.

Side effects

Dandelion is a safe and nutritious herb widely used throughout the world. No health hazards have been reported when dandelion is used in designated therapeutic doses. According to the *PDR For Herbal Medicine*, however, some "superacid gastric complaints"

could be triggered by using the herb. Dandelion stems contain a liquid latex substance that may be irritating to the skin of senstitive persons.

Interactions

No interactions have been reported between dandelion and standard medications.

Resources

BOOKS

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.
Foster, Steven, and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston New York: Houghton Mifflin Company, 1990.
Hoffmann, David. *The New Holistic Herbal*. 2nd ed. Boston: Element, 1986.
Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.
PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.
Tyler, Varro E., Ph.D. *Herbs of Choice*. New York: The Haworth Press, Inc., 1994.
Weiss, Gaea, and Shandor Weiss. *Growing & Using the Healing Herbs*. New York: Wings Books, 1992.

OTHER

Hoffmann, David L. "Dandelion." In *Herbal Materia Medica*. Health World Online. http://www.healthy.net.

Clare Hanrahan

Dandruff

Definition

Dandruff is the common name for a mild form of seborrheic **dermatitis** of unknown cause. It is a natural and harmless scalp condition in which the shedding of dead skin cells occurs at an unusually fast rate. Because of the oily skin often associated with this condition, these cells clump together and flake off as dandruff.

Description

Dandruff is very common. Up to one-third of the U.S. population is affected by this condition. While it is not considered a disease, dandruff is a cosmetic concern for many people.

The following problems tend to exacerbate dandruff:

- cold weather
- dry indoor heating

Close-up view of the scalp of a 50 year old man with severe dandruff. *(Dr. P. Marazzi / Photo Researchers, Inc.)*

- stress (physical or emotional)
- food allergies
- nutritional deficiencies (B-complex vitamins or omega-3 fatty acids)
- use of hair spray and gels
- use of hair-coloring chemicals
- use of electric hair curlers or blow dryers

Causes and symptoms

Dandruff is caused by an overgrowth of skin cells that make up the scalp. It is not known what accelerates this cell growth. Scientists have suggested that dandruff may be a hypersensitive reaction to the proliferation of *Pityrosporum ovale*, a yeast that occurs naturally on the scalp. Another theory that held for some time linked dandruff to a fungus. A 2002 report said that scientists had identified new fungi of the Malassezia that seem to exist in overabundance on the scalps of those affected with the disease.

Diagnosis

Dandruff is easy to diagnose. The condition is characterized by the appearance of white flakes on the hair or on the shoulders and collar. People with oily hair tend to have dandruff more often. Dandruff usually does not require medical treatment. However, if, in addition to dandruff, a person also has greasy scaling on the face, eyebrows and eyelashes and thick, red patches on the body, he or she may have the more severe form of seborrheic dermatitis. This condition may require medical advice and treatment.

KEY TERMS

Cytostatic—Suppressing the growth and multiplication of cells.

Flake—A small, thin skin mass.

Scale—Any thin, flaky, plate-like piece of dry skin.

Seborrheic dermatitis—An inflammatory condition of the skin of the scalp, with yellowish greasy scaling of the skin and itching. Other areas of the body may also be affected. Mild seborrheic condition is called dandruff.

Treatment

Alternative treatments for dandruff include nutritional therapy, herbal therapy and **relaxation** therapy.

Nutritional therapy

The following nutritional changes may be helpful:

- Identification and avoidance of potential allergenic foods.
- Limited intake of milk and other dairy products, seafoods and fatty treats. These foods tend to exacerbate dandruff.
- Reduction or elimination of animal proteins and eating mostly whole grains, fresh vegetables, beans and fruit.
- Avoiding citrus until dandruff clears.
- Diet supplemented with B-complex vitamins which may alleviate dandruff condition.
- Avoiding excess salt, sugar, and alcohol.
- Taking 1 tablespoon of flaxseed oil per day. Flaxseed oil is rich in omega-3 fatty acids, which may be effective in treating a variety of skin conditions including dandruff.

From a traditional medical approach, dandruff may be the body's way of eliminating excess protein accumulated but not assimilated in the system. It may also be a symptom of liver and kidney imbalances. A more stabilizing diet is needed, reducing highly acidic foods such as tomatoes and certain spices.

Herbal therapy

Massaging **tea tree oil** (*Melaleuca alternifolia*) into the scalp may help prevent or relieve dandruff. This oil can relieve scaling and **itching**. Ayurvedic treatment also includes various oil therapies, called *suehana* for the head. Increased **exercise** can increase circulation and help eliminate fats and oils.

Relaxation therapies

Relaxation techniques such as **meditation** or **yoga** may help relieve **stress**, which exacerbates dandruff.

Allopathic treatment

There is no cure for this natural harmless skin condition. Because a greasy scalp is associated with dandruff condition, more frequent hair washing using regular shampoo is usually all that is needed. In more severe cases, medicated shampoo may be necessary.

The two most commonly used anti-dandruff shampoos are **selenium** sulfide and **zinc** pyrithione. Both of these are cytostatic agents. Cytostatic drugs slow down the growth and formation of top skin layer on the scalp. To get the best result, one should leave the shampoo on for as long as possible. It is recommended that a person lather the anti-dandruff shampoo at the beginning of the shower, leave it on until the end of the shower, then rinse, lather, and rinse again. As a result of treatment with any of these drugs, dandruff will become less noticeable. Because it can be irritating, shampoo containing selenium sulfide should not be used if the skin is cut or abraded.

Products containing salicylic acid and **sulfur** are reserved for more severe cases. Salicylic acid loosens the dead skin cells so that they can be sloughed off more easily. Sometimes, antibacterial shampoos are used to reduce bacteria on the scalp.

Recently, antifungal products, such as ketoconazole (Nizoral) shampoos, are available over-the-counter (1% preparation) and by prescription (2% preparation). These shampoos are often prescribed by dermatologists to reduce the growth of *P. ovale*. These preparations may be helpful if dandruff is not relieved by other shampoo treatments.

The most severe and recalcitrant dandruff conditions may require tar shampoos. These shampoos reduce the growth of top skin cells on the scalp. It is recommended that the shampoo be left on the hair for at least 10 minutes for best results. Coal tar shampoos can be messy and can stain blond or white hair. Coal tar also can be carcinogenic (causing **cancer**). The FDA approves this product because when used as shampoo, because it contacts the scalp for only a short period of time. Still, it is a good idea to use alternative treatments for this relatively harmless condition.

Because anti-dandruff shampoos may lose effectiveness after a while, it may be helpful to rotate

between a medicated shampoo and a regular shampoo or try a different type of anti-dandruff shampoo.

Expected results

While one can not cure dandruff, it can be easily managed. A mild dandruff condition often responds to more frequent hair washes with regular shampoo. More severe conditions may require anti-dandruff preparations.

Prevention

Preventive measures include regular hair washing, reducing stress, eating healthy foods and increasing humidity inside the house. In addition, excessive use of hair curlers, hair sprays and gels, and frequent hair coloring should be avoided. These tend to irritate the scalp and may worsen dandruff.

Resources

BOOKS

"Dandruff." In *The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments, home edition*. Alexandria, VA: Time Life, Inc., 1997.

Murray, Michael T. and Joseph E. Pizzorno. "Seborrheic Dermatitis." In *Encyclopedia of Natural Medicine*. 2nd ed. Roseville, CA: Prima Publishing, 1998.

PERIODICALS

Johnson, Betty Anne and Julia R. Nunley. "Treatment of Seborrheic Dermatitis." *American Family Physician* 61 (2000): 2703 2710.

"P&G Scientists Pinpoint Cause of Dandruff." *Health & Medicine Week* (August 12, 2002): 11.

Snyder, Karyn. "Is OTC Dandruff Shampoo As Effective As Rx?" *Drug Topics Archive* (September 16, 1996). http://www.pdr.net.

ORGANIZATIONS

American Academy of Dermatology. P.O. Box 4014, Schaumburg, IL 60168. (888) 462 DERM. Fax: (847) 330 8907. http://www.aad.org.

OTHER

"Seborrheic Dermatitis." *The Merck Manual of Diagnosis and Therapy*. http://www.merck.com/pubs/manual/section101chapter111/111d.htm.

Sorgen, Carol. "Go Hug a Tree: Tea Tree Oil Treats Skin Conditions." *CBSHealthWatch*. http://cbs.medscape.com.

Mai Tran
Teresa G. Odle

Deadly nightshade *see* **Belladonna**

Deglycyrrhizinated licorice

Description

Deglycyrrhizinated **licorice**, or DGL, is a specific type of preparation derived from the licorice root. It is used differently than herbal licorice because it is much higher in agents that soothe or heal mucous membranes, and lower in other constituents found in licorice root and full extracts of licorice root. DGL may also be spelled, deglycyrrhizinated liquorice. The herb, licorice, from which DGL is derived, is known by the names *Glycyrrhiza*, sweet root, and *Yasti-madhu* with the glycyrrhizin removed.

Licorice is a perennial herb, which is native to the Middle East, and widely cultivated in Europe, the Middle East, and Asia. The root has a long history of use as a medicament and flavoring agent. Its name, *Glycyrrhiza* (sweet root) has been attributed to the first century Greek physician, Dioscorides.

Glycyrrhizin is the cause of pseudoaldosteronism, a condition mimicking the effects of excessive levels of the adrenal hormone aldosterone. The deglycyrrhizinated product was developed to concentrate the demulcent and healing aspects of licorice, while avoiding excess exposure to glycerrhizin and its adverse effects when taken in high doses.

General use

Deglycyrrhizinated licorice is used to soothe and protect the lining of the stomach and duodenum (upper small intestine)—the common sites of gastric ulcers. Ulcers in the stomach are known as peptic ulcers, while those in the small intestine are duodenal ulcers. DGL has been studied for the treatment of peptic and duodenal ulcers, and appears to be both safe and effective for long-term maintenance therapy for certain patients who have these ulcers. Some marketers claim that DGL has anti-inflammatory, antimicrobial, and antioxidant activities. However, these claims are unsubstantiated.

One study, using a mouthwash containing deglycyrrhizinated licorice, showed dramatic improvement in the healing and **pain** of mouth ulcers.

Preparations

DGL is available as:

- capsules, 250 milligrams (mg)
- chewable tablets (with or without sugar), 140 and 380 mg

KEY TERMS

Aldosterone—A hormone produced by the adrenal gland, instrumental in the regulation of sodium and potassium resorption by the kidney.

Demulcent—An oily or sticky substance used to soothe irritation in mucous membranes.

Expectorant—A medication that promotes the secretion or expulsion of phlegm, mucus, or other matter from the respiratory tract.

Gastritis—Inflammation of the stomach, particularly of its mucous membrane.

Lozenge—A medicated candy intended to be dissolved slowly in the mouth to soothe irritated tissues of the throat.

Milk alkali syndrome—A disorder of the kidneys caused by long-term treatment of ulcers with antacids, particularly alkaline compounds such as sodium bicarbonate, and large amounts of calcium.

- lozenges, 400 mg
- wafers, 380 mg
- liquid, various concentrations

Precautions

Deglycyrrhizinated licorice appears to be very safe. However, severe allergic reactions are possible. There has been one report of a case of milk alkali syndrome in a patient who was drinking unusually large amounts of milk. This has led to a caution against taking **calcium** supplements and deglycyrrhizinated licorice at the same time. It is usually safe at normal dose levels.

Although there have been few studies conducted to determine whether interactions between deglycyrrhizinated licorice and conventional drugs exist, research has failed to identify problems.

Side effects

Gastritis, **nausea**, and **diarrhea** are reported side effects.

Interactions

All clinically significant adverse interactions with licorice have been due to the effects of the glycyrrizic acid. They would not be anticipated with this component removed. DGL reportedly reduces the gastric ulceration caused by aspirin and other non-steroidal anti-inflammatory drugs.

Resources

BOOKS

Blumenthal, M., ed. *The Complete German Commission E Monographs*. Austin, TX: The American Botanical Council, 1998.

Blumenthal, M., A. Goldberg, and J. Brinckmann, eds. *Herbal Medicine: Expanded Commission E Mono graphs*. Austin, TX: The American Botanical Council, 2000.

PERIODICALS

Gibbs, C. J., and H. A. Lee. "Milk Alkali Syndrome Due to Caved S." *J R Soc Med* (August 1992): 498 9.

Petry, J. J., and S. K. Hadley. "Medicinal Herbs: Answers and Advice, Part 2." *Hospital Practice* (August 15, 2001): 55 9.

Rees, W. D., J. Rhodes, J. E. Wright, L. F. Stamford, and A. Bennett. "Effect of Deglycyrrhizinated Liquorice on Gastric Mucosal Damage by Aspirin." *Scandinavian Journal of Gastroenterol* (1979: 605 7.

Samuel Uretsky, Pharm.D.

Dehydroepiandrosterone *see* **DHEA**

Dementia

Definition

Dementia is a loss of mental ability severe enough to interfere with normal activities of daily living, lasting more than six months, not present since birth, and not associated with a loss or alteration of consciousness.

Description

Dementia is a group of symptoms caused by gradual death of brain cells. The loss of cognitive abilities that occurs with dementia leads to impairments in memory, reasoning, planning, and personality. While the overwhelming majority of people with dementia are elderly, the condition is not an inevitable part of **aging**. Instead, dementia is caused by specific brain diseases. **Alzheimer's disease** is the most common cause, followed by vascular or multi-infarct dementia.

The prevalence of dementia has been difficult to determine, partly because of differences in definition among different studies, and partly because there is some normal decline in functional ability with age. Dementia affects 5–8% of all people between ages 65

and 74, and up to 20% of those between 75 and 84. Estimates for dementia in those 85 and over range from 30–47%. Between two and four million Americans have Alzheimer's disease; that number is expected to grow to as many as 14 million by the middle of the twenty-first century as the population as a whole ages.

The cost of dementia can be considerable. While most people with dementia are retired and do not suffer income losses from their disease, the cost of care is often enormous. Financial burdens include lost wages for family caregivers, medical supplies and drugs, and home modifications to ensure safety. Nursing home care may cost several thousand dollars a month or more. The psychological cost is not as easily quantifiable but can be even more profound. Individuals with dementia lose control of many of the essential features of their life and personality, and loved ones lose a family member even as they continue to cope with the burdens of increasing dependence and unpredictability.

Causes and symptoms

Causes

Dementia is usually caused by degeneration of brain cells in the cerebral cortex, the part of the brain responsible for thoughts, memories, actions, and personality. Death of brain cells in this region leads to the cognitive impairment that characterizes dementia.

The most common cause of dementia is Alzheimer's disease (AD), accounting for half to three-fourths of all cases. The brain of a person with AD becomes clogged with two abnormal structures, called neurofibrillary tangles and senile plaques. Neurofibrillary tangles are twisted masses of protein fibers inside nerve cells, or neurons. Senile plaques are composed of parts of neurons surrounding a group of proteins called beta-amyloid deposits. Why these structures develop is unknown. As of 2008, research indicated possible roles for inflammation, blood flow restriction, and accumulation of aluminum in the brain and toxic molecular fragments known as free radicals or oxidants.

Several genes have been associated with higher incidences of AD, although the exact role of these genes is still unknown. In 2001, investigators discovered a rare mutation in the amyloid precursor protein (APP) that is linked to early-onset Alzheimer's. The discovery pointed scientists toward new ideas for targeting and treating the disease.

Vascular dementia is estimated to cause from 5–30% of all dementias. It occurs from a decrease in blood flow to the brain, most commonly due to a series of small strokes (multi-infarct dementia). Other cerebrovascular causes include: vasculitis from **syphilis**, **Lyme disease**, or **systemic lupus erythematosus**; subdural hematoma; and subarachnoid hemorrhage. Because of the usually sudden nature of its cause, the symptoms of vascular dementia tend to begin more abruptly than those of Alzheimer's dementia. Symptoms may progress stepwise with the occurrence of new strokes. Unlike AD, the incidence of vascular dementia is lower after age 75.

Other conditions that may cause dementia include:

- AIDS
- Parkinson's disease
- Lewy body disease
- Pick's disease
- Huntington's disease
- Creutzfeldt-Jakob disease
- brain tumor
- hydrocephalus
- head trauma
- multiple sclerosis
- prolonged abuse of alcohol or other drugs
- vitamin deficiency: thiamin, niacin, or B_{12}
- hypothyroidism
- hypercalcemia

Symptoms

Dementia is marked by a gradual impoverishment of thought and other mental activities. Losses eventually affect virtually every aspect of mental functioning. The slow progression of dementia is in contrast with delirium, which involves some of the same symptoms, but has a very rapid onset and fluctuating course with alteration in the level of consciousness. However, delirium may occur with dementia, especially since the person with dementia is more susceptible to the delirium-inducing effects of many types of drugs.

Symptoms include:

- Memory losses. Short-term memory loss is usually the first symptom noticed. It may begin with misplacing valuables such as a wallet or car keys, then progress to forgetting appointments, where the car was left, and the route home, for instance. More profound losses may eventually follow, such as forgetting the names and faces of family members.
- Impaired abstraction and planning. The person with dementia may lose the ability to perform familiar tasks, to plan activities, and to draw simple conclusions from facts.

- Language and comprehension disturbances. Individuals may be unable to understand instructions or follow the logic of moderately complex sentences. Later, they may not understand their own sentences, and they may have difficulty forming thoughts into words.
- Poor judgment. Individuals may not recognize the consequences of their actions or be able to evaluate the appropriateness of behavior. Behavior may become crude or offensive, overly-friendly, or aggressive. Personal hygiene may be ignored.
- Impaired orientation ability. Individuals may not be able to identify the time of day, even from obvious visual clues or may not recognize their location, even if familiar. This disability may stem partly from losses of memory and partly from impaired abstraction.
- Decreased attention and increased restlessness. Individuals may begin an activity and quickly lose interest and wander away frequently. Wandering may cause significant safety problems when combined with disorientation and memory losses. Individuals may begin to cook something on the stove then become distracted and wander away while it is cooking.
- Personality changes and psychosis. Individuals may lose interest in once-pleasurable activities and become more passive, depressed, or anxious. Delusions, suspicion, paranoia, and hallucinations may occur later in the disease. Sleep disturbances may occur, including insomnia and sleep interruptions.
- Apathy. A four-year study by researchers at the University of Nebraska Medical Center reported in 2007 that apathy may be a behavioral marker for dementia. Apathy—a loss of motivation—is identified by symptoms such as diminished initiation, poor persistence, lack of interest, indifference, low social interactions, muted emotional responses, and a lack of insight, according to study researchers. The incidence of apathy may be as high as 80% in people with primary dementia, and the rate increases as the severity of dementia increases, the study reported.

Diagnosis

Since dementia usually progresses slowly, diagnosing it in its early stages can be difficult. Several office visits over several months or more may be needed. Diagnosis begins with a thorough physical exam and complete medical history, usually including comments from family members or caregivers. A family history of either Alzheimer's disease or cerebrovascular disease may provide clues to the cause of symptoms. Simple tests of mental function, including word recall, object naming, and number-symbol matching, are used to track changes in the person's cognitive ability. Some studies suggest that positron emissions tomography (PET) scans of the brain might be able to identify those at risk for Alzheimer's. As these tests become more widely available, they may offer hope for earlier detection of dementia.

Depression is common in the elderly and can be mistaken for dementia; therefore, ruling out depression is an important part of the diagnosis. Distinguishing dementia from the mild normal cognitive decline of advanced age is also critical. The medical history includes a complete listing of drugs being taken, since a number of drugs can cause dementia-like symptoms.

Determining the cause of dementia may require a variety of medical tests, chosen to match the most likely etiology. Cerebrovascular disease, hydrocephalus, and tumors may be diagnosed with x rays, CT or MRI scans, and vascular imaging studies. Blood tests may reveal nutritional or metabolic deficiencies or hormone imbalances.

Treatment

Nutritional supplements

Some nutritional supplements may be helpful, especially if dementia is caused by deficiency of these essential nutrients:

- Acetyl-L-carnitine: improves brain function and increases attention span, enhances ability to concentrate and increases energy in patients with Alzheimer's disease.
- Antioxidants (vitamin E, vitamin C, beta-carotene, or selenium): may slow disease progression by preventing the damaging effects of free radicals. An 18-year long study of more than 4,000 persons reported in 2007 that people who take 50 mg a day of beta-carotene for at least 15 years are less likely to develop dementia than those who do not take the dietary supplement.
- B-complex vitamins and vitamin B_{12}: may significantly improve mental function in patients who have low levels of these essential nutrients.
- Coenzyme Q10: helps deliver more oxygen to the brain.
- DHEA: may increase brain function in old people.
- Magnesium: may be helpful if the dementia is caused by magnesium deficiency and/or accumulation of aluminum in the brain.
- Phosphotidylserine: deficiency of this nutrient may decrease mental function and cause depression.
- Zinc: may boost short-term memory and increase attention span.

Herbal treatment

Herbal remedies that may be helpful in treating dementia include Chinese or **Korean ginseng**, **Siberian ginseng**, **gotu kola**, and *Ginkgo biloba*. Of these, **ginkgo biloba** is the most well-known and widely accepted by

Western medicine. Ginkgo extract, derived from the leaves of the *Ginkgo biloba* tree, interferes with a circulatory protein called platelet-activating factor. It also increases circulation and oxygenation to the brain. Ginkgo extract has been used for many years in China and is widely prescribed in Europe for treatment of circulatory problems. A 1997 study of patients with dementia appeared to show that gingko extract could reduce their symptoms. Some scientists believe that, taken early enough in the process, *Ginkgo biloba* can delay the onset of Alzheimer's, but this claim has not yet been sufficiently backed by supportive studies. A traditional Chinese herb, *ba wei di huang wan,* is useful in helping slow cognitive and physical decline in people with dementia, according to the American Geriatrics Society.

Homeopathy

A homeopathic physician may prescribe patient-specific homeopathic remedies to alleviate symptoms of dementia.

Acupressure

This form of therapy uses hands to apply pressure on specific **acupressure** points to improve blood circulation and calm the nervous system.

Aromatherapy

Aromatherapists use **essential oils** as inhalants or in baths to improve mental performances and to calm the nerves.

Chelation therapy

This controversial treatment may provide symptomatic improvement in some patients. However, its effectiveness has not been supported by clinical studies. In addition, this form of therapy may cause kidney damage. Therefore, it should only be given under the watchful eyes of a qualified physician.

Other therapy

A Canadian study reported in 2008 that **relaxation** techniques, such as music and **massage therapy**, can decrease agitation and improve the quality of life in persons with dementia. The study showed that playing favorite music to patients and giving them a massage by hand, used individually or together, significantly reduced agitation in people with mild to moderate dementia in a nursing home setting.

Allopathic treatment

As of 2008, there were no therapies that can reverse the progression of Alzheimer's disease. Therefore, treatment of dementia begins with treatment of the underlying disease when possible. Aspirin, estrogen, **vitamin E**, selegiline, propentofylline, and milameline were being evaluated for their ability to slow the rate of progression.

Care for individuals with dementia can be difficult and complex. Patients cope with functional and cognitive limitations, while family members or other caregivers assume increasing responsibility for the person's physical needs.

Symptoms of dementia may be treated with a combination of **psychotherapy**, environmental modifications, and medication. Behavioral approaches may be used to reduce the frequency or severity of problem behaviors, such as aggression or socially inappropriate conduct.

Modifying the environment can increase safety and comfort while decreasing agitation. Home modifications for safety include removal or lock-up of hazards such as sharp knives, dangerous chemicals, and tools. Child-proof latches or Dutch doors may be used to limit access as well. Lowering the hot water temperature to 120°F (48.9°C) or less reduces the risk of scalding. Bed rails and bathroom safety rails can be important safety devices, as well. Confusion may be reduced with simpler decorative schemes and presence of familiar objects. Covering or disguising doors (with a mural, for example) may reduce the tendency to wander. Positioning the bed in view of the bathroom can decrease incontinence.

Two drugs, tacrine (Cognex) and donepezil (Aricept), are commonly prescribed for Alzheimer's disease. These drugs inhibit the breakdown of acetylcholine in the brain, prolonging its ability to conduct chemical messages between brain cells. They provide temporary improvement in cognitive functions for about 40% of patients with mild-to-moderate AD. Hydergine is sometimes prescribed as well, though it is of questionable benefit for most patients. Drugs that are frequently used in dementia patients include antianxiety (for agitation and **anxiety**), antipsychotics (for paranoia, delusions or hallucinations), and antidepressants (for depressive symptoms). Evaluation of any medical side effects from the medications should be ongoing.

Long-term institutional care may be needed for individuals with dementia, as profound cognitive losses often precede death by a number of years. Early planning for the financial costs of nursing home care is critical. Useful information about financial planning for long-term care is available through the Alzheimer's Association.

Expected results

The prognosis for dementia depends on the underlying disease. On average, people with Alzheimer's

KEY TERMS

Donepezil—A drug commonly prescribed for Alzheimer's disease that provides temporary improvement in cognitive functions for some patients with mild-to-moderate forms of the disease.

Ginkgo extract—Made from the leaves of the *Ginkgo biloba* tree, this extract, used in other countries to treat circulatory problems, may reduce the symptoms of patients with dementia.

Neurofibrillary tangles—Abnormal structures, composed of twisted masses of protein fibers within nerve cells, found in the brains of persons with Alzheimer's disease.

Senile plaques—Abnormal structures, composed of parts of nerve cells surrounding protein deposits, found in the brains of persons with Alzheimer's disease.

Tacrine—A drug commonly prescribed for Alzheimer's disease that provides temporary improvement in cognitive functions for some patients with mild-to-moderate forms of the disease.

disease live eight years past their diagnosis, with a range from one to twenty years. Vascular dementia is usually progressive, with death from **stroke**, infection, or **heart disease**.

Prevention

There is no known way to prevent Alzheimer's disease, although several drugs are under investigation and may reduce its risk or slow its progression. Nutritional supplements, including **antioxidants**, may also help protect against Alzheimer's disease. Some studies also show that use of nonsteroidal anti-inflammatory agents (over-the-counter **pain** relievers such as ibuprofen and naproxen) may lower risk of Alzheimer's. The risk of developing multi-infarct dementia may be reduced by reducing the risk of stroke. Sources of aluminum, which can be found in aluminum cookware, canned sodas, and certain antacids and deodorants, should be avoided.

Resources

BOOKS

Bayles, Kathryn A., and Cheryl K. Tomoeda. *Cognitive Communicative Disorders of Dementia: Definition, Diagnosis, and Treatment*. San Diego: Plural, 2007.

Brooker, Dawn. *Person Centered Dementia Care: Making Services Better*. London: Jessica Kingsley, 2007.

Lanza, Susan E. *Nurturing Nuggets for Dementia Caregivers: 25 Supportive Strategies in Caring for Persons with Dementia*. Lebanon, NJ: Buttonberry Books, 2006.

PERIODICALS

Grady, Denise. "When Both Parents Suffer Dementia, Children Suspect It Is Also in Their Future." *New York Times* (December 26, 2007): A24.

Harris, Phyllis Braudy, and John Keady. "Wisdom, Resil ience, and Successful Aging: Changing Public Dis courses on Living with Dementia." *Dementia* (February 2008): 5(4).

Hicks Moore, Sandee L., and Bryn A. Robinson. "Favorite Music and Hand Massage: Two Interventions to Decrease Agitation in Residents with Dementia." *Dementia* (February 2008): 95(14).

Mahendra, Nidhi, and Allegra Apple. "Human Memory Systems: A Framework for Understanding Dementia." *ASHA Leader* (November 27, 2007): 8(4).

Schuyler, Devon. "Recognition of Apathy as Marker for Dementia Growing." *Applied Neurology* (October 1, 2007): 8.

Tanday, Sanjay. "Beta Carotene Cuts Dementia." *GP* (November 16, 2007): 2.

ORGANIZATIONS

Alzheimer's Association, 225 N. Michigan Ave., 17th Floor, Chicago, IL, 60601, (800) 272 3900, http://www.alz.org.

American Geriatrics Society, Empire State Building, 350 Fifth Ave., Suite 801, New York, NY, 10118, (212) 308 1414, http://www.americangeriatrics.org.

Division of Aging and Seniors, Health Canada, 200 Eglan tine Driveway, Ottawa, ON, K1A 1B4, Canada, (613) 952 7606, http://www.publichealth.gc.ca.

National Institute on Aging, 31 Center Dr., Building 31, Room 5C27, Bethesda, MD, 20892, (800) 222 2225, http://www.nia.nih.gov.

National Institute of Mental Health, 6001 Executive Blvd, Room 8184, MSC 9663, Bethesda, MD, 20892 9663, (866) 615 6464, http://www.nimh.nih.gov.

Mai Tran
Ken R. Wells

Depression

Definition

Depression, also known as depressive disorders or unipolar depression, is a mental illness characterized by a profound and persistent feeling of sadness or despair and/or a loss of interest in things that once were pleasurable. Disturbance in sleep, appetite, and mental processes are a common accompaniment.

Symptoms of childhood/adolescent depression

- Drop in school performance
- Appetite changes (usually loss, but sometimes can be an increase)
- Weight loss or gain
- Stomachaches
- Insomnia
- Excessive daytime sleepiness
- Social withdrawal
- Drug or alcohol abuse
- Isolation
- Apathy
- Fatigue
- Lack of concentration

(Illustration by Corey Light. Cengage Learning, Gale)

Symptoms of adult depression

- Long-term sadness
- Feelings of worthlessness or guilt
- Lack of interest in sex
- Loss of concentration, memory, and ability to make decisions
- Loss of interest in activities
- Fatigue
- Weight loss or gain
- Insomnia or oversleeping
- Increased use of alcohol or drug use
- Anxiety
- Suicidal thoughts
- Slowed speech and physical movement

(Illustration by Corey Light. Cengage Learning, Gale)

Description

Everyone experiences feelings of unhappiness and sadness occasionally. However, when these depressed feelings start to dominate everyday life without a recent loss or trauma and cause physical and mental deterioration, they become what is known as depression. Each year in the United States, depression affects an estimated 17 million people at an approximate annual direct and indirect cost of $53 billion. One in four women is likely to experience an episode of severe depression in her lifetime, with a 10–20% lifetime prevalence, compared to 5–10% for men. The average age a first depressive episode occurs is in the mid-20s, although the disorder strikes all age groups indiscriminately, from children to the elderly.

There are two main categories of depression: major depressive disorder and dysthymic disorder. Major depressive disorder is a moderate to severe episode of depression lasting two or more weeks. Individuals experiencing this major depressive episode may have trouble sleeping, lose interest in activities in which they once took pleasure, experience a change in weight, have difficulty concentrating, feel worthless and hopeless, or have a preoccupation with death or suicide. In children, major depression may appear as irritability.

While major depressive episodes may be acute (intense but short-lived), dysthymic disorder is an ongoing, chronic depression that lasts two or more years (one or more years in children) and has an average duration of 16 years. The mild to moderate depression of dysthymic disorder may rise and fall in intensity, and those afflicted with the disorder may experience some periods of normal, nondepressed mood of up to two months in length. Its onset is gradual, and dysthymic patients may not be able to pinpoint exactly when they started feeling depressed. Individuals with dysthymic disorder may experience a change in sleeping and eating patterns, low self-esteem, **fatigue**, trouble concentrating, and feelings of hopelessness.

Depression also can occur in **bipolar disorder**, an affective mental illness that causes radical emotional changes and mood swings, from manic highs to depressive lows. The majority of bipolar individuals experience alternating episodes of mania and depression.

Causes and symptoms

The causes behind depression are complex and not yet fully understood. While an imbalance of certain neurotransmitters, the chemicals in the brain that transmit messages between nerve cells, is believed to be key to depression, external factors such as upbringing (more so in dysthymia than major depression) may be as important. For example, it is speculated that, if an individual is abused and neglected throughout childhood and adolescence, a pattern of low self-esteem and negative thinking may emerge, and from that, a lifelong pattern of depression may follow. A 2003 study reported that two-thirds of patients with major depression stated they also suffered from chronic **pain**. It is not clear what the relationship is, because while pain inducing conditions are a common cause of depression, one of the first symptoms of depression may be pain.

Heredity seems to play a role in those who develop depression. Individuals with major depression in their immediate family are up to three times more likely to have the disorder themselves. It would seem that biological and genetic factors may make certain individuals predisposed or prone to depressive disorders, but environmental circumstances may often trigger the disorder.

External stressors and significant life changes, such as chronic medical problems, death of a loved one, divorce or estrangement, miscarriage or neonatal death, or loss of a job also can result in a form of depression known as adjustment disorder. Although periods of adjustment disorder usually resolve themselves, occasionally they may evolve into a major depressive disorder.

Major depressive episode

Individuals experiencing a major depressive episode have a depressed mood and/or a diminished interest or pleasure in activities. Children experiencing a major depressive episode may appear or feel irritable, rather than depressed. In addition, five or more of the following symptoms occur on an almost daily basis for a period of at least two weeks:

- significant change in weight
- insomnia or hypersomnia (excessive sleep)
- psychomotor agitation or retardation
- fatigue or loss of energy
- feelings of worthlessness or inappropriate guilt
- diminished ability to think or to concentrate or indecisiveness
- recurrent thoughts of death or suicidal and/or suicide attempts

Dysthymic disorder

Dysthymia commonly occurs in tandem with other psychiatric and physical conditions. Up to 70% of dysthymic patients have both dysthymic disorder and major depressive disorder, known as double depression. **Substance abuse**, panic disorders, personality disorders, social **phobias**, and other psychiatric conditions also are found in many dysthymic patients. Dysthymia is prevalent in patients with certain medical conditions, including **multiple sclerosis**, **AIDS**, **hypothyroidism**, **chronic fatigue syndrome**, **Parkinson's disease**, diabetes, and postcardiac transplantation. The connection between dysthymic disorder and these medical conditions is unclear, but it may be related to the way the medical condition and/or its pharmacological treatment affects neurotransmitters. Dysthymic disorder can lengthen or complicate the recovery of patients who also have medical conditions.

Along with an underlying feeling of depression, people with dysthymic disorder experience two or more of the following symptoms on an almost daily basis for a period of two or more years (most suffer for five years), or one year or more for children:

- under or overeating
- insomnia or hypersomnia
- low energy or fatigue
- low self-esteem
- poor concentration or trouble making decisions
- altered libido
- altered appetite
- altered motivation
- feelings of hopelessness

Diagnosis

The guidelines for diagnosis of major depressive disorder and dysthymic disorder are found in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) (*DSM IV*). In addition to an interview, several clinical inventories or scales may be used to assess a patient's mental status and determine the presence of depressive symptoms. Among these tests are: the Hamilton Depression Scale (HAM-D), Child Depression Inventory (CDI), Geriatric Depression Scale (GDS), Beck Depression Inventory (BDI), and the Zung Self-Rating Scale for Depression. These tests may be administered in an outpatient or hospital setting by a general practitioner, social worker, psychiatrist, or psychologist.

Treatment

A variety of alternative medicines have proven to be helpful in treating depression. A recent report from Great Britain emphasized that more physicians should encourage alternative treatments such as behavioral and self-help programs, supervised **exercise** programs, and watchful waiting before subscribing antidepressant medications for mild depression. Chocolate, coffee, sugar, and alcohol can negatively affect mood; however, this connection may be due to emotional associations of these foods rather than pharmacologic effects. In a 2007 study, researchers found that when women following a weight loss program thought about chocolate, without eating it, they experienced feelings of guilt, which could be tied to minor depression. Similar responses might be associated with other forbidden substances. **Essential fatty acids** may reduce depression and boost mood. Expressing thoughts and feelings in a journal is therapeutic. **Aromatherapy**, particularly citrus fragrance, has had a positive effect on depression. **Psychotherapy** or counseling is an integral component of treatment because it can find and treat the cause of the depression.

Psychosocial therapy

Psychotherapy explores a person's life to bring forth possible contributing causes of depression. During treatment, therapists help individual patients to become aware of their thinking patterns and how these originated. There are several different subtypes of psychotherapy, but all have the common goal of helping patients develop healthy problem solving and coping skills.

Cognitive-behavioral therapy assumes that the patient's faulty thinking causes the current depression and focuses on changing thought patterns and perceptions. Therapists help their patients identify negative or distorted thought patterns and the emotions and behavior that accompany them and then retrain the patients to recognize the thinking and react differently to it.

Chinese medicine and herbals

The principle of treatment of depression involves regulating qi, reducing phlegm, calming the mind, and promoting mental resuscitation. The Chinese medicine *Bai Jin Wan* (White Metal Pill) is used to treat depression (5 g twice daily). A practitioner may prescribe a variety of treatments—including lifestyle changes—depending on the type and severity of the depression.

There is some evidence that **acupuncture** is a helpful treatment for depression. One double-blind study found that patients who received acupuncture specific for depression were significantly less depressed than control patients who had either nonspecific acupuncture or no treatment.

St. John's wort (*Hypericum perforatum*) is the most widely used antidepressant in Germany. Many studies on the effectiveness of St. John's wort have been performed. One review of the studies determined that St. John's wort is superior to placebo and comparable to conventional antidepressants. In early 2000, well designed studies comparing the effectiveness of St. John's wort versus conventional antidepressants in treating depression were conducted in the United States. Despite uncertainty concerning its effectiveness, a 2003 report said acceptance of the treatment continued to increase. A 2006 study compared hypericum with placebo in patients with either minor depression or dysthymia. The treatment showed significant advantages in the non-dysthymia patients only. A poll showed that about 41% of 15,000 science professionals in 62 countries said they would use St. John's wort for mild to moderate depression. Although St. John's wort appears to be a safe alternative to conventional antidepressants, care should be taken, as the herb can interfere with the actions of some pharmaceuticals. The usual dose is 300 mg three times daily.

Orthomolecular therapy

Orthomolecular therapy refers to therapy that strives to achieve the optimal chemical environment for the brain. The theory behind this approach is that mental disease is caused by low concentrations of specific chemicals. Linus Pauling believed that mental disease was caused by low concentrations of the B vitamins, **biotin**, **vitamin C**, or **folic acid**. Supplementation with vitamins B_1, B_2, and B_6 improved the symptoms of depression in geriatric patients taking tricyclic antidepressants. The **amino acids** tryptophan, tyrosine, and phenylalanine have been shown to have positive effects on depression, although large, controlled studies need to be carried out to confirm these findings.

S-ADENOSYL-METHIONINE. In several small studies, S-adenosyl-methionine (SAM, SAMe) was shown to be more effective than placebo and equally effective as tricyclic antidepressants in treating depression. The usual dosage is 200 mg to 400 mg twice daily. In 2003, a U.S. Department of Health and Human Services team reviewed 100 clinical trials on SAMe and concluded that it worked as well as many prescription medications without the side effects of stomach upset and decreased sexual desire.

5-HYDROXYTRYPTOPHAN. 5-hydroxytryptophan (5-HT, **5-HTP**) is a precursor to serotonin. Most of the commercially available 5-HT is extracted from the plant *Griffonia simplicifolia*. In several small studies, treatment with 5-HT significantly improved depression in more than half of the patients. One review of these studies suggests that 5-HT has antidepressant properties; however, large studies must be performed to confirm this finding. The usual dose is 50 mg three times daily. Side effects include **nausea** and gastrointestinal disturbances.

Homeopathic remedies

Homeopathic remedies can be helpful treatments for depression. A British study claims that more than 75% of treated patients show a favorable response to homeopathic therapy after the second visit. A homeopathic practitioner should be consulted for dosages, but common remedies are:

- *Arum metallicum* for severe depression
- Ignatia for adjustment disorder
- Natrum muriaticum for depression of long duration

Light therapy

Light therapy is helpful in controlling the depression of **seasonal affective disorder** (SAD). Treatment consists of exposure to light of a high intensity and/or specific spectra for an hour per day from a light box placed on the floor or on a table. The light intensity is usually 10,000 lux, which is similar to the light of a sunny day. The opposite may be used as well, which is the use of a dawn simulator for those patients who have an overdose of light exposure and require more sleep with less light. Most persons will see an effect within three to four weeks. Side effects include headaches, eyestrain, irritability, and **insomnia**. A week or more in a sunny climate may improve SAD.

Allopathic treatment

Depression usually is treated with antidepressants and/or psychosocial therapy. When used together correctly, therapy and antidepressants constitute a powerful treatment plan for depressed individuals.

Drugs

Selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine (Prozac) and sertraline (Zoloft), reduce depression by increasing levels of serotonin, a neurotransmitter. Some clinicians prefer SSRIs for treatment of dysthymic disorder. **Anxiety**, **diarrhea**, drowsiness, **headache**, sweating, nausea, poor sexual functioning, and insomnia are all possible side effects of SSRIs. A recent study shows this generation of drugs increases patients' risk of gastrointestinal bleeding.

Tricyclic antidepressants (TCAs) are less expensive than SSRIs but have more severe side effects, including persistent **dry mouth**, sedation, **dizziness**, and cardiac arrhythmias. Because of these side effects, caution is taken when prescribing TCAs to elderly patients. TCAs include amitriptyline (Elavil), imipramine (Tofranil), and nortriptyline (Aventyl, Pamelor). A 10-day supply of TCAs can be lethal if ingested all at once, so these drugs may not be a preferred treatment option for patients at risk for suicide.

Monoamine oxidase inhibitors (MAOIs), such as tranylcypromine (Parnate) and phenelzine (Nardil), block the action of monoamine oxidase (MAO), an enzyme in the central nervous system. Patients taking MAOIs must avoid foods high in tyramine (found in aged cheeses and meats) to avoid potentially serious hypertensive side effects.

Heterocyclics include bupropion (Wellbutrin) and trazodone (Desyrel). Bupropion is prescribed to patients with a seizure disorder. Side effects include agitation, anxiety, confusion, **tremor**, dry mouth, fast or irregular heartbeat, headache, low blood pressure, and insomnia. Because trazodone has a sedative effect, it is useful in treating depressed patients with insomnia. Other possible side effects of trazodone include dry mouth, gastrointestinal distress, dizziness, and headache. In 2003, Wellbutrin's manufacturer released a once-daily version of the drug that offered low risk of sexual side effects or weight gain.

Electroconvulsive therapy

Electroconvulsive therapy (ECT) usually is employed after all therapy and pharmaceutical treatment options have been explored and exhausted. However, it is sometimes used early in treatment when severe depression is present and the patient refuses oral medication or when the patient is becoming dehydrated, extremely suicidal, or psychotic.

The treatment consists of a series of electrical pulses that move into the brain through electrodes on the patient's head. ECT is given under general anesthesia, and patients are administered a muscle relaxant to prevent convulsions. Although the exact mechanisms behind the success of ECT therapy are not known, it is believed that the electrical current modifies the electrochemical processes of the brain, consequently relieving depression. Headaches, muscle soreness, nausea, and confusion are possible side effects immediately following an ECT procedure. **Memory loss**, typically transient, has also been reported in ECT patients. ECT

KEY TERMS

Dysthemia—A state of chronic, mild depression.

Hypersomnia— Excessive sleeping (can be from 9 20 hours, or more); a symptom of dysthymic and major depressive disorder.

Neurotransmitter—A chemical in the brain that transmits messages between neurons, or nerve cells. Changes in the levels of certain neurotransmitters, such as serotonin, norepinephrine, and dopamine, are thought to be related to depressive disorders.

Psychomotor agitation—Disturbed physical and mental processes (e.g., fidgeting, wringing of hands, racing thoughts); a symptom of major depressive disorder.

Psychomotor retardation—Slowed physical and mental processes (e.g., slowed thinking, movement, and talking); a symptom of major depressive disorder.

Seasonal affective disorder (SAD)—Depression caused by decreased daylight during the winter months.

causes severe memory problems for months or years in one out of every 200 patients treated.

Late in 2001, a study reported on a pacemaker-like device used to treat **epilepsy** adapted for patients with depression. An implanted electronic device sends intermittent signals to the vagus nerve, which in turn carries the signals to the brain, connecting in areas known to regulate mood. Although still experimental at that time, early results in treating depression were encouraging.

Expected results

Untreated or improperly treated depression is the number one cause of suicide in the United States. Proper treatment relieves symptoms in 80–90% of depressed patients. After each major depressive episode, the risk of recurrence climbs significantly—50% after one episode, 70% after two episodes, and 90% after three episodes. For this reason, patients need to be aware of the symptoms of recurring depression and may require long-term maintenance treatment.

Overall, recommendations in the early 2000s from mental health clinicians suggested that the recovery process for patients with depression works best when mental health professionals focus on the whole person behind the disorder. In addition to prescribing medications, they also should address patients' self-esteem, feeling of control, and determination. They emphasize that patients with depression need a sense of optimism and should be encouraged to seek the support of family members and friends.

Prevention

Patient education in the form of therapy or self-help groups is crucial for training patients with depressive disorders to recognize early symptoms of depression and to take an active part in their treatment program. Extended maintenance treatment with antidepressants may be required in some patients to prevent relapse. Early intervention with children with depression is effective in halting development of more severe problems.

ORGANIZATIONS

American Psychiatric Association (APA), Office of Public Affairs, 1400 K St. NW, Washington, DC, 20005, (202) 682 6119, http://www.psych.org/.

American Psychological Association (APA), Office of Pub lic Affairs, 750 First St. NE, Washington, DC, 20002 4242, (202) 336 5700, http://www.apa.org/.

National Alliance for the Mentally Ill (NAMI), 200 North Glebe Road, Suite 1015, Arlington, VA, 22203 3754, (800) 950 6264, http://www.nami.org.

National Depressive and Manic Depressive Association (NDMDA), 730 N. Franklin St., Suite 501, Chicago, IL, 60610, (800) 826 3632, http://www.ndmda.org.

National Institute of Mental Health (NIMH), 5600 Fishers Lane, Rm. 7C 02, Bethesda, MD, 20857, (301) 443 4513, http://www.nimh.nih.gov/.

Belinda Rowland
Teresa G. Odle
Sam Uretsky, PharmD

Dermatitis

Definition

Dermatitis is a general term used to describe inflammation of the skin.

Description

Most types of dermatitis are characterized by a pink or red rash that itches.

Contact dermatitis is an allergic reaction to something that irritates the skin and is manifested by one or more lines of red, swollen, blistered skin that may itch or weep. It usually appears within 48 hours after coming into contact with a substance to which the skin is

sensitive. The condition is more common in adults than in children. The rash most people develop when exposed to poison ivy is an example of contact dermatitis.

Contact dermatitis can occur on any part of the body, but it usually affects the hands, feet, and groin. Contact dermatitis usually does not spread from one person to another, nor does it spread beyond the area exposed to the irritant unless affected skin comes into contact with another part of the body. In the case of some irritants, such as poison ivy, contact dermatitis can be passed to another person or to another part of the body by direct contact. Contact dermatitis can develop when the first contact occurs or after years of use or exposure.

Stasis dermatitis is characterized by scaly, greasy-looking skin on the lower legs and around the ankles. Stasis dermatitis is most apt to affect the inner side of the calf.

Nummular dermatitis, which is also called nummular eczematous dermatitis or nummular **eczema**, generally affects the hands, arms, legs, and buttocks of men and women older than 55 years of age. This stubborn, inflamed rash forms circular, sometimes itchy, patches and is characterized by flares and periods of inactivity.

Itching, scaling, swelling, and sometimes blistering characterize atopic dermatitis. In early childhood it is called infantile eczema and is characterized by redness, oozing, and crusting. It is usually found on the face, inside the elbows, and behind the knees.

Seborrheic dermatitis may be dry or moist. It is characterized by greasy scales and yellowish crusts on the scalp, eyelids, face, external surfaces of the ears, underarms, breasts, and groin. In infants it is called **cradle cap**.

Causes and symptoms

Allergic reactions are genetically determined, and different substances cause contact dermatitis to develop in different people. A reaction to resin produced by poison ivy, poison **oak**, or poison sumac is the most common source of symptoms. It is, in fact, the most common allergy in the United States, affecting one of every two people.

Flowers, herbs, and vegetables (e.g., fresh okra, jalapeno peppers) can affect the skin of some people. **Burns** and **sunburn** increase the risk of dermatitis developing, and chemical irritants that can cause the condition include the following:

- chlorine
- cleansers
- detergents and soaps
- fabric softeners
- glues used on artificial nails
- perfumes
- topical medications

Stasis dermatitis, a consequence of poor circulation, occurs when leg veins can no longer return blood to the heart as efficiently as they once did. When that happens, fluid collects in the lower legs and causes them to swell (**edema**). Stasis dermatitis can also result in a rash that can develop into sores known as stasis ulcers.

The cause of nummular dermatitis is not known, but it usually occurs in cold weather and is most common in people who have dry skin. Hot weather and **stress** can aggravate this condition, as can the following:

- allergies
- fabric softeners
- soaps and detergents
- wool clothing
- bathing more than once a day

Atopic dermatitis can be caused by **allergies**, **asthma**, or stress. There appears to be a genetic predisposition for atopic conditions. It is sometimes caused by an allergy to nickel in jewelry.

Seborrheic dermatitis, for which there may also be a genetic predisposition, is usually caused by overproduction of the oil glands. In adults it can be associated with **diabetes mellitus** or gold allergy. In infants and adults it may be caused by a **biotin** or vitamin B deficiency.

Diagnosis

The diagnosis of dermatitis is made on the basis of how the rash looks and its location. The doctor may scrape off a small piece of affected skin for microscopic examination. The patient may be directed to discontinue use of any potential irritant that has recently come into contact with the affected area to see if the rash disappears. Two weeks after the rash disappears, the patient may resume use of the suspect substances, one at a time, until the condition recurs. Eliminating the substance most recently added should eliminate the irritation.

If the origin of the irritation has still not been identified, a dermatologist may perform one or more patch tests, which involves dabbing a small amount of a suspected irritant onto skin on the patient's back. If no irritation develops within a few days, another patch

test is performed. The process continues until the patient experiences an allergic reaction at the spot where the irritant was applied.

Treatment

General herbal therapies for dermatitis can be useful for some conditions. Among the herbs most often recommended are:

- burdock root (*Arctium lappa*)
- calendula (*Calendula officinalis*) ointment
- chamomile (*Matricaria recutita*) ointment
- cleavers (*Galium* ssp.)
- evening primrose oil (*Oenothera biennis*)
- nettles (*Urtica dioica*)

Patients who have a history of dermatitis should remove their rings before washing their hands. They should use bath oils or glycerin-based soaps and bathe in lukewarm saltwater.

Treatments for contact dermatitis

Contact dermatitis can be treated botanically and homeopathically. Specific homeopathic remedies are designed for individuals. Grindelia (*Grindelia* spp.) and **sassafras** (*Sassafras albidum*) can help when applied topically. Oatmeal baths are helpful in relieving the itch. Bentonite clay packs or any mud-pack draws the fluid and helps dry up the lesions. Practitioners of natural medicine do not recommend cortisone creams as they suppress the reaction rather than clear it.

Treatments for atopic dermatitis

NUTRITIONAL THERAPY. Because most cases of atopic dermatitis are caused by food allergy, the following dietary changes are often recommended:

- Identification and avoidance of allergenic foods. Foods that often cause allergy in infants include milk, eggs, peanuts, tomatoes, seafood, wheat, and soybean.
- Supplementing daily diet with vitamin A (5,000 U), vitamin E (400 IU), and zinc (45–60 mg) or alternatively, taking multivitamin-and-mineral supplement one tablet once daily.
- Taking fish oils supplements. Adults should take 540 mg of EPA and 360 mg of docosahexaenoic acid (DHA) per day.

Additionally, flavonoids such as **quercetin**, **grape seed extract**, **green tea** extract, and **ginkgo biloba** may be helpful for some people.

HERBAL THERAPY. The following herbal preparations may be helpful in treating atopic dermatitis:

- *Glycyrrhiza glabra* (licorice)
- *Arctium lappa* (burdock, gobo)
- *Taraxacum officinale* (dandelion)

Treatments for seborrheic dermatitis

Treatments for this common skin disorder include nutritional therapy and topical applications.

NUTRITIONAL THERAPY. Diet is one of the major causes of seborrheic dermatitis especially in infants. Therefore, the following dietary changes and nutritional supplements are often necessary:

- Identification and avoidance of foods that may cause allergies. Common allergenic foods in infants are wheat, corn, citrus, peanuts, eggs, and seafood.
- Eating biotin-rich foods (soy foods, sesame, barley) or taking biotin supplements. Seborrheic dermatitis may be caused by biotin deficiency. Infants often respond well to biotin treatment alone (without vitamin B-complex supplementation).
- Taking daily multivitamin and mineral supplement that provides high amounts of vitamin B-complex, especially vitamin B_6 and zinc. Seborrheic adults often require both vitamin B-complex and biotin supplements.
- Flaxseed oil in the amount of one tablespoon per day for adults. Flaxseed oil is a good source of omega-3 fatty acids that help moisturize the skin and decrease inflammation.

TOPICAL TREATMENT. Selenium-based shampoos are often used to treat greasy scales and crusts on the scalp. Some adults with seborrheic scales on the scalp, nose, brow, and around the mouth respond well to topical treatment with **pyridoxine** (50 mg/g) ointment.

Stasis dermatitis

Stasis dermatitis should be treated by a trained practitioner. This condition responds well to topical herbal therapies; however, the underlying cause of poor circulation must also be addressed.

Allopathic treatment

Treating contact dermatitis begins with eliminating or avoiding the source of irritation. Prescription or over-the-counter corticosteroid creams can lessen inflammation and relieve irritation. Creams, lotions, or ointments not specifically formulated for dermatitis can intensify the irritation. Oral antihistamines are sometimes recommended to alleviate itching, and

antibiotics are prescribed if the rash becomes infected. Medications taken by mouth to relieve symptoms of dermatitis can make skin red and scaly and cause **hair loss**.

Patting rather than rubbing the skin after bathing and thoroughly massaging lubricating lotion or nonprescription cortisone creams into still-damp skin can soothe red, weepy nummular dermatitis. Highly concentrated cortisone preparations should not be applied to the face, armpits, groin, or rectal area.

Coal-tar salves can help relieve symptoms of nummular dermatitis that have not responded to other treatments, but these ointments have an unpleasant odor and stain clothing.

Patients who have stasis dermatitis should elevate their legs as often as possible and sleep with a pillow between the lower legs. It is important that these patients receive treatment that addresses the cause of their poor circulation.

Tar or **zinc** paste may also be used to treat stasis dermatitis. Because these compounds must remain in contact with the rash for as long as two weeks, the paste and bandages must be applied by a nurse or a doctor.

Coal-tar shampoos may be used for seborrheic dermatitis that occurs on the scalp. Sun exposure after the use of these shampoos should be avoided because the risk of sunburn of the scalp is increased.

Expected results

Dermatitis is often chronic, but symptoms can generally be controlled. Contact dermatitis can be eliminated by avoiding the substance that causes the skin reaction.

Prevention

Contact dermatitis can be prevented by avoiding the source of irritation. If the irritant cannot be avoided completely, the patient should wear gloves and other protective clothing whenever exposure is likely to occur.

Immediately washing the exposed area with soap and water may stem allergic reactions to poison ivy, poison oak, or poison sumac.

Clothing should be loose fitting and 100% cotton. New clothing should be washed in dye-free, unscented detergent before being worn.

Injury to the lower leg can cause stasis dermatitis to ulcerate (form open sores). If stasis ulcers develop, a doctor should be notified immediately.

KEY TERMS

Allergic reaction—An inappropriate or exaggerated genetically determined reaction to a chemical that occurs only on the second or subsequent exposures to the offending agent, after the first contact has sensitized the body.

Corticosteroid—A group of synthetic hormones that are used to prevent or reduce inflammation. Toxic effects may result from rapid withdrawal after prolonged use or from continued use of large doses.

Patch test—A skin test that is done to identify allergens. A suspected substance is applied to the skin. After 24 to 48 hours, if the area is red and swollen, the test is positive for that substance.

Rash—A spotted, pink or red skin eruption that may be accompanied by itching and is caused by disease, contact with an allergen, food ingestion, or drug reaction.

Ulcer—An open sore on the skin, resulting from tissue destruction, that is usually accompanied by redness, pain, or infection.

Yoga and other **relaxation** techniques may help prevent atopic dermatitis caused by stress.

Avoidance of sweating may aid in preventing seborrheic dermatitis.

A patient who has dermatitis should notify a doctor if any of the following occurs:

- fever develops
- skin oozes or other signs of infection appear
- symptoms do not begin to subside after seven days' treatment
- contact with someone who has a wart, cold sore, or other viral skin infection

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

Weil, Andrew, *Natural Health, Natural Medicine*, rev. ed. New York: Houghton Mifflin, 2004.

OTHER

"Contact Dermatitis." *eMedicineHealth*. September 10, 2005 [cited April 20, 2008]. http://www.emedicinehealth. com/contact_dermatitis/article_em.htm.

"Dermatitis." *Mayo Clinic*. December 7, 2007 [cited April 20, 2008]. http://www.mayoclinic.com/health/dermatitis eczema/DS00339.

"Rashes." *MedlinePlus*. April 15, 2008 [cited April 20, 2008]. http://www.nlm.nih.gov/medlineplus/rashes.html.

"Understanding Dermatitis: The Basics." *WebMD*. May 1, 2007 [cited April 20, 2008]. http://www.webmd.com/skin prob lems and treatments/understanding dermatitis basics.

ORGANIZATIONS

Alternative Medicine Foundation., PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www. amfoundation.org.

American Dermatological Association., PO Box 551301, Davie, FL, 33355, (954) 452 1113, http://www.amer derm assn.org.

American Holistic Medical Association., PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www. holisticmedicine.org.

Mai Tran
Tish Davidson, A. M.

Detoxification

Definition

Detoxification is one of the more widely used treatments and concepts in alternative medicine. It is based on the principle that illnesses can be caused by the accumulation of toxic substances (toxins) in the body. Eliminating existing toxins and avoiding new toxins are essential parts of the healing process. Detoxification utilizes a variety of tests and techniques.

Origins

Detoxification methods of healing have been used for thousands of years. **Fasting**, a method used often in detoxification treatments, is one of the oldest therapeutic practices in medicine. Hippocrates, the ancient Greek known as the father of Western medicine, recommended fasting as a means for improving health. **Ayurvedic medicine**, a traditional healing system that has developed over thousands of years, uses

Common herbs used for detoxification

Antibiotics	Anticatarrhals (help eliminate mucus)	Blood Cleansers
Clove	Boneset	Burdock root
Echinacea	Echinacea	Dandelion root
Eucalyptus	Garlic	Echinacea
Garlic	Goldenseal root	Oregon grape root
Myrrh	Hyssop	Red clover blossoms
Prickly ash bark	Sage	Yellow dock root
Propolis	Yarrow	
Wormwood		

Diaphoretics/Skin Cleaners	Diuretics	Laxatives
Boneset	Cleavers	Buckthorn
Burdock root	Corn silk	Cascara sagrada
Cayenne pepper	Horsetail	Dandelion root
Elder flowers	Juniper berries	Licorice root
Ginger root	Parsley leaf	Rhubarb root
Goldenseal root	Uva ursi	Senna leaf
Peppermint	Yarrow dock	Yellow dock
Oregon grape root		
Yellow dock		

(Illustration by Corey Light. Cengage Learning, Gale)

detoxification methods to treat many chronic conditions and to prevent illness.

Detoxification treatment has become a cornerstone of alternative medicine. Conventional Western medicine accepts that environmental factors can play a significant role in many illnesses. Environmental medicine is a field that studies exactly how those environmental factors influence disease. Diseases such as **asthma**, **cancer**, **chronic fatigue syndrome** and conditions such as **multiple chemical sensitivity** are strongly influenced by exposure to toxic or allergenic substances in the environment. The United States Centers for Disease Control estimate that over 80% of all illnesses have environmental and/or lifestyle causes.

Detoxification has become a more common treatment as people have been made more aware of environmental pollution. Heavy metals such as lead, mercury, cadmium, and arsenic are by-products of industry. Agriculture chemicals, many of which are known to cause health problems, are also found in food, air, and water. American agriculture uses nearly 10 pounds of pesticides per person on the food supply each year. These toxins have become almost unavoidable. Pesticides that are used only on crops in the southern United States have been found in the tissue of animals in the far north of Canada. DDT, a cancer-causing insecticide that has been banned for decades, is still found in the fatty tissue of animals, birds, and fish, even in extremely remote regions such as the North Pole.

The problem of toxins in the environment is compounded because humans are at the top of the food chain and are more likely to be exposed to an accumulation of toxic substances in the food supply. For instance, pesticides and herbicides are sprayed on grains that are then fed to farm animals. Toxic substances are stored in the fatty tissue of those animals. In addition, those animals are often injected with synthetic hormones, antibiotics, and other chemicals. When people eat meat products, they are exposed to the full range of chemicals and additives used along the entire agricultural chain. Detoxification specialists call this build up of toxins bioaccumulation. They assert that the bioaccumulation of toxic substances over time is responsible for many physical and mental disorders, especially ones that are increasing rapidly such as asthma, cancer, and mental illness. Although there is no scientific proof for many of their assertions, detoxification therapies have increased in popularity.

Benefits

Alternative medical practitioners claim that detoxification is helpful for those individuals suffering from many chronic diseases and conditions, including **allergies**, **anxiety**, arthritis, asthma, chronic **infections**, **depression**, diabetes, headaches, **heart disease**, high **cholesterol**, low blood sugar levels, digestive disorders, mental illness, and **obesity**. It is helpful for people with diseases, such as cancer that are influenced by environmental factors and for those who have been exposed to high levels of toxic materials as a result of accident or occupation. People who have allergies or immune system problems that conventional medicine is unable to diagnose or treat, including chronic **fatigue** syndrome, environmental illness/multiple chemical sensitivity, and **fibromyalgia**, often turn to detoxification therapy for relief. Symptoms for those suffering these conditions may include unexplained fatigue, increased allergies, hypersensitivity to common materials, food intolerances, chronic **indigestion**, aches and pains, low grade **fever**, headaches, **insomnia**, depression, sore throats, sudden weight loss or gain, lowered resistance to infection, general malaise, and disability. Detoxification also can be used as a beneficial preventative measure and as a tool to increase overall health, vitality, and resistance to disease.

Description

Toxins in the body include heavy metals and various chemicals such as pesticides, industrial pollutants, and food additives. Drugs and alcohol also have toxic effects in the body. Toxic wastes are produced as a normal by-product of cellular metabolism and by the bacteria that live in the intestine.

The body has natural methods of detoxification. The liver is the principle organ of detoxification, assisted by the kidneys and intestines. Toxins can be excreted from the body by the kidneys, bowels, skin, and lungs. Detoxification treatments become necessary when the body's natural detoxification systems become overwhelmed. Long-term effects of improper diet, **stress**, overeating, sedentary lifestyles, illness, and poor health habits can cause this in general. When a build up of toxic substances in the body creates illness, it is called toxemia. Some people's digestive tracts become unable to digest food properly, due to years of overeating and **diets** that are high in fat and processed foods and low in fiber (the average American diet). Obstruction of food passing through the large intestine can lead to the growth of harmful microbes.

This state is known as toxic colon syndrome or intestinal toxemia.

Detoxification therapies try to activate and assist the body's own detoxification processes. They also try to eliminate additional exposure to toxins and strengthen the body and immune system so that toxic imbalances will not occur in the future.

Testing for toxic substances

Detoxification specialists use a variety of tests to determine the causes contributing to toxic conditions. These causes include infections, allergies, addictions, toxic chemicals, and digestive and organ dysfunction. The results of blood, urine, stool, and hair analyses, as well as allergy tests, can indicate problems that may be resolved with detoxification therapy. Detoxification therapists usually have access to laboratories that specialize in sophisticated diagnostic tests for toxic conditions.

People who have toxemia are often susceptible to infection because their immune systems are weakened. Parasites, bacteria, viruses, and fungi can cause infections. Detoxification therapists will screen patients for underlying infections that may be contributing to illness.

Liver function is studied closely using blood and urine tests because the liver is the principle organ in the body responsible for removing toxic compounds. Results of the tests may identify where problems are occurring and may point to specific types of toxins. Blood and urine tests can also screen for toxic chemicals such as PCBs (environmental poisons), formaldehyde (a common preservative), pesticides, and heavy metals. Another useful blood test is a test for **zinc** deficiency, which may indicate **heavy metal poisoning**. Hair analysis is used to test for heavy metal levels in the body. Blood and urine tests that check immune system activity, and hormone levels can also indicate specific toxic compounds. A 24-hour urine analysis, where samples are taken around the clock, allows therapists to determine the efficiency of the digestive tract and kidneys. Together with stool analysis, these tests may indicate toxic digestive system disorders. Certain blood and urine tests may point to nutritional deficiencies so that proper recovery diets can be designed for patients as well.

Detoxification therapists may also perform extensive allergy and hypersensitivity tests. Intradermal (between layers of the skin) and sublingual (under the tongue) allergy tests are used to determine a patient's sensitivity to a variety of common substances, including formaldehyde, auto exhaust, perfume, tobacco, chlorine, jet fuel, and other chemicals.

Food allergies require additional tests because these allergies often cause reactions that are delayed for several days after the food is eaten. The radioallergosorbent test (RAST) is a blood test that determines the level of antibodies (immunoglobulins) in the blood after specific foods are eaten. The cytotoxic test is a blood test that determines if certain substances affect blood cells, including foods and chemicals. The enzyme-linked immunoserological assay activated cell test (ELISA-ACT) is considered one of the most accurate tests for allergies and hypersensitivity to foods, chemicals, and other agents. Other tests for food allergies are the elimination and rotation diets, in which foods are systematically evaluated to determine the ones that are causing problems.

Detoxification therapists usually interview and counsel patients closely to determine and correct lifestyle, occupational, psychological, and emotional factors that may be contributing to illness.

Detoxification therapies

Detoxification therapists use a variety of healing techniques after a diagnosis is made. The first step is to eliminate a patient's exposure to all toxic or allergenic substances. These include heavy metals, chemicals, radiation (from x rays, power lines, cell phones, computer screens, and microwaves), smog, polluted water, foods, drugs, **caffeine**, alcohol, perfume, excess noise, and stress. If **mercury poisoning** has been determined, the patient will be advised to have mercury fillings from the teeth removed, preferably by a holistic dentist.

Specific treatments are used to stimulate and assist the body's detoxification process. Dietary change is immediately enacted, eliminating allergic and unhealthy foods, and emphasizing foods that assist detoxification and support healing. Detoxification diets are generally vegetarian diets low in fat, high in fiber, with a raw food emphasis. Processed foods, alcohol, and caffeine are avoided. Nutritional supplements such as vitamins, minerals, **antioxidants**, **amino acids**, and **essential fatty acids** are often prescribed. **Spirulina** is a sea alga that is frequently given to assist in eliminating heavy metals. Lipotropic agents are certain vitamins and nutrients that promote the flow of bile and fat from the liver.

Many herbal supplements are used in detoxification therapies as well. **Milk thistle** extract, called silymarin, is one of the more potent herbs for detoxifying the liver. Naturopathy, Ayurvedic medicine, and **traditional Chinese medicine** (TCM) recommend numerous herbal formulas for detoxification and

immune strengthening. If infections or parasites have been found, these are treated with herbal formulas and antibiotics in difficult cases.

For digestive tract disorders, herbal laxatives and high fiber foods such as **psyllium** seeds may be given to cleanse the digestive tract and promote elimination. Colonics are used to cleanse the lower intestines. **Digestive enzymes** are prescribed to improve digestion, and **acidophilus** and other friendly bacteria are reintroduced into the system with nutritional supplements.

Fasting is another major therapy in detoxification. Fasting is one of oldest and quickest ways to promote the elimination of stored toxins in the body and to prompt the healing process. People with severe toxic conditions are supervised closely during fasting because the number of toxins in the body temporarily increases as they are being released.

Chelation therapy is used by detoxification specialists to rid the body of heavy metals. Chelates are particular substances that bind to heavy metals and speed their elimination. Homeopathic medicine also offers remedies for removing heavy metals.

Sweating therapies can detoxify the body because the skin is a major organ of elimination. Sweating helps release those toxins that are stored in the subcutaneous (under the skin) fat cells. Saunas, therapeutic baths, and **exercise** are some of these treatments. Body therapies may also be prescribed, including **massage therapy**, **acupressure**, **shiatsu**, manual lymph drainage, and **polarity therapy**. These body therapies seek to improve circulatory and structural problems, reduce stress, and promote healing responses in the body. Mind/body therapies such as **psychotherapy**, counseling, and stress management techniques may be used to heal the psychological components of illness and to help patients overcome their negative patterns contributing to illness.

Practitioners and treatment costs

The costs of detoxification therapies can vary widely, but can be quite expensive depending on the number of tests and treatments required. Some of these tests may not be covered by medical insurance. Detoxification treatments can be lengthy and involved since illnesses associated with toxic conditions usually develop over many years and may not resolve quickly. Detoxification treatments may be lengthy because they often strive for the holistic healing of the body, mind, and emotions.

Practitioners may be conventionally trained medical doctors with specialties in environmental medicine or interests in alternative treatment. The majority of detoxification therapists are alternative practitioners, such as naturopaths, homeopaths, Ayurvedic doctors, or traditional Chinese doctors. Insurance coverage varies, depending on the practitioner and the treatment involved. Consumers should review their individual insurance policies regarding treatment coverage.

KEY TERMS

Allergen—A foreign substance, such as mites in house dust or animal dander that, when inhaled, causes the airways to narrow and produces symptoms of asthma.

Antibody—A protein, also called immunoglobulin, produced by immune system cells to remove antigens (the foreign substances that trigger the immune response).

Ayurvedic medicine—A 5,000 year old system of holistic medicine developed on the Indian subcontinent. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Fibromyalgia—A condition of debilitating pain, among other symptoms, in the muscles and the myofascia (the thin connective tissue that surrounds muscles, bones, and organs).

Hypersensitivity—The state where even a tiny amount of allergen can cause severe allergic reactions.

Multiple chemical sensitivity—A condition characterized by severe and crippling allergic reactions to commonly used substances, particularly chemicals. Also called environmental illness.

Toxemia—The presence of toxic substances in the bloodstream.

Preparations

Patients can assist diagnosis and treatment by keeping detailed diaries of their activities, symptoms, and contact with environmental factors that may be affecting their health. Reducing exposure to environmental toxins and making immediate dietary and lifestyle changes may speed the detoxification process.

Side effects

During the detoxification process, patients may experience side effects of fatigue, malaise, aches and pains, emotional duress, **acne**, headaches, allergies, and symptoms of colds and **influenza**. Detoxification specialists claim that these negative side effects are

part of the healing process. These reactions are sometimes called "healing crises". They are caused by temporarily increased levels of toxins in the body due to elimination and cleansing.

Research and general acceptance

Although environmental medicine is gaining more respect within conventional medicine, detoxification treatment is scarcely mentioned by the medical establishment. The research that exists on detoxification is largely testimonial, consisting of individual personal accounts of healing without statistics or controlled scientific experiments. In the alternative medical community, detoxification is an essential and widely accepted treatment for many illnesses and chronic conditions.

Resources

BOOKS

Bennett, Peter. *The Purification Plan: Featuring an Exclusive 7 Day Detox Program*. Emmaus, PA: Rodale 2006.

Brown, Phil. *Toxic Exposures: Contested Illnesses and the Environmental Health Movement*. New York: Columbia University Press, 2007.

Haas, Elson M. *The New Detox Diet: The Complete Guide for Lifelong Vitality with Recipes, Menus, and Detox Plans,* 2nd ed. Berkeley, CA: Celestial Arts, 2004.

Lieberman, Shari, and James J. Gromley. *Basic Health Publications User's Guide to Detoxification Discover How Vitamins, Herbs, and Other Nutrients Help You Survive in a Toxic World*. Laguna Beach, CA: Basic Health Publications, 2005.

PERIODICALS

Natural Solutions Magazine. 2995 Wilderness Place, Suite 205, Boulder, CO 80301 5408. (303) 440 7402. http://www.naturalsolutionsmag.com.

OTHER

"Detoxification Techniques." *Holistic Healing*. [cited Feb ruary 20, 2008]. http://www.holisticmed.com/detox/detox.html.

Haas, Elson. "General Detoxification and Cleansing." *Health World*. [cited February 20, 2008]. http://www.healthy.net/scr/article.asp?ID 1558.

Smith, Deborah. "10 Ways to Detoxify Your Body." *Gaiam Community*. [cited February 20, 2008]. http://community.gaiam.com/gaiam/p/10WaystoDetoxifyYourBody.html.

ORGANIZATIONS

American Holistic Medical Association, P. O. Box 2016, Edmonds, WA, 98020, (425) 967 0737. http://www.holisticmedicine.org.

Cancer Prevention Coalition, c/o University of Illinois at Chicago School of Public Health, MC 922, 2121 West Taylor Street, Chicago, IL, 60612, (312) 996 2297. http:\\www.preventcancer.com.

Center for Occupational and Environmental Medicine, 7510 Northforest Dr., North Charleston, SC, 29420, (843) 572 1600. http://www.coem.com.

Douglas Dupler
Teresa G. Odle
Tish Davidson, A. M.

Devil's claw

Description

Devil's claw (*Harpagophytum procumbens*) is an African plant whose fruit looks like a giant claw. The plant grows in an arid climate and is found in Namibia, Madagascar, the Kalahari Desert, and other areas on the African continent. The tuberous roots are used in traditional medicine. The root is collected when the rainy season ends. The root is chopped and dried in the sun for three days. Devil's claw is also known as grapple plant and wood spider.

General use

Devil's claw has been used for numerous conditions in several areas of the world. In South Africa, the root and tuber have been used for centuries as an all-purpose folk remedy. Devil's claw has been used to reduce **fever** and **pain**, to treat **allergies** and **headache**, and to stimulate digestion. Traditional healers also used devil's claw to treat inflammatory conditions such as arthritis, rheumatism, and lower back pain. Devil's claw has also been used as a remedy for liver and kidney disorders.

Devil's claw root was also used in folk medicine as a pain reliever and for complications with pregnancies. In addition, an ointment made from devil's claw was used for skin injuries and disorders.

European colonists brought the African plant back to their continent where it was used to treat arthritis. In the United States, use of devil's claw dates back to the time of slavery. The slaves brought herbs and herbal knowledge with them to the new continent.

Devil's claw has been used as an herbal remedy in Europe for a long time. Current uses for devil's claw are much the same as they were centuries ago. In Europe, the herb is still a remedy for arthritis and other types of joint pain, such as **rheumatoid arthritis**, **osteoarthritis**, and **gout** (a painful joint inflammation disease).

Devil's claw (*Harpagophytum procumbens*). *(PHOTOTAKE Inc. / Alamy)*

Devil's claw is also used for soft tissue conditions with inflammation, like **tendinitis** and **bursitis**. The bitter herb is also used as a remedy for loss of appetite and mildly upset stomach.

The herb is currently used for other conditions such as problems with **pregnancy**, **menstruation**, and **menopause**. Devil's claw is also regarded as a remedy for headaches, **heartburn**, liver and gallbladder problems, allergies, skin disorders, and nicotine poisoning.

European research during the late 1990s indicated that devil's claw relieved arthritis and joint pain conditions. The herb also helped with soft muscle pain such as tendinitis. However, there is no evidence that proves devil's claw is an effective remedy for other conditions such as difficulties during pregnancy and skin disorders.

Preparations

Several forms of devil's claw are used. In Europe, doctors treat some conditions like arthritis with an injection of devil's claw extract. The herb is taken internally as a tea or in capsule form. When taken for pain relief, devil's claw must be taken regularly for up to one month before results are seen. An ointment form of devil's claw can be applied to the skin to treat **wounds** or scars.

Herbal tea and tincture

Devil's claw tea is prepared by pouring 1.25 cups (300 ml) boiling water over 1 tsp (4.5 g) of the herb. The mixture, which is also called an infusion, is steeped for eight hours and then strained. The daily dosage is 3 cups of warm tea.

For most conditions, the average daily dosage is 1 tsp (4.5 g) of devil's claw herb. However, the amount is reduced to 1/3 tsp (1.5 g) when devil's claw is taken for appetite loss.

In a tincture, the herb is preserved with alcohol. The tincture steeps for two weeks and is shaken daily. It is then strained and bottled. When devil's claw tincture is used as a remedy, the dosage is 1 tsp (4.5 g) taken three times per day for a specified period.

Tea and tincture should be consumed 30 minutes before eating. This allows for better absorption of the herb.

Devil's claw capsules

The anti-inflammatory properties of devil's claw are attributed to two constituents, harpagoside and beta sitoserol. If a person takes devil's claw capsules or tablets as a remedy, attention should be paid to the harpagoside content. The daily amount of harpagoside in capsules should total 50 mg.

Combinations

For arthritis treatment, devil's claw can be combined with anti-inflammatory or cleansing herbs. In addition, devil's claw can be combined with bogbean or meadowsweet. An herbalist, naturopathic doctor, or traditional healer can provide more information on herb combinations appropriate for a specific condition.

Precautions

Devil's claw is safe to use when proper dosage recommendations are followed, according to sources including the *PDR (Physician's Desk Reference) for Herbal Medicines*, the 1998 book based on the 1997 findings of Germany's Commission E.

Although devil's claw has not undergone the U.S. Food and Drug Administration (FDA) research required for approval as a remedy, other studies in Europe confirm that devil's claw is safe for most people. People with ulcers should be cautious because the herb stimulates the production of stomach acid.

Furthermore, it is not known if devil's claw is safe for people with major liver or kidney conditions. In addition, devil's claw could cause an allergic reaction.

There is some debate in the alternative medicine community about whether pregnant women can use devil's claw as a remedy. Some researchers say that the herb is safe to use; others say that not enough research has been done to prove that the herb is safe for pregnant women. There appears to be no scientific proof that using devil's claw could result in miscarriages.

Side effects

Devil's claw could cause an allergic reaction or mild gastrointestinal difficulties.

Interactions

No interactions between other medications and devil's claw have been reported according to the *PDR for Herbal Medicines*. However, the herb may possibly block the effect of medication taken to correct abnormal heart rhythms.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.
Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.
Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.
PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company, 1998.
Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.
Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.
Tyler, Varro, and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

ORGANIZATIONS

American Botanical Council. PO Box 201660, Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org/.
Arthritis Foundation. 1330 W. Peachtree St., Atlanta, GA 30309. http://www.arthritis.org.
Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

Liz Swain

DGL *see* **Licorice; Deglycyrrhizanated licorice**

DHEA

Description

DHEA is the acronym for dehydroepiandrosterone, a hormone produced naturally from **cholesterol** in the adrenal glands of males and females. It is a precursor to the male sex hormone testosterone. It is also sold as an over-the-counter dietary supplement.

The human body produces very little DHEA until about the age of seven, when production soars. Production peaks in the mid-20s and starts to decline in the early 30s. By the mid-70s, DHEA production has dropped by about 80 to 90% of its maximum. At all ages, DHEA levels are slightly higher in men than women. The optimum DHEA level in a healthy adult is 750 to 1,250 milligrams per deciliter of blood (mg/dL) for men and 550 to 980 mg/dL for women.

DHEA was first identified in 1934 and was sold over the counter mainly as a weight loss aid until the late 1980s. Then the U.S. Food and Drug Administration (FDA) classified DHEA as a drug, making it available by prescription only. The FDA reversed itself in 1994, reclassifying DHEA as a dietary supplement obtainable without a prescription.

A 1994 study by researchers at the University of California, San Diego, looked at 30 middle-age men and women who took 50 mg of DHEA a day for three months. The test subjects generally reported an improved sense of well-being, increased energy, enhanced sex drive, and an improved ability to deal with **stress**. The results were widely reported by the mass media, with several referring to DHEA as the "fountain of youth hormone."

Despite hundreds of studies of DHEA between the late 1970s and the late 2000s, researchers remain unclear as to how the hormone works or exactly what it does in the body. Although it is known that DHEA decreases with age, it is not known whether this constitutes a deficiency or is because the body needs less DHEA as it ages.

So little is known about DHEA because the hormone is not patentable, so drug companies are unwilling to spend money doing further research on it. Much of the research as of 2008 is funded through universities and the National Institute on **Aging** (NIA) that maintains a skeptical attitude about DHEA supplementation. In one statement on the use of DHEA (January 19, 2007), NIA noted that it "does not recommend taking any supplement, including DHEA and **melatonin**, that is touted as an 'anti-aging' remedy because no supplement has been proven to serve this purpose."

General use

Originally marketed as a weight loss supplement, DHEA was later promoted as beneficial for treating a wide variety of medical conditions, including **cancer**, **heart disease**, Alzheimer's, and **AIDS**. It was also purported to have anti-aging qualities. Studies in rodents and test tubes showed that daily doses of DHEA seemed to prevent or to improve such conditions as cancer, heart disease, **osteoporosis**, diabetes, lupus, **obesity**, and viral **infections**. Far fewer long-term studies had been done on humans, and the results were often conflicting. In general, DHEA supplementation seemed to be more beneficial to men than women. In 2008, the Mayo Clinic Web site listed 28 uses for which DHEA has been recommended. It said that there was "good scientific evidence" for four of those uses (in the treatment of adrenal insufficiency, **depression**, obesity, and **systemic lupus erythematosus**), "fair scientific evidence against the use" of four other treatments (**fibromyalgia**, as an immune system stimulant, as a memory enhancer, and for muscle strength) and "unclear scientific evidence" on the other 20 uses.

Preparations

Most DHEA is derived from Mexican wild yams through a chemical process. Eating the yams will not produce the hormone. DHEA is generally taken once daily. Dosage recommendations vary. Allopathic physicians who support DHEA supplementation usually recommend 5 to 10 mg once a day. Some homeopathic health practitioners recommend 10 to 50 mg a day. Ray Sahelian, a physician and author of several books on dietary supplements, recommends "hormone holidays." With this approach, persons would take DHEA every other day, five days in a row and two days off, or go off it one or two weeks a month. DHEA commonly is sold in tablets of 5 mg, 10 mg, 25 mg, and 50 mg. It also is available as a cream, ointment, lozenge, and herbal tea.

Precautions

Several studies have shown DHEA may increase the risks of **prostate cancer** in men and endometrial cancer in women. Medical experts suggest that individuals have a blood test to determine existing DHEA and other hormone (testosterone or estrogen) levels before taking DHEA supplements. Also, men taking the supplement should have regular PSA tests and women should have periodic mammograms since DHEA may promote the growth of **breast cancer**.

There are several warnings associated with DHEA use. It should not be taken by men who have a history of prostate problems or by women with a history of breast, ovarian, or **uterine cancer**. It is not recommended for anyone under age 40 or by women who are pregnant, nursing, or who are of childbearing age. Women who are taking an estrogen replacement, who have a history of heart disease, and anyone with other significant health problems should consult their doctor before taking DHEA.

Side effects

Some side effects have been reported and are usually associated with doses of 5 mg a day or more. These include **acne**, body and facial hair growth in women, enlarged breasts in men, scalp **hair loss**, **anxiety**, **insomnia**, headaches, mood changes, and **fatigue**. DHEA can cause menstrual irregularities in women under age 50 and may decrease HDL (good cholesterol) in women. A

KEY TERMS

Adrenal glands—A pair of endocrine organs near the kidneys that produce steroids such as sex hormones, hormones associated with metabolic functions, and epinephrine.

Cholesterol—A fatty substance manufactured in the liver and carried throughout the body in the bloodstream.

Endometrial—Pertaining to the endometrium, a mucous membrane lining the uterus.

Estrogen—A hormone that stimulates development of female secondary sex characteristics.

Lupus—A group of diseases characterized by skin lesions.

Osteoporosis—A condition or disease characterized by low density and fragility of the bones.

Pregnenolone—A steroid ketone formed by the oxidation of other steroids, such as cholesterol, a precursor to the hormone progesterone.

PSA test—A blood test to determine prostate-specific antigen levels in men, which can help determine the risk for prostate cancer.

Testosterone—A male hormone produced in the testes or made synthetically that is responsible for male secondary sex characteristics.

few cases of irregular heart rhythm have been reported in people taking 25 to 50 mg a day of DHEA.

Interactions

DHEA functions similarly to pregnenolone, so the two should not be taken together in full doses. Natural Standard, an international organization that studies the risks and benefits of complementary and alternative therapies, suggests a number of possible interactions between DHEA and certain drugs, including triazolam (Halcion); carbamazepine; phenytoin; anticoagulants and antiplatelet drugs, such as warfarin (Coumadin), heparin, and clopidogrel (Plavix); diltiazem (Cardizem) and alprazolam (Xanax); clofibrate and tamoxifen; insulin; corticosteroids, such as dexamethasone; danazol; opiate painkillers; and estrogen-containing drugs. Interactions may also occur with certain herbal products, such as chasteberry (*Vitex agnus-castus*), **bitter melon** (*Momordica charantia*), **Ginkgo biloba**, **garlic** (*Allium sativum*), coenzyme Q10, Panax ginseng, **red clover** (*Trifolium pratense*), **hawthorn** (*Crataegus oxycantha*), **chromium** picolinate, and **carnitine**.

Resources

BOOKS

Moore, Neecie. *The Facts about DHEA*. Scottsdale, AZ: Alethia Press, 2005.

Morfin, Robert. *DHEA and the Brain*. London: Taylor & Francis, 2007.

PERIODICALS

Basu, Rita, et al. "Two Years of Treatment with Dehydroe piandrosterone Does Not Improve Insulin Secretion, Insulin Action, or Postprandial Glucose Turnover in Elderly Men or Women." *Diabetes* (May 2007): 753 766.

Finckh, A., et al. "A Randomized Controlled Trial of Dehydroepiandrosterone in Postmenopausal Women with Fibromyalgia." *Journal of Rheumatology* (July 2005): 1336 1340.

Nair, K. Sreekumaran, et al. "DHEA in Elderly Women and DHEA or Testosterone in Elderly Men." *New England Journal of Medicine* (October 19, 2006): 1647 1659.

Schmidt, P. J., et al. "Dehydroepiandrosterone Monother apy in Midlife onset Major and Minor Depression." *Archives of General Psychiatry* (February 2005): 154 162.

Tworoger, S. S., et al. "The Association of Plasma DHEA and DHEA Sulfate with Breast Cancer Risk in Pre dominantly Premenopausal Women." *Cancer Epidemi ology Biomarkers & Prevention* (May 2006): 967 971.

OTHER

"DHEA." MayoClinic.com. May 1, 2006 [cited March 19, 2008]. http://www.mayoclinic.com/health/dhea/NS_ patient dhea.

"DHEA (Dehydroepiandrosterone)." AetnaInteliHealth. July 14, 2005 [cited March 19, 2008]. http://www. intelihealth.com/IH/ihtIH?d dmtContent& 347263&p .

Ken R. Wells
David Edward Newton, Ed.D.

Diabetes mellitus

Definition

Diabetes mellitus is a disease in which the body is unable to properly use (metabolize) sugar (glucose). It arises from two causes. In type 1 diabetes (formerly called insulin-dependent, juvenile, or childhood-onset diabetes), the pancreas, a digestive organ, does not produce enough of the hormone insulin to allow the body to use glucose. Type 2 diabetes (formerly called noninsulin dependent or adult-onset diabetes) occurs when the pancreas produces insulin, but cells in the body stop responding to the hormone. In either case, the result is that glucose builds up in the blood because

Symptoms of diabetes mellitus

- Excessive thirst
- Increased appetite
- Increased urination
- Unexplained weight loss
- Fatigue
- Nausea
- Blurred vision
- Frequent vaginal infections in women
- Impotence in men
- Frequent yeast infections

(Illustration by Corey Light. Cengage Learning, Gale)

the body cannot use it. Gestational diabetes is transient diabetes that occurs during **pregnancy** and resolves after pregnancy.

Description

Diabetes mellitus is a chronic disease that contributes to serious health complications, including renal (kidney) failure, **heart disease**, **stroke**, and blindness. In 2007, diabetes affected an estimated 246 million people worldwide, with that number estimated to grow by 7 million per year. The highest rate of growth is expected to occur in developing countries. Of people with diabetes, 9 out of 10 have type 2 diabetes. The five countries with the largest numbers of people with diabetes are India, China, the United States, Russia, and Germany. Worldwide 3.8 million deaths are directly attributable to diabetes. The disease also is a contributing factor in many deaths due to cardiovascular disease.

In the United States in 2005, approximately 20.8 million people, or 7% of the population, had diabetes. Of these, 14.6 million were diagnosed with the disease, while another estimated 6.2 million remained undiagnosed. Another 54 million people have pre-diabetes. In pre-diabetes, blood glucose levels are higher than normal, but not so high as to justify a diagnosis of diabetes. The number of people with diabetes in the United States is increasing rapidly, especially among overweight and obese children.

Background

Every cell in the body needs energy to function. The body's primary energy source is glucose, a simple sugar that results from the digestion of foods containing carbohydrates (sugars and starches). Glucose from digested food circulates in the blood (blood glucose) as a ready energy source for cells. Insulin is a hormone produced by cells in the pancreas and released into the bloodstream. Insulin binds to receptor sites on the outside of cells and acts like a key to open a doorway into the cell through which glucose can enter. When not enough insulin is produced or when the doorway no longer recognizes the insulin key (a condition called **insulin resistance**), glucose stays in the blood instead of entering the cells. This results in high blood glucose levels, a condition called hyperglycemia.

For the body to function properly, the level of glucose in the blood must remain stable within fairly narrow limits. When the blood glucose level gets too high, the body attempts to dilute the concentration of glucose in the blood by drawing water out of the cells and into the bloodstream. The excess glucose, along with water, is then excreted in urine. It is common for people with undiagnosed or uncontrolled diabetes to be constantly thirsty, to drink large quantities of water, and produce large quantities of dilute, sweet-smelling urine as their bodies try to remove excess glucose from the blood.

At the same time that the body is trying to remove glucose from the blood, the cells are starving for glucose and sending signals to the body to eat more food, thus causing people with diabetes to be constantly hungry. To provide energy for the starving cells, the body also converts fats and proteins into glucose, an activity that does not require insulin. The breakdown of fats and proteins for energy causes acid compounds called ketones to form in the blood. These ketones cause the breath of an uncontrolled diabetic to smell like acetone (nail polish remover). Ketones are also excreted in urine. As ketones build up in the blood, the blood becomes more acidic and a condition called ketoacidosis can occur. If left untreated, ketoacidosis can lead to coma and death.

Types of diabetes mellitus

Type 1 diabetes begins most often during childhood or adolescence. In this type of diabetes, the pancreas produces little or no insulin. Type 1 diabetes is characterized by a sudden onset. It occurs more frequently in people of northern European ancestry than in those from southern European countries, the Middle East, or Asia. This form of diabetes also is

called insulin-dependent diabetes because people who develop type 1 diabetes need injections of insulin one or more times daily.

Brittle diabetics, sometimes called uncontrolled diabetics, are a subgroup of individuals with type 1 diabetes. These individuals, even when carefully complying with their insulin and diet regimen, have frequent and rapid swings of blood sugar levels moving between hyperglycemia (a condition in which there is too much glucose or sugar in the blood) and **hypoglycemia** (a condition in which there are abnormally low levels of glucose or sugar in the blood). These diabetics may require several injections of different types of insulin or an insulin pump during the day to keep their blood sugar within a fairly normal range.

The more common form of diabetes, type 2 diabetes, occurs in approximately 3 to 5% of Americans under age 50, and increases to 10 to 15% in those older than 50. More than 90% of the diabetics in the United States are type 2 diabetics. Symptoms of type 2 diabetes are milder than those of type 1 diabetes. As a result, many people (as many as 80% in some developing countries) with type 2 diabetes remain undiagnosed. This form of diabetes occurs most often in people who are overweight and who do not get adequate **exercise**. It also is more common in people of Native American, Hispanic, and African American descent. Type 2 diabetes appears to be somewhat linked to diet. People who have migrated to Western cultures from East India, Japan, and Australian Aboriginal cultures are more likely to develop type 2 diabetes than those who remain in their original countries.

Type 2 diabetes is initially a milder form of diabetes because of its slow onset (sometimes developing over the course of several years) and because it can often be controlled with diet, exercise, and oral medication instead of insulin injections. The consequences of uncontrolled and untreated type 2 diabetes, however, are just as serious as those for type 1. This form of diabetes also is called noninsulin-dependent diabetes, a term that is somewhat misleading. Many people with type 2 diabetes can control the condition with diet and oral medications; however, when this fails, insulin injections are necessary.

Another form of diabetes, called gestational diabetes, can develop during pregnancy. It usually resolves after the baby is delivered. This diabetic condition develops during the second or third trimester of pregnancy in about 2% of pregnancies. The condition usually is treated by diet; however, insulin injections may be required. Women who have diabetes during pregnancy are at higher risk for developing type 2 diabetes within 5 to 10 years.

Diabetes also can develop as a result of pancreatic disease, **alcoholism**, malnutrition, or other severe illnesses that **stress** the body and damage the pancreas.

Causes and symptoms

The causes of diabetes mellitus are unclear; however, there seem to be both complex hereditary (genetic factors passed on in families) and environmental factors involved. Research has shown that some people who develop diabetes have common genetic markers, but identical twins do not always both develop diabetes. In type 1 diabetes, an autoimmune response is believed to be triggered by a virus, other microorganism, or exposure to an environmental toxin. This causes the immune system to incorrectly identify its own insulin-producing cells as foreign material and to destroy them.

Ketoacidosis, a condition caused by starvation or uncontrolled diabetes, is common in type 1 diabetes. Ketones are acid compounds that form in the blood when the body breaks down fats and proteins. Symptoms include abdominal **pain**, **vomiting**, rapid breathing, extreme tiredness, and drowsiness. Patients with ketoacidosis will also have a sweet breath odor. Left untreated, this condition can lead to diabetic coma and death.

In type 2 diabetes, the pancreas may produce enough insulin; but cells have become resistant to the insulin produced, so that it does not work effectively. Symptoms of type 2 diabetes can begin so gradually that individuals may not know that they have it. Age, **obesity**, diet, and family history of diabetes all play significant roles in the development of type 2 diabetes.

Early signs of type 2 diabetes include tiredness, extreme thirst, and frequent urination. Other symptoms may include sudden weight loss, slow wound healing, urinary tract **infections**, **gum disease**, or blurred vision. It is common for type 2 diabetes to be detected while a patient is seeing a doctor about a health concern caused by the yet undiagnosed diabetes. Symptoms of type 1 diabetes are similar to those of type 2 diabetes, but often develop suddenly (over days or weeks) in previously healthy children or adolescents.

Individuals who are at high risk of developing type 2 diabetes mellitus include people who have the following characteristics:

- are obese (a body mass index [BMI] of 30 or higher)
- have a close relative with diabetes mellitus

- belong to a high-risk ethnic population (African American, Native American, Hispanic, or Native Hawaiian)
- have been diagnosed with gestational diabetes or have delivered a baby weighing more than 9 lbs (4 kg)
- have high blood pressure (140/90 mmHg or above)
- have a high density lipoprotein (HDL or "bad") cholesterol level less than or equal to 35 mg/dL and/or a triglyceride level greater than or equal to 250 mg/dL
- have had impaired glucose tolerance or impaired fasting glucose on previous tests

Several common drugs can impair the body's use of insulin, causing a condition known as secondary diabetes. These medications include treatments for high blood pressure (furosemide, clonidine, and thiazide diuretics), drugs with hormonal activity (oral contraceptives, thyroid hormone, progestins, and glucocorticorids), and the anti-inflammation drug indomethacin. Several drugs used to treat mood disorders also can impair glucose absorption. These drugs include haloperidol, lithium carbonate, phenothiazines, tricyclic antidepressants, and adrenergic agonists. Other drugs that can cause diabetes symptoms include isoniazid, nicotinic acid, cimetidine, and heparin.

Diagnosis

Diabetes is suspected based on symptoms. Urine tests and blood tests are used to confirm a diagnosis of diabetes. These tests measure the amount of glucose in the urine and blood. Urine tests also can detect ketones and protein in the urine, which may help to diagnose diabetes and assess how well the kidneys are functioning. These tests are also used to monitor the disease once the patient is under treatment.

Urine tests

Clinistix and Diastix are paper strips or dipsticks that change color when dipped in urine. The test strip is compared to a chart that shows the amount of glucose in the urine based on the change in color. The level of glucose in the urine lags behind the level of glucose in the blood. Testing the urine with a test stick, paper strip, or tablet is not as accurate as blood testing, but it can give a fast, simple, noninvasive reading.

Ketones in the urine can be detected using similar types of dipstick tests (Acetest or Ketostix). Ketoacidosis can be life-threatening in type 1 diabetics, so having a quick and simple test to detect ketones can assist in establishing a diagnosis rapidly.

Another dipstick test can determine the presence of protein or albumin in the urine. Protein in the urine can indicate problems with kidney function and can be used to track the development of renal failure. A more sensitive test for urine protein uses radioactively tagged chemicals to detect microalbuminuria, small amounts of protein in the urine, which may not show up on dipstick tests.

Blood tests

In a **fasting** plasma glucose test (FPT), blood is drawn from a vein in the patient's arm after the patient has not eaten for at least eight hours, usually in the morning before breakfast. The red blood cells are separated from the sample and the amount of glucose is measured in the remaining plasma. A plasma level of 99 mg/dL or below is normal. Readings of 100–125 mg/dL indicate pre-diabetes (impaired fasting glucose) and readings of 126 mg/dL or greater indicate diabetes. The fasting glucose test is usually repeated on another day to confirm the results. A postprandial glucose test in which blood is taken shortly after the patient has eaten a meal may also be done.

In the oral glucose tolerance test, blood samples are taken from a vein before and after a patient drinks a sweet syrup of glucose and other sugars. In a nondiabetic, the level of glucose in the blood goes up immediately after the drink and then decreases gradually as insulin is used by the body to metabolize, or absorb, the sugar. In a person with diabetes, the glucose in the blood goes up and stays high after drinking the sweetened liquid. A plasma glucose level after two hours that is 139 mg/dL is normal. Two-hour readings of 140 to 199 mg/dL indicate pre-diabetes and readings of 200 mg/dL or higher at two hours after drinking the syrup and at one other point during the two-hour test period confirms the diagnosis of diabetes.

In 2002, scientists announced that a simple blood test to screen for diabetes had been developed. Before that time, community-wide screening procedures had not proven cost-effective. The screening test was shown to be cost-effective if conducted in physician offices on patients with the three known risk factors of obesity, self-reported high blood pressure, and family history of diabetes.

Home blood glucose monitoring kits are available so diabetics can monitor their own levels. A small needle or lancet is used to prick the finger and a drop of blood is collected and analyzed by a monitoring device. Some patients may test their blood glucose levels several times during a day and use this information to adjust their diet or insulin dosage.

In the United States beginning in the early 2000s, a small number of service dogs, mostly Labrador retrievers, were trained to detect ketones in their diabetic human companions by smell. The dogs are trained to give a behavioral signal to the handler if they detect a smell that indicates the handler's metabolism is out of balance. Their acute sense of smell allows them to warn the diabetic handler of problems before the person can physically sense them. These dogs are permitted to travel in public places with their handlers under the Americans with Disabilities Act.

Treatment

There is no cure for diabetes. Treatment of diabetes focuses on two goals: keeping blood glucose within the normal range and preventing the development of long-term complications. Diet, exercise, medication, and careful monitoring of blood glucose levels are the keys to managing diabetes so that patients can live healthier lives. Diabetes can be life-threatening if not properly managed, so individuals should not attempt to treat this condition without medical supervision. Alternative treatments cannot replace the need for insulin, but they may enhance insulin's effectiveness and may lower blood glucose levels. In addition, alternative medicines may help to treat complications of the disease and improve quality of life.

Diet

Both conventional and alternative medicine practitioners agree that diet and moderate exercise are the first treatments to be implemented in diabetes. For overweight and obese type 2 diabetics, weight loss is an important goal to help them to control their blood glucose levels. A well-balanced, nutritious diet provides approximately 50 to 60% of calories from carbohydrates, approximately 10 to 20% of calories from protein, and less than 30% of calories from fat. The number of calories required depends on the patient's age, weight, and activity level. Calorie intake also needs to be distributed fairly evenly over waking hours so that surges of glucose entering the blood are kept to a minimum. Generally, whole grains and foods that provide large amounts of dietary fiber are helpful in controlling blood glucose levels and reducing glucose surges in people with type 2 diabetes.

Keeping track of the number of calories provided by different foods can be complicated, so patients are usually advised to consult a nutritionist or dietitian. An individualized, easy-to-manage diet plan can be set up for each patient. Both the American Diabetes Association and the American Dietetic Association recommend **diets** based on the use of food exchange lists. Each food exchange contains a known amount of calories in the form of protein, fat, or carbohydrate. A patient's diet plan will consist of a certain number of exchanges from each food category (meat or protein, fruits, breads and starches, vegetables, and fats) to be eaten at meal times and as snacks. Patients have flexibility in choosing the foods they eat as long as they do not exceed the number of exchanges prescribed. The food exchange system, along with a plan of moderate exercise, can help diabetics lose excess weight and improve their overall health. Certain foods will be emphasized over others to promote a healthy heart as well.

Supplements

Supplement use to control blood glucose levels is controversial, as many studies have either produced conflicting results or have been done using such a small number of patients that their general validity can be questioned. Patients should be sure to inform their healthcare provider of all herbal and dietary supplements and over-the-counter medications that they are taking because these remedies may enhance or diminish the effects of conventional drugs used to treat diabetes.

CHROMIUM PICOLINATE. Several studies have had conflicting results on the effectiveness of **chromium** picolinate supplementation for control of blood glucose levels. In one study, approximately 70% of the diabetics receiving 200 micrograms of chromium picolinate daily reduced their need for insulin and medications. While some studies have shown that supplementation caused significant weight loss and decreases in blood glucose and serum triglycerides, others have shown no benefit. Chromium supplementation may cause hypoglycemia and other side effects.

MAGNESIUM. Magnesium deficiency may interfere with insulin secretion and uptake and worsen the patient's control of blood sugar. Also, magnesium deficiency puts diabetics at risk for certain complications, especially **retinopathy** and cardiovascular disease.

VANADIUM. Vanadium has been shown to bring blood glucose to normal levels in diabetic animals. In human studies, people who took vanadium were able to decrease their need for insulin.

Traditional Chinese medicine

In one study, non-insulin dependent diabetics who practiced daily **qigong** for one year had decreases in fasting blood glucose and blood insulin levels. Qigong also provides general health benefits.

Acupuncture may relieve pain in patients with diabetic neuropathy, a condition in which the nerves of the spinal column degenerate due to diabetes. Some studies have suggested that acupuncture also may help to bring blood glucose to normal levels in diabetics who do not require insulin.

When used in consultation with a **traditional Chinese medicine** practitioner, some traditional Chinese herbal medicines are believed to alleviate symptoms of or complications from diabetes. However, none of these treatments eliminates the need for insulin in people with type 1 diabetes or weight and diet control (and possibly medications) in people with type 2 diabetes. These traditional Chinese medicines include:

- Xiao Ke Wan (Emaciation and Thirst Pill) for diabetics with increased levels of sugar in blood and urine.
- Yu Quan Wan (Jade Spring Pill) for diabetics with a deficiency of Yin.
- Liu Wei Di Huang Wan (Six Ingredient Pill with Rehmannia) for stabilized diabetics with a deficiency of Kidney Yin.
- Jin Gui Shen Wan (Kidney Qi Pill) for stabilized diabetics with a deficiency of Kidney Yang.

Herbs

Herbal medicines can have a positive effect on blood glucose and quality of life in diabetics. Herbs recommended by herbal practitioners to help control blood glucose levels include the following:

- ginseng (genus *Panax*), shown to moderately lower blood glucose levels in several well-designed clinical trials
- wormwood (*Artemisia herba-alba*), shown to decreased blood glucose
- gurmar (*Gymnema sylvestre*), thought to decrease blood glucose levels and the need for insulin
- *Coccinia indica*, believed to improved glucose tolerance
- fenugreek seed powder (*Trigonella foenum graecum*) shown to decrease blood glucose and improved glucose tolerance
- bitter melon (*Momordica charantia*) believed to decrease blood glucose and improved glucose tolerance
- cayenne pepper (*Capsicum frutescens*) to help relieve pain in the peripheral nerves (a type of diabetic neuropathy)

Other herbals that may treat or prevent diabetes and its complications include the following:

- bilberry (*Vaccinium myrtillus*) may lower blood glucose levels and maintain healthy blood vessels
- garlic (*Allium sativum*) may lower blood sugar and cholesterol levels
- onions (*Allium cepa*) may help lower blood glucose levels
- ginkgo (*Ginkgo biloba*) may improve blood circulation

Yoga

Studies of diabetics have shown that practicing **yoga** leads to decreases in blood glucose, increased glucose tolerance, decreased need for diabetes medications, and improved insulin processes. Yoga also enhances the sense of wellbeing and improves circulation and flexibility.

Biofeedback

Many studies have been performed to test the benefit of adding **biofeedback** to the diabetic's treatment plan. **Relaxation** techniques, such as visualization, usually were included. Biofeedback can have significant effects on diabetes, including improved glucose tolerance and decreased blood glucose levels. In addition, biofeedback can be used to treat diabetic complications and improve quality of life.

Allopathic treatment

Traditional treatment of diabetes begins with a well balanced diet and moderate exercise. Medications are prescribed only if the patient's blood glucose cannot be controlled by these methods.

Oral medications

Oral prescription medications are available to lower blood glucose in type 2 diabetics. Drugs first prescribed for type 2 diabetes are in a class of compounds called sulfonylureas and include tolbutamide, tolazamide, acetohexamide, chlorpropamide, glyburide, glimeperide, and glipizide. The way that these drugs work is not well understood; they seem to stimulate cells of the pancreas to produce more insulin. Other drugs available to treat diabetes include metformin, acarbose, and troglitizone. These medications are not a substitute for a well-planned diet and moderate exercise. Oral medications are not effective for type 1 diabetes, in which the patient produces little or no insulin.

Insulin

Patients with type 1 diabetes need daily injections of insulin to help their bodies use glucose. Some patients with type 2 diabetes may need to use insulin injections if their diabetes cannot be controlled. Injections are given subcutaneously—just under the skin, using a small needle and syringe. Insulin comes in many forms, including rapid-acting, short-acting, intermediate-acting, long-acting, and pre-mixed (several types in a specific ratio) insulin. Synthetic human insulin is commonly considered superior to bovine (cow) or porcine (pig) insulin. The type of insulin used varies with the age, health, and lifestyle of each diabetic. Different types of insulin can be mixed and given in one dose or split into two or more doses during a day. Patients who require multiple injections over the course of a day may be able to use an insulin pump that administers small doses of insulin on demand.

New drugs and new drug delivery systems to treat diabetes were active areas of research as of 2008. For example, in 2004, the United States Food and Drug Administration (FDA) approved a rapid-acting form of synthetic insulin, insulin glulisine (Apidra), to control hyperglycemia following meals. In 2007, the FDA approved a new delivery system for insulin glargine (Lantus) called LantusSoloStar, which consists of individual pre-loaded insulin pens to be used once daily at bedtime. Because the number of individuals with diabetes was expected to rise substantially between 2008 and 2018, research on new drugs, delivery systems, and blood glucose test kits is likely to remain vigorous.

Hypoglycemia, or low blood sugar, is a condition that can be caused by too much insulin, eating too little food, eating too late to coincide with the action of the insulin, alcohol consumption, or increased exercise. A patient with symptoms of hypoglycemia may be hungry, sweaty, shaky, cranky, confused, and tired. Left untreated, the individual can lose consciousness or have a seizure. This condition is sometimes called an insulin reaction or "insulin shock" and should be treated by giving the individual something sweet to eat or drink such as candy, sugar cubes, or juice.

Surgery

Transplantation of a healthy pancreas into a person with type 1 diabetes might seem like a successful treatment. Nevertheless, this transplant usually is done only if a kidney transplant is performed at the same time. Transplanted pancreases are rejected about half the time, so in many cases the potential benefits of transplantation are overshadowed by the risks of the surgery and subsequent immune system drug therapy.

Expected results

Individuals who can control their diabetes and keep their blood glucose levels constant within a normal range can, with care, lead a relatively healthy, normal life. Some diabetics have even been successful in playing professional sports (Bobby Clark, hockey player for the Philadelphia Flyers was one of the first professional sports figures to publicly discuss his diabetes). Uncontrolled diabetes is a leading cause of blindness, end-stage renal disease, and limb amputations. It also doubles the risk of heart disease and increases the risk of stroke. Eye problems, including **cataracts**, **glaucoma**, and retinopathy, also are more common in diabetics. Kidney disease is a common complication of diabetes and may require kidney dialysis or a kidney transplant. Babies born to diabetic mothers have an increased risk of birth defects and distress at birth.

Diabetic **peripheral neuropathy** is a condition in which nerve endings, particularly in the legs and feet, become less sensitive. Diabetic foot ulcers are a common problem since the patient does not feel the pain of a blister, callous, or other minor injury. Poor blood circulation in the legs and feet then contributes to slowing wound healing. The inability to sense pain along with the complications of delayed wound healing can result in minor injuries, **blisters**, or **calluses** becoming infected and difficult to treat. Severely infected tissue breaks down and rots, often necessitating amputation of toes, feet, or legs.

Prevention

Research continues on ways to prevent diabetes and to detect those at risk for developing diabetes. While the onset of type 1 diabetes is unpredictable, the risk of developing type 2 diabetes can be reduced by losing excess weight, exercising regularly, and eating a diet low in calories and high in fruits, vegetables, and whole grains. The Diabetes Prevention Program, a large well-designed clinical trial, found that people with pre-diabetes were substantially less likely to develop diabetes if they lost weight and exercised 150 minutes per week. People taking metformin (Glucophage) without lifestyle changes also reduced their

KEY TERMS

Body Mass Index (BMI)—A measurement of fatness that compares height to weight.

Cataracts—A condition in which the lens of the eye becomes cloudy.

Diabetic peripheral neuropathy—Dulled sensitivity of nerves to pain, temperature, and pressure particularly in the legs and feet.

Diabetic retinopathy—The tiny blood vessels to the retina, the tissues that sense light at the back of the eye, are damaged, leading to blurred vision, sudden blindness, or black spots, lines, or flashing light in the field of vision.

Glaucoma—A condition in which pressure within the eye causes damage to the optic nerve, which sends visual images to the brain.

Hyperglycemia—A condition of having too much glucose or sugar in the blood.

Hypoglycemia—A condition of having too little glucose or sugar in the blood.

Insulin—A hormone produced by the pancreas that is needed by cells of the body to use glucose (sugar), the body's main source of energy.

Ketoacidosis—A condition due to starvation or uncontrolled type 1 diabetes. Ketones are acid compounds that form in the blood when the body breaks down fats and proteins. Symptoms include abdominal pain, vomiting, rapid breathing, extreme tiredness, and drowsiness.

Kidney dialysis—A process by which blood is filtered through a dialysis machine to remove waste products that would normally be removed by the kidneys. The filtered blood is then circulated back into the patient; also called renal dialysis.

Pancreas—An organ located near the liver that produces the hormones insulin, glucagon, and somatostatin as well as digestive enzymes.

chance of developing diabetes, but less so than those who changed their eating and exercise habits.

The physical and emotional stress of surgery, illness, and alcoholism can increase the risks of diabetes, so stress reduction and maintaining a healthy lifestyle is important in preventing the onset of type 2 diabetes or reducing complications of the disease.

In early 2002, researchers announced that patients at high risk for developing diabetes who took an ACE inhibitor called ramipril (Altace) reduced their risk of developing diabetes by 30%. However, a large clinical trial reported in 2006 found that people who had impaired fasting glucose levels or impaired glucose tolerance and who used ramipril for three years developed diabetes and died at the same rate as people who did not take the drug, although of those people who did not develop diabetes, more returned to normal blood sugar levels while taking ramipril. These mixed results leave the effects of ACE inhibitors on diabetes unclear and open to more research as of 2008.

Resources

BOOKS

American Diabetes Association Complete Guide to Diabetes, 4th ed. New York: Bantam Books, 2006.

Becker, Gretchen. *The First Year Type 2 diabetes: An Essential Guide for the Newly Diagnosed*, 2nd ed. New York: Marlowe and Co., 2007.

Bernstein, Richard K. *Dr. Bernstein's Diabetes Solution: The Complete Guide to Achieving Normal Blood Sugars,* rev. ed. New York: Little, Brown, 2007.

Foster, Daniel W. "Diabetes Mellitus." In *Harrison's Principles of Internal Medicine*. 17th ed. Edited by Anthony S. Fauci et al. New York: McGraw Hill, 2008.

Rubin, Alan L. *Diabetes for Dummies*. Indianapolis, IN: Wiley, 2005.

Shane McWhorter, Laura. *Complementary & Alternative Medicine (CAM) Supplement Use in People with Diabetes: A Clinician's Guide: Chemical Constituents, Mechanism of Action, Adverse Effects, and Drug Interactions for 36 Commonly Used Supplements*. Alexandria, VA: American Diabetes Association, 2007.

PERIODICALS

Alternative Therapies Magazine. PO Box 627, Holmes, PA 19043 9650. http://www.alternative therapies.com/.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960 http://www.amfoundation.org.

American Diabetes Association, 1701 North Beauregard Street, Alexandria, VA, 22311, (800) 342 2383 http://www.diabetes.org.

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600 http://www.eatright.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737 http://www.holisticmedicine.org.

Juvenile Diabetes Research Foundation International, 120 Wall Street, New York, NY, 10005 4001, (800) 533 2873 http://www.jdrf.org.

National Diabetes Information Clearinghouse, 1 Information Way, Bethesda, MD, 20892 3560, (800) 860 8747 http://diabetes.niddk.nih.gov.

National Institutes of Health. National Institute of Diabetes, Digestive, and Kidney Diseases., Building 31, Room 9A06, 31 Center Drive, MSC 2560, Bethesda, MD, 20892 2560, (301) 496 3583 http://www2.niddk.nih.gov.

Belinda Rowland
Teresa G. Odle
Tish Davidson, A. M.

Diamond diet

Definition

The Diamond diet, popularly known as the Fit for Life Program, is a way of eating designed to be employed as a health lifestyle. Developed by Harvey and Marilyn Diamond, it is a set of dietary principles intended to serve as a blueprint for habits that can easily become routine, allowing individuals to take control of their health.

Origins

Harvey Diamond was an ill and underweight child with chronic and painful stomach problems. As a young adult, his health problems continued as he became overweight. After experiencing the dieting merry-go-round of losing and regaining his weight, Diamond decided that dieting does not work and that he needed to learn how to best care for his body. In 1970, Diamond found his answer in the concept of natural hygiene, an approach to the care and upkeep of the body that focuses on prevention of disease and healthful living. As described by Diamond, the concept of natural hygiene teaches that the body is self-cleansing, self-healing, and self-maintaining. Healing powers are contained within the body itself. He states "the body is always striving for health and . . . achieves this by continuously cleansing itself of deleterious waste material." In combination with an overall healthful lifestyle of adequate rest, **exercise**, sunshine, **stress** management, and interpersonal relationships, understanding how food impacts this cleansing process allows individuals to eliminate the cause of their health problems.

Almost immediately upon Diamond's introduction to this concept, his lifelong stomach pains ceased. Within one month, he had lost 50 pounds (a loss he was able to maintain). Diamond became a proponent of natural hygiene and, in 1981, began a seminar program known as The Diamond Method. In 1983, he earned a doctorate in nutritional science from the American College of Health Science, a non-accredited college in Austin, Texas. It is the basic fundamentals of natural hygiene that Harvey and Marilyn Diamond synthesized into the dietary and lifestyle principles of the Fit for Life Program.

Benefits

Although popularly discussed as a weight loss program, Fit for Life is not a diet. True to the tenets of natural hygiene, the approach to eating laid out in the Fit for Life books is designed to provide for optimal body functioning by internal cleansing of illness-producing toxins. Although weight loss and energy enhancements are positive results, the underlying goal is cleansing. Disease, as understood in this approach, is "nothing more than the body's own effort to cleanse itself of toxins." These toxins are the products of metabolic imbalance, or toxemia, resulting from wastes. Dead cells, food residue, and additives build up in the bodies and cannot be eliminated at the same rate they are produced. Understanding and minimizing this level of toxemia is the key to healthy longevity. The dietary guidelines of the Fit for Life program are designed to generate a minimum of toxic food residue within the body and to enable the body to continuously expel the toxic waste that is produced. An additional intent is that the dietary guidelines incorporate good food and enjoyable meals rather than strict, hard-to-follow regimens. If the program is stopped for any reason, according to Diamond, it can be re-started with almost immediate results.

Description

The Fit for Life program places an emphasis not only on what foods are eaten, but also in what combinations and at what time of day those foods are eaten. Three general principles guide Diamond's hygienic approach to eating.

The Principle of High-Water-Content Food

Water is vital to cleansing the inside of the body of accumulated wastes. Consuming sufficient high-water-content foods, fruits, and vegetables is crucial to accomplish this cleansing. Unlike drinking water, the water found in fruits and vegetables provides for the transport of the nutrients found in those foods. It then flushes waste matter from the body.

The Principle of Proper Food Combining

According to this principle, foods should be eaten in combinations that are most compatible with

digestive chemistry. Otherwise, the food will remain in the stomach longer than it should and cause digestive problems. Proteins and starches should not be eaten together because the stomach cannot digest both efficiently at the same time. For optimal digestion, proteins should be combined with vegetables at mealtime or a starch combined with vegetables.

The Principle of the Correct Consumption of Fruit

Fruit should be fresh and ripe when eaten. It should be eaten alone on an empty stomach, not with or after anything else. The reason is that fruit requires no digestion in the stomach and should be able to pass through the stomach quickly to help the body in its **detoxification** efforts. Additionally, because fruit requires so little digestive energy, it should be eaten in the morning to best work with natural body cycles of food utilization and elimination. The body needs to spend its energy on proper cleansing during the morning hours rather than diverting crucial energy to digestive processes. According to Diamond, the most beneficial habit a person can develop is consuming exclusively fresh fruit and fresh fruit juice from awakening until noon.

Research and general acceptance

Proponents, including some **nutrition** and medical professionals, claim benefits include weight loss, improved energy, and overall better health from following the program. Medical doctors, including Edward Taub, an Assistant Clinical Professor at the University of California, Irvine, and Kay S. Lawrence, contributed to the first Fit for Life book. Critics contend that the principles of the program disagree with much established nutritional advice such as that provided by the American Dietetic Association (ADA). The regimen does not, for example, advocate weight loss by counting calories, recommend the basic food groups, or call to attention the health benefits of milk. Although the emphasis on fresh fruits and vegetables is generally seen as positive, it is also called extreme by some reviewers. Reviewers in nutritional publications have raised concerns about inadequate protein intake, the possibility of deficiencies in **calcium**, **zinc**, some B vitamins (notably **riboflavin** and **thiamine**), and **iron** deficiency **anemia**. Some nutritionists have also argued that rigorously following the Fit for Life dietary guidelines could lead to inadequate nutrition for the proper development of growing children or fetuses. Critical reviews range from Environmental Nutrition's assessment that the Fit for Life regimen is "probably not dangerous, [but] has the potential to be unhealthy and therefore is not recommended" to the position of J. Lynne Brown, Ph.D., R.D. that if "followed rigorously, it could lead to serious health problems." Diamond rebuffs his critics, ADA guidelines and nutritional advice in particular, calling for a broader understanding of science, a quest for truth and less emphasis on credentials which are, he argues, the way organizations such as the ADA maintain power over dissenting opinions.

Resources

BOOKS

Diamond, Harvey and Marilyn. *Fit for Life*. New York, Warner Books. 1985.
Diamond, Harvey and Marilyn. *Fit for Life II: Living Health*. New York, Warner Books. 1987.

PERIODICALS

Brown, J. Lynne. "Fit for Life." *Journal of Nutrition Education* (1986): 18, 6.
Kenny, James J. "Fit for Life." *Nutrition* (1986): 3, 8.

ORGANIZATIONS

American Dietetic Association. 216 Jackson Blvd., Chicago, Illinois 60606. (312) 899 0040. adaf@eatright.org. http://www.eatright.org.
American Natural Hygiene Society. P.O. Box 30630, Tampa, FL 33630. (813) 855 6607. anhs@anhs.org. http://www.anhs.org/index.html.

OTHER

Healthcare Reality Check. http://www.hcrc.org.
Quackwatch: Your guide to Health Fraud, Quackery, and Intelligent Decisions. http://www.quackwatch.com/index.html.

Kathy Stolley

Diaper rash

Definition

Dermatitis of the buttocks, genitals, lower abdomen, or thigh folds of an infant or toddler is commonly referred to as diaper rash.

Description

The outside layer of skin normally forms a protective barrier that prevents infection. One of the primary causes of dermatitis in the diaper area is prolonged skin contact with wetness. Under these circumstances, natural oils are stripped away, the outer layer of skin is damaged, and there is increased susceptibility to infection by bacteria or yeast.

Male baby with severe diaper rash. *(Custom Medical Stock Photo. Reproduced by permission.)*

Diaper rash is a term that covers a broad variety of skin conditions that occur on the same area of the body. Some babies are more prone to diaper rash than others.

Causes and symptoms

Frequently, a flat, red rash is caused by simple chafing of the diaper against tender skin, initiating a friction rash. This type of rash is not seen in the skin folds. It may be more pronounced around the edges of the diaper, at the waist and leg bands. The baby generally does not appear to experience much discomfort. Sometimes the chemicals or detergents in the diaper are contributing factors and may result in **contact dermatitis**. These **rashes** should clear up easily with proper attention. Ignoring the condition may lead to a secondary infection that is more difficult to resolve.

Friction of skin against itself can cause a rash in the baby's skin folds, called intertrigo. This rash appears as reddened areas that may ooze, and is often uncomfortable when the diaper is wet. Intertrigo can also be found on other areas of the body where there are deep skin folds that tend to trap moisture.

Seborrheic dermatitis is the diaper area equivalent of **cradle cap**. It is scaly and greasy in appearance and may be worse in the folds of the skin.

Yeast, or candidal dermatitis, is the most common infectious cause of diaper rash. The affected areas are raised and quite red with distinct borders, and satellite lesions may occur around the edges. Yeast is part of the normal skin flora, and is often an opportunistic invader when simple diaper rash is untreated. It is particularly common after treatment with antibiotics, which kill the good bacteria that normally keep the yeast population in check. Usual treatments for diaper rash will not clear it up. Repeated or difficult to resolve episodes of **yeast infection** may warrant further medical attention, since this is sometimes associated with diabetes or immune problems.

KEY TERMS

Dermatitis—Inflammation of the skin.

Another infectious cause of diaper rash is **impetigo**. This bacterial infection is characterized by **blisters** that ooze and crust.

Diagnosis

The presence of skin lesions in the diaper area means that the baby has diaper rash. However, there are several types of rash that may require specific treatment in order to heal. It is useful to be able to distinguish them by appearance.

A baby with a rash that does not clear up within two to three days, or a rash with blisters or bleeding, should be seen by a healthcare professional for further evaluation.

Treatment

Good diaper hygiene will prevent or clear up many simple cases of diaper rash. Diapers should be checked very frequently and changed as soon as they are wet or soiled. Good air circulation is also important for healthy skin. Babies should have some time without wearing a diaper, and a waterproof pad can be used to protect the bed or other surface. Rubber pants, or other occlusive fabrics, should not be used over the diaper area. Some cloth-like disposable diapers promote better air circulation than plastic-type diapers. It may be necessary for mothers to experiment with diaper types to see if the baby's skin reacts better to cloth or disposable ones. If disposable diapers are used, the baby's skin may react differently to various brands. If the baby is wearing cloth diapers, they should be washed in a mild detergent and double rinsed.

The diaper area should be cleaned with something mild, even plain water. Some wipes contain alcohol or chemicals that can be irritating for some babies. Plain water may be the best cleansing substance when there is a rash. Using warm water in a spray bottle (or giving a quick bath) and then lightly patting the skin dry can produce less skin trauma than using wipes. In the event of suspected yeast, a tablespoon of cider vinegar can be added to a cup of warm water and used as a cleansing solution. This is dilute enough that it should

not burn, but acidifies the skin pH enough to hamper the yeast growth.

Barrier ointments can be valuable to treat rashes. Those that contain zinc oxide are especially effective. These creams and ointments protect already irritated skin from the additional insult of urine and stool, particularly if the baby has **diarrhea**. Cornstarch powder may be used on rashes that are moist, such as impetigo.

Nutrition

What the baby eats can make a difference in stool frequency and acidity. Typically, breast-fed babies will have fewer problems with rashes. When adding a new food to the diet, the baby should be observed closely to see whether rashes are produced around the baby's mouth or anus. If this occurs, the new food should be discontinued.

Babies who are taking antibiotics are more likely to get rashes due to yeast. To help bring the good bacterial counts back to normal, *Lactobacillus bifidus* can be added to the diet. It is available in powder form from most health food stores.

Herbal treatment

Some herbal preparations can be useful for diaper rash. **Calendula** reduces inflammation, tightens tissues, and disinfects. It has been recommended for seborrheic dermatitis as well as for general inflammation of the skin. The ointment should be applied at each diaper change. **Chickweed** ointment can also be soothing for irritated skin and may be applied once or twice daily.

Allopathic treatment

Antibiotics are generally prescribed for rashes caused by bacteria, particularly impetigo. This may be a topical or oral formulation, depending on the size of the area involved and the severity of the infection.

Over-the-counter antifungal creams, such as Lotrimin, are often recommended to treat a rash resulting from yeast. If topical treatment is not effective, an oral antifungal may be prescribed.

Mild steroid creams, such as 0.5-1% hydrocortisone, can be used for seborrheic dermatitis and sometimes intertrigo. Prescription strength creams may be needed for short-term treatment of more stubborn cases.

Expected results

Treated appropriately, diaper rash will resolve fairly quickly if there is no underlying health problem or skin disease.

Prevention

Frequent diaper changes are important to keep the skin dry and healthy. Application of powders and ointments is not necessary when there is no rash. Finding the best combination of cleansing and diapering products for the individual baby will also help to prevent diaper rash.

Resources

BOOKS

Eisenberg, Arlene, Heidi Murkoff, and Sandee Hathaway. *What to Expect the First Year*. New York: Workman Publishing, 1989.

Sears, William, and Martha Sears. *The Baby Book*. Boston: Little, Brown and Company, 1993.

OTHER

Greene, Alan. "Diaper Rash." *Dr. Greene's HouseCalls* http://drgreene.com/960430.asp. (1996).

Judith Turner

Diarrhea

Definition

To most persons, diarrhea means an increased frequency or softer consistency of bowel movements. The medical definition specifies that diarrhea correlates with an increase in stool weight; stool weights above 300 g per day generally indicate diarrhea. This is mainly due to excess water, which normally makes up 60 to 85% of fecal matter. In this way, true diarrhea is distinguished from diseases that cause only an increase in the number of bowel movements (hyperdefecation) or incontinence (involuntary loss of bowel contents).

Diarrhea is also classified by physicians into acute, which lasts one to two weeks, and chronic, which continues for longer than 23 weeks. Viral and bacterial **infections** are the most common causes of acute diarrhea.

Description

In many cases, acute infectious diarrhea is a mild, limited annoyance. However, acute infectious diarrhea has a huge impact worldwide, causing more than five million deaths per year. While most deaths are among children under five years of age in developing nations, the impact, even in developed countries, is considerable. For example, over 250,000 persons are admitted to hospitals in the United States each year

Causes of diarrhea

Causes	Examples
Viral infections	Rotavirus, Norwalk virus
Bacterial infections	*E. coli, Vibrio cholerae, Campylobacter, Shigella*
Parasites	*Giardia, Entamoeba*
Helminths (intestinal worms)	Strongyloides
Allergic	Lactose intolerance, celiac sprue, medication side effects
Autoimmune	Ulcerative colitis, Crohn's disease
Malabsorptive	Pancreatic deficiency, biliary disease
Nutritional	Zinc deficiency, vitamin A deficiency, enteral feedings consisting of liquid nutritional formulas delivered straight to the bowels
Functional	Irritable bowel syndrome, short bowel syndrome, cancer

(Illustration by GGS Information Services. Cengage Learning, Gale)

because of diarrhea. Rapid diagnosis and proper treatment can prevent much of the suffering associated with this illness.

Chronic diarrhea also has a considerable effect on health, as well as on social and economic well being. Patients with **celiac disease**, **inflammatory bowel disease**, and other prolonged diarrheal illnesses develop nutritional deficiencies, which diminish growth and immunity. They affect social interaction and result in the loss of many working hours.

Causes and symptoms

Diarrhea occurs because more fluid passes through the large intestine (colon) than can be absorbed. As a rule, the colon can absorb several times more fluid than is required on a daily basis. However, when this reserve capacity is overwhelmed, diarrhea occurs.

Diarrhea is caused by infections or illnesses that either lead to excess production of fluids or prevent absorption of fluids. Also, certain substances in the colon, such as fats and bile acids, can interfere with water absorption and cause diarrhea. In addition, rapid passage of material through the colon can cause diarrhea.

Symptoms related to diarrheal illness are often those associated with any injury to the gastrointestinal tract, such as **fever**, **nausea**, **vomiting**, and abdominal **pain**. All or none of these may be present depending on the cause of diarrhea. The number of bowel movements can vary with up to 20 or more per day. In some patients, blood or pus is present in the stool. Bowel movements may contain undigested food material.

The most common causes of acute diarrhea are infections (the cause of traveler's diarrhea), **food poisoning**, and medications. Medications are a frequent and often overlooked cause, especially antibiotics and antacids. Both prescription and over-the-counter medications can contain additives, such as lactose and sorbitol, that will produce diarrhea in sensitive persons. Less often, various sugar-free foods, which sometimes contain poorly absorbable materials, cause diarrhea. Review of **allergies** or skin changes may also point to a cause.

Rotavirus is a common cause of diarrhea in children. A study performed at the Baylor College of Medicine in Houston, Texas, found that children who have rotavirus in their intestine have a high likelihood of the presence of the disease in their bloodstream.

Chronic diarrhea is frequently due to many of the same conditions that cause the shorter episodes (e.g., infections, medications); symptoms just last longer. Some infections can become chronic. This occurs mainly with **parasitic infections** (such as *Giardia*) or in cases in which patients have altered immunity (such as **AIDS**).

The following are the more usual causes of chronic diarrhea:

- AIDS
- colon cancer and other bowel tumors
- endocrine or hormonal abnormalities (e.g., thyroid, diabetes mellitus)
- food allergy
- inflammatory bowel disease, or IBD (Crohn's disease and ulcerative colitis)
- lactose intolerance
- malabsorption syndromes (celiac and Whipple's disease)
- other (alcohol, microscopic colitis, radiation, surgery)

Complications

The major effects of diarrhea are dehydration, malnutrition, and weight loss. Signs of dehydration can be hard to notice but include thirst, **dry mouth**, weakness or lightheadedness (particularly if worsening on standing), urine darkening, or a decrease in urination. Severe dehydration leads to changes in the body's chemistry and could become life-threatening. Dehydration from diarrhea can result in kidney failure, neurological symptoms, arthritis, and skin problems. Dehydration in chronic diarrhea, such as that associated with inflammatory bowel disease, increases a person's risk for **kidney stones**.

Diagnosis

Most cases of acute diarrhea never need diagnosis or treatment, as many are mild and produce few problems. Patients with fever over 102°F (38.9°C), signs of dehydration, bloody bowel movements, severe abdominal pain, known immune disease, or recent use of antibiotics need prompt medical evaluation.

When diagnostic studies are needed, the most useful are stool culture and examination for parasites; however, these are often negative and a cause cannot be found in a large number of patients. The earlier cultures are performed, the greater the chance of obtaining a positive result. Stool samples of patients who had used antibiotics in the preceding two months need to be examined for the toxins that cause antibiotic-associated **colitis**. Tests are also available to check stool samples for microscopic amounts of blood and for cells that indicate severe inflammation of the colon. Examination with an endoscope is sometimes helpful in determining severity and extent of inflammation. Tests to check changes in blood chemistry (e.g., **potassium**, **magnesium**) and a complete blood count (CBC) may be performed.

Chronic diarrhea is quite different, and most patients with this condition will receive some degree of testing. Many exams are the same as for an acute episode, as some infections and parasites cause both types of diarrhea. A careful history to evaluate medication use, dietary changes, family history of illnesses, and other symptoms is necessary. Key points in determining the seriousness of symptoms are weight loss of over 10 lb (4.5 kg), blood in the stool, and nocturnal diarrhea (symptoms that awaken the patient from sleep). A combination of stool, blood, and urine tests may be needed in the evaluation of chronic diarrhea; in addition a number of endoscopic and x-ray studies are frequently required.

In some cases, appendectomy leads to a diagnosis of inflammatory bowel disease. The specimen removed during the procedure may contain signs of the disorder and may be the first clue that a patient has IBD.

Treatment

Diet

Treatment is ideally directed toward correcting the cause; however, the first aim is to prevent or treat dehydration and nutritional deficiencies. When possible, food intake should be continued even in patients with acute diarrhea. A physician should be consulted as to what type and how much food is permitted. Low-fat **diets** or more easily digestible fat is useful in some patients. The BRAT diet, which limits food intake to bananas, rice, applesauce, and toast, can help to resolve diarrhea. These foods provide soluble and insoluble fiber without irritation. If the toast is slightly burnt, the charcoal can help sequester toxins and pull them from the body.

The patient should drink plenty of fluids; however, in severe cases hospitalization to provide intravenous fluids may be necessary. A physician should be notified if the patient is dehydrated, and if oral replacement is suggested then commercial (Pedialyte and others) or homemade preparations can be used. The World Health Organization (WHO) has provided this easy recipe for home preparation, which can be taken in frequent small sips:

- table salt: 3/4 teaspoon
- baking powder: 1 teaspoon
- orange juice: 1 cup
- water: 1 quart or liter.

Supplements

Nutrient replacement also plays a role in preventing and treating diarrhea. **Zinc** especially appears to have an effect on the immune system, and deficiency of this mineral can lead to chronic diarrhea. Also, zinc replacement improves growth in young patients.

Dietary supplements that are generally beneficial in the treatment of digestive disorders include the following:

- vitamin C: 50-500 mg daily
- vitamin B_6: 50 to 150 mg daily
- magnesium aspartate: 400 mg daily
- vitamin E: 400 IU daily
- glutamine: 3,000 mg daily
- garlic, deodorized: 2,000 mg daily
- deghycirrhizinated licorice: chew as needed

Studies conducted at the Children's Hospital Oakland Research Institute (Oakland, California) and at the Heinrich Heine University (Dusseldorf, Germany), found that cocoa flavonoids in dark chocolate can limit the amount of fluid in the intestine, possibly relieving diarrhea. More research in the area was needed as of 2008; however, scientists noted that using chocolate as a diarrhea treatment dates back hundreds of years, although the mechanism was not known.

Probiotics

Probiotics refers to treatment with beneficial microbes either by ingestion or from a suppository. Studies and the clinical use of probiotics have shown

their utility in the resolution of diarrhea, especially antibiotic-associated diarrhea. Beneficial microbes include the bacteria *Lactobacillus acidophilus* and *L. bifidus* and the yeast *Saccharomyces boulardii*. To treat diarrhea, the patient can eat one cup of yogurt (containing active *Lactobacillus acidophilus* cultures) daily. Alternatively, one or two **acidophilus** capsules may be taken at each meal or at bedtime.

Researchers at Ohio State University found that treatment with probiotics lessened the chance of diarrhea in persons taking antibiotics. In the study, diarrhea was experienced by 20% of individuals not taking the probiotics. Only 8% of individuals taking probiotics had diarrhea.

Acupuncture

Shallow **acupuncture**, when the needles are inserted superficially and rapidly removed, was more therapeutic than drugs in children with acute or chronic diarrhea. In another study, acupuncture eliminated symptoms and normalized stools in children with chronic diarrhea who had not responded to conventional or Chinese medicines.

Herbals and Chinese medicines

Herbal remedies for diarrhea include meadowsweet, **goldenseal**, and **chamomile** taken as an infusion throughout the day.

Chinese patent medicines used for treating diarrhea include the following:

- Xiang Sha Liu Jun Wan (Six-Gentlemen Pill with Aucklandia and Amomum)
- Fu Zi Li Zhong Wan (Prepared Aconite Pill to Regulate the Middle)
- Si Shen Wan (Four-Miracle Pill)
- Wu Mei Wan (Mume Pill)
- Jian Pi Wan (Strengthen the Spleen Pill)
- Shen Ling Bai Zhu Wan (Ginseng, Poria, and Atractylodes Macrocephala Pill)

Allopathic treatment

Anti-motility agents, such as loperamide (Imodium AD) and diphenoxylate are useful for persons with chronic diarrhea; their use is limited or even contraindicated in patients with acute diarrhea, especially in those with high fever or bloody bowel movements. They should not be taken without the advice of a physician. Other treatments that are available, depending on the cause of diarrhea, include the bulk agent **psyllium** and the binder cholestyramine. Also, new antidiarrheal drugs that decrease excessive secretion of fluid by the intestinal tract are available.

A University of Tennessee study found promising results in treating certain types of traveler's diarrhea with the antibiotic Rifximin (Xafaxan). In the study, travelers to Mexico and Kenya who experienced traveler's diarrhea reduced the duration of the loose stools. The drug was found to be effective for certain strains of *E. coli* but is not effective if fever is present or if the stool contains blood.

KEY TERMS

Anti-motility medications—Medications such as loperamide (Imodium), diphenoxylate (Lomotil), or medications containing codeine or narcotics that decrease the ability of the intestine to contract. These can worsen the condition of a patient with dysentery or colitis.

Colitis—Inflammation of the colon.

Endoscope—A thin flexible tube with a lens or miniature camera that allows a doctor to view various internal organs, including the gastrointestinal tract. Both diagnosis and therapeutic procedures can be done with this instrument.

Endoscopy—The performance of an exam using an endoscope.

Lactose intolerance—An inability to properly digest milk and dairy products.

Probiotics—The use of beneficial microbes to treat various diseases, including diarrhea.

Rotavirus—The primary infectious cause of diarrhea in infants and children.

Expected results

Prognosis is related to the cause of the diarrhea; for most individuals in developed countries, a bout of acute, infectious diarrhea is at best uncomfortable. However, in both industrialized and developing areas, serious complications and death can occur.

Prevention

Proper hygiene and food handling techniques will prevent many cases. Traveler's diarrhea can be avoided by use of Pepto-Bismol and/or antibiotics, if necessary. The most important action is to prevent dehydration.

Resources

BOOKS

Miskovitz, Paul, and Marian Betancourt. *The Doctor's Guide to Gastrointestinal Health: Preventing and Treating Acid Reflux, Ulcers, Irritable Bowel Syndrome, Diverticulitis, Celiac Disease, Colon . . . Pancreatitis, Cirrhosis, Hernias and More*. Hoboken, NJ: Wiley, 2005.

PERIODICALS

Keenum, Amy, and M. David Stockton. "Rifaximin (Xifaxan) for Traveler's Diarrhea." *American Family Physician* 71, no. 11 (June 1, 2005): 2095 2107.

Schuier, Maximilian, et al. "Cocoa Related Flavonoids Inhibit CFTR Mediated Chloride Transport across T84 Human Colon Epithelia." *Journal of Nutrition* 135 (October 2005): 2320 2325.

OTHER

"Rotavirus Can Spread Beyond the Intestine." *ScienceDaily*. (April 17, 2007). http://www.sciencedaily.com/releases/2007/04/070417073806.htm. (April 6, 2008).

ORGANIZATIONS

World Health Organization (WHO), CH 1211, Geneva 27, Switzerland, +41 22 791 2111 http://www.who.ch.

Belinda Rowland
Rhonda Cloos, R.N.

It was once planned to erect diathermy machines like the one in this photo in New York in 1946. In diathermy, high-frequency electrical currents are used to heat deep muscular tissues. *(Black Star / Alamy)*

Diathermy

Definition

In diathermy, high-frequency electrical currents are used to heat deep muscular tissues. The heat increases blood flow, speeding up recovery. Doctors also use diathermy in surgical procedures by sealing blood vessels with electrically heated probes.

The term diathermy is derived from the Greek words *therma,* meaning heat, and *dia,* meaning through. Diathermy literally means heating through.

Origins

The therapeutic effects of heat have long been recognized. More than 2,000 years ago, the Romans took advantage of heat therapies by building hot-spring bathhouses. Since then, various methods of using heat have evolved. In the early 1890s, French physiologist Arséne d'Arsonval began studying the medical application of high-frequency currents. The term diathermy was coined by German physician Carl Franz Nagelschmidt, who designed a prototype apparatus in 1906. Around 1925, United States doctor J. W. Schereschewsky began studying the physiological effects of high-frequency electrical currents on animals. It was several years, however, before the fundamentals of the therapy were understood and put into practice.

Benefits

Diathermy can be used to treat arthritis, **bursitis**, and other conditions involving stiff, painful joints. It is also used to treat pelvic **infections** and sinusitis. A benefit of diathermy is that it is a painless procedure that can be administered at a clinic. Also, if the treatment relieves **pain**, then patients can discontinue pain killers and escape their high cost and side effects.

Description

Diathermy involves heating deep muscular tissues. When heat is applied to the painful area, cellular metabolism speeds up and blood flow increases. The increased metabolism and circulation accelerates tissue repair. The heat helps the tissues relax and stretch, thus alleviating stiffness. Heat also reduces nerve fiber sensitivity, increasing the patient's pain threshold.

KEY TERMS

Bursitis—Pain and swelling in a joint, often the elbow, hip, knee or shoulder. In bursitis, the bursa (a sac-like membrane that acts as a pillow between the bones and tissues) becomes inflamed.

Capacitor plates—An apparatus that can carry electricity and stores an electrical charge.

Hemophilia—A blood-clotting disorder that can lead to serious hemorrhage from minor cuts and injuries.

There are three methods of diathermy. In each, energy is delivered to the deep tissues, where it is converted to heat. The three methods are:

- Shortwave diathermy. The body part to be treated is placed between two capacitor plates. Heat is generated as the high-frequency waves travel through the body tissues between the plates. Shortwave diathermy is most often used to treat areas like the hip, which is covered with a dense tissue mass. It is also used to treat pelvic infections and sinusitis. The treatment reduces inflammation. The Federal Communications Commission regulates the frequency allowed for short-wave diathermy treatment. Most machines function at 27.33 megahertz.
- Ultrasound diathermy. In this method, high-frequency acoustic vibrations are used to generate heat in deep tissue.
- Microwave diathermy. This method uses radar waves to heat tissue. This form is the easiest to use, but the microwaves cannot penetrate deep muscles.

Diathermy is also used in surgical procedures. Many doctors use electrically heated probes to seal blood vessels to prevent excessive bleeding. This is particularly helpful in neurosurgery and eye surgery. Doctors can also use diathermy to kill abnormal growths, such as tumors, **warts**, and infected tissues.

Preparations

To keep patients from sweating, patients are usually asked to remove clothing from the body part being treated. If a patient sweats, the electrical currents may pool in the area, causing **burns**. Also, clothing containing metal must be removed, as must earrings, buttons, barrettes, or zippers that contain metal. Watches and hearing aids should be removed because the therapy may affect their function.

Practitioners of surgical diathermy should steer clear of alcohol-based solutions to prepare and cleanse the skin. These preparations can create a flammable vapor and cause burns and fires.

Precautions

Patients with metal implants should not undergo diathermy treatment because the metal can act as a conductor of heat and result in serious internal burns. Female patients with metallic uterine implants, such as an IUD, should avoid treatment in the pelvic area. Diathermy should not be used in joints that have been replaced with a prosthesis or in those with sensory impairment who may not be able to tell if they are burning. Furthermore, pulsed shortwave diathermy should be avoided during **pregnancy**, as it can lead to abnormal fetal development.

Patients with hemophilia should avoid the treatment because the increased blood flow could cause them to hemorrhage.

Side effects

Some patients may experience superficial burns. Since the therapy involves creating heat, care must be taken to avoid burns, particularly in patients whose injuries have caused decreased sensitivity to heat. Also, diathermy may affect pacemaker function.

Female patients who receive treatment in the lower back or pelvic area may experience an increased menstrual flow.

Research and general acceptance

For years, physiotherapists and physical therapists have used diathermy as a routine part of physical rehabilitation.

Training and certification

It is recommended that those who treat patients with diathermy complete a course in shortwave therapy and should retake courses every five years to stay updated on procedures. Physiotherapists should also stay updated by reading appropriate medical journals.

Resources

BOOKS

Magill's Medical Guide. Englewood Cliffs, NJ: Salem Press Inc., 1998.

The Merck Manual. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

Michlovitz, Susan L. *Thermal Agents in Rehabilitation*. Philadelphia: F.A. Davis Company, 1996.

Thom, Harald. *Introduction to Shortwave and Microwave Therapy*. Springfield, IL: Charles C. Thomas, 1966.

OTHER

"Diathermy." *Surgical tutor.org.uk*. http://www.surgicaltutor.org.uk/core/preop1/diathermy.htm. (19 June 2000).

Lisa Frick

Diets

Definition

Humans may alter their usual eating habits for many reasons, including weight loss, disease prevention or treatment, removing toxins from the body, or to achieve a general improvement in physical and mental health. Others adopt special diets for religious reasons. In the case of some vegetarians and vegans, dietary changes are made out of ethical concerns for the rights of animals.

Origins

The practice of altering diet for special reasons has existed since antiquity. For example, Judaism has included numerous dietary restrictions for thousands of years. One ancient Jewish sect, the Essenes, is said to have developed a primitive **detoxification** diet aimed at preparing the bodies, minds, and spirits of its members for the coming of a "messiah" who would deliver them from their Roman captors. Preventative and therapeutic diets became quite popular during the late twentieth century. Books promoting the latest dietary plan continue to make the bestseller lists, although not all of the information given is considered authoritative.

Benefits

People who are moderately to severely overweight can derive substantial health benefits from a weight-loss diet. A weight reduction of just 10 to 20 lbs (5-10 kg) can result in reduced **cholesterol** levels and lower blood pressure. Weight-related health problems include **heart disease**, diabetes, high blood pressure, and high levels of blood sugar and cholesterol.

In individuals who are not overweight, dietary changes may also be useful in the prevention or treatment of a range of ailments including acquired immunodeficiency syndrome (**AIDS**), **cancer**, **osteoporosis**, **inflammatory bowel disease**, chronic pulmonary disease, renal disease, **Parkinson's disease**, seizure disorders, and food **allergies** and intolerances.

Description

The idea of a healthful diet is to provide all of the calories and nutrients needed by the body for optimal performance, at the same time ensuring that neither nutritional deficiencies nor excesses occur. Diet plans that claim to accomplish those objectives are so numerous they are virtually uncountable. These diets employ a variety of approaches, including the following:

- Fixed-menu: Offers little choice to the dieter. Specifies exactly which foods will be consumed. Easy to follow, but may be considered "boring" to some dieters.
- Formula: Replaces some or all meals with a nutritionally balanced liquid formula or powder.
- Exchange-type: Allows the dieter to choose between selected foods from each food group.
- Flexible: Doesn't concern itself with the overall diet, simply with one aspect such as fat or energy.

Diets may also be classified according to the types of foods they allow. For example, an omnivorous diet consists of both animal and plant foods, whereas a lacto-ovo-vegetarian diet permits no animal flesh, but does include eggs, milk, and dairy products. A vegan diet is a stricter form of **vegetarianism** in which eggs, cheese, and other milk products are prohibited.

A third way of classifying diets is according to their purpose: religious, weight-loss, detoxification, lifestyle-related, or aimed at prevention or treatment of a specific disease.

Precautions

Dieters should be cautious about plans that severely restrict the size of food portions, or that eliminate entire food groups from the diet. It is highly probable that they will become discouraged and drop out of such programs. The best diet is one that can be maintained indefinitely without ill effects, that offers sufficient variety and balance to provide everything needed for good health, and that is considerate of personal food preferences.

Fad diets for quick weight loss are coming under increasing fire, since dieters seldom maintain the weight loss. In 2001, researchers found that three times as many people on moderate fat weight loss diets stuck to their plan compared to those on traditional low-fat diets. Not only do many diets offer only short-term and rapid weight loss, some can be bad for the dieter's health. For instance, the American Heart Association made a statement in late 2001 questioning

Unhealthy food additives

Name	Description	Example products
Aspartame	An artificial sweetener associated with rashes, headaches, dizziness, depression, and insomnia, and can also affect calcium metabolism	Diet sodas, sugar substitutes, gelatin desserts, low-calorie frozen desserts, etc.
Brominated vegetable oil (BVO)	Used as an emulsifier and clouding agent. Its main ingredient, bromate, is a poison.	Sodas, etc.
Butylated hydroxyanisole (BHA)/butylated hydroxytoluene (BHT)	Prevents rancidity in foods and is added to food packagings. It slows the transfer of nerve impulses, effects sleep, aggressiveness and weight in test animals, and may be carcinogenic.	Cereals, cheese packaging, chewing gum, potato chips, oils, etc.
Citrus red dye #2	Used to color the skin of oranges, it is a probable carcinogen. The FDA has recommended it to be banned.	Oranges
Monosodium glutamate (MSG)	A flavor enhancer that can cause headaches, heart palpitations and nausea.	Restaurant and fast food, processed and packaged food
Nitrates	Used as preservatives, nitrates form cancer-causing compounds in the gastrointestinal tract and have been associated with cancer and birth defects.	Cured meats and wine
Saccharin	An artificial sweetener that may be carcinogenic.	Diet sodas and sugar substitutes
Sulfites	Used as a food preservative, sulfites have been linked to at least four deaths reported to the FDA in the United States. They destroy vitamin B-1, and can also cause severe allergic reactions, especially in asthmatics.	Dried fruits, shrimp, frozen potatoes, and wine
Tertiary butyhydroquinone (TBHQ)	It is extremely toxic in low doses and has been linked to childhood behavioral problems.	Candy bars, baking sprays, butter/ margarine blends and other animal fats, and fast foods
Yellow dye #6	Increases the number of kidney and adrenal gland tumors in lab rats. It has been banned in Norway and Sweden.	Candy, sodas, gelatin, baked goods, and sausages

(Illustration by Corey Light. Cengage Learning, Gale)

the value of high-protein, low-carbohydrate diets. The association said that the diets do not work over the long term and that they can pose some health risks to dieters. In 2003, these statements were largely supported. Though clinical trials showed that these types of diets worked in lowering weight without raising cholesterol for the short-term, many of the participants gained a percentage of the weight back after only one year. A physician group also spoke out about high protein diets' dangers for people with decreased kidney function and the risk of bone loss due to decreased **calcium** intake.

Low-fat diets are not recommended for children under the age of two. Young children need extra fat to maintain their active, growing bodies. Fat intake may be gradually reduced between the ages of two and five, after which it should be limited to a maximum of 30% of total calories through adulthood. Saturated fat should be restricted to no more than 10% of total calories.

Weight-loss dieters should be wary of the "yo-yo" effect that occurs when numerous attempts are made to reduce weight using high-risk, quick-fix diets. This continued "cycling" between weight loss and weight gain can slow the basal metabolic rate and can sometimes lead to eating disorders. The dieter may become discouraged and frustrated by this success/failure cycle. The end result of yo-yo dieting is that it becomes more difficult to maintain a healthy weight.

Caution should also be exercised about weight-loss diets that require continued purchases of special prepackaged foods. Not only do these tend to be costly and over-processed, they may also prevent dieters from learning the food-selection and preparation skills essential to maintenance of weight loss. Further, dieters should consider whether they want to carry these special foods to work, restaurants, or homes of friends.

Concern has been expressed about weight-loss diet plans that do not include **exercise**, considered essential to long-term weight management. Some diets and supplements may be inadvisable for patients with special conditions or situations. In fact, use of the weight loss supplement **ephedra** was found to cause serious conditions such as **heart attack** and **stroke**. In 2004, the U.S. Food and Drug Administration (FDA) banned the sale of supplements containing ephedra. In short, most physician organizations see fad diets as distracting from learning how to achieve weight control over the long term through healthy lifestyle changes such as eating smaller, more balanced meals and exercising regularly.

Certain fad diets purporting to be official diets of groups such as the American Heart Association and the Mayo Clinic are in no way endorsed by those institutions. Patients thinking of starting such a diet should check with the institution to ensure its name has not been misappropriated by an unscrupulous practitioner.

Side effects

A wide range of side effects (some quite serious) can result from special diets, especially those that are nutritionally unbalanced. Further problems can arise if the dieter is taking high doses of dietary supplements. Food is essential to life, and improper **nutrition** can result in serious illness or death.

Research and general acceptance

It is agreed among traditional and complementary practitioners that many patients could substantially benefit from improved eating habits. Specialized diets have proved effective against a wide variety of conditions and diseases. However, dozens of unproved but widely publicized "fad diets" emerge each year, prompting widespread concerns about their usefulness, cost to the consumer, and their safety.

Training and certification

A wide variety of practitioners provide advice on dietary matters. These range from unregulated, uncertified alternative practitioners, to registered dietitians, medical doctors, and specialists. Nutritional advice can also be obtained from home economists and from college or university nutrition departments.

Resources

PERIODICALS

"American College of Preventive Medicine Weighs in Against Fad Diets." *Obesity and Diabetes Week* (March 17, 2003): 7.

"Atkins Diet Vindicated But Long term Success Question able." *Obesity, Fitness and Wellness Week* (June 14, 2003): 25.

Cerrato, Paul C. "AHA Questions High protein Weight loss Diets." *Contemporary OB/GYN* 46, no. 12 (December 2001): 107 112.

"Healthy Fat Superior to Low fat Diet for Long term Weight Loss." *Obesity, Fitness and Wellness Week* (November 10, 2001): 2.

"High protein Diets Risky for Bones and Kidneys." *Health Science* (Spring 2003): 9.

Kirn, Timothy F. "FDA Probes Ephedra, Proposes Warn ing Label (Risk of Heart Attack, Seizure, Stroke)." *Clinical Psychiatry News* (April 2003): 49.

ORGANIZATIONS

American Dietetic Association. 216 West Jackson Blvd., Chicago, IL 60606 6995. (312) 899 0040. http://www.eatright.org.

David Helwig
Teresa G. Odle

Digestive enzymes

Description

Enzymes are catalysts for virtually every biological and chemical reaction in the body, and digestive enzymes are crucial for the breakdown of food into nutrients that the body can absorb. Digestive enzymes, among which are a variety are herbs, are used to treat a number of digestive problems and other conditions.

General use

Digestive enzymes are used for relief of a number of digestive symptoms and conditions:

- flatulence
- heartburn
- diarrhea
- spasms
- inflammation
- constipation
- gastroesophageal reflux
- peptic ulcers
- indigestion
- age-related digestive problems

Digestive enzymes also may be used to treat and to provide relief to other conditions, such as anorexia, **Crohn's disease**, ulcerative **colitis**, **parasitic infections**, cystic fibrosis, and **pancreatitis**. Potential systemic benefits of digestive enzymes include increasing healing and reducing water retention after surgery, reducing inflammation, enhancing the immune system, and reducing the risk of malnutrition. **Enzyme therapy** also has been shown to reduce the adverse effects of radiotherapy and chemotherapy in **cancer** treatment due to its anti-inflammatory properties.

In Europe, supplemental oral enzymes have been used as substitutes for nonsteroidal anti-inflammatory drugs to treat inflammation-related conditions such as **osteoarthritis** and **rheumatoid arthritis**.

Preparations

Pancreatin, also called pancreatinum, is an animal-based enzyme mixture of several enzymes released by the pancreas, including *proteases* to break down proteins into **amino acids**; *amylase* to break down complex carbohydrates; and *lipase* to break down lipids (fats). Pancreatin has been shown to reduce bloating, **gas**, and the feeling of fullness, particularly after eating high-fat meals.

Lactase aids the digestion of lactose (milk sugar found in dairy products) when taken just before eating lactose-containing foods. Lactase supplements are available over-the-counter in caplet and chewable tablet form and are commonly used to treat lactose intolerance. Two common brands are Lactaid and Lactrase. A variety of lactose-reduced products, such as Lactaid and Dairy Ease, are available at many grocery stores.

Beano is an over-the-counter dietary supplement that can help prevent gas by aiding the digestion of the gas-producing sugars in complex carbohydrates that are found in beans and many vegetables. The supplement is available in liquid and tablet form, and the recommended dose is five drops or one tablet taken just before eating.

Herbal preparations

Carminative herbs are considered to be mild and are rich in volatile oils, which have antibacterial properties. These herbs include **peppermint** (*Mentha spicata*), **ginger** (*Zingiber officinale*), **fennel** (*Foeniculum vulgare*), **anise** (*Pimpinella anisum*), and **lemon balm** (*Melissa officinalis*). Carminative herbs help to stimulate peristalsis, which is the wave-like action that pushes food through the digestive tract. These herbs can also help to relax the smooth muscle of the digestive tract, helping to reduce spasms. The antibacterial properties of the volatile oils aid in reducing gas pains that result from bacteria in the intestines acting on pieces of food that have not been digested fully.

Peppermint is one of the oldest medicinal herbs. Peppermint has three major actions in the body: it reduces **nausea** and **vomiting**, it encourages the liver to produce bile, and it clears the stomach of imbalanced bacteria. It is particularly useful for treating spastic colon, **irritable bowel syndrome**, and **diarrhea**. Peppermint is also useful for reducing gas **pain** and **indigestion**.

Demulcent herbs can help ease **heartburn**, another bothersome digestive condition. These herbs are rich in mucilage, soothing irritated or inflamed

tissue. Examples of demulcent herbs are **marsh mallow** root (*Althaea officinalis*), Irish moss (*Chondrus crispus*), and **slippery elm** (*Ulmus rubra*).

Herbs, known as **bitters**, can relieve **constipation** and assist the stomach in acid digestion. Bitter herbs stimulate bile production, and bile is the body's natural laxative. Taking bitters in a capsule or pill form will not work because in order for the liver to produce bile, the bitters must be tasted, not just ingested. Some examples of a bitter herb are **dandelion** root (*Taraxacum officinale*), ginger, and **aloe** (*Aloe vera*).

Ginger has been found to be particularly useful in treating nausea. Ginger has stimulating and antiemetic properties that warm the stomach to reduce intestinal and gas pain.

Aloe can be a powerful laxative when used internally. It takes 10 to 15 hours to work in the body, so it is best used in the evening before bedtime. People should not use aloe for an extended period of time, or dependency can develop. Overuse of aloe can result in loss of intestinal tone. Overdoses of aloe can result in diarrhea, intestinal distress, and kidney problems, so caution should be taken when using this herb.

Papain, also known as papaya extract, aids with the digestion of protein. It has also been used to treat **burns** and to help treat cancer.

Astringent herbs are beneficial in slowing down diarrhea. These herbs contain tannin, a substance that causes protein in body tissues to tighten up. When an astringent herb is taken, the proteins in the digestive tract tighten up to form a protective barrier that reduces fluid and electrolyte loss.

Many of these herbs make delicious teas and are commonly available as packaged teas. Those who wish to make their own tea should try steeping one teaspoon of dry herb per cup of boiled water for five to 10 minutes. They should be sure to cover the tea so that the volatile oils do not evaporate. An Indian custom that is also helpful for digestion is to keep fennel or anise seed available at the table to pass around following a meal.

Precautions

A few suggestions apply before using any of the various herbal supplements to aid digestion. It is best not to overeat, and snacking between meals on anything other than fruit should be avoided. Individuals should increase their consumption of fruit, vegetables, and whole grains and try to decrease the amount of fatty foods, red meat, dairy products, nuts, and nut butters from the diet. People should try to relax while eating, chew food 10 to 20 times, and avoid distractions while eating, such as reading or watching television. They should also drink at least eight glasses of water each day. Care should be taken not to exceed the recommended dosage as indicated on the product label.

There have been very few scientific studies to prove either the adverse or the beneficial health effects of the 1,500-plus herbal products that are available throughout the United States. Furthermore, under the Dietary Supplement Health and Education Act of 1994, herbal products are not required to be proven safe before they are marketed. After the product is marketed, the U.S. Food and Drug Administration (FDA) must prove the dietary supplement unsafe before it can be removed from the shelves. Many people associate the term natural with safe, and that is not always the case. Anyone taking herbal products of any kind should be certain to read labels carefully and discuss the products with a physician to evaluate potential interactions with other medical conditions and/or prescription medications. As is the case with some prescription medications, dependency on some herbal supplements is possible.

Herbal preparations can vary widely from one brand to another and within the same brand from one purchase to the next, making inconsistency in the concentration of ingredients a potential risk. Anyone using herbal products should be careful and try to use well-known brands, because these products are largely unregulated.

Side effects and interactions

Side effects such as breathing problems or tightness in the throat or chest, chest pain, skin **hives**, rash, or itchy or swollen skin may be the signs of an allergic reaction. The product should be discontinued and the patient should seek the advice of a physician.

Persons wishing to take digestive enzymes should consult a physician. Herbs have the potential to interact with any prescription medication, as well as with other herbs. Patients taking the prescription medications acarbose (Precose), anisindione (Miradon), or miglitol (Glyset) should consult their physician before using pancreatin. The use of digestive enzymes has not been extensively studied in pregnant women, so the use of these supplements during **pregnancy** is not recommended. Patients taking the anticoagulant warfarin (Coumadin) should consult their doctor before using papain digestive enzymes.

KEY TERMS

Cellulose—A material derived from the cell walls of certain plants. It is used in the production of many vegetable fibers and is a major raw material component in the production of manufactured fibers including acetate, rayon, and triacetate.

Digestion—The body's process of breaking down food, extracting energy and nutrients, and eliminating unusable components.

Microflora—Beneficial bacteria in the intestines that produce enzymes to aid digestion.

Peristalsis—The wave-like action that pushes food through the digestive tract.

Resources

BOOKS

Bender, David. A. *Oxford Dictionary of Food and Nutrition,* 2nd ed. New York: Oxford University Press, 2005.

Bohager, Tom. *Enzymes: What the Experts Know*. Prescott, AZ: One World Press, 2006.

Bohager, Tom. *Everything You Need to Know about Enzymes: A Simple Guide to Using Enzymes to Treat Everything from Digestive Problems and Allergies to Migraines and Arthritis*. Austin, TX: Greenleaf Book Group, 2008.

PERIODICALS

Klein, G., W. Kullich, J. Schnitker, and H. Schwann. "Effi cacy and Tolerance of an Oral Enzyme Combination in Painful Osteoarthritis of the Hip: A Double Blind, Randomized Study Comparing Oral Enzymes with Non Steroidal Anti inflammatory Drugs." *Clinical and Experimental Rheumatology* 24, no. 1 (January 2006): 25 30.

Wintergerst E. S., S. Maggini, and D. H. Homig. "Contri bution of Selected Vitamins and Trace Elements to Immune Function." *Annals of Nutrition & Metabolism* 51, no. 4 (2007): 301 323.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

Digestive Disease National Coalition, 507 Capitol Court NE, Suite 200, Washington, DC, 20002, (202) 544 7497, http://www.ddnc.org.

Gastro Intestinal Research Foundation, 70 East Lake Street, Suite 1015, Chicago, IL, 60601 5907, (312) 332 1350, http://www.girf.org.

National Center for Complementary and Alternative Med icine. National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

National Digestive Diseases Information Clearinghouse, 2 Information Way, Bethesda, MD, 20892 3570, (800) 891 5389, http://digestive.niddk.nih.gov.

Office of Dietary Supplements. National Institutes of Health, 6100 Executive Blvd. Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Kim Sharp
Angela M. Costello

Digitalis

Definition

Digitalis is the name of a genus of plants in the Plantaginaceae family. The genus, also known as foxgloves, contains about 20–30 species, perhaps the best

Digitalis. *(© Michael P. Gadomski/Photo Researchers, Inc. Reproduced by permission.)*

known of which is *Digitalis purpurea*, the common **foxglove**. The plant's common name comes from the fact that its flowers often fit neatly over a human finger, like a tiny glove. The term *digitalis* also refers to a class of cardiac glycosides obtained from the plant. A glycoside is a chemical compound consisting of two parts, one of which is always a sugar. Cardiac glycosides are glycosides that stimulate the heart, and that have important medical applications in coronary diseases and disorders.

Description

Digitalis is usually a biennial, although it may survive as a perennial. In its first year, the plant sends up a rosette of smallish leaves; in its second year, it has long (3–4 feet in length) flowering stems that carry pink, white, purple, or even yellow flowers that are very attractive to bees and other insects. The plant is tolerant of poor soil, although it prefers a loose, well–drained habit. It fluorishes in Europe (where it is especially popular among British gardeners), western and central Asia, and northwestern Africa.

An English physician, William Withering (1741–1799) is usually given credit for having discovered the medical benefits of the digitalis plant. The story is told that one of Withering's patients was cured of a potentially fatal heart condition after taking a secret concoction that he received from a local gypsy. Withering convinced the gypsy to reveal her secret: The concoction consisted of a mixture of herbs, the most important of which was leaves of *D. purpurea*.

The cardiac effects of digitalis had been known long before Withering's time, but within a different context. The plant had frequently been used as a poison. The essential discovery Withering made was that, in addition to being poisonous, digitalis could have beneficial effects if used in less concentrated, smaller amounts. A typical dose of digitalis used for therapeutic treatment is less than 0.5 mg per day. The drug is widely used to treat heart failure and arrhythmias (irregular heartbeat).

Probably the best known and most widely used cardiac glycosides extracted from the digitalis plant are digoxin (Lanoxin®, Stillicor®, Vanoxin®) and digitoxin (Crystodigin®, Unidigin®, Tardigal®), both obtained from *D. purpurea*. A second member of the digitalis genus, *D. lanata* also contains medically useful glycosides, deslanoside (Cedilanid–d®, Deacetyllanatoside C®) and lanatoside C (Isolanide®). Cardiac glycosides are also extracted from a number of non–digitalis plants, including:

- Adonitoxin, from *Adonis vernalis*, false hellebore
- Convallatoxin, from *Convallaria majalis*, lily of the valley
- Neriantin, from *Nerium oleander*, common oleander
- Proscillaridin, from *Scilla maritima*, squill
- Sarveroside, from *Strophanthus sarmentosus*

Mechanism of action

The cardiac effects produced by digoxin, digitoxin, and other cardiac glycosides are the result of their inhibitory action on a critical enzyme in the central nervous system, Na^+/K^+–ATPase (the so–called "sodium–potassium pump"). This enzyme facilitates the flow of **sodium** ions (Na^+) and **potassium** ions (K^+) across cell membranes, maintaining the proper electrical potential in cells. The flow of sodium ions is also associated with the flow of **calcium** ions into and out of heart muscle cells by a mechanism that is not yet completely understood by scientists. Since calcium ions are needed for the contraction of heart muscle, any change in their concentration affects and may inhibit normal heart rhythms. Such inhibition may have beneficial effects, as in controlling arrhythmias or harmful effects, as in stopping heart contractions entirely, resulting in heart failure and death.

Uses

In allopathic medicine, digoxin, digitoxin, and other cardiac glycosides have relatively limited and specific applications in the treatment of coronary disorders, primarily arrhythmias and heart failure. Alternative healers have not suggested other uses beyond these applications. Some early studies suggest that cardiac glycosides may have some benefit in the treatment of **cancer**, although much more research is needed to confirm this hypothesis.

Side effects

The most serious side effect of the cardiac glycosides is the induction of cardiac arrhythmia, which, in turn, leads to death. The use of digitalis drugs is contraindicated with individuals who are hypokalemic (deficient in potassium), who have an atrioventricular block (a dysfunctional electrical function of cardiac muscle), or who have Wolff–Parkinson–White (WPW) syndrome (a condition caused by abnormal electrical function in the heart). Individuals with abnormal or deficient renal function are also not candidates for digitalis therapy since the drug is not excreted normally by such individuals and serum levels of the drug may accumulate to hazardous or toxic levels.

KEY TERMS

Arrhythmia—An irregular heartbeat.

Atrioventricular block—A dysfunctional electrical function of cardiac muscle.

Cardiac glycoside—A chemical compound, often derived from a plant, consisting of a sugar joined to another chemical group, with biological effects on the heart.

Hypokalemia—A deficiency of potassium in the bloodstream.

Sodium–potassium pump—A system responsible for the diffusion of sodium ions and potassium ions across cell membranes.

Wolff–Parkinson–White (WPW) syndrome—A condition caused by abnormal electrical function in the heart.

Interactions

Digitalis interacts with a number of commonly used allopathic medications, including non–steroidal anti–inflammatory drugs (NSAIDs), calcium–channel blockers, beta–blockers, and the antiarrhythmic medication quinidine. All of these drugs operate directly on the cardiac system and, thus, amplify the effects of cardiac glycosides. Other drugs interact with digitalis indirectly. Diuretics, for example, tend to reduce the concentration of potassium in the blood, disrupting the normal sodium/potassium levels needed for operation of the sodium–potassium pump.

Alternative healers list a number of possible interactions with herbs and other supplements used in their practice, including interactions with:

- Potassium and magnesium supplements
- Buckthorn (*Rhamnus catharticus*)
- Cascara (*Rhamnus purshiani cortex*)
- Hawthorne (*Crataegus oxyacantha/monogyna*)
- Licorice (*Glycyrrhiza glabra*)
- Sarsaparilla (*Smilax spp.*)
- Senna (*Cassia senna/angustifolia*)
- St. John's wort (*Hypericum perforatum*)

Resources

BOOKS

Digitalis A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego: ICON Health Publications, 2004.

Digoxin A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego: ICON Health Publications, 2004.

Ebadi, Manuchair S. *Pharmacodynamic Basis of Herbal Medicine*. Boca Raton, Fla.: CRC Press, 2002.

Luckner, Martin, and Max Wichtl. *Digitalis*. Stuttgart, Germany: Wissenschaftliche Verlagsges, 2000.

PERIODICALS

Aperia, Anita. "New Roles for an Old Enzyme: Na, K ATPase Emerges as an Interesting Drug Target." *Journal of Internal Medicine* (January 2007): 44 52.

Breckenridge, Alasdair. "William Withering's Legacy For the Good of the Patient." *Clinical Medicine, Journal of the Royal College of Physicians* (July August 2006): 393 397.

Hamad, Eman, et al. "Pharmacologic Therapy of Chronic Heart Failure." *American Journal of Cardiovascular Drugs* (April 2007): 235 248.

López Lázaro, Miguel. "Digitoxin as an Anticancer Agent with Selectivity for Cancer Cells: Possible Mechanisms Involved." *Expert Opinion on Therapeutic Targets* (August 2007): 1043 1053.

Margossian, Renee. "Contemporary Management of Pediatric Heart Failure." *Expert Review of Cardiovas cular Therapy* (February 2008): 187 197.

Sokolova, S., M. Lovkova, and G. Buzuk. "Microelements and Cardiac Glycosides from Medicinal Plants." *Dok lady Biological Sciences* (April 2007): 146 148.

OTHER

Schreiber, Donald, and Sarah Robertson. "Toxicity, Digi talis." emedicine.com. http://www.emedicine.com/EMERG/topic137.htm (February 16, 2008).

Texas Heart Institute. "Digitalis Medicines." http://www.texasheartinstitute.org/HIC/Topics/Meds/digimeds.cfm (February 16, 2008).

David Edward Newton, Ed.D.

Diverticulitis

Definition

Diverticulitis refers to the development of inflammation and infection in one or more *diverticula*. Diverticula are outpouchings or bulges that occur when the inner lining layer of the large intestine (colon) bulges out (herniates) through the outer muscular layer. The presence of diverticula indicates a condition called diverticulosis.

Description

Diverticula tend to occur in the last segment of the large intestine, the sigmoid colon. They occur with decreasing frequency toward the beginning of the large intestine. The chance of developing diverticula increases with age, so that by the age of 50, about 20 to 50% of all people have some diverticula. By the age of 90, virtually everyone has developed some diverticula. Most diverticula measure 3 to 30 mm in diameter. Larger diverticula, termed giant diverticula, are quite infrequent but may measure as large as 15 cm in diameter.

The great majority of people with diverticulosis remain symptom-free. Many diverticula are quite accidentally discovered during examinations for other conditions of the intestinal tract.

Causes and symptoms

Diverticula are believed to be caused by overly forceful contractions of the muscular wall of the large intestine. As areas of this wall spasm, they become weaker and weaker, allowing the inner lining to bulge through. The anatomically weakest areas of the intestinal wall occur next to the blood vessels that course through the wall, so diverticula commonly occur in these locations.

Diverticula are most common among the populations of the developed countries of the West (North America, Great Britain, and northern and western Europe). Experts believe that this pattern is due to **diets** in these countries, which tend to be quite low in fiber. A diet low in fiber results in the production of smaller volumes of stool. In order to move this smaller stool along the colon and out of the rectum, the colon must narrow itself significantly and does so by contracting down forcefully. This causes an increase in pressure, which, over time, weakens the muscular wall of the intestine and allows diverticular pockets to develop.

Diverticulitis is believed to occur when a hardened piece of stool, undigested food, and bacteria (called a fecalith) becomes lodged in a diverticulum. This blockage interferes with the blood supply to the area, and infection sets in.

Diverticulitis is three times more likely to occur in the left side of the large intestine. Since most diverticula are located in the sigmoid colon (the final segment of the large intestine that empties into the rectum), most diverticulitis also takes place in the sigmoid. The elderly have the most serious complications from diverticulitis, although very severe **infections** can also occur in patients under the age of 50. Men are three times more likely than women to be stricken with diverticulitis.

An individual with diverticulitis experiences **pain** (especially in the lower left side of the abdomen) and **fever**. In response to the infection and the irritation of nearby tissues within the abdomen, the abdominal muscles may begin to spasm. About 25% of all patients with diverticulitis have some rectal bleeding, although this condition rarely becomes severe. Walled-off pockets of infection, called abscesses, may appear within the wall of the intestine or even on the exterior surface of the intestine. When a diverticulum weakens sufficiently and is filled to bulging with infected pus, a perforation in the intestinal wall may develop. When the infected contents of the intestine spill into the abdomen, a severe infection called peritonitis occurs. Peritonitis is an infection and inflammation of the lining of the abdominal cavity, the peritoneum. Other complications of diverticulitis include the formation of abnormal connections, called fistulas, between two organs that normally do not connect (for example, the intestine and the bladder), and scarring outside the intestine that squeezes off and obstructs a portion of the intestine.

Diagnosis

When diverticula are suspected because a patient begins to have sudden rectal bleeding, the location of the bleeding can be studied by performing angiography. Angiography involves the insertion of a tiny tube (catheter) through an artery in the leg and moving it up into one of the major arteries of the gastrointestinal system. A dye (contrast medium) that will show up on x-ray films is injected into the catheter, and the area of bleeding is located by looking for an area where the contrast is leaking into the interior (lumen) of the intestine.

A procedure called colonoscopy provides another method for examining the colon and locating the site of bleeding. In colonoscopy, a small, flexible scope (colonoscope) is inserted through the rectum and into the intestine. A fiber-optic camera that projects to a nearby television screen is mounted in the colonoscope, which allows the physician to view the interior of the colon and locate the source of bleeding.

Diagnosis of diverticulitis is not difficult in patients with previously diagnosed diverticulosis. The presence of abdominal pain and fever in such an individual would make the suspicion of diverticulitis quite high. Examination of the abdomen usually reveals tenderness to touch, with the patient's abdominal muscles contracting strongly to protect the tender

area. During a rectal exam, a doctor may be able to feel an abnormal mass. Touching this mass may prove painful to the patient.

When doctors suspect diverticulitis as the cause for the patient's symptoms, they most likely avoid the types of tests usually used to diagnose gastrointestinal disorders. These tests include barium enema and colonoscopy (although colonoscopy may have been used earlier to diagnose the diverticulosis). The concern is that the increased pressure exerted on the intestine during these exams may increase the likelihood of intestinal perforation. After medical treatment for the diverticulitis, these examinations may be performed in order to learn the extent of the patient's disease.

Treatment

Treatment for uncomplicated diverticulitis usually requires hospitalization, but some physicians try treatment at home for very mildly ill patients. These patients are put on a liquid diet and receive oral antibiotics. Although **relaxation**, **guided imagery**, and **acupuncture** treatment may be helpful in alleviating pain symptoms, a course of antibiotics is necessary to treat the infection itself.

An infusion of herbs with anti-inflammatory and soothing properties, such as **Mexican yam** (*Dioscorea villosa*), German **chamomile** (*Matricaria recutita*), **marsh mallow** (*Althaea officinalis*), and calamus (*Acorus calamus*, or sweet flag) may be helpful in treating the inflammation of diverticulitis. **Ginger** (*Zingiber officinale*) can also be helpful in relieving gastrointestinal **gas** that may be symptomatic of the disorder.

Allopathic treatment

Resting the bowel is a mainstay of treatment and involves keeping the patient from eating or sometimes even drinking anything by mouth. Therefore, a patient hospitalized for diverticulitis receives fluids through a needle in the vein (intravenous or IV fluids). Antibiotics are also administered through the IV. In cases of severe bleeding (hemorrhaging), blood transfusion may be necessary. Medications that encourage clotting may also be required.

While there are almost no situations in which uncomplicated diverticulosis requires surgery, giant diverticula always require removal. This procedure is necessary because of the very high chance of infection and perforation of these diverticula. When giant diverticula are diagnosed, the usual treatment involves removing that portion of the intestine in which they are located.

The various complications of diverticulitis need to be treated aggressively because the death rate from problems such as perforation and peritonitis is quite high. Abscesses can be drained of their infected contents by inserting a needle through the skin of the abdomen and into the **abscess**. When this procedure is unsuccessful, open abdominal surgery is required to remove the piece of the intestine containing the abscess. Fistulas require surgical repair, including the removal of the length of intestine containing the origin of the fistula, followed by immediate reconnection of the two free ends of intestine. Peritonitis requires open surgery. The entire abdominal cavity is cleaned by being irrigated (washed) with a warmed sterile salt-water solution, and the damaged piece of intestine is removed. Obstructions require immediate surgery to prevent perforation. Massive, uncontrollable bleeding, while rare, may require removal of part or all of the large intestine.

During any of these types of operations, the surgeon must make an important decision regarding the quantity of intestine that must be removed. When the amount of intestine removed is great, it may be necessary to perform a colostomy. A colostomy involves pulling the end of the remaining intestine through the abdominal wall to the outside. This bit of intestine is then fashioned so that a bag can be fit over it. The patient's waste (feces) collects in the bag because the intestine no longer connects with the rectum. This colostomy may be temporary, in which case another operation is required to reconnect the intestine, after some months of substantial healing has occurred. Other times, the colostomy needs to be permanent, and the patient has to adjust to living permanently with the colostomy bag. Most people with colostomies are able to have active lives.

Occasionally, a patient has such severe diverticular disease that a surgeon recommends planning ahead and schedules removal of a portion of the colon. This procedure is done to avoid the high risk of surgery performed after a complication has set in. Certain developments identify those patients who are at very high risk of experiencing dangerous complications, such as those with a history of diverticulitis.

Surgery for chronic (recurring) diverticulitis remains controversial. Some surgeons say that surgery prevents recurrence of problems, while others say it does not. The guidelines of the Society for Surgery of the Alimentary Canal (2007) suggest that "elective sigmoid resection may not be necessary after any specific number of episodes of uncomplicated diverticulitis, or with any definite age thresholds."

KEY TERMS

Angiography—X-ray imaging of the arteries in a particular part of the body. Angiography is often performed in order to determine the location of internal bleeding.

Bowel obstruction—A blockage in the intestine that prevents the normal flow of waste down the length of the intestine.

Colonoscopy—Examination of an area of the gastrointestinal tract by putting a lighted scope, usually bearing a fiber-optic camera, into the rectum and passing it through the intestine.

Colostomy—A procedure performed when a large quantity of intestine is removed. The end piece of the intestine leading to the rectum is closed.

Fistula—An abnormal connection formed between two organs which usually have no connection at all.

Sigmoid colon—The final portion of the large intestine which empties into the rectum.

Expected results

The prognosis for people with diverticula is excellent, with only 20% of such patients ever seeking any medical help for their condition.

While diverticulitis can be a difficult and painful disease, it is usually quite treatable. Prognosis is worse for individuals who have other medical problems, particularly those requiring the use of steroid medications, which increase the chances of developing a serious infection. Prognosis is also worse in the elderly.

Prevention

While there is no certain way to prevent the development of diverticula, experts believe that high-fiber diets may help. Foods that are recommended for their high fiber content include whole grain breads and cereals and all types of fruits and vegetables. Most experts suggest that individuals take in 20 to 35 grams of fiber daily. If this is not possible to achieve through diet, an individual may supplement with fiber products that are mixed into juice or water.

Resources

BOOKS

Cartwright, Peter. *Coping with Diverticulitis*. London: Sheldon Press, 2007.

PERIODICALS

Anaya D. A., and D. R. Flum. "Risk of Emergency Colectomy and Colostomy in Patients with Diverticular Disease." *Archives of Surgery* (July 2005): 681 685.

Bordeianou, L., and R. Hodin. "Controversies in the Surgical Management of Sigmoid Diverticulitis." *Journal of Gastrointestinal Surgery* (April 2007): 542 548.

Makela, J. T., H. O. Kiviniemi, and S. T. Laitinen. "Elective Surgery for Recurrent Diverticulitis." *Hepatogastroenterology* (July/August 2007): 1412 1416.

Nelson, R. S., A. Velasco, and B. N. Mukesh. "Management of Diverticulitis in Younger Patients." *Diseases of the Colon and Rectum* (September 2006): 1341 1345.

Peppas, G., et al. "Outcomes after Medical and Surgical Treatment of Diverticulitis: A Systematic Review of the Available Evidence." *Journal of Gastroenterology and Hepatology* (September 2007): 1360 1368.

ORGANIZATIONS

National Digestive Diseases Information Clearinghouse, 2 Information Way, Bethesda, MD, 20892 3570, (301)654 3810, http://www.niddk.nih.gov/health/digest/nddic.htm.

Paula Ford-Martin
Teresa G. Odle
David Edward Newton, Ed.D.

Diverticulosis *see* **Diverticulitis**

Dizziness

Definition

Dizziness is classified into three categories—vertigo, syncope, and nonsyncope nonvertigo. Each category has a characteristic set of symptoms, all related to the sense of balance. In general, syncope is defined by a brief loss of consciousness (fainting) or by dimmed vision and feeling uncoordinated, confused, and lightheaded. Many people experience a sensation like syncope when they stand up too fast. Vertigo is the feeling that either the individual or the surroundings are spinning. This sensation is like being on a spinning amusement park ride. Individuals with nonsyncope nonvertigo dizziness feel as though they cannot keep their balance. This sensation may become worse with movement.

Description

The brain coordinates information from the eyes, the inner ear, and the body's senses to maintain balance. If any of these sources of information is disrupted,

the brain may not be able to compensate. For example, people sometimes experience **motion sickness** because the information from their body tells the brain that they are sitting still, but information from the eyes indicates that they are moving. The messages do not correspond and dizziness results.

Vision and the body's senses are the most important systems for maintaining balance, but problems in the inner ear are the most frequent cause of dizziness. The inner ear, also called the vestibular system, contains fluid that helps to fine tune the information the brain receives from the eyes and the body. When fluid volume or pressure in the inner ear changes, information about balance is altered. The discrepancy gives conflicting messages to the brain about balance and induces dizziness.

Certain medical conditions can cause dizziness because they affect the systems that maintain balance. For example, the inner ear is very sensitive to changes in blood flow. Because such medical conditions as high blood pressure or low blood sugar can affect blood flow, these conditions are frequently accompanied by dizziness. Circulation disorders are the most common causes of dizziness. Other causes are head injuries, ear **infections**, **allergies**, and nervous system disorders.

Dizziness often disappears without treatment or with treatment of the underlying problem, but it can be long-term or chronic. According to the National Institutes of Health, 42% of Americans will seek medical help for dizziness at some point in their lives. The costs may exceed a billion dollars and account for five million visits to physicians annually. Episodes of dizziness increase with age. Among people aged 75 or older, dizziness is the most frequent reason for seeing a doctor.

KEY TERMS

Acoustic neuroma—A benign tumor that grows on the nerve leading from the inner ear to the brain. As the tumor grows, it exerts pressure on the inner ear and causes severe vertigo.

Autonomic nervous system—The part of the nervous system that controls such involuntary body functions as breathing and heart beat.

Electronystagmography—A method for measuring the electricity generated by eye movements. Electrodes are placed on the skin around the eye and the individual is subjected to a variety of stimuli so that the quality of eye movements can be assessed.

Ménière's disease—A disease of the labyrinth in the ear, characterized by dizziness, hearing loss, ringing in the ears, and nausea.

Syncope—Dizziness or brief loss of consciousness resulting from an inadequate flow of oxygenated blood to the brain.

Vertigo—Dizziness associated with a sensation of whirling or spinning.

Vestibular system—The area of the inner ear that helps maintain balance.

Causes and symptoms

Careful attention to symptoms can help determine the underlying cause of the dizziness. The underlying problems may be benign and easily treated, or they may be dangerous and require intensive therapy. Not all cases of dizziness can be linked to a specific cause. More than one type of dizziness can be experienced at the same time and symptoms may be mixed. Episodes of dizziness may last for a few seconds or for days. The length of an episode is related to the underlying cause.

The symptoms of syncope include dimmed vision, loss of coordination, confusion, lightheadedness, and sweating. These symptoms can lead to a brief loss of consciousness or fainting. They are related to a reduced flow of blood to the brain; they often occur when a person is standing up and can be relieved by sitting or lying down. Vertigo is characterized by a sensation of spinning or turning, accompanied by **nausea**, **vomiting**, ringing in the ears, **headache**, or **fatigue**. An individual may have trouble walking, remaining coordinated, or keeping balance. Nonsyncope nonvertigo dizziness is characterized by a feeling of being off balance that becomes worse if the individual tries moving or performing detail-intense tasks.

A person may experience dizziness for many reasons. Syncope is associated with low blood pressure, heart problems, and disorders in the autonomic nervous system, which controls such involuntary functions as breathing. Syncope may also arise from emotional distress, **pain**, and other reactions to outside stressors. Nonsyncope nonvertigo dizziness may be caused by rapid breathing, low blood sugar, or **migraine headache**, as well as by more serious medical conditions.

Vertigo is often associated with inner ear problems called vestibular disorders. A particularly intense vestibular disorder, **Ménière's disease**, interferes with the volume of fluid in the inner ear. This disease, which affects approximately one in every 1,000 people, causes intermittent vertigo over the course of weeks, months, or years. Ménière's disease is often accompanied by

ringing or buzzing in the ear, **hearing loss**, and a feeling that the ear is blocked. Damage to the nerve that leads from the ear to the brain can also cause vertigo. Such damage can result from head injury or a tumor. An acoustic neuroma, for example, is a benign tumor that wraps around the nerve. Vertigo can also be caused by disorders of the central nervous system and circulation, such as hardening of the arteries (arteriosclerosis), **stroke**, or **multiple sclerosis**.

Some medications cause changes in blood pressure or blood flow. These medications can cause dizziness in some people. Prescription medications carry warnings of such side effects, but common drugs such as **caffeine** or nicotine can also cause dizziness. Certain antibiotics can damage the inner ear and cause hearing loss and dizziness.

Diet may cause dizziness. The role of diet may be direct, as through alcohol intake. It may also be indirect, as through arteriosclerosis caused by a high-fat diet. Some people experience a slight dip in blood sugar and mild dizziness if they miss a meal, but this condition is rarely dangerous unless the person is diabetic. Food sensitivities or allergies can also be a cause of dizziness. Such chronic conditions as **heart disease** and serious acute problems such as seizures and strokes can cause dizziness. These conditions, however, usually exhibit other characteristic symptoms.

Diagnosis

During the initial medical examination, an individual with dizziness should provide a detailed description of the type of dizziness experienced, when it occurs, and how often each episode lasts. A diary of symptoms may help to track this information. The patient should report any symptoms that accompany the dizziness, such as ringing in the ear or nausea, any recent injury or infection, and any medication taken.

The examiner will check the patient's blood pressure, pulse, respiration, and body temperature as well as the ear, nose, and throat. The sense of balance is assessed by moving the individual's head to various positions or by tilt-table testing. In tilt-table testing, the person lies on a table that can be shifted into different positions and reports any dizziness that occurs.

Further tests may be indicated by the initial examination. Hearing tests help assess ear damage. X rays, computed tomography scan (CT scan), and magnetic resonance imaging (MRI) can pinpoint evidence of nerve damage, tumors, or other structural problems. If a vestibular disorder is suspected, a technique called electronystagmography (ENG) may be used. ENG measures the electrical impulses generated by eye movements. Blood tests can determine diabetes, high **cholesterol**, and other diseases. In some cases, a heart evaluation may be useful. Despite thorough testing, however, an underlying cause cannot always be determined.

Doctors caution that childhood syncope (fainting), although rarely serious, can indicate a serious cardiac condition. If the fainting is abrupt or happens with exertion, it may indicate a more serious problem.

Treatment

Because dizziness may arise from serious conditions, it is advisable to seek medical treatment. Alternative treatments can often be used alongside conventional medicine without conflict. Potentially beneficial therapies include nutritional therapy, herbal remedies, **homeopathy**, **aromatherapy**, **osteopathy**, **acupuncture**, **acupressure**, and **relaxation** techniques.

Nutritional therapy

To prevent dizziness, nutritionists often advise eating smaller but more frequent meals and avoiding caffeine, nicotine, alcohol, foods high in fat or sugar, or any substances that cause allergic reactions. A low-salt diet may also be helpful to some people. Nutritionists may also recommend certain dietary supplements:

- Magnesium citrate, aspartate or maleate: for dizziness caused by magnesium deficiency.
- B-complex vitamins, especially vitamin B_{12}: for dizziness caused by deficiency of these essential vitamins.

Herbal remedies

The following herbs have been used to treat dizziness symptoms:

- Ginger: for treatment of dizziness caused by nausea.
- *Ginkgo biloba*: may decrease dizziness by increasing blood flow to the brain.

Homeopathy

Homeopathic therapies can work very effectively for dizziness, and are especially applicable when no organic cause can be identified. They are chosen according to the patient's specific symptom profile:

- Aconite: for feeling light-headed from postural hypotension (getting up too quickly).
- Coccolus: for motion sickness or syncope.
- Conium maculatum: for feeling dizzy while looking at rapidly-moving images.

- Gelsemium: for feeling light-headed and out of balance, often associated with influenza or stage fright.
- Petroleum: for dizziness upon standing up too fast and headache before and after a storm.

Aromatherapy

Aromatherapists recommend a warm bath scented with **essential oils** of **lavender**, geranium, and sandalwood as treatment for dizziness. This therapy can have a calming effect on the nervous system.

Osteopathy

An osteopath or chiropractor may suggest manipulations or adjustments of the head, jaw, neck, and lower back to relieve pressure on the inner ear.

Acupressure

Acupressure may be able to improve circulation and decrease the symptoms of vertigo. The Neck Release, which involves pressing on five pairs of points on the shoulder blades and neck, is helpful for dizziness associated with migraine headaches.

Relaxation techniques

Relaxation techniques, such as **yoga**, **meditation**, and **massage therapy** for relieving tension, are popularly recommended methods for reducing **stress**.

Allopathic treatment

Treatment of dizziness is determined by the underlying cause. If an individual has a cold or **influenza**, a few days of bed rest is usually adequate to resolve dizziness. Other causes of dizziness, such as mild vestibular system damage, may resolve without medical treatment. If dizziness continues, drug therapy may be required to treat such underlying illnesses as high blood pressure, arteriosclerosis, nervous conditions or diabetes. A physician may also prescribe antibiotics if ear infections are suspected. Selective serotonin reuptake inhibitors (SSRIs) have recently been shown to relieve dizziness in patients who have psychiatric symptoms. When other measures have failed, surgery may be suggested to relieve pressure on the inner ear. If the dizziness is not treatable by drugs, surgery, or other means, physical therapy may be used and the patient may be taught coping mechanisms for the problem.

Expected results

The outcome of treatment depends on the cause of dizziness. Controlling or curing the underlying factors usually relieves the dizziness itself. In some cases, the symptoms disappear without treatment. In a few cases, dizziness can become a permanent disabling condition.

Prevention

Most people learn through experience that certain activities will make them dizzy and they learn to avoid them. For example, if reading in a car produces motion sickness, reading should be postponed until after the trip. Changes in diet can also cut down on episodes of dizziness in susceptible people. For example, persons with Ménière's disease may avoid episodes of vertigo by leaving salt, alcohol, and caffeine out of their **diets**. Reducing blood cholesterol can help diminish arteriosclerosis and indirectly treat dizziness. Daily multiple vitamin and mineral supplements may help prevent dizziness caused by deficiencies of these essential nutrients. Relaxation techniques can help ward off tension and **anxiety** that can cause dizziness.

Some cases of dizziness cannot be prevented. Acoustic neuromas, for example, are not predictable or preventable. Alternative approaches designed to rebalance the body's energy flow, such as acupuncture and constitutional homeopathy, may be helpful in cases where the cause of dizziness cannot be pinpointed.

Resources

BOOKS

Cameron, Myra. *Lifetime Encyclopedia of Natural Remedies*. Paramus, NJ: Prentice Hall, 1993.

Yardley, Lucy. *Vertigo and Dizziness*. New York: Rout ledge, 1994.

Zand, Janet, Allan N. Spreen, and James B. LaValle. *Smart Medicine for Healthier Living: A Practical A Z Refer ence to Natural and Conventional Treatments for Adults*. Garden City Park, NY: Avery Publishing Group, 1999.

PERIODICALS

Ohnson, Kate. "Fainting Usually is Benign, but it can be Fatal." *Pediatric News* (July 2002): 25.

"SSRIs Relieve Dizziness in Psyciatric Patients." *Critical Care Alert* (August 2002): 2.

ORGANIZATIONS

Ménière's Network. 2000 Church St., P.O. Box 111, Nash ville, TN 37236. (800) 545 4327.

The Vestibular Disorders Association. P.O. Box 4467, Portland, OR 97208 4467. (503) 229 7705. http:// www.teleport.com/~veda/.

Mai Tran
Teresa G. Odle

Dolomite

Description

Physical characteristics

Dolomite is a common mineral. Chemically, dolomite is **calciummagnesium** carbonate $CaMg(CO_3)_2$, a type of compact limestone. In combination with calcite and aragonite, dolomite makes up approximately 2% of the earth's crust. The mineral was first described by and then named after the French mineralogist and geologist Deodat de Dolomieu (1750–1801).

Dolomite is a fairly soft mineral that occurs as crystals as well as in large sedimentary rock beds several hundred feet thick. The crystals—usually rhombohedral in shape—are transparent to translucent and are colorless, white, reddish-white, brownish-white, gray, or sometimes pink. In powdered form, dolomite dissolves readily with effervescence in warm acids.

Although rock beds containing dolomite are found throughout the world, the most notable quarries are located in the Midwestern United States; Ontario, Canada; Switzerland; Pamplona, Spain; and Mexico.

Formation

Although dolomite does not form on the surface of the earth at the present time, massive layers of dolomite can be found in ancient rocks. Dolomite is one of the few sedimentary rocks that undergoes a significant mineralogical change after it is deposited. Dolomite rocks are originally deposited as calcite/aragonite–rich limestone, but during a process called diagenesis, the calcite and/or aragonite is transformed into dolomite. Magnesium-rich ground water containing a significant amount of salt is thought to be essential to dolomite formation. Thus, warm, tropical marine environments are considered the best sources of dolomite formation.

Close-up view of the mineral dolomite. In combination with calcite and aragonite, dolomite makes up approximately two percent of the earth's crust. *(GC Minerals / Alamy)*

Chemical components

Dolomite is composed of 52.06% oxygen, 13.03% carbon, 13.18% magnesium, and 21.73% calcium. **Iron** and **manganese** carbonates, barium, and lead are sometimes present as impurities.

General use

Dolomite is commonly used in a variety of products. A few of these are listed below:

- antacids (neutralizes stomach acid)
- base for face creams, baby powders, or toothpaste
- calcium/magnesium nutritional supplements for animals and humans
- ceramic glazes on china and other dinnerware (dolomite is used as source of magnesia and calcia)
- fertilizers (dolomite added as soil nutrient)
- glass (used for high refractive optical glass)
- gypsum impressions from which dental plates are made (magnesium carbonate)
- mortar and cement
- plastics, rubbers, and adhesives

Although calcium carbonate (as found in dolomite) has a high percentage of calcium by weight (40%) and is the most common preparation available, this form of calcium is relatively insoluble and can be difficult to break down in the body. In contrast, calcium citrate, although containing about half as much calcium by weight (21%), is a more soluble form. Since calcium citrate does not require gastric acid for absorption, it is considered a better source of supplemental calcium, particularly for the elderly, whose stomach acid secretions are decreased.

Calcium supplements offer many benefits and research indicates that calcium supplements can help prevent formation of **kidney stones** when combined with a fairly low animal protein-low salt diet. Doctors once advised a low-calcium diet to prevent kidney stones.

Preparations

Dolomite is generally ground into coarse or finely grained powder and made into calcium/magnesium capsules or antacids for human consumption. The powdered form is also used in animal feed, fertilizers, and a variety of other applications.

Precautions

Nutritional supplements

Concern about heavy-metal contamination of calcium supplements first arose in the early 1980s. Natural sources of dolomite sometimes contain small amounts of lead and other heavy metals that remain after being processed for human use. As late as 2005, *Consumer Reports* magazine reported that some calcium supplements still contain very small amounts of lead. Most experts believe that such supplements are generally safe and their benefits far outweigh the small risks they pose to human health.

When purchasing calcium supplements, products marked as purified (especially those made from dolomite, bone meal, or oyster shells) or those containing the USP (*United States Pharmacopoeia*) symbol are considered the safest. The symbol means that the vitamin and mineral manufacturer's product has voluntarily met the USP criteria for quality, strength, and purity.

Research also encourages consumers to tell their doctors when they take antacids and calcium supplements so that physicians can watch for possible side effects or interactions with medications. Some antacids can cause side effects that eventually put patients at risk for serious problems. If patients have a complicating problem such as renal dysfunction, they can suffer from aluminum toxicity from certain antacids.

Ceramic glazes

Another potential health risk associated with dolomite arises from storing food in or eating or drinking from dinnerware or cups made with glazes containing dolomite. Although it is not possible to detect a lead glaze on china with the naked eye, corroded glaze, or a dusty or chalky, gray residue on the glaze after the piece has been washed is a good indication of lead content. Although high lead toxicity is rare, trace amounts may be present. If possible, it is best to purchase dinnerware that is labeled lead-free. Also, stoneware, unless painted with decorations on the surface, are normally coated with a material that contains no lead. Glass dishes, with the exception of leaded glass and glass painted with decorations or decals, are also considered safe.

The problem is intensified if the food or beverage consumed is acidic, since acid increases lead leaching. Although other additives in glazes may contribute to the lead content (such as lead oxide

or cadmium) leaching out, dolomite is a potential cause for lead toxicity.

Glazes on bathtubs also may contain harmful amounts of lead, which may leach out into the bathwater, especially if the glaze is worn. Information regarding lead content can be obtained from the manufacturer. Lead testing kits are also available by mail order or at most home and garden centers.

Fertilizers and animal feed

Dolomite and bone meal in fertilizers and animal feed may contaminate the soil, animals, and humans with lead and other toxic metals.

Side effects

Indirect side effects may occur if more than the recommended dosage of any calcium supplement is taken over an extended period of time. If an individual consumes more than 2,000 mg/day of calcium, gastrointestinal problems can occur.

Some of the short-term symptoms of low-level lead exposure (which is particularly harmful to the young and elderly) are:

- decreased appetite
- stomachache
- sleeplessness
- constipation
- vomiting
- diarrhea
- fatigue
- irritability
- headaches

Some of the long-term effects of low-level lead exposure are:

- learning disabilities
- brain damage
- loss of IQ points
- attention deficit disorder
- hyperactive behavior
- criminal or antisocial behavior
- neurological problems

Interactions

Research on the interactions of dolomite with other drugs, vitamins, minerals, or foods as of 2008 was limited.

KEY TERMS

Calcium citrate—A chemical compound made from calcium and citric acid.

Diagenesis—Changes that occur in sediment or a sedimentary rock after deposition.

Rhombohedral—A parallelepiped whose edges are all of equal length.

Sedimentary—Formed by deposits of sediment, or material that settles on the bottom in a body of water.

Resources

BOOKS

Sanson, Gillian. *The Myth of Osteoporosis*. Ann Arbor, MI: MCD Century Publications, 2003.

PERIODICALS

Kenny, Anne, et al. "Comparison of the Effects of Calcium Loading with Calcium Citrate or Calcium Carbonate on Bone Turnover in Postmenopausal Women." *Osteoporosis International* (April 2004): 290 294.

Kim, Meehye. "Mercury, Cadmium and Arsenic Contents of Calcium Dietary Supplements." *Food Additives and Contaminants* (August 2004): 763 767.

Moyad, M. A. "The Potential Benefits of Dietary and/or Supplemental Calcium and Vitamin D." *Urologic Oncology: Seminars and Original Investigations* (September 2003): 384 391.

ORGANIZATIONS

National Osteoporosis Foundation, 1232 Twenty Second St.NW, Washington, DC, 20037 1292, (202) 223 2226 http://www.nof.org.

Genevieve Slomski
Teresa G. Odle
David Edward Newton, Ed.D.

Dong quai

Description

Dong quai, *Angelica sinensis*, also called Chinese **angelica**, is a member of the Umbelliferae (Apiaceae), or carrot family. This Oriental medicinal herb is sometimes called the empress of herbs, or female ginseng.

Dong quai grows best in such damp places as moist meadows, river banks, and mountain ravines. It may be biennial or perennial. The bitter-sweet root,

described by some herbalists as resembling carved ivory, is used medicinally. Dong quai, variously known as dang gui or tang kuei, produces a round, hollow, grooved stem that grows as high as 7 ft. The lower leaves are large and tri-pinnate, each further divided into two or three leaflets. The smaller upper leaves are pinnate, which means that the leaflets are arranged in opposite rows along the leaf stalk. The leaves of dong quai resemble those of carrot, celery, or **parsley** and emerge from dilated sheaths surrounding a bluish-colored stem that is branched at the top. Honey-scented, greenish-white flowers grow in large compound flat-topped clusters and bloom from May to August.

KEY TERMS

Decoction—A medication or herbal preparation made by boiling.

Infusion—A medicine or herbal preparation made by steeping plant parts or other substances in water to extract their medicinal principles.

Volatile—Evaporating readily at room temperature. The essential oils of a plant are sometimes called volatile oils for this reason.

General use

Dong quai is one of the most extensively researched Chinese medicinal herbs. It is well known as a female remedy thought to benefit women throughout the menstrual cycle and during the transition to **menopause**. A recent study indicates that dong quai is a popular herbal remedy among women being treated for **ovarian cancer**. Dong quai has been used in China for thousands of years to treat ailments of the female reproductive system and as a tonic herb to treat **fatigue**, mild **anemia**, high blood pressure and poor circulation in both men and women. Chinese herbalists prepare dong quai in combination with other herbs, including **astragalus** (*Astragalus membranaceus*) as a fatigue tonic, **mugwort** (*Artemesia vulgaris*), bai shao (white peony), chai hu (bupleurum root), and rou gui (**cinnamon bark**) in medicinal formulas for women. Secondary herbs are used to enhance the action of the primary ingredient or to provide additional properties that work synergistically with the primary ingredient. Research in the United States indicates that dong quai has no demonstrable estrogen-like effect on menopausal women when it is used alone. However, other research has shown that dong quai, when used in combination with other herbs, resulted in a reduction of the severity of **hot flashes**, vaginal dryness, **insomnia**, and mood changes. Dong quai should not be regarded as a replacement for natural estrogen. Its unique mechanism of action reportedly promotes the synthesis of natural progesterone, a hormone whose production declines during menopause. Dong quai's ability to relieve menstrual problems has been attributed to its muscle-relaxing properties and its ability to quiet spasms in the internal organs. Dong quai has a tonic effect on all female reproductive organs and increases blood flow to the uterus. It acts to increase vaginal secretions and to nourish vaginal tissue. Dong quai root's analgesic properties help diminish uterine **pain** and have been found to be as much as 1.7 times as effective as aspirin. The herb has also been useful in the treatment of migraine headaches.

One recent Western study has called into question the value of dong quai for treating menopausal symptoms. The authors of the study found that **black cohosh** appears to be a more effective herbal remedy for hot flashes and other symptoms associated with menopause.

Research in China indicates that dong quai stimulates production of the red blood cells that carry oxygen throughout the body. Its sedative properties relieve emotional distress and irritability. It is used to treat mild anemia and as a liver tonic. The herb is beneficial to the endocrine and circulatory systems, promoting healthful blood circulation. Its laxative properties ease **constipation**, particularly in the elderly. This beneficial herb has also been proven effective against certain fungi, such as *Candida albicans*, the primary cause of vaginal **yeast infection**. Dong quai also helps to dissolve **blood clots**.

Dong quai contains high amounts of **vitamin E**, **iron**, cobalt, and other vitamins and minerals important to women, including **niacin**, **magnesium**, **potassium**, and vitamins A, C, and B_{12}. The plant contains numerous phytochemicals, including coumarins, phytosterols, polysaccharides, and flavonoids.

European angelica (*A. archangelica*) stimulates secretion of gastric juices and has been used to treat digestive problems, flatulence, and loss of appetite. The root of European angelica has sometimes been used in cases of prolonged labor or to treat problems with retention of the placenta after **childbirth**.

American angelica (*A. atropurpurea*) has also been used by some herbalists for menstrual complaints, though the Chinese dong quai is most often used in formulas for women.

Preparations

The medicinal part of the angelica plant is the root. Dong quai root can be prepared as an infusion or decoction, tincture, tablet, or capsule. It is also available dried, either whole, diced, or sliced. The herb is nontoxic, but recent findings suggest caution in using it over an extended period of time. The dried root may be chewed in quarter inch segments two to three times daily, up to 3-4 g grams per day.

Infusion or decoction: Research indicates that extracts of dong quai that retain the volatile constituents act to raise blood pressure and relax uterine muscles. An infusion of the root, steeped in hot water, retains the volatile constituents and is useful to treat **dysmenorrhea** and to quiet uterine spasm. For **amenorrhea**, where stimulation of the uterine muscles is sought, a decoction is indicated. Simmer the root in water to evaporate the volatile constituents. Most Chinese herbalists use dong quai in combination with other herbs depending on the problems being addressed and these are prepared together.

Alcohol tincture: Combine fresh or dry, chopped root with enough alcohol to cover in a glass container. Alcohol should be of good quality. A 50/50 alcohol/water ratio is optimal. If the alcohol is not 100 proof, add pure water to obtain a 50/50 ratio. Brandy, vodka, and gin are often used. Seal the mixture in an air-tight container and set aside in a dark place for about two weeks. Shake daily. Strain through cheesecloth or muslin and store in dark containers for up to two years. Dosage: 10-40 drops of the fresh root tincture one to three times daily.

Precautions

Pregnant or lactating women are advised not to use dong quai. Menstruating women who are experiencing unusually heavy bleeding should discontinue use of dong quai without advice of a qualified herbal practitioner, because in certain preparations the herb may act to increase the blood flow. Consult a qualified herbalist before use if fibroids are present, or when there is unusual breast tenderness.

Dong quai should not be used as a substitute for hormonal replacement therapy, or HRT. Women who are concerned about the possible side effects of HRT should consider fo-ti or such other herbs as **licorice** and **hops**.

Side effects

Dong quai has been considered quite safe; however, it may cause minor gastric upset in sensitive individuals. Stomach upset can be eliminated if dong quai is combined with other herbs in preparation. The herb may also increase sensitivity to the sun and other ultraviolet exposure in fair-skinned individuals.

More seriously, a study published in 2002 reported that dong quai appears to encourage the growth of **breast cancer** cells independent of its estrogenic activity. The researchers recommend cautious use of dong quai until definitive studies can be performed. Interestingly, two teams of researchers in the United States and China respectively reported in 2003 that dong quai appears to suppress the growth of human **prostate cancer** cells.

Interactions

Some herbalists suggest that fruit consumption be decreased when using dong quai.

As of 2003, dong quai has been reported to interact with some prescription medications, particularly anticoagulant and antiplatelet drugs. Dong quai appears to have an additive effect with these medications, increasing bleeding time. In May 2002 the U.S. Food and Drug Administration added dong quai to the list of herbal products not to be used together with sodium warfarin (Coumadin).

Dong quai has also been reported to interact with bleomycin (Blenoxane), an anticancer drug used to treat tumors of the cervix, uterus, testicle, and penis, as well as certain types of lymphoma.

Resources

BOOKS

The Alternative Advisor, The Complete Guide to Natural Therapies and Alternative Treatments. Alexandria, VA: Time Life, Time Warner, Inc., 1997.

Gladstar, Rosemary. *Herbal Healing for Women*. New York: Simon & Schuster, 1993.

The PDR Family Guide To Natural Medicines And Healing Therapies. New York: Three Rivers Press, 1999.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Werbach, Melvyn R., M.D., and Michael T. Murray, N.D. *Botanical Influences on Illness, A Sourcebook of Clinical Research*. 2nd ed. Tarzana, CA: Third Line Press, 2000.

PERIODICALS

Amato, P., S. Christophe, and P. L. Mellon. "Estrogenic Activity of Herbs Commonly Used as Remedies for Menopausal Symptoms." *Menopause* 9 (March April 2002): 145 150.

Huntley, A. L., and E. Ernst. "A Systematic Review of Herbal Medicinal Products for the Treatment of Men opausal Symptoms." *Menopause* 10 (September October 2003): 465 476.

Ng, S. S., and W. D. Figg. "Antitumor Activity of Herbal Supplements in Human Prostate Cancer Xenografts

Implanted in Immunodeficient Mice." *Anticancer Research* 23 (September October 2003): 3585 3590.
Oerter Klein, K., M. Janfaza, K. A. Wong, and R. J. Chang. "Estrogen Bioactivity in Fo Ti and Other Herbs Used for Their Estrogen Like Effects as Determined by a Recombinant Cell Bioassay." *Journal of Clinical Endo crinology and Metabolism* 88 (September 2003): 4077 4079.
Powell, C. B., S. L. Dibble, J. E. Dall'Era, and I. Cohen. "Use of Herbs in Women Diagnosed with Ovarian Cancer." *International Journal of Gynecologic Cancer* 12 (March April 2002): 214 217.
Scott, G. N., and G. W. Elmer. "Update on Natural Prod uct Drug Interactions." *American Journal of Health System Pharmacists* 59 (February 2002): 339 347.
Shang, P., A. R. Qian, T. H. Yang, et al. "Experimental Study of Anti Tumor Effects of Polysaccharides from *Angelica sinensis*." *World Journal of Gastroenterology* 9 (September 2003): 1963 1967.

ORGANIZATIONS

National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse. P.O. Box 7923, Gai thersburg, MD 20898 7923. (888) 644 6226. http:// nccam.nih.gov.
U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http:// www.fda.gov.

OTHER

Herbal Hall: Home for Herbs. http://www.herb.com/ herbal.html.
Khalsa, Karta Purkh Singh. "The Chinese Way to Women's Health." *Delicious Magazine*. http://www.delicious. online.com. (March 1997).
Life Extension Foundation. "Female Hormone Modulation Therapy." *Nutrition Science News*. http://www.lef.org. (March 1998).
Walker, Christy, Amy Bigus, and Deanna Massengil. "Dong Quai." http://www.geocities.com/chadrx/dong.html.

Clare Hanrahan
Rebecca J. Frey, PhD

Dowsing *see* **Radiesthesia**

Drug abuse *see* **Substance abuse and dependence**

Dry mouth

Definition

Dry mouth, known medically as xerostomia, is the abnormal reduction of saliva due to medication, disease, or medical therapy.

KEY TERMS

Salivary duct—Tube through which saliva is carried from the salivary gland to the mouth.

Salivary gland—Gland in which saliva is formed.

Sjögren's syndrome—An autoimmune disorder in which the body's white cells attack the glands that produce saliva and tears. Dry mouth is a core symptom of Sjögren's syndrome.

Xerostomia—The medical term for dry mouth.

Description

Dry mouth due to the lack of saliva can be a serious medical problem. Decreased salivation can make swallowing difficult, decrease taste sensation, and promote tooth decay.

Causes and symptoms

Dry mouth, resulting from thickened or reduced saliva flow, can be caused by a number of factors: medications, both prescription and over-the-counter; systemic diseases, such as **anemia** or diabetes, manifestations of syndromes such as **rheumatoid arthritis**, lupus, chronic hardening and thickening of the skin, or chronic and progressive inflammation of skeletal muscles; **infections** of the salivary glands; blockage of the salivary ducts caused by stones or tumors forming in the ducts through which the saliva passes; dehydration; medical therapies, such as local surgery or radiation; secretion reduction due to the normal **aging** process; and emotional **stress**.

Dry mouth, together with dry eyes, is a core symptom of **Sjögren's syndrome**, named for the Swedish physician who first described it. Sjögren's syndrome is an autoimmune disorder in which the body's white cells attack the glands that produce saliva and tears. It is a common cause of dry mouth in the elderly.

Although psychiatric disorders involving dry mouth are unusual, several cases have been reported of somatoform disorders in which dry mouth is a central symptom. Somatoform disorders are psychiatric disturbances characterized by external physical symptoms or complaints that are related to psychological problems rather than organic illness.

Diagnosis

The diagnosis of dry mouth is not difficult. The patient will state that his or her saliva is very thick or

non-existent. Finding the cause of the dry mouth may be more difficult and require some laboratory testing. Salivary gland biopsy for stones or tumors should be performed if indicated.

Treatment

To treat dry mouth, the use of caffeine-containing beverages, alcoholic beverages, and mouthwashes containing alcohol should be minimized. Drinking water and fruit juices will decrease dry mouth problems. Chewing gum and lemon drops can be used to stimulate saliva flow. **Bitters** also can initiate salivary flow as long as the salivary glands and ducts are functional. Commercial saliva substitutes are available without prescription and can be used as frequently as needed. Use of a humidifier in the bedroom reduces nighttime oral dryness.

Herbal therapy

There are several herbal remedies that may be effective in increasing saliva production and preventing dry mouth. Drinking **ginger**, **chamomile**, or Chinese **green tea** at frequent intervals stimulates salivary flow. A Chinese herbal mix of ophiopogois, pinelliae tuber, zizyphi fructus, glycyrrhiaze, ginseng radix, and oryzae semen has been evaluated as treatment for dry mouth. Studies have shown this formula is effective in relieving dry mouth in half of those tested, including severe cases, such as **cancer** patients undergoing radiation therapy.

Nutritional therapy

Because dry mouth often causes **gum disease**, patients should take **vitamin C** and beta-carotene supplements as a preventive measure.

Acupuncture

Acupuncture has been tried since the late 1990s as a treatment for dry mouth caused by cancer treatments. Practitioners at a California clinic that offers acupuncture to cancer patients use a total of eight needles, to stimulate three points on each ear and one on each index finger. Of the 50 patients who have been treated with acupuncture in this clinic, 35 reported significant improvement in their salivation, and 13 reported that the improvement lasted for over three months before they required another treatment.

Allopathic treatment

Treatment of dry mouth involves management of the underlying condition. If dry mouth is caused by medication, the medication should be changed. If dry mouth is caused by blockage of the salivary ducts, the cause of the blockage should be investigated. When such systemic diseases as diabetes and anemia are brought under control, dry mouth problems may decrease.

Some new medications have been developed to treat dry mouth associated with cancer therapy and Sjögren's syndrome. Amifostine (Ethyol), a medication that protects the cells of the mouth against radiation and chemotherapy agents, has been approved by the U.S. Food and Drug Administration (FDA) as a treatment for dry mouth related to cancer therapy. Pilocarpine hydrochloride (Salagen) is a drug that was approved in 1998 for treating dry mouth associated with Sjögren's syndrome; it works by stimulating the salivary glands to produce more moisture. A study published in 2002 indicates that pilocarpine also relieves dry mouth in cancer patients. Cevimeline (Evoxac) is a newer drug that was approved by the FDA in February 2000 for the treatment of dry mouth associated with Sjögren's syndrome. All three medications appear to give good results and to be well tolerated by patients.

Expected results

The prognosis for patients with xerostomia due to medication problems is good, if the offending agent can be changed. Dry mouth due to systemic problems may be eliminated or improved once the disease causing the dry mouth is under control. Persistent xerostomia can be managed well with saliva substitutes.

Prevention

A patient needs to ask his or her health care provider if any medication to be prescribed will cause dry mouth. Patients with persistent xerostomia need to practice good oral hygiene and visit a dentist on a regular basis; the lack of adequate saliva can cause severe dental decay. The salivary glands are very sensitive to radiation, so any patient scheduled for radiation therapy of the head and neck should discuss minimizing exposure of the salivary glands to radiation with the radiation therapy provider.

Resources

BOOKS

Lee, K. J., ed. *Essential Otolaryngology*. 7th ed. New York: McGraw Hill, 1998.

Rakel, Robert, ed. *Conn's Current Therapy*. Philadelphia: W.B. Saunders Company, 1997.

PERIODICALS

Johnstone, P. A., R. C. Niemtzow, and R. H. Riffenburgh. "Acupuncture for Xerostomia: Clinical Update." *Can cer* 94 (February 15, 2002): 1151 1156.

Koukourakis, M. I. "Amifostine in Clinical Oncology: Current Use and Future Applications." *Anticancer Drugs* 13 (March 2002): 181 209.

Leek, H., and M. Albertsson. "Pilocarpine Treatment of Xerostomia in Head and Neck Patients." *Micron* 33 (2002): 153 155.

Petrone, D., J. J. Condemi, R. Fife, et al. "A Double Blind, Randomized, Placebo Controlled Study of Cevimeline in Sjögren's Syndrome Patients with Xerostomia and Keratoconjunctivitis Sicca." *Arthritis Rheum* 46 (March 2002): 748 754.

Ship, J. A., S. R. Pillemer, and B. J. Baum. "Xerostomia and the Geriatric Patient." *Journal of the American Geriatric Society* 50 (March 2002): 535 543.

Sugano, Sumio, Isamu Takeyama, Sadao Ogino, et al. "Effectiveness of Formula Ophiopogoins in the Treat ment of Xerostomia and Pharyngoxerosis." *Acta Oto lanryngol (Stockh)* 252 (1996): 124 129.

Votta, T. J., and L. Mandel. "Somatoform Salivary Com plaints. Case Reports." *New York State Dental Journal* 68 (January 2002): 22 26.

ORGANIZATIONS

American Dental Association. 211 E. Chicago Ave. Chi cago, IL 60611. (312) 440 2500. http://www.ada.org.

American Medical Association. 515 N. State Street, Chi cago, IL 60612. (312) 464 5000. http://www.ama assn.org.

Mai Tran
Rebecca J. Frey, PhD

Dysbosis

Definition

Dysbiosis typically refers to a disorder of the gastro-intestinal tract occurring when there is a disturbance of the complex ecological balance between the microbial organisms in the gut and their human host.

Russian scientist and Nobel Prize winner Elie Metchniko (Llya Llyich Metchniko, 1845–1916), a colleague of Louis Pasteur (1822–1895), devised the term in the early twentieth century to denote the condition when healthy symbiosis of intestinal flora is disrupted bringing about a harmful relationship between the human host and the gastro-intestinal bacteria. Researchers afterward determined that such a non-infectious microbial overgrowth can occur in various locations inside the body, on the skin surface, or in the external environment.

Alex Vasquez, a widely published **chiropractic** and naturopathic doctor, writing in the *Journal of the Council on Nutrition of the American Chiropractic Association*, uses a broad definition of dysbiosis as "a relationship of non-infectious host-microorganism interaction that adversely affects the human host." He specifies the subtype of dysbiosis based on the location: "gastrointestinal, oral, sinus, genitourinary, dermatologic, or environmental." According to Vasquez, with multifocal dysbiosis in general the adverse physiologic and clinical consequences are "additive and synergistic."

Although it is difficult to obtain a culture of intestinal microorganisms and separate and count the various types of protozoa, bacteria, and fungi in a laboratory environment, using these methods, researchers identified as many as 500 different species. However, subsequent advances in DNA sequence-based technologies permitted a genetic analysis without the need for prior cultivation. This process, known as metagenomics, enabled a detailed ecological analysis of the gastrointestinal tract. Researchers Daniel N. Frank and Norman R. Pace, writing in 2008 in the journal *Current Opinion in Gastroenterology* reported that there may be as many as 40,000 bacterial species comprising the "collective gastrointestinal microbiome."

According to researchers Jason A. Hawrelak and Stephen P. Meyers, reporting in a 2004 review of the scientific literature on dysbiosis, intestinal microflora are involved with the synthesis of vitamins, stimulation of the immune system, digestion and absorption of nutrients, metabolism of drug and plant compounds, and in improving the function and motility of the gastro-intestinal system. Microflora also act to inhibit pathogens and aid in the production of short-chain fatty acids and polyamines. Beneficial lactic-acid producing lactobacilli and bifidobacteria, which constitute a major part of healthy human intestinal microflora, help increase bioavailability and absorption of minerals such as **calcium**, **copper**, **iron**, **magnesium**, and **manganese**.

Researchers concur that dysbiosis is a contributing factor in many chronic and degenerative diseases, including **irritable bowel syndrome** (IBS), **inflammatory bowel disease** (IBD), autoimmune disorders, **rheumatoid arthritis** and **ankylosing spondylitis**, atopic **eczema**, and mental and emotional disorders.

Eliminating toxins in the intestinal tract has been seen as a vital component of health maintenance for as

long as 5,000 years. In **Ayurvedic medicine**, intestinal toxins were understood to be at the root of all disease.

There are differences in both quality and quantity of the commensal bacteria present in non-harmful relationship throughout the healthy gastro-intestinal tract. These bacteria are an integral part of the immune system and form a front-line defense. As many as 80% of the body's immune cells (lymphocytes) are present in the intestinal lining, positioned there to protect the system from the toxins, bacteria, viruses, and allergens found in the bowel contents.

Causes and symptoms

There are four patterns of intestinal dysbiosis, according to Leo Galland, MD, and Stephen Barrie, ND. These patterns are: putrefacation, deficiency, fermentation, and sensitization. Researchers have identified various factors that contribute to development of the patterns of dysbiosis:

- prolonged and repeated antibiotic drug use
- diets of high-fat, animal protein, and low-fiber
- psychological and physical stress
- immune system dysfunction
- processed foods, refined sugars, and food additives
- oral contraceptives
- long-term use of pharmaceutical pain medications
- geriatric deficiency of gastric hydrochloric acid

Common symptoms of dysbiosis include abdominal cramps and bloating, chronic **fatigue**, food **allergies** and intolerance, fluid retention, headaches, **tinnitus**, vertigo, unclear thinking, weight gain, **diarrhea** and/or **constipation**, flatulence, and gastro-intestinal disturbances such as irritable bowel syndrome (IBS).

Serious conditions such as **autism** and attention deficit hyperactivity disorder (ADHD) have been linked to overgrowth of the gastro-intestinal yeast, candida *(Candida albicans)*.

According to Marcelle Pick, an OB/GYN physician, women in the United States seek medical help for digestive disorders two to three times as often as men. Some research suggests that the hormones estrogen and progesterone may influence digestion. A decline in these ovarian hormones is strongly linked to symptoms of gastro-intestinal distress.

Diagnosis

Though there is not much scientific literature establishing diagnostic criteria for dysbiosis, some health practitioners suggest a comprehensive diagnostic stool analysis (CDSA) to determine the dysbiosis risk index based upon gut microbiology, pH, and short-chain fatty acids. Many studies of microbiota in the human GI tract have used fecal samples, but these samples may not accurately detect the micro flora along the entire GI tract, according to researchers. More accurate diagnostic tools may be required to distinguish the particular pattern of intestinal dysbiosis. This determination is crucial to developing and effective treatment plan.

Treatment

Dietary and nutritional therapies

The first and most important treatment is a change in the diet. Care must be taken to eliminate the foods that feed the unhealthy bacteria. A diet eliminating simple sugars and refined carbohydrates and low in fruit and starchy vegetables may help to keep yeast growth in check and eliminate the toxins created from fermentation. To assure lasting results, the diet should be adhered to for as long as one year, though relief from symptoms of various patterns of dysbiosis may be observed much earlier.

When it is determined that the dysbiosis is caused by bacteria and/or yeast, a supplementation with friendly probiotic organisms such as Lactobacillus and Bifidobacterium may be indicated. The best food sources of these bacteria are organic yogurt with live cultures and kefir. Some additional food sources are: **garlic**, onions, asparagus, artichokes, **chicory**, bananas, wheat, barley and rye, miso, tempeh, tamari, pickled daikon, and sauerkraut. **Probiotics** are also available in capsule form.

Prebiotics are non-digestible food ingredients that help promote and stimulate the growth and/or activity of beneficial bacteria. These include **fructooligosaccharides** (FOS), inulin, and galactooligosaccharides.

Herbal remedies

Some recommended herbal remedies include:

- An extract of the inner rind and seeds of grapefruit *(Citrus racemosa)* acts as a broad-spectrum natural antibiotic that is highly active against protozoa, bacteria, yeast, and some viruses.
- An extract of the western larch tree *(Larix occidentalis)*, which contains the water-soluble polysaccharide arabinogalactan with immune-enhancing properties. Arabinogalactans are also found in other plants and herbs, including echinacea (*Echinacea purpurea*) and tumeric *(Curcuma longa)*.
- Berberine, containing medicinal plants such as goldenseal *(Hydrastis canadensis)*, and Barberry (*Berberis vulgaris*), which studies have shown fight bacterial,

KEY TERMS

Ankylosing spondylitis—A systemic rheumatic disease causing chronic inflammation (spondylitis) and stiffness in the spine, the lower back, and inflammation of other tissues throughout the body such as the eyes, heart, lungs, and kidneys. Over time, the inflamation may lead to a complete fusion of the vertebrae and loss of spinal mobility (ankylosis).

Autoimmune—An abnormal, overactive and misdirected immune response against substances and tissues in the body that are normally not recognized as a threat.

Candidiasis—A systemic infection caused by an imbalance of intestinal bacteria with an overgrowth of the yeast *Candida albicans*.

Leaky gut—Intestinal permeability caused by damage to the intestinal mucosa, which leads to increase in the toxic load placed on the liver.

Probiotics—Beneficial bacteria in the gastrointestinal tract essential to healthy digestion. Probiotics produce certain essential vitamins and provide protection from bacteria, parasites, viruses, yeasts, and fungi while promoting the breakdown of waste and toxins. The lactobacillus species is the best known of the many probiotics.

Short-chain fatty acids—End products of bacterial fermentation derived from the breakdown of complex carbohydrates by anaerobic micro-organisms in the large intestine.

viral, fungal, and parasitic infections with the alkaloid berberine.

- Kombucha (*Fungus japonicus*) tea, a fermented drink containing a colony of yeast and bacteria, helps correct the intestinal flora imbalance.
- Vitamin and mineral supplementation may help counteract the effects of malabsorption, maldigestion, and hypermetabolism that may be factors contributing to dysbiosis.
- Time-released capsules of oregano, and the extract hyperforin from St. John's Wort *(Hypericum perforatum)*, myrrh *(Commiphora molmol)* and thyme, clove, and anise may also help.

Prevention

Prevention of dysbiosis may involve lifestyle change that reduces physical and mental **stress**, adoption of a healthy diet, body cleansing, including periodic **fasting**, physical exercises, vitamin and mineral supplementation, and traditional and natural therapies that maximize general health and wellbeing.

Resources

PERIODICALS

Bralley, J. Alexander, Robert M. David, and Richard S. Lord. "DNA Detection of Gut Microbiota Advancing Routine Characterization of Microbial Populations." *The Townsend Letter* (January 2008).

Frank, Daniel N., and Norman R. Pace. "Gastrointestinal Microbiology Enters the Metagenomics Era." *Current Opinion in Gastroenterology* 24, no. 1 (2008): 4 10.

Vasquez, Alex. "Reducing Pain and Inflammation Natu rally. Part 6: Nutritional and Botanical Treatments Against 'Silent Infections' and Gastrointestinal Dys biosis, Commonly Overlooked Causes of Neuromus culoskeletal Inflammation and Chronic Health Problems." *Nutritional Perspectives: Journal of the Council on Nutrition of the American Chiropractic Association* 29, no. 1 (January 2006).

OTHER

"Bacterial Dysbiosis." *Diagnose Me.com*. http://www. diagnose me.com. (February 24, 2008).

"Probiotics and Prebiotics: Treatment Options Treatment Information." *Environmental Illness Resource*. http:// www.ei resource.org. (February 25, 2008).

Remington, Charles. "The 30 foot Pathway: A Guide to Intestinal Health." *Natural Life Magazine* January/ February 2007. http://www.life.ca/nl/113/intestines. html. (February 25, 2008).

ORGANIZATIONS

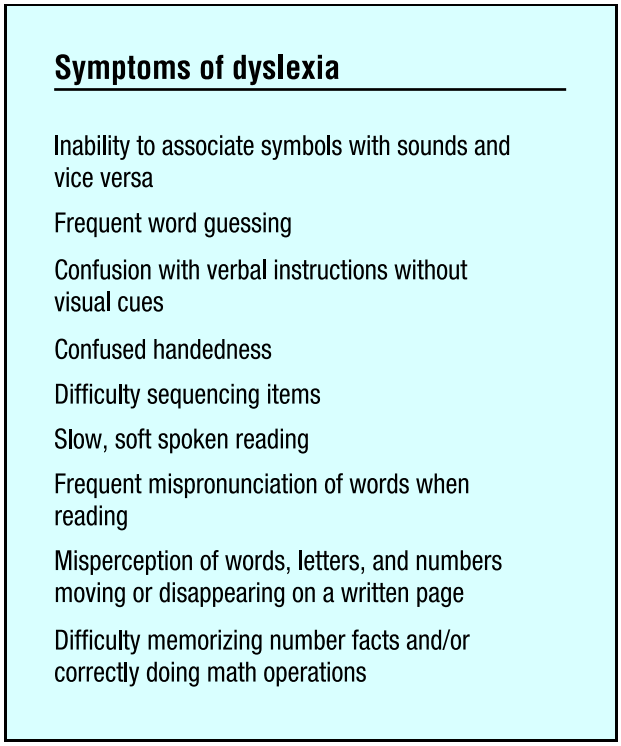
American Naturopathic Medical Association (ANMA), PO Box 96273, Las Vegas, NV, 89193, (702) 897 7053 www.anma.com.

Clare Hanrahan

Dyslexia

Definition

Dyslexia is a kind of learning disability noted for spatial reversals and shifts and is sometimes described as a neurological disorder. It manifests as difficulties with reading, writing, spelling and sometimes math. Occasionally, balance, movement, and rhythm are affected. Persons with dyslexia frequently display above average to superior intelligence, gifted creativity and genius. Leonardo da Vinci, Albert Einstein, Walt Disney, and the Olympic multi-Gold Medal diving champion, Greg Louganis, are noted examples of persons with dyslexia.



(Illustration by Corey Light. Cengage Learning, Gale)

Description

Genetics is believed to be a deciding factor in whether or not a person develops dyslexia. The condition may appear as early as three months. One report suggested that as many as 5–15% of Americans are affected. The National Institute of Health (NIH) reports that up to 8% of American elementary school children may have the unique characteristics described originally in 1920 by Dr. Samuel Torrey Orton. Believing it first a condition of "cross lateralization of the brain," by which he meant that functions normally processed on the right side of the brain are processed on the left side in the person with dyslexia, Orton later modified his description of the condition as being a "mixed hemispheric dominance," by which he meant that the alteration of functions to the opposite side of the brain occurred sometimes, but not all the time.

Since the advent of magnetic resonance imaging (MRIs), scientists have been able to view dyslexia from another vantage point, ironically, a process imitating what happens inside the mind of a dyslexic individual, according to one educator with dyslexia, Ronald D. Davis. He describes the ordinary ability of the person with dyslexia to visualize an object from multiple points of view, a process which has a moving point of view and which is spatially unanchored. When presented with a word that is easily visualized as a known object, like horse, the dyslexic mind easily imagines the horse from multiple perspectives, and, so rapidly—somewhere between 400 to 2,000 times faster than those without dyslexia—visual cues are processed 'almost intuitively,' demonstrating great mastery of the objectified visual world. However, when it comes to processing sound, language, speaking, handwriting and understanding verbalized communication not associated with an object, like the words "the" or "and", a series of non-image disconnections leads to confusion, disorientation, and an inability to adequately make sense of key pieces of visual information. To the person with dyslexia, a simple seven word sentence may look like a three word sentence with four blank spaces here and there.

Causes and symptoms

Although an exact cause has not been identified, studies have identified differences in the way sound and visual information are processed between persons with and without dyslexia. In the dyslexic individual these differences create what one NIH scientist refers to as a "physiologic signature"—a unique brain pattern—perhaps the result of emphasized activity along dopamine related neuro-pathways. Dopamine is a neurotransmitter, a chemical substance acting in the brain that facilitates certain kinds of messages. According to one author, when dopamine levels are high, the person with dyslexia experiences time as moving very slowly outside themselves, and very fast inside; as if time stands still. This author also notes that when the person with dyslexia experiences episodes of disorientation, when words or sounds do not create a visual picture for them and their mind continues to try and solve the confusion visually, dopamine levels shift and change. This would seem to be consistent with some of the symptoms of dyslexia, such as inaccurate perceptions of time and a lot of day dreaming.

Symptoms may include:

- poor ability to associate symbols with sounds and vice versa
- frequent word guessing when reading, and an inability to retain meaning
- confusion when given verbal instructions unaccompanied by visual cues
- confused sense of spatial orientation, especially by reversing letters and numbers, and losing one's place frequently while reading, or skipping lines

KEY TERMS

Acetylcholine—A chemical of nerve transmission involved with movement.

Attention Deficit Disorder (ADD)—A learning disability characterized by an inability to pay attention. It may be different from dyslexia in that dyslexic individuals are highly aware and able to pay attention, but unable to make sense of their perceptions.

Attention Deficit with Hyperactivity Disorder (ADHD)—A learning disability characterized by an inability to sit still or concentrate well. It has been demonstrated to be diagnostically different from dyslexia by speech and vocalization patterns.

Cross lateralization—A term used to describe what was believed to be a difference in the way the mind works in persons with and without dyslexia. It was believed that functions processed in the right half of the brain by a person without dyslexia were processed in the left half by a person with dyslexia.

Dopamine—A chemical of nerve transmission involved with pleasure and pain and some forms of movement.

Dyslexia—A term applied to a kind of learning disability particularly noted for reversals and spatial shifts, making reading, writing, spelling and math very difficult.

Koosh ball—A lightweight, "furry" ball of rubber band material used in Davis technique exercises for retraining neuropathways in the brain of a person with dyslexia.

Mind's eye—A term referring to an imaginary point from which the mind views what the eyes look at or what the imagination presents. In dyslexia, the mind's eye is unanchored to one location, and sends many signals to the brain about what it sees, which causes disabling confusion.

Mixed hemispheric dominance—A term later used to describe what was believed to be a difference in the way the mind works in persons with and without dyslexia. It was believed that functions processed in the right half of the brain by a person without dyslexia were sometimes processed in the left half by a person with dyslexia.

Monoamine oxidase (MAO) inhibitors—A group of anti-depressant drugs.

Neurotransmitter—A chemical substance that facilitates the passing of messages along nerve pathways. There are several different neurotransmitters used in the human nervous system, each with distinct effects on mood, movement and perception.

Point of view—In a person with dyslexia, this term is used to describe the angle from which their mind's eye views an object. This point of view may be unanchored and moving about, as if several different people were telling what they see all at the same time.

- having the perception that words, letters and numbers move around, disappear, or get bigger or smaller
- overlooking punctuation marks or other details of language
- slow, labored reading and speech may be difficult to understand, words often mispronounced and softly spoken
- confused sense of right and left handedness
- math concepts are difficult to learn, excessive daydreaming, and difficulty with time
- difficulty sequencing items
- difficulty with jigsaw puzzles, walking a chalk line straightly or other fine motor skill tasks.

Other more positive characteristics common with dyslexia include:

- primary ability of the brain to alter and create perceptions
- highly aware of their environment, intelligent, and above average curiosity
- intuitive, insightful, and having the extraordinary ability of thinking in pictures
- multi-dimensional perception (from various viewpoints almost simultaneously)
- vivid imagination
- experiencing thought as reality (confusing what they see with what they think they see), thereby being abundantly creative

Diagnosis

Diagnosis is difficult in part because symptoms can also result from other conditions and because no two individuals display the same symptoms. As a result, dyslexia can be viewed as a developmental condition, a "self-created condition," rather than as a disease. As each individual baby interprets visual data, and adapts to the environment accordingly,

they develop their own individual and unique brain patterns. It is that developmental pattern that is consistent among people with dyslexia. When the individual's mind cannot make sense of the data, confusion and disorientation result; incorrect data is incorporated, causing the individual to make mistakes that leads to emotional reactions, primarily frustration. A behavior is adopted that constitutes a learning disability because it disables future learning and, ultimately, affects self esteem.

Sometimes the learning disorder of dyslexia is inaccurately paralleled to Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD). In a 2003 study, distinguishable differences between the two **learning disorders** were readily apparent. Comparing 105 boys between the ages of eight and ten, from three different schools and cross divided into three different groups—35 boys diagnosed with ADHD not taking stimulant medication, 35 boys with dyslexia, and 35 boys without learning disabilities—the study found clear and diagnostically useful differences in speech related patterns between all groups. Since diagnosis of a learning disability may be made between parents and teachers or other school administrators on the basis of symptoms rather than clinical diagnostic testing, careful diagnosis is advisable.

Treatment

Ronald D. Davis, writing in *The Gift of Dyslexia* outlines an alternative and complementary treatment consistent with the "moving point of view" model. According to this model, and the reason why letters seem to change shape and float, why lines of print appear to move, and why words appear to be other than they are is that the dyslexic individual sees the world predominantly through his or her "mind's eye," rather than through his or her physiologic eye. In other words, the person with dyslexia more than all others, sees what he or she 'thinks' they see, rather than what their eyeballs see. To further complicate matters, they do this so quickly, they easily become confused when the multiple facets do not produce a solid view. The object of treatment proposed by Davis, a dyslexic individual himself, is to train the mind's eye to return to a learned, anchored, viewpoint when they realize they are seeing with their mind, and not with their eyeballs. This is accomplished with assessment testing, followed by one-on-one exercises that retrain mental perception pathways. Using the gifts of the dyslexic individual—their imagination and curiosity—these exercises involve creative physical activities, including the use of modeling clay, "koosh" balls, and movement training. Davis founded the Reading Research Council's Dyslexia Correction Center in 1982, and the Davis Dyslexia Association International, which trains educators and therapists, in 1995.

Another alternative treatment option seeks to address unmastered learning skills needed for reading and math. This system, called Audioblox, may be used one-on-one (especially for children) or in groups, and involves a series of mental exercises that address learning, focusing on the "deficits" of dyslexia. Treatment involves the purchase of a kit online that contains a book entitled *The Right to Read,* a supplementary manual, a computer program on CD to supplement Audioblox training, and teaching materials. The book is in two parts; first, an explanation of theory; second, the program itself, with exercises. The supplementary manual contains specialized programs for areas of deficit, including handwriting, spelling, math, preschool readiness, and high school or adult learning. The teaching materials include 96 colored blocks, representing each of six colors on each of the six sides of the block; a view blocking screen; colored cards with preprinted patterns; letter cards; a reading book with a story written in the 800 most common English words, and word cards; and, a demonstration video. The kit originates in England; pricing in America ranges approximately between $135 and $150.

Special education recommendations include helping a child stay organized and on task by keeping their desk and workplace free of extraneous, distracting materials; making more frequent, shorter assignments to increase confidence; providing positive, "immediate gratification" feedback; and short conferences or work contracts as needed.

Allopathic treatment

Allopathic medical treatment for dyslexia includes use of anti-motion drugs, addressing the symptoms of balance and coordination that results from visual perception alterations; stimulant drugs, such as Cylert or Ritalin, to address symptoms of low self esteem, restlessness, and distractibility, and 'nootropics' drugs, a class of drugs believed to improve cognitive function. The stimulant drugs may be more effective for learning disorders related to ADHD or ADD than for dyslexia. The drug Piracetam, a nootropic, although reported as a possible treatment for dyslexia, is also reported to have legal issues because it has not been approved for use in the United States by the Food and Drug Administration (FDA). Reported potential side effects of the stimulants include nervousness and **insomnia**, and are

contra-indicated with **epilepsy**, **allergies**, blood pressure problems, or with use of monoamine oxidase (MAO) inhibitors. Long-term use of stimulants in children are reported to adversely affect growth, and may ironically depress the nervous system or lead to loss of consciousness. By reducing natural levels of stimulants in the brain, they may also cause dependence. The stimulants and nootropics are said to increase the effects of alcohol and amphetamines. Other possible interactions include use of anti-convulsants or anti-epileptics; tricyclic anti-depressants; anti-coagulants, like Coumadin; and atropine-like drugs that blocks the neurotransmitter acetylcholine.

Prognosis

If left unaddressed, a person with dyslexia may become functionally illiterate, able to function limited by their ability to read, spell, have their handwriting understood, or do arithmetic. Recognizing that dyslexia is a developed learning disorder affecting people of extraordinary curiosity, imagination and intelligence—people of genius, often—from a productive or functional point of view, dyslexia may contribute significantly, positively or negatively, to performance levels. From an emotional or psychological point of view, dyslexia affects self esteem, and promotes confusion and frustration that may contribute to under achievement.

Prevention

No method of preventing dyslexia is currently known. However, existing methods of treatment may prevent or reduce the secondary or indirect losses to individuals, society and culture that might otherwise occur. As the genetic aspects of dyslexia are revealed, genetic chromosomal modifications may prevent the expression of dyslexia in future generations. Wise use of present and future understandings will allow individuals with dyslexic gifts, individuals such as Leonardo daVinci, Albert Einstein, Walt Disney and Greg Louganis, to continue to contribute their genius and talents.

Resources

BOOKS

Clayman, M.D., Charles B., ed. *The American Medical Association Guide to Prescription and Over The Counter Drugs*. New York: Random House, 1988.

Davis, Ronald D., with Edlon M. Braun. *The Gift of Dys lexia, Why Some of the Smartest People Can't Read and How They Can Learn*. New York: Berkley Publishing Group, 1997.

Pierangelo, Ph.D., Roger and Robert Jacoby. *Parents' Complete Special Education Guide*.New York: Simon Schuster, 1996.

Thomas, M.D., Clayton L., ed. *Taber's Cyclopedic Medical Dictionary, 16th edition*. Philadelphia: Davis Co., 1989.

OTHER

Audioblox U.K. *Audioblox Program* Cited May 12, 2004]. http://www.audiblox2000.com/uk/program.htm

Audioblox U.K. *Dyslexia* [Cited May 12, 2004]. http://www.audiblox2000.com/uk/dyslexia.htm

Breznitz, Zvia. "The Speech and Vocalization Patterns of Boys with ADHD Compared with Boys with Dyslexia and Boys Without Learning Disabilities." *Journal of Genetic Psychology*. 164, no. 4 (December 2003).

"Dyslexia" *The Dyslexia File, Center for Current Research*. [Cited May 12, 2004]. http://www.lifestages.com/health/dyslexia.html.

Schoon, Chris. *Piracetam FAQ*. Version 0.6. March 14, 2004 [cited May 10, 2004]. http://www.erowid.org/smarts/piracetam/piracetam faq.shtml.

Katy Nelson, N.D.

Dysmenorrhea

Definition

Dysmenorrhea is the occurrence of painful cramps during **menstruation**.

Description

More than half of all girls and women have dysmenorrhea (cramps), a dull or throbbing **pain** that usually centers in the lower mid-abdomen, radiating toward the lower back or thighs. Menstruating women of any age can experience cramps.

While the pain may be only mild for some women, others experience severe discomfort that can significantly interfere with everyday activities for several days each month. In fact, about 43% of women in the United States have pain so severe that it disrupts their daily lives and about 18% miss one or more days or work, school, or other activities each year because of menstrual cramps.

Causes and symptoms

Dysmenorrhea is called "primary" when there is no specific abnormality, and "secondary" when the pain is caused by an underlying gynecological problem. It is believed that primary dysmenorrhea occurs when

KEY TERMS

Endometriosis—The growth of uterine tissue outside the uterus.

Hormone—A chemical messenger secreted by a gland and released into the blood, where it travels to distant cells to exert an effect.

Ovary—One of the two almond-shaped glands in the female body that produces the hormones estrogen and progesterone.

Ovulation—The monthly release of an egg from an ovary.

Progesterone—The hormone produced by the ovary after ovulation that prepares the uterine lining for a fertilized egg.

Uterus—The female reproductive organ that contains and nourishes a fetus from implantation until birth.

prostaglandins, hormone-like substances produced by uterine tissue, trigger strong muscle contractions in the uterus during menstruation. However, the level of prostaglandins does not seem to correlate with the strength of a woman's cramps. Some women have high levels of prostaglandins and no cramps, whereas other women with low levels have severe cramps. This is why experts assume that cramps must also be related to other causes, such as **diets**, genetics, **stress**, and different body types, in addition to prostaglandins. The first year or two of a girl's periods are not usually very painful. However, once ovulation begins, the blood levels of the prostaglandins rise, leading to stronger contractions.

Secondary dysmenorrhea may be caused by **endometriosis**, fibroid tumors, or an infection in the pelvis.

The likelihood that a woman will have cramps increases if she:

- has a family history of painful periods
- leads a stressful life
- does not get enough exercise
- uses caffeine
- has pelvic inflammatory disease (PID)

Symptoms include a dull, throbbing cramping in the lower abdomen that may radiate to the lower back and thighs. In addition, some women may experience **nausea** and **vomiting**, **diarrhea**, irritability, sweating, or **dizziness**. Cramps usually last for two or three days at the beginning of each menstrual period. Many women often notice their painful periods disappear after they have their first child, probably due to the stretching of the opening of the uterus or because the birth improves the uterine blood supply and muscle activity, although others do not notice a change.

Diagnosis

A doctor should perform a thorough pelvic exam and take a patient history to rule out any underlying condition that could cause cramps.

Treatment

Nutritional therapy

The following dietary changes may help prevent or treat menstrual pain:

- Increased dietary intake of foods such as fiber, calcium, soy foods, fruits and vegetables.
- Decreased consumption of foods that exacerbate PMS. They include caffeine, salt and sugar.
- Quitting smoking. Smoking has been found to worsen cramps.
- Taking daily multi-vitamin and mineral supplements that contain high doses of magnesium and vitamin B_6 (pyridoxine), and flaxseed or fish oil supplements. Recent research suggests that vitamin B supplements, primarily vitamin B_6 in complex, magnesium, calcium, zinc, vitamin E, and fish oil supplements (omega-3 fatty acids) also may help relieve cramps.

Herbal therapy

An herbalist may recommend one of the following herbal remedies for menstrual pain:

- Chasteberry (*Vitex agnus-castus*) for women who also experience breast pain, irregular periods, and ovarian cysts.
- Dong quai (*Angelica sinensis*) for women with typical menstrual pain.
- Licorice (*Glycyrrhiza glabra*) for abdominal bloating and cramping.
- Black cohosh (*Cimifuga racemosa*) for relief of menstrual pain as well as mood swing and depression.

Yoga

Several **yoga** positions are popular as methods to ease menstrual pain. In the "cat stretch" position, the woman rests on her hands and knees, slowly arching the back. The pelvic tilt is another popular yoga position, in which the woman lies with knees bent, and then lifts the pelvis and buttocks.

Exercise

Exercise may be a way to reduce the pain of menstrual cramps through the brain's production of endorphins, the body's own painkillers.

Other remedies

Acupuncture and Chinese herbs are other popular alternative treatments for cramps. There are particular formulas depending on the pattern of imbalance. **Aromatherapy** and massage may ease pain for some women. Transcutaneous Electrical Nerve Stimulation (TENS) has been touted as a safe and practical way to relieve the pain of dysmenorrhea. It works by using electrodes to stimulate nerve fibers. Some women find relief through visualization, concentrating on the pain as a particular color and gaining control of the sensations. Others find that imagining a white light hovering over the painful area can actually lessen the pain for brief periods. Simply changing the position of the body can help ease cramps. The simplest technique is assuming the fetal position with knee pulled up to the chest while hugging a heating pad or pillow to the abdomen. Also, orgasm can make a woman feel more comfortable by releasing tension in the pelvic muscles.

Allopathic treatment

Several drugs can lessen or completely eliminate the pain of primary dysmenorrhea. Most popular are the non-steroidal anti-inflammatory drugs (NSAIDs), which prevent or decrease the formation of prostaglandins. These include aspirin, ibuprofen (Advil), and naproxen (Aleve). For more severe pain, prescription strength ibuprofen (Motrin) is available. These drugs are usually begun at the first sign of the period and taken for a day or two.

If an NSAID is not available, acetaminophen (Tylenol) may also help ease the pain. Heat applied to the painful area may bring relief, and a warm bath twice a day also may help.

Studies of a drug patch containing glyceryl trinitrate to treat dysmenorrhea suggest that it also may help ease pain. This drug has been used in the past to ease preterm contractions in pregnant women.

In 2002, an intrauterine device (IUD) was introduced to help eliminate the pain of menstrual cramps related to endometriosis. The IUD, known as Mirena, is approved for use in the Untied States as a contraceptive.

Expected results

Treatments should lessen or eliminate pain.

Prevention

Avoidance of **caffeine**, alcohol, and sugar prior to onset of period and NSAIDs taken a day before the period begins should eliminate cramps for some women.

Resources

BOOKS

Carlson, Karen J., Stephanie Eisenstat, and Terra Ziporyn. *The Harvard Guide to Women's Health*. Cambridge: Harvard University Press, 1996.

Murray, Michael T., and Joseph E. Pizzorno. "Premenstrual syndrome." In *Encyclopedia of Natural Medicine*. Rev. 2nd ed. Rocklin, CA: Prima Publishing, 1998.

PERIODICALS

Hale, Ellen. "Taming menstrual cramps." *FDA Consumer* 25, no. 5 (June 1991): 26 29.

Harel, Z., et.al. "Supplementation with omega 3 polyunsa turated fatty acids in the management of dysmenorrhea in adolescents." *American Journal of Obstetrics and Gynecology* 174 (April 1996): 13, 335 8.

McDonald, Claire, and Susan McDonald. "A Woman's Guide to Self care." *Natural Health* (January February 1998): 121 142.

"Menstrual Pain Severely Affects almost Half of U.S. Women." *AORN Journal* (April 2002): 121 778.

"More Power, Less Pain." *Chemist & Druggist* (April 6, 2002): 36.

"The Mirena IUD May Diminish Endometriosis related Dysmenorrhea (Results of Two Small Studies)." *OB GYN News* (May 15 2002): 16.

ORGANIZATIONS

American College of Obstetricians and Gynecologists. 409 12th St. SW, Washington, DC 20024. (202) 638 5577.

Federation of Feminist Women's Health Centers. 633 East 11th Ave., Eugene, OR 97401. (503) 344 0966.

National Women's Health Network. 1325 G St. NW, Washington, DC 20005. (202) 347 1140.

Mai Tran
Teresa G. Odle

Dyspepsia *see* Indigestion

E

Ear acupuncture *see* **Auriculotherapy**

Ear infection

Definition

Otitis media is an infection of the middle ear space, which lies behind the eardrum (tympanic membrane). It is characterized by **pain**, **dizziness**, and partial loss of hearing.

Description

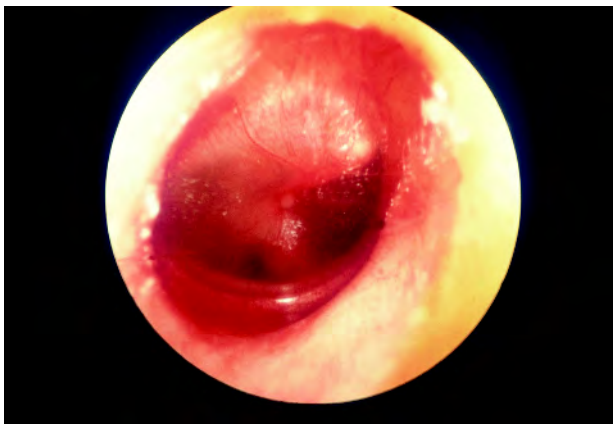
A little knowledge of the basic anatomy of the middle ear will be helpful for understanding the development of otitis media. The external ear canal is a tube that leads from the outside opening of the ear to a structure called the tympanic membrane. Behind the tympanic membrane is the space called the middle ear. Within the middle ear are three tiny bones called ossicles. These are the malleus, the incus, and the stapes. Their shapes are often described as a hammer, an anvil, and a stirrup. Sound in the form of vibration causes movement in the eardrum, and then in the chain of ossicles. The ossicles transmit the sound to the cochlea within the inner ear, which sends it to the brain for processing.

The nasopharynx is the passageway behind the nose that takes inhaled air into the breathing tubes leading to the lungs. The eustachian tube is a canal that runs between the middle ear and the nasopharynx. One of the functions of the eustachian tube is to keep the air pressure in the middle ear equal to that outside. This equalization of the air pressure allows the eardrum and ossicles to vibrate appropriately, so that hearing is normal.

By age three, almost 85% of all children will have had otitis media at least once. It is the most common pediatric complaint. Babies and children between the ages of six months and six years are most likely to develop otitis media. Children at higher risk for otitis media include boys, children from poor families, those with **allergies**, Native Americans, Native Alaskans, children born with cleft palate or other defects of the structures of the head and face, and children with Down syndrome. Babies whose first ear infection occurs prior to six months of age are more prone to chronic problems with otitis media. There also appears to be some genetic predisposition towards otitis media, which may be related to the structure and function of the area in and around the middle ear. Exposure to cigarette smoke significantly increases the risk of ear **infections**, as well as other problems affecting the respiratory system. In addition, children who enter daycare at an early age have more upper respiratory infections (URIs or colds), and thus more cases of otitis media. Although the ear infection itself is not contagious, the URIs that predispose children to them certainly are. The most common times of year for otitis media to strike are winter and early spring, which are the same times that URIs are most common.

Otitis media is an important medical problem because it often results in fluid accumulation within the middle ear. This is known as otitis media with effusion (OME). The effusion can last for weeks to months. Effusion within the middle ear can cause significant hearing impairment. When such hearing impairment occurs in a young child, it may interfere with the development of normal speech and language processing. A chronic effusion also increases the risk for subsequent infections, as the fluid provides a growth medium for bacteria.

In adults, acute otitis media can lead to such complications as paralysis of the facial nerves. Recovery from these complications may take from two weeks to as long as three months.



A photograph of the eardrum, through the ear using an otoscope, in a patient with otitis media, an ear infection. *(© Medical-on-Line / Alamy)*

KEY TERMS

Adenoid—A collection of lymph tissue located in the nasopharynx.

Effusion—A collection of fluid that has leaked out into some body cavity or tissue.

Eustachian tube—A small tube that runs between the middle ear space and the nasopharynx.

Fomite—An inanimate object that can transmit infectious organisms.

Myringotomy—A surgical procedure performed to drain an infected middle ear. A newer type of myringotomy uses a laser instead of a scalpel.

Nasopharynx—The part of the airway leading into the nose.

Ossicles—Tiny bones located within the middle ear that convey the vibrations of sound through to the inner ear.

Perforation—A hole that develops in a body tissue. In otitis media, the eardrum sometimes perforates because of the pressure of fluid behind it.

Topical—Referring to a medication applied to the skin or outward surface of the body. Ear drops are one type of topical medication.

Causes and symptoms

The first precondition for the development of acute otitis media is exposure to an organism capable of causing the infection. Otitis media can be caused by either viruses or bacteria. Virus infections account for about 15% of cases. The three most common bacterial pathogens are *Streptococcus pneumoniae*, *Haemophilus influenzae*, or *Moraxella catarrhalis*. About 75% of ear infections caused by *S. pneumoniae* are reported to be resistant to penicillin.

Otitis media may also be caused by other disease organisms, including *Bordetella pertussis*, the causative agent of **whooping cough**, and *Pneumocystis carinii*, which often causes opportunistic infections in patients with **AIDS**.

There are other factors that make the development of an ear infection more likely. Because the eustachian tube has a more horizontal orientation and is considerably shorter in early childhood, material from the nasopharynx can easily reach the middle ear. Discharges from the nasopharynx include infection-causing organisms. Children also have a lot of lymph tissue, some of which makes up the adenoids, in the area of the eustachian tube. The adenoids may enlarge with repeated respiratory tract infections, ultimately blocking the eustachian tubes. When the eustachian tube is blocked, the middle ear is more likely to fill with fluid. This fluid increases the risk of infection, and the corresponding risks of **hearing loss** and delayed speech development.

Recent advances in gene mapping have led to the discovery of genetic factors that increase a child's susceptibility to otitis media. Researchers are hoping to develop molecular diagnostic assays that will help to identify children at risk for severe ear infections.

Most cases of acute otitis media occur during the course of a URI. Symptoms may include cold symptoms, **fever**, ear pain, irritability, and problems with hearing. Babies may have difficulty feeding. When significant fluid is present within the middle ear, pain can increase depending on position. Lying down may cause an increase in painful pressure within the middle ear, so that babies often fuss if not held upright. Older children sometimes complain of a full sensation in the affected ear. If the fluid build-up behind the eardrum is sufficient, the eardrum may develop a hole (perforate), causing bloody fluid or greenish-yellow pus to drip from the ear. Although the pain may be severe before the eardrum perforates, the pain is usually relieved by the reduction of pressure brought on by a perforation.

Diagnosis

Diagnosis is usually made simply by looking at the eardrum through a special lighted instrument called an otoscope. The eardrum will appear red and swollen,

and may appear either abnormally drawn inward, or bulging outward. Under normal conditions, the ossicles create a particular pattern on the eardrum, referred to as "landmarks." These landmarks may be obscured in the course of an infection. Normally, the light from the otoscope reflects off the eardrum in a characteristic fashion. This is called the "cone of light." In an infection, this cone of light may be shifted or absent.

A special attachment to the otoscope allows the examiner to blow a puff of air gently into the ear. Normally, this should cause movement of the eardrum. In an infection, or when there if fluid behind the eardrum, this movement may be decreased or absent. Movement of the eardrum can also be assessed by a tympanogram. A tympanogram is a quick, painless test. If there is fluid in the middle ear, the tympanogram reading will be flat. If the middle ear is filled with air, as it is normally, the test will also show whether it is at higher or lower pressure than it should be. This measurement could be an indicator of abnormal function of the eustachian tube.

Hearing tests, or audiograms, are sometimes used to determine whether hearing loss has occurred because of infection or persistent fluid, and whether the loss is severe. A hearing screen for children old enough to describe their own hearing reliably can be performed in schools or at the pediatrician's office. More accurate testing is done in a soundproof booth by an audiologist. This method can also be modified for use with children who can not give a verbal indication that they have heard a sound, but are old enough to turn their heads to see the source of a noise.

Fluid or pus draining from the ear can be collected. This sample can then be processed in a laboratory to allow any organisms present to multiply sufficiently (cultured) to permit the organisms to be viewed under a microscope and identified. Cultures are also used to determine the sensitivity of the organisms to specific antibiotics.

Treatment

Chiropractic

One particular **chiropractic** procedure, known as the endonasal technique, is thought to help the eustachian tube to open and thus improve drainage of the middle ear. The tube is sometimes blocked off due to exudates or inflammatory processes. The endonasal technique can offer significant relief from **earache**.

Craniosacral therapy and osteopathy

Craniosacral therapy uses gentle manipulation of the bones of the skull to relieve pressure and improve eustachian tube function. This treatment may also help the eustachian tubes to assume a position in which they can drain on their own. The pressure exerted on a baby's head during the birth process sometimes contributes to the tubes being in a position in which it is hard for them to drain. Osteopaths practice a similar gentle manipulation of the bones of a child's head. One osteopathic study of children from kindergarten through third grade in a Missouri school district found a direct correlation between abnormal head shape at birth and susceptibility to otitis media during the early elementary school years. Pediatric osteopaths specialize in cranial work in children.

Herbal therapy

A number of herbal treatments for otitis media have been recommended, including eardrops made with **goldenseal** (*Hydrastis canadensis*), **mullein** (*Verbascum thapsus*), **St. John's wort** (*Hypericum perforatum*), and **echinacea** (*Echinacea* spp.). Tinctures of echinacea, **thyme** (*Thymus vulgaris*), and elderflower (*Sambucus nigra*) are often recommended for oral treatment of otitis media due to chronic congestion. Warm **garlic** oil can be instilled directly into the ear. Steam inhalation infused with **eucalyptus** or **chamomile** may reduce the congestion of the URIs that often accompany otitis media.

Homeopathy

Homeopathic remedies that may be prescribed for middle ear infections include **aconite**, ferrum phosphoricum, **belladonna**, chamomilla, **lycopodium**, **pulsatilla**, or **silica**.

Nutrition

Some practitioners believe that food allergies may increase the risk of ear infections, and they suggest eliminating suspected food allergens from the diet. The top food allergens are wheat, dairy products, corn, peanuts, citrus fruits, and eggs. Elimination of sugar and sugar products can allow the immune system to work more effectively. Other nutritionists have noted that children who were breastfed as babies are less susceptible to ear infections.

Acupuncture

Acupuncture can help to reestablish a normal flow of fluids within the head. This form of treatment may also enhance the immune system.

Allopathic treatment

Medications

Antibiotics are the treatment of choice for acute otitis media (AOM). Different antibiotics are used depending on the type of bacteria most likely to be causing the infection. This decision involves knowledge of the types of antibiotics that have worked on other ear infections occurring within a particular community at a particular time. Options include sulfa-based antibiotics, as well as a variety of penicillins, cephalosporins, and others. The patient's sensitivity to certain medications, as well as previously demonstrated resistant **strains**, also contributes to the choice of antibiotic. An 0.3% topical solution of ofloxacin has been recommended as a more effective medication than other oral or topical antibiotics.

Following a course of antibiotic treatment, approximately 40% of children will continue to have fluid behind the eardrum, resulting in otitis media with effusion (OME). The eardrum is no longer red or infected. The fluid may take weeks to months to resolve. Generally, it is safe to allow this condition to continue with observation for up to 12 weeks. At that time, hearing should be tested. If hearing loss is insignificant or only in one ear, observation can continue for up to a total of 4–6 months, at which time placement of ventilation tubes in the eardrum is often recommended. The tube functions as an accessory eustachian tube until it falls out. If hearing loss is significantly affecting both ears at any time after six weeks from diagnosis of OME, antibiotic treatment or tube placement should be considered.

The overuse of antibiotics is contributing to some strains of bacteria—particularly *S. pneumoniae*—developing resistance and becoming more difficult to treat. Research is being done to try to help determine whether there may be some ear infections that would resolve without antibiotic treatment. One pediatrician has suggested some changes in usage of antibiotics for otitis media. He describes five factors to use to determine whether antibiotic treatment can be limited to five days or perhaps avoided altogether. The factors to consider are the age of the child; time of year; severity of the infection; frequency of infection; and rapidity of response to antibiotics. Generally, otitis media clears more readily when it occurs in an older child, in the summer, and causes relatively mild symptoms in a child who has not experienced frequent infections in the past. Given these factors, it may be possible to avoid antibiotic use. The patient must be monitored to be sure the infection clears without complication. If antibiotic treatment is initiated and the infection clears quickly, a five-day course of medication may be all that's needed.

Whether or not antibiotics are used, such pain relievers as Tylenol or Motrin can be very helpful in reducing the pain and inflammation associated with otitis media.

The use of decongestants and antihistamines does not appear to shorten the course of infection.

Surgery

In a few rare cases, a surgical perforation to drain the middle ear of pus may be performed. This procedure is called a myringotomy. The hole created by the myringotomy generally heals itself in about a week. In 2002 a minimally invasive procedure was introduced that uses a laser to perform the myringotomy. It can be performed in the doctor's office and heals more rapidly than the standard myringotomy.

Although some doctors have recommended removing the adenoids to prevent recurrent otitis media in young children, recent studies indicate that surgical removal of the adenoids does not appear to offer any advantages over a myringotomy as a preventive measure.

Expected results

With treatment, the prognosis for acute otitis media is very good. Long-lasting accumulations of fluid within the middle ear, however, place the patient at risk both for difficulties with hearing and speech, and for the repeated development of ear infections. Without treatment, otitis media occasionally leads to serious complications, including an infection within the nearby mastoid bone, called mastoiditis.

Prevention

Although otitis media seems inevitable in childhood, some measures can be taken to decrease the chance of repeated infections and fluid accumulation. Breastfeeding provides some protection against URIs, which in turn protects against the development of otitis media. If a child is bottle-fed, parents should be advised to feed him or her upright, rather than allowing the baby to lie down with the bottle. General good hygiene practices (especially hand washing) help to decrease the number of upper respiratory infections in a household or daycare center. Hand sanitizers are preferable to antibacterial soaps, which may contribute to bacterial resistance.

The use of pacifiers should be avoided or limited. They may act as fomites, particularly in a daycare setting. In children who are more susceptible to otitis media, pacifier use can increase by as much as 50% the number of ear infections experienced.

Two vaccines can prevent otitis media associated with certain strains of bacteria. One is designed to prevent **meningitis** and other diseases, including otitis media, that result from infection with *Haemophilus influenzae* type B. Another is a vaccine against *Streptococcus pneumoniae*, a very common cause of otitis media. Children who are at high risk or have had severe or chronic infections may be good candidates for these vaccines; in fact, a recent consensus report among pediatricians recommended routine administration of the pneumococcal conjugate vaccine to children younger than two years, as well as those at high risk for AOM. Parents should consult a health care provider concerning the advisability of this treatment.

Another vaccine that appears to lower the risk of AOM in children is the intranasal vaccine that was recently introduced for preventing **influenza**. Although the flu vaccine was not developed to prevent AOM directly, one team of researchers found that children who were given the vaccine before the start of flu season were 43% less likely to develop AOM than children who were not vaccinated.

As of early 2003, there was no vaccine effective against *M. catarrhalis*. Researchers are working on developing such a vaccine, as well as a tribacterial vaccine that would be effective against all three pathogens that commonly cause otitis media.

A nutrition-based approach to preventive treatment is undergoing clinical trials as of late 2002. This treatment involves giving children a dietary supplement of lemon-flavored cod liver oil plus a multivitamin formula containing **selenium**. The pilot study found that children receiving the supplement had fewer cases of otitis media, and that those who did develop it recovered with a shorter course of antibiotic treatment than children who were not receiving the supplement.

After a child has completed treatment for otitis media, a return visit to the practitioner should be scheduled. This visit should occur after the course of antibiotic has been completed. It allows the practitioner to evaluate the patient for the persistent presence of fluid within the middle ear. In children who have a problem with recurrent otitis media, a small daily dose of an antibiotic may prevent repeated full attacks of otitis media. In children who have frequent bouts of otitis media or persistent fluid, a procedure to place ventilation tubes within the eardrum may help to equalize pressure between the middle ear and the outside, thus preventing further fluid accumulation.

Resources

BOOKS

Duran, Marlene, et al. "Infections of the Upper Respiratory Tract." In *Harrison's Principles of Internal Medicine,* 14th ed., edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

"Otitis Media and its Complications." In *Nelson's Textbook of Pediatrics,* edited by Richard Behrman. Philadelphia: W.B. Saunders Co., 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Chiropractic and Osteopathy. New York: Simon & Schuster, 2002.

Ray, C. George. "Eye, Ear, and Sinus Infections." In *Sherris Medical Microbiology: An Introduction to Infectious Diseases,* edited by Kenneth J. Ryan. Norwalk, CT: Appleton and Lange, 1994.

PERIODICALS

Abes, G., N. Espallardo, M. Tong, et al. "A Systematic Review of the Effectiveness of Ofloxacin Otic Solution for the Treatment of Suppurative Otitis Media." *ORL* 65 (March April 2003): 106 116.

Bucknam, J. A., and P. C. Weber. "Laser Assisted Myrin gotomy for Otitis Media with Effusion in Children." *ORL Head and Neck Nursing* 20 (Summer 2002): 11 13.

Cripps, A. W., and J. Kyd. "Bacterial Otitis Media: Current Vaccine Development Strategies." *Immunology and Cell Biology* 81 (February 2003): 46 51.

Decherd, M. E., R. W. Deskin, J. L. Rowen, and M. B. Brindley. "*Bordetella pertussis* Causing Otitis Media: A Case Report." *Laryngoscope* 113 (February 2003): 226 227.

Goodwin, J. H., and J. C. Post. "The Genetics of Otitis Media." *Current Allergy and Asthma Reports* 2 (July 2002): 304 308.

Hoberman, A., C. D. Marchant, S. L. Kaplan, and S. Feld man. "Treatment of Acute Otitis Media Consensus Recommendations." *Clinical Pediatrics* 41 (July August 2002): 373 390.

Linday, L. A., J. N. Dolitsky, R. D. Shindledecker, and C. E. Pippinger. "Lemon Flavored Cod Liver Oil and a Multivitamin Mineral Supplement for the Secondary Prevention of Otitis Media in Young Children: Pilot Research." *Annals of Otology, Rhinology, and Laryng ology* 111 (July 2002): 642 652.

Marchisio, P., R. Cavagna, B. Maspes, et al. "Efficacy of Intranasal Virosomal Influenza Vaccine in the Preven tion of Recurrent Acute Otitis Media in Children." *Clinical Infectious Diseases* 35 (July 15, 2002): 168 174.

Mattila, P. S., V. P. Joki Erkkila, T. Kilpi, et al. "Prevention of Otitis Media by Adenoidectomy in Children Younger Than 2 Years." *Archives of Otolaryngology Head and Neck Surgery* 129 (February 2003): 163 168.

Menger, D. J., and R. G. van den Berg. "*Pneumocystis carinii* Infection of the Middle Ear and External Audi tory Canal. Report of a Case and Review of the Liter ature." *ORL* 65 (January February 2003): 49 51.

Redaelli de Zinis, L. O., P. Gamba, and C. Balzanelli. "Acute Otitis Media and Facial Nerve Paralysis in Adults." *Otology and Neurotology* 24 (January 2003): 113 117.

Weiner, R., and P. J. Collison. "Middle Ear Pathogens in Otitis Prone Children." *South Dakota Journal of Med icine* 56 (March 2003): 103 107.

ORGANIZATIONS

American Academy of Otolaryngology, Head and Neck Surgery, Inc. One Prince Street, Alexandria, VA 22314 3357. (703) 836 4444.

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847) 434 4000. www.aap.org.

American Osteopathic Association (AOA). 142 East Ontario Street, Chicago, IL 60611. (800) 621 1773. www.aoa net.org.

Judith Turner
Rebecca J. Frey, PhD

Earache

Definition

An earache is a commonly used term for ear **pain** or discomfort that is a symptom of disease or injury.

Description

An earache itself is not a disease, but it is a symptom of disease or injury in the external or middle ear. It may also be a symptom of problems in the mouth, nose, or throat. Infants or very young children may be unable to say that they are in pain. Increased irritability or pulling at the ears is often a sign of ear pain in infants.

Causes and symptoms

The most common cause of an earache is a buildup of pressure in the eustachian tube. Among other functions, the eustachian tube drains fluids out of the middle ear via the back of the throat. A cold, allergy, or **sore throat** can cause the eustachian tube to swell shut. Infants and young children are especially susceptible to earaches caused by problems with the eustachian tube, since the structure is still underdeveloped in that age group. When the normal drainage of fluid is prevented, it can accumulate in the middle ear, causing pressure, pain, stagnation, and possibly infection.

An earache may be due to a perforated, or broken, eardrum. The eardrum can be broken as a result of a blow to the head, infection in the inner ear, suction applied to the ear, or the insertion of a foreign object into the ear. **Infections** of the middle and outer ears are often associated with earaches. Other causes of an earache may be the obstruction of the ear canal with a foreign object or excessive ear wax, **boils** in the ear canal, a herpes zoster infection of the ear, keratosis of the ear, tumors, an infection of the mastoid process, "swimmer's ear," and the aftermath of surgical procedures. Ear pain can also be caused by a rapid descent from high altitudes, during air travel or travel in the mountains. A **sinus infection**, arthritis of the jaw, sore throat, **tonsillitis**, and dysfunction of the temporomandibular joint (TMJ) may be the source of referred pain to the ears.

Diagnosis

A history of the illness should be obtained, including information about the symptoms accompanying the earache. A physical exam should be performed, which may include an examination of the ears, the nasal passages and sinuses, and the throat. An otoscope may be used to see more deeply into the ears, nose, and throat. In addition, the teeth, tongue, tonsils, salivary glands, and TMJ should be examined for problems that might be causing referred pain to the ears. A culture and sensitivity test should be done if there is any discharge from the ears. X rays or a computed tomography (CT) scan may be required to diagnose the problem. Hearing and balancing tests are important to the diagnosis of an earache.

Treatment

Three to five drops of the warmed oil extract of **mullein** flowers (*Verbascum thapsus*), **garlic** (*Allium sativa*), or **St. John's wort** (*Hypericum perforatum*), or a combination of any of the three should be placed into the affected ear. The oil of *Calendula officinalis* may be used in the same manner. If there is a persistent **ear infection**, **goldenseal** (*Hydrastis canadensis*) salve or tincture can be placed directly onto the outer ear or into the ear canal three to four times per day. Glycerin can be introduced into the ear if it is suspected that excessive earwax or water in the ear is causing the problem.

Food and environmental **allergies** should be considered as contributors to the development of ear pain and infections, especially if the earache is chronic or

KEY TERMS

Computed tomography (CT) scan—A medical procedure where a series of x rays are taken and put together by a computer in order to form detailed pictures of areas inside the body.

Eustachian tube—A canal extending from the middle ear to the pharynx.

Mastoid process—The rounded protrusion of bone that can be felt just behind the ear.

Middle ear—The inner portion of the ear made up of an air-filled chamber, which is separated from the outer ear by the tympanic membrane.

Otoscope—A lighted medical instrument that can be used to visualize the ear canal and the tympanic membrane.

Swimmer's ear—An inflammation or infection of the ear canal due to overexposure to water.

Temporomandibular joint (TMJ)—The joint responsible for movement of the jawbone.

recurrent. Allergy testing should be done, and then the allergens should be avoided. Alcohol, dairy products, **smoking**, **caffeine**, sugary foods, and processed foods should also be avoided to keep from stressing the immune system. One or two cloves of raw garlic daily may help end chronic episodes of earache, since garlic can kill many of the pathogens that cause earaches. If there is trouble tolerating raw garlic, a daily garlic supplement can be taken instead. Daily supplementation of **vitamin C**, **bioflavonoids**, **zinc**, and **beta carotene** is recommended to treat some of the underlying conditions causing ear pain and bolster general immune function.

Several homeopathic remedies may also be helpful in treating earaches. Depending upon the symptoms, a 6C or 12C dose of **Pulsatilla**, Mercurius, or Hepar sulphuris, or a 30C dose of **Belladonna** can be taken for up to four doses. If there is no symptom relief, a homeopath or other healthcare practitioner should be consulted.

Hydrotherapy treatment for earaches includes the use of hot compresses. To make a compress, a large cloth soaked in hot water should be placed over both ears and the throat for about five minutes. A hot water bottle or smaller compress can also be used. A new hot compress can be used every three to five minutes until the earache is relieved for a maximum of 30 minutes. This treatment is best when the feet are in a hot footbath while the compresses are being applied. Hot water can be added as needed to keep the water comfortably hot. The soak can be repeated two or three times a day as needed.

Massage such as tui na or **reflexology** can be helpful in clearing up ear pain, congestion, and TMJ dysfunction. A knowledgeable practitioner should be consulted.

Allopathic treatment

If an earache is accompanied by any of the following symptoms, a healthcare provider should be consulted as soon as possible:

- severe pain
- discharge from the ear
- a fever of 102°F (38.8°C) or higher
- a sudden change in hearing
- a sudden onset of dizziness
- an inability to concentrate
- facial muscle weakness
- the earache lasts for more than a few days
- the earache is worse during chewing
- there is sudden or severe ear pain without any other accompanying symptoms
- the earache does not respond to home treatment
- the earache appears to be getting worse
- pain, tenderness, or redness of the over the area of the mastoid process, which often indicates a serious infection

Antibiotics, decongestants, and antihistamines are often prescribed to halt the infection and inflammation that may be the cause of ear pain. The insertion of ear tubes may be recommended for children who have persistent ear infections to reestablish proper functioning of the middle ear. However, the effectiveness of this treatment is still widely debated. Repeated swallowing or gum-chewing can relieve ear pain caused by changes in pressure secondary to changes in altitude. Allowing infants and young children to suck on a bottle during descent can help relieve popping and ear pain. TMJ dysfunction should be evaluated by a dentist. Anti-inflammatory medication, tranquilizers, or muscle relaxants may be prescribed for temporary relief. Other treatments for TMJ problems include braces to correct the bite or a bite plate to wear when sleeping.

Expected results

Earaches can generally be relieved by attending to the underlying problem. Untreated problems may lead

to serious ear damage and possible **hearing loss**. Most children with chronic earaches due to infections tend to outgrow the condition.

Prevention

A hair dryer or other method should be used after swimming if there is a tendency for the ears to retain water. Earplugs should be worn while swimming and cotton or wool should be loosely inserted into the outer ear canal during showers or when the hair is being washed. Objects such as cotton swabs should not be inserted into the ear canal. A healthy immune system should be maintained to reduce the opportunity for infections.

Resources

OTHER

Merck & Co., Inc. *The Merck Manual of Diagnosis and Therapy*. http://www.merck.com/pubs/mmanual/section7/chapter84/84a.htm.

WebMD, Inc. *Earache*. http://webmd.lycos.com/content/article/3172.10330.

Patience Paradox

Eastern red cedar *see* **Juniper**

Eating disorders *see* **Anorexia nervosa; Binge eating disorder; Bulimia nervosa**

Echinacea

Description

Echinacea, commonly known as purple coneflower, is a perennial herb of the Composite family, commonly known as the daisy family. In addition to being known as purple coneflower, this hardy plant is also sometimes called Sampson root, Missouri snakeroot, coneflower, American coneflower, and rudbeckia. The prominent, bristly seed head inspired the generic name of the plant, taken from the Greek word, *echinos* meaning hedgehog.

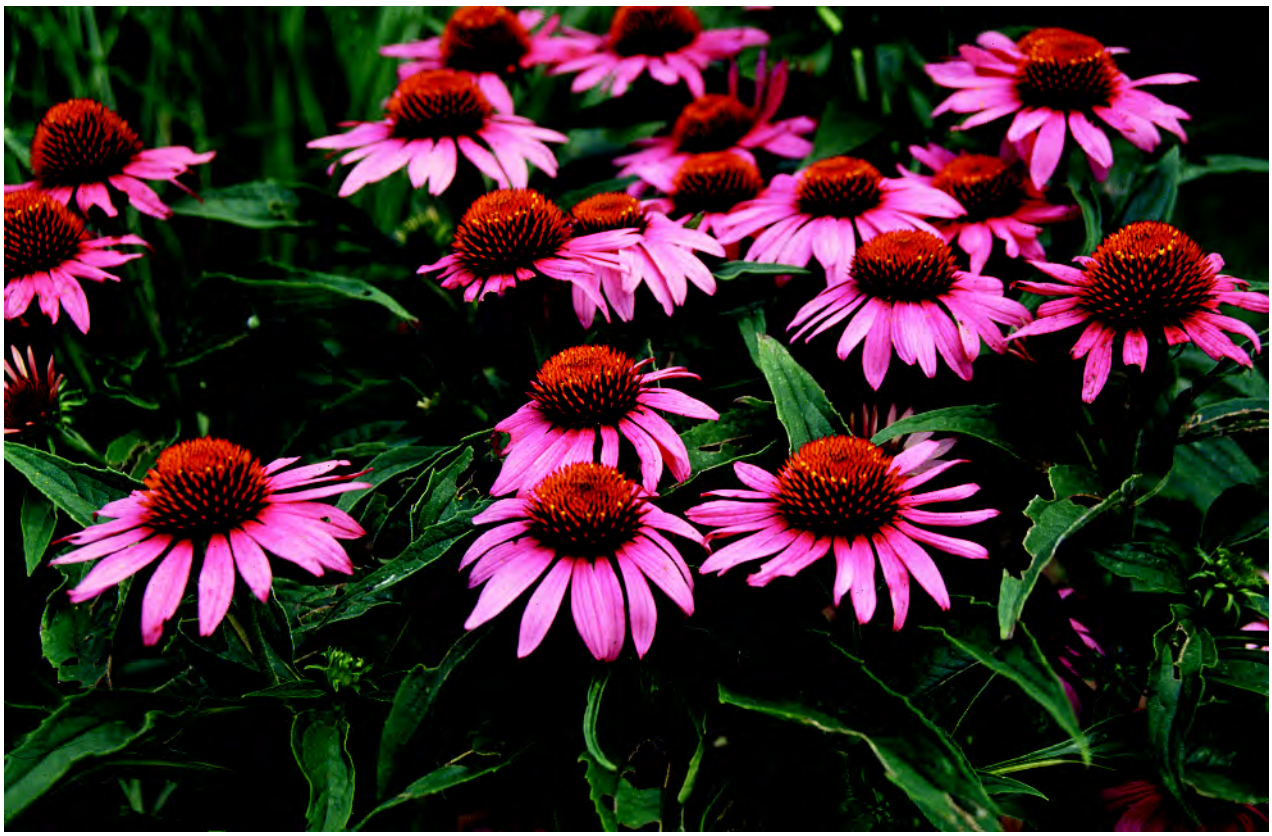
Echinacea is a North American prairie native, abundant in the mid west and cultivated widely in ornamental and medicinal gardens. The purple-pink rays of the blossom droop downward from a brassy hued center cone composed of many small, tubular florets. The conspicuous flowers bloom singly on stout, prickly stems from mid-summer to autumn. Flower heads may grow to 4 in (10 cm) across. The dark green leaves are opposite, entire, lanceolate, toothed, and hairy with three prominent veins. The narrow upper leaves are attached to the stem with stalks. The lower leaves are longer, emerging from the stem without a leaf stalk, and growing to 8 in (20 cm) in length. The plant develops deep, slender, black roots. Echinacea propagates easily from seed or by root cuttings. However, due to its increasing popularity as an herbal supplement, echinacea is numbered among the 19 medicinal plants considered at risk by the nonprofit organization United Plant Savers.

General use

Three species of echinacea are used medicinally: *Echinacea augustifolia, E. purpurea*, and *E. pallida*. The entire plant has numerous medicinal properties that act synergistically to good effect.

Native American plains Indians relied on echinacea as an all-purpose antiseptic. The Sioux valued the root as a remedy for snake bite, the Cheyenne chewed the root to quench thirst, and another tribe washed their hands in a decoction of echinacea to increase their tolerance of heat. European settlers learned of the North American herb's many uses, and soon numerous echinacea-based remedies were commercially available from pharmaceutical companies in the United States. Echinacea was a popular remedy in the United States through the 1930s. It was among many medicinal herbs listed in the *U.S. Pharmacopoeia*, the official U.S. government listing of pharmaceutical raw materials and recipes. The herb fell out of popular use in the United States with the availability of antibiotics. In West Germany, more than 200 preparations are made from the species *E. purpurea*. Commercially prepared salves, tinctures, teas, and extracts are marketed using standardized extracts. Echinacea is regaining its status in the United States as a household medicine-chest staple in many homes. It is one of the bestselling herbal supplements in the United States.

In the early twenty-first century, echinacea is most often used to boost the immune system and fight infection. Research has shown that echinacea increases production of interferon in the body. It is antiseptic and antimicrobial, with properties that act to increase the number of white blood cells available to destroy bacteria and slow the spread of infection. As a depurative, the herbal extract cleanses and purifies the bloodstream and has been used effectively to treat **boils**. Echinacea is vulnerary, promoting wound healing through the action of a chemical substance in



Echinacea, close-up of deep pink and purple coneflowers, used in herbal medicine. *(© Photo Researchers, Inc. Reproduced by permission.)*

the root known as caffeic acid glycoside. As an alterative and an immuno-modulator, echinacea acts gradually to promote beneficial change in the entire system. It has also been used to treat urinary infection and *Candida albicans* **infections**. Echinacea is a febrifuge, useful in reducing fevers. It is also useful in the treatment of **hemorrhoids**. A tincture, or a strong decoction, of echinacea serves as an effective mouthwash for the treatment of pyorrhea and gingivitis.

The various uses of echinacea were the subject of clinical research in the 2000s. Echinacea appears to be a complex plant, containing many different active substances. A study published in January 2008 stated that two different substances found in echinacea appeared to have opposite effects when applied to a certain type of human cells. Many other studies, instead of focusing on certain compounds applied to only one type of human cell, tried to evaluate echinacia's effectiveness in treating diseases and conditions for which it is commonly taken. One such study, published in 2002 in the *Annals of Internal Medicine* found that taking echinacea had no significant effect on the **common cold**. However, another study, published in 2007 found that taking echinacea reduced the likelihood of getting a common cold by 58% and decreased the average duration of the cold by 1.4 days. These types of seemingly contradictory results make echinacea research an active and strongly debated field.

In addition to investigating its effects on the common cold, researchers have studied echinacea's possible benefits for upper respiratory infections. The National Institutes of Health's National Center for Complementary and Alternative Medicine stated that research in this area was promising enough that they sponsored ongoing clinical trials of echinacea to treat upper respiratory infections. Research is also being done on the effects of echinacea on the gastrointestinal tract and its possible use to help protect the immune system during **cancer** treatment with chemotherapy.

Preparations

Decoction is the best method to extract the mineral salts and other healing components from the

coarser herb materials, such as the root, bark, and stems. It is prepared by adding 1 oz (28 g) of the dried plant materials, or 2 oz (56 g) of fresh plant parts, to one pint of pure, chlorine-free, boiled water in a non-metallic pot. The mixture is simmered for about one half hour, then strained and covered. A decoction may be refrigerated for up to two days and retain its healing qualities.

An infusion is the method used to derive benefits from the leaves, flowers, and stems in the form of an herbal tea. Twice as much fresh, chopped herb as dried herb should be used. It is steeped in one pint of boiled, chlorine-free water for 10–15 minutes. Next, it is strained and covered. The infusion is drunk warm and sweetened with honey if desired. A standard dose is three cups per day. An infusion will keep for up to two days in the refrigerator and retain its healing qualities.

A tincture is the usual method for preparing a concentrated form of the herbal remedy. Tinctures, properly prepared and stored, will retain medicinal potency for two years or more. Combine 4 oz (113 g) of finely cut fresh or powdered dry herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts and have a 50/50 ratio of alcohol to water. The mixture should be placed away from light for about two weeks and shaken several times each day. It should be strained and stored in a tightly capped, dark glass bottle. A standard dose is 4 ml of the tincture three times a day.

Precautions

Echinacea is considered safe in recommended doses. Women who are pregnant or breastfeeding are generally advised not to take echinacea in injection form. Because the plant has proven immuno-modulating properties, individuals with systemic lupus erythmatosus, **rheumatoid arthritis**, **tuberculosis**, **leukemia**, **multiple sclerosis**, or **AIDS** should consult their physician before using echinacea. Echinacea should not be given to children under two years of age, and it should only be given to children over two in consultation with a physician. Research indicates that echinacea is most effective when taken at first onset of symptoms of cold or flu and when usage is continued no longer than eight weeks. There is some indication that the herb loses its effectiveness when used over a long period of time. Echinacea is believed to be more effective when use is discontinued for a period after every eight weeks of use.

Studies investigating the active ingredients in echinacea preparations available commercially have found widely varying potencies. In many cases the amount and type of echinacea contained in the product was not that specified on the label. One study even found that 10% of brands investigated contained no echinacea at all. Individuals should be sure to obtain echinacea from a trusted, reputable brand, preferably one that guarantees the amount, type, and potency of the echinacea contained in it.

KEY TERMS

Alterative—A medicinal substance that acts gradually to nourish and improve the system.

Antimicrobial—A plant substance that acts to inhibit the growth of harmful microorganisms or acts to destroy them.

Febrifuge—A plant substance that acts to prevent or reduce fever.

Glycoside—An herbal carbohydrate that exerts powerful effect on hormone-producing tissues. The glycoside breaks down into a sugar and a non-sugar component.

Lanceolate—Narrow, leaf shape that is longer than it is wide and pointed at the end.

Macrophage—Specialized cells present throughout the lymphoid tissues of the body that circulate in the bloodstream. Macrophages have a surface marker that stimulates other cells to react to an antigen.

Side effects

Most people experience no side effects when taking echinacea at recommended dosage levels. Some instances of side-effects have been reported however, including rash, temporary numbing of the tongue, and gastrointestinal problems. Echinacea may cause allergic reaction in some people. It is believed to be more likely to cause an allergic reaction in individuals who are allergic to other members of the daisy family, including daisies, marigolds, chrysanthemums, and ragweed. Individuals who have **asthma** may also be at increased risk.

Interactions

Individuals taking drugs that suppress the immune system should check with their doctor before taking echinacea. It is believed that echinacea might interact with immunosuppressant drugs, making them less effective.

Resources

BOOKS

Marian, Mary J., Pamela Williams Mullen, and Jennifer Muir Bowers. *Integrating Therapeutic and Complementary Nutrition*. Boca Raton, FL: CRC Taylor and Francis, 2007.

PERIODICALS

Bone, Kerry. "Echinacea and Autoimmune Disease." *Townsend Letter: The Examiner of Alternative Medicine* 294 (January 2008): 57 59.

Linde, K., and C. I. Coleman. "Do Echinacea Spp. Products Prevent and Shorten the Common Cold?" *Focus on Alternative and Complementary Therapies* 12, no. 4 (December 2007): 255 257.

Shah, Steven Sander, et al. "Evaluation of Echinacea for the Prevention and Treatment of the Common Cold." *The Lancet Infectious Diseases* 7, no. 7 (July 2007): 473 481.

ORGANIZATIONS

American Botanical Council, 6200 Manor Rd., Austin, TX 78723, (512) 926 4900, http://abc.herbalgram.org.

National Center for Complementary and Alternative Medicine at the National Institutes of Health, 9000 Rockville Pike, Bethesda, MD 20892, (888) 644 6226, http://nccam.nih.gov.

Clare Hanrahan
Teresa G. Odle
Helen Davidson

Eczema

Definition

Eczema, also called atopic **dermatitis** (AD), is a noncontagious inflammation of the skin that is characteristically very dry and itchy. The condition is frequently related to some form of allergy, which may include foods or inhalants.

Description

Atopic dermatitis is sometimes described as "the itch that rashes"—the scratching of the irritated areas may very well initiate the rash in some patients. The skin of those affected by AD is abnormally dry because of excessive loss of moisture. Chronic or severe cases of it can cause the affected areas to form thick plaques (patches of slightly raised skin), develop serous (watery) exudates, or become infected.

The areas of the body that are affected by AD tend to vary with age. Children under five years old most commonly have AD, but it can occur at any age. It can be mild and intermittent, or severe and chronic. Infants frequently experience it on the face and other areas of the head. They frequently rub their heads with their hands or on the crib bedding. The stomach and limbs may also become involved. Older children commonly have the worst spots on flexor surfaces, namely the inner wrists and elbows, backs of knees, and tops of ankles. The hands and feet are other common sites. The knees, elbows, hands, and feet may continue to be a problem into adulthood.

KEY TERMS

Atopy—A group of diseases, including eczema, that develop in people with an inherited tendency to develop immediate antibodies to common environmental allergens.

Corticosteroids—A group of synthetic hormones that are used to prevent or reduce inflammation. Toxic effects may result from rapid withdrawal after prolonged use or from continued use of large doses.

Dermatitis—An irritation or imflammation of the skin.

Nummular dermatitis—A skin infection in which the areas of irritated skin are coin-shaped.

Causes and symptoms

Genetic predisposition plays a large role in who will get AD or other **allergies**. The condition is not contagious. A child who has one parent with some form of allergic, or atopic, disease has somewhere between a 25–60% chance of also experiencing allergies, whether AD or some other form. There is approximately a 50–80% chance that a child of two parents with allergies will also develop some form of atopy. The genetic predisposition of the individual, combined with such factors such as early exposure to strong antigens, will determine whether and to what extent that person will develop allergies. Aside from a predisposition to eczema, increased use of soapy detergents and baby wipes is probably responsible for higher incidence of childhood eczema as well.

The hallmark sign of AD is a red, itchy rash. The age of the patient determines what regions are most likely affected, but exceptions do occur.

Diagnosis

No laboratory test can reliably diagnose AD, although some patients will be reactive to tests

designed to diagnose allergy. These would include skin tests by intradermal injection, scratch, or patch tests. There is also a blood test available that measures levels of antibodies to suspected allergens. Diagnosis is generally made by the appearance and location of the rash. A personal or family history of allergy of any type, including food allergy, **asthma**, or **hay fever** also supports the diagnosis of AD.

Other types of dermatitis that may be described as eczematous include **contact dermatitis**, nummular dermatitis, and stasis dermatitis. The stasis type is related to poor circulation, which may also be a factor in nummular dermatitis. These forms generally occur in older adults, whereas AD is primarily a disease of children. Contact dermatitis can occur at any age. It results from skin contact with either an irritant or an allergen. The area affected is limited to the area in contact with the offending substance.

Treatment

The basis of treatment for AD is keeping the skin moist and clean, as well as avoiding irritants and known allergens as much as possible. Further measures become necessary if the case is particularly severe, or if the skin becomes infected.

Conventional wisdom has been that minimal bathing of the patient with AD is ideal. The rationale was that bathing would break down the natural oil barrier of the skin and cause further drying. It actually appears now that frequent long, tepid soaks are beneficial to hydrate the very dry skin that this condition produces. Adding a muslin bag filled with milled oats or the commercially available preparation Aveeno bath to the water can be soothing. The bath water should cover as much of the skin as possible. Wet towels may be draped around the shoulders, upper trunk, and arms if they are above the water level. The face should be dabbed frequently during bathing to keep it moist. The use of soap should be minimized, and limited to very mild agents such as Cetaphil. The bath must be followed within two or three minutes by a gentle patting dry, and a thick application of a water barrier ointment, such as Aquaphor, Unibase, or Vaseline. Lotions are not generally recommended as they almost universally contain alcohol, which is drying and may burn when applied. Soaking in plain water can be painful during severe episodes of AD. Adding one-half cup of table salt to one-half tub of water creates a normal saline solution, similar to what is naturally present in the tissues, and may relieve the burning. Commercial Domeboro powder may also be helpful.

One alternative to bathing is to use soaking wraps. For this method, cotton towels or other cloths are soaked in tepid water, with table salt or Domeboro powder added for comfort if desired. The patient's bed is covered with something waterproof, and the bare skin is covered as thoroughly as possible with the wet wrappings. The body should then be covered by a waterproof covering to slow evaporation. Vinyl sheeting and plastic wrap are two alternatives. The wraps should be left in place for as long as possible, but at least for 30 minutes, before the water barrier and any topical medications are applied.

Environmental improvement affords some relief for many patients. Pet dander and cigarette smoke are potential aggravating factors. Keeping these out of the home is probably for the best, but at minimum, they should not be allowed in the room of the allergic person. Clothing and bedding should be 100% soft cotton, and laundered in detergent with no perfumes. These items should also be washed before the initial use in order to rid them of potentially irritating residues. Clothes should fit loosely to prevent irritation from rubbing. Washing bedding in hot water will help to kill dust mites. Running laundry through a double rinse cycle will help to remove any vestiges of detergent. Avoiding the use of fabric softener or dryer sheets helps, as these are frequently scented and may be irritating. Drying clothes or bedding outdoors should be avoided, because pollen and other potential allergens are likely to cling to them. Mattresses and pillowcase can be covered by special casings that are impervious to the microscopic dust mites that infest them. Under normal circumstances, these mites cause no problem, but they can be a major irritant for the individual with asthma or AD.

Temperature extremes can make AD worse, so heating and cooling should be employed as appropriate, along with adding humidity if needed. Patients tend to have abnormal regulation of body temperature, and sometimes feel warmer or colder than other people in similar circumstances. Sweating will frequently aggravate AD. Room temperature should be adjusted for comfort. Central air conditioning is the best option for cooling the home. Evaporative cooling brings a large amount of potential irritants into the house, as do open windows. Air conditioning rather than open windows should also be used to cool the car. Electrostatic filters and vent covers are available to remove irritants from the air in the house. These should be frequently changed or cleaned as recommended by the manufacturer.

In the patient's room, dust-collecting items such as curtains, carpeting, and stuffed animals are best

minimized. Vacuuming and dusting should be done regularly when the affected person is not in the room. A HEPA filter unit, and a vacuum with a built-in HEPA filter remove a high percentage of dust and pollen from the environment.

Some simple mechanical measures will reduce the amount of skin damage done by scratching. It is important to keep fingernails short. Using a nail file will produce a smoother nail edge than scissors or clippers. It is particularly difficult to keep children from scratching irritated and itchy skin, but using pajamas and clothing with maximum skin coverage will help to protect the bare skin from fingernails. Mittens or socks may be used to cover the hands at night to reduce the effects of scratching. Infant gowns with hand coverings are useful for the very young patient.

In addition to the skin care and environmental measures to relieve eczema, there are some complementary therapies that may prove helpful.

Acupuncture

Any type of therapy that relieves **stress** can also help to manage AD. Acupuncturists also claim to be able to treat blood and energy deficiencies, and to counteract the effects of detrimental elements, including heat, dampness, and wind.

Autogenic training

Autogenic training is similar to methods of **meditation** and self-hypnosis. Instructors help the patient to achieve and maintain a relaxed state of positive concentration. This is eventually done independently. Even ten minutes of practice per day can produce beneficial results for mind and body. Research has shown AD to be one of the conditions that is improved by this technique.

Aromatherapy/massage

Massage is another therapy that can be effective in reducing stress. The oils that are used in the treatment can also make a difference in AD. Some patients get relief from the topical use of **evening primrose oil** (EPO) diluted in carrier oil. Aromatherapists may use small amounts of **essential oils** from **lavender**, bergamot, and geranium. These are promoted to decrease both **itching** and inflammation. Improper dilutions, however, can worsen the condition.

Herbal therapy

Some herbal therapies can be useful for skin conditions. Among the herbs most often recommended are:

- Calendula (*Calendula officinalis*) ointment, for anti-inflammatory and antiseptic properties.
- Chickweed (*Stellaria media*) ointment, to soothe itching.
- Evening primrose oil (*Oenograceae*) topically to relieve itching, and internally to supplement fatty acids.
- German chamomile (*Chamomilla recutita*) ointment, for anti-inflammatory properties.
- Nettle (*Urtica dioica*) ointment, to relieve itching.
- Peppermint (*Menta piperita*) lotion, for antibacterial and antiseptic properties.
- Chinese herbal medicine. In traditional Chinese medicine, there are formulas used to treat eczema that nourish the blood, moisten the skin, stop itching, and encourage healing. Some formulas are used topically and others taken internally.

There is individual variation in the effectiveness of the topical treatments. Some experimentation may help to find the combination that most benefits an individual. When the condition is chronic, severe, or infected, guidance from a health care professional should be sought before attempting self-treatment.

Hypnotherapy

Hypnotherapy has the potential to improve AD through using the power of suggestion to reduce itching. Since mechanical damage to the skin done by scratching may irritate, or actually cause, the rash, any measure that reduces scratching can prove helpful.

Nutritional supplements

There are several nutrients that can prove helpful for treating AD. Oral doses of EPO, which contains gamma-linolenic acid, have been shown to significantly reduce itching. The amount used in studies was approximately 6 g of EPO per day. **Fish oil** has also been shown to improve AD, at an approximate dose of 1.8 g per day. **Vitamin C** can affect both skin healing and boost the immune system. Doses of 50–75 mg per kilogram of body weight have been proven to relieve symptoms of AD. Additional **copper** may be required in supplemental form when high doses of vitamin C are taken. **Vitamin E** is reportedly useful, but there are no documented studies of its benefits.

Reflexology

The areas of the foot that receive attention from a reflexologist when a patient has AD include the ones relating to the affected areas of the body, as well as

those for the solar plexus, adrenal glands, pituitary gland, liver, kidneys, gastrointestinal tract, and reproductive glands.

Allopathic treatment

Allopathic treatment involves use of oral antihistamines to decrease itching, topical water barriers, mild topical corticosteroids when indicated, and topical antibiotics if needed. The water barrier should be applied generously; the corticosteroids and antibiotics used sparingly, and only on areas where indicated. The person applying the topical medications can wear gloves to minimize exposure to the steroids and antibiotics. Oral antibiotics may also be used when widespread infection is present. On rare occasions, oral corticosteroids are prescribed to reduce severe itching and inflammation, but this course is best avoided due to its potential side effects. In 2001, the U.S. Food and Drug Administration (FDA) approved a new nonsteroid prescription cream for patients age two and older called Elidel.

Expected results

There is no cure for AD, although most patients will experience improvement with age. Perhaps half of children will have no further trouble past the age of five years. However, as many as 75% of those who have AD in childhood will go on to have other allergic manifestations such as asthma, food allergies, and hay fever. Diligent daily care of the skin and avoidance of known triggers will control most cases of AD to a large extent.

Prevention

One of the best things a mother can do to help keep her child from getting AD is to breastfeed. It is best for the baby to have breast milk exclusively for at least six months, particularly when there is a family history of AD or other types of allergy. There also appears to be an advantage to the breastfeeding mother avoiding foods known to be commonly allergenic, particularly if there is a family history. This would include wheat, eggs, products made from cow's milk, peanuts, and fish. If breastfeeding is not possible, a hypoallergenic formula should be used if there is family history of allergy. Consult a health care provider for help with determining the best type.

The patient already diagnosed with AD can minimize flare-ups by avoiding known triggers and following the skin care program outlined above. It is important to continue to follow guidelines for a daily emollient routine (moistening skin twice daily) even when skin is under control to prevent flare-ups. Eczematous skin is also more susceptible to **infections**. Patients should try to stay away from people with chicken pox, cold sores, and other contagious skin infections.

Resources

BOOKS

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Conventional and Alternative Treatments*. Alexandria, VA: Time Life, Inc., 1996.

Gottlieb, Bill, editor. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Shealy, C. Norman. *The Complete Illustrated Encyclopedia of Alternative Healing Therapies*. Boston: Element Books, Inc., 1999.

PERIODICALS

"Detergents Linked to Rise in Infant Eczema." *Australian Nursing Journal* (July 2002): 29.

"Eczema Guidelines to Make up for Inadequate Training." *Practice Nurse* (September 27, 2002): 9.

"Guidelines for the Effective Use of Emollients." *Chemist & Druggist* (September 14, 2002): 22.

"Prescription Cream Treats Atopic Eczema." *Critical Care Nurse* (August 2002): 76.

OTHER

Food Allergy Network. *Food Allergy and Atopic Dermatitis* Fairfax, VA: Food Allergy Network, 1992.

Hollandsworth, Kim et. al. *Atopic Dermatitis*. Pediatric Clinical Research Unit, 1994.

Judith Turner
Teresa G. Odle

Edema

Definition

Edema is a condition of abnormally large fluid volume in the circulatory system or in tissues between the body's cells (interstitial spaces).

Description

Normally the body maintains a balance of fluid in tissues by ensuring that the same amount of water entering the body also leaves it. The circulatory system transports fluid within the body via its network of blood vessels. The fluid, which contains oxygen and nutrients needed by the cells, moves from the walls of the blood vessels into the body's tissues. After its

nutrients are used up, fluid moves back into the blood vessels and returns to the heart. The lymphatic system (a network of channels in the body that carry lymph, a colorless fluid containing white blood cells to fight infection) also absorbs and transports this fluid. In edema, either too much fluid moves from the blood vessels into the tissues, or not enough fluid moves from the tissues back into the blood vessels. This fluid imbalance can cause mild to severe swelling in one or more parts of the body.

KEY TERMS

Digitalis—A naturally occurring compound used in the preparation of the medication digoxin, prescribed to increase the heart rate and strengthen the force of the heart's contractions.

Diuretics—Medications used in the treatment of fluid overload to promote excretion of sodium and water.

Interstitial spaces—Areas of the body occurring outside the vessels or organs, between the cells.

Pitting edema—A swelling in the tissue under the skin, resulting from fluid accumulation, that is measured by the depth of indentation made by finger pressure over a boney prominence.

Causes and symptoms

Many ordinary factors can upset the balance of fluid in the body to cause edema, including:

- Immobility. The leg muscles normally contract and compress blood vessels to promote blood flow with walking or running. When these muscles are not used, blood can collect in the veins, making it difficult for fluid to move from tissues back into the vessels.
- Heat. Warm temperatures cause the blood vessels to expand, making it easier for fluid to cross into surrounding tissues. High humidity also aggravates this situation.
- Medications. Certain drugs, such as steroids, hormone replacements, nonsteroidal anti-inflammatory drugs (NSAIDs), and some blood pressure medications may affect how fast fluid leaves blood vessels.
- Intake of salty foods. The body needs a constant concentration of salt in its tissues. When excess salt is taken in, the body dilutes it by retaining fluid.
- Menstruation and pregnancy. The changing levels of hormones affect the rate at which fluid enters and leaves the tissues.

Some medical conditions may also cause edema, including:

- Heart failure. When the heart is unable to maintain adequate blood flow throughout the circulatory system, the excess fluid pressure within the blood vessels can cause shifts into the interstitial spaces. Left-sided heart failure can cause pulmonary edema, as fluid shifts into the lungs. The patient may develop rapid, shallow respirations, shortness of breath, and a cough. Right-sided heart failure can cause pitting edema, a swelling in the tissue under the skin of the lower legs and feet. Pressing this tissue with a finger tip leads to a noticeable momentary indentation.
- Kidney disease. The decrease in sodium and water excretion can result in fluid retention and overload.
- Thyroid or liver disease. These conditions can change the concentration of protein in the blood, affecting fluid movement in and out of the tissues. In advanced liver disease, the liver is enlarged and fluid may build up in the abdomen.
- Malnutrition. Protein levels are decreased in the blood, and in an effort to maintain a balance of concentrations, fluid shifts out of the vessels and causes edema in tissue spaces.

Some conditions that may cause swelling in just one leg include:

- Blood clots. Clots can cause pooling of fluid and may be accompanied by discoloration and pain. In some instances, clots may cause no pain.
- Weakened veins. Varicose veins, or veins whose walls or valves are weak, can allow blood to pool in the legs. This is a common condition.
- Infection and inflammation. Infection in leg tissues can cause inflammation and increasing blood flow to the area. Inflammatory diseases, such as gout or arthritis, can also result in swelling.
- Lymphedema. Blocked lymph channels may be caused by infection, scar tissue, or hereditary conditions. Lymph that can not drain properly results in edema. Lymphedema may also occur after cancer treatments, when the lymph system is impaired by surgery, radiation, or chemotherapy.
- Tumor. Abnormal masses can compress leg vessels and lymph channels, affecting the rate of fluid movement.

Symptoms vary depending on the cause of edema. In general, weight gain, puffy eyelids, and swelling of the legs may occur as a result of excess fluid volume. Pulse rate and blood pressure may be elevated. Hand and neck veins may be observed as fuller.

Diagnosis

Edema is a sign of an underlying problem, rather than a disease unto itself. A diagnostic explanation should be sought. Patient history and presenting symptoms, along with laboratory blood studies, if indicated, assist the health professional in determining the cause of the edema.

Treatment

Simple steps to lessen fluid build-up may include:

- reducing sodium intake
- maintaining proper weight
- exercise
- elevation of the legs
- use of support stockings
- massage
- travel breaks

Nutritional therapy

A naturopath or a nutritionist may recommend the following dietary changes:

- Reduction of salt intake, including salty foods such as olives, soy sauce, or pickles. Cutting back the amount of sodium eaten may help reduce edema.
- Limited use of alcohol, caffeine, sugar, and dairy products.
- Increased consumption of whole grain foods, cucumbers, apples, potatoes, grapes, onions, cabbage, and oranges.
- Daily vitamin and mineral supplements.

Herbal therapy

Diuretic herbs can also help relieve edema. One of the best herbs for this purpose is **dandelion** (*Taraxacum mongolicum*), since, in addition to its diuretic action, it is a rich source of **potassium**. (Diuretics flush potassium from the body, and it must be replaced to avoid potassium deficiency.)

Hydrotherapy

Hydrotherapy using daily contrast applications of hot and cold (either compresses or immersion) may also be helpful.

Other alternative treatments

Other alternative therapies may also reduce edema. They include **traditional Chinese medicine**, Ayurveda, juice therapy, and bodywork. Traditional Chinese medicine and **acupuncture** have an elaborate diagnostic system to determine the pattern causing the edema. Thus treatment, if done correctly, results not only in the removal of fluid, but also with the correction of the problem.

Allopathic treatment

The three "Ds"—diuretics, **digitalis**, and diet—are frequently prescribed for medical conditions that result in excess fluid volume. Diuretics are medications that promote urination of **sodium** and water. Digoxin is a digitalis preparation that is sometimes needed to decrease heart rate and increase the strength of the heart's contractions. One dietary recommendation includes less sodium in order to decrease fluid retention. Consideration of adequate protein intake is also made.

For patients with lymphedema, a combination of therapies may prove effective. Combined decongestive therapy includes the use of manual lymph drainage (MLD), compression bandaging, garments and pumps, and physical therapy.

Resources

BOOKS

The Burton Goldberg Group. "Edema." in *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

Monahan, Frances D., and Marianne Neighbors. *Medical Surgical Nursing: Foundation for Clinical Practice,* 2nd ed. Philadelphia: W. B. Saunders,1998.

ORGANIZATIONS

Lymphedema and Wound Care Clinic of Austin. 5750 Bal cones Dr., Ste. 110, Austin, TX 78731. (512) 453 1930. http://www.lymphedema.com.

Mai Tran

Elder

Description

Gaining popularity in modern times as a cold and flu medicine, elder flower has been an important folk remedy for centuries. The Roman naturalist Pliny wrote about the therapeutic value of this flowering tree in the first century A.D. Native Americans used elder as a treatment for respiratory **infections** and **constipation** as well as an herbal pad for healing **wounds**. Black elder (*Sambucus nigra*) is the most popular variety of the plant, though there are other species known to have similar chemical ingredients. Elder grows in Europe, Asia, North Africa, and the

Elderflowers. *(©PlantaPhile, Germany. Reproduced by permission.)*

United States. Most medicinal elder is obtained from the former Soviet Union, Eastern Europe, and the United Kingdom. The Latin word *sambucus* is thought to be derived from the Greek *sambuca*, which refers to a stringed musical instrument popular among the Ancient Romans. In fact, some modern day Italians still make a primitive pipe called a *sampogna* from the branches of the tree, which also produces fragrant, cream-colored flowers and deep-violet berries. The flowers and berries are used most often in the drug of commerce, though the leaves, bark, and roots are also considered to have therapeutic effects. The berries traditionally have been used to make elderberry wine as well as pies and jellies, although no value has yet been found in these products.

The German Commission E, considered an authoritative source of information on alternative remedies, determined that elder has the ability to increase bronchial secretions as well as perspiration. These properties can be useful in helping to alleviate symptoms of the **common cold** or the flu. Even more interesting is the possibility that elder, like another herbal remedy called **echinacea**, may have the power to shorten the duration of colds by up to a few days. While it is not known exactly how elder produces its therapeutic effects, study has focused on several naturally occurring chemicals in the plant. Elder's flavonoids and phenolic acids are thought to be responsible for its ability to increase perspiration. The triterpenes in elder may also be potential active ingredients, though more study is required to confirm this. The remaining chemical constituents of medicinal elder usually include **potassium** and other minerals; sterols; volatile oils containing linoleic, linolenic, and palmitic acid; mucilage; pectin; protein; sugar; and tannins.

A number of other properties have been ascribed to elder as well, including anti-inflammatory, diuretic, antiviral, and antispasmodic activities. A 1997 study published in the *Journal of Ethnopharmacology*, which studied black elder in the test tube, indicates that the herb has some activity as an anti-inflammatory. While this may help to partially explain elder's success in treating colds, it also suggests that the herb may have potential as a treatment for inflammatory diseases such as rheumatism. Elder has also been described in the history of folk medicine as a laxative and a sedative.

General use

While not approved by the U.S. Food and Drug Administration (FDA), black elder flower is primarily used in the United States and Europe for colds and the flu. When taken internally, elder flower is approved by the Commission E for colds. In Germany, elder flower tea is licensed by the government to treat the common cold and other upper respiratory problems. By increasing bronchial secretions as well as perspiration, elder is believed to help ease symptoms such as **cough** and **fever** and may even shorten a cold's duration. In the United States and Canada, elder is often combined with **peppermint** leaf and **yarrow** flower in preparations intended to alleviate cold-related fever.

In a study published in the *Journal of Alternative and Complementary Medicine* in 1995, use of a standardized elderberry extract shortened the duration of the flu by about three days. The placebo-controlled, double-blind study involved the residents of an Israeli kibbutz. "A significant improvement of the symptoms, including fever, was seen in 93.3% of the cases in the SAM-treated group [elder-treated group] within 2 days," the researchers reported, "whereas in the control group 91.7% of the patients showed an improvement within 6 days." About 90% of the people treated with elder were considered flu-free in two to three days, while the majority of patients in the

KEY TERMS

Antispasmodic—An agent with the ability to prevent or relieve convulsions or muscle spasms.

Diuretic—An agent that increases the production of urine.

Echinacea—A popular herbal remedy used to treat colds, the flu, and urinary tract infections.

Edema—Abnormal swelling of tissue due to fluid buildup. Edema, which typically occurs in the legs, liver, and lungs, is often a complication of heart or kidney problems.

placebo group only got well after about 6 days. The authors of the study recommended elder as a possible treatment for **influenza** A and B based on the herbal remedy's effectiveness, lack of side effects, and low cost. By way of comparison, over-the-counter synthetic drugs may offer some measure of symptomatic relief for a cold but have not been proven to actually speed recovery. Elder is also being investigated as a treatment for other viral infections such as human immunodeficiency virus (HIV) and herpes.

Throughout its long history, elder has been used to treat a variety of other diseases and medical problems. These include liver disease, kidney disorders, rheumatism, **insomnia**, toothaches, **measles**, **asthma**, **cancer**, chafing, **epilepsy**, **gout**, headaches, **neuralgia**, **psoriasis**, **syphilis**, and **laryngitis**. It has also been used topically as an herbal pad to reduce external swelling and heal wounds. Some women have used elder to increase the amount of milk produced during breastfeeding. However, sufficient scientific evidence to support these additional uses is lacking. While elder has been used as a folk remedy for treating diabetes, studies in rodents suggest that it has no effects on blood sugar regulation.

Preparations

Dosage of elder generally ranges from 10-15 g per day, divided into three equal doses. The drug, which is recommended for internal use only, is usually taken as a tea or liquid extract. Elder tea can be prepared by steeping 3-4 g (2 teaspoonfuls) of dried elder flower in 150 ml of hot (not boiling) water. The mixture should be strained after about 5 minutes. The tea works best when it is consumed at a temperature as hot as can be safely tolerated. Dosage is several cups of tea a day (do not exceed the daily maximum of 15 g of elder), taken in the afternoons and evenings. When using a standardized liquid extract of elder, follow the package directions for proper use.

Precautions

Taken in recommended dosages, elder is not known to be harmful. It should be used with caution in children, women who are pregnant or breastfeeding, and people with kidney or liver disorders because its effects in these groups has not been sufficiently studied.

Be careful not to confuse black elder with a more toxic species of the plant called dwarf elder (*Sambucus ebulus*). Dwarf elder is generally not recommended for medical purposes and may cause **vomiting** and **diarrhea** in large dosages.

Side effects

Side effects are considered rare. Mild abdominal distress or allergic reactions may occur.

Interactions

Elder is not known to interact adversely with other medications or herbal remedies. Preparations that combine elder with yarrow flower and peppermint leaf have been used without apparent harm.

Resources

BOOKS

Fetrow, Charles W., and Juan R. Avila. *Professional's Handbook of Complementary and Alternative Medicine*. Pennsylvania: Springhouse, 1998.

Gruenwald, Joerg. *PDR for Herbal Medicines*. New Jersey: Medical Economics, 1998.

Sifton, David W. *PDR Family Guide to Natural Medicines and Healing Therapies*. New Jersey: Medical Economics, 1999.

PERIODICALS

Yesilada, E., O. Ustun, E. Sezik, et al. "Inhibitory effects of Turkish folk remedies on inflammatory cytokines: interleukin 1alpha, interleukin 1beta and tumor necrosis factor alpha." *J Ethnopharmacol* 58, no.1 (1997): 59 73.

Zakay Rones, Z., et al. "Inhibition of several strains of influenza virus in vitro and reduction of symptoms by an elderberry extract (*Sambucus nigra L.*) during an outbreak of influenza B Panama." *J Altern Complement Med* 1, no. 4 (1995): 361 9.

ORGANIZATIONS

American Botanical Council. PO Box 144345, Austin, TX 78714 4345.

Herb Research Foundation. 1007 Pearl Street, Suite 200, Boulder, CO 80302.

OTHER

Herb Research Foundation. http://www.herbs.org.

OnHealth. http://www.onhealth.com.
Discovery Health. http://www.discoveryhealth.com.

Greg Annussek

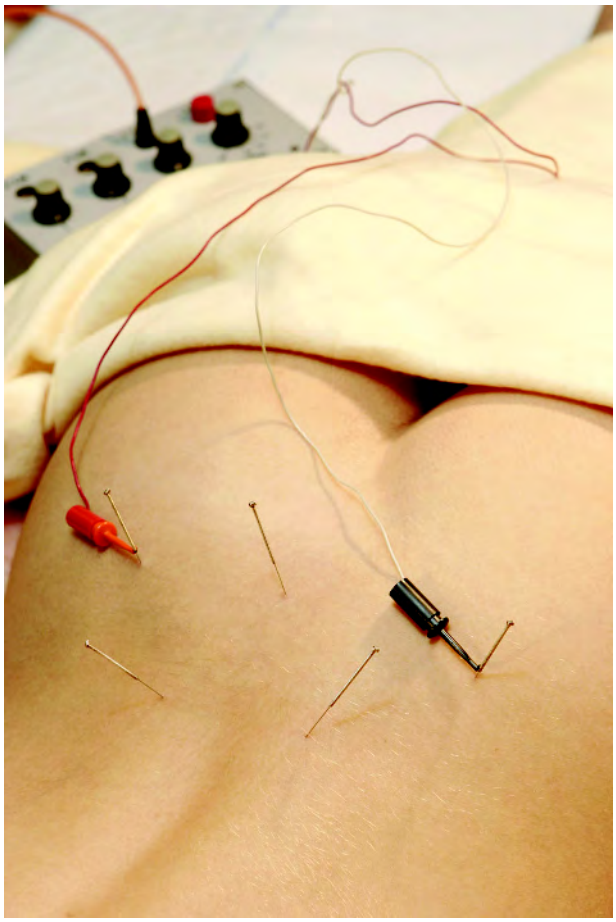
Electroacupuncture

Definition

Electroacupuncture is an **acupuncture** technique that applies small electrical currents to needles that have been inserted at specific points on the body.

Origins

Acupuncture originated thousands of years ago in China as a healing technique. Electroacupuncture was developed in 1958 in China, when acupuncturists there began experimenting with it as surgical anesthesia, or **pain** control. After several years of testing during surgery, acupuncturists began applying electroacupuncture in clinical practice for many conditions.



Electroacupuncture. *(© Peter Banos / Alamy)*

KEY TERMS

Anesthesia—Method of controlling pain during surgery.

Epilepsy—Condition characterized by sudden seizures and other symptoms.

Pacemaker—Device that is surgically implanted in patients with heart disease or disorders, that regulates the beating of the heart.

Benefits

Electroacupuncture can be used to treat the same variety of health conditions that regular acupuncture treats, and for conditions that do not respond to conventional acupuncture. It is effectively used as surgical anesthesia, as a means of reducing chronic pain and **muscle spasms**, and as a treatment for neurological (nerve) disorders.

Description

Acupuncturists begin treatment by diagnosing a patient. Diagnosis is performed with interviews, close examinations (such as of the tongue and **pulse diagnosis**), and other methods. Acupuncture strives to balance and improve the flow of *chi*, or life energy, which travels throughout the body in channels called *meridians*. According to **traditional Chinese medicine** (TCM), illness is caused when chi does not move properly in the body. Acupuncturists are trained to determine where chi is stagnated, weak, or out of balance, which indicates where and how acupuncture points on the body should be stimulated. Electroacupuncture is often recommended for cases of accumulation of chi, such as in chronic pain, and in cases where the chi is difficult to prompt or stimulate.

Patients usually lie down for acupuncture treatment. Thin, sterilized needles are used, and the surface of the skin where they will be inserted is sterilized, as well. One advantage of electroacupuncture is that the margin of error for needle placement is greater than for regular acupuncture, because the electrical current stimulates a larger area around the needle. Electroacupuncture works with two needles at a time, in order for electrical current to pass through the body from one needle to another. Small devices are used to create and regulate a pulsing electric charge, which is

REINHOLD VOLL (1909-1989)

German physician Reinhold Voll initially studied architecture in school and had no intention to become a physician. He decided to study medicine when various treatments to restore the health of his father failed. He spent much of his early career specializing in tropical diseases, sports medicine, and public health, and set up a practice in Plochingen in southern Germany. He was introduced to methods of Chinese acupuncture by a doctor who worked in the tropics and was a firm believer in the practice. By the 1950s, Voll was engaging in the ancient Chinese practice. He had an idea that modern technology might enhance acupuncture in the treatment of various chronic diseases such as allergies, chronic fatigue, migraines, and chronic liver, kidney or pancreatic diseases. His research led him to electroacupuncture (EAV), using electric currents to enhance manipulation of the traditional acupuncture points. In addition to that, he realized there were even more points, or meridians, that corresponded directly with particular organs. Voll then developed a system to measure the degree of inflammation these organs suffered.

Voll focused on certain criteria by which to treat these points. He determined that conditions were either inflammable, chronic, or subchronic. By the use of nosodes, remedies composed of bacteria or viruses, and based on the causes of those diseases and using other homeopathic agents, he was able to test for drugs before the patient ingested them. It was Voll who also discovered the relationship between teeth and the inner organs, an important key to understanding health and disease.

The Institute for ElectroAcupuncture & ElectroDiagnostics is based on Voll's original methods and is located in Munich, Germany. The website for additional information can be located at: http://www.eavnet.com.

sent to the needles by attaching small clips to their ends. The electric charge is very small, and can be adjusted by the acupuncturist or patient. Both the voltage (intensity) and the frequency of the electric charge can be adjusted for healing effects. Voltage levels should be raised slowly. Several pairs of needles may be stimulated at one time, for up to 30 or more minutes of electrical stimulation along the meridians. Another similar, though conventional, medical technique is called transcutaneous electrical nerve stimulation (TENS), which uses electrodes that are taped to the surface of the skin instead of attached to inserted needles, which may be advantageous for patients for whom needles pose risks or problems. This technique stimulates along nerve and muscle groups.

Precautions

Electroacupuncture should not be used on people who have seizures, **epilepsy**, histories of **heart disease** or strokes, or on those with heart pacemakers. Electroacupuncture should not be performed on the head, throat, or directly over the heart, and should be performed with care on spastic muscles. Another recommended precaution is that electrical current should not be sent across the midline of the body, which is the line running from the nose to the navel.

Side effects

During electroacupuncture, patients report sensations of tingling, warmth, and mild aches. Bruising and bleeding may occur, as the needles may hit small blood vessels.

Resources

BOOKS

Kakptchuk, Ted. *The Web That Has No Weaver: Understanding Chinese Medicine*. New York: Congdon and Weed, 1983.

Requena, Yves, M.D. *Terrains and Pathology in Acupuncture*. Massachusetts: Paradigm, 1986.

OTHER

American Association of Oriental Medicine. http://www.aaom.org.

North American Society of Acupuncture and Alternative Medicine. http://www.nasa altmed.com.

Douglas Dupler

Eleutherococcus senticosus see **Ginseng, Siberian**

Elimination diet

Definition

An elimination diet functions as a test, determining whether patients may have a sensitivity to certain foods. Elimination diets are used to detect food **allergies** and food intolerances. They are not nutritionally balanced and are intended to be used only for

diagnostic purposes. Initially, patients stop eating foods suspected of causing illness. Then, after a suitable period of time (often 10–14 days), they review their symptoms. If significant improvement has occurred, it is assumed that an allergy or intolerance to certain foods may be involved. These suspect foods are then reintroduced to the diet, one by one. When symptoms return (usually within three days), the problematic food is identified and removed from the diet.

Benefits

Elimination diets are potentially useful in identifying hard-to-detect food intolerances that proponents believe are responsible for a wide range of ailments, including **constipation**; headaches or migraine; **infections** of the ear or sinuses; frequent colds, post nasal drip, chronic nasal congestion, sore throats or chronic **cough**; **eczema**, **hives**, or **acne**; **asthma**; **pain** or stiffness in the muscles or joints; heart palpitations; **indigestion**; ulcers of the mouth, stomach, or duodenum; **Crohn's disease**; **diarrhea**; yeast infections; urticaria; **edema**; **depression** or **anxiety**; hyperactivity; weight change; and generalized **fatigue**.

Description

A true elimination diet is very rigorous and needs to be implemented under the direction of a physician often in consultation with a dietitian or nutritionist. For the elimination diet to be useful, the patient must follow the diet strictly. Cheating invalidates the results.

For two to three weeks, a person on the elimination diet eats absolutely none of the following foods (this list may be modified by the physician):

- Additives: monosodium glutamate, artificial preservatives, sweeteners, flavors, or colors
- Alcohol: beer, ale, stout, porter, malt liquors, wine, coolers, vodka, gin, rum, whiskey, brandy, liqueurs, and cordials
- Citrus fruits: oranges, calamondins, tangerines, clementines, tangelos, satsumas, owaris, lemons, limes, kumquats, limequats, and grapefruit
- Commonly eaten foods: anything consumed more than three times weekly, as well as foods that are craved or that cause a feeling of weakness
- Corn: as well as corn syrup or sweetener, corn oil, vegetable oil, popcorn, corn chips, corn tortillas
- Dairy products: milk, milk solids, cheese, butter, sour cream, yogurt, cottage cheese, whey, and ice cream
- Eggs: both yolks and whites
- Gluten: any pasta, breads, cakes, flour, or gravies containing wheat
- Honey
- Maple syrup
- Sugar: candy, soft drinks, fruit juices with added sugar or sweetener, cakes, cookies, sucrose, fructose, dextrose, or maltose

Foods that may be allowed include:

- Cereals: puffed rice or millet, oatmeal, or oat bran
- Daily multivitamin: this is especially important during extended dieting, to replace missing nutrients
- Fats and oils: soy, soy milk, soy cheese, sunflower oil, safflower oil, flaxseed oil, olive oil, and sesame oil
- Fruits and vegetables: typically, anything except corn and citrus fruits. Some practitioners suggest fruit be consumed in moderation and preferably whole as opposed to juices.
- Grain and flour products: rice cakes or crackers, rye or spelt bread (both must be 100% with no added wheat), kasha, rice, amaranth, quinoa, millet, oriental noodles, other exotic grains
- Legumes: soybeans, string beans, black beans, navy beans, kidney beans, peas, chickpeas, lentils, tofu. Canned beans should be avoided unless they are free of preservatives and sugar.
- Seeds and nuts: must not contain sugar or salt. Nut butters are allowed if they meet this requirement and are organic.
- Water: two quarts daily. Preferably bottled, as tap water contains potential allergens, including fluoride and chlorine.
- Other: white vinegar, salt, pepper, garlic, onions, ginger, herbal teas, coffee substitutes, spices or condiments (mustard, ketchup) that are free from sugar, preservatives, and citrus. These products can commonly be found at health food stores.

The individual must avoid all medicines containing aspirin (salicylates) and food colorings. After several weeks on these restricted foods, one new food is introduced in larger than normal amounts. This is the challenge food, and it is eaten for three days in a row. If no symptoms appear, the dieter continues to eat that food in normal amounts and adds another challenge food. If symptoms appear, the challenge food is stopped immediately and no new challenge food is introduced until symptoms disappear. During this time the dieter keeps a food journal, writing down everything that is eaten and any symptoms, either physical or emotional, that appear. It can take two to three months to work through all challenge foods.

Precautions

As with all therapies, anyone considering an elimination diet should consider the potential benefits against the risks. The decision, according to some, is comparable to deciding to take a prescribed medication and should be done only under the supervision of a competent medical practitioner.

Anyone suspected of having a moderate to severe food allergy should be under the care of a physician. Any food challenging must be done in a healthcare setting, as severe reactions can cause anaphylactic shock and death.

A serious risk of self-administered elimination diets is that people who self-diagnose symptoms as food intolerances using a non-medically supervised elimination diet may be ignoring symptoms of more serious and progressive diseases such as **celiac disease**, Crohn's disease, gastroesophageal reflux disease, **irritable bowel syndrome**, and other health problems that need medical treatment.

Patients need to know that following a strict elimination diet is not an easy matter. It is extremely important to read packaged-food labels carefully because many processed foods contain monosodium glutamate, sugar, and other substances that may be prohibited. It is almost impossible for elimination-diet patients to eat in restaurants, at school, or at the homes of friends. The resulting isolation must be considered as part of the decision to undertake an elimination diet. Patients should also consider whether they have sufficient time for the extra planning, shopping, and food preparation involved.

Elimination-diet patients should be vigilant to replace any nutrients missing from their restricted diet. For example, **calcium** supplements may be advisable for someone eliminating dairy products from the diet. Any prescribed medications should be continued during any diet.

Putting a very young child on an elimination diet may endanger the child's **nutrition** and normal growth. A breastfeeding mother may harm both her own health and that of her infant if she undertakes an elimination diet during lactation.

Side effects

The most significant side effects of an elimination diet are nutritional disorders resulting from a prolonged, highly restrictive diet, and the risk of a serious reaction as suspect foods are reintroduced to the diet. Some proponents also caution that patients consuming a very limited variety of foods risk becoming allergic to those very foods. For these reasons, professional supervision and substitution of missing nutrients are both essential.

KEY TERMS

Anaphylactic shock—An extreme allergic reaction characterized by swelling, constriction in the bronchi, circulatory collapse, heart failure, and even death.

Urticaria—Itchy pustules that may be caused by a hypersensitivity to food, drugs, or other substances.

Research and general acceptance

Elimination diets are widely used by medical doctors, but considerable differences of opinion exist over the range of illnesses that may be caused by food allergies or intolerances. Many physicians and researchers question the role of allergies in migraine, **rheumatoid arthritis**, **osteoarthritis**, and other conditions. Some doctors suggest that elimination diets should be used only after other diagnostic methods have been tried, including history-taking, skin tests, blind food challenges, and radioallergosorbent testing.

Training and certification

Because of the risks involved, elimination diets should be undertaken only under competent medical supervision. Some patients may wish to consult an allergy specialist.

Resources

BOOKS

Carter, Jill, and Alison Edwards. *The Allergy Exclusion Diet: The 28 Day Plan to Solve Your Food Intolerances*. Carlsbad, CA: Hay House, 2003.

Scott Moncrieff, Christina. *Overcoming Allergies: Home Remedies, Elimination and Rotation Diets, Complemen tary Therapies*. London: Collins & Brown, 2002.

ORGANIZATIONS

American Dietetic Association,120 South Riverside Plaza, Suite 2000, Chicago, IL 60606 6995, (800) 877 1600, http://www.eatright.org.

Chronic Fatigue and Immune Dysfunction Syndrome Association of America (CFIDS), P. O. Box 220398, Chapel Hill, NC 20222 0398, http://www.cfids.org.

David Helwig
Helen Davidson

Emphysema

Definition

Emphysema is a progressive, incurable chronic lung condition that usually develops after many years of tobacco **smoking** or exposure to air-borne pollutants. The air sacs (alveoli) at the end of the bronchial tubes are destroyed, and oxygen uptake is restricted due to the loss of elasticity of lung tissue.

Description

Emphysema frequently occurs with one or more other respiratory diseases, such as **bronchitis** and **asthma**. It is one of those diseases that are collectively referred to as chronic obstructive pulmonary disease (COPD).

Normally functioning lungs are elastic and efficiently expand and recoil as air passes freely through their passageways (bronchi) to the alveoli, where oxygen is moved into the blood and carbon dioxide is filtered out. When individuals inhale cigarette smoke or air-borne pollutants, their immune system responds by releasing substances that are meant to defend the lungs against the smoke. These substances can also attack the cells of the lungs, but the body normally inhibits such action with the release of other substances.

When individuals are exposed to air pollution or occupational pollutants over a long period of time, the lung tissue becomes damaged in such a way that it loses its elasticity. When damage has occurred to the alveoli, patients have difficulty making a complete exhalation, which causes residual volume (air trapped inside the lungs). With the passage of time, this residual volume causes the chest to permanently expand and become barrel shaped. As the disease progresses, increasingly more effort is needed to breathe.

Demographics

As reported by the American Lung Association, approximately 4.1 million Americans were diagnosed with emphysema in 2006, and 93% were aged 45 or older. This group included an estimated 3.7 million Caucasians and 193,000 African Americans affected by the condition. Men have a higher prevalence of emphysema than women; with 2.5 million men affected compared to 1.6 million women, as reported in 2006.

Every year, approximately 100,000 people die of the disease, making it the fourth largest cause of mortality in the United States (after **heart disease**, **cancer**, and **stroke**), according to the National Emphysema Foundation.

Giant bullous emphysema is a rare type of emphysema of unknown origin that affects young men, usually smokers. It is characterized by large (>1 cm in diameter) bullae in the alveoli of the upper lobes that greatly increase the risk of pneumothorax (collapsed lung). Bullae are round bubbles or air cavities that expand from beneath the pleura (thin membranes that line the lungs) and put pressure on the lungs, causing severe lung dysfunction. A giant bulla is defined as taking up one-third or more of the space in and around the affected lung. Surgical treatment is usually required to treat this type of emphysema.

Causes and symptoms

Causes

Smoking is the primary cause of emphysema. Environmental exposure and genetic factors are other contributing factors.

GENETICS. An inherited disorder called alpha 1-antitrypsin (AAT) deficiency can increase the risk of emphysema. AAT is a protein produced in the liver that is transported to the lungs to aid proper breathing function and to reduce inflammation. In people with AAT deficiency, the liver produces little or no AAT to offer these protective properties, which can lead to alveoli damage and restricted oxygen uptake.

ENVIRONMENTAL EXPOSURE. Emphysema has traditionally been a disease suffered by miners, particularly coal miners, as the fine dust that results from mining attacks the alveoli over time. Most miners develop emphysema to some degree after a lifetime in the mining pit. In fact, emphysema is sometimes referred to as miner's lung or black lung. Due to awareness of the causes of emphysema and improved working conditions for many miners, the incidence of emphysema has somewhat decreased in this population.

Any worker who is exposed to abnormal levels of dust, fumes, smoke, gases, vapors or mists over a long period of time may be at risk for emphysema. This group of workers includes sand blasters and metal grinders, as well as individuals who are exposed at work to **silica** (silicosis), asbestos (asbestososis), or **iron** filings (siderosis). In addition, dust from wood, cotton, talc, cereal grains, coffee, pesticides, drug or enzyme powders, or fiberglass may cause emphysema. People who use their lungs in their work are also susceptible (such as trumpet players and glass blowers).

People who develop emphysema as a result of their work often develop asthma prior to emphysema.

Symptoms

People with emphysema typically complain that they cannot get enough air as stale air builds up inside the lungs and the person is starved of oxygen. Coughing, **wheezing** and chronic mucus production, blueness of the lips and fingernails, and exhaustion are common symptoms.

Diagnosis

A diagnosis of emphysema is not made on the basis of symptoms alone. A detailed medical history is taken along with x rays and pathology examinations. Diagnostic tests may include:

- chest x ray
- pulmonary function tests (also called spirometry) to determine air flow in the lungs and the movement of oxygen in the blood
- pulse oximetry to measure blood oxygen saturation
- arterial blood gas test to determine the amount of oxygen and carbon dioxide in the blood
- exercise testing to determine if the oxygen level in the blood drops during exercise
- electrocardiogram to rule out heart disease as a cause of shortness of breath

Treatment

Damage to the lungs as a result of emphysema cannot be reversed, so preventative measures to limit its progression are essential. The following measures and treatments are regarded as beneficial for emphysema patients.

Herbalism

Herbs can be beneficial in relieving the symptoms of emphysema, helping the body to ward off infection, and easing the asthmatic symptoms that often accompany emphysema.

Some beneficial herbs are:

- Lobelia: This is a mild sedative, also having strong expectorant properties. It is widely used for chest complaints, including emphysema and bronchitis, and can help to shorten an asthma attack.
- Thyme: A tea made with thyme is recommended for overcoming shortness of breath. It is also a powerful antiseptic.
- Mullein: This is another traditional remedy for chest complaints. To make a tea, boil two tablespoons of the dried leaves with a glass of milk and drink the mixture.
- Echinacea: Echinacea is a powerful immune system stimulant and strengthens the body in general, warding off colds and infections.
- Lungwort: A member of the borage family, this herb is very healing for the lungs. It should be taken as an infusion.
- Black cohosh: This herb is an expectorant and astringent. It relieves coughing.
- Sage: This is one of the most useful of all herbs and is said to be good for whatever it is taken for. It is antiviral and bactericidal.
- Garlic: A very powerful anti-viral, garlic can be of real help to those trying to avoid infections and lung congestion.

Chinese herbal medicine

Qing Qi Hua Tan Wan (**Pinellia** expectorant pills) are the Chinese herbalists' treatment for chronic lung complaints, particularly bronchitis and asthma.

Juices for emphysema

Kitty Campion, a British naturopathic herbalist expert, recommends the following juices for the treatment of emphysema: equal parts of carrot juice, parsnip juice, watercress juice, and potato juice, or equal parts of orange juice and lemon juice, diluted half and half with a strong decoction of rosehip tea.

Aromatherapy

Aromatherapy involves massaging the patient with potent plant **essential oils**, which have been proven to enter the circulation through the skin. The constituents of the oils can have a powerful effect on a variety of illnesses, but since their beneficial qualities are also transported through the air, they are considered to be doubly beneficial to those who have respiratory ailments.

Aromatherapy oils for respiratory disease:

- *Canada balsam* may alleviate respiratory symptoms and is an expectorant. It is also a bactericide and recommended for those with chronic chest ailments.
- *Tolu balsam* is an excellent treatment for chest infections.
- *Frankincense* is good for infection and catarrhal discharge.

- *Niaouli* is a very strong antiseptic and beneficial for pulmonary trouble.
- *Rose damascena* is recommended for bronchial complaints, and it also lifts the spirits.
- *Tea tree oil* is one of the most potent anti-viral, anti-bacterial and anti-fungal agents known to herbal medicine, therefore, highly beneficial as a preventative measure against chest infection.

Acupuncture

This ancient Chinese system of holistic treatment works on the principal that illness is the result of blockage in the flow of life force. The practitioner aims to stimulate relevant meridians in the body and thus release trapped life force, returning bodily functions to normal. The treatment is virtually painless.

Treatment can be expected to improve blood circulation and the capacity of the body to restore itself. Research has indicated that **acupuncture** can produce changes in the electrical fields of body cells, which promote a return to the body's normal state. Consequently, few negative side effects are associated with acupuncture treatment.

Breathing techniques

Very few people actually breathe correctly, and if lung function is not up to par, the difference between breathing fully and taking shallow, ineffective breaths can make a remarkable difference to the way persons feel and their bodies functions. Oxygen shortage in the body promotes disease, and ensuring that oxygen levels are kept up can avert disaster, even with the existence of lung-impairment. Improved breathing techniques can rid the body of free radicals, neutralize environmental toxins, and destroy many harmful microbes that cannot exist in an oxygen-rich environment. Without sufficient oxygen, the body cannot fully utilize nutrients from food, and bodily functions generally become less efficient, so every effort must be made to promote proper breathing, in order to offset the effects of reduced lung function.

In cases of emphysema, it is particularly important to ensure that the out breath expels all of the previous in-breath. When exhalation is incomplete wastes produced by breathing are not expelled from the body in the normal way and residual volume, which is a common occurrence with progressive emphysema, may cause chest enlargement.

Postural positions can help manage shortness of breath by relieving strain on the upper chest. When sitting, patients can lean forward slightly, resting the elbows on the knees. When lying down, the patient can rest on his side with a pillow between his legs and his head elevated with pillows.

Homeopathy

Homeopathy is the treatment of illness according to a system of "like cures like" that stimulates the body to heal itself. While it could definitely contribute to the successful treatment of emphysema, homeopathy requires a qualified practitioner, as the patient's condition must be accurately assessed so that the correct remedy can be prescribed. Even for the same disorder, no two patients receive the same treatment.

Lifestyle

For lung dysfunction of any kind, it is vital to take steps to ensure that a person's lifestyle is not contributing to the problem. Pollution must be avoided at all costs, and steps should be taken to ensure that the living environment is free of chemical irritants, which may involve avoiding fragrances, as they can overburden damaged lungs. Some unscented products use a masking fragrance, which only increases toxicity. Common household products, such as fabric softeners, bleach, scented detergents, and furniture polish, can harm the body and the environment.

It must be noted that pesticides, fungicides, herbicides, and fertilizers are all neurotoxins (poisonous to the nervous system). Natural alternatives are obtainable for most household cleaning products. Personal care products can also cause damage, so only natural sources should be used. Chlorinated swimming pools should be avoided.

Every effort should be made to obtain food that is organically grown, in order to avoid pesticides and chemicals. Processed foods should be avoided because they often contain chemicals, dyes, and preservatives and because the food is stripped of most of its nutritional value. Notably, artificial sweeteners, particularly aspartame, break down into deadly poisons in the body.

Clothing should be all natural fibers, as permanent press and wrinkle-resistant clothes have often been treated with formaldehyde, which does not wash out. For the same reasons, synthetic fiber bed coverings should also be avoided. All plastic products should be avoided as much as possible as they all have toxic elements. Windows should be open as often as possible to increase oxygen in the atmosphere. Some houseplants should be acquired, as they give off oxygen.

It is also very important to undertake some form of gentle, regular **exercise** as this can do much to

improve symptoms. Suitable forms of exercise may be swimming, walking, and gentle rebounding. If an emphysema patient is very weak, he could sit on a mini-trampoline while a helper does the strenuous bit; very real benefits will still be obtained in this way. Strenuous activities are not suitable for anyone with lung impairment.

Naturopathy

According to the principles of naturopathy, the body has the power to heal itself. Treatment should focus on providing the system with optimum **nutrition** in order that it can carry out all repairs necessary, which involves ensuring that all food that is eaten is of the highest quality.

Naturopaths advocate dietary supplements to assist with this process, and certain dietary supplements can be very valuable in arresting the progress of emphysema. Trials have been conducted involving treating emphysema patients with **vitamin A**, which is known to play an important role in healthy body tissue. **Vitamin E** can also be helpful, and **vitamin C** should always be taken, as it is a catalyst for other nutrients. For best results, it is advised to consult a practitioner.

Allopathic treatment

Prior to any other treatment, it is essential that emphysema patients who smoke take steps to give up the habit. Otherwise, damage to the lungs will continue to go unchecked, and other measures will be very limited in their success. Apart from lifestyle changes, physicians generally recommend avoidance of infection, and antibiotics may be prescribed as a preventative measure.

A physician may also prescribe bronchodilator medicines (including beta agonists and anticholinergics) if there is any obstruction of the airways. For the same reason, anti-inflammatories, including corticosteroids, may also be prescribed. There are a variety of delivery methods for emphysema medications, including metered dose inhalers, dry powder inhalers, nebulizer breathing treatments, and powder-filled inhalation capsules.

Pulmonary rehabilitation, which typically includes chest physiotherapy, breathing exercises, and a program of physical exercise, is considered to benefit all emphysema patients, regardless of the degree of impairment. Supplemental **oxygen therapy** may be required at some stage.

Augmentation therapy is available for the treatment of alpha-1 antitrypsin deficiency. This intravenous therapy involves the delivery of AAT from healthy plasma donors, which replaces the so-called faulty AAT in the patient's blood. The dosage is adjusted based on the patient's body weight and is usually delivered once a week. As of 2008, further research was needed to evaluate the effectiveness of augmentation therapy in preventing the progression of emphysema.

In select patients, lung volume reduction surgery may be recommended. In this procedure, the damaged parts of the lung are removed, in order to allow healthy lung tissue to expand. If successful, this surgery may eliminate the need for supplemental oxygen and improve breathing function. However, the National Emphysema Therapy Trial (NETT) demonstrated that only a small number of people with COPD actually benefit from this surgery. Therefore, careful screening is required to determine patient eligibility.

Bullectomy is the surgical removal of bullae that may develop with the giant bullous emphysema. This procedure results in improved total lung capacity and overall morbidity improvements.

A final resort is lung transplant surgery. Because of the relatively large risk involved, transplant surgery is carried out in only a small minority of patients.

Promising research is being conducted to evaluate several less-invasive procedures to treat emphysema. These procedures include bronchoscopic techniques to reduce lung volume, including bypass stents; bronchial occlusive devices; and endobronchial valves, as well as biological reagents to remodel and shrink damaged lung tissue. Minimally invasive surgical techniques are also being evaluated.

Prognosis

It is generally accepted that emphysema is incurable. Physicians and alternative medicine practitioners assert that they can relieve patients greatly from symptoms and halt the progress of the disease with appropriate management, preventative measures, along with the patient's lifestyle changes.

Prevention

Individuals who feel that their work conditions are likely to be a possible cause of emphysema should take steps to protect themselves. A respirator should be worn, at least until work conditions can be improved. Improving ventilation can also help remedy working conditions.

Early diagnosis is vital to the successful management of emphysema. If preventative and therapeutic

KEY TERMS

Acupuncture—An ancient Chinese system of treatment, which involves the painless insertion of very fine needles under the skin at certain key points on the body.

Alveoli—Small, thin-walled sacs located at the end of the smallest airways in the lungs where the exchange of oxygen and carbon dioxide takes place.

Anti-inflammatory—Medication that reduces inflammation (swelling in the airway and mucus production).

Bronchial tubes—Airways in the lungs that branch from the trachea (windpipe).

Bronchioles—The smallest branches of the airways in the lungs.

Bronchodilators—Medications that help relax the muscles surrounding the breathing tubes to aid breathing.

Catalyst—An agent that helps other substances to do their work.

Free radicals—The result of oxidization in the body, these molecules are chemically unbalanced and cause a chain reaction of damage to other molecules in the body, one of the prime causes of aging symptoms and deterioration in body functions.

Inflammation—A basic response in the body to infection, irritation or injury. Inflammation is marked by redness, warmth, swelling, and pain.

Naturopathy—A medical paradigm of diagnosis and healing based on removing the obstacles to cure and using as modalities: diet, therapeutic nutrition, botanical medicine, homeopathy, physical medicine, and counseling.

Peak Expiratory Flow (PEF)—A test used to measure how fast air can be exhaled from the lungs to measure the openness of the airways.

Pulmonary function tests—Tests that measure the amount and rate of air breathed in over a period of time. PFTs also measure how well the lungs move oxygen into the blood.

Residual volume—The amount of air trapped inside the lungs as a result of incompletely exhaling.

measures are taken at the early onset of symptoms, damage can be restricted and the outlook is positive. At all times, care should be taken to eliminate sources of pollution or chemical irritants from the environment, both in the home and elsewhere. The first step in overcoming emphysema for any patient should be to remove the cause, whether it be smoking, working conditions, or polluted atmosphere.

People with emphysema have an increased risk for developing lung **infections**. To reduce the risk of infection, patients should keep the house clean and free from excess dust and bathrooms free from mold or mildew; keep breathing equipment clean and covered when not in use; and frequently wash hands. Patients should notify their doctor if they have any of these signs of infection: increased shortness of breath, difficulty breathing or wheezing; coughing up increased amounts of mucus; change in color of mucus; **fever** or **chills**; increased **fatigue** or weakness; **sore throat** or **pain** when swallowing; unusual sinus drainage or nasal congestion; headaches or pain along upper cheeks.

Numerous smoking cessation programs are available, and physicians can provide referrals to community programs. The American Lung Association also offers many resources to help people quit smoking.

Regular exercise of moderate intensity may reduce lung function decline in smokers, as shown in a 2007 study published in the *American Journal of Respiratory and Critical Care Medicine*.

Resources

BOOKS

Blackler, Laura, Christine Jones, and Caroline Mooney, eds. *Managing Chronic Obstructive Pulmonary Disease*. Hoboken, NJ: Wiley, 2007.

Green, Robert J., Jr. *Emphysema and Chronic Obstructive Pulmonary Disease: Therapeutic Approaches through Nutrition, Natural Medicine, Alternative Medicine*. San Diego, CA: Aventine Press, 2005.

PERIODICALS

Garcia Aymerich J., P. Lange, M. Benet, P. Schnohr, and J. M. Anto. "Regular Physical Activity Modifies Smoking Related Lung Function Decline and Reduces Risk of Chronic Obstructive Pulmonary Disease: A Population Based Cohort Study." *American Journal of Respiratory and Critical Care Medicine* 175, no. 5 (March 1, 2007): 458 463.

Lederer, David J., and Selim M. Arcasoy. "Update in Sur gical Therapy for Chronic Obstructive Pulmonary Dis ease." *Clinics in Chest Medicine* 28, (2007): 639 653.

Naunheim K. S., et al. "Predictors of Operative Mortality and Cardiopulmonary Morbidity in the National Emphysema Treatment Trial (NETT)." *Journal of Thoracic and Cardiovascular Surgery* 131, no. 1 (Janu ary 1, 2006): 43 53.

Reilly, John, et al. "Biological Lung Volume Reduction: A New Bronchoscopic Therapy for Advanced Emphy sema." *Chest* 131, no. 4 (April 2007): 1108 1013.

ORGANIZATIONS

American Academy of Allergy, Asthma and Immunology, 555 E. Wells St., Suite 1100, Milwaukee, WI 53202 3823, (414) 272 6071, http://www.aaaai.org.

American Lung Association, 61 Broadway, 6th Floor, New York, NY 10006, (800) 548 8252, (212) 315 8700, http://www.lungusa.org.

Global Alliance Against Chronic Respiratory Diseases (GARD), World Health Organization, Department of Chronic Diseases and Health Promotion, 20, Avenue Appia CH 1211 27, Geneva, Switzerland, http://www.who.int/respiratory/gard/en/ .

National Emphysema Foundation, 128 East Ave., Norwalk, CT 06851, (203) 866 5000, http://www.emphysemafoundation.org.

National Heart, Lung, and Blood Institute Information Center, PO Box 30105, Bethesda, MD 20824 0105, (301) 592 8573, http://www.nhlbi.nih.gov.

Patricia Skinner
Angela M. Costello

Encopresis *see* **Constipation**

Endometrial cancer *see* **Uterine cancer**

Endometriosis

Definition

Endometriosis is a condition in which bits of tissue similar to the lining of the uterus (endometrium) grow in other parts of the body (and within the uterus). Like the uterine lining, this tissue builds up and sheds in response to monthly hormonal cycles. The blood discarded from these implants falls onto surrounding organs, causing swelling and inflammation. This repeated irritation leads to the development of scar tissue and adhesions.

Description

Endometriosis is estimated to affect 7% of women of childbearing age in the United States. It most commonly strikes between the ages of 25 and 40. Endometriosis can also appear in the teen years, but never before the start of **menstruation**. It is seldom seen in postmenopausal women.

Endometriosis was once called the career woman's disease because it was thought to be a product of delayed childbearing. The statistics defy such a narrow generalization; however, **pregnancy** may slow the progress of the condition. Women whose periods last longer than a week with an interval of less than 27 days between them seem to be more prone to the condition.

Endometrial implants are most often found on the pelvic organs, including the ovaries, uterus, fallopian tubes, and in the cavity behind the uterus. Occasionally, this tissue grows in such distant parts of the body as the lungs, arms, and kidneys. **Ovarian cysts** may form around endometrial tissue (endometriomas) and may range from pea to grapefruit size. Endometriosis is a progressive condition that usually advances slowly, over the course of many years. Doctors rank cases from minimal to severe based on factors such as the number and size of the endometrial implants, their appearance and location, and the extent of the scar tissue and adhesions in the vicinity of the growths.

Causes and symptoms

Although the exact cause of endometriosis is unknown, a number of theories have been put forward. Some of the more popular ones are:

- Implantation theory. This theory states that a reversal in the direction of menstrual flow sends discarded endometrial cells into the body cavity where they attach to internal organs and seed endometrial implants. There is considerable evidence to support this explanation. Reversed menstrual flow occurs in 70 to 90% of women and is thought to be more common in women with endometriosis.
- Vascular-lymphatic theory. This theory suggests that the lymph system or blood vessels (vascular system) are the vehicles for distribution of endometrial cells out of the uterus.
- Coelomic metaplasia theory. According to this hypothesis, remnants of tissue left over from prenatal development of the woman's reproductive tract transform into endometrial cells throughout the body.
- Induction theory. This explanation postulates that an unidentified substance found in the body forces cells from the lining of the body cavity to change into endometrial cells.

In addition to these theories, the following factors are thought to influence the development of endometriosis:

- Heredity. A woman's chance of developing endometriosis is seven times greater if her mother or sisters have the disease.
- Immune system function. Women with endometriosis may have lower functioning immune systems that have trouble eliminating stray endometrial cells, which would explain why a high percentage of

women experience reversed menstrual flow while relatively few develop endometriosis.

- Dioxin exposure. Some research suggests a link between exposure to dioxin (TCCD), a toxic chemical found in weed killers, and the development of endometriosis.

While many women with endometriosis experience debilitating symptoms, others have the disease without knowing it. Strangely, there does not seem to be any relation between the severity of the symptoms and the extent of the disease. The most common symptoms are:

- Menstrual pain. Pain in the lower abdomen that begins a day or two before the menstrual period starts and continues until the end is typical of endometriosis. Some women also report lower back aches and pain during urination and bowel movement, especially during their periods.
- Painful sexual intercourse. Pressure on the vagina and cervix causes severe pain for some women.
- Abnormal bleeding. Heavy menstrual periods, irregular bleeding, and spotting are common features of endometriosis.
- Infertility. There is a strong association between endometriosis and infertility, although the reasons for this connection had not been fully explained as of 2008. Some experts believe that the buildup of scar tissue and adhesions blocks the fallopian tubes and prevents the ovaries from releasing eggs. Endometriosis may also affect fertility by causing hormonal irregularities and a higher rate of early miscarriage.

Diagnosis

The first step in diagnosing endometriosis is to perform a pelvic examination to determine if implants are present. Very often there is no strong evidence of endometriosis from a physical exam. The only way to make a definitive diagnosis is with a minor surgery called a laparoscopy. A laparoscope, a slender scope with a light on the end, is inserted into the woman's abdomen through a small incision near her navel. This procedure allows the doctor to examine the internal organs. Often, a sample of tissue is taken for later examination in the laboratory. Endometriosis is sometimes discovered when a woman has abdominal surgery for another reason such as tubal ligation or hysterectomy.

Various imaging techniques such as ultrasound, computed tomography scan (CT scan), or magnetic resonance imaging (MRI) can offer additional information but are not useful in making the initial diagnosis. A blood test may also be ordered because women with endometriosis have higher levels of the blood protein CA125. Testing for this substance before and after treatment can predict a recurrence of the disease, but is not reliable as a diagnostic tool.

Treatment

Although severe endometriosis should not be self-treated, many women find they can help relieve symptoms through alternative therapies. In a survey conducted by the Endometriosis Association, 40% to 60% of the women who used alternative medicines reported relief of **pain** and other symptoms.

Diet

A **high-fiber diet**, particularly from grains and beans, may decrease cramping and inflammation. The oils in seeds, nuts, and certain fish (cod, salmon, mackerel, and sardines) may help to relieve cramping. Carrots, beets, lemons, cauliflower, brussels sprouts, cabbage, onions, **garlic**, citrus fruits, vegetables, **chicory**, radicchio, and yogurt may help to reduce symptoms. Some women have found relief when they turned to a **macrobiotic diet** (one that is very restrictive and intended to prolong life). Occasionally, an allergy **elimination diet** may be recommended.

Sugar and animal fats can increase inflammation and aggravate pain. Milk and meat may contain hormones, so these should be avoided. Vegetarian or vegan **diets** may be recommended for those with endometriosis.

Supplements

The following supplements can be used to treat endometriosis:

- vitamin B complex to help the liver break down excess estrogen
- vitamin C to reduce heavy menstrual bleeding
- calcium
- bioflavonoids to help reduce heavy menstrual bleeding
- magnesium to relieve pain and flush out toxins
- vitamin E to heal inflamed tissues
- iron for anemia resulting from heavy bleeding
- lipotropic factors (Choline, methionine, and inositol enhance liver function)
- fish oil capsules, flax oil, or any essential fatty acid to reduce cramping

Several herbal remedies for endometriosis exist. The first four in this list are the most commonly used remedies:

- Genistein (soy/isoflavone) helps the body excrete excess estrogen and possibly blocks estrogen's effect.
- Cramp bark (*Viburnum opulus*) helps ease cramping.
- Dong quai (*Angelica sinensis*) balances hormone levels and reduces inflammation.
- Black cohosh (*Cimicifuga racemosa*) helps the body excrete excess estrogen and improves the health of pelvic organs.
- Red clover (*Trifolium pratense*) balances hormone levels.
- Milk thistle (*Silybum marianum*) may improve liver function.
- Life root (*Senecio aureus*) may improve the health of pelvic organs.
- Feverfew (*Chrysanthemum parthenium*) eases pain and cramping.
- Dandelion eases pain and cramping and supports the liver.
- Yarrow (*Archillea millefolium*) eases cramping and restores hormonal balance.
- Evening primrose (*Oenothera biennis*) oil relieved endometriosis symptoms in 90% of patients in one study.
- Shepherd's purse (*Capsella bursa-pastoris*) reduces heavy menstrual bleeding and tones the uterus.
- Meadowsweet (*Filipendula ulmaria*) reduces pain.

Other treatments

Other remedies for endometriosis include **acupuncture** or **acupressure** to relieve pain, visualization, **guided imagery**, naturopathy, **homeopathy** (Lilium tigrum, **sepia**, and **belladonna**), **hydrotherapy**, **exercise**, and **meditation**.

Allopathic treatment

How endometriosis is treated depends on the woman's symptoms, her age, the extent of the disease, and her personal preferences. The condition cannot be fully eradicated without surgery. Treatment focuses on managing pain, preserving fertility, and delaying the progress of the condition.

Medication

Over-the-counter pain relievers such as aspirin, acetaminophen (Tylenol), ibuprofen (Motrin, Advil), and naproxen (Aleve, Naprosyn) are useful for mild cramping and menstrual pain. If pain is severe, a doctor may prescribe narcotic medications, although these can be addicting and are rarely used.

Hormonal therapies effectively tame endometriosis but also act as contraceptives. They include oral contraceptives, synthetic male hormones (danazol, gestrinone), progestins, and gonadotropin-releasing hormone antagonists.

Surgery

Endometrial implants and ovarian cysts can be removed with laser surgery performed through a laparoscope. For women with minimal endometriosis, this technique is usually successful in reducing pain and slowing disease progress. It may also help infertile women increase their chances of becoming pregnant.

Removing the uterus, ovaries, and fallopian tubes (a hysterectomy) is the only permanent method of eliminating endometriosis. This extreme measure deprives a woman of her ability to bear children and forces her body into **menopause**.

Expected results

Most women who have endometriosis have minimal symptoms and do well. Overall, endometriosis symptoms come back in an average of 40% of women over the five years following treatment. A 2002 review found that teenagers and young women under the age of 22 years have almost twice the chance of symptom recurrence after surgical removal of endometriosis compared with older women. Some researchers believe that younger women may have a different form of endometriosis than that found in older women.

With hormonal therapy, pain returned after five years in 37% of patients with minimal symptoms and 74% of those with severe cases. The highest success rate from conservative treatment followed complete removal of implants using laser surgery. Of these women, 80% were still pain-free five years later. Hysterectomy may be necessary should other treatments fail.

Prevention

There is no proven way to prevent endometriosis. One study, however, indicated that girls who begin participating in aerobic exercise at a young age are less likely to develop the condition.

Resources

BOOKS

Krotec, Joseph, and Sharon Perkins. *Endometriosis for Dummies*. Indianapolis, IN: For Dummies, 2006.

KEY TERMS

Adhesions—Web-like scar tissue that may develop as a result of endometriosis and bind organs to one another.

Endometrial implants—Growths of endometrial tissue that attach to organs, primarily in the pelvic cavity.

Endometrium—The tissue lining the uterus that grows and sheds each month during a woman's menstrual cycle.

Estrogen—A female hormone that promotes the growth of endometrial tissue.

Laparoscopy—Procedure used to diagnose and treat endometriosis. It is performed by inserting a slender, wand-like instrument through a small incision in the woman's abdomen.

Menopause—The end of a woman's menstrual periods when the body stops making estrogen.

Retrograde menstruation—Menstrual flow that travels into the body cavity rather than out through the vagina.

Morris, Kerry Ann. *Living Well with Endometriosis: What Your Doctor Doesn't Tell You . . . That You Need to Know*. Doughcloyne, Wilton, Cork, Ireland: Collins Press, 2006.

Watson, Stephanie. *Endometriosis*. New York: Rosen, 2006.

Worwood, Valerie Ann, and Julia Stonehouse. *The Endometriosis Natural Treatment Program: A Complete Self Help Plan for Improving Health and Well Being*. Novato, CA: New World Library, 2007.

PERIODICALS

Rodgers, Allison K., and Tommaso Falcone. "Treatment Strategies for Endometriosis." *Expert Opinion on Pharmacotherapy* (February 2008): 243 255.

Simsa, Peter, et al. "Future of Endometriosis Research." *Women's Health* (September 2007): 647 654.

Whelan, Emma. "'No One Agrees except for Those of Us Who Have It': Endometriosis Patients as an Epistemo logical Community." *Sociology of Health & Illness* (November 2007): 957 982.

ORGANIZATIONS

Endometriosis Association, International Headquarters, 8585 North Seventy Sixth Place, Milwaukee, WI 53223, (414) 355 2200, http://EndometriosisAssn.org.

Belinda Rowland
Teresa G. Odle
David Edward Newton, Ed.D.

Energy medicine

Definition

Energy medicine is based upon the belief that changes in the "life force" of the body, including the electric, magnetic and electromagnetic fields, affect human health and can promote healing.

Origins

The notion of a life force or energy is shared by people around the world. Since ancient times, traditional cultures have believed that a special energy vitalizes all life. This energy is known as chi, prana, pneuma, orgone, mana, ether, odyle, élan vital, biocosmic energy and many other names.

Early Ayurvedic references to a life force, or prana, go back to the eighth century B.C. In the West, as early as the sixth century B.C., Pythagoras conceived of a life energy, or pneuma, visible in a luminous body. A century later, Hippocrates, the father of modern medicine, recognized the body's natural capacity for healing, or *Vis medicatrix naturae*. He instructed physicians to find the blocking influences both within a patient and between them and the cosmos, in order to restore the healing life force. Nature, not the doctor, is the source of healing.

In the sixteenth century, the Swiss alchemist and physician Paracelsus reported "a healing energy that radiates within and around man like a luminous sphere." He believed this energy could cause and cure disease and could work from a distance. He also thought that magnets, planets, and stars could influence this energy. There are echoes of these beliefs in some of theories and practices of contemporary energy medicine. However, the ideas of Francis Bacon and the French philosopher and mathematician René Descartes have had a much greater impact on Western medicine as a whole.

Bacon applied logical mathematical concepts to analyze humans and the world. He believed that the laws of science should be used to "master rather than become harmonious with nature." Descartes proposed that the body, which was measurable, and the mind, which was immeasurable, were firmly separate. The body could influence the mind but the mind could not influence the body. These notions promoted the search for physical causes of human illness. They also led to a denial of the mind's ability to affect physical health. As a result, mainstream science came to devalue or reject any phenomenon that cannot be measured or objectively proved.

KEY TERMS

Aura—A light or radiance that is claimed to emanate from the body and to be visible to certain persons with psychic or spiritual powers.

Bioenergetics—The study of energy transformation in living systems.

Paradigm—A pattern or model.

From the seventeenth century onward, Western medicine has focused primarily upon the physical aspects of disease. Scientists who studied forces within the body that were difficult to measure were often ignored or ridiculed. The Austrian psychiatrist Wilhelm Reich, who had been a student and colleague of Sigmund Freud, was jailed and his books publicly burned because of his theories about "orgone" energy. His views, however, have influenced the development of many body-mind approaches, particularly bioenergetics.

The 1990s brought a new emerging scientific paradigm in relation to medicine and health care. According to biophysicist Beverly Rubik, this emerging paradigm "... celebrates the creative, subtle, empowering, wise, and enduring features of life that were never acknowledged during the age of machines and mechanistic thought. Living systems are self-organizing systems that expend energy in order to maintain their coherence and integrity...Healing is ultimately self-healing, a natural response to internal dynamic shifts or external challenges." This new paradigm also conveys that "...very small or subtle stimuli applied to the body-mind can have profound effects and set a person on the road to recovery."

Benefits

In a 1990 review of more than 131 controlled scientific studies of healers from around the world, Dr. Daniel Benor found evidence of healing for a wide range of human conditions. These include changes in immune system functioning as well as improvement of skin—wound healing, blood pressure, nearsightedness, **leukemia**, **anxiety**, **asthma**, **bronchitis**, **epilepsy**, tension **headache**, neck and back **pain**, post-operative pain, self-esteem, **heart disease**, and relationships.

Patients have also reported spontaneous healing of a variety of conditions including **cancer** and paralysis. Spiritual awakenings or new attitudes and a fresh sense of meaning in life can also result from energy healing.

Description

Energy medicine is a broad term that includes touch therapies, movement therapies, spiritual healing, **meditation**, magnetic field therapy, **homeopathy**, **acupuncture**, **light therapy**, and other innovative methods of healing. What these various approaches have in common is an energetic understanding of health and healing. These therapies may affect the patient's internal energy, external energy (aura, or other energy fields surrounding the body) or both. Many of these therapies fall into several different categories at once and their benefits may not be exclusively due to changes in life force. Energetic touch therapies include, but are not limited to, **reiki**, **therapeutic touch** (although the physical body is not touched), watsu, **polarity therapy**, Ayurvedic massage, zero balancing, **reflexology**, Jin Shin Jyutsu, **lomilomi**, **breema** bodywork, **Thai massage**, **shiatsu**, amma, Chi Nei Tsang, Jin Shin Do, Shen, and **Chinese massage**, and **acupressure**. Energetic movement therapies include **qigong**, **t'ai chi** chuan, aikido, karate, and **yoga** (there are many different forms of yoga). Spiritual healing includes distance healing, laying on of hands, meditation, ceremony, ritual and other shamanic practices.

Some of the methods of energy medicine involve gentle physical touch, while others work with the energy around the body with the practitioner holding his or her hands several inches away. Some methods can be applied from a distance, others require attendance at a ceremony and may include family and friends. The movement modalities may require learning and practicing a particular movement or breath sequence. Other therapies may involve wearing magnets, being exposed to various kinds of light rays, or receiving energy stimulation with needles and heat.

The duration and cost of an energy medicine session vary greatly depending upon the method and the healer. Some methods are expensive while others are free or offered for a modest donation. These modalities are not covered by insurance unless administered by a licensed health care professional.

Preparations

The amount and type of preparation vary. While some forms of energy medicine require no specific preparations, others do. These preparations may range from wearing loose clothing for yoga and other movement therapies, to an hour-long diagnostic interview with a practitioner of **traditional Chinese medicine** prior to receiving certain types of Chinese massage. In general, people with heart problems,

CAROLINE MYSS (1953–)

Caroline Myss graduated with a B.A. in Journalism in 1974 from St. Mary of the Woods College in Terre Haute, Indiana. Working as a journalist in her native Chicago, Myss interviewed Dr. Elisabeth Kubler Ross, M.D., who was devoted to the study of death and the dying. She credits Kubler Ross with inspiring her to go on to Loyola Mundelein University, a Jesuit school in Chicago, to get an M.A. in Theology in 1979. Myss then started a small New Age publishing company, consulted with holistic doctors, and gave individuals intuitive readings. It was her pairing with Dr. C. Norman Shealy, founder of the American Holistic Medical Association, in 1984, that began to thrust her into the limelight in energy medicine. With television appearances on such high profile shows as *Oprah*, Myss is the best known intuitive on the circuit of holistic practitioners. Her belief stems from a principle that the mind and body work together to contribute to a person's well being. While the traditional medical community is skeptical of the scientific basis for her claims, her interna tional popularity continues to rise.

Her first book, *Anatomy of the Spirit*, was published in 1996, followed in the fall of 1997 with *Why People Don't Heal and How They Can*. Those, along with an audiotape series called *Energy Anatomy*, are bestsellers. By 2000, Myss discontinued private readings and devotes herself to workshops and seminars worldwide.

Myss can be contacted at her office, at 7144 N. Har lem Avenue, Chicago, IL 60631, or through her website: http://www.myss.com.

recent surgery, or back problems should consult a physician before attempting any of the movement therapies.

Precautions

Other treatments besides, or instead of, energy medicine may be needed for a particular disease or condition. In addition, persons who have experienced physical violence or abuse may have strong emotional reactions to therapies that involve physical contact; they should consult a knowledgeable counselor before undertaking these forms of treatment.

Side effects

The side effects can vary depending upon the modality. It is not unusual for people to experience some soreness or stiffness after a session of bodywork or movement therapies, particularly if they have not been accustomed to regular physical **exercise**. Some people experience headaches after light therapy. Lastly, some people find that energy therapies bring up painful emotions and memories.

Research and general acceptance

In the course of the past three decades, energy medicine has moved from being a marginal area of research to gaining a large measure of mainstream acceptance. The Human Potential movement of the 1960s and the counterculture of the early 1970s helped to stimulate popular interest in Eastern practices and belief systems, while the feminist movement of the same period led many women to explore mind/body connections and question the masculine assumptions and values of Western science and medicine. In recent years, the medical establishment has shown a new openness to research in the area of energy medicine, as was shown by the funding of the Office of Alternative Medicine at the National Institutes of Health. At present there are a number of clinical trials that have been designed to measure the effectiveness of alternatives to conventional treatment.

Despite over 300 studies during the past 40 years showing the efficacy of energy healing, however, these findings are still ignored or rejected by many scientists. Benor details many reasons for this rejection, including the fact that healers have not been able to produce results with reliability and consistency in a laboratory setting. Benor writes, "The time has come to accept that healing is the way it is. It appears to be influenced by multiple factors—so many, in fact, that it is virtually impossible to establish a repeatable experiment in which all would occur in the same combination more than once...We will have to be content with our human limitations and settle for approximate results, measured in probabilities over large numbers of trials. No apologies are needed. These are the limitations of healing."

Training and certification

There is no course of training leading to certification or licensure for energy medicine as such. Various schools of touch and **movement therapy**, as well as energy healing, offer their own forms of certification. The requirements vary according to each modality and each school. Spiritual healers may be certified through a school of energy healing, recognized within a particular religious tradition for their healing aptitude, or initiated into healing by another means. Many healers develop

their healing gifts on their own. The evidence suggests that any caring person can develop a certain amount of healing ability through meditation, **prayer**, study with other experienced healers, and practice.

Resources

BOOKS

Becker, Robert O., et al. *The Body Electric: Electromagnetism and the Foundation of Life*. New York: William Morrow and Company, 1987.

Benford, Sue, et al. "Exploring the Concept of Energy in Touch Based Healing" in *Clinician's Complete Reference to Complementary and Alternative Medicine,* ed. Donald Novey. St. Louis, MO: Mosby, 2000.

Collinge, William, PhD. *Subtle Energy: Awakening to the Unseen Forces in Our Lives*. New York: Warner Books, Inc., 1998.

Dossey, Larry, M.D. *Reinventing Medicine: Beyond Mind Body to a New Era of Healing*. New York: HarperCollins Publishers, 1999.

Gerber, Richard. *Vibrational Medicine for the 21st Century: The Complete Guide to Energy Healing and Spiritual Transformation*. Eagle Books, 2000.

Rubik, Beverly. *Life at the Edge of Science*. Oakland, CA: The Institute of Frontier Science, 1996.

ORGANIZATIONS

Barbara Brennan School of Healing. P.O. Box 2005. East Hampton, NY 11937. (516) 329 0951. Fax: (516) 324 9745. e mail: bbshoffice@barbarabrennan.com.

Healing Light Center Church. 261 E. Alegria Ave. #12. Sierra Madre, CA 91024. (626) 306 2170. Fax: (626) 355 0996.

Institute for Frontier Science. 6114 LaSalle Ave. Oakland, CA 94611. (510) 531 5767. E mail: brubik@compuserve.com. http://www.healthy.net/frontierscience/.

International Society for the Study of Subtle Energies and Energy Medicine (ISSSEEM). 356 Goldco Circle. Golden, CO 80401. (303) 278 2228. http://www.vitalenergy.com/ISSSEEM.

Linda Chrisman

English plantain *see* **Plantain**

Enuresis *see* **Bedwetting**

Environmental therapy

Definition

Environmental therapy, also known as environmental medicine and formerly called clinical ecology, is the diagnosis and treatment of conditions caused by environmental factors.

Origins

The founder of environmental medicine was Theron G. Randolph, M.D., who was a trained specialist in internal medicine, immunology, and **allergies**. Several decades ago, Randolph became concerned with chronically ill patients who had symptoms of allergies and immune system disorders, but did not respond to conventional medical care. Randolph believed that patients were getting sick from environmental substances and pollutants that allergy specialists could not determine or did not recognize as causing illness. Conventional allergy specialists in Randolph's time believed that allergies could only be detected by measuring the response of immunoglobulin E (IgE). IgE is a particular antibody produced by the immune system when an antigen (foreign substance) triggers a reaction. Randolph believed that testing for allergies using only this technique limited the determination of immune system problems. Using other tests and techniques, he found that many substances that did not necessarily cause increased amounts of IgE could create allergic symptoms and complications in the body. Research has since shown that food allergies cause increases in immunoglobulin G (IgG) and not in IgE. Scientists now recognize that the immune system is too complex to be measured by only one test.

Randolph also found that allergic and toxic substances often produce subtle reactions in the body that may accumulate into major illnesses and problems. Many of these substances were not previously thought of as allergenic or toxic, including numerous common foods and chemicals (particularly petrochemicals and by-products of industry). Randolph determined that environmental agents could cause mental and behavioral disturbances as well as physical symptoms. Randolph and other doctors developed and used new diagnostic techniques, including intradermal (between skin layers) and sublingual (under the tongue) allergy tests, to determine exactly which environmental factors were influencing illnesses. Environmental doctors were able to heal many patients simply by removing certain foods and chemicals from their environment.

Randolph went on to dedicate his work to studying the interaction between patients and their environment. He and his colleagues called this new field of medicine clinical ecology, which was later changed to environmental medicine. The field's basic ideas are that doctors must consider both the patient and the patient's environment in treatment, and that there are cause and effect relationships between environmental factors and illness. Environmental factors include food, air, water, living arrangements, and workplace

KEY TERMS

Allergen—A foreign substance, such as mites in house dust or animal dander that, when inhaled, causes the airways to narrow and produces symptoms of asthma.

Antibody—A protein, also called immunoglobulin, produced by immune system cells to remove antigens.

Fibromyalgia—A condition of debilitating pain, among other symptoms, in the muscles and the myofascia (the thin connective tissue that surrounds muscles, bones, and organs).

Hypersensitivity—The state where even a tiny amount of allergen can cause severe allergic reactions.

Multiple chemical sensitivity—A condition characterized by severe and crippling allergic reactions to commonly used substances, particularly chemicals. Also called environmental illness.

environments. For illnesses that are caused by exposure to negative environmental factors, healing can be induced not by drugs, but by testing for and removing the environmental causes of illness and by strengthening the patient's resistance.

Environmental therapists have isolated many substances that cause illness and adverse reactions in people, including chemicals, car exhaust, tobacco smoke, pesticides, drugs, food additives, and common allergens like dust, mold, animal dander, and pollen. Many people may also have allergic and negative reactions to common foods such as dairy products, corn syrup, sugar, wheat, certain fruits and vegetables, nuts, and meat. Exposure to toxic and allergenic substances may exert a cumulative effect on the body, weakening and taxing the immune system over time so that the body becomes hypersensitive (more susceptible) to substances that were once tolerated.

In 2002, a Harvard University study demonstrated that global warming was adding to the presence of airborne allergens like ragweed pollen. Atmospheric carbon dioxide concentration is up 29% since industrial times began and is expected to double again in the next 50 to 100 years. The heavy carbon dioxide concentration helps plants grown faster and larger, producing more allergens.

Environmental medicine has become increasingly popular in the last few decades as the public has become more aware of environmental pollution. Every year, more than 700,000 different chemicals are released into the environment, and the figure has been growing by 10% or more per year. Toxic or allergenic chemicals can be found in everything from common household materials like carpet and furniture to basic items like food and water. Environmental therapists believe that new medical problems have arisen due to the immune system's inability to handle all of the new pollutants and synthetic chemicals to which it is exposed. Environmental illness is the cumulative effect of lengthy or constant exposure to these toxins. Those with environmental illness become hypersensitive to even minute quantities of common materials. Environmental hypersensitivity can cause severe disability in many people.

Environmental medicine recognizes that some new and baffling illnesses have appeared that conventional medicine either does not recognize or is unable to treat, sometimes called "twentieth century diseases." These conditions include environmental illness/multiple chemical sensitivity (EI/MCS), **chronic fatigue syndrome**, **fibromyalgia**, **Gulf War syndrome**, and **sick building syndrome**. Furthermore, diseases for which environmental causes are believed to be major factors are also increasing (like **cancer** and **asthma**), making environmental medicine increasingly important.

Benefits

Environmental medicine is helpful for patients with chronic allergies, asthma, chronic **fatigue** syndrome, EI/MCS, fibromyalgia, Gulf War syndrome, and sick building syndrome. It is helpful for those with conditions that are influenced by environmental factors, such as cancer, as well as for those who have been exposed to high levels of toxic materials due to accident or occupation. Environmental medicine is also used for people with allergic or immune system problems that conventional medicine is unable to diagnose or treat. Symptoms for patients with environmental illness include unexplained fatigue, increased allergies, hypersensitivity to common materials, intolerance to certain foods and **indigestion**, aches and pains, low-grade **fever**, headaches, **insomnia**, **depression**, sore throats, sudden weight loss or gain, lowered resistance to infection, general malaise, and disability.

Description

Environmental therapy treats patients by first identifying the environmental causes of illness. The

next step is removing environmental causes and reducing exposures to all potential toxins. Cleansing and detoxifying the body of toxic substances and supporting overall (holistic) healing and recovery are the other components of the treatment process.

The cost of treatment by a practitioner of environmental medicine can vary depending on the education of the practitioner. Costs are generally comparable to visits to trained medical specialists. Practitioners may be conventionally trained medical doctors, researchers with graduate degrees in environmental medicine, or alternative medicine practitioners such as homeopaths, **Ayurvedic medicine** practitioners, **traditional Chinese medicine** practitioners, and naturopaths. Treatment costs vary, depending on the type and number of tests required to identify problems and the subsequent healing therapies required. Many insurance policies cover costs of environmental therapy, particularly when the practitioner is a certified medical doctor. Consumers should be aware of their insurance company's policies on coverage.

Diagnosing environmental illness

Environmental therapists use extensive testing to determine the environmental factors that may be causing illness. These factors include infection, allergy, addictions, and toxic chemicals. **Infections** that often plague those with environmental illness can be caused by parasites, bacteria, viruses, and yeast. Blood, urine, stool, and hair analyses are used to measure a variety of bodily functions that may indicate problems. Environmental therapists have access to laboratories that specialize in sophisticated blood, urine, and other diagnostic tests.

In testing for environmental illness, liver function is studied closely because the liver is the principle organ in the body responsible for removing toxic compounds. Another useful blood test is a test for **zinc** deficiency, which may indicate **heavy metal poisoning**. Heavy metal poisoning can be caused by lead, mercury, arsenic, cadmium, and aluminum, all of which are present in the environment. Hair analysis is also used to test for heavy metal toxicity. Blood and urine tests can also be completed that screen for toxic chemicals such as PCBs (environmental poisons), formaldehyde (a common preservative), pesticides, and heavy metals. Immune system tests, which show levels of particular antibodies, can also indicate specific environmental factors. Hormone levels also may indicate environmental illness. Certain blood and urine tests may suggest nutritional deficiencies and proper recovery **diets** can be designed for patients.

Environmental therapists also perform extensive allergy and hypersensitivity tests. Intradermal and sublingual allergy tests are used to determine a patient's sensitivity to a variety of common substances, including formaldehyde, auto exhaust, perfume, tobacco, chlorine, jet fuel, and other chemicals.

Food allergies require additional tests because these allergies often have reactions that are delayed for several days after eating the food. The RAST (radioallergosorbent test) is a blood test that determines the level of immunoglobulins in the blood after specific foods are eaten. The cytotoxic test is a blood test that determines if certain substances affect blood cells, including foods and chemicals. The ELISA-ACT (enzyme-linked immunoserological assay activated cell test) is considered one of the most accurate tests for allergies and hypersensitivity to foods, chemicals, and other agents. Other tests for food allergies are the elimination and rotation diets, where foods are systematically evaluated to isolate those that are causing problems.

Therapies used in environmental medicine

After environmental causes of illness are identified, the next step is to reduce or eliminate the patient's exposure to them to reduce the burden on the immune system. Patients are advised to immediately remove toxic and allergic agents from the home and workplace, and to make lifestyle and dietary changes to reduce exposure and to improve general physical and mental health.

Detoxification methods are used by alternative practitioners in treating environmental illnesses. These methods try to rid the body of accumulated toxic substances and to restore efficient functioning. Detoxification methods include dietary therapies, **fasting**, **exercise**, sweating, laxatives, enemas, and other techniques that stimulate and support the body's natural detoxification mechanisms. Nutritional and herbal supplements are used in the detoxification and strengthening process. These supplements include **antioxidants** and vitamins, numerous herbs that detoxify the body and stimulate the immune system, and enzymes to improve digestion. Natural and holistic treatments are used to rebuild and strengthen the patient's overall health and resistance. Traditional healing systems such as traditional Chinese medicine, naturopathy, ayurveda, and **homeopathy** may be used as therapeutic programs for environmental illness.

Preparations

Patients can assist diagnosis and treatment by keeping detailed diaries of their activities, symptoms, and contact with environmental factors that may be affecting their health.

Side effects

If detoxification treatments are used, patients may experience side effects of fatigue, malaise, aches and pains, emotional duress, **acne**, headaches, allergies, and symptoms of colds and flu. Detoxification specialists claim that these negative side effects are part of the healing process. These reactions are sometimes called *healing crises*, which are caused by temporarily increased levels of toxins in the body due to elimination and cleansing.

Research and general acceptance

Environmental medicine is gaining more respect in the medical community and is now a field in conventional medicine. Many leading medical schools and universities offer programs or specialties in environmental medicine. Research in environmental medicine is being widely funded and conducted by mainstream organizations such as the National Institutes of Health, the Environmental Protection Agency, as well as alternative medical schools. The National Academy of Science recognizes that many illnesses are caused or influenced by environmental factors, including cancer and **multiple chemical sensitivity**. The U.S. Centers for Disease Control estimates that up to 82% of diseases may be due to environmental and lifestyle factors.

Training and certification

The American College of Occupational and Environmental Medicine is the world's largest organization for environmental medicine. Its members include certified and practicing doctors. The American Academy of Environmental Medicine certifies environmental medicine practitioners. The National Institute of Environmental Health Sciences is affiliated with the National Institutes of Health. It conducts research in environmental medicine and supports several academic programs of study in environmental medicine, including those at Harvard, Oregon State University, Vanderbilt, University of California, and MIT.

Resources

BOOKS

Goldberg, Burton. *Chronic Fatigue, Fibromyalgia and Environmental Illness*. Tiburon, CA: Future Medicine, 1998.

Lawson, Lynn. *Staying Well in a Toxic World*. Chicago: Noble, 1993.

Randolph, Theron G., M.D. *Environmental Medicine: Beginnings and Bibliographies of Clinical Ecology*. Fort Collins, CO: Clinical Ecology Publications, 1987.

Steinman, David, and Samuel Epstein. *The Safe Shopper's Bible*. New York: IDG, 1993.

PERIODICALS

"Global Warming May Significantly Increase Airborne Allergies." *Immunotherapy Weekly* (April 10, 2002): 4.

Health Connections Quarterly 7510 Northforest Dr., North Charleston, SC 29420. (843) 572 1600. http://www.coem.com.

Journal of Occupational and Environmental Medicine 1114 N. Arlington Heights Rd., Arlington Heights, IL 60004. (847) 818 1800.

ORGANIZATIONS

American Academy of Environmental Medicine. 23121 Verdugo Dr., Suite 204, Laguna Hills, CA 92653. (714) 583 7666.

Center for Occupational and Environmental Medicine. 7510 Northforest Dr., North Charleston, SC 29420. (843) 572 1600. http://www.coem.com.

Northwest Center for Environmental Medicine.177 NE 102nd St., Portland, OR 97220. (503) 561 0966.

Douglas Dupler
Teresa G. Odle

Environmental therapy, Clinical ecology *see* **Water**

Enzyme therapy

Definition

Enzyme therapy is a plan of dietary supplements of plant and animal enzymes used to facilitate the digestive process and improve the body's ability to maintain balanced metabolism.

Origins

Enzymes are protein molecules used by the body to perform all of its chemical actions and reactions. The body manufactures several thousand enzymes. Among them are the **digestive enzymes** produced by the stomach, pancreas, small intestine, and the salivary glands of the mouth. Their energy-producing properties are responsible for not only the digestion of nutrients, but their absorption, transportation, metabolism, and elimination as well.

Enzyme therapy is based on the work of Edward Howell in the 1920s and 1930s. Howell proposed that enzymes from foods work in the stomach to pre-digest food. He advocated the consumption of large amounts of plant enzymes, theorizing that if the body had to use less of its own enzymes for digestion, it could store them for maintaining metabolic harmony. Four categories of plant enzymes are helpful in pre-digestion: protease, amylase, **lipase**, and cellulase. Cellulase is particularly helpful because the body is unable to produce it.

Animal enzymes, such as pepsin extracted from the stomach of pigs, work more effectively in the duodenum. They are typically used for the treatment of nondigestive ailments.

The seven categories of food enzymes and their activities are:

- Amylase: breaks down starches
- Cellulase: breaks down cellulose
- Lactase: breaks down lactose (milk sugar)
- Lipase: breaks down fats
- Maltase: breaks down maltose (malt sugar)
- Protease: breaks down proteins
- Sucrase: breaks down sucrose (table sugar)

Enzyme theory generated further interest as the human diet became more dependent on processed and cooked foods. Enzymes are extremely sensitive to heat, and temperatures above 118°F (48°C) destroy them. Modern processes of pasteurization, canning, and microwaving are particularly harmful to the enzymes in food.

Benefits

In traditional medicine, enzyme supplements are often prescribed for patients with disorders that affect the digestive process, such as cystic fibrosis, Gaucher's disease, diabetes, and **celiac disease**. A program of enzyme supplementation is rarely recommended for healthy patients. However, proponents of enzyme therapy believe that such a program is beneficial for everyone. They point to the ability of enzymes to purify the blood, strengthen the immune system, enhance mental capacity, cleanse the colon, and maintain proper pH balance in urine. They believe that by improving the digestive process, the body is better able to combat infection and disease.

Some evidence exists that pancreatic enzymes derived from animal sources are helpful in **cancer** treatment. The enzymes may be able to dissolve the coating on cancer cells and may make it easier for the immune system to attack the cancer cells.

A partial list of the wide variety of complaints and illnesses that can be treated by enzyme therapy includes:

- AIDS
- anemia
- alcoholism
- anxiety
- acute inflammation
- back pain
- cancer
- colds
- chronic fatigue syndrome
- colitis
- constipation
- diarrhea
- food allergies
- gastritis
- gastric duodenal ulcer
- gout
- headaches
- hepatitis
- hypoglycemia
- infections
- mucous congestion
- multiple sclerosis
- nervous disorders
- nutritional disorders
- obesity
- premenstrual syndrome (PMS)
- stress

Evidence to support enzyme therapy for treatment of these conditions tends to be sparse or lacking.

Description

Enzyme supplements are extracted from plants such as pineapple and papaya and from the organs of cows and pigs. The supplements are typically given in tablet or capsule form. Pancreatic enzymes may also be given by injection. The dosage varies with the condition being treated. For nondigestive ailments, the supplements are taken in the hour before meals so that they can be quickly absorbed into the blood. For digestive ailments, the supplements are taken immediately before meals accompanied by a large glass of fluids. Pancreatic enzymes may be accompanied by doses of **vitamin A**.

Preparations

Enzyme preparations are available in a variety of forms, including tablets, capsules, liquid formations, and topical ointments.

Precautions

People with **allergies** to beef, pork, pineapples, and papaya may have allergic reactions to enzyme supplements. Tablets are often coated to prevent them from breaking down in the stomach and usually should not be chewed or crushed. People who have difficulty swallowing pills can request enzyme supplements in capsule form. The capsules can then be opened and the contents sprinkled onto soft foods such as applesauce.

Side effects

Side effects associated with enzyme therapy include **heartburn**, **nausea** and **vomiting**, **diarrhea**, bloating, **gas**, and **acne**. According to the principles of therapy, these are temporary cleansing symptoms. Drinking eight to ten glasses of water daily and getting regular **exercise** can reduce the discomfort of these side effects. Individuals may also experience an increase in bowel movements, perhaps one or two per day. This side effect is also considered a positive effect.

Plant enzymes are safe for pregnant women, although individuals should always check with a doctor before using enzymes. Pregnant women should avoid animal enzymes. In rare cases, extremely high doses of enzymes can result in a build up of uric acid in the blood or urine and can cause a break down of proteins.

Research and general acceptance

In the United States, the FDA has classified enzymes as a food. Therefore, they can be purchased without a prescription. Insurance coverage is usually dependent upon the therapy resulting from a doctor's orders. As of 2008, the use of enzyme therapy was still controversial among traditional physicians and some alternative healers. Scientific evidence for the effectiveness of enzyme therapy was still very limited.

Training and certification

There is no specific training or certification required for practicing enzyme therapy.

KEY TERMS

Celiac disease—A chronic disease characterized by defective digestion and inadequate fat metabolism.

Cystic fibrosis—A genetic disease that causes multiple digestive, excretory, and respiratory complications. Among the effects, the pancreas fails to provide secretions needed for the digestion of food.

Duodenum—The upper part of the small intestine.

Gaucher's disease—A rare genetic disease caused by a deficiency of enzymes needed for the processing of fatty acids.

Metabolism—The system of chemical processes necessary for living cells to remain healthy.

Resources

BOOKS

Bohager, Tom. *Enzymes: What the Experts Know*. Prescott, AZ: One World Press, 2006.

PERIODICALS

Cornell, Hugh, et al. "Enzyme Therapy for Management of Coeliac Disease." *Scandinavian Journal of Gastroenter ology* (November 2005): 1304 1312.

Pastores, G. M. "Enzyme Therapy for the Lysosomal Stor age Disorders: Principles, Patents, Practice, and Pros pects." *Expert Opinion on Therapeutic Patents* (August 2003): 1157 1172.

OTHER

"Enzyme Therapy." American Cancer Society. July 20, 2007 [cited March 20, 2008]. http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Enzyme_Therapy.asp?sitearea ETO.

Mary McNulty
Teresa G. Odle
David Edward Newton, Ed.D.

EPA *see* **Fish oil**

Ephedra

Description

Ephedra, also known as Ma Huang, is banned from sale in the United States. On February 5, 2004, the United States Food and Drug Administration (FDA) issued a press release stating it prohibited the

Ephedra. *(©PlantaPhile, Germany. Reproduced by permission.)*

sale of dietary supplements containing ephedrine alkaloids (ephedra) because such supplements present an unreasonable risk of illness or injury. The rule became effective 60 days later.

Although ephedra has a long history of medicinal use, the FDA, in banning ephedra, concluded that: "Multiple studies demonstrate that dietary supplements containing ephedrine alkaloids, like other sympathomimetics, raise blood pressure and increase heart rate. These products expose users to several risks, including the consequences of a sustained increase in blood pressure (e.g., serious illnesses or injuries including **stroke** and **heart attack** that can result in death). There is also a risk of increased morbidity and mortality from worsened heart failure and pro-arrhythmic effects. Although the pro-arrhythmic effects of these products typically occur only in susceptible individuals, the long-term risks from elevated blood pressure can occur even in nonsusceptible, healthy individuals. These risks are not outweighed by the known or reasonable likely benefits of dietary supplements containing ephedrine alkaloids. These products do not provide a meaningful health benefit. The best clinical evidence for a benefit is for weight loss, but even there the evidence supports only a modest short-term weight loss insufficient to positively affect cardiovascular risk factors or health conditions associated with being overweight or obese. Other possible benefits, such as enhanced athletic performance, enhanced energy, or a feeling of alertness, lack scientific support and/or they would provide only temporary benefits that are trivial in comparison to the risks."

This prohibition on sale of ephedra was appealed, and in 2005 sales of low-dose preparations were briefly reinstated, but on August 17, 2006, the U.S. Court of Appeals for the Tenth Circuit upheld the FDA's 2004 regulation. On May 14, 2007, the United States Supreme Court declined to review the decision, and so the FDA ruling remained in effect. Laws in other nations vary: In some countries ephedra is not restricted, while in others low doses are permitted.

Ephedra is an herb used by Chinese medicine for more than 2,500 years due to its ability to remedy symptoms of **asthma** and upper respiratory **infections**. A member of the Ephedracae family of herbs (*Ephedra sinica*), ephedra is native to northern China and Inner Mongolia where it thrives in desert areas as a jointed, barkless plant with branches that bear few leaves and tiny yellow-green flowers that bloom in summer. While varieties of ephedra grow throughout the world, the United States version flourishes in the dry southwest.

Ephedra became popular to Mormon settlers in the early 1800s as a stimulant consumed in the form of tea in place of the coffee and black tea from which they abstained, giving the plant one of its many names, Mormon tea. Other folk names that have resulted over time include desert tea, desert herb, and squaw tea. The herbal drink was named whorehouse tea after it was served in brothels during the 1800s due to unproven beliefs that it cured **gonorrhea** and **syphilis**.

The medicinal herb Ma Huang is made of the dried, young branchlets of ephedra. Harvested in the autumn, ephedra is reproduced from seed or by root division and the stems are dried in the sun throughout the year for production. The herb should be stored away from light. Ephedra gains its strength primarily from the alkaloid ephedrine, pseudephedrine, and norpseudephedrine. These active ingredients produce central nervous system stimulation.

Other key components of ephedra include:

- tannin, an acidic substance found in the bark
- saponin, originating in the roots

- flavone, the chemical from which natural colors of many plants originate
- volatile oil

General use

A bitter-tasting herb that has been relied upon by the Chinese throughout centuries to heal ailments from fevers and **chills** to nasal and chest congestion, ephedra also maintains its prominence as a strong stimulant. Contrary to its reputation, Zen monks used the herb to promote calm concentration during **meditation**. However, larger amounts can make a person jittery. Before the 2004 ban, ephedra was used in the United States as an herbal medicine to treat asthma and **hay fever** and the beginnings of colds and flu. The herb was also used to raise blood pressure, cool fevers, and ease the **pain** of rheumatism.

While ephedrine was used in various decongestant and bronchodilator products in the United States beginning in the late 1920s through the 1940s, its potential for causing dangerous side effects led to the creation of a chemical substitute. Scientists created the equally effective, but safer pseudephedrine that remains the active ingredient in many over-the-counter (OTC) products such as Sudafed. Primatene Mist, an OTC that contains ephedrine, is used regularly to treat asthma.

The body responds to ephedra as one of its key ingredients, ephedrine, opens bronchial passages, activating the heart and raising blood pressure while increasing metabolism. Due to its stimulating effect on the nervous system, many weight loss and energy products contained ephedra. Ephedrine increases basal metabolic rate (BMR), causing the body to burn calories faster. Dieters used ephedra-based products because they suppress the appetite and stimulate metabolism. While these diet products proved to be effective, their results were rarely permanent, and long-term use was perceived to be quite harmful. Chinese sources only recommended its use for acute situations.

As an "energy" product, ephedra increases alertness and perception. The use of ephedra in this way dates back to bodyguards of Genghis Khan, who, legend has it, fearful of being beheaded if they fell asleep on duty, consumed tea containing ephedra to stay alert. **Caffeine** products, such as coffee, tea, chocolate, and cola drinks, enhance the effect of energy products containing ephedra. Additional medicinal uses of ephedra include the promotion of **menstruation**, the decreased desire for cigarettes, and the promotion of uterine contractions. Ma Huang is also known for its ability to increase sexual sensation.

Some controversy surrounds the extended use of ephedra. It is recommended that products containing ephedra be taken only for short periods of time. Tachyphylaxis, or becoming immune to a drug's effectiveness due to overuse, and dependence on the drug may develop when it is taken consistently over time. Both ephedrine and Ma Huang are considered doping substances. In April 1996, the FDA issued a warning on dietary supplements containing ephedra that were labeling themselves as safe substitutes for "street drugs," such as the illegal drug ecstasy. The FDA stated that these products could have "potentially dangerous effects on the nervous system and heart."

While questions surround the correct use of ephedra in the United States, the German government's Federal Institute for Drugs and Medical Devices (Commission E) certifies that ephedra herba, ephedra, and Ma Huang is an approved remedy for diseases of the respiratory tract with mild bronchospasms. Approval from Commission E, however, is not equivalent to the FDA's higher standards of drug approval.

Preparations

Before the 2004 ban in the United States, ephedra was available over the counter as a fluid extract, in tablet form, or as a dried bulk herb at Chinese pharmacies, Asian markets, and health food stores.

Chinese herbalists prepare ephedra for use by combining one part honey, four parts dried herb in combination with other herbs, and a small amount of water in a wok. The herbs are simmered over low heat until the water has evaporated and the herb begins to turn brown. Other forms of preparation include frying ephedra in vinegar or wine to improve its tonic effect on blood circulation and toasting it to an ash so that it may increase its ability to stop bleeding.

To treat **fever** and chills, Chinese herbalists recommend combining ephedra with cinnamon twig and other herbs. Coughing and **wheezing** are remedied with a mixture of ephedra and **apricot seed**, while **licorice** is added to the herb for **stomachaches**. An upper respiratory infection, or congestion, is treated with a combination of ephedra and **ginger**. The powder form, mixed with rehmannia, is also used by the Chinese to treat kidney energy (yin) deficiency.

When the United States adopted the herb for its healing properties, the variety of ephedra preparations increased. The average single dose of ephedrine for adults is 15–30 mg, with a maximum allowed daily dose of 300 mg per day. When consumed as a tea, 1 teaspoon (5 ml) of ephedra is boiled with 1 cup (250 ml) water for 15–20 minutes, with up to 2 cups (500 ml) of the tea allowed per day. This tea (also known as a decoction) is prescribed by herbalists for asthma. The tincture preparation is used in treatments to ease the

aches and joint pains caused by rheumatism. The amount of tincture recommended is 1/4 teaspoon (1.25 ml)–1 teaspoon (5 ml) in combination with other herbs, up to three times a day.

Precautions

While ephedra has an extensive history of medicinal use, the supplement has shown to be harmful to children, adolescents, older or chronically ill people, and pregnant women or women who are breastfeeding. Those with **heart disease**, high blood pressure, **prostate enlargement**, pheochromocytoma, diabetes, **glaucoma**, thyrotoxicosis, overactive thyroid gland (**hyperthyroidism**), nervousness, anorexia, **insomnia**, suicidal tendencies, stomach ulcers, or bulimia should not take ephedra. The herb should be avoided by those with **diarrhea** or abdominal bloating.

Before its ban, ephedra was an ingredient in many weight-loss aids. While it is effective for a dieter's purpose as it accelerates the metabolism, the excess stimulation can cause dangerous consequences. The herb is extremely powerful as a stimulant, with its active ingredient epinephrine mimicking the effects of adrenaline. The molecular structure of epinephrine is close to methampetamine, also known as speed, and the use of ephedra can result in a positive test for amphetamines in the urine. Regular use of ephedra has been shown to lead to dependence on the herb.

Many cases of Ma Huang toxicity were reported to the FDA and possibly serious cardiovascular effects have been associated with its use. Health Canada issued a recall for products containing more than recommended levels of ephedra in early 2002 because of serious, possibly fatal, side effects. The dose limits set by Canadian authorities were more than 8 mg of ephedrine or a label that recommended more than 8 mg per dose or 32 mg per day. It also included products recommended use exceeding seven days.

A 2002 study concluded that use of Ma Huang could be associated with serious complications, including increased risk of stroke, heart attack or even sudden death, and urged that the effects were not limited to massive doses.

Side effects

Side effects of ephedra include insomnia, **dry mouth**, nervousness, irritability, **headache**, and **dizziness**. The following side effects are considered serious: increased blood pressure, increased heart rate, and heart palpitations. If these develop, the use of ephedra should be stopped, and a physician should be consulted immediately.

KEY TERMS

Central nervous system—Consisting of the brain and spinal cord, with their nerves and end organs that control voluntary acts; includes sensory and motor nerve fibers controlling skeletal muscles.

Dietary supplement—According to the United States Food and Drug Administration (FDA), any product intended for ingestion as a supplement to the diet.

Ergot preparations—A classification of drugs made from a fungus, used primarily for the treatment of migraines.

Metabolism—The result of all physical and chemical changes that take place within an organism, for example, the human body.

Pheochromocytoma—A tumor of the sympathoadrenal system that produces hypertension resulting in excessive headaches, sweating, and palpitation, apprehension, flushing of the face, nausea, and vomiting.

Thyrotoxicosis—Toxic condition due to hyperactivity of the thyroid gland.

Drugs that may cause adverse effects if combined with ephedra include:

- methyl xanthines, such as caffeine
- beta blockers
- Dexamthasone
- Reserpine
- Amitriptyline
- urinary alklinizers, such as sodium bicarbonate
- unrinary acidifiers, for example, ammonium chloride
- monoamine oxidase inhibitors, such as heart glycosides
- secale alkaloid derivatives, such as oxytocin
- Yohimbine
- Gaunethidine, which leads to the enhancement of the sympathomimetic effect, or stimulation of the nervous system

People who are taking any of these drugs should avoid ephedra. The isolated drug ephedrine (the active ingredient of ephedra) has also been shown to cause side effects if combined with other drugs, including antidepressants that increase the overall effect of ephedrine; methyldopa, due to possible increased blood pressure; and ergot preparations that may lead to

serious blood pressure problems. Other substances that may cause alarming circumstances if combined with any form of ephedra include cocaine, **marijuana**, and caffeinated drinks. While it is known that Ma Huang taken with certain drugs and other substances may causes adverse effects, overall drug interactions with the supplement ephedra have not been thoroughly studied. It is recommended that a physician be notified before beginning the use ephedra in any form, or of any herbal supplement.

Resources

PERIODICALS

Samenuk, David, et al. "Adverse Cardiovascular Events Temporarily Associated with Ma Huang, an Herbal Source of Ephedrine." *Mayo Clinic Proceedings* 77, no. 1 (January 2002): 12 60

OTHER

Drug Digest. http://www.drugdigest.org.
The Ephedra Site. http://ephedra.demon.nl/index.html.
Nutraceutical Corporation; Solray, Inc., Plaintiffs Appellees, v. Andrew Von Eschenbach, No. 05 4151 United States Court of Appeals 10th Circuit, August 17, 2006. http://www4.ncsu.edu/~baumerdl/BUS590.Cases/Week.11/Ephedra.enforcement.htm.
Press release: FDA Statement on Tenth Circuit's Ruling to Uphold FDA Decision Banning Dietary Supplements Containing Ephedrine Alkaloids, August 21, 2006. http://www.fda.gov/bbs/topics/NEWS/2006/NEW01434.html.
WebMD. http://WebMD.com.

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX 78714 7105, (800) 373 7105, http://abc.herbalgram.org/site/PageServer.
Food and Drug Administration, 5600 Fishers Lane, Rock ville, MD 20857, (888) 463 6332, http://www.fda.gov/.
Herb Research Foundation, 4140 Fifteenth St., Boulder, CO 80304, (303) 449 2265, http://www.herbs.org/.

Beth Kapes
Teresa G. Odle
Sam Uretsky, PharmD

Epididymitis

Definition

Epididymitis is the inflammation or infection of the epididymis, the long coiled tube that attaches to the upper part of each testicle. The epididymis functions as a storage, transport, and maturation place for sperm before ejaculation.

Saw palmetto is one herbal remedy for epididymtis. *(David Davis / Photo Researchers, Inc.)*

Description

In adults, epididymitis is the most common cause of **pain** in the scrotum, and in adolescents, the second most common cause. The acute form is usually associated with the most severe pain and swelling. If symptoms last for more than six weeks after treatment begins, the condition is considered chronic.

Epididymitis is most common between the ages of 18 and 40, but children can get it, too. Boys who experience painful urination, have a history of urinary tract **infections**, abnormal bladder function, or abnormalities of the genitals and urinary structures are more inclined to get epididymitis. It is seldom found in adolescents who are not sexually active.

The infection is especially common among members of the military who **exercise** for extended periods without emptying their bladders.

Factors that increase the risk of developing epididymitis include:

KEY TERMS

Acute—Refers to a condition or pain that is sharp and short in course.

Chronic—A condition that has a long duration.

Testicle—One of the two male sex glands, located in the scrotum, where sperm and hormones are produced.

Urethra—Refers to the opening at the end of the penis; drains urine from the bladder.

Vas deferens—The duct that stores sperm and carries it from the testicles to the urethra.

- infection of the bladder, kidney, prostate, or urinary tract
- other recent illness
- narrowing of the urethra (the tube that drains urine from the bladder)
- use of a urethral catheter

The infection does not start in the epididymis. It is an ascending infection that most often starts in the urethra or urinary tract before spreading to the epididymis.

Causes and symptoms

Among men under age 35 who are sexually active, *Chlamydia trachomatis* or *Neisseria gonorrhoeae* are the most common causes of epididymitis.

Nonsexually transmitted epididymitis is associated with urinary tract infections and is more common in men who have undergone surgery for urinary tract problems or who have anatomical abnormalities.

Although epididymitis is often caused by and associated with some of the same organisms that cause some sexually transmitted diseases, there are other causes as well. The condition can also be attributed to pus-generating bacteria associated with infections in other parts of the body. This cause, however, is rare.

Epididymitis can be caused by injury or infection of the scrotum or by irritation from urine that has accumulated in the vas deferens (the duct through which sperm travels after leaving the epididymis).

Epididymitis is characterized by pain in the testes. The pain, which usually develops gradually over several hours or days, is followed by sudden redness and swelling of the scrotum. Generally, only one testicle is affected. The affected testicle is hard and sore, and the other testicle may feel tender. The patient has **chills**, a low-grade **fever** and usually has acute urethritis (inflammation of the urethra).

Sometimes, there is a discharge from the urethra and blood in the semen. Ejaculation can be painful.

Enlarged lymph nodes in the groin cause scrotal pain that intensifies throughout the day and may become so severe that walking normally becomes impossible.

Diagnosis

Doctors test for epididymitis through:

- Urinalysis, which will likely show an elevated white blood-cell count and the presence of bacteria.
- Urine culture, to identify the organism responsible for the infection.
- Examination of discharges from the urethra and prostate gland.
- Blood tests to measure white-cell counts, which will be elevated.
- Ultrasound, which will reveal an enlarged epididymis.

The condition may lead to an **abscess** or cause such complications as **infertility**, so it is best to consult a urologist about the condition and treatment.

Treatment

Conventional treatment involves the use of antibiotics to treat the infection and pain killers to ease the pain. With alternative therapies, the treatment involves increasing circulation to the area. This reduces inflammation, which helps the body heal.

Fasting is recommended for some people, since digestion slows down the body's healing mechanisms. A water fast is best, but if that is not possible, the patient should confine intake to fruit and vegetable juices. If food must be eaten, a light diet of fresh fruits and vegetables is recommended. Fasting eases pain. Fluids should also be increased.

In **traditional Chinese medicine**, there are formulas of herbs that need to be designed to fit the individual case. Herbs like philodendron (Huang Bai) are used for inflammation in the lower torso area. **Pulsatilla**, which helps with swelling and pain, particularly in the genitals, and podophyllum are the most effective in treating epididymitis. These plants, however, are toxic, and the herb should only be taken under the direct supervision of an experienced herbalist. **Echinacea**, **horsetail**, **saw palmetto** berries, **cranberry** extract, and chimaphilla are also effective.

Hydrotherapy may also help. Sitting in hot water increases circulation to the prostate area, alleviating discomfort and speeding recovery. Patients are advised to sit in a tub for 15 to 30 minutes once or twice a day. The water should be as hot as can be tolerated.

Homeopathy is also an option. Homeopathic physicians may prescribe remedies that are specific to the person.

Since epididymitis is caused by an infection and often involves the urinary tract, the following alternative remedies may also be helpful in treatment of the condition:

- Acupuncture, which may help ward off another infection.
- Aromatherapy. A hot sitz bath with drops of juniper berry or sandalwood may relieve symptoms of the infection.
- Chiropractic. Strengthening bladder muscles by adjusting the joints and bones in the pelvic area may keep infection at bay.

Allopathic treatment

Epididymitis is traditionally treated with antibiotic therapy. To prevent reinfection, patients must take their medication exactly as prescribed, even if the patient's symptoms disappear or if he begins to feel better. Over-the-counter anti-inflammatories may be taken to relieve pain. The over-the-counter medicines will have the same effects as herbal anti-inflammatories.

Bed rest is recommended until symptoms subside, and patients are advised to wear athletic supporters when they resume normal activities. If pain is severe, a local anesthetic like lidocaine (Xylocaine) may be injected directly into the spermatic cord. Scrotal ice packs and scrotal elevation are also recommended.

Self-care

A patient who has epididymitis should not drink beverages that contain **caffeine**. To prevent **constipation**, he should use stool softeners or eat plenty of fruit, nuts, whole grain cereals, and other foods with laxative properties.

Strenuous activity should be avoided until symptoms disappear. Sexual activity should not be resumed until a month after symptoms disappear.

If a second course of treatment does not eradicate stubborn symptoms, long-term anti-inflammatory therapy may be recommended. In rare instances, chronic symptoms require surgery.

Surgery

There are two surgical procedures used to treat epididymitis, and both of them cause sterility.

Epididymectomy involves removing the inflamed section of the epididymitis through a small incision in the scrotum.

Bilateral vasectomy prevents fluid and sperm from passing through the epididymis. This procedure is usually performed on men who have chronic epididymitis or on elderly patients undergoing prostate surgery.

Before considering surgeries that will lead to infertility, patients may want to try alternative therapies.

Expected results

Herbal preparations are very effective in treating epididymitis. Some sources say that given in medicinal doses, the herbs pulsatilla and podophyllum can treat epididymitis with the same results as conventional medicine.

Pain may begin to subside within 24 hours of treatment, but complete healing may take weeks or even months.

Prevention

Using condoms and not having sex with anyone who has a sexually transmitted disease (STD) can prevent some cases of epididymitis. Also, drinking plenty of fluids, which will increase urine flow, will help prevent urine retention, which can lead to infection.

Resources

BOOKS

The Alternative Advisor. Alexandria, VA: Time Life Books, 1997.

The Alternative Health and Medicine Encyclopedia. Detroit: Visible Ink Press, 1995.

The Medical Advisor. Alexandria, VA: Time Life Books, 1996.

Shaw, Michael, ed. *Everything You Need to Know About Diseases*. Springhouse, PA: Springhouse Corporation, 1996.

PERIODICALS

Baren, Jill M., "The Acute Scrotum: Serious or Benign?" *Emergency Medicine* 28, 8 (August 1996): 24 45.

OTHER

"Epididymitis." *Adam.com*. http://www.adam.com/ency/article/001279.htm.

"Epididymitis." *AlternativeMedicine.com*. http://www.alternativemedicine.com.

"Epididymitis." Digital Urology Journal. http://www.duj.com/epididymitis.html.

Lisa Frick

Epilepsy

Definition

Epilepsy is a condition characterized by recurrent seizures that may include repetitive muscle jerking called convulsions. A seizure is a sudden disruption of the brain's normal electrical activity accompanied by altered consciousness and/or other neurological and behavioral manifestations.

Description

Epilepsy affects 2.7 million people in the United States. Although epilepsy is as common in adults over 60 as in children under 10, 25% of all cases develop before the age of five. One in every two cases develops before the age of 25. About 200,000 new cases of epilepsy are diagnosed each year, and a significant number of children and adults that have not been diagnosed or treated have epilepsy.

Most seizures are benign, but a seizure that lasts a long time can lead to status epilepticus, a life-threatening condition characterized by continuous seizures, sustained loss of consciousness, and respiratory distress. Nonconvulsive epilepsy can impair physical coordination, vision, and other senses. Undiagnosed seizures can lead to conditions that are more serious and more difficult to manage.

Types of seizures

Generalized epileptic seizures occur when electrical abnormalities exist throughout the brain. A partial seizure does not involve the entire brain. A partial seizure begins in an area called an epileptic focus, but it may spread to other parts of the brain and cause a generalized seizure. Some people who have epilepsy have more than one type of seizure.

Motor attacks cause parts of the body to jerk repeatedly. A motor attack usually lasts less than an hour and may last only a few minutes. Sensory seizures begin with numbness or tingling in one area. The sensation may move along one side of the body or the back before subsiding.

Visual seizures that affect the area of the brain that controls sight cause people to hallucinate. Auditory seizures affect the part of the brain that controls hearing and cause the patient to imagine hearing voices, music, and other sounds. Other types of seizures can cause confusion, upset stomach, or emotional distress.

PARTIAL SEIZURES. Simple partial seizures do not spread from the focal area from which they arise. Symptoms are determined by the part of the brain affected. The patient usually remains conscious during the seizure and can later describe it in detail.

COMPLEX PARTIAL SEIZURES. A distinctive smell, taste, or other unusual sensation (aura) may signal the start of a complex partial seizure.

Complex partial seizures start as simple partial seizures but move beyond the focal area and cause loss of consciousness. Complex partial seizures can become major motor seizures. Although individuals who are having a complex partial seizure may not seem to be unconscious, they do not know what is happening and may behave inappropriately. They do not remember the seizure but may seem confused or intoxicated for a few minutes after it ends.

Causes and symptoms

The origin of 50 to 70% of all cases of epilepsy is unknown. Epilepsy sometimes results from trauma at birth. Such causes include insufficient oxygen to the brain; head injury; heavy bleeding or incompatibility between a woman's blood and the blood of her newborn baby; and infection immediately before, after, or at the time of birth.

Other causes of epilepsy include:

- head trauma resulting from a car accident, gunshot wound, or other injury
- alcoholism
- brain abscess or inflammation of membranes covering the brain or spinal cord
- phenylketonuria (PKU), a disease that is present at birth, is often characterized by seizures and can result in mental retardation
- other inherited disorders
- infectious diseases such as measles, mumps, and diphtheria
- degenerative disease
- lead poisoning, mercury poisoning, carbon monoxide poisoning, or ingestion of some other poisonous substance
- genetic factors

Status epilepticus, a condition in which a person suffers from continuous seizures and may have trouble breathing, can be caused by the following:

- suddenly discontinuing anti-seizure medication
- hypoxic or metabolic encephalopathy (a brain disease resulting from lack of oxygen or malfunctioning of other physical or chemical processes)
- acute head injury
- infection spread from blood (for example, meningitis or encephalitis) caused by inflammation of the brain or the membranes that cover it

Diagnosis

Personal and family medical history, description of seizure activity, and physical and neurological examinations help primary care physicians, neurologists, and epileptologists diagnose this disorder. Doctors rule out conditions that cause symptoms that resemble epilepsy, including small strokes (transient ischemic attacks, or TIAs), fainting (syncope), pseudoseizures, and sleep attacks (**narcolepsy**).

Neuropsychological testing uncovers learning or memory problems. Neuroimaging provides views of brain areas involved in seizure activity.

The electroencephalogram (EEG) is the main test used to diagnose epilepsy. EEGs use electrodes placed on or within the skull to record the brain's electrical activity and pinpoint the exact location of abnormal discharges.

Individuals may be asked to remain motionless during a short-term EEG or to go about their normal activities during extended monitoring. Some patients are deprived of sleep or exposed to seizure triggers, such as rapid, deep breathing (hyperventilation) or flashing lights (photic stimulation). In some cases, people may be hospitalized for EEG monitorings that can last as long as two weeks. Video EEGs also document what individuals were doing when the seizure occurred and how the seizure changed their behavior.

Other techniques used to diagnose epilepsy include:

- Magnetic resonance imaging (MRI), which provides clear, detailed images of the brain. Functional MRI (fMRI), performed while the patient does various tasks, can measure shifts in electrical intensity and blood flow and indicate which brain region each activity affects.
- Positron emission tomography (PET) and single photon emission tomography (SPECT) monitor blood flow and chemical activity in the brain area being tested. PET and SPECT are effective in locating the brain region in which metabolic changes take place between seizures.

Treatment

Relaxation techniques

Stress increases seizure activity in 30% of people who have epilepsy. **Relaxation** techniques can provide some sense of control over the disorder, but they should never be used instead of anti-seizure medication or without the approval of the patient's doctor. **Yoga**, **meditation**, and favorite pastimes help some people relax and manage stress more successfully. **Biofeedback** can teach adults and older adolescents how to recognize an aura and what to do to stop its spread. Children under 14 usually are not able to understand and apply principles of biofeedback.

Acupuncture

Acupuncture treatments (acupuncture needles inserted for a few minutes or left in place for as long as 30 minutes) make some people feel pleasantly relaxed.

Acupressure

Acupressure can have the same pleasantly relaxed effect on children or on adults who dislike needles.

Aromatherapy

Aromatherapy involves mixing aromatic plant oils into water or other oils and massaging them into the skin or using a special burner to waft their fragrance throughout the room. Aromatherapy oils affect the body and the brain, but undiluted oils should never be applied directly to the skin. Ylang ylang, **chamomile**, or **lavender** can create a soothing mood. People who have epilepsy should not use **rosemary**, **hyssop**, citrus (such as lemon), **sage**, or sweet **fennel**, which seem to stimulate the brain.

Nutritional therapy

KETOGENIC DIET. A special high-fat, low-protein, low-carbohydrate diet sometimes is used to treat patients whose severe seizures have not responded to other treatment. Calculated according to age, height, and weight, the ketogenic diet induces mild starvation and dehydration. This procedure forces the body to create an excessive supply of ketones, natural chemicals with seizure-suppressing properties.

The goal of this controversial approach is to maintain or improve seizure control while reducing

medication. The ketogenic diet works best with children between the ages of one and 10. It is introduced over a period of several days, and most children are hospitalized during the early stages of treatment.

If a child following this diet remains seizure-free for at least six months, increased amounts of carbohydrates and protein gradually are added. If the child shows no improvement after three months, the diet gradually is discontinued. A 2003 study of the diet and its effect on growth noted that if the diet is used, clinicians should recommend adequate intake of energy foods and protein and a higher proportion of unsaturated to saturated dietary fats. The report also recommended use of vitamin and mineral supplements with the diet.

Introduced in the 1920s, the ketogenic diet had limited, short-term success in controlling seizure activity. Its use exposes patients to such potentially harmful side effects as the following:

- staphylococcal infections
- stunted or delayed growth
- low blood sugar (hypoglycemia)
- excess fat in the blood (hyperlipidemia)
- disease resulting from calcium deposits in the urinary tract (urolithiasis)
- disease of the optic nerve (optic neuropathy)

Homeopathy

Homeopathic therapy also can work for people with seizures, especially constitutional homeopathic treatment that acts at the deepest levels to address the needs of the individual person.

Allopathic treatment

The goal of epilepsy treatment is to eliminate seizures or make the symptoms less frequent and less severe. Long-term anticonvulsant drug therapy is the most common form of epilepsy treatment.

Medication

A combination of drugs may be needed to control some symptoms, but many patients who have epilepsy take one of the following medications:

- phenytoin (Dilantin)
- carbamazepine (Tegretol)
- phenobarbital (Barbita)
- primidone (Mysoline)
- valproic acid, sodium valproate (Depakene)
- clonazepam (Klonopin)
- ethosuximide (Zarontin)

Dilantin, Tegretol, Barbita, and Mysoline are used to manage or control generalized tonic-clonic and complex partial seizures. Depakene, Klonopin, and Zarontin are prescribed for patients who have absence seizures.

Neurontin, Lamictal, and Topamax are among medications approved in the United States to treat adults who have partial seizures or partial and grand mal seizures. Another medication, levetiracetam (Keppra), was approved and showed particularly good results in reducing partial seizures among elderly patients with few side effects. Having minimal side effects is important because elderly patients often have other conditions and must take other medications that might interact with seizure medications. In 2003, Keppra's manufacturer was working on a new anti-epilectic drug from the same chemical family as Keppra that was anticipated to be more potent and effective. That drug was in phase III trials as of 2008. Available medications frequently change, and the physician determines the best treatment for an individual patient. A 2003 report found that monotherapy (using just one medication rather than a combination) works better for most patients. The less complicated the treatment, the more likely the patient will comply and better manage the seizure disorder.

Even epileptic patients whose seizures are well controlled should have regular blood tests to measure levels of anti-seizure medication in their system and to check to see if the medication is causing any changes in blood or liver function. A doctor should be notified if any signs of drug toxicity appear, including uncontrolled eye movements; sluggishness, **dizziness**, or hyperactivity; inability to see clearly or speak distinctly; **nausea** or **vomiting**; or sleep problems.

Status epilepticus requires emergency treatment, usually with Valium, Ativan, Dilantin, or Barbita. An intravenous dextrose (sugar) solution is given to patients whose condition is due to low blood sugar, and a vitamin B_1 preparation is administered intravenously when status epilepticus results from chronic alcohol withdrawal. Because dextrose and **thiamine** are essentially harmless and because delay in treatment can be disastrous, these medications are given routinely, as it is typically difficult to obtain an adequate history from a patient suffering from status epilepticus.

Intractable seizures are seizures that cannot be controlled with medication or without sedation or other unacceptable side effects. Surgery may be used to eliminate or control intractable seizures.

Surgery

Surgery can be used to treat patients whose intractable seizures stem from small focal lesions that can be removed without endangering the patient, changing the patient's personality, dulling the patient's senses, or reducing the patient's ability to function.

A physical examination is conducted to verify that a patient's seizures are caused by epilepsy, and surgery is not used to treat patients with severe psychiatric disturbances or medical problems that raise risk factors to unacceptable levels.

Surgery is never recommended unless the following have occurred:

- The best available anti-seizure medications have failed to control the patient's symptoms satisfactorily.
- The origin of the patient's seizures has been precisely located.
- There is good reason to believe that surgery will significantly improve the patient's health and quality of life.

Every patient considering epilepsy surgery is carefully evaluated by one or more neurologists, neurosurgeons, neuropsychologists, and/or social workers. A psychiatrist, chaplain, or other spiritual advisor may help the patient and his family cope with the stresses that occur during and after the selection process.

TYPES OF SURGERY. Surgical techniques used to treat intractable epilepsy include:

- Lesionectomy. Removing the lesion (diseased brain tissue) and some surrounding brain tissue is very effective in controlling seizures. Lesionectomy is generally more successful than surgery performed on patients whose seizures are not caused by clearly defined lesions, but removing only part of the lesion lessens the effectiveness of the procedure.
- Temporal resections. Removing part of the temporal lobe and the part of the brain associated with feelings, memory, and emotions (the hippocampus) provides good or excellent seizure control in 75 to 80% of properly selected patients with appropriate types of temporal lobe epilepsy. Some patients experience post-operative speech and memory problems.
- Extra-temporal resection. This procedure involves removing some or all of the frontal lobe, the part of the brain directly behind the forehead. The frontal lobe helps regulate movement, planning, judgment, and personality. Special care must be taken to prevent post-operative problems with movement and speech. Extra-temporal resection is most successful in patients whose seizures are not widespread.
- Hemispherectomy. This method of removing brain tissue is restricted to patients with severe epilepsy and abnormal discharges that often extend from one side of the brain to the other. Hemispherectomies are most often performed on infants or young children who have had an extensive brain disease or disorder since birth or from a very young age.
- Corpus callosotomy. This procedure, an alternative to hemispherectomy in patients with congenital hemiplegia, removes some or all of the white matter that separates the two halves of the brain. Corpus callosotomy is performed almost exclusively on children who are frequently injured during falls caused by seizures. If removing two-thirds of the corpus callosum does not produce lasting improvement in the patient's condition, the remaining one-third is removed during another operation.
- Multiple subpial transection. This procedure is used to control the spread of seizures that originate in or affect the so-called eloquent cortex, the area of the brain responsible for complex thought and reasoning.

Other forms of treatment

VAGUS NERVE STIMULATION. Approved for adults and adolescents (over 16 years old) with intractable seizures, vagus nerve stimulation (VNS) uses a pacemaker-like device implanted under the skin in the upper left chest, to provide intermittent stimulation to the vagus nerve. Stretching from the side of the neck into the brain, the vagus nerve affects swallowing, speech, breathing, and many other functions, and VNS may prevent or shorten some seizures.

First aid for seizures

A person with epilepsy having a seizure should not be restrained, but sharp or dangerous objects should be moved out of reach. Anyone having a complex partial seizure can be warned away from danger by someone calling his/her name in a clear, calm voice.

A person with epilepsy having a grand mal seizure should be helped to lie down, and those aiding the patient should contact emergency medical personnel. Tight clothing should be loosened. A soft, flat object like a towel or the palm of a hand should be placed under the person's head. Forcing a hard object into the mouth of someone having a grand mal seizure could cause injuries or breathing problems. If the person's mouth is open, placing a folded cloth or other soft object between his or her teeth will protect the tongue. Turning the patient's head to the side will help with breathing. After a grand mal seizure has ended, the person who had the seizure should be told what has happened and reminded of where he or she is.

KEY TERMS

Acupressure—Needleless acupuncture.

Acupuncture—An ancient Chinese method of relieving pain or treating illness by piercing specific areas of the body with fine needles.

Biofeedback—A learning technique that helps individuals influence automatic body functions.

Epileptologist—A physician who specializes in the treatment of epilepsy.

Expected results

People who have epilepsy have a higher than average rate of suicide; sudden, unexplained death; and drowning and other accidental fatalities.

Benign focal epilepsy of childhood and some absence seizures may disappear in time, but remission is unlikely if seizures occur several times a day, several times in a 48-hour period, or more frequently than in the past.

Epilepsy can be partially or completely controlled if the individual takes anti-seizure medication according to directions; avoids seizure-inducing sights, sounds, and other triggers; gets enough sleep; and eats regular, balanced meals.

Individuals who have epilepsy should wear a bracelet or necklace identifying the seizure disorder and listing the medication they take.

Prevention

Eating properly, getting enough sleep, and controlling stress and fevers can help prevent seizures. A person who has epilepsy should be careful not to hyperventilate. Those who experience auras should find a safe place to lie down and stay until the seizure passes. Anticonvulsant medications should not be stopped suddenly, and if other medications are prescribed or discontinued, the doctor treating the seizures should be notified. In some conditions, such as severe head injury, brain surgery, or subarachnoid hemorrhage, anticonvulsant medications may be given to the patient to prevent seizures.

Resources

BOOKS

Browne, Thomas R., and Gregory L. Holmes. *Handbook of Epilepsy*, 4th ed. Philadelphia: Lippincott Williams & Wilkins, 2008.

Sanders, J. W., and Yvonne Hart. *Epilepsy Questions and Answers*. Jupiter, FL: Merit, 2007.

Wylie, Elaine. *Epilepsy: A Cleveland Clinic Guide*. Cleveland, OH: Cleveland Clinic Press, 2007.

PERIODICALS

Bauer, J., et al. "Which Patients Become Seizure Free with Antiepileptic Drugs? An Observational Study in 821 Patients with Epilepsy." *Acta Neurologica Scandinavica* (January 2008): 55 59.

Hauser, W. Allen, and Ettore Beghi. "First Seizure Definitions and Worldwide Incidence and Mortality." *Epilepsia* (January 2008): 8 12.

Kossoff, Eric H., et al. "A Prospective Study of the Modified Atkins Diet for Intractable Epilepsy in Adults." *Epilepsia* (February 2008): 316 319.

Kossoff, Eric H., et al. "When Do Seizures Usually Improve with the Ketogenic Diet?" *Epilepsia* (February 2008): 329 333.

Lowenstein, Daniel H. "Pathways to Discovery in Epilepsy Research: Rethinking the Quest for Cures." *Epilepsia* (January 2008): 1 7.

Plummer, Chris, A. Simon Harvey, and Mark Cook. "EEG Source Localization in Focal Epilepsy: Where Are We Now?" *Epilepsia* (February 2008): 201 218.

OTHER

"Epilepsy." Medline Plus. [cited March 20, 2008]. http://www.nlm.nih.gov/medlineplus/epilepsy.html.

"NINDS Epilepsy Information Page." National Institute of Neurological Disorders and Stroke. February 13, 2008 [cited March 20, 2008]. http://www.ninds.nih.gov/disorders/epilepsy/epilepsy.htm.

ORGANIZATIONS

American Epilepsy Society, 342 N. Main St., Rm. 301, Hartford, CT 06105 4298, (860) 586 7505, http://www.aesnet.org/.

Epilepsy Foundation, 8301 Professional Place, Landover, MD 20785, (800) 332 1000, http://www.epilepsyfoundation.org/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Epimedium

Description

Epimedium is a genus of 21 species and is a member of the buttercup family. *Epimedium* is a woody, pungent ornamental herb found in western and eastern Asia and the Mediterranean. Various hybrids are grown elsewhere and most often are used as groundcover, particularly in shady areas. The herb also goes by the name

Epimedium is a woody, pungent ornamental herb found in western and eastern Asia and the Mediterranean. *(© Frank Blackburn / Alamy)*

KEY TERMS

Expectorant—A preparation that loosens or liquefies thick mucus.

Impotence—Refers to a condition where the penis is unable to get erect or stay erect.

Shen Nong—A legendary emperor, he was called the "Divine Farmer" of China. Shen Nong made many discoveries concerning herbal medicine and cataloged 365 species of medicinal plants. An early herbal text, written around 400 A.D., was named after him.

Sinusitis—An infection of the sinus cavities characterized by pain in the eyes and cheeks, fever, and difficulty breathing through the nose.

Suet—Refers to the hard fat found around cattle and sheep kidneys and loins; it is used in cooking.

horny goat weed and barrenwort. The Chinese call it *Yin Yang Huo*, which means "licentious goat plant."

The plant was named epimedium because it is akin to a plant found in the ancient southwest Asian kingdom of Media, now a part of Iran. Plants used for medicinal purposes include *Epimedium sagittatum, Epimedium brevicornum, Epimedium wushanense, Epimedium koreanum,* and *Epimedium pubescens.*

General use

The use of epimedium as a medicinal herb dates back thousands of years. Shen Nong's *Canon of Medicinal Herbs,* compiled around 400 A.D., mentions its use.

The odorless, bitter herb has been used as a:

- Kidney tonic to help relieve problems of frequent urination and correct problems of lightheadedness and weakness associated with improper body fluid volumes.
- Reproductive system tonic to treat impotence and premature ejaculation.
- Rejuvenating tonic, as an aphrodisiac or to relieve fatigue.

The herb, which dilates blood vessels, has also been used to treat coronary **heart disease**, **asthma**, **bronchitis**, and sinusitis. An expectorant, it can be used to control coughing. It can also be used to lower blood pressure.

Studies have shown that epimedium raises adrenaline, noradrenaline, serotonin, and dopamine levels in animals. It is the dopamine that may be responsible for the herb's use as a reproductive tonic. The increased dopamine levels in the body set off a chain reaction that leads to a release of testosterone, the male sex hormone.

Other evidence suggests the herb increases sensitivity in nerve endings, which may explain why it is prescribed as an aphrodisiac.

Preparations

The herb is collected in summer or early autumn, then dried in the sun. Some use it unprepared, while others bake it with sheep fat.

The herb can be ingested as a tea infusion. To make the tea, 1 oz (28 g) of the cut leaves are added to a pint of hot water. The recommended dosage is one to three cups per day. The tea should be taken with food.

A powder form may be made by combining 100 kg of dried epimedium leaves with 20 kg of refined suet, then stir-frying the concoction.

Epimedium may also be combined with **lycium fruit** to make a tea concoction to stimulate the Kidneys and reproductive system. Combine one ounce of epimedium and wolfberries (lycium) with hot water and drink after the concoction has steeped for 10 to 15 minutes. Note that individuals with **allergies** to

tomatoes and other vegetables in the nightshade family may also be allergic to lycium berries.

Precautions

When buying epimedium, be sure to pick leaves with a dark color. Those that are yellow or blanched probably sat in the sun too long when drying and will not be as effective.

Also, purchase herbs from reputable companies to ensure their purity.

Side effects

Ingesting an excess amount of the herb can lead to **vomiting**, **dizziness**, thirst, and nosebleed.

Interactions

Just like other drugs, herbs can be hazardous to health both by themselves and particularly in certain combinations. For this reason, consult a knowledgeable herbal therapist before taking epimedium to find out what it can and cannot be used with. Also, be aware that herbs can interfere with prescription medication.

Resources

BOOKS

Bown, Deni. *Encyclopedia of Herbs and Their Uses*. New York: Dorling Kindersley, 1995.

Keys, John D. *Chinese Herbs: Their Botany, Chemistry, and Pharmacodynamics*. Rutland, VT: Charles E. Tuttle, 1976.

OTHER

"Epimedium." *Herbwalk.com*. http://herbwalk.com/remedy/herb_Epimedium_132.html.

"*Epimedium grandiflorum*." *AdvancedHerbals.com*. http://www.advancedherbals.com/herbs/div/epimedium_grandiflorum.html.

"Traditional Chinese Medicine Herbal Database." *China Med.net*. http://www.china med.net/unified_site/herb_library/materia_medica.html.

Lisa Frick

Erectile dysfunction *see* **Impotence**

Escharotic treatment

Description

Escharotic treatment is the use of topical herbal preparations to treat a variety of cancerous lesions. Escharotic treatments are highly corrosive and produce a thick crust (eschar) that results in extensive scarring.

General use

Escharotic treatments have been used for hundreds of years. During the late twentieth century, these agents were used for the self-treatment of basal cell, squamous cell, and melanoma skin cancers, as well as cervical **cancer**, among others.

Many components of escharotic treatments have been identified as having antioxidant, antimitotic (inhibit cell division), and other anticarcinogenic properties. Escharotic agents may have beneficial properties when used by trained, licensed medical professionals for specific applications, including debridement of chronic leg ulcers and chemosurgical debridement of bone cancers.

Frederic Mohs developed the micrographic fixed-tissue staged excision procedure of his namesake in the 1930s. For this procedure, he used the escharotic agent **zinc** chloride (later coined "Mohs paste"). The Mohs procedure in the 2000s does not involve the use of zinc chloride because the cure rate and tissue conservation associated with this procedure are related to surgical technique and not to the use of the escharotic agent. The Mohs procedure involves the surgical removal of the visible tumor, followed by microscopic examination of the removed tissue. If cancer is seen at the margins, the suspected area plus a thin margin are removed, and this process is repeated until all of the cancer appears to have been identified and removed. This procedure is associated with a very high cure rate, reduced scarring, and minimal removal of healthy tissue.

There is very little evidence-based clinical research to support the benefits of these remedies when used for other applications, especially when they are used by consumers as self-treatment in lieu of recommended conventional therapies. There have been numerous reports of adverse effects associated with the use of these products. Several case studies have reported that tumors are not reliably treated with escharotic treatments, result in extensive scarring that is often unsightly, and have been associated with tumor recurrence within the scar tissue.

Escharotic products that contain labeling or marketing statements claiming that they treat cancers cannot legally be marketed in the United States. However, the distribution of escharotic substances grew considerably in the United States between 1998 and 2008 via unregulated Internet direct-to-consumer sales. As a result, many patients who have sought alternative remedies instead of more conventional treatments have experienced serious side effects.

The U.S. Federal Trade Commission (FTC), the U.S. Food and Drug Administration (FDA), and Health Canada (the Canadian federal health department), created a law enforcement and consumer education campaign in 1999 called Operation Cure All, in order to teach consumers how to identify health fraud and to provide information for businesses about truthful marketing practices for health products.

Research is ongoing to determine how escharotic treatments alter certain diseases or reduce the risk of diseases and how they can be used effectively while minimizing side effects. In addition, labeling terminology, including product health claims, are still being determined for escharotic agents.

Preparations

Escharotic treatments are available in salve, paste, poultice, or plaster preparations. The recommended use is to apply a liberal amount over the lesion or affected area and leave it on the skin for a long period of time, up to 24 hours.

The most caustic escharotic treatments, sometimes referred to as "black salves " include:

- bloodroot *(Sanguinaria canadendid)*
- zinc chloride
- goldenseal *(Hydrastis canadensis)*

Other herbal preparations used as escharotic treatments include:

- red clover *(Trifolium pretense)*
- combination preparations containing red clover, bloodroot, galangal, and sheep sorrel (*Rumex acetosella*, also known as sour grass)
- carbamide (urea)
- graviola leaf *(Annona muricata)*

Precautions

Escharotic agents are not recommended for self-treatment applications because of the associated risk of serious side effects, which have been well-documented. Escharotic treatments do not completely remove tumors, they may damage surrounding healthy tissue, and they may result in significant scarring with poor cosmetic outcomes.

The FDA has banned black salve products, including all products containing *Cansema*, as well as **bloodroot** paste *Sanguinaria canadensis* due to their harmful effects.

In the United States, herbal supplements are not required to be standardized. Although regulated under the 1994 Dietary Supplement Health and Education Act (DSHEA), there are no safety reviews or approved therapeutic uses for escharotic treatments by the FDA. After the product is marketed, the FDA must prove the product unsafe before it can be removed from the shelves. Fortunately, several escharotic treatments have been proven unsafe and removed from the market, although there are many harmful products still available.

Manufacturing guidelines for herbal remedies are not standardized; therefore, preparations can vary widely from one brand to another and within the same brand from one purchase to the next, making inconsistency in the concentration of ingredients a potential risk.

Many people associate the term "natural" with "safe" and that is not always the case. Anyone taking herbal products of any kind should be certain to read labels carefully and discuss the products with a physician to evaluate potential interactions with other medical conditions and/or prescription medications.

Side effects

Escharotic treatments can result in large open sores or lesions that often spread well beyond the

KEY TERMS

Antioxidant—A substance that protects against the oxidative processes that may lead to cellular damage. Antioxidants are associated with a reduced risk of cancer, cardiovascular disease, and other medical conditions.

Caustic—Corrosive; capable of destroying by chemical action.

Epithelial—Tissues that line cavities and body surfaces, such as the skin.

Mohs surgery—A type of micrographic surgery for removal of a visible tumor. Mohs surgery has a high cure rate (up to 99% for certain types of new lesions and 95% for recurrent cancers), with minimal removal of healthy surrounding tissue.

Paste—Water-based products that are thick when applied and have a tendency to dry out and build up.

Poultice—A soft mass that is usually heated, spread on a cloth, and applied to sores or other lesions.

Salve—A substance that is applied to wounds or sores.

margins of the original tumor or lesion. These agents do not completely remove tumors; they damage surrounding healthy tissue, and they result in significant scarring with poor cosmetic outcomes.

Interactions

Serious side effects have occurred with the use of bloodroot paste (*Sanguinaria canadendid*) and zinc chloride combination as part of the Mohs chemosurgery fixed-tissue technique.

Resources

BOOKS

Mills, Simon, and Kerry Bone. *The Essential Guide to Herbal Safety*. New York: Churchill Livingstone, 2005.

Stargrove, Mitchell B., Johathan Treasure, and Dwight L. McKee. *Herb, Nutrient, and Drug Interactions: Clinical Implications and Therapeutic Strategies*. Philadelphia: Mosby, Elsevier, 2008.

PERIODICALS

Elston, Dirk M. "Escharotic Agents, Fred Mohs, and Harry Hoxsey." *Journal of the American Academy of Dermatology* 53, no. 3 (September 2005): 523–525.

Jellinek, N., and M. E. Maloney. "Escharotic and Other Botanical Agents for the Treatment of Skin Cancer: A Review." *Journal of the American Academy of Dermatology* 53, no. 3 (September 2005): 487–495.

Moran, Anna M., and Klaus F. Helm. "Histopathologic Findings and Diagnostic Difficulties Posed with Use of Escharotic Agents for Treatment of Skin Lesions: A Case Report and Review of the Literature." *Journal of Cutaneous Pathology* 35, no. 4 (April 2008): 404–406.

OTHER

Operation Cure.All. http://www.ftc.gov/cureall.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD 20859, (301) 340 1960, http://www.amfoundation.org.

National Center for Complementary and Alternative Medicine, National Institutes of Health, 9000 Rockville Pike, Bethesda, MD 20892, (888) 644 6226, http://www.nccam.nih.gov.

Angela M. Costello

Essential fatty acids

Description

Essential fatty acids (EFAs) are fats that are essential to the diet because the body cannot produce them. Essential fatty acids are extremely important nutrients for health. They are present in every healthy cell in the body and are critical for the normal growth and functioning of the cells, muscles, nerves, and organs. EFAs are also used by the body to produce a class of hormone-like substances called prostaglandins, which are key to many important processes. Deficiencies of EFAs are linked to a variety of health problems, including major ones such as **heart disease**, **cancer**, and diabetes. It has been estimated that as many as 80% of Americans may consume insufficient quantities of EFAs.

Very few health issues received as much attention during the last third of the twentieth century as the question of fat in the diet. Sixty-eight percent of deaths in the United States are related to fat consumption and diet, including heart disease (44% of deaths), cancer (22%) and diabetes (2%). There are several types of dietary fats. Saturated fat is found mainly in animal products, including meat and dairy products, avocados, and nuts. **Cholesterol** is a dietary fat that is only found in animal products. Cholesterol is also made by the body in small amounts from saturated fats. Heavy consumption of saturated fat and cholesterol has been linked to heart disease and cancer. Unsaturated fats are typically oils from vegetables and nuts and are present in some fish. These are considered the healthiest dietary fats. Essential fatty acids are unsaturated fats. EFAs are the only fats that may need to be increased in the U.S. diet.

Scientists classify essential fatty acids in two types, **omega-3 fatty acids** and **omega-6 fatty acids**, depending on their chemical composition. Technically, the omega-3 fatty acids are alpha-linolenic acid, stearidonic acid, and two others called EPA and DHA. Alpha-linolenic acid is found mainly in **flaxseed** oil, canola oil, soybeans, walnuts, hemp seeds, and dark green leafy vegetables. Stearidonic acid is found in rarer types of seeds and nuts, including black currant seeds. EPA and DHA are present in cold-water fish, including salmon, trout, sardines, mackerel, and cod. Cod liver oil is a popular nutritional supplement for omega-3 EFAs.

Omega-6 fatty acids are more common in the U.S. diet than the omega-3 EFAs. These include **linoleic acid**, which is found in safflower, olive, almond, sunflower, hemp, soybean, walnut, pumpkin, sesame, and flaxseed oils. Gamma-linolenic acid (GLA) is found in some seeds and evening primrose oil. Arachidonic acid (AA) is present in meat and animal products.

Both types of EFAs, omega-3 and omega-6 fatty acids, are necessary in a healthy diet. Deficiencies of EFAs have been brought about by changes in diet and

the modern processing of foods and oils. Many nutritionists believe that a major dietary problem is the use of hydrogenated oils, which are present in margarine and many processed foods. Hydrogenated oils are highly refined by industrial processes and contain toxic by-products and trans-fatty acids. Trans-fatty acids are fat molecules with chemically altered structures and are believed to have several detrimental effects on the body. Trans-fatty acids interfere with the absorption of healthy EFAs and may contribute to **atherosclerosis** or damage to the arteries. Deep-fried foods, which are cooked in oil that is altered by very high temperatures, also contain trans-fatty acids. Many health professionals, including those at the World Heath Organization, have protested against the use of hydrogenated oils in food and the consumption of trans-fatty acids. Health conditions linked to the consumption of trans-fatty acids and hydrogenated oils include cancer, heart disease, high cholesterol, diabetes, **obesity**, immune system disorders, decreased sperm counts, and infant development problems.

Dietary changes that have contributed to EFA deficiency or imbalances include the increased use of oils that contain few or no omega-3 EFAs; the industrial milling of flour that removes the EFA-containing germ; the increase of sugar and fried foods in the diet that may interfere with the body's absorption of EFAs; and the decreased consumption of fish.

A balance of omega-3 and omega-6 EFAs in the diet is recommended by experts. Americans typically consume higher quantities of omega-6 EFAs because these are found in meat, animal products, and common cooking oils. Research has shown that too many omega-6 EFAs in the diet can lead to the imbalanced production of prostaglandins, which may contribute to health problems. Experts recommend that omega-3 and omega-6 EFAs be present in the diet in a ratio of around one to three. Americans consume a ratio as high as one to 40. Thus, the need for greater amounts of omega-3 EFAs in the diet has increased.

Symptoms of EFA deficiency or imbalance include dry or scaly skin, excessively dry hair, cracked fingernails, **fatigue**, weakness, frequent **infections**, **allergies**, mood disorders, hyperactivity, **depression**, memory and learning problems, slow wound healing, aching joints, poor digestion, high blood pressure, obesity, and high cholesterol.

General use

EFA supplementation is recommended for more than 60 health conditions. EFAs are used therapeutically to treat and prevent cardiovascular problems, including heart disease, high cholesterol, strokes, and high blood pressure. EFAs also have anti-inflammatory effects in the body and are used in the nutritional treatment of arthritis, **asthma**, allergies, and skin conditions (e.g., **eczema**). EFAs are used as support for immune system disorders, including **AIDS**, **multiple sclerosis**, and lupus. EFAs have been thought to reduce the risk of cancer, but this assumption came under question in 2006 when an analysis of previous studies, called a meta-analysis, found mixed results. The study concluded that there is not enough evidence to suggest a significant relationship between consumption of omega-3 fatty acids and a reduced risk of cancer. Meta-analyses became fashionable topics in major medical journals in the late 1990s and 2000s, mainly because they are easy to conduct, require no new research, and are relatively inexpensive. However, many researchers point out that the findings of meta-analysis studies can be biased, depending on what criteria are used in selecting previous studies to be included in the meta-analysis. This criticism has been leveled at the 2006 study of omega-3 and cancer. In the August-September issue of *Townsend Letter: The Examiner of Alternative Medicine*, Melvyn R. Werbach wrote: "Not only are there numerous problems with the selection of studies for this meta-analysis, but the lack of consistently positive findings was not a basis for reaching such a negative conclusion." Werbach added that further research is needed to prove the positive effects of EFAs in fighting cancer as well as in establishing the correct dosages required. With the ratio of omega-3 to omega-6 fatty acids widening, Werbach suggests this imbalance may be contributing to rising cancer rates and that an increase in the dietary intake of omega-3 fatty acids should reduce the risk of cancer.

Other conditions that may improve with EFA supplementation include **acne** and other skin problems, depression, menopausal problems, nervous conditions, obesity, memory and learning disabilities, eye problems, and digestive disorders. A 2007 University of Colorado study found that a diet rich in omega-3 fatty acids might delay the onset of type 1 diabetes in children at risk for the disease. EFAs are recommended for weight loss programs, as they may assist fat metabolism in the body. In 2007, two studies reported that **diets** high in omega-3 fatty acids could be helpful in treating several psychiatric disorders. An Australian study found that children with early signs of psychosis who were given omega-3 supplements were six times less likely to develop a psychotic disorder than those who did not take a supplement. The second study, a meta-analysis done by U.S. researchers, reported that omega-3 fatty acid supplements

were effective in treating borderline personality disorder (BPD). BPD occurs primarily in women and symptoms include a lack of self-sense, chaotic relationships with other people, depression, impulsive aggression, and unstable personality traits.

Preparations

Common EFA supplements are flaxseed oil, **evening primrose oil**, **borage oil**, **black currant seed oil**, hemp seed oil, and cod liver oil. Consumers should search for supplements that contain both omega-3 and omega-6 EFAs because imbalances of EFAs may occur if either is taken in excess over long periods of time. Flaxseed oil is a recommended supplement because it contains the highest percentage of omega-3 fatty acids with some omega-6 EFAs as well. Flaxseed oil is generally the least expensive source of omega-3 EFAs as well, generally much cheaper than **fish oil** supplements. Evening primrose oil is a popular supplement as well because the GLA it contains has shown benefits in treating **premenstrual syndrome** and other conditions. However, evening primrose oil contains no omega-3 EFAs. Hemp seed oil is a well-balanced source of both EFAs.

Supplements are available from health food stores in liquid and capsule form. The recommended daily dosage is one to two tablespoons (13-26 capsules), taken with meals. EFAs can also be obtained from a diet that includes cold-water fish consumed twice per week, whole grains, dark green leafy vegetables, walnuts, pumpkin seeds, **wheat germ**, soy products, canola oil, and other foods. Whole flaxseeds are a wholesome source of EFAs as well and can be freshly ground and added to salads and other dishes. Supplements that contain the enzyme **lipase** help the body more efficiently digest the oils.

In 2007, *USA Today* named omega-3 fatty acids one of the hottest food additives of 2007 because an increasing number of food manufacturers add omega-3 fatty acids to a wide range of food products, including milk, soy milk, yogurt, flax oil, canola oil, butter-like spreads, mayonnaise, and even microwavable popcorn. The reason is that dozens of studies conducted between 2000 and 2007 in the United States, Britain, Australia, Italy, and elsewhere showed that a diet high in omega-3 fatty acids significantly reduces the risk of heart disease.

Precautions

EFA supplements are generally fragile products and must be produced, packaged, and handled properly. Consumers should search for quality EFA supplements produced by reputable manufacturers. Products that are organically grown and certified by a third party are recommended. EFA products should be produced by cold or modified expeller pressing, which means that they were produced without damaging temperatures or pressure. Products should be packaged in light-resistant containers because sunlight damages EFAs. Packages should include manufacturing and expiration dates, in order to assure freshness. Stores and consumers should keep EFA products under refrigeration because heat damages them. Taste can indicate the quality of EFA oils: those that have no flavor usually are overly refined, and those that taste bitter are old or spoiled. Because of their low temperature threshold, nearly all oils that are used as EFA supplements are not suitable for use as cooking oils.

The U.S. Food and Drug Administration (FDA) cautions pregnant and nursing women and parents of infants and toddlers about the potential dangers of exposure to mercury from fish rich in omega-3 fatty acids and from fish oil capsules. High levels of mercury can affect brain development in fetuses and young children. The FDA recommends that these groups instead opt for younger species of fish such as canned tuna or farm-raised fish and skip fish oil capsules altogether. Vegetarians can supplement their diets with foods high in alpha-linoleic acids, including certain oils, flaxseed, and walnuts.

Side effects

Side effects with most EFA supplements are rare because EFAs are nontoxic and are used by the body as energy when taken in excess. The exception is cod liver and fish oil supplements, which can cause **vitamin A** and D toxicity when taken in excess. Side effects of vitamin A and D toxicity include headaches, skin discoloration, fatigue, **nausea**, and gastrointestinal problems. Fish oil supplements that have vitamins A and D removed are available.

Interactions

To maximize the benefits of EFA supplements, several recommendations can be followed. EFA users should reduce the amount of fat, particularly saturated fat from animal products, in their diet. The American Heart Association recommends that a healthy diet contains 30% or less of its total calories from fat. For 2,000 total calories per day, 600 calories or less should be from fat, including EFA supplements. Consumers should also completely eliminate hydrogenated and partially hydrogenated oils from their diets, which includes eliminating all processed foods that contain them, such as margarine and many packaged foods. Other foods that contain

KEY TERMS

Atherosclerosis—Hardening of the arteries.

Cholesterol—A steroid fat found in food derived from animals that is also produced in the body for several important functions. Excess cholesterol intake is linked to many diseases.

Hydrogenated fat—Unsaturated fat, commonly vegetable oil, that is processed with high heat and hydrogen to make it solid at room temperature. Margarine is a common hydrogenated fat.

Trans-fatty acid—A toxic type of fat created by hydrogenating oils and by deep frying foods.

trans-fatty acids, such as deep fried foods, should also be eliminated. Recommended cooking oils are olive, safflower, canola, and sesame oils. EFA effectiveness may be increased by lowering the intake of sugar and alcohol in the diet. Nutrients that assist EFA uptake are the B-complex vitamins, **vitamin C**, **zinc**, and **magnesium**. As with any supplement, EFA effectiveness can be augmented with a nutritious, high fiber diet that emphasizes fresh and natural foods, and the intake of fish two times a week.

Resources

BOOKS

Chow, Ching K., ed. *Fatty Acids in Foods and Their Health Implications* (3rd ed.). Boca Raton, FL: CRC, 2007.

Stehr, Sebastian N., and Thea Koch, eds. *Omega 3 Fatty Acids in Clinical Nutrition*. Hauppauge, NY: Nova Science, 2006.

Teale, M. C., ed. *Omega 3 Fatty Acid Research*. Hauppauge, NY: Nova Science, 2006.

PERIODICALS

Babbington, Gabrielle. "Omega 3 Beneficial in Early Psychosis." *Australian Doctor* (December 6, 2007): 6.

Jenkins, David J. A., and Andrea R. Josse. "Fish Oil and Omega 3 Fatty Acids." *Canadian Medical Association Journal* (January 15, 2008): 150.

Leard Hansson, Jan, and Laurence Guttmacher. "Omega 3 Fatty Acids and Borderline Personality Disorder." *Clinical Psychiatry News* (October 2007): 17.

Liebman, Bonnie. "Omega Medicine? Is Fish Oil Good for What Ails You?" *Nutrition Action Healthletter* (October 2007): 1(5).

Peskin, Brian Scott. "EFAs, Oxygenation, and Cancer Prevention: A New Solution." *Townsend Letter: The Examiner of Alternative Medicine* (August September 2007): 81(7).

Weede, Tom. "Supplement from the Sea: The Fat from Fish Oil Can Benefit Your Heart, Eyes, Joints, and Brain." *Natural Health* (October 2007): 105(2).

ORGANIZATIONS

American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL 60606, (800) 877 1600, http://www.eatright.org.

Dieticians of Canada, 480 University Ave., Suite 604, Toronto, ON, M5G 1V2, Canada, (416) 596 0857, http://www.dieticians.ca.

National Center for Complementary and Alternative Medicine, 900 Rockville Pike, Bethesda, MD 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD 20892, (301) 435 2920, http://www.ods.od.nih.gov.

Douglas Dupler
Ken R. Wells

Essential oils

Description

Essential oils are fragrant oils present in many plants. Hundreds of plants yield essential oils that are used as perfumes, food flavorings, medicines, and as fragrant and antiseptic additives in many common products.

Essential oils have been used for thousands of years. The ancient civilizations of Mesopotamia, more than 5,000 years ago, had machines for obtaining essential oils from plants. Essential oils were the primary source of perfumes for the ancient civilizations of Egypt, India, Greece, and Rome. Essential oils have been found in 3,000-year-old tombs in the Pyramids. Early Greek physicians, including Hippocrates, mentioned aromatic plant essences and oil massages for their healing and mood-enhancing qualities. The Romans associated essential oils and their fine aromas with wealth and success. **Ayurvedic medicine**, the world's oldest healing system, has long recommended essential oil massage as a health treatment for many conditions.

In modern times, essential oils have been used in the manufacture of high quality perfumes, as additives in many common products, and in the healing practice of **aromatherapy**. Aromatherapy was begun in the 1920s by a French chemist named Réné-Maurice Gattefosse, who became convinced of the healing powers of essential oils when he used **lavender** oil to

effectively heal a severe burn on his body. Gattefosse also discovered that essential oils could be absorbed into the bloodstream when applied to the skin and had medicinal effects inside the body. Another Frenchman, Jean Valnet, used essential oils during World War II to treat soldiers' **wounds** and wrote a major book on the topic in 1964 titled *Aromatherapie*. Another European biochemist, Marguerite Maury, performed thorough studies of how essential oils influence the body and emotions and popularized essential oil massages as therapy. During the 1990s, aromatherapy was one of the fastest growing alternative health treatments.

Essential oils are produced in several ways. Distillation uses water and steam to remove the oils from dried or fresh plants, and the expression method uses machines to squeeze the oil out of plants. Other techniques may use alcohol or solvents to remove essential oils from plant materials.

Essential oils are extremely concentrated. It would take roughly thirty cups of herbal tea to equal the concentration of plant essence in one drop of essential oil. Some essential oils made from rose plants require 4,000 lbs (1,814 kg) of rose petals to make 1 lb (0.5 kg) of essential oil and are thus very expensive. Lavender is one of the easiest essential oils to produce because it takes only 100 lbs (45 kg) of plant material to produce 1 lb (0.5 kg) of essential oil. Essential oils are generally very complex chemically, containing many different substances. Some experts have theorized that essential oils are the lifeblood of a plant and contain compounds that the plant uses to fight **infections** and drive away germs and parasites. Scientific research has isolated hundreds of chemicals in essential oils and has shown many essential oils to have antibacterial, anti-fungal, and anti-parasitic properties. Some essential oils contain more than 200 identified chemical substances.

Although there are hundreds of essential oils used regularly in healing treatments and perfumes, some of the more commonly used essential oils are lavender, **chamomile**, **peppermint**, **tea tree oil**, **eucalyptus**, geranium, jasmine, rose, lemon, orange, **rosemary**, frankincense, and sandalwood.

General use

Essential oils are used in several healing systems, including aromatherapy, Ayurvedic medicine, and **massage therapy**. Essential oils are used for skin and scalp conditions, including **acne**, **athlete's foot**, **burns**, **cuts**, **dandruff**, **eczema**, insect **bites**, parasites, **sunburn**, **warts**, and wrinkles. They are recommended for muscle, joint, and circulation problems such as arthritis, high blood pressure, **cellulite**, aches and pains, and **varicose veins**. For respiratory problems and infections, various essential oils are prescribed for **allergies**, **asthma**, **earache**, sinus infections, congestion, and colds and flu. Essential oils are also used to improve digestion, promote hormonal balance, and tone the nervous system in conditions such as **anxiety**, **depression**, **sexual dysfunction**, and exhaustion.

Essential oils can be used as quick and effective mood enhancers, for increasing energy and alertness, reducing **stress**, and promoting **relaxation**. Essential oils can be used as perfumes and lotions and can be used as incense to improve the atmosphere in houses and offices.

Preparations

Essential oils work by entering the body in two ways, through the nose and through the skin. The nose is a powerful sense organ, and the sense of smell is connected directly to the limbic system of the brain, which helps control emotions, memory, and several bodily functions. Research has shown that aromas and the sense of smell influence memory recall, moods, and bodily responses such as heart rate, respiration, hormone levels, and stress reactions. Essential oils with their potent aromas can be used to enhance moods, promote relaxation, and increase energy levels.

Essential oils are also absorbed by the skin and act medicinally once they are absorbed into the body. For instance, eucalyptus oil, long used in common **cough** and cold remedies, can be rubbed on the chest to break up congestion and mucus inside the lungs. Some essential oils, such as tea tree oil, lavender, and **thyme**, have natural antiseptics in them and can be applied to cuts, burns, and sores to disinfect and promote healing.

Because essential oils are strong and concentrated, they should be diluted with *base oils* before rubbing them directly on the body. Base oils are gentle and inexpensive oils such as almond, jojoba, grapeseed, sunflower, and **sesame oil**. Mineral oil is not recommended as a base oil. Essential oils should be diluted to make up 1 to 3% of a base oil solution, which is one to three drops of essential oil per teaspoon of base oil. For larger quantities, 20 to 60 drops can be added per 100 milliliters of base oil. Only a few essential oils can be rubbed directly on the skin without dilution. These are lavender, tea tree oil, eucalyptus, and geranium, although people with sensitive skin should use these oils with care.

Allergic reactions are possible with essential oils. People with sensitive skin or allergies should perform a

simple skin test when using essential oils for the first time. To do a skin test, one drop of essential oil can be added to a teaspoon of base oil, and a small amount of this solution can be rubbed on a sensitive spot on the skin, such as the soft side of the arm or behind the ear. If no irritation occurs after 24 hours, then the essential oil is non-allergenic.

Essential oils can be used in a variety of ways. They can be added to massage oils for therapeutic massages. Essential oil solutions can be used on the skin, scalp, and hair as lotions, conditioners, and perfumes. A few drops of essential oils can be added to bath water or used in the sauna. Essential oil diffusers, lamps, and candles are available that use heat and steam to spread (diffuse) the aroma of essential oils in rooms. Essential oils can be added to hot-and-cold compresses for injuries and aches. Some essential oils, such as tea tree, **fennel**, and peppermint oil, can be combined with a mixture of water and **apple cider vinegar** and used as mouthwash. For colds and congestion in the lungs or sinuses essential oils can be inhaled by adding a few drops to a pot of boiling water, and covering the head with a towel over the pot and breathing the vapors.

Consumers should search for essential oils made by reputable manufacturers. Essential oils should be certified to be 100% pure, without chemical additives or synthetic fragrances. The highest quality oils are generally obtained from distillation and cold pressing methods.

Precautions

Essential oils should not be taken internally, by mouth, rectum, or vagina, unless under medical supervision. Essential oils should be kept away from the eyes. If an essential oil gets into the eyes, the eyes should be rinsed immediately with cold water. Essential oils should be used with care on broken or damaged skin.

Some essential oils had not been thoroughly tested as of 2008 and may be toxic. The oils to be avoided include **arnica**, bitter almond, calamus, cinnamon, clove, **mugwort**, **sage**, **wintergreen**, and **wormwood**. Pregnant women should avoid these oils as well as oils of basil, fennel, marjoram, **myrrh**, oregano, star **anise**, and tarragon. In general, those essential oils that have not been tested or for which adequate information is not available should be avoided.

Some essential oils may cause the skin to become photosensitive, or more sensitive to sunlight and more likely to become sunburned. Essential oils that are photosensitizing include bergamot, orange, lemon, lime, grapefruit, and **angelica** root. These oils should be avoided before exposure to sunlight and ultraviolet light such as in tanning salons. People with sun-related skin problems should avoid these oils.

KEY TERMS

Aromatherapy—The use of essential oil aromas as health therapies.

Ayurvedic medicine—Healing system developed in ancient India and practiced around the world in the twenty-first century.

Homeopathic remedy—Medication prescribed by a homeopathic doctor.

Individuals with health conditions should use care with essential oils. Steam inhalation of essential oils is not recommended for people with asthma. The essential oils of rosemary, fennel, and sage should be avoided by those with **epilepsy**.

Pregnant and nursing women should use caution with essential oils because their skin and bodies are more sensitive, and some oils may cause adverse reactions. Essential oils should not be used during the first three months of **pregnancy**, and after that they should only be used when heavily diluted with base oils. Women with histories of miscarriage should not use essential oils during pregnancy at all. Pregnant women should perform skin tests before using essential oils. Essential oils are not recommended for nursing mothers.

Essential oils should be used with care on children. They are not recommended for children under one year of age and should be heavily diluted with base oils when used as a skin massage or lotion for children.

Essential oils should be stored out of the reach of children. Clean glass containers are the best storage vessels and should be dark in color to keep sunlight from damaging the oil. Some essential oils can damage wood, varnish, plastic and clothing, and should be handled with care.

Side effects

Most readily available essential oils are safe if used in small doses, and side effects are generally rare. Possible side effects include **rashes**, **itching**, and irritation on the skin. Allergic reactions include watery eyes, **sneezing**, and inflammation. Some essential oils may cause **nausea**, **dizziness**, or gastrointestinal discomfort when used in excess or by those with allergic reactions. Some essential oils, particularly those derived from citrus fruit plants, can cause increased sensitivity to sunlight and increased risk of sunburn.

Interactions

Essential oils are not recommended for those taking homeopathic remedies, as essential oils are believed to interfere with their effectiveness. Essential oils are often blended together to enhance their healing effects, and mixtures can be tailored to individual preferences and conditions. Aromatherapists specialize in creating essential oil blends for individuals and health conditions.

Resources

BOOKS

Clark, Marge. *Essential Oils and Aromatics: A Step by Step Guide for Use in Massage and Aromatherapy*. Sandy, UT: Silverleaf Press, 2008.

Harding, Jennie. *The Essential Oils Handbook: All the Oils You Will Ever Need for Health, Vitality, and Well Being*. London: Duncan Baird, 2008.

Keim, Joni, and Ruah Bull. *Daily Aromatherapy: Trans forming the Seasons of Your Life with Essential Oils*. Berkeley, CA: North Atlantic Books, 2008.

PERIODICALS

Bursn, Zobbi, et al. "Aromatherapy in Childbirth: A Pilot Randomised Controlled Trial." *BJOG: An Interna tional Journal of Obstetrics & Gynaecology* (July 2007): 838 844.

Placzek, Marianne, et al. "Evaluation of Phototoxic Prop erties of Fragrances." *Acta Dermato Venereologica* (July 2007): 312 316.

Shu Feng, Zhou, et al. "Metabolic Activation of Herbal and Dietary Constituents and Its Clinical and Toxicological Implications: An Update." *Current Drug Metabolism* (August 2007): 526 553.

Viuda Martos, Manuel, et al. "Antibacterial Activity of Different Essential Oils Obtained from Spices Widely Used in Mediterranean Diet." *International Journal of Food Science & Technology* (March 2008): 526 531.

Douglas Dupler
Teresa G. Odle
David Edward Newton, Ed.D.

Essiac tea

Description

Essiac tea is based on a Canadian Ojibwa Indian formula containing primarily **burdock root** (*Arctium lappa*), Turkish **rhubarb root** (*Rheum palmatum*), **sheep sorrel** (*Rumex acetosella*), and the inner bark of the **slippery elm** (*Ulmus fulva* or *Ulmus rubra*). It is used in alternative medicine mainly as a treatment for **cancer**.

The formula is said to have been first developed by an Ojibwa healer to purify the body and balance the spirit. In 1922, the formula came to the attention of Rene Caisse (essiac is Caisse spelled backwards), a nurse in Ontario, Canada, after hearing first-hand accounts of it curing cancer. She began administering the tea to cancer patients and found it to have remarkable healing abilities. She continued treating cancer patients with the tea until she died in 1978. In 1977, Caisse sold the essiac tea formula to the Resperin Corp. of Ontario, Canada.

Caisse reported that hundreds of her patients had been cured of their cancers through the use of her tea, sometimes used as intramuscular injections. Most of the patients came to her after conventional cancer treatments (surgery, chemotherapy, and radiation therapy) failed. Several alternative health care practitioners report essiac tea seems to work best in patients who have had the least amount of radiation therapy or chemotherapy.

The mainstream medical community does not embrace essiac tea. Critics contend that a certain number of cancers deemed incurable spontaneously go into remission without an adequate medical explanation as to why. Others chalk up the successes to the so-called **placebo effect**, where the belief that the treatment is working effects a cure rather than the treatment itself. The treatment is not approved by the American Medical Association or the American Cancer Society.

In 1938, a bill in the Canadian Parliament to legalize essiac tea failed by three votes. It is still not approved for marketing in the United States or Canada. However, the Canadian Health and Welfare Department permits compassionate use of essiac tea on an emergency basis.

In 1975 and again in 1982, the Memorial Sloan-Kettering Cancer Center in New York tested only the sorrel component in the tea. They boiled it, which may have neutralized any beneficial compounds in the left-over tea and administered it to mice with cancerous tumors. It determined the formula had no anticancer effects. The National Cancer Institute and Canadian Bureau of Prescription Drugs reached the same conclusion in the 1980s.

General use

Essiac tea is generally used by alternative health care practitioners to treat, and even cure, various forms of cancer and the side effects of conventional

KEY TERMS

Chemotherapy—The use of chemical agents to treat or control diseases, especially cancer.

Cholesterol—A steroid alcohol found in human cells and body fluids, implicated in the onset of heart disease.

Degenerative diseases—A group of diseases characterized by progressive degenerative changes in tissue, including arteriosclerosis, diabetes mellitus, and osteoarthritis.

Diabetes—Any of a variety of abnormal conditions characterized by excessive amounts of urine.

Diabetes mellitus—A degenerative disease characterized by inadequate production or absorption of insulin, excessive urine production, and excessive amounts of sugar in the blood and urine.

cancer therapy. It is also used to treat **AIDS**. It is used to a lesser extent to treat a variety of other medical conditions, including diabetes, skin inflammation, liver and thyroid problems, **diarrhea**, ulcers, and some other degenerative diseases. It is more commonly used in Canada than the United States. Other uses include treating **pain**, purifying the blood, healing **wounds**, lowering **cholesterol**, and increasing energy levels.

Although each of the four main ingredients in essiac tea are used to treat other conditions, only the sorrel is used separately to treat cancer. Only when the four are combined do they effect anti-cancer properties. It is not clear exactly how or why the ingredients work in combination, but it is generally believed they work synergistically to stimulate production of antibodies. Caisse herself said she believed essiac tea purified the blood and carried away damaged tissue and infection related to the cancer. She also believed the tea strengthened the immune system, allowing healthy cells to destroy cancerous cells.

Caisse also maintained that tumors not destroyed by essiac tea would be shrunk and could be surgically removed after six to eight weeks of treatment. To insure any malignant cells that remained after treatment and surgery were destroyed, Caisse recommended at least three months of additional weekly essiac treatments.

One of Caisse's patients was her mother, Friseide Caisse, who was diagnosed with liver cancer at the age of 72. Her mother's physician reportedly said she had only days to live. Rene Caisse began giving her mother daily intramuscular injections of the tea. Friseide began recovering within a few days and after a few months, with less frequent doses of essiac, her cancer was gone. She lived to be 90, finally succumbing to **heart disease**.

Preparations

The four main ingredients of essiac tea are sold separately and can be combined at home. Essiac tea is also marketed as tea bags and in bottles of the prepared formula. The basic formula for essiac tea is to combine 6.5 c of cut burdock root, 16 oz of powdered sheep sorrel (including stems, seeds, and leaves), 1 oz of powdered Turkish rhubarb root, and 4 oz of powdered slippery elm bark. Mix the ingredients thoroughly. Boil 2 gal of fresh spring water, add 8 oz of the essiac blend, cover, and boil on high heat for 10 minutes. Turn heat off and let sit for six hours. Remove cover and stir. Replace cover and let steep another six hours. Turn on heat and return the mixture to a boil. Remove from heat and strain into another pot. Wash original pot and strain mixture again into it. Then pour liquid into amber bottles, cap, and store in a dark cool location. Refrigerate after opening.

The formula is ready to use immediately. When ready, shake the bottle well to mix the sediments. Blend 4 tsp of the essiac formula with 4 tsp of warm spring water. The usual daily dosage is 2–4 oz of tea for persons weighing 100–150 lb and 2 oz for every 50 lb over 150 lb. Some alternative health practitioners recommend regular doses of essiac to strengthen the immune system and as a preventative for certain diseases, including cancer. The frequency ranges from daily to weekly.

Precautions

Essiac tea is not recommended for pregnant or lactating women. The formula should not be prepared or stored in plastic or aluminum containers. Sunlight and freezing temperatures destroys the formula's effectiveness. It is generally recommended that persons consult with their physician before treating any condition with essiac. It is important to remember that essiac is often used in combination with traditional cancer treatments, such as chemotherapy, radiation, and surgery.

Side effects

No major adverse side effect have been associated with essiac tea.

Interactions

Essiac is not known to adversely interact with other medications or nutritional supplements.

Resources

BOOKS

Glum, Gary L. *Calling of an Angel*. Los Angeles: Silent Walker Publishing, 1988.

Olsen, Cynthia and Dr. Jim Chan. *Essiac: A Native Herbal Cancer Remedy*. Pagosa Springs, CO: Kali Press, 1998.

Snow, Sheila and Mali Klein. *Essiac Essentials*. Dublin: Gill & Macmillan, 1999.

Walters, Richard. *Options: The Alternative Cancer Therapy Book*. New York: Avery Publishing Group, 1992.

PERIODICALS

McCutcheon, Lynn."Essiac: The Not so Remarkable Cancer Remedy." *Skeptical Inquirer*. (July/Aug. 1998): 43 46.

Steinberg, Phillip N. "Cat's Claw, Essiac, and Whole leaf Aloe Vera: Mother Nature's Healers." *Let's Live* (Sept. 1996): 70 72.

Tyler, Varro E. "Essiac: A Native Herbal Cancer Remedy." *Nutrition Forum* (May/June 1998): 24.

Ken R. Wells

Eucalyptus

Description

The eucalyptus tree is a large, fast-growing evergreen that is native to Australia and Tasmania. The tree can grow to 375-480 ft (125-160 m). Eucalyptus belongs to the myrtle (Myrtaceae) family. There are more than 300 species of eucalyptus, and *Eucalyptus globulus* is the most well-known species. One species (*E. amygdalin*) is the tallest tree known in the world. The tree grows best in areas with an average temperature of 60°F (15°C).

Eucalyptus trees constitute over 75% of the tree population of Australia. The eucalyptus tree is also known in Australia as the blue gum tree or malee. Other names for eucalyptus include Australian **fever** tree and stringy bark tree. The name is actually derived from the Greek word "eucalyptos," which means "well covered," and refers to the cuplike membrane that covers the budding flowers of the tree.

The bluish green leaves carry the medicinal properties of the tree and grow to a length of 6-12 in (15-30 cm). While the leathery leaves are the sole food for koala bears, the leaves also contain a fragrant volatile oil that has antiseptic, expectorant, antibacterial, anti-inflammatory, deodorant, diuretic, and antispasmodic properties. Other constituents of the leaves include tannins, phenolic acids, flavonoids (eucalyptin, hyperin, hyperoside, quercitin, quercitrin, rutin), sesquiterpenes, aldehydes, and ketones.

KEY TERMS

Diuretic—A substance that promotes urination.

Expectorant—A substance that promotes the coughing up of mucous or other fluids from the lungs.

Febrifuge—A substance that reduces fevers.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Eucalyptus oil is obtained through a steam distillation process that removes the oil from the fresh, mature leaves and branch tips of older trees. Approximately 25 species of eucalyptus trees in Australia are grown for their oil.

There are three grades of eucalyptus oil: medicinal, which contains the compound eucalyptol (also called cineol); industrial, in which a component of the oil is used in mining operations; and aromatic, which is used in perfumes and fragrant soap products. These oils vary greatly in character. When choosing an oil for therapeutic use, it is important to know from what species the oil was derived. Species used medicinally include *E. globulus*, which contains up to 70% eucalyptol; *E. polybractea*, which contains 85% eucalyptol; and *E. Smithii*. *E. amygdalina* and *E. dives* contain little eucalyptol and are used to separate metallic sulfides from ores in the mining industry. *E. citriodora* contains a lemon-scented oil and is an ingredient in perfumes, as is *E. odorata* and *E. Sturtiana*. Two species, *E. dives* and *E. radiata*, have oils with a strong **peppermint** odor.

The most common species grown for its medicinal oil is *E. globulus*. The eucalyptol found in this species is a chief ingredient in many over-the-counter cold and **cough** remedies, such as cough lozenges, chest rubs, and decongestants. It acts to stimulate blood flow and protects against infection and germs. The *British Pharmocopoeia* requires that commercial eucalyptus oils contain 55% eucalyptol by volume.

Origins

The Australian aborigines have used eucalyptus for hundreds of years as a remedy for fever, **wounds**, coughs, **asthma**, and joint **pain**. Australian settlers

named the eucalyptus the fever tree because of its disease-fighting properties. Baron Ferdinand von Miller, a German botanist and explorer, was responsible for making the properties of eucalyptus known to the world in the mid-1800s. Likening eucalyptus' scent to that of cajaput oil (a disinfectant), von Miller suggested that eucalyptus might also be used as a disinfectant in fever districts. Seeds of the tree were sent to Algiers, France and planted. The trees thrived and, because of the drying action of the roots, turned one of the marshiest areas of Algiers into a dry and healthy environment, thereby driving away malaria-carrying mosquitoes. Eucalyptus trees were then planted in temperate areas around the world to prevent **malaria**. As a result, eucalyptus trees are now cultivated in China, India, Portugal, Spain, Egypt, South and North Africa, Algeria, South America, and in the southern portion of the United States.

Commercial production of eucalyptus began in Victoria, Australia in 1860. The nineteenth century eclectic doctors adopted eucalyptus as a treatment for fevers, **laryngitis**, asthma, chronic **bronchitis**, **whooping cough**, **gonorrhea**, ulcers, gangrenous tissue, **edema**, and gastrointestinal disturbances. European doctors used eucalyptus oil to sterilize their surgical and medical equipment. Eucalyptus leaves were often made into cigars or cigarettes and smoked to relieve asthma and bronchial congestion.

Modern medicines around the world have included eucalyptus in their practices. Indian ayurvedics use eucalyptus to treat headaches resulting from colds. Eucalyptus is listed in the *Indian Pharmacopoeia* as an expectorant and in the *Chinese Pharmacopoeia* as a skin irritant used in nerve pain. In France, eucalyptus leaves are applied topically to relieve congestion from colds and to treat acute bronchial disease. A standardized eucalyptus tea is licensed in Germany to treat bronchitis and throat inflammations. Eucalyptus is also an ingredient in German herbal cough preparations. The German Commission E has approved the internal use of eucalyptus to treat congestion of the respiratory tract, and the external use to treat rheumatic complaints. In the United States, eucalyptus is a component of many decongestant and expectorating cough and cold remedies, such as cough drops, cough syrups, and vapor baths. Eucalyptus is often used in veterinary medicine. It is used to treat horses with flu, dogs with distemper, and to treat parasitic skin conditions.

General use

Eucalyptus is most popular for its ability to clear congestion due to colds, coughs, flu, asthma, and sinusitis. The tannins found in eucalyptus have astringent properties that reduce mucous membrane inflammation of the upper respiratory tract. Eucalyptol, the chemical component of the oil, works to loosen phlegm. Cough drops containing eucalyptus promote saliva production, which increases swallowing and lessens the coughing impulse. Earaches can also be treated with eucalyptus. When inhaled, the eucalyptus fumes open the eustachian tubes, draining fluids and relieving pressure. Eucalyptus enhances breathing, which makes it an effective remedy for asthma, bronchitis, sinusitis, whooping cough, and colds.

Eucalyptus is a component of many topical arthritis creams and analgesic ointments. When applied to the skin, eucalyptus stimulates blood flow and creates a warm feeling to the area, relieving pain in muscles and joints.

The oil extracted from the eucalyptus leaf has powerful antiseptic, deodorizing, and antibacterial properties. It is especially effective in killing several **strains** of *Staphylococcus* bacteria. A mixture of 2% eucalyptus oil evaporated in an aroma lamp has been shown to destroy 70% of the *Staphylococcus* bacteria in the affected room. When the oil is applied to **cuts**, scrapes, and other minor wounds, it inhibits **infections** and viruses. A 2002 report out of Australia made researchers around the world take note when two cases of patients with staph infections resistant to traditional antibiotic therapy responded to a mixture of eucalyptus leaf oil abstract. The Australian researchers recommended formal clinical trials to test the therapy, based on an ancient aboriginal remedy. Eucalyptus also fights plaque-forming bacteria and is used to treat **gum disease** and gingivitis.

In large doses, the oil can be a kidney irritant and can induce excretion of bodily fluids and waste products. Eucalyptus oil added to water may be gargled to relieve **sore throat** pain or used as a mouthwash to heal mouth sores or gum disorders. Consequently, eucalyptus is an ingredient in many commercial mouthwashes.

Eucalyptus' pain-relieving properties make it a good remedy for muscle tension. One study showed that a mixture of eucalyptus, peppermint, and ethanol oils successfully relieved headache-related muscle tension.

Eucalyptus may lower blood sugar levels. Placing a drop of the oil on the tongue may reduce **nausea**. The oil has also been used to kill dust mites and fleas.

Eucalyptus oil is one of the most well-known fragrances in **aromatherapy**. Two species of eucalyptus are used in aromatherapy oils: *E. globulus* and *E. citriodora.*

The essential oil of eucalyptus is used to relieve cramps, cleanse the blood, heal wounds, disinfect the air, and to treat conditions such as asthma, bronchitis, throat and sinus infections, fevers, **kidney infections**, rheumatism, bladder infections, and sore muscles.

The essential oil can be diluted and added to a massage oil to ease aching muscles. The oil can be added to hot water and inhaled to reduce nasal congestion. It can also be diffused in the room of a sick patient to disinfect the air.

Some believe that inhaling the diffused oil can enhance concentration and thought processes. Studies have shown that inhalation of the cineole compound of eucalyptus stimulates coordination and motor activities in mice. Eucalyptus oil may also uplift the spirit during times of emotional overload or general sluggishness.

Applying a diluted oil to the skin instead of inhaling it increases the rate of absorption into the blood. Often the speed with which it is absorbed is so fast, the odor can be detected on the breath within minutes.

The oil is also an effective febrifuge, and a cold compress with eucalyptus oil added to it has a cooling effect that is useful in helping to reduce a fever. The essential oil of eucalyptus is also used to treat wounds, herpes simplex virus, skin ulcers, and **acne**. Combined with water, the oil makes an effective insect repellant. Because of its skin-moistening properties, the oil is often an ingredient in **dandruff** shampoo.

Eucalyptus oil may be combined with other oils that have similar properties, such as niaouli, pine, Swiss pine, **hyssop**, and **thyme** oils. It also mixes well with lemon, verbena, balm, and **lavender** oils.

Preparations

Eucalyptus is available as a tincture, cream, ointment, essential oil, or lozenge. Many health food stores carry fresh or dried eucalyptus leaf in bulk. Eucalyptus can be ingested through the use of teas or tincture preparations, inhaled, or applied externally.

Eucalyptus infusion is ingested to treat coughs, colds, bronchitis, congestion, and throat infections. To create an infusion, 1 cup of boiling water is poured over 1-2 teaspoons of crushed eucalyptus leaves. The mixture is covered and steeped for 10 minutes and is then strained. Up to 2 cups can be drunk daily.

Inhaling eucalyptus vapors is beneficial for sinus and bronchial congestion that occurs with bronchitis, whooping cough, colds, asthma, **influenza**, and other respiratory illnesses. A drop of eucalyptus oil or two to three fresh or dried leaves are added to a pan of boiling water or to a commercial vaporizer. The pan is removed from the heat, a towel is placed over the pan and the patient's head, and the patient inhales the rising steam. Patients should close their eyes when inhaling the steam to protect them from eucalyptus' strong fumes.

For healing wounds and preventing infection, the wound is washed and then diluted eucalyptus oil or crushed eucalyptus leaves are applied to the affected area.

For relief of muscle aches or arthritis pain, several drops of the diluted oil are rubbed onto the affected area, or a few drops of diluted oil are added to bath water for a healing bath. Adding eucalyptus leaves wrapped in a cloth to running bath water is also effective.

For gum disease, a few drops of diluted oil are placed on a fingertip and massaged into the gums.

Tinctures should contain 5-10% essential oil of eucalyptus. A person can take 1 ml three times daily.

Ointments should contain 5-20% essential oil of eucalyptus. The person should use as directed for chapped hands, joint and muscle pains, and dandruff.

Precautions

Children or infants should not be treated with eucalyptus. Of special note, eucalyptus oil should not be applied to the facial areas (especially the nose or eyes) of small children or infants. Pregnant or breast-feeding women should not use eucalyptus.

People with digestive problems, stomach or intestinal inflammations, biliary duct disorders, or liver disease should not take eucalyptus.

Undiluted eucalyptus oil should never be ingested. Small amounts of undiluted oil (even in amounts as little as one teaspoon) are toxic and may cause circulatory problems, collapse, suffocation, or death. Eucalyptus oil should always be diluted in a carrier oil such as almond, grapeseed, or other vegetable oil before applying to the skin.

Side effects

Nausea, **vomiting**, or **diarrhea** may occur in rare cases. Applying eucalyptus to the skin may cause a rash in those who are sensitive or allergic to eucalyptus.

Interactions

Eucalyptus works to detoxify the body. If it is used simultaneously with other drugs, the effects of those drugs may be weakened.

Resources

BOOKS

Fischer Rizzi, Susanne. *Medicine of the Earth*. Rudra Press, 1996.

Prevention. *The Complete Book of Natural and Medicinal Cures*. Rodale Press, Inc., 1994.

PERIODICALS

"One Answer to MRSA May be Growing on Trees: Euca lyptus Leaves Show Power over Pathogen." *Hospital Infection Control* 29, no. 1 (January 2002): 11.

Jennifer Wurges
Teresa G. Odle

Eucommia bark

Description

Eucommia bark is the gray, grooved bark of the tree *Eucommia ulmoides*, commonly called the hardy rubber tree or the gutta-percha tree. The Chinese name for eucommia bark is *Du Zhong*. This name refers to a Taoist monk who was said to be immortal, suggesting that the herb provides long life, good health, and vitality. The tree is a member of the rubber family and is native to the mountainous regions of China. It normally grows to about 50 ft (15 m) in height. Small patches of bark are harvested from trees over 10 years old in late summer and early autumn. The outer bark is peeled away and the smooth inner bark is dried. This inner bark contains pure white, elastic latex that is thought to contain the compounds that account for eucommia bark's healing properties. Older, thicker inner bark with more latex is considered more desirable for the herbalist to use than younger, thinner bark.

Although traditionally only the bark of *E. ulmoides* was used for healing, research in the later half of the 1990s in Japan indicated that the leaves also have healing properties. The green leaves are shiny, narrow, and pointed. The tree's flowers are very small and are not used in healing.

General use

Eucommia bark has been used in **traditional Chinese herbalism** for over 3,000 years. Since the tree does not grow widely outside China, this herb was not used in other cultures until the later twentieth century.

Eucommia bark is strongly associated with the kidneys and to a lesser extent with the liver. In Chinese medicine, the kidneys store *jing*. *Jing* is an essential life source and associated with whole body growth and development, as well as normal sexual and reproductive functioning. The kidney and liver *jing* also affects the bones, ligaments, and tendons.

In the Chinese system of health, *yin* aspects must be kept in balance with *yang* aspects. Ill health occurs when the energies and elements of the body are out of balance or in disharmony. Health is restored by taking herbs and treatments that restore that balance.

Eucommia bark is the primary herb used to increase *yang* functions in the body. However, it also supports *yin* functions. Eucommia bark helps to build strong bones and a flexible skeleton with strong ligaments and tendons. It is a primary herb used to heal tissues that are slow to mend after an injury or that have weakened through **stress** or age. It is given to treat lower back and leg **pain**, stiffness, arthritis, and knee problems, including continual dislocation. Eucommia bark is also believed to have diuretic properties that aid in reducing swelling. Although it can be used alone, eucommia bark is most often used in conjunction with other herbs that support its functions.

In addition to healing tissues, eucommia bark has two other major functions. In pregnant women it is given to calm the fetus, soothe the uterus, and prevent miscarriage. Eucommia bark also has the ability to lower blood pressure. This property has been investigated since 1974 and is well established. It may be related to the herb's mild diuretic action.

Other modern uses of eucommia bark include treatment of **impotence**, premature ejaculation, and as a mild anti-inflammatory. It is included in tonics that boost the immune system and generally improve wellness. However, as of the early 2000s, there was little rigorous scientific research to support these uses.

In the late 1990s Japanese researchers became interested in eucommia bark. In 2000, researchers at Nihon University in Chiba, Japan, published two studies showing that both the leaves and the bark of *Eucommia ulmoides* contained a compound that encourages the development of collagen in rats. Collagen is an important part of connective tissues such as

KEY TERMS

Collagen—A white, fibrous protein that is found in skin, bones, ligaments, tendons, cartilage, and all other connective tissue.

Decoction—The liquid made by boiling an herb, then straining out the solid material.

Diuretic—Any substance that increases the production of urine.

Yang aspects—Identifies qualities such as warmth, light, and activity.

Yin aspects—Identifies qualities that are the opposite of yang aspects, such as cold, stillness, darkness, and passiveness.

tendons and ligaments. They found that the compound was present in much greater quantities in fresh leaves and fresh bark and that much of it was destroyed during the drying process.

In modern Japan, eucommia leaves are also believed to help with weight loss by reducing the urge to eat. For this reason, beginning in the late 1990s eucommia leaves became an increasingly popular herb there. As of the early 2000s, there were no scientific studies to support this function of the herb.

Preparations

Eucommia bark is harvested and dried. Before boiling, it is sliced to expose the inside of the bark. The bark is then boiled to make a decoction. Generally this decoction is combined with other herbs and extracts to create *yang* enhancing tonics to treat kidney and liver deficiencies and impotence.

Precautions

Eucommia bark has a long history of use with no substantial reported problems.

Side effects

No side effects have been reported with the use of eucommia bark. However, the bark contains latex. People who develop **contact dermatitis** (a rash) from exposure latex appear to be able to ingest tonics containing eucommia bark without stimulating an allergic reaction. Nevertheless, individuals with latex allergy should be cautious about using this herb.

Interactions

Eucommia bark is often used in conjunction with other herbs with no reported interactions. Since eucommia bark has been used almost exclusively in Chinese medicine, there are no studies of its interactions with Western pharmaceuticals as of the early 2000s. People who are taking tonics containing eucommia bark should tell their doctors before taking traditional drugs, especially drugs that regulate blood pressure.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

Tish Davidson, A. M.

Eupatorium

Definition

Eupatorium is a genus of flowering plants with a somewhat uncertain taxonomic description. At times, it has included anywhere from a few dozen to a few hundred species of plants. Some herbal specialists suggest that the genus is one of the most valuable groups of plants for medical purposes of any in the plant kingdom. Some species to which health benefits are credited are:

- *E. ageratoides*, or White Snake-root
- *E. album*, or White Thoroughwort
- *E. aromaticum*, or Mata
- *E. ayapana*, or Water Hemp
- *E. cannabinum*, or Hemp Agrimony
- *E. glutinosum*

- *E. nervosum*, or Bitter-Bush
- *E. perfoliatum*, or Boneset
- *E. purpureum*, or Joe Pye Weed, or Gravelroot (also Gravel Root)
- *E. rotundifolium*
- *E. rebaudiana*, or Sweet Herb
- *E. teucrifolium*, or Wild Horehound

Eupatorium occurs naturally in temperate regions of North American, Europe, and eastern Asia. Most species are herbaceous plants or shrubs ranging in height from 2 to 10 feet. Flower color, leaf structure, and other physical properties differ somewhat from species to species within the genus.

Medical uses

The two most widely used members of the Eupatorium genus are *E. perfoliatum* and *E. purpureum*. *E. perfoliatum*, or **Boneset** has been widely used by Native Americans for centuries for a variety of uses, and it continues to be popular among herbalists today. The herb is recommended as a digestive tract stimulant, and as a diuretic, laxative, and diaphoretic (an agent that increases perspiration). It is also used as an antipyretic (for the reduction of **fever**) and for the treatment of **gout** and **influenza**. Because of its modest anti-inflammatory properties, it is sometimes used to treat arthritis. All parts of the *E. purpureum* plant are used for medical purposes, although the roots are thought to have the strongest effects. The plant is named after an American Indian who reputedly used it to cure typhus among his neighbors. The dried plant is said to be an effective treatment for kidney and urinary problems, while a tea made from those parts is used as a diaphoretic and antipyretic and for the treatment of rheumatism and **edema**. A less familiar member of the genus in North America is *E. ayapana*, a native of South America, where people have traditionally used the herb to treat a wide variety of disorders including stomach and liver disorders. It has also been used as an antiseptic and vulnerary (wound healing) agent and for the treatment of coughs and tumors.

Side effects

Both Boneset and Joe Pye weed are toxic to humans and other animals in large doses. Pregnant women and individuals with liver problems are advised not to take any form of Eupatorium internally. In general, care must be observed in using either herbal medicine. Some possible side effects include the following:

- nausea
- diarrhea
- vomiting
- rash or itchy or swollen skin
- chest pain
- tightness in the throat or chest
- difficulty in breathing
- muscular weakness or tremors
- constipation

KEY TERMS

Antidiuretic—An agent that reduces fever.

Diaphoretic—A substance that increases the rate of perspiration.

Diuretic—A substance that increase urination.

Interactions

No interactions between Eupatorium preparations and other drugs or foods have as yet been reported. The lack of such information should not be taken to mean that interactions are not possible, however, and individuals should report to their physicians or healers of other medications or herbal supplements they may be taking.

Resources

BOOKS

Hatfield, Gabrielle. *Encyclopedia of Folk Medicine: Old World and New World Traditions*. Santa Barbara, CA: ABC CLIO, 2004.

PERIODICALS

Clavina, M., et al. "Anti inflammatory Activity of Flavo noids from *Eupatorium arnottianum*." *Journal of Eth nopharmacology* (July 2007): 585 589.

Gupta, Malaya, et al. "Antimicrobial Activity of *Eupato rium ayapana*." *Fitoterapia* (April 2002): 168 170.

Lans, Cheryl. "Ethnomedicines Used in Trinidad and Tobago for Reproductive Problems." *Journal of Eth nobiology and Ethnomedicine* (March 2007): 13.

Maia, J. G. S., et al. "Essential Oils Composition of Eupa torium Species Growing Wild in the Amazon." *Bio chemical Systematics and Ecology* (December 2002): 1071 1077.

Navarro, Garca V. M., et al. "Antifungal Activities of Nine Traditional Mexican Medicinal Plants." *Journal of Ethnopharmacology* (July 2003): 85 88.

OTHER

"Boneset." GNC Live Well. http://gnclivewell.com.au/healthnotes.aspx?org gncau&ContentID 2052000 (February 6, 2008).

"Eupatorium perfoliatum." abcHomeopathy. http://abchomeopathy.com/r.php/Eup per (February 6, 2008).
"Gravel Root Extract." Kalyx. http://www.kalyx.com/store/proddetail.cfm/ItemID/117406.0/CategoryID/6000.0/SubCatID/2075.0/file.htm (February 6, 2008).

David Edward Newton, Ed.D.

Euphrasea officinalis see **Eyebright**

Euphrasia

Definition

Euphrasia is a genus of about 450 herbaceous flowering plants. The common name for the genus is **eyebright**, (*Euphrasia officinalisa*) name that comes from the most common traditional medical use for the plant: the treatment of eye disorders.

Description

The name *euphrasia* is derived from one of the three graces in Greek mythology, Euphrosyne, whose name means "gladness." In spite of this classical reference, the plant's medicinal uses were apparently not mentioned until about the fourteenth century, when it was recommended for the cure of all manner of eye diseases. Some early writers (as well as some modern observers) claim healing powers for euphrasia that extend beyond eye problems to include a cure for colds, headaches, and other head problems and an aid to improved memory.

The physical characteristic of euphrasia plants vary depending on soil and other growing conditions. In less desirable conditions, it is a very small plant, sometimes no more than 1 in (2.5 cm) in height. In better environments, it may grow to 8 in (20.3 cm) or more. It has deeply–cut leaves and flowers set on terminal spikes that may be white, bluish–white, violet, or purple in color, often with distinct purple veins. The lower (and sometimes upper) lip contains a yellow patch that apparently acts as a guide for bees, which relish the plant's nectar. The plant occurs in many parts of the world, ranging from mountain tops to near–desert conditions.

Uses

Herbalists, naturopaths, and homeopaths recommend the use of euphrasia for nearly every manner of eye disorder, including irritated eyes, **conjunctivitis**, inflammation of the eyes and eyelids, watery eyes, injuries to the eyes, impaired eyesight, and eye problems related to other diseases and disorders, such as colds, the flu, and **allergies**. They often suggest using the herb in a variety of other head–related problems, such as **headache**, nasal problems, sore throats, and discharge from the eyes, nose, or mouth. In 2008, Natural Standard, an international agency that collects data on complementary and alternative therapies, noted that "[l]ittle data exists regarding the safety and toxicity of eyebright," that there was little clinical evidence on the efficacy of eyebright in treating pink eye, and that there had been essentially no research on the use of eyebright for the treatment of other eye problems or other conditions for which it is recommended.

Natural Standard did take note of the fact that euphrasia contains significant amounts of iridoid glycosides, which have been found to have significant antibacterial action and hepatoprotective (liver–protecting) properties. No research has yet suggested medicinal uses of euphrasia based on these properties.

Preparations

Euphrasia is usually commercially available as a tincture in which the leaves, flowers, and stems of the plant are collected, cut up, and dried and **essential oils** removed in alcoholic solution. The herb can also be prepared as an extract by combining two cups of water with one tablespoon of dried plant parts and boiled for ten minutes. Euphrasia, as a water extract, is also often used as a topical application to the eyes and surrounding areas.

Side effects

Scientific research on the safety and efficacy of euphratis is limited. For this reason, the German Commission E, which has studied the medicinal value of more than 300 herbal medications, has recommended that consumers not use euphratis. The herb is available for sale and use in the United States, however. Almost nothing is known about possible toxic effects of euphratis, although a number of side effects have been documented, including:

- headache
- stuffy nose
- vision problems
- stuffy nose
- muscle weakness
- confusion
- restlessness
- sneezing

KEY TERMS

Allopathy—A method of treating disease by using substances that are opposite to the symptoms presented by a patient.

Conjunctivitis—Inflammation of the conjunctiva, the mucous membrane surrounding the eye. Also known as pinkeye.

Ophthalmic—Relating to the eye.

Tincture—A preparation made by mixing an herb with an alcohol water solution.

Because of uncertainties about its safety, euphrasia is generally not recommended during **pregnancy** and breastfeeding. In 2008, the website Drugs.com recommended that "[t]he range of adverse effects [of eyebright] is considered to outweigh the dubious benefits."

Interactions

No interactions between euphratis and prescription or non–prescription medications have been reported. However, some providers warn against using the herb with allopathic ophthalmic products since the combination of drug and herb might tend to "overwhelm" the body's optical system.

Resources

BOOKS

Gruenwald, Joerg, Thomas Brendler, and Christof Jaenicke, eds. *PDR for Herbal Medicines,* 4th edition. London: Thomson Healthcare, 2007.

Karalliedde, Lakshman, Rita Fitzpatrick, and Debbie Shaw. *Traditional Herbal Medicines: A Guide to Their Safer Use*. London: Hammersmith Press, 2007.

Mars, Brigitte. *The Desktop Guide to Herbal Medicine: The Ultimate Multidisciplinary Reference to the Amazing Realm of Healing Plants, in a Quick study, One stop Guide*. Laguna Beach, CA: Basic Health Publications, 2007.

Schmukler, Alan. *Homeopathy: An A to Z Home Handbook*. Woodbury, MN: Llewellyn Publications, 2006.

PERIODICALS

Petrichenko, V., et al. "Chemical Composition and Antiox idant Properties of Biologically Active Compounds from *Euphrasia brevipila*." *Pharmaceutical Chemistry Journal* (June 2006): 312 316.

Petrichenko, V., et al. "The Technology and Pharmacolog ical Properties of Dry Extract from *Euphrasia brevipila* Grass." *Pharmaceutical Chemistry Journal* (March 2005): 145 148.

Rhee, D. J., et al. "Complementary and Alternative Medi cine for Glaucoma." *Survey of Ophthalmology* (July 2001): 43 55.

OTHER

Botanical.com. "Eyebright." http://www.botanical.com/botanical/mgmh/e/eyebri20.html#med (February 16, 2008).

MDIdea Exporting Division. "Eyebright Just the Greek Euphrasia. Euphrosyne. Gladness." http://www.mdidea.com/products/new/new028.html#07 (February 16, 2008).

Sahelian, Ray. "Eyebright Herb." http://www.raysahelian.com/eyebright.html. (February 16, 2008).

David Edward Newton, Ed.D.

Evening primrose oil

Description

Evening primrose (*Oenothera biennis*) is a tall, hardy, native biennial of the Onagraceae family. Its Latin name is derived from the Greek word *oinos* for wine and *thera* for hunt and reflects the folk belief that the herb could minimize the ill effect of over-indulgence in wine following a hunt.

The plant thrives in dry, sunny meadows, and is abundant in many parts of the world. The leaves of the first-year plant form a bright-green, basal rosette. In the second year, the coarse, erect stalk reaches up to 4 ft (1.2 m) high with hairy, alternate, lanceolate leaves with a distinctive mid rib. Leaves grow from 3–6 in (7.6–15.2 cm) long. The blossoms are pale yellow with a slight lemon scent and a cup-like shape. They grow in clusters along the flower stalk, and bloom from June to September, opening at dusk to attract pollinating insects and night-flying moths. These phosphorescent blossoms inspired a common name for the herb, evening star. The seeds grow within an oblong, hairy capsule. The root is large and fleshy.

General use

The medicinal components of evening primrose are found in the seed-extracted oil, which contains **essential fatty acids** including gamma **linoleic acid** (GLA). GLA is often deficient in the Western diet and is needed to encourage the production of prostraglandins. Low levels of essential fatty acids may increase the symptoms of **premenstrual syndrome** (PMS), diabetes, etc. Evening primrose oil has been used to treat PMS and menopausal symptoms, **asthma**, and has been shown to reduce high blood **cholesterol** levels.

Evening primrose flower. *(© Photo Researchers, Inc. Reproduced by permission.)*

KEY TERMS

Antioxidant—Any of several substances that have been shown to counteract the damaging effects of oxidation in human and animal tissue. Evening primrose oil is rich in antioxidants.

Biennial—A plant that requires two years to complete the cycle from seed to maturity and death.

Catechin—A yellow, slightly bitter antioxidant found in evening primrose oil. Catechin appears to slow tumor growth and to protect against heart disease.

Mucilage—A gelatin-like plant substance found in leaves and stems. Any substance that resembles mucilage in having a thick or sticky texture is said to be mucilaginous.

Research conducted in Great Britain has indicated that evening primrose oil can also be medicinally useful in the treatment of nerve disorders, such as **multiple sclerosis** and **rheumatoid arthritis**. The essential oil does appear to be of some benefit in cases of alcohol poisoning and in alleviating hangovers, and to ease symptoms of alcohol withdrawal. The oil can also help relieve dry eyes, brittle nails, and **acne** when combined with **zinc**. When taken as a supplement, evening primrose has helped to promote weight loss.

Traditionally, Native Americans valued evening primrose as a treatment for **bruises** and **cuts**. The Flambeau Ojibwe tribe soaked the whole plant in warm water to make a poultice for healing bruises and to overcome skin problems. The mucilaginous juice in the stem and leaf can be applied externally to soothe skin irritations, or may be eaten to relieve digestive discomfort and for its stimulating effect on the liver and spleen. The astringent properties of the plant are helpful to soothe inflamed tissue. The plant has sedative properties and has been used to decrease hyperactivity in children.

The entire plant is edible. The root from the first-year growth is a nutritious pot herb. Boiled roots taste somewhat like parsnips.

Evening primrose oil is valued for its antioxidant properties. **Antioxidants** are substances that counteract the damaging effects of oxidation in living tissue. A team of Canadian researchers has recently identified the specific antioxidant compounds in evening primrose oil; one of them, a yellow substance known as catechin, appears to inhibit the growth of cancerous tumors and to lower the risk of **heart disease**.

Preparations

Evening primrose oil is prepared commercially and widely available in health food stores. The extract should be stored in a cool, dry place in order to avoid spoilage. Capsules are also available. Correct dosage should be decided in consultation with a practitioner.

An ointment can be prepared by mixing one part of the diced plant with four parts of heated petroleum jelly. Stored in a tightly closed container and refrigerated, the preparation will maintain its effectiveness. Apply as needed to soothe the skin.

Precautions

Use by persons with **epilepsy** is discouraged because evening primrose oil appears to lower the effectiveness of medications used to treat epilepsy. Physicians should be consulted before using evening primrose oil on children.

Side effects

There have been some reports of **headache**, **nausea**, loose stools, and skin rash after using evening primrose preparations.

Resources

BOOKS

Lust, John. *The Herb Book*. New York: Batam Books, 1974.

Mabey, Richard. *The New Age Herbalist*. New York: Simon & Schuster, 1988.

McVicar, Jekka. *Herbs for the Home*. New York: Viking Studio Books, 1995.

Phillips, Roger, and Nicky Foy. *The Random House Book of Herbs*. New York: Random House, 1990.

PERIODICALS

Wettasinghe, M., F. Shahidi, and R. Amarowicz. "Identifi cation and Quantification of Low Molecular Weight Phenolic Antioxidants in Seeds of Evening Primrose (*Oenothera biennis L.*)." *Journal of Agricultural and Food Chemistry* 50 (February 27, 2002): 1267 1271.

Clare Hanrahan
Rebecca J. Frey, PhD

***Evodia rutaecarpa* blooming.** *(©blickwinkel / Alamy)*

Evodia fruit

Description

Evodia fruit is the small, reddish fruit of the plant *Evodia rutaecarpa*. This plant is native to northern China and Korea, although it is cultivated as an ornamental landscaping plant in many other places in the world.

E. rutaecarpa is a deciduous tree that grows to a height of about 30 ft (10 m) along the sunny edges of woodlands and in suburban settings as an ornamental. It has long, dark green, shiny leaves and blooms with many small clusters of white flowers in the summer. The fruit, which is the part of the plant used in healing, is reddish when it appears in August and darkens to black by November. The fruit is harvested for medicinal purposes when it is not yet ripe and reddish brown in color. It is then either used fresh or dried. Evodia fruit is also known by its Chinese name *wu zhu yu* and is called *gosyuyu* in Japan.

General use

Evodia fruit has been used since at least the first century A.D. in **traditional Chinese medicine** (TCM). It is characterized as having a warm nature and an acrid, bitter, slightly toxic taste, although the fruit is quite fragrant.

Taken internally, evodia fruit is used to treat symptoms of abdominal distress. These include **nausea**, **vomiting**, and **diarrhea**. It is said to be especially effective in treating morning diarrhea. Evodia is used to stimulate the appetite and to treat abdominal symptoms associated with lack of interest in food.

Evodia is also used as a painkiller. It is a remedy for headaches, especially headaches associated with nausea and vomiting. Traditional Chinese herbalists use it to treat **pain** in the upper abdomen and pain associated with abdominal hernias. According to Chinese herbalism, the warm nature of the evodia fruit counteracts cold conditions in the stomach.

There are several other reported uses of evodia fruit. The root bark taken internally is considered useful for expelling parasitic tapeworms and pinworms. The fruit is also believed to have contraceptive properties. Various healers report that the fruit has anti-inflammatory, anti-tumor, anti-viral, astringent, and diuretic properties. Although evodia fruit has been used for thousands of years in China, its use only in modern times increased in Japan.

Scientific research

Scientists, primarily from Japan and China, have undertaken laboratory studies of evodia fruit to determine which traditional uses are supported by modern medical findings.

Researchers at AGI Dermatics in Freeport, New York, studied the effect of evodia extract on skin inflammation. The researchers concluded that compounds found in evodia had powerful anti-inflammatory activity when used on human skin.

That finding was consistent with previous studies by Japanese researchers. They found that compounds extracted from dried evodia fruit had anti-inflammatory and pain-reducing properties in dogs. Reduction of pain was believed to occur because the compounds interfere with pain receptors.

Furthermore, Chinese researchers in Taiwan consistently reported that extracts of evodia fruit interferes with blood clotting. It was anticipated that this finding could be of significance in treating **stroke**.

In addition, Japanese researchers discovered that in test-tube studies extracts of evodia fruit strongly inhibit the growth of one specific bacteria (*Helicobacter pylori*, a bacteria usually treated in mainstream medicine with antibiotics). Unlike conventional antibiotics, the extract did not alter the growth patterns of any other intestinal bacteria. This finding supported the traditional use of evodia fruit in digestive disorders.

Preparations

Evodia fruit can be used fresh, or it can be dried and ground into a powder for medicinal use. Powdered evodia fruit is sometimes mixed with vinegar to make a paste that is applied externally to the navel to relieve **indigestion**. A similar paste is applied to the soles of the feet to treat high blood pressure or directly to sores in the mouth.

Powdered evodia fruit is also taken internally. The usual daily dosage is 1.5 g to 5 g. The herb may be boiled in water and consumed.

Evodia fruit is often mixed with other herbs, such as **ginger**, **pinellia** root, or **coptis**, in formulas to control vomiting. In addition, evodia fruit is used in the TCM formulas ilex and evodia to treat symptoms of cold and flu, including **fever**, **chills**, swollen glands, and sore throat.

KEY TERMS

Deciduous—A tree or bush that sheds its leaves seasonally.

Diuretic—Any substance that increases the production of urine.

Yin—Opposite of yang and having qualities such as cold, stillness, darkness, and passiveness.

Precautions

Evodia fruit is considered by herbalists to be slightly toxic. It should be taken under the supervision of a practitioner or healthcare provider. Pregnant women should not use evodia fruit. Women who desire to conceive a child should keep in mind that evodia fruit is thought to have anti-fertility properties.

Furthermore, the United States Food and Drug Administration does not regulate herbal supplements such as evodia fruit, which means that the remedies have not proven to be safe or effective. The safety of evodia fruit has not been established for use by children, pregnant women, and nursing mothers. In addition, ingredients are not standardized to comply with federal regulations.

Side effects

Herbalists consider evodia fruit mildly toxic, so long-term use is discouraged.

Interactions

As of 2008, there were no known interactions associated with evodia fruit. Evodia fruit is often used in conjunction with other herbs and there were no reported interactions. Since evodia fruit has been used almost exclusively in Chinese medicine, there were no studies of its interactions with Western pharmaceuticals as of 2008.

Resources

PERIODICALS

Iwata, H., Y. Tezuka, S. Kadota, A. Hiratsuka, and T. Watabe. "Mechanism based Inactivation of Human Liver Microsomal CYP3A4 by Rutaecarpine and Limonin from Evodia Fruit Extract." *Drug Metabolism and Pharmacokinetics* (February 2005): 34 45.

Yarosh, D. B., J. W. Galvin, S. L. Nay, A. V. Peña, M. T. Canning, and D. A. Brown. "Anti Inflammatory Activity in Skin by Biomimetic of Evodia Rutaecarpa Extract from Traditional Chinese Medicine." *Journal of Dermatological Science* (April 2006): 13 21.

OTHER

"Euodia rutaecarpa." Plants for a Future. http://www.pfaf.org/database/plants.php?Euodia+ruticarpa. (February 28, 2008).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine, PO Box 162340, Sacramento, CA 95816, (866) 455 7999, http://www.aaom.org.

National Center for Complementary and Alternative Medicine, National Institute of Health (NCCAM), 9000 Rockville Pike, Bethesda, MD 20892, (888) 644 6226, http://nccam.nih.gov.

Tish Davidson
Liz Swain

Exercise

Definition

Exercise is any activity requiring physical exertion done for the sake of health. Activities range from walking and **yoga** to lifting weights and **martial arts**.

Origins

Regular exercise as a way of promoting health can be traced back at least 5,000 years to India, where yoga originated. In China, exercises involving martial arts, such as **t'ai chi**, **qigong**, and kung fu, developed possibly 2,500 years ago. The ancient Greeks also had exercise programs 2,500 years ago, which led to the first Olympic games in 776 B.C. Other exercise routines have been in use throughout Asia for hundreds of years.

Only within the last 100 years have the scientific and medical communities documented the benefits that even light but regular exercise has on physical and mental health.

The earliest forms of exercise stressed activities that involved stretching and light muscle resistance. Next came martial arts that promoted self-defense. In nearly all forms of Asian exercise routines, some type of **meditation** was a major component because the ancients believed physical and mental health went together. The ancient Greek and Roman civilizations advocated vigorous physical activity since exercise was associated with military training. The Greeks also believed that a healthy body would promote a healthy mind.

KEY TERMS

Aerobic—Any cardiovascular exercise that increases heart rate and breathing, such as jogging, bicycling, and swimming.

Cardiovascular—Relating to the heart and blood vessels.

Kung fu—Another name for qigong; today it more commonly means a Chinese martial arts practice.

Osteoporosis—A bone disease that causes a loss in bone density; occurs most often in postmenopausal women.

Qigong—A Chinese exercise system (similar to t'ai chi) where people learn how to control the flow and distribution of qi (life energy); thought to improve health and harmony of mind and body.

T'ai chi—A slow, relaxed, stylized form of exercise developed by the Chinese; can be called an "inner" martial art.

Taoism—A philosophy of life based on the writings of Chinese philosopher Lao-tse who lived about 500 B.C.

Yin and yang—A Taoist concept that the universe is split into two separate but complementary aspects. Balance is sought between the passive force of yin (female) and the active force of yang (male). The idea of balance between yin and yang is important in traditional Chinese medicine and is the object of various healing arts.

"Physical culture" was popular in the nineteenth and early twentieth centuries. Medical journals showed exercise machines in the 1800s in Europe and North America. Although weight training became popular with a small number of people in the 1940s, it was not until the 1960s that regular exercise programs began to flourish throughout the United States. Gymnasiums, once used mainly by male weight lifters and boxers as training facilities, now are common throughout the United States. Today's gyms and health clubs offer a wide range of exercise activities for men and women that can fit every lifestyle, age group, and exertion level.

Benefits

The medical community recognizes that regular exercise, along with a proper diet, is one of the two most important factors in maintaining good physical and mental health, and in preventing and managing

many diseases. Most certified physical trainers advocate at least 20 minutes of exercise at least three times a week. But for people who have a sedentary lifestyle, even walking for 10 minutes a day has health benefits. One study of 13,000 people followed for more than eight years showed that people who walk 30 minutes a day have a significantly reduced risk of premature death than people who did not exercise regularly.

Walking and other cardiovascular exercises can reduce the risk of **heart disease**, some cancers, **hypertension** (high blood pressure), arthritis, **osteoporosis**, **stroke**, and **depression**. A study by the Centers for Disease Control and Prevention (CDC) reported in 2001 that running just once a month could help keep bones strong. In addition to physical benefits, a 2001 study showed that exercising just 10 minutes a day can improve mental outlook.

A study released in 2003 reported that exercise combined with **behavioral therapy** may even help manage the symptoms experienced by Gulf War veterans. Specifically, exercise helped improve symptoms related to **fatigue**, distress, cognitive problems and mental health functioning. In the same year, the American Heart Association released a statement saying that exercise was beneficial even for patients awaiting heart transplants. Another study showed that women who participated in strenuous physical activity over a number of years could reduce their risk of **breast cancer**. Finally, research showed that men and women age 40 to 50 who exercised moderately for 60 to 90 minutes a day were less likely to catch a cold than those who sat around.

Description

Exercise comes in many forms, but there are three basic types: resistance, aerobics, and stretching. Yoga and martial arts are basically muscle stretching routines, walking and running are primarily aerobic, and weight lifting is mainly resistance. Exercises such as swimming are considered crossover activities since they build muscle and provide a good aerobic, or cardiovascular, workout. Certified physical trainers usually advocate a combination program that involves stretching, aerobics, and at least some resistance activity for 30-60 minutes a day three times a week.

Stretching and meditative exercises

The most common types of alternative health exercises are the ancient disciplines of yoga and the martial arts (such as t'ai chi and qigong).

YOGA. The ancient East Indian discipline of yoga is probably the most widely practiced exercise advocated by alternative health practitioners. This may be because there is a heavy emphasis on mental conditioning as well as physical exertion. Yoga is the practice of incorporating mind, body, and spirit through a series of physical postures, breathing exercises, and meditation. It improves muscle flexibility, strength, and tone while calming the mind and spirit. Most contemporary **stress** reduction techniques are based on yoga principles.

There are a variety of yoga styles, each with its own unique focus. In the United States, **hatha yoga** is the most practiced. The pace is slow and involves a lot of stretching and breathing exercises. Much like the Chinese philosophy of yin and yang, hatha yoga strives to balance the opposite forces of ha (sun) and tha (moon). Astanga, or power yoga, involves more intense yoga postures done in rapid succession. Its vigorous workout is especially good in developing muscle strength. Iyengar yoga promotes body alignment while kripalu yoga develops mind, body, and spirit awareness. Pranayama yoga is a series of breathing exercises designed to increase vitality and energy.

Yoga helps strengthen the heart and slow respiration. Studies have shown it is beneficial in treating a variety of conditions, including heart disease, hypertension, arthritis, depression, fatigue, chronic **pain**, and carpal-tunnel syndrome. A 2001 study at the Cleveland Clinic Foundation in Ohio looked at yoga's effect on people with lower back pain and pain due to conditions like **carpal tunnel syndrome** and arthritis. After a four-week period, investigators noted that yoga helped lessen pain, improve participants' moods and decreased pain medication requirements.

There are four main groups of yoga postures, also called asanas: standing, seated, reclining prone, and reclining supine. Other groups include forward bends, back bends, side bends, twists, inverted, and balancing. Within each group there are dozens of different yoga poses at beginning and advanced levels.

MARTIAL ARTS. While the words "martial arts" may be associated with conflict, they usually are graceful exercise movements that keep the body and mind strong and healthy. They can be performed by young and old. Martial arts range from simple stretching and meditative exercises to complicated and demanding exercises requiring more physical activity and mental concentration.

Probably the most popular among alternative health participants is t'ai chi, derived from the Chinese philosophy of Taoism and based on the concept of yin and yang. T'ai chi has a self-defense aspect based on

counteracting an opponent's attack and then counter-attacking, all in the same movement. As an exercise to maintain health, t'ai chi strengthens muscles and joints. It requires deep breathing techniques that increase blood circulation, benefiting the heart, lungs, and other organs. New research states that t'ai chi may improve physical functioning, like bending and lifting, in older age.

Another martial art growing in popularity in the United States is qigong (pronounced chee kung), although it has several forms that are more Taoist and Buddhist than martial. Qigong is a gentle exercise program that can increase vitality, enhance the immune system, and relieve stress when performed regularly. In China, there are hospitals that use qigong to treat terminal illnesses, particularly **cancer**.

Cardiovascular and aerobic

Aerobic, also called cardiovascular, exercises use a variety of muscle groups continuously and rhythmically, increasing heart rate and breathing. Specific aerobic activities include walking, jogging, running, bicycling, swimming, tennis, and cross-country skiing. Another popular form is aerobic dance exercise. Routines should last 10-60 minutes and be performed at least three times a week. Aerobic exercise is especially beneficial for losing weight and building endurance.

Aerobic exercises can be done outside a formal setting, with little or no equipment. However, since boredom is a frequent cause for stopping exercise, it often is beneficial to participate in exercise classes or join a gym or health club. Exercising with a group often helps with motivation. Also, health clubs usually offer a variety of stationary aerobic equipment, such as bikes, treadmills, stair climbers, and rowing machines.

Resistance

Resistance exercises generally are accomplished by lifting weights such as barbells and dumbbells, or by using a variety of resistance machines. They can also be done using only the body as resistance, such as doing push-ups, pull-ups, and sit-ups. Resistance exercise is particularly good for building muscles. For patients with kidney disease, weight lifting offers added benefit. Chronic kidney disease can lead to muscle wasting, which is compounded by low-protein **diets** that may be described for these patients. A 2001 study demonstrated that resistance training can improve muscle mass in kidney disease patients.

Unlike aerobics, which can be done daily, weight-lifting exercises require a period for the muscles to rest and rebuild. A total-body workout should be done every other day, or two to three times a week. A more advanced workout would exercise the lower body muscles one day and upper body muscles the next. It is also important to do 5-10 minutes each of warm-up and cool-down exercises, which will help increase flexibility and decrease soreness and fatigue.

Preparations

No advance preparations are required for exercising. However, a trainer can test a person's strength level and outline an appropriate program. Proper shoes are essential, especially for running. Any exercise should start with a warm-up of 5-10 minutes. Anyone considering a regular exercise program should consult first with a doctor, and possibly a sports podiatrist, to avoid strain and injury. Persons with serious health problems, such as heart disease, diabetes, **AIDS**, **asthma**, and arthritis should only begin an exercise regimen with their doctor's approval.

Precautions

In most people, the main exercise precaution is to avoid strain and overexertion. Exercise does not need to be strenuous to be beneficial. People with certain chronic health problems should take special precautions. Diabetics should closely monitor their blood sugar levels before and after exercising. Heart disease patients should never exercise to the point of chest pain. Exercise can induce asthma. It is essential for people with asthma to get their doctor's permission before starting an exercise program. It also is important for people to be shown the proper form in any activity to avoid strain and possible injury, especially when using exercise equipment. People also should know what parts of the body might be stressed by a particular exercise. They can then use supplemental exercises or stretches to add balance to the exercise program.

Side effects

The primary adverse effects of exercising can be sore muscles and stiff joints a day or two after beginning an exercise routine. These pains may last for several days. Other minor problems can include headaches, **dizziness**, fatigue, and **nausea**, usually indicating the exercise routine is too strenuous. A person can agitate old injuries or create new ones by improperly using equipment or wearing inadequately cushioned shoes.

Research and general acceptance

There almost is universal acceptance by allopathic and homeopathic health practitioners that exercise can be beneficial to overall good health. Thousands of studies during the past several decades link regular exercise to reduced risks for heart disease, stroke, diabetes, **obesity**, depression, hypertension, and osteoporosis. For example, a 1998 study by Harvard University of more than 11,000 people showed that people who exercise for an hour a day cut their risk of stroke in half over people who do not exercise regularly.

Training and certification

No special training or certification is required for exercising. People who want help in developing an exercise program should consult a certified physical trainer.

Resources

BOOKS

Devi, Nischala Joy, and Dean Ornish. *The Healing Path of Yoga: Time Honored Wisdom and Scientifically Proven Methods That Alleviate Stress, Open Your Heart, and Enrich Your Life*. New York: Three Rivers Press, 2000.

Feuerstein, Georg, et al. *The Yoga Tradition: Its History, Literature, Philosophy and Practice*. Prescott, AZ: Hohm Press, 1998.

Goldberg, Linn, and Diane L. Elliot. *The Healing Power of Exercise: Your Guide to Preventing and Treating Dia betes, Depression, Heart Disease, High Blood Pressure, Arthritis, and More*. New York: John Wiley & Sons, 2000.

McArdle, William D., et al. *Essentials of Exercise Physiol ogy*. Philadelphia: Lippincott, Williams & Wilkins, 1999.

Norris, Christopher M. *The Complete Guide to Stretching*. London: A & C Black, 2000.

PERIODICALS

Castaneda, Carmen, et al. "Resistance Training to Coun teract the Catabolism of a Low protein Diet in Patients with Chronic Renal Insufficiency." *Annals of Internal Medicine* (December 4, 2001): 965 912.

"Cognitive Behavioral Therapy Plus Exercise May Alleviate Symptoms." *Mental Health Weekly Digest* (March 31, 2003): 3.

"Exercise May Help Patients." *Heart Disease Weekly* (March 30, 2003): 44.

"Fast Facts." *Runner's World* (November 2001): 24.

Mooney, Linda, and Shelly Reese. "I Fought My Cancer Comeback in the Gym." *Prevention* (June 1999): 177.

"Stay Active to Stay Cold Free: A Recent Study Found that You can Ward Off the Sniffle with a Little Exercise." *Natural Health* (March 2003): 30.

Sternberg, Steve. "Exercise Helps Some Cancer." *Science News* (May 3, 1997): 269.

"Strenuous Physical Activity Throughout Life can Decrease Risk." *Cancer Weekly* (March 18, 2003): 32.

"Study is First to Confirm Link Between Exercise and Changes in Brain." *Obesity, Fitness and Wellness Week* (February 22, 2003): 13.

"Yoga Provides a Fresh Twist on Pain Relief." *Tufts Uni versity Health and Nutrition Letter* (November 2001): 2.

ORGANIZATIONS

Aerobic and Fitness Association of America. 15250 Ventura Blvd., Suite 200, Sherman Oaks, CA 91403. (877) 968 2639. http://www.afaa.com.

American Council on Exercise. 5820 Oberlin Dr., Suite 102, San Diego, CA 92121 0378. (858) 535 8227. http:// www.acefitness.org.

American Society of Exercise Physiologists. Department of Exercise Physiology, The College of St. Scholastica, 1200 Kenwood Ave., Duluth, MN 55811. (218) 723 6297. http://www.css.edu/asep.

National Council of Strength & Fitness. P.O. Box 557486, Miami, FL 33255. (800) 772 6273. http://www.ncsf.org.

Ken R. Wells
Teresa G. Odle

Eyebright

Description

Eyebright (*Euphrasia officinalis*) is an annual plant that grows wild in meadows, grassy areas, heaths, and pastures of Britain, northern and western Asia, North America, and Europe. It belongs to the Scrophulariaceae plant family, which also includes the **foxglove** plant.

Eyebright grows to a height of 4-8 in (10-20 cm) and has small white or purple flowers with red spots. These petals resemble bloodshot eyes, suggesting the plant's name and its eye-clearing action. Downy hairs cover the stems, which produce toothed leaves.

Eyebright is a semiparasitic plant. This means that it is nourished by the roots of other plants. Generally, it does not grow well if transplanted from the wild. The plant is harvested during the late summer or fall when the flowers are in bloom. The whole plant is cut off just above the root and then dried.

Eyebright contains vitamins A, C, D, and B complex; **iron**; silicon; and traces of **iodine**, **copper**, and **zinc**. Other components of eyebright include tannins, iridoid glycosides, the flavonoids rutin and **quercetin**,

KEY TERMS

Annual—A plant that grows every year.

Blepharitis—A condition where the eyelids become red, irritated, and scaly. The eyes are painful, red, and inflamed.

Conjunctivitis—An inflammation of the mucous membranes that cover the outer eyeball and line the eyelids. The eye appears red or pink and is itchy or sore.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Tincture—The concentrated solution of an herbal extract made with alcohol.

essential fatty acids, glycoside aucuboside, caffeic and ferulic acids, sterols, **choline**, and a volatile oil.

History

The Latin name *Euphrasia* is derived from the Greek word "Euphrosyne," meaning gladness. Euphrosyne was the name of one of three Graces known for her joy and happiness. The ancient Greeks used eyebright to treat eye **infections**, thereby creating happiness.

Eyebright has been used as a folk medicine to treat eye inflammations and infections, coughs, and poor memory since the Middle Ages. The poet Milton mentions eyebright in his book *Paradise Lost*, in which the archangel Michael gives eyebright to Adam to cure an eye infection. In 1485, eyebright was listed in a German book on medicinal herbs. Many sixteenth century herbalists championed eyebright as a treatment for various eye diseases. During the time of Queen Elizabeth, an eyebright ale was popular. Dried eyebright was often combined with tobacco and smoked to provide relief for bronchial colds.

General use

Modern herbalists still prescribe eyebright as a popular remedy for eye irritations and disorders, such as **conjunctivitis** and blepharitis. Icelanders use the juice from the pressed plant to treat most eye afflictions. Scottish people make an infusion in milk for inflamed or weak eyes. Eyebright is used to treat poor vision, eye strain, eye infections, sensitivity to light, and eye ulcers. Eyebright's antiseptic properties are highly regarded in soothing and cooling eyes that itch, burn, weep, and are red.

Eyebright is beneficial in the treatment of coughs, colds, **allergies**, sinusitis, **hay fever**, earaches, headaches, **jaundice**, throat and bronchial congestion, hoarseness, flu, and sinus inflammation. The flavonoids in eyebright act as anti-inflammatory agents that can help relieve inflamed mucous membranes of the eyes, sinuses, and upper respiratory tract. Eyebright's astringent properties also help reduce inflammation and mucous drainage, making the plant a popular remedy for many allergy, cold, and sinus symptoms.

Preparations

The stems, leaves, and flowers of the plant are collected and dried for medicinal use. Eyebright is often combined with **goldenseal** to treat eye afflictions. Eyebright may also be combined with **goldenrod**, **elder** flower, and/or goldenseal to provide relief from congestion.

In **homeopathy**, *Euphrasia officinalis* is a remedy used to treat colds accompanied by a nonirritating, watery nasal discharge and frequent burning tears. Conjunctivitis with symptoms of red eyes and lips, and acrid, watery tears may also be treated with this remedy. *Euphrasia officinalis* is also used as a remedy for **measles** and allergies.

Eyebright is available in bulk form for teas or compresses, and in capsule and tincture forms. Capsules and tinctures should be used as directed on the commercial package.

To make a tea, 1 cup of boiling water is poured over 2-3 teaspoons of dried eyebright and steeped for 5-10 minutes. One cup should be drunk three times daily to maintain eyesight, relieve nasal congestion, and soothe coughs. This infusion can also be used as an eye bath to treat inflamed or painful eyes. The mixture is cooled, and then the eyes are bathed with the warm liquid three to four times daily.

To make a compress, 1-2 tablespoons of dried eyebright are simmered in 1 pint (0.4 l) of water for 10 minutes. The mixture is cooled and then strained. A clean cloth is dipped in the mixture, wrung out, and then placed over the eyes for 15 minutes several times daily. Caution should be used when applying compresses. An unsterilized, homemade compress of eyebright may contain bacteria that could lead to an eye infection.

Precautions

A qualified herbalist should be consulted before administering eyebright to children. Although herbalists

maintain the benefits of eyebright, there are no known scientific studies or research to validate these claims.

Side effects

If a tincture solution of eyebright is placed on the eyes, tearing, **itching**, reddening, and swelling of the eyelids may develop because of the alcohol in the tincture. Eyebright may also cause a skin rash or **nausea**.

Interactions

There are no known interactions.

Resources

BOOKS

Pahlow, Mannfried. *Healing Plants*. Barron's Educational Series, Inc., 1993.

Jennifer Wurges

F

Facial massage

Definition

Facial massage is a very popular Western beauty treatment to slow down the **aging** process and achieve younger-looking and healthier skin. It is also used to relieve **stress**, **migraine headache**, **premenstrual syndrome** (PMS) and sinus congestion. It may involve a whole massage session, a portion of a whole-body massage or a part of a facial treatment. Facial massage can be done by a professional massage therapist, an esthetician, or a cosmetologist. Simple massage can also be done at home. Massage of the face is usually done with the hands; however, mechanical massaging devices are also used in beauty salons or spas. A small amount of oil or lotion is often applied to facilitate movement over the delicate facial areas.

In Eastern therapies, facial massage is part of a full-body treatment in which pressure points on the face and neck are stimulated in order to release blockages in the flow of qi, or vital energy. Lotions or oils are not used on the face in **acupressure**, **shiatsu**, or **yoga** techniques of facial massage.

Origins

Massage has been used for **pain** relief, healing and cosmetic improvement by people of all cultures since ancient times. The first written record of **massage therapy** is a Chinese medical text dating from the third century B.C. The ancient Greeks, Persians, Japanese and Indians also recorded the use of massage treatment in great detail in their early medical literature.

The Western version of facial massage as a cosmetic treatment is a relatively recent twentieth-century innovation. It has become especially popular in Europe. Many of the best-known European practitioners have set up shop in the United States and taught others. This form of facial massage has generally been regarded as belonging more to estheticians and makeup artists than to massage therapists.

Benefits

Western-style facial massage may offer the following potential benefits:

- improvement of facial skin and muscle tone.
- relaxation of facial and eye muscles
- relief from tension headaches and facial pain
- alleviation of stress and anxiety
- overall physical and mental relaxation

Facial massage as part of Eastern therapies may offer the following potential benefits:

- stimulation of meridian points on the face
- relief from eyestrain
- correction of liver and gall bladder imbalances
- relief of neck tension
- alleviation of nervous disorders
- relief of premenstrual water retention

Description

Western-style facial massage

In Western massage, a facial massage as part of a full-body treatment is different from a full facial treatment, which includes masks, steaming, and similar techniques. A regular massage simply includes massage of the face, usually at the beginning or the end of the massage session.

For a Western facial massage, a gentle effleurage (gliding) movement is most often used. To perform the facial massage, the strokes must be gentle as well as stimulating, in order not to stretch the skin. Pressure strokes should move upward to give the muscles of the

Massage therapist performing a facial massage. *(Custom Medical Stock Photo. Reproduced by permission.)*

face a lift rather than dragging them down. A typical facial massage includes the following steps:

- Before the massage, wash hands with soap and clean water. If the person to be massaged wears contact lens, ask her or him to remove them.
- Position: The most comfortable position has the client lying down on a massage table or sitting in a chair. Facial massage can be done, however, on any flat surface like a clean floor.
- Using a small amount of cleanser, gently wash the client's face. Wet cotton pads or facial sponges or wedges can be used to apply the cleanser. Then remove the cleanser, using fresh damp cotton pads.
- Apply the massage cream or lotion and begin massaging the face and neck areas in small symmetrical circles. The strokes should move up the neck and along the contour of the face. Do not leave out any facial muscles.

KEY TERMS

Massage—A rubbing or kneading with hands or other parts of the body to stimulate circulation, make joints more supple and relieve stress or tension.

- Next, gently glide the back of the hands across the forehead with light pressure. Placing the thumbs side by side on the center of the forehead with the hands cradling the face, draw the thumbs outward towards the temples and make a gentle sweeping movement around the temple. Repeat the movement several times to relieve tension in the temples.
- Apply pressure in the hollow areas under the eyebrows by placing the hands along the sides of the face; use the thumb to press gently under the ridge one spot at a time. Move the pressure point from the inner to the outer edge of the brows and repeat the thumb pressure. This technique can help relieve tension headache.
- Position the thumbs alongside the nose bridge with hands cupping the face. Firmly slide the thumbs downward to the nostrils and outwards along the contour of the cheeks applying pressure along the way. Gently release the pressure when the thumbs reach the hairline. Then pull both hands up alongside the face towards the top of the head and away from the face. Repeat this motion two more times.
- Position fingertips in the cheek muscles and gently make circling movements counter-clockwise for a few times moving along the cheek muscles. This motion alleviates tension in the cheek area.
- Gently stroke the ears with the index fingers and thumbs while moving along the rims of the ears. This technique is very relaxing and enjoyable.
- Position the fingers just behind the neck while pressing with a thumb pad on a spot in the jaw area and circling this spot before moving to the next one. Holding the chin with the fingers, stroke the chin with the thumbs using circular motions downward. Finish the jaw massage with gentle strokes alongside the chin. This movement releases tension in the mouth and jaw.
- Make circular motions on the scalp and comb the fingers through the hair to release tension from the face and the head and to stimulate the scalp.
- Finally, remove the massage cream or lotion with fresh and damp cotton pads. Most facials end with a special lotion applied to the face.

Facial massage in Eastern therapies

In shiatsu, acupressure, and similar Eastern therapies, pressure is applied to points on the face in order to stimulate or unblock the flow of vital energy in specific meridians. The pressure points located on the face, along with the conditions that they are used to treat, are as follows:

- Stomach 1, under the center of the eye along the nasal bone: Tension and eyestrain.
- Stomach 3, about 4 cm below Stomach 1 at the level of the base of the nose: Sinus and nasal congestion.
- Stomach 4, at the corners of the mouth: General stress and tension.
- Stomach 6, about 2 cm in front of the base of the ear lobe: Toothache.
- Conception vessel (end), between the lower lip and chin: Tension in the face and mouth.
- Bladder 1, at the inside corner of the eye: Headache and eyestrain.
- Gall bladder 1, a hollow about 2 cm from the outside corner of the eye: Headaches.
- Gall bladder 2, the hollow directly above and in front of the ear lobe: Ringing in the ears, swollen eyes, and dizziness.

Some yoga techniques include self-treatment for eye problems or tension by pressing the palms or knuckles against the pressure points surrounding the eyes.

Preparations

Western-style facial massage may require the following items:

- Towel to drape over the shoulders of the person to be massaged.
- Mild cleansing lotion to cleanse the face before massage.
- Moistened cotton pads, cotton-tipped swabs and facial tissues to remove cosmetics, cleansers and massage cream.
- Facial lotion or cream to facilitate the massage.

Facial massage as part of Eastern therapies does not require any specific preparation.

Precautions

Facial massage should not be done if any of the following conditions are present:

- Wearing contact lenses. The client should remove contact lenses before the procedure.
- Open sores, boils or cuts on the face.
- Inflamed or bruised skin.
- Recent scar tissue.
- Acne, psoriasis or eczema. Facial massage can worsen these conditions.

Side effects

Facial massage may irritate and worsen such skin conditions as **acne**, **psoriasis** or **eczema**.

Research and general acceptance

Western-style facial massage is a popular cosmetic procedure for many women and some men to improve the way the skin looks and feels. There is also evidence that massage can reduce stress, **headache** and facial pain.

Training and certification

Training requirements for cosmetologists and estheticians vary from state to state, ranging from a hair-care license to passing a required licensing examination. In addition to the techniques of facial massage, these beauticians may also be knowledgeable regarding clinical cosmetology and skin care.

Facial massage can also be performed by massage therapists as part of a full-body massage. Certified therapists are graduates of accredited massage programs who have passed the national certification examination in therapeutic massage. They are also required to participate in continuing education programs to keep their skills current.

Practitioners of shiatsu, acupressure, and similar Eastern therapies may be certified or licensed by institutions in the United States and abroad that offer instruction in these forms of treatment.

Resources

BOOKS

Beck, Mark F. *Milady's Theory and Practice of Therapeutic Massage,* 3rd ed. Albany, NY: Milady Publishing.

Gach, Michael Reed, with Carolyn Marco. *Acu Yoga: Self Help Techniques to Relieve Tension*. New York: Japan Publications, Inc., 1998.

Novick, Nelson Lee. *You Can Look Younger at Any Age: A Leading Dermatologist's Guide*. New York: Henry Holt and Company, 1996.

Price, Shirley. *Practical Aromatherapy,* Chapter Four, "Yin, Yang, and Shiatsu." London: Thorsons, 1994.

Tourles, Stephanie. *Naturally Healthy Skin*. Pownal, VT: Schoolhouse Road, 1999.

ORGANIZATIONS

American Massage Therapy Association. 820 Davis St., Suite 100. Evanston, IL 60201. (847) 864 0123. Fax: (847) 864 1178. E mail: info@inet.amtamassage.org. http://www.amtamassage.org.

National Association of Nurse Massage Therapists. 1710 East Linden St. Tucson, AZ 85719.
National Certification Board of Therapeutic Massage and Bodywork. 8201 Greensboro Dr., Suite 300. McLean, VA 22102. (703) 610 9015 or (800) 296 0664.

Mai Tran

Faith healing *see* **Prayer and spirituality**
Farsightedness *see* **Hyperopia**

Fasting

Definition

Fasting is voluntarily not eating food for varying lengths of time. Fasting is used as a medical therapy for many conditions. It is also a spiritual practice in many religions.

Origins

Used for thousands of years, fasting is one of the oldest therapies in medicine. Many of the great doctors of ancient times and many of the oldest healing systems have recommended it as an integral method of healing and prevention. Hippocrates, the father of Western medicine, believed fasting enabled the body to heal itself. Paracelsus, another great healer in the Western tradition, wrote 500 years ago that "fasting is the greatest remedy, the physician within." **Ayurvedic medicine**, the world's oldest healing system, has long advocated fasting as a major treatment.

Fasting has also been used in nearly every religion in the world, including Christianity, Judaism, Buddhism, and Islam. Many of history's great spiritual leaders fasted for mental and spiritual clarity, including Jesus, Buddha, and Mohammed. In one of the famous political acts of the last century, the Indian leader Mahatma Gandhi fasted for 21 days to promote peace.

Fasting has been used in Europe as a medical treatment for years. Many spas and treatment centers, particularly those in Germany, Sweden, and Russia, use medically supervised fasting. Fasting has gained popularity in American alternative medicine over the past several decades, and many doctors feel it is beneficial. Fasting is a central therapy in **detoxification**, a healing method founded on the principle that the build up of toxic substances in the body is responsible for many illnesses and conditions.

Benefits

Fasting can be used for nearly every chronic condition, including **allergies**, **anxiety**, arthritis, **asthma**, **depression**, diabetes, headaches, **heart disease**, high **cholesterol**, low blood sugar, digestive disorders, mental illness, and **obesity**. Fasting is an effective and safe weight loss method. It is frequently prescribed as a detoxification treatment for those with conditions that may be influenced by environmental factors, such as **cancer** and **multiple chemical sensitivity**. Fasting has been used successfully to help treat people who have been exposed to high levels of toxic materials due to accident or occupation. Fasting is thought to be beneficial as a preventative measure to increase overall health, vitality, and resistance to disease. Fasting is also used as a method of mental and spiritual rejuvenation.

Description

The principle of fasting is simple. When the intake of food is temporarily stopped, many systems of the body are given a break from the hard work of digestion. The extra energy gives the body the chance to heal and restore itself, and burning stored calories gets rid of toxic substances stored in the body.

The digestive tract is the part of the body most exposed to environmental threats, including bacteria, viruses, parasites, and toxins. It requires the most immune system support. When food is broken down in the intestines, it travels through the blood to the liver, the largest organ of the body's natural detoxification system. The liver breaks down and removes the toxic by-products produced by digestion, including natural ones and the chemicals now present in the food supply. During fasting, the liver and immune system are essentially freed to detoxify and heal other parts of the body.

Many healers claim that fasting is a particularly useful therapy for Americans and for the modern lifestyle, subjected to heavy **diets**, overeating, and constant exposure to food additives and chemicals. Some alternative practitioners have gone so far as to estimate that the average American is carrying 5-10 pounds of toxic substances in their bodies, for which fasting is the quickest and most effective means of removal.

Physiology of fasting

Through evolution, the body became very efficient at storing energy and handling situations when no food was available. For many centuries, fasting was probably a normal occurrence for most people, and

EVARTS LOOMIS (1910–2003)

Evarts G. Loomis is known as the father of holistic medicine. A homeopathic physician of international renown, he was an advocate of holistic treatment of dis ease, natural foods, exercise and meditation. Loomis was licensed to practice traditional medicine in 1946, but began early in his career to diverge from a quiet or dull practice. He served as a dog sled doctor with the Grenfell Mission in Newfoundland, Canada, worked in Algeria, as well as with the Friends Ambulance Unit in China before he founded Meadowlark, the first holistic retreat in North America. Loomis was a pioneer in the holistic health movement in the United States. He was also a proponent of regulated, monitored 24 36 hour fasts, touting the ben efits of both the water fast and the all juice fast.

He and his partner, Fay Loomis, operated Health and Growth Associates, from their home in Hemet, California. Loomis also utilized Dream Work and Kinesiology (the study of human movement) in his health and personal growth counseling.

the body adapted to it. It is estimated that even very thin people can survive for 40 days or more without food. The body has a special mechanism that is initiated when no food is eaten. Fasting is not starvation, but rather the body's burning of stored energy. Starvation occurs when the body no longer has any stored energy and begins using essential tissues such as organs for an energy source. Therapeutic fasts are stopped long before this happens.

Many physiological changes occur in the body during fasting. During the first day or so, the body uses its glycogen reserves, the sugars that are the basic energy supply. After these are depleted, the body begins using fat. However, the brain, which has high fuel requirements, still needs glucose (sugars converted from glycogen). To obtain glucose for the brain, the body begins to break down muscle tissue during the second day of the fast. Thus, during fasting some muscle loss will occur. To fuel the brain, the body would need to burn over a pound of muscle a day, but the body has developed another way to create energy that saves important muscle mass. This protein-sparing process is called ketosis, which occurs during the third day of a fast for men and the second day for women. In this highly efficient state, the liver begins converting stored fat and other nonessential tissues into ketones, which can be used by the brain, muscles, and heart as energy. It is at this point in the fast that sensations of hunger generally go away, and many people experience normal or even increased energy levels. Hormone levels and certain functions become more stable in this state as well. The goal of most fasts is to allow the body to reach the ketosis state in order to burn excess fat and unneeded or damaged tissue. Thus, fasts longer than three days are generally recommended as therapy.

Weight loss occurs most rapidly during the first few days of a fast, up to 2 lbs (1kg) per day. In following days, the figure drops to around 0.5 pound per day. An average weight loss of a pound a day for an entire fast can be expected. Studies show that cutting back just once a month can jump-start healthier eating and help rid one's body of a lifetime of extra calories.

Performing a fast

Fasts can be performed for varying lengths of time, depending on the person and his or her health requirements. For chronic conditions, therapists recommend from two to four weeks to get the most benefits. Seven-day fasts are also commonly performed. A popular fasting program for prevention and general health is a three-day fast taken four times per year, at the change of each season. These can be easily performed over long weekends. Preventative fasts of one day per week are used by many people as well.

Juice fasts are also used by many people, although these are not technically fasts. Juice fasts are less intensive than water fasts because the body does not reach the ketosis stage. The advantage of juice fasts is that fruit and vegetable drinks can supply extra energy and nutrients. People can fit a few days of juice fasting into their normal schedules without significant drops in energy. Juice fasts are also said to have cleansing and detoxifying effects. The disadvantage of juice fasts is that the body never gets to the ketosis stage, so these fasters are thought to lack the deep detoxification and healing effects of the water fast.

Medical supervision is recommended for any fast over three days. Most alternative medicine practitioners, such as homeopaths, naturopathic doctors, and ayurvedic doctors, can supervise and monitor patients during fasts. Those performing extended fasts and those with health conditions may require blood, urine, and other tests during fasting. There are many alternative health

KEY TERMS

Ayurvedic medicine—A traditional healing system developed in India.

Toxin—A substance that has poisonous effects on the body.

clinics that perform medically supervised fasts as well. Some conventional medical doctors may also supervise patients during fasts. Costs and insurance coverage vary, depending on the doctor, clinic, and requirements of the patient.

Preparations

Fasts must be entered and exited with care. To enter a fast, the diet should be gradually lightened over a few days. First, heavy foods such as meats and dairy products should be eliminated for a day or two. Grains, nuts, and beans should then be reduced for several days. The day before a fast, only easily digested foods like fruits, light salads, and soups should be eaten. During the fast, only pure water and occasional herbal teas should be drunk. If you **exercise**, keep your workouts during fasting light and relatively brief, stopping immediately if you feel dizzy, lightheaded or short of breath.

Fasts should be ended as gradually as they are entered, going from lighter to heavier foods progressively. The diet after a fast should emphasize fresh, wholesome foods. Fasters should particularly take care not to overeat when they complete a fast.

Precautions

Fasting is not appropriate for everyone and, in some cases, could be harmful. Any person undertaking a first fast longer than three days should seek medical supervision. Those with health conditions should always have medical support during fasting. Plenty of water should be taken by fasters since dehydration can occur. Saunas and sweating therapies are sometimes recommended to assist detoxification, but should be used sparingly. Those fasting should significantly slow down their lifestyles. Taking time off of work is helpful, or at least reducing the work load. Fasters should also get plenty of rest. Exercise should be kept light, such as walking and gentle stretching.

Side effects

Those fasting may experience side effects of **fatigue**, malaise, aches and pains, emotional duress, **acne**, headaches, allergies, swelling, **vomiting**, bad breath, and symptoms of colds and flu. These reactions are sometimes called *healing crises*, which are caused by temporarily increased levels of toxins in the body due to elimination and cleansing. Lower energy levels should be expected during a fast.

Research and general acceptance

The physiology of fasting has been widely studied and documented by medical science. Beneficial effects such as lowered cholesterol and improved general functioning have been shown. Fasting as a treatment for illness and disease has been studied less, although some studies around the world have shown beneficial results. A 1984 study showed that workers in Taiwan who had severe **chemical poisoning** had dramatic improvement after a ten-day fast. In Russia and Japan, studies have demonstrated fasting to be an effective treatment for mental illness. Fasting was featured on the cover of the *New England Journal of Medicine*, although mainstream medicine has generally ignored fasting and detoxification treatments as valid medical procedures.

The majority of research that exists on fasting is testimonial, consisting of individual personal accounts of healing without statistics or controlled scientific experiments. In the alternative medical community, fasting is an essential and widely accepted treatment for many illnesses and chronic conditions.

Training and certification

The International Association of Professional Natural Hygienists (IAPNH) is an organization of healthcare professionals who specialize in therapeutic fasting. It certifies doctors who have completed approved residencies in therapeutic fasting, including conventional medical doctors, naturopaths, and osteopathic doctors.

Resources

BOOKS

Cott, Alan. *Fasting: The Ultimate Diet*. Chicago: Hastings House, 1997.

Fuhrman, Joel, M.D. *Fasting and Eating for Health*. New York: St. Martin's, 1995.

Page, Linda, N.D. *Healthy Healing*. CA: Healthy Healing Publications, 1998.

PERIODICALS

Kallen, Ben."The Slow Fast: Fasting May Not be for You, but a Few 1,000 Calorie Days can Launch You into Better Health." *Men's Fitness* (April 2002): 34.

ORGANIZATIONS

Fasting Center International. 32 West Anapurna St., #360, Santa Barbara, CA 93101. http://www.fasting.com.

Douglas Dupler
Teresa G. Odle

Dried damiara is one of several herbal remedies used to counteract fatigue. *(Geoff Kidd / Photo Researchers, Inc.)*

Fatigue

Definition

Fatigue is physical and/or mental exhaustion that can be triggered by **stress**, medication, overwork, mental and physical illness, or disease.

Description

Everyone experiences fatigue occasionally. It is the body's way of signaling its need for rest and sleep. But when fatigue becomes a persistent feeling of tiredness or exhaustion that goes beyond normal sleepiness, it is usually a sign that something more serious is amiss.

Physically, fatigue is characterized by a profound lack of energy, feelings of muscle weakness, and slowed movements or central nervous system reactions. Fatigue can also trigger serious mental exhaustion. Persistent fatigue can cause a lack of mental clarity (or feeling of mental "fuzziness"), difficulty concentrating, and in some cases, **memory loss**.

Causes and symptoms

Fatigue may be the result of one or more environmental causes such as inadequate rest, improper diet, work and home stressors, or poor physical conditioning. It also can be one symptom of a chronic medical condition or disease process in the body. **Heart disease**, low blood pressure, diabetes, end-stage renal disease, iron-deficiency **anemia**, **insomnia**, **narcolepsy**, **sleep apnea**, chronic obstructive pulmonary disease (COPD), **cancer** or cancer treatment, and untreated **parasitic infections** are a few of the diseases and disorders that can cause long-term, ongoing fatigue symptoms. Acute illnesses such as viral and bacterial **infections** can also trigger temporary feelings of exhaustion. In addition, mental disorders such as **depression** can cause fatigue.

Many common medications, including antihistamines, antibiotics, and blood pressure drugs, may cause drowsiness as a side effect. Individuals already experiencing fatigue who are prescribed one of these medications may wish to check with their healthcare provider about alternative treatments.

Extreme fatigue that persists unabated for at least six months, is not the result of a diagnosed disease or illness, and is characterized by flu-like symptoms such as swollen lymph nodes, **sore throat**, and muscle weakness and/or **pain** may indicate a diagnosis of **chronic fatigue syndrome** (CFS). CFS, also called chronic fatigue immune deficiency syndrome, is a debilitating illness that causes overwhelming exhaustion and a number of neurological and immunological symptoms. Between 1.5 and 2 million Americans are estimated to have this disorder, which is found worldwide. CFS is definitely associated with immune system response and likely caused by a virus or bacteria, although no single cause has yet been identified.

Diagnosis

Patients know when they are fatigued, but because fatigue is a symptom of a number of different disorders, diseases, and lifestyle choices, diagnosing the cause may be difficult. A thorough examination and patient history by a qualified healthcare provider is the first step in determining the cause of the fatigue. A physician can order blood, urine, and other tests to rule out physical conditions and diseases that feature fatigue as a symptom and can also determine if prescription drugs, poor dietary habits, work environment, or other external stressors could be triggering the exhaustion. Several diagnostic tests may also be required to rule out common physical causes of exhaustion, such as blood tests to check for iron-deficiency anemia.

Diagnosis of chronic fatigue syndrome is significantly more difficult. Because there is no specific biological marker or conclusive blood test to check for the disorder, healthcare providers must rely on the patient's condition

and the severity of symptoms to make a diagnosis. In many cases, individuals with chronic fatigue syndrome go through a battery of invasive diagnostic tests and several years of consultation with medical professionals before receiving a correct diagnosis.

Treatment

The treatment of fatigue depends on its direct cause, but there are several commonly prescribed treatments for non-specific fatigue, including dietary and lifestyle changes, the use of **essential oils** and herbal therapies, deep breathing exercises, **traditional Chinese medicine**, and **color therapy**.

Dietary changes

Inadequate or inappropriate nutritional intake can cause fatigue symptoms. To maintain an adequate energy supply and promote overall physical wellbeing, individuals should eat a balanced diet and observe the following nutritional guidelines:

- Drink plenty of water. Individuals should try to drink a minimum of eight glasses of water a day. Dehydration can reduce blood volume, which leads to feelings of fatigue.
- Eat iron-rich foods (i.e., liver, raisins, spinach, apricots). Iron enables the blood to transport oxygen throughout the tissues, organs, and muscles, and diminished oxygenation of the blood can result in fatigue. Adequate iron is especially important for women of reproductive age, as blood, and the iron it contains, are lost with every menstrual cycle.
- Avoid high-fat meals and snacks. High-fat foods take longer to digest, reducing blood flow to the brain, heart, and rest of the body while blood flow is increased to the stomach.
- Eat unrefined carbohydrates and proteins together for sustained energy.
- Balance proteins. Limiting protein to 15 to 20 grams per meal and two snacks of 15 grams is recommended; however, not getting enough protein adds to fatigue. Pregnant or breastfeeding women should eat more protein.
- Get the recommended dietary allowance of B complex vitamins (specifically, pantothenic acid, folic acid, thiamine, and vitamin B_{12}). Deficiencies in these vitamins can trigger fatigue.
- Get the recommended daily allowance of selenium, riboflavin, and niacin. These are all essential nutritional elements in metabolizing food energy.
- Get the recommended daily allowance of calcium and vitamin D supplementation, which can lessen fatigue symptoms in persons with hypocalcaemia-caused fatigue and also help strengthen bones and prevent osteoporosis.
- Control portion size. Individuals should only eat when they are hungry and stop when they are full. An overstuffed stomach can cause short-term fatigue, and individuals who are overweight are much more likely to regularly experience fatigue symptoms.

Lifestyle changes

Lifestyle factors such as a high-stress job, erratic work hours (e.g., as flight attendants experience), lack of social or family support, or erratic sleep patterns can all cause prolonged fatigue. If stress is contributing to fatigue, **relaxation** therapies and techniques are available to help alleviate tension, including massage, **yoga**, **aromatherapy**, **hydrotherapy**, progressive relaxation exercises, **meditation**, and **guided imagery**. Some may also benefit from individual or family counseling or **psychotherapy** sessions to work through stress-related fatigue that is a result of family or social issues.

Maintaining healthy sleep patterns is critical to getting proper rest. Having a set bedtime helps to keep sleep on schedule. A calm and restful sleeping environment is also important to healthy sleep. Above all, the bedroom should be quiet and comfortable, away from loud noises and with adequate window treatments to keep sunlight and streetlights out. Removing distractions from the bedroom such as televisions and telephones can also be helpful. People who experience insomnia may find herbal or pharmaceutical treatment can help get them back into good sleep patterns.

Essential oils

Aromatherapists, hydrotherapists, and other holistic healthcare providers may recommend the use of essential oils of **rosemary** (*Rosmarinus officinalis*), **eucalyptus** blue gum (*Eucalyptus globulus*), **peppermint**, (*Mentha x piperata*), or scots pine oil (*Pinus sylvestris*) to stimulate the nervous system and reduce fatigue. These oils can be added to bathwater or massage oil as a topical application. Citrus oils such as lemon, orange, grapefruit, and lime have a similar effect and can be added to a steam bath or vaporizer for inhalation.

Herbal remedies

Herbal remedies that act as circulatory stimulants can offset the symptoms of fatigue in some individuals. An herbalist may recommend an infusion of **ginger** (*Zingiber officinale*) root or treatment with **cayenne** (*Capsicum annuum*), balmony (*Chelone glabra*), **damiana**

(*Turnera diffusa*), ginseng (*Panax ginseng*), or rosemary (*Rosmarinus officinalis*) to treat ongoing fatigue.

An infusion is prepared by mixing the herb with boiling water, steeping it for several minutes, and then removing the herb from the infusion before drinking. A strainer, tea ball, or infuser can be used to immerse loose herbs in the boiling water before steeping and separating them. A second method of infusion is to mix the loose herbal preparation with cold water first, bringing the mixture to a boil in a pan or teapot and then separating the tea from the infusion with a strainer before drinking.

Caffeine-containing central nervous system stimulants such as tea (*Camellia senensis*) and cola (*Cola nitida*) can provide temporary relief of fatigue symptoms. However, long-term use of **caffeine** can cause restlessness, irritability, and other unwanted side effects, and in some cases, it may actually work to increase fatigue after the stimulating effects of the caffeine wear off. To avoid these problems, caffeine intake should be limited to 300 mg or less a day (the equivalent of 4–8 cups of brewed, hot tea).

Traditional Chinese medicine

Chinese medicine regards fatigue as a blockage or misalignment of *qi*, or energy flow, inside the human body. The practitioner of Chinese medicine chooses **acupuncture** and/or herbal therapy to rebalance the entire system. The Chinese formula Minot Bupleurum soup (Xiao Chia Hu Tang) has been used for nearly 2,000 years for the type of chronic fatigue that follows **influenza**. In this condition, the person has low-grade **fever**, **nausea**, and fatigue. Other formulas are helpful in other cases. Acupuncture involves the placement of a series of thin needles into the skin at targeted locations on the body known as acupoints in order to harmonize the energy flow within the human body.

Deep breathing exercises

Individuals under stress often experience fast, shallow breathing. This type of breathing, known as chest breathing, can lead to shortness of breath, increased muscle tension, inadequate oxygenation of blood, and fatigue. Breathing exercises can both improve respiratory function and relieve stress and fatigue.

Deep breathing exercises are best performed while lying flat on the back on a hard surface, usually the floor. The knees are bent, and the body (particularly the mouth, nose, and face) is relaxed. One hand should be placed on the chest and one on the abdomen to monitor breathing technique. With proper breathing techniques, the abdomen will rise further than the chest. The individual takes a series of long, deep breaths through the nose, attempting to raise the abdomen instead of the chest. Air is exhaled through the relaxed mouth. Deep breathing can be continued for up to 20 minutes. After the **exercise** is complete, the individual checks again for body tension and relaxation. Once deep breathing techniques have been mastered, an individual can use deep breathing at any time or place as a quick method of relieving tension and preventing fatigue.

Color therapy

Color therapy, also known as chromatherapy, is based on the premise that certain colors are infused with healing energies. The therapy uses the seven colors of the rainbow to promote balance and healing in the mind and body. Red promotes energy, empowerment, and stimulation. Physically, it is thought to improve circulation and stimulate red blood cell production. Red is associated with the seventh chakra, located at the root, or base, of the spine. In yoga, the chakras are specific spiritual energy centers of the body.

Therapeutic color can be administered in a number of ways. Practitioners of Ayurvedic, or traditional Indian medicine, wrap their patients in colored cloth chosen for its therapeutic hue. Individuals experiencing fatigue would be wrapped in reds and oranges chosen for their uplifting and energizing properties. Patients may also be bathed in light from a color-filtered light source to enhance the healing effects of the treatment.

Individuals may also be treated with color-infused water, which is achieved by placing translucent red colored paper or colored plastic wrap over and around a glass of water and placing the glass in direct sunlight so the water can soak up the healing properties and vibrations of the color. Environmental color sources may also be used to promote feelings of stimulation and energy. Red wall and window treatments, furniture, clothing, and even food may be recommended for their energizing healing properties.

Color therapy can be used in conjunction with both hydrotherapy and aromatherapy to heighten the therapeutic effect. Spas and holistic healthcare providers may recommend red color baths or soaks, which combine the benefits of a warm or hot water soak with energizing essential oils and the fatigue-fighting effects of bright red hues used in color therapy.

KEY TERMS

Aromatherapy—Therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological wellbeing.

Guided imagery—Use of relaxation and mental visualization to improve mood and/or physical wellbeing.

Hydrotherapy—Use of water (hot, cold, steam, or ice) to relieve discomfort and promote physical wellbeing.

Allopathic treatment

Conventional medicine recommends the dietary and lifestyle changes outlined as a first line of defense against fatigue. Individuals who experience occasional fatigue symptoms may benefit from short-term use of caffeine-containing central nervous stimulants such as energy drinks, which make people more alert and improve coordination. However, these should be prescribed with caution, as overuse of the drug can lead to **sleep disorders** that result in increased fatigue.

Another reason to avoid extended use of caffeine is its associated withdrawal symptoms. People who use large amounts of caffeine over long periods build up a tolerance to it. When that happens, they have to use more and more caffeine to get the same effects. Heavy caffeine use can lead to dependence. If an individual stops using caffeine abruptly, withdrawal symptoms may occur, including **headache**, fatigue, drowsiness, yawning, irritability, restlessness, **vomiting**, or runny nose. These symptoms can go on for as long as a week.

Expected results

Fatigue related to a chronic disease or condition may last indefinitely, but it can be alleviated to a degree through some of the treatment options outlined above. Exhaustion that can be linked to environmental stressors is usually easily alleviated when those stressors are dealt with properly.

There is no known cure for chronic fatigue syndrome, but steps can be taken to lessen symptoms and improve quality of life for these individuals while researchers continue to seek a cure.

Prevention

Many of the treatments mentioned are also recommended to prevent the onset of fatigue. Getting adequate rest and maintaining a consistent bedtime schedule are the most effective ways to combat fatigue. A balanced diet and moderate exercise program are also important to maintaining a consistent energy level.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Davis, Martha, et al. *The Relaxation & Stress Reduction Workbook,* 6th ed. Oakland, CA: New Harbinger, 2008.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thompson Healthcare, 2007.

OTHER

"Chronic Fatigue Syndrome." *eMedicineHealth.com*. September 1, 2005. http://www.emedicinehealth.com/chronic_fatigue_syndrome/article_em.htm. (April 7, 2008).

"Fatigue." *eMedicine Health.com*. August 10, 2005. http://www.emedicinehealth.com/fatigue/article_em.htm. (April 7, 2008).

ORGANIZATIONS

Chronic Fatigue and Immune Dysfunction Syndrome Association of America (CFIDS), PO Box 220398, Chapel Hill, NC, 20222 0398, http://www.cfids.org.

Paula Ford-Martin
Teresa G. Odle
Tish Davidson, A. M.

Feldenkrais

Definition

The Feldenkrais method is an educational system that allows the body to move and function more efficiently and comfortably. Its goal is to re-educate the nervous system and improve motor ability. The system can accomplish much more, relieving pressure on joints and weak points, and allowing the body to heal repetitive strain injuries. Continued use of the method can relieve **pain** and lead to higher standards of achievement in sports, the **martial arts**, dancing and other physical disciplines.

Pupils are taught to become aware of their movements and to become aware of how they use their

MOSHE FELDENKRAIS (1904–1984)

Moshe Feldenkrais was born on the border between Russia and Poland. When he was only 13, he traveled to Palestine on foot. The journey took a year, and once there, young Feldenkrais worked as a laborer and cartographer, also tutoring others in mathematics. Moving to France in 1933, he graduated in mechanical and electrical engineering from the Ecole des Travaux Publiques de Paris.

Feldendrais became the first person to open a Judo center in Paris after meeting with Jigaro Kano. He was also one of the first Europeans to become a black belt in Judo, in 1936.

Obtaining his Ph.D. at the Sorbonne, he went on to assist Nobel Prize laureate, Frédéric Joliot Curie at the Curie Institute. During World War II in England, he worked on the new sonar anti submarine research.

Prompted by a recurring leg injury, he applied his knowledge of the martial arts and his training as an engineer to devise a method of re integrating the body. The concept was that more efficient movement would allow for the treatment of pain or disability, and the better functioning of the body as a whole. Later on, he would begin to teach what he had learned to others in Tel Aviv.

In addition to many books about judo, including *Higher Judo*, he wrote six books on his method.

bodies, thus discovering possible areas of **stress** and strain. The goal of Feldenkrais is to take the individual from merely functioning, to functioning well, free of pain and restriction of movement. Feldenkrais himself stated that his goal was, "To make the impossible possible, the possible easy, and the easy, elegant."

Origins

Moshe Feldenkrais (1904–1984) was a Russian-born Israeli physicist and engineer who was also an active soccer player and judo master. He devised his system in response to his own recurring knee injury, which had restricted his movement and caused him great pain over a long period of time. Feldenkrais believed that repeated muscle patterns cause the parts of the brain controlling those muscles to stay in a fixed pattern as well. He thought that the more the muscles are used, the more parts of the brain can be activated. He devised a method of re-educating the neuromuscular system and re-evaluating movement to increase efficiency and reduce stress, using his knowledge of mechanics and engineering, and applying some of his martial arts training.

Benefits

This method of re-educating the nervous system can be beneficial to a wide range of people, including athletes, children, the elderly, martial artists, those who are handicapped, people with special needs, and people with degenerative diseases. It has also proved popular with artists, particularly musicians, a number of whom have used Feldenkrais to improve their performance.

The Feldenkrais Guild of North America (FGNA) states that over half of the those who turn to Feldenkrais practitioners are seeking relief from pain. Many people who have pain from an injury compensate by changing their movements to limit pain. Often these changed movements remain after the pain from the original injury is gone, and new pain may occur. Feldenkrais helps students become aware of the changed movements and allows them to learn new movements that relieve their pain. Apart from the obvious physical benefits of more efficient movement and freedom from pain and restriction, Feldenkrais practitioners assert that there are other positive benefits for overall physical and mental health. Feldenkrais can result in increased awareness, flexibility, and coordination, and better **relaxation**. Feldenkrais practitioners have also noted other benefits in their students, including improvements in awareness, flexibility, coordination, breathing, digestion, sleep, mood, mental alertness, energy, and range of motion, as well as reduced stress and **hypertension**, and fewer headaches and backaches.

Musicians and athletes can improve their performance in many ways when they learn to use their bodies more efficiently. Feldenkrais can also help injured athletes regain lost potential and free them from pain and restriction of movement.

There are numerous accounts of the remarkable results obtained when Feldenkrais is taught to handicapped children so that they can learn to function despite their limitations. Handicapped people can learn to make full use of whatever potential they have, and to have more confidence in their abilities. Practitioners who specialize in teaching Feldenkrais to those who have handicaps have in many cases allowed the patient to discover ways of performing tasks which were previously thought to be impossible for them.

The elderly, whose movements are often restricted by pain and stiffness, can learn to overcome these

KEY TERMS

Neuromuscular—The body system of nerves and muscles as they function together.

Repetitive strain injury—Injury resulting from a repeated movement such as typing or throwing a ball.

obstacles with Feldenkrais instruction. In some instances even severe cases of arthritis have been conquered. Theoretically, Feldenkrais can make possible renewed levels of energy and freedom from restriction.

Description

Feldenkrais is described a being a dual system, with two components: "Awareness Through Movement" and "Functional Integration." The system aims to re-educate the body so that habitual movements that cause strain or pain can be relearned to improve efficiency and eliminate dangerous or painful action.

Feldenkrais helps to translate intention into action. In practice, an individual can learn to achieve his or her highest potential, while at the same time learning to avoid and eliminate stresses, **strains**, and the possibility of injury.

Functional integration

During this session, the patient wears comfortable clothing, and may sit, stand, walk, or lie on a low padded table. The practitioner helps the pupil by guiding him or her through a number of movements. The practitioner may use touch to communicate with the student, but touch is not used to correct any movements. The purpose of this session is to increase a student's awareness of his or her own movement and become open to different possibilities for movement. The instruction can be focused on a particular activity that the student does every day, or that causes him or her pain. The student can learn to alter habitual movements and re-educate the neuromuscular system. This type of session is particularly useful for those who have limitations originating from misuse, stress, illness, or accident. It can also help athletes and musicians perform to the best of their ability by increasing their possibilities for movement. It offers students the potential for improving their physical and mental performance in addition to heightening the sense of well-being.

Awareness through movement

Feldenkrais's martial arts background can be clearly identified in many of the aspects of Awareness Through Movement (ATM). During group sessions, pupils are taught to become acutely aware of all their movements and to imagine them, so that they can improve the efficiency of their actions in their minds, and put them into practice. Pupils are encouraged to be disciplined about practicing their exercises, to achieve maximum benefit.

Awareness through movement is described as an exploratory, nonjudgmental process through which pupils are encouraged to observe and learn about themselves and their movements. The range of this therapy is wide, and there are thousands of different lessons designed to help specific areas.

Preparations

No preparation is necessary for the practice of Feldenkrais, and all are encouraged to seek help from this system. No condition is considered a preclusion to the benefits of Feldenkrais.

Precautions

As with any therapy or treatment, care should be taken to choose a qualified practitioner. Feldenkrais practitioners stress that the body must not be forced to do anything, and if any movement is painful, or even uncomfortable, it should be discontinued immediately and the patient should seek professional help.

Side effects

No known side effects are associated with the practice of Feldenkrais.

Research and general acceptance

Since Feldenkrais began to teach his method, it has gradually gained acceptance as an education system. Published research using the method can be found in U.S. and foreign publications.

Training and certification

Guild-accredited Feldenkrais training courses leading to certification for the practice or teaching of the method are available throughout the United States and in other countries. Guild-certified Feldenkrais practitioners undergo a four-year training course (800 hours) that includes studying numerous movements and becoming aware of the smallest details in movement. After two years of formal training, practitioners may become authorized. The FGNA can be contacted to find a certified Feldenkrais practitioner.

Resources

BOOKS

Alon, Ruthy. *Mindful Spontaneity: Lessons in the Feldenk rais Method*. 2d ed. Berkeley: North Atlantic Books, 1996.

Bratman, Steven. *The Alternative Medicine Sourcebook*. 2d ed. Chicago: Lowell House, 1999.

Feldenkrais, Moshe. *Awareness Through Movement*. New York: HarperSanFrancisco, 1991.

Rywerant, Yochanan. *The Feldenkrais Method*. Chicago: Keats Publishing, 1991.

Shafarman, Steven. *Awareness Heals: The Feldenkrais Method for Dynamic Health*. Cambridge, Mass.: Per seus Publishing, 1997.

Somerville, Robert. *Alternative Medicine: The Definitive Guide*. Tiburon, Calif.: Future Medicine Publishing, Inc., 1999.

Stillerman, Elaine. *The Encyclopedia of Bodywork*. New York: Facts On File, Inc., 1996.

Thomas, Richard, and C. Norman Shealy, eds. *The Com plete Family Guide to Alternative Medicine*. Dorset, U.K.: Element Books Ltd., 1996.

Zemach Bersin, David and Kaethe, and Mark Reese. *Relaxercise*. New York: HarperSanFrancisco, 1990.

ORGANIZATIONS

Feldenkrais Guild of North America. 3611 SW Hood Ave., Suite 100, Portland, OR 97201. (800) 775 2118. (503) 221 6612. Fax: (503) 221 6616. http://www.feldenkrais.com.

Patricia Skinner

Feng shui

Definition

Feng shui, pronounced "foong swee" (Cantonese) or "fong shway" (Mandarin) is the Chinese art of arranging buildings, objects, and space in the environment in order to achieve energy harmony and balance. The English translation of Feng shui is "the way of Wind (feng) and Water (shui)" or "the natural forces of the universe."

Origins

Feng shui, derived from the Chinese concept of yin and yang, has been practiced for thousands of years. Evidence of the existence of this practice can be found in the alignment and organization of graves in the Yangshao villages from 6000 B.C. In fact, there is compelling evidence that suggests that feng shui was not strictly an Asian entity. In prehistoric Europe, the practice of arranging objects and structures to be in harmony with the universe was a relatively common practice.

A popular theory regarding the origins of feng shui suggests that the practice stemmed from ancient shaman who understood the vital importance of strategically placing a village. Areas that possessed mild winds would generate plentiful harvests while harsh winds would stunt crop growth or destroy the harvest altogether. In addition, the placement of a village in close proximity to flowing water and fresh springs would stimulate growth and ensure health, while stagnant water would foster disease and disharmony within the community. As the centuries passed, these shaman correlated their thoughts on wind and water with the teachings of Daoism, thus creating the practice of feng shui.

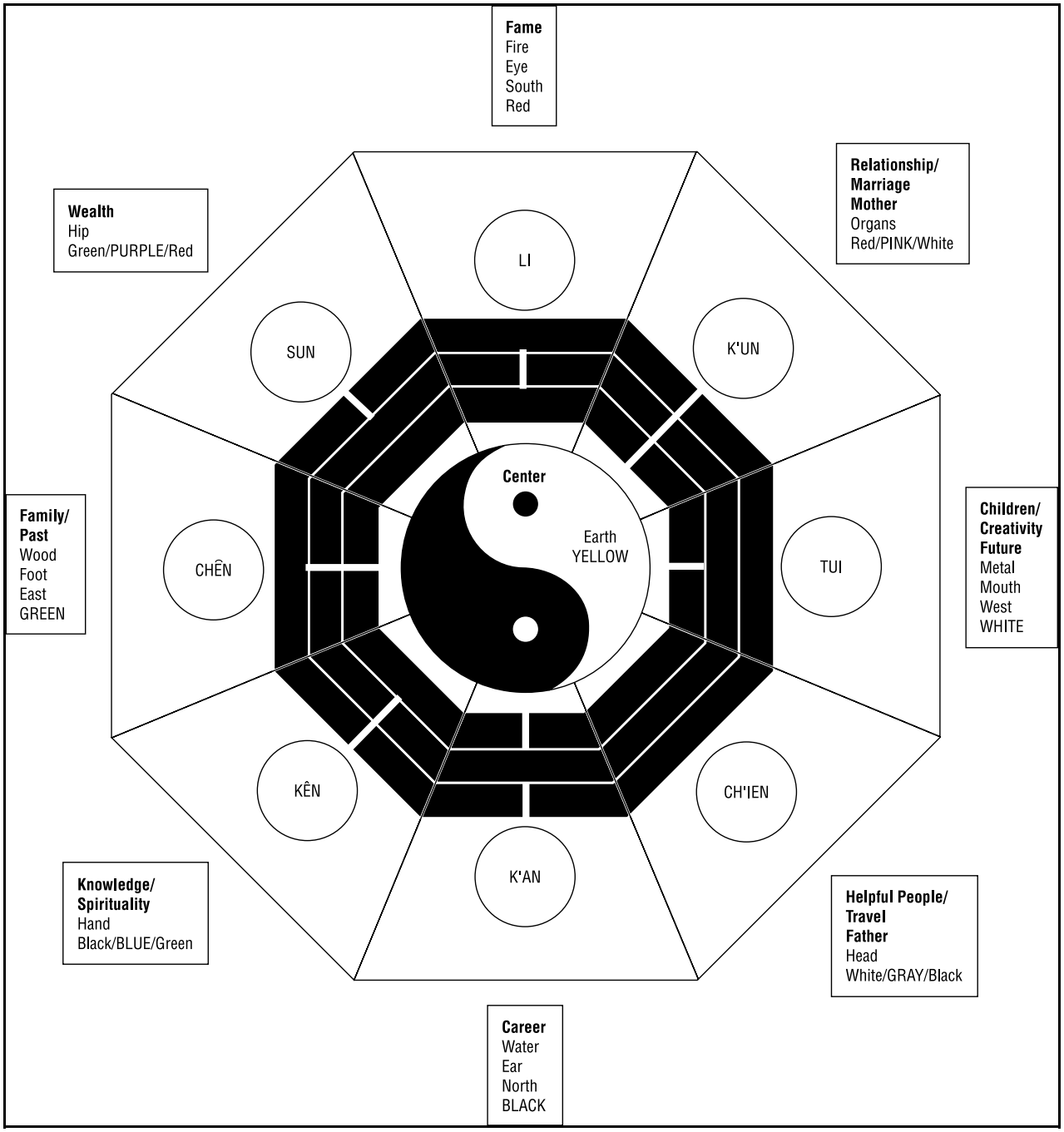
Benefits

As a design philosophy, "good" feng shui is believed to promote health, prosperity, creativity, positive social relationships, self-confidence, contemplation, and respect for others.

Description

An ancient Daoist Chinese theory of design and placement, feng shui grew from observations that an individual's surroundings elicit positive and negative effects. According to Daoism, everything that exists contains qi (chi), the energy or life force. This qi possesses two properties, yin (receptive) and yang (active)—they are opposites and cannot exist without the other. Within the qi, eight constituents compose the universe (the Lake, the Mountain, Fire, Water, Heaven, Thunder, Wind, and Earth). Each trigram, or combination of three yin/yang elements, represents a particular quality and pattern of energy. In turn, the proper arrangement of these energetic qualities would affect not only the qi of the environment, but that of the individual within the environment as well. With feng shui, the goal is to bring both into harmony so as to foster prosperity, health, and well-being with the Wind (feng) dispersing the qi throughout the universe and Water (shui).

The ba gua, or "Sequence of the Later Heaven," is the arrangement of the energy trigrams so that they exist in harmony and balance. Each trigram has a balancing partner that contributes to universal harmony. For example, Earth is balanced by the Mountain, Fire is balanced by the Water, Wind is balanced by Heaven, and Thunder is balanced by Lake. The ba gau is laid in a circular pattern with Fire at the top, followed by Earth, the Lake, Heaven, Water, the Mountain, Thunder, and



(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)

Wind (clockwise). The Taiji (or yin-yang symbol) is located in the center of the trigrams, and represents the unifying force of the universe.

Practitioners of feng shui use the ba gua to determine the energy flow throughout the home and in other living spaces. By corresponding the trigram pattern to the different parts of a room, a practitioner determines if the room is in harmony with the universe. For example, when analyzing a home office or workspace of a writer or artist, a feng shui specialist would pay particular attention to the portion of the room that corresponds to the Lake of the ba gua, because the Lake represents creative energy. If there is clutter or disorganization in the section of the room that corresponds to

KEY TERMS

Daoism—Also called Taoism, Dao means "the way." Daoism is a holistic spiritual philosophy of the universe that is based on the idea that all elements in the universe are interactive and interdependent with each other and that the universe and natural world are in a constant state of change, or flux.

the Lake, or if the room is partitioned so that the Lake section is actually occupied by a bookcase or closet, then the environment would be considered to stifle creativity. A feng shui specialist might recommend moving the office to a more hospitable room in the house, or reconstructing the storage space to free up the creative energy in the Lake section of the room. Good health is said to be located in the Wind trigram of the ba gua, so maintaining this space and using it effectively is critical to practitioners of feng shui.

There are many other design tenets of feng shui, but some of the most commonly used and basic concepts include:

- Energy, or qi, enters and exits rooms through doorways. Doors facing each other encourage qi to move too quickly through and out of the room. Doors on adjoining walls encourage a circular movement of qi that is considered relaxing and "good" feng shui.
- Arranging chairs, beds, chaises, sofas, or other seating with their backs to the door and/or windows is not recommended in feng shui. It is considered "bad" feng shui to leave the back exposed to possible attack through the door.
- Homes located at the end of a cul-de-sac, across from a church or other spiritual center, at the end of a bridge, or near a freeway are not desirable to feng shui practitioners because these locations all have either too fast or not enough energy flow.
- When choosing a home site to build on, the ideal location according to feng shui principles is a rectangular plot of land, on a hill, with open space in front of the home.
- The front door of a home should be in proportion to the size of the house. Too large or too small of an entrance will not facilitate proper qi flow through the home.
- Mirrors used in the home should not face chairs or beds.
- Windows should face only pleasing, natural views when at all possible. If a view is dreary, the feng shui of the room can be improved by using window treatments inside and/or window box plantings outside.

Precautions

Individuals should observe basic building code and fire safety rules when redesigning a home according to feng shui principles.

Feng shui adjustments to living space should not be relied upon as a sole source of treatment for individuals with health problems. Although feng shui principles can be employed as an adjunct, or complementary, treatment, proper diagnosis and treatment from a qualified healthcare professional is necessary in treating any chronic or acute physical disorder.

Research and general acceptance

Feng shui has been practiced throughout Asia for thousands of years, and has recently grown in popularity in the United States as a tool for home design. Although considered part of **traditional Chinese medicine** in Asia, it is not largely regarded as a healthcare tool in the United States, preventative or otherwise.

Training and certification

Certification and/or licensing is not required to practice feng shui in the United States. However, there are some national organizations that offer training and certification programs.

Resources

BOOKS

Henwood, Belinda. *Feng Shui: How to Create Harmony and Balance in Your Living and Working Environment*. Pownal, VT: Storey Books, 1999.

Williams, Tom. *The Complete Illustrated Guide to Chinese Medicine*. Boston, MA: Element Books, 1996.

ORGANIZATIONS

Geomancy, the Feng Shui Education Association. 2939 Ulloa Street, San Francisco, CA 94116. (415) 753 6408. http://www.geofengshui.com.

Paula Ford-Martin

Fennel

Description

Fennel (*Foeniculum vulgare*), also known as *F. officinale*, is a member of the Umbelliferae (Apiaceae) or carrot family, along with dill (*Anethum graveolens*),

caraway (*Carum carvi*), and **anise** (*Pimpinella anisum*). Fennel has a thick, spindle-shaped taproot that produces a pithy, smooth or finely-fluted round stem that may reach to 6 ft (1.8 m) in height. The finely divided leaves, with numerous thread-like segments, grow from a sheath surrounding the stalk at the base of the leaf stem. The delicate, blue-green filiform leaf segments have a pungent scent, somewhat similar to **licorice**, and an anise-like flavor. This characteristic is due to the presence of the phytochemical anethol, also a primary constituent of anise oil. Fennel's tiny yellow flowers form in large, compound umbells. The blossoms are frequently visited by bees, wasps, and other insects, and fennel leaf is a favorite food of the swallowtail-butterfly.

This perennial native of the Mediterranean is called marathon in Greece, a name derived from the word *maraino*, meaning to grow thin. Fennel was recommended as an herb for weight reduction, "to make people more lean that are too fat," according to the seventeenth century herbalist and astrologer Nicholas Culpeper. He considered fennel to be an herb of Mercury, under the sign of Virgo. In Chinese and Hindu cultures fennel was ingested to speed the elimination of poisons from the system, particularly after snakebite and scorpion **stings**. As one of the ancient Saxon people's nine sacred herbs, fennel was credited with the power to cure what were then believed to be the nine causes of disease. Fennel was also valued as a magic herb. In the Middle Ages it was draped over doorways on Midsummer's Eve to protect the household from evil spirits. As an added measure of protection, the tiny seeds were stuffed into keyholes to keep ghosts from entering the room.

Fennel was introduced to North America by Spanish missionaries for cultivation in their medicinal gardens. Fennel escaped cultivation from the mission gardens, and is now known in California as wild anise. English settlers brought the herb with them to the New England colonies where it became part of their kitchen gardens. In Puritan folk medicine fennel was taken as a digestive aid. The herb is still found growing on the sites of these early English settlements. This attractive, aromatic and sun-loving herb thrives on roadsides, embankments, sea cliffs, and in dry, stony fields.

There are several different species and varieties of fennel that may be annual, biennial, or perennial. *F. vulgare var. dulce*, known as sweet fennel, or *finocchio*, is cultivated for the fleshy basal stalks. The stalks may be eaten fresh, like celery, or boiled and baked as a vegetable. This delicacy is known in Italy as *carosella*. Fennel has naturalized in most temperate areas of the world, and is extensively cultivated for medicinal, ornamental, and culinary uses.

General use

The seeds, leaves, and roots of fennel are safe and edible. The essential oil, extracted from the seeds, is toxic even in small amounts. Fennel has been widely used in culinary and medicinal preparations for centuries. The herb acts as a carminative, and was traditionally employed as a digestive aid and remedy for flatulence. An infusion or decoction of the dried seeds is anti-spasmodic and will ease stomach pains and speed up the digestion of fatty foods. Fennel is a proven remedy for **colic** in infants, and is safe when administered as a mild infusion of the leaf and seed. It is also used for coughs and colds. Fennel exerts a calming influence on the bronchial tissues. The seeds contain large amounts of the phytochemical alpha-pinene, which acts as an expectorant and helps to loosen phlegm in the lungs. An eyewash, prepared from a decoction of the crushed seeds, is said to improve eyesight and reduce irritation and eyestrain. Fennel has a long history of use as a galactagogue. The seed, when boiled in barley water, acts to increase the flow of breast milk in nursing mothers. A poultice of the herb may be helpful to relieve swelling of the breasts during lactation. A leaf and seed tea has been used to expel hookworm and kill intestinal bacteria. Fennel has also been used to promote appetite. The entire herb is used in culinary dishes, and the fleshy sheaths surrounding the base of the leaf stems are a staple in Italian cuisine. The foliage, known as fennel weed, is used to flavor eggs, fish, stews, and vegetables. The root is sometimes grated fresh and added to salads. The licorice-flavored seeds are traditionally served after meals in India to cleanse the breath. The flowers produce a yellow tint and the leaves a light brown hue as a natural dye for wool fabrics.

Fennel seed contains volatile oil, most of which is identified as trans-anethole, with a much smaller amount identified as fenchone. Other components of the essential oil include limonene, camphene, and alpha-pinene.

Preparations

Harvest fennel leaf from time to time throughout the growing season. Use the fresh leaf when possible as the herb may lose much of the flavor when dried. The leaves may also be frozen for later use. Harvest the seeds in autumn. Seeds are fully ripe just as the color fades and the seed-bearing umbells turn from yellow-green to a light brown. Cut the brown umbell from the stalk and place it in a paper bag to dry in a warm room. Shake the dried seeds from the umbell and store them in tightly sealed, clearly labeled, dark-glass containers.

Harvest the root late in the fall at the same time the stems are harvested as a vegetable. The root is generally less medicinally potent than the seeds.

Seed infusion: Crush 1 tsp–1 tbsp of the dried seed, add to 1 cup of unchlorinated water, fresh milk, or barley water, in a non-metallic pot. Bring to a boil; then steep, covered, for about 10 minutes. A standard dosage of the tea is two to three cups per day.

Root decoction: Add one ounce of the clean, thinly-sliced dry root, or 2 oz of thinly-sliced fresh root, to 1 pt of unchlorinated water in a non-metallic pot. Bring to a boil and simmer for about 10 minutes. Strain and cover. A decoction may be refrigerated for up to two days and retain its healing qualities.

Tincture: Combine half a cup of dried fennel seeds with 1 pt of brandy or vodka in a glass container. Seal the container with an airtight lid. Leave to macerate in a darkened place for two weeks. Shake daily. Strain the mixture through a cheesecloth or muslin bag and pour into a dark bottle for storage up to two years. Dosage is 2–4 ml of the tincture two times a day.

Precautions

Pregnant women should not use the herb, seeds, tincture, or essential oil of fennel in medicinal remedies. Small amounts used as a culinary spice are considered safe. In large doses fennel acts as a uterine stimulant. The essential oil of fennel is toxic in doses as small as 5 ml, and may cause skin irritation, **vomiting**, seizure, and respiratory problems. The volatile oil should not be ingested. The herb and seed oil may cause **contact dermatitis** in sensitive individuals.

Interactions

None reported.

Resources

BOOKS

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. New York: Random House Value Publishing, Inc., 1996.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, LLC, 1997.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies. Emmaus, PA: Rodale Press, Inc., 1997.

Tierra, Lesley. *The Herbs of Life, Health & Healing Using Western & Chinese Techniques*. Santa Cruz, CA: The Crossing Press, Inc., 1997.

Tyler, Varro E., Ph.D. *Herbs Of Choice, The Therapeutic Use of Phytomedicinals*. New York: The Haworth Press, Inc., 1994.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Weiss, Gaea and Shandor. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Diana Erney. "Healing Garden: Fennel's Not Just for Cooking." *Organic Gardening* (September/October 1999): 20.

Clare Hanrahan

Fenugreek

Description

Fenugreek is an herb native to southeastern Europe, northern Africa, and western Asia, but is widely cultivated in other parts of the world. Its botanical name is *Trigonella foenum-graecum*; its English name comes from two Latin words meaning Greek hay. Fenugreek is an annual plant that grows 2–3 ft (0.6–0.9 m) tall, with a strong odor and small pale yellow flowers. The seed of the fenugreek plant contains many active compounds with pharmaceutical applications. The seeds are collected in the autumn. The chemical components of fenugreek seed include **iron**, **vitamin A**, vitamin B_1, **vitamin C**, phosphates, flavonoids, saponins, trigonelline, and other alkaloids. The seed is also high in fiber and protein.

General use

Quite apart from its therapeutic value, fenugreek is used as a seasoning and flavoring agent in foods, particularly in Egypt, India, and the Middle East. The maple smell and flavor of fenugreek have led to its use as a spice in foods, beverages, confections, tobacco, and imitation maple syrup. In some countries, the seeds are eaten raw or boiled, or the greens are enjoyed as a fresh salad. Extracts of fenugreek are used in some cosmetic products as well.

In addition to its use in flavoring foods, the antifungal and antibacterial properties of fenugreek are now being applied to food preservation. In June 2002, a high school student from Maryland was awarded a Lemelson-MIT Invention Apprenticeship for her invention of a food packaging paper made from fenugreek seeds.

Fenugreek *Trigonella foenum graecum* plant in pod. *(© Holt Studios International Ltd. / Alamy)*

KEY TERMS

Anticoagulant—Any substance that inhibits clotting action.

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects on living tissue.

Corticosteroid—A class of hormones generally produced by the adrenal cortex, and often used to lower inflammation.

Galactogogue—A substance that stimulates the production of breast milk in nursing mothers.

Mucilage—A gummy, gelatinous substance that coats fenugreek seeds and helps them absorb water.

Peristalsis—Sweeping, rhythmic contractions of the intestine that move the intestinal contents through the digestive tract.

Topical—Applied to the skin or external surface of the body.

Trigonelline—An alkaloid compound found in fenugreek.

The best-documented medical use of fenugreek is to control blood sugar in both insulin-dependent (type 1) and noninsulin-dependent (type 2) diabetics. Some studies also show that serum **cholesterol** levels in diabetics, and perhaps in others, are reduced by fenugreek. Doses as low as 15 mg per day may produce beneficial effects on fasting blood sugar, elevation of blood sugar after a meal, and overall glycemic control. The use of fenugreek is likely to alter the diabetic patient's need for insulin or other medications used to control blood sugar. This treatment should be supervised by a health care provider familiar with the use of herbal therapies for diabetes. The recommended doses of fenugreek can vary rather widely.

The seeds of fenugreek can also act as a bulk laxative as a result of their fiber and mucilage content. These portions of the seed swell up from being in contact with water, filling the bowel and stimulating peristaltic activity. For laxative purposes, 0.5–1 tsp of freshly powdered herb per cup of water, followed by an additional 8 oz water, can be taken one to three times daily. Patients should begin with the lowest effective dose of fenugreek; they should also avoid taking oral medications or vitamins at the same time as the herb.

Capsules of fenugreek seed are sometimes recommended as a galactogogue, or agent to increase milk production in the lactating mother. This use of the herb should be undertaken cautiously, since the evidence of safety for the nursing infant is only anecdotal. Some commercial teas promoted for the purpose of increasing lactation use fenugreek as an ingredient, but herbal concentration in teas can vary widely and are generally somewhat low.

There is some evidence that internal use of fenugreek seed can decrease some stone-forming substances in the kidney, particularly **calcium** oxalate. Patients who are prone to this type of kidney stone may wish to consult a health care provider about the advisability and dose of fenugreek seed for this use.

Fenugreek may encourage a flagging appetite, and is sometimes given during convalescence from illnesses to improve food intake, weight gain, and speed of recuperation.

Cancer researchers are also studying fenugreek for its potential effectiveness as a cancer chemopreventive. It is thought that fenugreek may help to prevent cancer by raising the levels of vitamin C, **vitamin E**, and other **antioxidants** in the bloodstream.

Historically, fenugreek has been used as a topical treatment for abscesses, **boils**, **burns**, **eczema**, **gout**, and ulceration of the skin as it has an anti-inflammatory effect. It is also reputedly useful for a number of digestive complaints, including **gastritis** and gastric ulcers. A study published in 2002 found that both an

aqueous solution and a gel fraction derived from fenugreek have anti-ulcer effects comparable to those of omeprazole, a standard medication given to reduce gastric secretions. The researchers found that the fenugreek solution protected the gastric mucosa from injury as well as reducing the secretion of gastric acid.

Fenugreek reportedly can be helpful in the induction of **childbirth**, as it is known to stimulate uterine contractions. For this reason it should not be taken during **pregnancy**. As a gargle, fenugreek may relieve sore throats and coughing. Arthritis, **bronchitis**, fevers, and male reproductive conditions are other traditional but unsubstantiated indications for this herb.

Preparations

Fenugreek may be purchased as bulk seeds, capsules, tinctures, or in teas. Due to the strong, bitter taste, capsules are used most often. The dose is variable, depending on the form of the herb that is used. The seeds may also be soaked to make a tea. For topical use, powdered fenugreek seed is mixed with water to form a paste. Herbal supplements should be stored in a cool, dry place, away from direct light and out of the reach of children.

Precautions

Fenugreek may, when taken in larger amounts than are used to season foods, cause contractions of the uterus. For this reason, women who are pregnant should avoid therapeutic doses. Frequent topical use of fenugreek preparations may cause skin irritation and sensitization. Symptoms of allergic reaction include swelling, numbness, and **wheezing**. This herb should not be used by anyone with sensitivity to fenugreek. Large doses (over 100 g per day) may cause intestinal symptoms, including **diarrhea**, **nausea**, and **gas**. Blood sugar can also drop to abnormally low levels. Fenugreek is generally recognized as safe, but its safety is not well-documented for use in small children, lactating women, or persons with liver or kidney disease.

Side effects

Depending on the dose used, fenugreek may cause a maple syrup odor in the patient's sweat and urine.

Interactions

Fenugreek can enhance anticoagulant activity, and should not be used with other herbs or medications (heparin, warfarin, ticlopidine) that have this effect due to increased risk of bleeding. It can lower blood sugar to a marked degree; blood sugar levels should be monitored closely, particularly in people who are taking insulin, glipizide, or other hypoglycemic agents. Medications that are being taken to control diabetes may need to have dosages adjusted, which should be done under medical supervision. In theory, since fenugreek is high in mucilage, it can alter the absorption of any oral medication. Corticosteroid and other hormone treatments may be less effective. Monoamine oxidase inhibitors (MAOIs) may have increased activity when used in conjunction with fenugreek.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Rocklin, CA: Prima Publishing, 1999.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. Tucson, AZ: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. Stockton, CA: Therapeutic Research Faculty, 1999.

Leninger, Skye. *The Natural Pharmacy*. Rocklin, CA: Prima Health, 1998.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Naturopathic Medicine. New York: Simon & Schuster, 2002.

PERIODICALS

Devasena, T., and V. P. Menon. "Enhancement of Circula tory Antioxidants by Fenugreek During 1,2 Dimethyl hydrazine Induced Rat Colon Carcinogenesis." *Journal of Biochemistry, Molecular Biology, and Biophysics* 6 (August 2002): 289 292.

Gabay, M. P. "Galactogogues: Medications That Induce Lactation." *Journal of Human Lactation* 18 (August 2002): 274 279.

Genet, S., R. K. Kale, and N. Z. Baquer. "Alterations in Antioxidant Enzymes and Oxidative Damage in Experimental Diabetic Rat Tissues: Effect of Vanadate and Fenugreek (*Trigonellafoenum graecum*)." *Molecu lar and Cellular Biochemistry* 236 (July 2002): 7 12.

Ohr, Linda M. "Catching Up with Diabetes." *Food Tech nology* 56 (September 2002): 87 92.

Pandian, R. S., C. V. Anuradha, and P. Viswanathan. "Gastroprotective Effect of Fenugreek Seeds (*Trigo nella foenum graecum*) on Experimental Gastric Ulcer in Rats." *Journal of Ethnopharmacology* 81 (August 2002): 393 397.

ORGANIZATIONS

American Botanical Council. PO Box 144345. Austin, TX 78714 4345.

Centre for International Ethnomedicinal Education and Research (CIEER). http://www.cieer.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

MIT News. "Lemelson MIT Program Awards 2002 High School Apprenticeship to Inventive Maryland Stu dent." web.mit.edu/invent.

Judith Turner
Rebecca J. Frey, PhD

Ferrum phosphoricum

Description

Ferrum phosphoricum, abbreviated as *Ferrum phos.*, is a homeopathic remedy compound made from **iron** and **phosphorus**. Its name is Latin for iron phosphate. The homeopathic formula of iron phosphate is derived from mixing iron sulfate, phosphate, and **sodium** acetate.

General use

Based on the homeopathic "law of similars," which states that any substance that can cause certain symptoms when given to healthy people can cure sick people with similar symptoms, *Ferrum phos.* is the remedy of choice for patients in the early stages of **fever** or other inflammatory conditions. It may also be given to patients experiencing low energy or **anemia**. Of the 2,000–3,000 homeopathic remedies that are available, *Ferrum phos.* is one that often appears on "short lists" of those recommended for a home medicine chest.

It is important to note that homeopaths do not prescribe a given remedy on the basis of a few physical symptoms. They try to match the remedy to the totality of the patient's symptoms, including emotional characteristics and personality traits. Thus a classically trained homeopath would not give *Ferrum phos.* automatically to every patient who walked into the office complaining of fever or a viral illness. A contemporary American practitioner of **homeopathy** recommends giving *Ferrum phos.* when the person does not have clear and distinct symptoms that would point to another remedy. The profile of the *Ferrum phos.* person is that he or she has a lower fever and is more alert than one who needs **belladonna** but less upset and fearful than one who needs **aconite**. Where a patient with the belladonna profile may have a face that is flushed all over with fever, the *Ferrum phos.* patient has clearly defined pink or red patches on the cheeks. The *Ferrum phos.* patient is not focused solely on his or her discomfort and may have conversations with others as if he or she were not ill.

Other characteristics of *Ferrum phos.* patients include a tendency to tire easily. They are nervous, sensitive people, disturbed by anxiety-provoking dreams. They may be restless sleepers, even though their illnesses are often brought on by overexertion. In addition, *Ferrum phos.* patients often bleed easily; they are more prone to **nosebleeds** or minor bleeding from the gums at the onset of an illness. If they **cough** up mucus, it is likely to be streaked with blood.

The homeopathic definition of "symptom" is broader than the standard medical understanding. To a homeopath, symptoms represent the body's attempts to deal with an internal or external ailment. They are guides to choosing the correct remedy rather than problems to be suppressed. A homeopathic practitioner who is asking a patient about symptoms will inquire about the circumstances (e.g., light or dark, heat or cold, rest or activity, etc.) that make the patient feel better or worse. These factors are called modalities in homeopathy. In terms of modalities, gentle motion and applications of cold make *Ferrum phos.* patients feel better, while cold air, nighttime, standing up, and heavy exertion make them feel worse.

A homeopathic practitioner might prescribe *Ferrum phos.* for any of the following conditions:

- tickling coughs accompanied by chest pain
- laryngitis
- red and swollen tonsils
- fevers that start slowly
- ear infections that have not yet produced pus
- incontinence, involuntary urination with coughing, bedwetting
- rheumatic joints
- menstrual periods that begin with headaches
- anemia
- fatigue
- nosebleeds
- sore throats, especially in singers
- vomiting
- diarrhea
- heart palpitations

Preparations

Ferrum phos. is available in the United States in both liquid and tablet form. It can be purchased from homeopathic pharmacies or over the internet. Common potencies of *Ferrum phos.* are 30C and 6X. The

KEY TERMS

Antidote—Any substance that slows or stops the effects of a homeopathic remedy. Coffee and camphor are considered to be particularly powerful antidotes.

Law of similars—A principle of homeopathic treatment according to which substances that cause specific symptoms in healthy people are given to sick people with similar symptoms.

Modality—A factor or circumstance that makes a patient's symptoms better or worse. Modalities include such factors as time of day, room temperature, the patient's level of activity, sleep patterns, etc.

Potency—The number of times that a homeopathic remedy has been diluted and succussed (shaken). In centesimal potencies, one part of the medicinal substance has been diluted with 99 parts of water or alcohol; in decimal potencies, the ratio is 1:9.

Succussion—A part of the process of making homeopathic remedies, in which the medicinal substance is diluted in distilled water and then shaken vigorously.

Symptom—In homeopathy, a positive sign of the body's self-defense and self-healing that assists the practitioner to choose the correct remedy. Symptoms include the patient's emotional state and psychological characteristics as well as physical symptoms in the narrow sense.

abbreviation 30C stands for a centesimal potency. This indicates that a process of dilution, along with vigorous shaking (succussion) of the remedy, has been repeated 30 times to achieve the desired potency. The abbreviation 6X indicates a decimal potency, and means that this decimal dilution has been repeated six times. In homeopathic practice, the strength of the remedy is in inverse proportion to the amount of chemical or plant extract in the alcohol or water; thus a 30C preparation of *Ferrum phos.* is considered a much higher potency than a 6X preparation. People using homeopathic remedies at home are generally encouraged to use the lower potencies such as 6X or 12X.

Precautions

The precautions recommended by homeopaths reflect concerns about proper administration of the remedies rather than specifying categories of patients who should not receive a given remedy. The quantity of a homeopathic remedy, for example, is less critical than the frequency of dosing. Homeopathy follows the principle of minimal dosing, which means in practice that the patient is not given a second dose of a remedy (or a dose of a different remedy) until the first has completed its action. Minimal dosing is based on the homeopathic belief that remedies work by stimulating or "jump-starting" the body's own natural defenses against illness rather than by killing germs. In general, however, the more severe the patient's acute symptoms, the more often he or she would be given the remedy. A *Ferrum phos.* patient with a bad cold might be given a dose of the remedy every three to six hours, while one with a milder illness might be given only one or two doses a day.

Precautions regarding homeopathic remedies also include avoiding contamination of the medicine. The patient should not touch the medicine; it should be dispensed into a cup and tipped directly into the patient's mouth. Homeopathic remedies are not taken with water but allowed to dissolve in the mouth. Patients are asked not to eat or drink for about twenty minutes before and after each dose.

Side effects

Homeopathic remedies rarely have side effects in the usual sense of the phrase because they are so dilute. On the other hand, a homeopathic remedy may sometimes appear to be making a patient's symptoms temporarily worse as part of the healing process. This temporary aggravation of the symptoms would be regarded by homeopaths as an indication that the remedy is effectively stimulating the patient's body to heal itself.

Interactions

Homeopathic practitioners are not as a rule concerned with drug interactions, in part because homeopathic remedies are so dilute that there is little of the original substance to interact with a prescription given by an allopathic physician. In addition, the homeopathic "single medicine" principle, according to which a patient is given only one homeopathic remedy at a time for a given illness, also minimizes potential interactions among different remedies. For example, a *Ferrum phos.* patient would not be given a different cold or cough remedy unless the homeopath determined that the patient's symptoms were changing and required a remedy with a different symptom profile. There is an ongoing debate among homeopathic practitioners about the legitimacy of combination remedies. Many homeopathic pharmacies sell preparations that

are low-potency combinations of the most commonly used remedies for use at home. Conservative homeopaths maintain that the possibility of interactions among the different ingredients makes it difficult to evaluate the effectiveness of these combinations.

Homeopaths are, however, concerned about the effect of other substances on homeopathic preparations. They believe that remedies can lose potency through interaction with heat, light, or other substances. Guidelines for proper storage of homeopathic remedies include keeping them away from strong sunlight and high temperatures, keeping them in their original containers, and not storing them near perfumes, bleach, or other strong-smelling substances. In addition, patients under the care of a homeopath are instructed to avoid coffee or products containing camphor (lip balms, chest rubs, etc.) during a period of homeopathic treatment and for two days after the last dose. Homeopaths believe that these substances counteract or "antidote" the effects of homeopathic remedies.

Resources

BOOKS

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. New York: G. P. Putnam's Sons, 1991.

MacEoin, Beth. *Homeopathy*. New York: HarperCollins Publishers, 1994.

Stein, Diane. "Homeopathy." In *All Women Are Healers: A Comprehensive Guide to Natural Healing*. Freedom, CA: The Crossing Press, 1996.

ORGANIZATIONS

Boiron Research Foundation. 1208 Amosland Road, Norwood, PA 19074.

Homeopathic Educational Services. 2124 Kittredge Street, Berkeley, CA 94704. (510) 649 0294. (800) 359 9051.

International Foundation for the Promotion of Homeopathy. 2366 Eastlake Avenue East, Suite 301, Seattle, WA 98102. (206) 324 8230.

National Center for Homeopathy (NCH). 801 North Fairfax Street, Suite 306, Alexandria, VA 22314. (703) 548 7790. Fax: (703) 548 7792.

Rebecca Frey

Fever

Definition

A fever is a rise in body temperature to greater than 100°F (37.8°C).

Description

A healthy person's body temperature fluctuates between 97°F (36.1°C) and 100°F (37.8°C), with the average being 98.6°F (37°C). The body maintains stability within this range by balancing the heat produced by the metabolism with the heat lost to the environment. The "thermostat" that controls this process is located in the hypothalamus, a small structure located deep within the brain. The nervous system constantly relays information about the body's temperature to the thermostat. In turn, the thermostat activates different physical responses designed to cool or warm the body, depending on the circumstances. These responses include:

- Decreasing or increasing the flow of blood from the body's core, where it is warmed, to the surface, where it is cooled.
- Slowing down or speeding up the rate at which the body turns food into energy (metabolic rate).
- Inducing shivering, which generates heat through muscle contraction.
- Inducing sweating, which cools the body through evaporation.

A fever occurs when the body's thermostat resets at a higher temperature, which primarily happens in response to an infection. To reach the higher temperature, the body moves blood to the warmer interior, increases the metabolic rate, and induces shivering. The **chills** that often accompany a fever are caused by the movement of blood to the body's core, which leaves the surface and extremities cold. Once the body reaches the higher temperature, the shivering and chills stop. When the infection has been overcome or drugs such as aspirin or acetaminophen (Tylenol) have been taken, the thermostat resets to normal. When this happens, the body's cooling mechanisms switch on. The blood moves to the surface and sweating occurs.

Fever is an important component of the immune response, though its role is not completely understood. Physicians believe that an elevated body temperature has several effects. Certain chemicals in the immune system react with the fever-inducing agent and trigger the resetting of the thermostat. These immune system chemicals also increase the production of cells that fight off the invading bacteria or viruses. Higher temperatures also inhibit the growth of some bacteria and speed up the chemical reactions that help the body's cells repair themselves. Changes in blood circulation may cause the heart rate to increase, which speeds the arrival of white blood cells to the sites of infection.

KEY TERMS

Antipyretic—A drug that lowers fever, like aspirin or acetaminophen.

Autoimmune disease—Condition in which a person's immune system attacks the body's own cells, causing tissue destruction.

Epstein-Barr virus—A common herpes virus that is responsible for causing infectious mononucleosis. This virus is problematic in people who have a compromised immune system.

Febrile seizure—Convulsions brought on by fever.

Malignant hyperthermia—A rare, inherited condition in which a person develops a very high fever when given certain anesthetics or muscle relaxants in preparation for surgery.

Meningitis—A potentially fatal inflammation of the thin membrane covering the brain and spinal cord.

Metabolism—The chemical process by which the body turns food into energy, which can be given off as heat.

Pyrogen—A chemical circulating in the blood that causes a rise in body temperature.

Reye's syndrome—A disorder principally affecting the liver and brain, marked by the rapid development of life-threatening neurological symptoms.

Causes and symptoms

Fevers are primarily caused by viral or bacterial **infections**, such as **pneumonia** or **influenza**. However, other conditions can induce a fever, including these:

- allergic reactions
- autoimmune diseases
- trauma, such as breaking a bone
- cancer
- excessive exposure to the sun
- intense exercise
- hormonal imbalances
- certain drugs
- damage to the hypothalamus

When an infection occurs, fever-inducing agents called pyrogens are released, either by the body's immune system or by the invading cells themselves. These pyrogens trigger the resetting of the thermostat. In other circumstances, an uncontrolled release of pyrogens may occur when the immune system overreacts due to an allergic reaction or becomes damaged due to an autoimmune disease. A **stroke** or tumor can damage the hypothalamus, causing the body's thermostat to malfunction. Excessive exposure to the sun or intense **exercise** in hot weather can result in heat stroke, a condition in which the body's cooling mechanisms fail. Malignant **hyperthermia** is a rare, inherited condition in which a person develops a very high fever when given certain anesthetics or muscle relaxants in preparation for surgery.

A recent study showed that most parents have misconceptions about fever and view it as a disease rather than a symptom. How long a fever lasts and how high it may go depend on several factors, including its cause and the patient's age and overall health. Most fevers caused by infections are acute, appearing suddenly and then dissipating as the immune system defeats the infectious agent. An infectious fever may also rise and fall throughout the day, reaching its peak in the late afternoon or early evening. A low-grade fever that lasts for several weeks is associated with autoimmune diseases such as lupus or with some cancers, particularly **leukemia** and lymphoma.

Diagnosis

A fever is usually diagnosed using a thermometer. A variety of different thermometers are available, including traditional oral and rectal thermometers made of glass and mercury, and more sophisticated electronic ones that can be inserted in the ear. For adults and older children, temperature readings are usually taken orally. Younger children who cannot or will not hold a thermometer in their mouths can have their temperature taken by placing an oral thermometer under their armpit. Infants generally have their temperature taken rectally using a rectal thermometer.

As important as registering a patient's temperature is determining the underlying cause of the fever. The physician can make a diagnosis by checking for accompanying symptoms and by reviewing the patient's medical history, any recent trips he or she has taken, what he or she may have ingested, or any illnesses he or she has been exposed to. Blood tests hold additional clues. Antibodies in the blood point to the presence of an infectious agent, which can be verified by growing the organism in a culture. Blood tests can also provide the doctor with white blood cell counts. Ultrasound tests, magnetic resonance imaging (MRI) tests, or computed tomography (CT) scans may be ordered if the doctor cannot readily determine the cause of a fever.

Treatment

Often, doctors must remind patients, especially parents, not to "overtreat" low fevers but to remember that they are symptoms of an underlying disease or condition. Alternative therapies for treatment of fever focus not only on reducing fever but also on boosting the immune function to help the body fight infections more effectively. They include nutritional therapy, herbal therapy and **traditional Chinese medicine**.

Nutritional therapy

Naturopaths often recommend that patients take high doses of **vitamin C** to ward off diseases and prevent fever. In addition to vitamin C, other **antioxidants** such as **vitamin A** and **zinc** also boost the immune function. Naturopaths may also suggest reducing sugar intake (even fruit juices) because sugar depresses the immune system. To replace fluid that is lost during fever, patients are advised to drink vegetable juices and eat soups.

Herbal therapy

Western herbalists use tea preparations containing herbs such as bupleurum root or **boneset** to reduce fever. Mild herbs such as **peppermint**, elderflower, or **yarrow** can provide comfort to the child who has a mild fever. Others believe in sweating a fever out, literally. They often recommend that patients take hot baths to induce sweating. This helps induce or increase fever, which is believed to help the body get rid of infections.

Chinese medicine (TCM) offers many herbs and formulas for fevers. There are many distinct kinds of fevers, also called heat syndromes. For example, an excess-heat syndrome is characterized by a high fever, great thirst, and lots of sweating. Deficiency heat syndrome is characterized by a low-grade fever with afternoon fevers or night sweats. For excess heat, herbs that are dispersing and cold in nature are used. For chronic and low-grade fevers, herbs that tonify the yin (cooling aspect) are used as well as herbs that get rid of heat. There are even herbs such as bupleurum root (called *Chai Hu* in TCM) that are used for intermittent fevers or conditions alternating between fever and chills. Alternating fevers and chills occur in **malaria**, conditions connected to **AIDS**, **chronic fatigue syndrome**, and Epstein-Barr virus. The individual pattern should be diagnosed by a trained practitioner.

Aromatherapy

Patients can reduce feverish symptoms by inhaling **essential oils** of camphor, **eucalyptus**, lemon, and **hyssop**. These oils can also be mixed with an unscented body lotion or a vegetable oil for **aromatherapy** massage.

Homeopathy

Homeopathic doctors may prescribe herbal remedies based on the patient's overall personality profile as well as specific symptoms.

Allopathic treatment

Physicians agree that the most effective treatment for a fever is to address its underlying cause. Also, because a fever helps the immune system fight infection, some clinicians suggest that it be allowed to run its course. Drugs to lower fever (antipyretics) can be given if a patient (particularly a child) is uncomfortable. These include aspirin, acetaminophen (Tylenol), and ibuprofen (Advil). Aspirin should not be given to a child or adolescent with a fever since this drug has been linked to an increased risk of Reye's syndrome. Sponging a child or infant with tepid (lukewarm) water can also help reduce mild fevers.

A fever requires emergency treatment under the following circumstances:

- Newborn (three months or younger) with a fever above 100.5°F (38°C).
- Infant or child with a fever above 103°F (39.4°C). A very high fever in a small child can trigger seizures (febrile seizures) and therefore should be treated immediately.
- Fever accompanied by severe headache, neck stiffness, mental confusion, or severe swelling of the throat. A fever accompanied by these symptoms can indicate the presence of a serious infection, such as meningitis, and should be brought to the immediate attention of a physician.

Expected results

Most fevers caused by infection end as soon as the immune system rids the body of the pathogen. Most fevers do not produce any lasting effects. The prognosis for fevers associated with more chronic conditions, such as autoimmune disease, depends upon the overall outcome of the disorder.

Resources

BOOKS

Bennett, J. Claude, and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders, 1996.

"Children's Health." In *Alternative Medicine: The Definitive Guide,* compiled by The Burton Goldberg Group. Tiburon, CA: Future Medicine Publishing, 1999.

"Fever and Chills." In *Reader's Digest Guide to Medical Cures and Treatment*. New York: Reader's Digest Association, 1996.
Gelfand, Jeffrey, et al. "Fever, Including Fever of Unknown Origin." In *Harrison's Principles of Internal Medicine,* edited by Kurt Isselbacher, et al. New York: McGraw Hill, 1997.
Tierney, Lawrence M., M.D., et al., eds. *Current Medical Diagnosis and Treatment*. Stamford, CT: Appleton & Lange, 1996.

PERIODICALS

Bernath, Vivienne F. "Tepid Sponging and Paracetamol for Reduction of Body Temperature in Febrile Chil dren." *The Medical Journal of Australia* (February 4, 2002): 130.
Huffman, Grace B. "Parental Misconceptions about Fever in Children." *American Family Physician* (February 1, 2002): 482.

Mai Tran
Teresa G. Odle

Fever blister *see* **Cold sores**

Feverfew

Description

Feverfew (*Chrysanthemum parthenium* or *Tanacetum parthenium*) is named for one of the herb's traditional medicinal uses as a febrifuge, from the Latin *febrifugia*, indicating its fever-reducing action. This European native of the Compositae (Asteraceae) or aster family has naturalized throughout North and South America, escaping from cultivation. It can be found along roadsides and along the borders of wooded areas. Other common names include featherfew, febrifuge plant, featherfoil, mid-summer daisy, and wild **chamomile**.

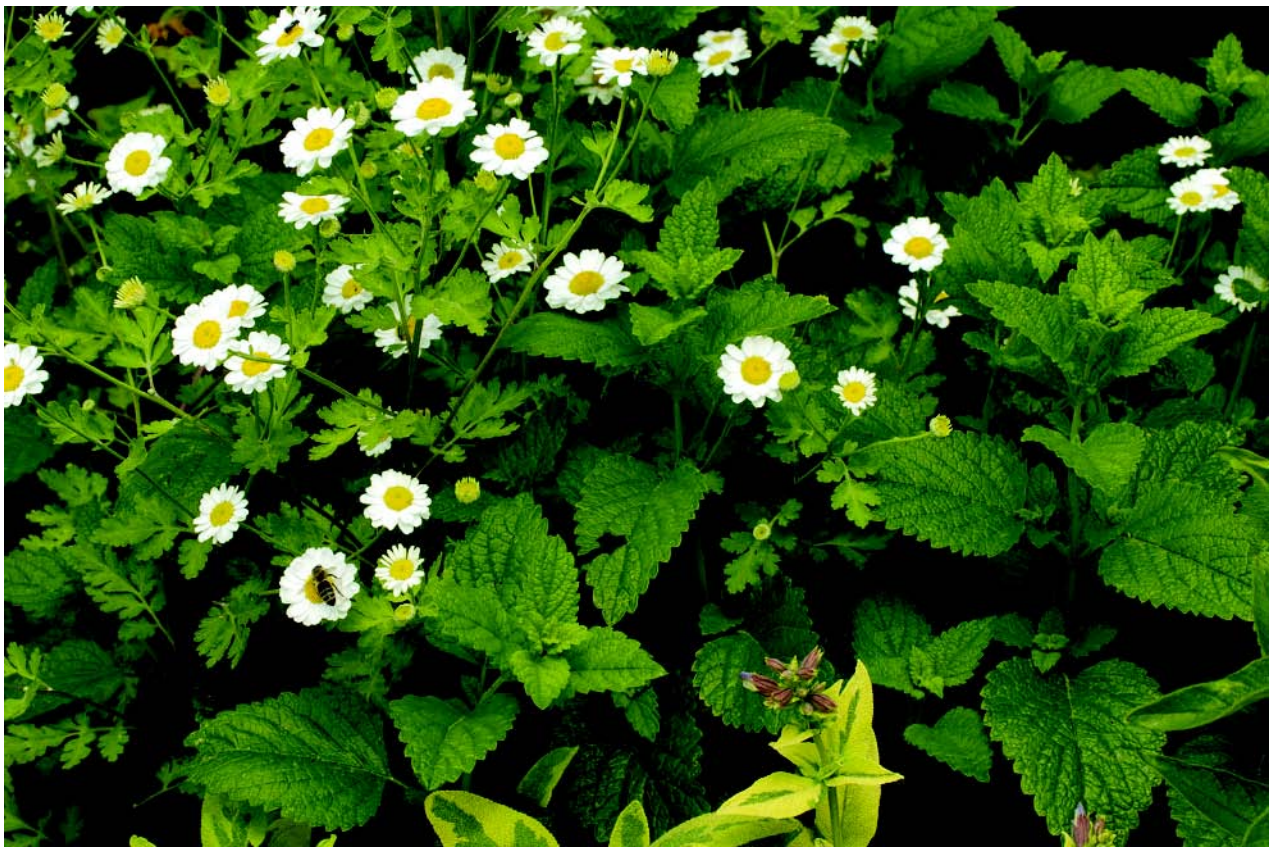
Feverfew is a bushy and herbaceous perennial that grows from a branched and tapering root to produce erect, round and slightly grooved stems. The feathery, aromatic, and bitter-tasting leaves are arranged alternately along the length of the many-branched stem. They are a yellow-green, stalked, and bipinnate with deeply cut, toothed segments in an oval shape. Flowers bloom in mid to late-summer in flat-topped clusters at the end of stems that may reach to a height of 3 ft (1 m). Smaller than daisies and without the protruding central disk of chamomile, feverfew blossoms have yellow centers consisting of tightly bunched tubular florets surrounded by creamy white rays. Bees seem to avoid feverfew, deterred by its pungent aroma. The plant self-seeds freely and thrives in full sun or partial shade in most soil.

General use

Feverfew leaves and flowers are used medicinally. Among its many uses, the herb has become a popular and proven herbal remedy for the treatment of migraine headaches. This important use of the plant was recorded as far back as 1633 by the British herbalist John Gerard. With frequent use, over time, feverfew can reduce the frequency, severity, and duration of migraine headaches and allay **nausea** and **vomiting**. It is most effective when used as a preventative. It acts to inhibit serotonin and histamine, substances that dilate blood vessels, and it helps to prevent the spasms in blood vessels that trigger migraine headaches. This much-researched herb has been shown to inhibit production of leukotines and other inflammatory substances. It is an effective remedy for relieving the **pain** and inflammation of arthritis and alleviating **hay fever**, **asthma**, and other allergy symptoms.

Other traditional uses of feverfew dating back to ancient Greece and Rome include its use as an emmenagogue (an infusion taken in cases of sluggish **menstruation** to relieve congestion and promote periodic flow). The herb has also been used after **childbirth** to help expel the placenta.

Feverfew was valued in past centuries for its believed protection against the plague and the bite of mad dogs. In the seventeenth century the herbalist John Parkinson recommended feverfew as a remedy to speed recovery from opium overdose. It has also been used in treating alcoholic delirium tremens and to expel intestinal **worms**. The seventeenth-century English physician Nicholas Culpeper recommended an external application of the fresh herb to treat ague, as the disease **malaria** was once called. Feverfew is a bitter digestive and liver tonic. A hot infusion may reduce **fever** and congestion from colds. The infusion, taken cold, has tonic properties. Feverfew may relieve mild **depression**, promote restful sleep, and ease the nerve pain of **sciatica** and **shingles**. Externally the strong infusion is an antiseptic skin wash for treatment of insect **stings** and **bites**. The wash may also be used as an insect repellent. Feverfew leaves and stems, gathered fresh, may be used as a dye plant, with a chrome mordant, to produce a light green-yellow color in natural fibers such as wool. Feverfew flowers have a purgative action if ingested, and if the blossom heads are carried into areas where bees are located, the insects will fly away.



Feverfew. *(© Arco Images / Alamy)*

The active compounds in feverfew include sesquiterpene lactones, predominantly parthenolide. Other phytochemicals include pyrethrin, volatile oils, tannins, bitter resin, and flavonoids.

Most of the benefits claimed for feverfew had not been confirmed scientifically as of 2008. In 2008, the National Center for Complementary and Alternative Medicine of the U.S. National Institutes of Health reported that most claims were either unsubstantiated or supported by limited evidence. It concluded that "There is not enough evidence available to assess whether feverfew is beneficial for [most] uses."

Preparations

Feverfew should be harvested just as the plant comes into flower and before the blossoms are fully open. Leaves are removed from the stalks and dried on paper-lined trays in a light, airy room, away from direct sunlight. The dried herb should be stored in clearly labeled, tightly sealed, dark glass containers.

Feverfew leaf in capsule form, at a 250 mg daily dose, is recommended for medicinal use. It may take four to six weeks before the herb provides noticeable relief. Studies of some commercially prepared capsules revealed that many did not contain a sufficient quantity of the active ingredient to be medicinally effective. Feverfew may be more medicinally potent when gathered fresh. Three to four fresh leaves, taken daily over a period of time are medicinally effective. A certified practitioner can help determine the most effective and safest levels for individual cases.

Fresh feverfew leaf can be added to honey or to a simple sugar syrup. The honey acts as a preservative and masks the bitter taste of the herb.

To make an infusion, one takes two to three teaspoons of chopped, fresh feverfew leaves and place them in a warmed container. One cup of fresh, nonchlorinated boiled water is added to the herbs and the mixture is covered. The tea is infused for about 15 minutes, then strained. A stronger infusion, using double the amount of leaf and steeping twice as long, is useful as a skin wash for repelling insects or soothing inflammations and **wounds**. The strong infusion has also been used as a mouthwash following tooth extraction. The prepared tea can be stored for about two

days in the refrigerator in an airtight container. The dosage is three cups at different times during the day.

To make a tincture, one combines four ounces of finely cut fresh or powdered dry herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts. Place the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped, dark glass bottle. A standard dose is 30 drops of the tincture three times a day.

Precautions

Since herbal preparations are not regulated by the U.S. Food and Drug Administration (FDA), consumers in the United States should check the labels of commercial products carefully for dosage instructions and the part(s) of the plant used for or contained in the product. A 2002 study of commercial feverfew preparations found wide variations in the recommended dosages and parthenolide contents of the products that were tested. The researchers found that "intake of parthenolide would range from 0.06 to 9.7 mg/day, a 160-fold variation." Any adverse effects from feverfew preparations or any other herbal products sold as dietary supplements should be reported to the FDA Center for Food Safety and Applied **Nutrition**.

Feverfew should not be used by pregnant or lactating women. Children under two years of age should not be given feverfew. Chewing the fresh leaves may irritate the mucous membranes in the mouth causing mouth ulcers in some persons. Traditionally, the fresh herb was enclosed between slices of bread to minimize the irritation and mask the bitter taste of the fresh leaves. Persons on prescribed blood-thinning drugs should not ingest feverfew as it might interfere with the rate of blood clotting.

Side effects

Feverfew is a safe herb of proven medicinal value. No side effects are reported when taken in designated therapeutic doses. Some cases of **contact dermatitis** and airborne **dermatitis**, however, have been reported by researchers in Denmark and the United States.

Interactions

According to the *PDR For Herbal Medicines*, feverfew may interact with anti-thrombotic medications, including aspirin and warfarin. The tannins in feverfew have been reported to interfere with **iron** absorption in persons who take supplemental iron.

KEY TERMS

Antispasmodic—A substance that relieves spasms in blood vessels or cramping in muscles. Feverfew has antispasmodic properties.

Delirium tremens—A potentially fatal withdrawal syndrome in persons who have become physically dependent on alcohol or other drugs, characterized by shaking, sweating, hallucinations, nausea, and agitation.

Emmenagogue—A substance or medication given to bring on a menstrual period.

Flavonoids—Plant pigments that have a variety of effects on human physiology.

Histamine—A substance released from cells that causes some of the symptoms of an allergic reaction.

Nonsteroidal anti-inflammatory drugs (NSAIDs)—A term used for a group of pain-relieving medications that also reduce inflammation when used over a period of time. NSAIDs are often given to patients with osteoarthritis.

Parthenolide—A sesquiterpene lactone isolated from feverfew that is thought to be responsible for most of its medical effectiveness.

Volatile oil—A concentrated oil that has been distilled from a plant; "volatile" means that the oil evaporates at room temperature.

Taking NSAIDs together with feverfew will decrease the beneficial effects of the herb.

Resources

BOOKS

Awang, D. V. C. "Feverfew (*Tanacetum parthenium*)." In P. Coates, et al. *Encyclopedia of Dietary Supplements*. New York: Marcel Dekker, 2005, 211 217.

PERIODICALS

Bauman, Leslie. "Less known Botanical Cosmeceuticals." *Dermatologic Therapy* (September 2007): 330 342.

Guzman, Monica L., and Craig T. Jordan. "Feverfew: Weeding Out the Root of Leukaemia." *Expert Opinion on Biological Therapy* (September 2005): 1147 1152.

Rendon, Wu J. "Enhancing Sunscreens Naturally." *Skin & Aging* (July 2006): 52 56.

Shrivastava, R., J. C. Pechadre, and G. W. John. "Tanace tum Parthenium and Salix Alba (Mig RL) Combina tion in Migraine Prophylaxis: A Prospective, Open Label Study." *Clinical Drug Investigation* (May 2006): 287 296.

OTHER

"Feverfew." University of Maryland Medical Center. January 31, 2007 [cited March 20, 2008]. http://www.umm.edu/altmed/articles/feverfew 000243.htm.

ORGANIZATIONS

American Botanical Council, 6200 Manor Road, Austin, TX, 78714 4345, (512) 926 4900, www.herbalgram.org.

Herb Research Foundation, 1007 Pearl St., Suite 200, Boulder, CO, 80302, (303) 449 2265, http://www.herbs.org.

National Center for Complementary and Alternative Medicine. National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov/.

Clare Hanrahan
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Feverwort *see* **Boneset**

Fibrocystic breast disease

Definition

Fibrocystic breast disease is a general term that refers to a variety of symptoms and diagnoses, including breast lumpiness, tenderness, and a wide range of vaguely-defined benign breast conditions. The term is also used diagnostically to describe the appearance of breast tissues viewed under the microscope, on x-ray film, or on ultrasound equipment.

Description

There is no such thing as a typical or normal female breast. Breasts come in all shapes and sizes, with varying textures from smooth to extremely lumpy. The tissues of the female breast change in response to hormone levels, normal **aging**, nursing (lactation), weight shifts, and injury. To further complicate matters, the breast has several types of tissue, each of which may respond differently to changes in body chemistry.

Fibrocystic breast disease is clearly not a single, specific disease process. Variations or changes in the way the breast feels or looks on an x ray may cause the condition to be called "fibrocystic change." Other names have been used to refer to this imprecise and ill-defined term: mammary dysplasia, mastopathy, chronic cystic mastitis, indurative mastopathy, mastalgia, lumpy breasts, or physiologic nodularity.

KEY TERMS

Selenium—A mineral supplement with antioxidant properties that may be useful for reducing breast pain and tenderness associated with fibrocystic breast disease. The recommended daily allowance of selenium is 70 mcg for men and 55 mcg for women.

Estimates vary, but 40–90% of all women have some evidence of fibrocystic condition, change, or disease. It is most common among women ages 30–50, but may be seen at other ages.

Causes and symptoms

Fibrocystic condition refers to technical findings. This discussion will focus on symptoms a woman experiences, which may fall under the general category of the fibrocystic condition.

The breast is not a soft, smooth, pulpy organ. It is actually a type of sweat gland. Milk, the breasts' version of sweat, is secreted when the breast receives appropriate hormonal and environmental stimulation.

The normal breast contains milk glands, with their accompanying ducts, or pipelines, for transporting the milk. These complex structures may not only alter in size, but can increase or decrease in number as needed. Fibrous connective tissue, fatty tissue, nerves, blood and lymph vessels, and lymph nodes, with their different shapes and textures, lie among the ever-changing milk glands. This explains why a woman's breasts may not feel uniform in texture, and why "lumpiness" may wax and wane.

Fibrocystic condition is the tenderness, enlargement, and/or changing lumpiness that many women encounter just before or during their menstrual periods. At this time, female hormones are preparing the breasts for **pregnancy**, by stimulating the milk-producing cells and storing fluid. Each breast may contain as much as three to six teaspoons of excess liquid. Swelling, with increased sensitivity or **pain**, may result. If pregnancy does not occur, the body reabsorbs the fluid, and the engorgement and discomfort are relieved.

These symptoms range from mildly annoying in some women to extremely painful in others. The severity of the sensations may vary from month to month in the same woman. Although sometimes distressing, this experience is the body's normal response to routine hormonal changes.

This cycle of breast sensitivity, pain, and/or enlargement can also result from medications. Some hormone replacement therapies used for post-menopausal women can produce these effects. Other medications, primarily, but not exclusively, those with hormones, may also provoke these symptoms.

Breast pain unrelated to hormone shifts is called "noncyclic" pain. This area-specific pain is also called "trigger-zone breast pain," and it may be continuous, or may be felt intermittently. Trauma, such as a blow to the area, or a breast biopsy performed several years before, or sensitivity to certain medications may also underlie this type of pain. Fibrocystic condition may be cited as the cause of otherwise unexplained breast pain.

Lumps, apart from those clearly associated with hormone cycles, may also be placed under the heading of fibrocystic condition. These lumps stand out from enlarged general breast tissue. The obvious concern with such lumps is **cancer**, although noncancerous lumps also occur. Two noncancerous types are fibroadenomas and cysts.

Fibroadenomas are tumors that form in the tissues outside the milk ducts. The cause of fibroadenomas is unknown. They generally feel smooth and firm, with a somewhat rubber-like texture. Typically a fibroadenoma is not attached to surrounding tissue, and will move slightly when touched. They are most commonly found in adolescents and women in their early 20s but can arise at any age.

Cysts are fluid-filled sacs in the breast. They probably develop as ducts become clogged with old cells in the process of normal emptying and filling. Cysts usually feel soft and round or oval. However, a cyst deep within the breast may feel hard, as it pushes up against firmer breast tissue. A woman with a cyst may experience pain, especially if it increases in size before her menstrual cycle, as many do. Women age 30–50 are most likely to develop cysts.

Sometimes one area of breast tissue persistently feels thicker or more prominent than the rest of the breast. This may be caused by hardened scar tissue and/or dead fat tissue from surgery or trauma. Often the cause of such tissue is unknown.

A number of other breast problems that are benign or noncancerous may be placed under the heading of fibrocystic condition. These include disorders that may lead to breast inflammation (mastitis), infection, nipple discharge, dilated milk ducts, milk-filled cyst, wart-like growth in the duct, and excess growth of fibrous tissue around the glands.

Diagnosis

Breast cancer is the concern in most cases of an abnormal breast symptom. A newly discovered breast lump should be brought to the attention of a family physician or an obstetrician-gynecologist. A physical examination of the area is usually performed. Depending on the findings, the patient may be referred for tests.

The most common tests are mammography and breast ultrasound. A cyst may be definitively diagnosed by ultrasound. To relieve the discomfort, the patient may choose to have the cyst suctioned, or drained. If there is any question as to the fluid diagnosis, the fluid is sent for analysis.

If a lump cannot be proven benign by mammography and ultrasound, a breast biopsy may be considered. Tissue is removed through a needle to obtain a sample of the lump. The sample is examined under the microscope by a pathologist, and a detailed diagnosis regarding the type of benign lesion or cancer is established.

A ductogram evaluates nipple discharge. A very fine tube is threaded into the duct, dye is injected, and the area is looked at for diagnosis. Other breast conditions such as inflammation or infection are usually recognized on the basis of suspicious history, such as breastfeeding and characteristic symptoms such as pain, redness, and swelling. A positive response to appropriate therapies will support the diagnosis.

Treatment

Warm soaks, heating pads, or ice packs may provide comfort. A well-fitted support bra worn day and night can minimize physical movement and do much to relieve breast discomfort. Breast massage may promote removal of excess fluid from tissues and alleviate symptoms. Massaging the breast with **castor oil**, straight or infused with herbs or diluted **essential oils**, can help reduce and dissipate fibroadenomas as well as keep women in touch with changes in their breasts.

Many women have reported relief of symptoms when **caffeine** was reduced or eliminated from their **diets**. Decreasing salt intake before and during the period when breasts are most sensitive may also ease swelling and discomfort. Vitamins A, B complex, and E and **selenium** supplements have been reported to be helpful. Because fat promotes estrogen production, and estrogen is thought to be linked to breast tenderness, low-fat diets and elimination of dairy products also seem to decrease soreness for some women. Restricting salt intake may also help reduce fluid retention and lessen breast pain. It may take several months to realize the effects of these various treatments.

Evening primrose oil (*Oenothera biennis*), flax oil, and fish oils have been reported to be effective in relieving cyclic breast pain for some women. In addition, a focus on liver cleansing is important to assist the body in conjugation and elimination of excess estrogens. The herb chaste tree (*Vitex angus-castus*) can be used to help relieve symptoms of **premenstrual syndrome** (PMS), including breast tenderness.

A Chinese herbalist may recommend Herba cum Radice Asari with Radix Angelicae Sinensis and Flos Carthami Tinctorii for painful breast lumps, or Rhizoma Cyperi Rotundi with Radix Bupleuri and Fructus Trichosanthis for breast masses that swell around the time of **menstruation**.

Allopathic treatment

A lump that has been proven benign can be left in the breast. Some women may choose to have a lump such as a fibroadenoma surgically removed, especially if it is large. **Infections** are treated with warm compresses and antibiotics. Lactating women are encouraged to continue breastfeeding, as it promotes drainage and healing. A serious infection may progress to form an **abscess**, which may need surgical drainage.

Once a specific disorder within the broad category of fibrocystic condition is identified, treatment can be prescribed. Symptoms of cyclical breast sensitivity and engorgement may be treated with diet, medication, and/or physical modifications.

Over-the-counter analgesics (pain relievers) such as acetaminophen (Tylenol) or ibuprofen (Advil) may be recommended. In some cases, treatment with hormones or hormone blockers may prove successful. Birth control pills may be prescribed.

Expected results

Most benign breast conditions carry no increased risk for the development of breast cancer. However, a small percentage of biopsies will uncover overgrowth of tissue in a particular pattern in some women that indicates a 15–20% risk of developing breast cancer over the next 20 years. Strict attention to early detection measures, such as annual mammograms, is especially important for these women.

Prevention

No way has yet been proven to prevent the various manifestations of fibrocystic condition from occurring. Some alternative practitioners believe that elimination of foods high in methylxanthines (primarily coffee and chocolate) can decrease or reverse fibrocystic breast changes.

Resources

BOOKS

Kneece, Judy C. *Finding a Lump In Your Breast*. Columbia, SC: EduCare Publishing, 1996.

Love, Susan M., with Karen Lindsey. *Dr. Susan Love's Breast Book*. 2nd ed. Reading, MA: Addison Wesley, 1995.

PERIODICALS

"Benign Conditions." *Harvard Women's Health Watch* 5 (May 1998): 4 5.

Paula Ford-Martin

Fibroids *see* **Uterine fibroids**

Fibromyalgia

Definition

Fibromyalgia is characterized by muscle **pain**, **fatigue**, and multiple tender points on the body. Many individuals with fibromyalgia describe the symptoms as similar to the aches and pains of a severe case of the flu. Fibrositis, fibromyalgia, and fibromyositis are names given to a set of symptoms believed to be caused by the same general problem.

Description

Fibromyalgia is more common than previously thought. According to the American College of Rheumatology, as many as 2–4% of the U.S. population may be affected by the disorder. Fibromyalgia is more prevalent in adults than children, with more women affected than men, particularly women of childbearing age.

Causes and symptoms

The exact cause of fibromyalgia is not known. Sometimes it occurs in several members of a family, suggesting that it may be an inherited disorder. Researchers have investigated a number of possible causes, including genetic causes, **sleep disorders**, specific injuries, **infections**, problems with muscle metabolism, problems with the neurons that transmit information about pain, and nervous system abnormalities. It is often difficult for research to determine if a specific problem, such as sleep disturbances, results from fibromyalgia or are a possible cause of the

condition. It is likely that a number of factors must occur in combination to cause fibromyalgia.

Pain is the major symptom with aches, tenderness, and stiffness of multiple muscles, joints, and soft tissues. The pain may move from one part of the body to another. It is most common in the neck, shoulders, chest, arms, legs, hips, and back. Although the pain is present most of the time and may last for years, the severity of the pain may fluctuate.

Symptoms of fatigue may result from the individual's chronic pain coupled with **anxiety** about the problem and how to find relief. The inflammatory process also produces chemicals that are known to cause fatigue. Other common symptoms are tension headaches, difficulty swallowing, recurrent abdominal pain, **diarrhea**, and numbness or tingling of the extremities. **Stress**, anxiety, **depression**, or lack of sleep can increase symptoms. Intensity of symptoms is variable, ranging from gradual improvement to episodes of recurrent symptoms.

Diagnosis

Diagnosis is difficult and frequently missed because symptoms of fibromyalgia are vague and generalized. Coexisting nerve and muscle disorders such as **rheumatoid arthritis**, spinal arthritis, or **Lyme disease** may further complicate the diagnostic process. As of 2008, there were no tests available to specifically diagnose fibromyalgia. The diagnosis is usually made after ruling out other medical conditions with similar symptoms such as lupus and **hypothyroidism**.

Because of the emotional distress experienced by people with this condition and the influence of stress on the symptoms themselves, fibromyalgia has often been labeled a psychological problem. Although the debate about fibromyalgia continues, research on possible causes of the condition and public awareness campaigns have helped promote fibromyalgia's validity as a physiological problem.

The American College of Rheumatology has developed standards for fibromyalgia that healthcare practitioners can use to diagnose this condition. According to these standards, individuals can be diagnosed with fibromyalgia if they have widespread pain in combination with tenderness in at least 11 of the 18 sites known as trigger points. Trigger point sites include the base of the neck, along the backbone, in front of the hip and elbow, and at the rear of the knee and shoulder.

Treatment

As of 2008, there was no known cure for fibromyalgia. Therefore, the goal of treatment is successful symptom management. Treatment usually requires a combination of therapies, including medication, **exercise**, and lifestyle adjustments. On June 21, 2007, the U.S. Food and Drug Administration (FDA) approved the first drug to treat fibromyalgia. Although previously many doctors had prescribed a variety of medications intended to help reduce the symptoms of fibromyalgia, Lycria (pregabalin) was the first drug approved specifically for the treatment of fibromyalgia. Made by Pfizer, Lycria was already used to treat pain associated with nerve damage caused by diabetes, pain following **shingles**, and partial seizures. A study of 1,800 patients showed that Lycria was also effective in treating the pain associated with fibromyalgia in many people. Lycria was not found to be effective in everyone with fibromyalgia, however, and it can have side effects, including sleepiness, **dizziness**, weight gain, swelling of the feet and hands, blurred vision, and **dry mouth**.

In addition to treatment with medication there are many other ways of managing the symptoms of fibromyalgia. Adequate rest is essential, as is a healthy diet. The diet should include a large variety of fruits and vegetables, which provide the body with trace elements and minerals that are necessary for healthy muscles. Avoidance of stimulating foods or drinks (such as coffee) and medications such as decongestants prior to bedtime is advised. Individuals should have a clear understanding of their role in the recovery process because it determines the successful management of this condition.

Other treatments found to be helpful include heat and occasionally cold compress applications. A regular stretching program is often useful. Aerobic activities focusing on increasing the heart rate are the preferred forms of exercise over most other forms of exertion. Exercise programs need to include good warm-up and cool-down sessions, with special attention given to avoiding exercises causing joint pain. **Hydrotherapy** exercises (exercises in a pool or tub) may be useful in providing a low impact exercise environment while soothing muscle and joint pain.

Massage therapy can be helpful, especially when a family member is instructed on specific massage techniques to manage episodes of increased symptoms. Short sessions are most helpful as repetitious movement can aggravate the condition. Specific attention to mental health, including psychological treatment, may also be important, since depression may precede or accompany fibromyalgia. **Relaxation** exercises, **yoga**, **aromatherapy**, **guided imagery**, and other relaxation therapies can be useful in easing stress and promoting overall well-being. A Mayo Clinic study

KEY TERMS

Connective tissue—Tissue that supports and binds other body tissue and parts.

Lyme disease—An acute recurrent inflammatory disease involving one or a few joints, believed to be transmitted by a tick-borne virus. The condition was originally described in the community of Lyme, Connecticut, but has also been reported in other parts of the United States and other countries. Knees and other large joints are most commonly involved with local inflammation and swelling.

Rheumatology—The study of disorders characterized by inflammation, degeneration of connective tissue, and related structures of the body. These disorders are sometimes collectively referred to as rheumatism.

released in 2006 found that **acupuncture** can be helpful in relieving the symptoms of fibromyalgia.

Herbalists and aromatherapists may recommend tub soaks or compresses with **lavender** (*Lavandula angustifolia*), **chamomile** (*Chamaemelum nobilis*), or **juniper** (*Juniperus communis*) to soothe muscle and joint pain.

Allopathic treatment

People with fibromyalgia often need a rheumatology consultation (a meeting with a doctor who specializes in disorders of the joints, muscles, and soft tissue) to decide the cause of various rheumatic symptoms, to be educated about fibromyalgia and its treatment, and to exclude other rheumatic diseases. A treatment program must be individualized to meet the patient's needs. The rheumatologist, as the team leader, enlists and coordinates the expertise of other health professionals in the care of the patient.

Expected results

Fibromyalgia is a chronic health problem. The symptoms sometimes improve and at other times worsen, but they often continue for months to years.

Prevention

There is no known or specific prevention for fibromyalgia. However, similar to many other medical conditions, remaining as healthy as possible with a good diet, safe exercise, and adequate rest is the best prevention.

Resources

BOOKS

Hu, Fengrui, ed. *Pain Research Progress: Migraine, Fibro myalgia, and Related Pain*. New York: Nova Science, 2007.

Skelly, Mari, and Helen Walker. *Alternative Treatments for Fibromyalgia & Chronic Fatigue Syndrome,* 2nd ed. Alameda, CA: Hunter House, 2007.

Trock, David H. *Living with Fibromyalgia*. Hoboken, NJ: Wiley, 2006.

PERIODICALS

Gallagher, Rollin M. "Fibromyalgia: New Hope for a Medical Dilemma." *Pain Medicine* 8, no. 8 (November/December 2007): 619 620.

Rutledge, Dana R., Kim Jones, and C. Jessie Jones. "Predicting High Physical Function in People with Fibromyalgia." *Journal of Nursing Scholarship* 39, no. 4 (Winter 2007): 319 325.

Sierpina, Victor S. "Is There a Role for Acupuncture in Fibromyalgia?" *Souther Medical Journal* 100, no. 12 (December 2007): 1183 1184.

ORGANIZATIONS

American Pain Society, 4700 W. Lake Ave., Glenview, IL, 60025, (847) 375 4715, http://www.ampainsoc.org.

National Fibromyalgia Association, 2121 S. Towne Centre Place, Suite 300, Anaheim, CA, 92806, (714) 921 0150, http://www.fmaware.org.

Paula Ford-Martin
Helen Davidson

Fish oil

Description

Fish oils are derived from such cold-water fish as salmon, cod, tuna, or mackerel. They have recently acquired a new visibility as dietary supplements because they are high in **omega-3 fatty acids**. Omega-3 fatty acids, together with the **omega-6 fatty acids**, are important components of a healthful diet. The body cannot manufacture them, therefore, they must be obtained from grains, fruits, vegetable oils, and other foods. In addition, people should consume a balanced ratio of omega-6 and omega-3 fatty acids. Some researchers believe that these two types of fatty acids should be consumed in a 1:1 ratio, while others maintain that people should obtain several times more omega-3 than omega-6 fatty acids from their diet. In either case, the fact that fish oils are high in omega-3 fatty acids may help people to maintain a good balance between the two types of fatty acids.

Fish oil capsules. *(Pulse Picture Library/CMP Images/ Phototake. Reproduced by permission.)*

The most important types of omega-3 fatty acids found in fish oils are eicosapentanoic acid (EPA) and docosahexaenoic acid (DHA). The body needs EPA to produce prostaglandins, which are hormone-like substances that help to protect the heart and the cell membranes. DHA is required for the normal development of the brain, the eyes, and the reproductive system.

General use

In general, fish oils are recommended as dietary supplements to lower the levels of triglycerides in the blood, counteract inflammation in various parts of the body, and thin the blood.

Heart disease and stroke

The omega-3 fatty acids in fish oils increase the concentrations of good **cholesterol** (high density lipoproteins, HDL) in the blood while decreasing the concentrations of bad cholesterol (triglycerides). They also lower the total cholesterol level. Furthermore, these omega-3 oils protect the heart by preventing the formation of **blood clots** and fatty deposits (plaque) on the arterial walls. In people with coronary **heart disease**, fish oils may help to reduce the risk of blood clots in the brain or in the lungs; **pain** associated with **angina**; and the risk of cardiac arrythmias.

The benefits of omega-3 fatty acids have been shown in clinical studies. Investigation of the possible benefits of fish oils began when researchers discovered that Eskimos rarely have heart attacks or **rheumatoid arthritis** (RA) even though their diet is high in fat from fish, seals, and whales. Because these sources of fat have a high omega-3 fatty acid content, it was assumed that the type of fatty acid that they contained helped to protect the Eskimos from the usual consequences of high-fat **diets**. Later studies confirmed that diets high in omega-3 fatty acids decrease the risk of heart attacks, strokes, and abnormal heart rhythms. In one study of 20,551 doctors, those who ate at least one fish meal per week cut their risk of heart attacks in half compared to those who ate fish once a month or less. In the five-year Lyon study, men who followed a **Mediterranean diet** with emphasis on omega-3-rich oils, fish, fruits, and vegetables had their **heart attack** rates reduced by 70% compared to subjects in the control group. One question, however, is whether fish oil used by itself as a dietary supplement is as effective as a diet high in fish, since the two are not the same. One open trial of 11,324 people who were followed for three to five years found that fish oil did reduce the risk of death from heart attack. This study, however, was not a double-blind study, and its results cannot be taken as conclusive.

High blood pressure

Fish oils may help to control high blood pressure. Several studies have shown that taking fish oil can lower blood pressure. On the other hand, a 1997 study involving 2,000 subjects found no significant effect.

Rheumatoid arthritis

Fish oil may be useful in managing the symptoms of early rheumatoid arthritis (RA). A significant reduction in joint tenderness, morning stiffness, and **fatigue**, coupled with an increase in grip strength, has been observed in patients taking fish oil capsules. Fish oil appears to reduce the symptoms of RA without side effects, and to increase the effectiveness of standard medications for it. Fish oil does not appear to slow the progress of RA.

Asthma

It has been claimed that fish oils reduce inflammation of the airways and may prevent **asthma** attacks. According to one author, allergic disorders such as asthma may be triggered by too much omega-6 and too little omega-3 fats in the diet. Two studies undertaken in 1994 and 1996 respectively found no benefits from using fish oil in the management of asthma.

Psoriasis and autoimmune disorders

Several small studies indicate that fish oil may be helpful in treating **psoriasis**, which is an inflammatory disorder of the skin; in lupus; and in Raynaud's

phenomenon, an autoimmune disorder in which the patient's hands and feet are abnormally sensitive to cold and emotional **stress**. With respect to the Raynaud's patients, small double-blind studies showed that very high doses of fish oil reduce their responses to cold. It appears that doses as high as 12 g of fish oil daily are necessary to provide this effect. With respect to lupus, a small study of 30 subjects found that 14 out of 17 patients given daily doses of 20 g of EPA derived from fish oil had significant improvement. Subjects given a placebo either showed no improvement or got worse.

Osteoporosis

When taken together with **calcium**, **essential fatty acids** may help to protect women from **osteoporosis**. One 18-month study of 65 postmenopausal women found that those who were given a combination of omega-6 fatty acids (GLA) and omega-3 fatty acids from fish oil together with calcium had higher bone density and fewer **fractures** than those who were given the calcium and a placebo.

Gynecological problems

Fish oil supplements may be helpful in alleviating the symptoms of **premenstrual syndrome** (PMS) and painful periods. A number of different substances that are high in fatty acids, including **flaxseed** oil and GLA as well as fish oil, have been recommended for painful menstrual periods. One four-month study of adolescents suggests that fish oil is useful in treating this condition. Forty-two young women were divided into two groups; half received a daily dose of 6 g of fish oil for two months, followed by two months of placebo. The other half received the placebo and fish oil in reverse order. The results indicated that the subjects had significantly less menstrual pain while taking the fish oil.

Bipolar disorder and depression

Fish oil does appear to offer considerable benefits to people with **bipolar disorder**. A four-month double-blind study of 30 subjects indicated that fish oil improves emotional stability and helps to prevent relapses. Of the 14 persons who took fish oil, 11 stayed well or improved, while only six out of 16 subjects given placebos stayed well. A 2001 report looked at the effects of fish oil on mood and **depression**. Two large studies showed a strong connection between rates of depression and bipolar disorder in countries with high amounts of fish in diets. Although researchers cannot say that fish oil is the only reason for the difference, evidence continues to mount that omega-3 and omega-6 fatty acids may work as mood stabilizers.

Other conditions

Fish oil has been touted as a useful treatment for diabetic neuropathy, **allergies**, migraine headaches, **Crohn's disease**, **gout**, and ulcerative **colitis**, but there has been little systematic research involving these applications. In addition, health food manufacturers list **hair loss**, memory problems, muscle strain, failing eyesight, liver complaints, rickets, and dental problems as ailments that can be treated with fish oil. No clinical studies have been cited in support of these claims.

Early studies in laboratories indicate that fish oils might prolong life in people with automimmune disorders like diabetes. Early results show that a diet high in fish oils helped improve immune system function in these patients.

Preparations

There is no minimum daily requirement of fish oil as such, but a healthy diet should supply at least 5 g of essential fatty acids every day. Typical doses of fish oil are 3–9 g daily, although some participants in research studies have taken much higher doses. If fish oil is taken as a dietary supplement, it should be taken in large enough doses to supply about 1.8 g of EPA and 0.9 g of DHA on a daily basis. Fish oil capsules are available in health food stores as over-the-counter items; prices range from $7 for 180 capsules of Norwegian cod liver oil to $14 for 180 capsules of salmon oil. Capsules of tuna oil and halibut liver oil are also available from several commercial suppliers.

Precautions

Fish oil can easily become rancid. The capsules can be stored in the refrigerator to slow the rate of oxidation. Another option is to purchase capsules that have added **vitamin E**.

The type of fish oil may make a difference. Although cod liver oil is the easiest form to obtain, it can cause a buildup of **vitamin A** and **vitamin D** in the body because these two vitamins are fat-soluble. Pregnant women should not take more than 2,500 IU of vitamin A per day because higher amounts can cause birth defects. Other adults should not consume more than 5,000 IU of vitamin A per day. Vitamin D can produce toxicity when taken at levels above 1,000 IU daily for long periods of time. Persons who obtain their fish oil from cod liver oil should check the label to see how much vitamin A and vitamin D it contains.

KEY TERMS

Essential fatty acid (EFA)—A fatty acid that the body cannot make but must obtain from the diet. EFAs include omega-6 fatty acids found in primrose and safflower oils, and omega-3 fatty acids oils found in fatty fish and flaxseed, canola, soybean, and walnuts.

Prostaglandins—Hormone-like substances that the body produces from essential fatty acids. Prostaglandins control the contraction of smooth muscle, body temperature, and many other processes.

Raynaud's disease—A vascular disorder in which the patient's fingers ache and tingle after exposure to cold or emotional stress, with characteristic color changes from white to blue to red. Raynaud's phenomenon may be seen in scleroderma and systemic lupus erythematosus.

It may be prudent to take salmon oil, mackerel oil, or oil from other coldwater fish.

Women who are pregnant or breastfeeding should talk to their physicians before taking fish oil supplements or any other medications.

Because fish oil can thin the blood, it should not be taken together with aspirin and other nonsteroidal anti-inflammatory drugs (NSAIDs, or over-the-counter pain killers), Coumadin (warfarin), or other anti-clotting medications. Fish oil does not seem to cause problems with bleeding when it is taken by itself, however.

Side effects

Fish oil generally appears to be safe when taken as a dietary supplement. The most common side effects are mild **indigestion** or a fishy taste in the mouth.

Interactions

Fish oil supplements may interact with nonsteroidal anti-inflammatory drugs (NSAIDs), warfarin, or other anti-clotting medications to cause excessive bleeding.

Resources

BOOKS

Murray, Michael, ND, and Joseph Pizzorno, ND. *Encyclo pedia of Natural Medicine*. 2nd ed. Rocklin, CA: Prima Publishing, 1998.

Sears, Barry. *The Omega Rx Zone: The Miracle of the New High Dose Fish Oil*. Regan Books, 2002.

PERIODICALS

Nichols, Sonia. "Fish Oil Diets Extend Survival in Auto immune Prone Mice." *Diabetes Week* (November 26, 2001): 3.

"Omega 3 Fatty Acids in the Treatment of Depression." *Harvard Mental Health Letter* (October 2001).

ORGANIZATIONS

American Association of Naturopathic Physicians (AANP). 8201 Greensboro Drive, Suite 300, McLean, VA 22102. (703) 610 9037. http://www.naturopathic.org.

Mai Tran
Teresa Odle

5-Hydroxytryptophan *see* **5-HTP**

5-HTP

Description

5-HTP is the acronym for 5-hydroxytryptophan, also called 5-hydroxy-L-tryptophan. 5-HTP is found primarily in the brain. This compound is made from tryptophan, a natural amino acid found in foods. Tryptophan is an essential amino acid, which means that it cannot be made by the body; it must be obtained from food, particularly proteins. In the liver and brain, 5-HTP is converted to an important monoamine neurotransmitter called serotonin. Neurotransmitters are chemical messengers that transmit signals between neurons (nerve cells).

Taking 5-HTP increases the body's supply of the compound, which leads to higher serotonin levels in the brain. Serotonin, also called 5-hydroxytryptamine or 5-HT, plays an important role in controlling behavior and moods. It influences many normal brain activities and also regulates the activity of other neurotransmitters. Having adequate levels of serotonin instills a feeling of **relaxation**, calm, and mild euphoria (extreme happiness). Low levels of serotonin, serotonin deficiency syndrome, leads to **depression**, **anxiety**, irritability, **insomnia**, and many other problems.

Conditions associated with low levels of serotonin include:

- anxiety
- attention deficit hyperactivity disorder (ADHD)
- bulimia
- depression
- epilepsy
- fibromyalgia

- headaches
- hyperactivity
- insomnia
- obesity
- obsessive compulsive disorder (OCD)
- panic attacks
- premenstrual syndrome (PMS)
- schizophrenia
- seasonal affective disorder (SAD)

5-HTP has other effects on the body. It is an antioxidant that protects the body from damage by substances called free radicals (unstable, toxic molecules). In this role, 5-HTP may help slow the **aging** process and protect the body from illness. Because serotonin is used to make **melatonin**, taking 5-HTP may help achieve some of the same benefits as melatonin, such as treating **jet lag**, depression, and insomnia. There is some evidence that 5-HTP can replenish the supply of the pain-relieving molecules called endorphins. Studies have shown that low levels of endorphins are associated with **chronic fatigue syndrome**, **fibromyalgia**, **stress**, and depression. In addition, 5-HTP affects other neurotransmitters, including norepinephrine and dopamine.

General use

In studies, 5-HTP has been proven effective in the treatment of carbohydrate cravings and binge eating, chronic headaches, depression, fibromyalgia, insomnia, anxiety, and panic disorders.

Much of the clinical research with 5-HTP focused on the treatment of depression. In 15 separate studies, 5-HTP was tested on a total of 511 patients with different kinds of depression. Over half (56%) of these patients had significant improvement in depression while taking 5-HTP. The compound was found to be as effective as the selective serotonin reuptake inhibitor (SSRI) fluvoxamine and the tricyclic antidepressants, chloripramine and imipramine. Many of these studies used relatively high doses ranging from 50–3,250 mg daily.

Three clinical studies found that 5-HTP can significantly improve the **pain**, anxiety, morning stiffness, and **fatigue** associated with fibromyalgia. The doses ranged from 300–400 mg daily. In one study, 5-HTP treatment was as effective as a tricyclic antidepressant (amitriptyline) and monamine oxidase inhibitors (MAOI; pargilyne or phenelzine).

Three clinical studies found that 5-HTP use led to decreased intake of food and subsequent weight loss in obese patients. The dose used in one study was 900 mg daily, which initially caused **nausea** in 80% of the patients.

A few clinical trials have found that 5-HTP can effectively prevent chronic headaches, including **migraine headache** and tension **headache**. In addition, 5-HTP compared favorably with propranolol and methysergide, drugs commonly used to prevent migraines.

In treating insomnia, 5-HTP is effective because it increases the length of rapid eye movement (REM) sleep, which improves sleep quality.

The symptoms of anxiety may be significantly reduced by 5-HTP. In studies, it instilled a sense of relief in patients with panic disorders.

Other conditions that may be treated with 5-HTP, but for which no studies exist, include chronic fatigue syndrome, **premenstrual syndrome**, **Parkinson's disease**, and seizure disorders (such as **epilepsy**).

Although 5-HTP may be a useful alternative to conventional antidepressant drugs, one study indicated that it may be of no value for patients who have failed to respond to traditional drugs. In this study, patients who failed to respond to tricyclic antidepressants were treated with either 5-HTP or a monoamine oxidase inhibitor (MAOI). Half of the patients improved with the MAOI treatment, while none showed any benefit from 5-HTP treatment.

Some uncertainty remained about the efficacy of 5-HTP. In reviewing the evidence about the use of 5-HTP in 2008, the Internet source SupplementWatch.com concluded that "The overall scientific evidence for the effectiveness of 5-HTP is not very strong."

Preparations

The 5-HTP preparation available commercially is isolated from the seed of an African plant called *Griffonia simplicifolia*. It is available as an enteric coated tablet, which does not break down until it reaches the intestine.

The recommended starting dose for headaches, weight loss, depression, and fibromyalgia is 50 mg three times daily. It can be taken with food. However, for weight loss it should be taken 20 minutes before eating. If it is not effective after two weeks, the dose may be increased to 100 mg three times daily, but only with the recommendation of a physician. Insomnia is treated with 25 mg (which may be increased to 100 mg after a few days) taken 30–45 minutes before bedtime.

Precautions

The Mayo Clinic detected, and the U. S. Federal Drug Administration (FDA) confirmed, the presence of a contaminant (peak X) in 5-HTP produced by six different manufacturers. This contaminant is similar

KEY TERMS

Eosinophilia myalgia syndrome (EMS)—A chronic, painful disease of the immune system that causes joint pain, fatigue, shortness of breath, and swelling of the arms and legs. EMS can be fatal.

Monoamine oxidase inhibitor (MAOI)—An antidepressant drug that prevents the breakdown of monoamine neurotransmitters (such as serotonin) in the gaps between nerve cells. Nardil and Parnate are common MAOI brands.

Neurotransmitter—A chemical messenger that transmits signals between nerve cells.

Selective serotonin reuptake inhibitor (SSRI)—A family of antidepressant drugs that block the reabsorption of serotonin by nerve cells. Prozac, Zoloft, and Paxil are common brand names for these drugs.

Serotonin syndrome—A syndrome characterized by agitation, confusion, delirium, and perspiration, which is caused by high levels of serotonin in the brain.

Tricyclic antidepressant (TCA)—A group of antidepressant drugs that all have three rings in their chemical structure. Their mechanism of action is not fully understood, but they appear to extend the duration of action of some neurohormones, including serotonin and norepinephrine. They have also been used to treat some forms of chronic pain. Common brand names are Aventyl, Elavil, Surmontil, and Vivactil.

to one found in L-tryptophan, which in 1989 caused the potentially fatal eosinophilia myalgia syndrome (EMS) in some persons. The L-tryptophan supplements were subsequently banned by the FDA. There have been 10 reports of EMS associated with 5-HTP use. The 5-HTP contaminant was not at levels high enough to cause illness. However, taking excessive doses of 5-HTP may lead to toxic levels of peak X.

Long-term studies on the safety of 5-HTP use had not been conducted as of 2008. To be safe, 5-HTP should be considered a short-term remedy.

Pregnant women should not take 5-HTP because there are no clinical studies on the compound's use among this population.

Side effects

Side effects associated with 5-HTP are rare but may include headaches, mild **stomachaches**, nausea, nasal congestion, and **constipation**. There are anecdotal reports that taking high doses of 5-HTP causes nightmares or vivid dreams. Side effects may be minimized by starting with a low dose of 5-HTP and taking it with food.

Interactions

It is theorized that the effectiveness of 5-HTP may be enhanced by taking vitamin B_6 and niacinamide. The action of 5-HTP may be enhanced by extracts of **ginger**, **passionflower** (*Passiflora incarnata*), **St. John's wort**, and *Ginkgo biloba*.

Dopa-decarboxylase inhibitors, such as carbidopa or benserazide block the enzyme that is responsible for the destruction of dopamine. A study by the Massachusetts College of Pharmacy and Health Sciences demonstrated that 5-HTP reaches the brain without the use of a dopa-decarboxylase inhibitor and will produce the benefits of stress reduction and reduced food intake even when used alone.

There is a chance of developing serotonin syndrome when taking 5-HTP with an antidepressant drug. Serotonin syndrome was seen in patients taking high doses (greater than 1,200 mg daily) of L-tryptophan and MAOIs. Combining 5-HTP with a MAOI or selective serotonin reuptake inhibitor antidepressant should be done with caution, under the supervision of a physician.

Resources

PERIODICALS

Jason, C. G., et al. "Serotonin (5 HT) Drugs: Effects on Appetite Expression and Use for the Treatment of Obesity." *Current Drug Targets* (March 2005): 201 213.

Keithahn, Christian, and Alexander Lerch. "5 Hydroxy tryptophan Is a More Potent in Vitro Hydroxyl Radical Scavenger than Melatonin or Vitamin C." *Journal of Pineal Research* (January 2005): 62 66.

OTHER

"5 Hydroxytryptophan." Swedish Medical Center. http://www.swedish.org/110780.cfm. (February 7, 2008).

"5 Hydroxy tryptophan (5 HTP)." SupplementWatch.com. http://supplementwatch.com/suplib/supplement.asp?DocId 1167. (February 7, 2008).

"5 Hydroxytryptophan (5 HTP)." University of Maryland Medical Center. http://www.umm.edu/altmed/articles/5 htp 000283.htm. (February 7, 2008).

Belinda Rowland
Samuel Uretsky, Pharm.D.
David Edward Newton, Ed.D.

Flatulence *see* **Gas**
Flavonoids *see* **Bioflavonoids**

Flaxseed

Description

Flaxseed (also called linseed) comes from the flax plant (*Linum usitatissimum*), which belongs to the Linaceae plant family. The flax plant is a small, single-stemmed annual that grows to about 2 ft (0.6 m) tall and has grayish green leaves and sky blue flowers. Flax has been cultivated for thousands of years. Linen made from flax has been found in the tombs of Egyptian pharaohs and is referred to in the Bible and in Homer's *Odyssey*. The Roman naturalist Pliny wrote about the laxative and therapeutic powers of flax in the first century A.D., and many authorities believe it has been used as a folk remedy since ancient times. Flax is believed to be native to Egypt, but its origins are questionable since it has been used widely around the world. It is cultivated in many places, including Europe, South America, Asia, and parts of the United States. Only the seeds (flaxseed) and oil of the flax plant (flaxseed oil) are used medicinally. Linseed oil is the term usually used for the oil found in polishes, varnishes, and paints.

Flaxseed oil is derived from the flax plant's crushed seeds, which resemble common sesame seeds but are darker. The amber oil is very rich in a type of fat called alpha-linolenic acid (ALA), an omega-3 fatty acid that is good for the heart and found in certain plants. High amounts of **omega-3 fatty acids** are found in fish and smaller amounts are found in green leafy vegetables, soy-derived foods, and nuts. Many doctors consider these acids important for cardiovascular health. Studies suggest that they can lower triglyceride levels and reduce blood pressure. Omega-3 fatty acids may also decrease the risk of heart attacks and strokes by preventing the formation of dangerous **blood clots**. In high dosages, the fatty acids may help to alleviate arthritis, though flaxseed products have not yet been shown to be effective for this purpose. The National Center for Complimentary and Alternative Medicine (NCCAM) funded a study on the effects of flaxseed on high **cholesterol** levels and in the prevention of **heart disease** and **osteoporosis**.

In addition to omega-3 fatty acids, flaxseed products also contain potentially therapeutic chemicals called lignans. Flaxseed contains from 100 to 800 times more lignans than any other plant. Lignans are believed to have antioxidant properties and may also act as phytoestrogens, very weak forms of estrogen found in fruits, vegetables, whole grains, and beans. Unlike human estrogen, phytoestrogens have dual properties: They can mimic the effects of the hormone in some parts of the body while blocking its effects in others. Many herbalists believe that phytoestrogens can be useful in the prevention or treatment of a variety of diseases, including **cancer**, cardiovascular disease, and osteoporosis. The estrogen-blocking effects of phytoestrogens may be particularly effective at combating certain cancers that depend on hormones, such as cancers of the breast or uterus. Women who consume large amounts of lignans appear to have lower rates of **breast cancer**. The fact that heart disease and certain cancers occur less frequently in Asian countries is sometimes attributed to a diet rich in plant foods containing phytoestrogens.

General use

While not approved by the United States Food and Drug Administration (FDA), flaxseed products are reputed to have a number of beneficial effects. Flaxseed is sometimes referred to as a nutraceutical, a term that includes any food or food ingredient thought to confer health benefits, including preventing and treating disease. In the late twentieth century and early 2000s, the omega-3 fatty acids derived from flaxseed and other sources became an important food additive. Omega-3 is included in cereals, eggs (derived from hens on a flaxseed-enhanced diet), orange juice, and even in pet foods. Since 2006, as many as 250 food products have added the fatty acid Omega-3 as a nutritional boost. Several studies, some conducted in people, suggest that flaxseed products (or agents contained in them) may help to keep the heart and cardiovascular system healthy. Flaxseed products may lower cholesterol levels, help control blood pressure, and may reduce the buildup of plaque in arteries. Test tube and rat studies suggest that chemicals in flaxseed may help to prevent or shrink cancerous tumors. Due to its estrogen-like effects, some women use flaxseed oil to ease breast tenderness, alleviate symptoms of **premenstrual syndrome** (PMS), and help control menopausal symptoms. Flaxseed oil has also been recommended to treat skin conditions, inflammation, and arthritis. It is usually taken internally for all the purposes mentioned above. The oil may be used externally to help the healing of scalds and **burns**.

Additionally, flaxseed has been shown to be beneficial for people suffering from digestive disorders. It is recommended as an "effective herbal agent" for treating **irritable bowel syndrome** (IBS).

Clinical studies

The link between flaxseed and heart disease has been examined in a number of published studies. One of these studies published in the journal *Atherosclerosis*

in 1997, observed the effects of adding flaxseed to the diet of rabbits with **atherosclerosis**. Researchers found that flaxseed reduced the development of plaque build-up by almost 50%. The authors concluded that flaxseed may help to prevent heart attacks and strokes related to high cholesterol levels. However, a 2002 clinical trial on postmenopausal women concluded that the evidence remained "indeterminate," as to the effectiveness of dietary flaxseed for chloresteral reduction.

A study at the University of Toronto, reported in Clinical Cancer Research in 2005, concluded that dietary flaxseed has the potential to reduce tumor growth in patients with breast cancer. The clinical trial consisted of a randomized, double-bind, placebo controlled study on a small group of postmenopausal patients with newly diagnosed breast cancer. Participants ingested either a 25 g flaxseed-containing muffin or a (placebo) muffin, without the flaxseed. Researchers reported that the results of the clinical trial agreeed with previous clinical and preclinical studies showing antitumor effects of flaxseed in **prostate cancer** patients and in laboratory animal studies with carcinogen-treated rats.

Though early animal research and small clinical trials with people suggest that flaxseed has the potential as a dietary cancer fighter and a useful nutritional aid in preventing the spread of cancer, a review of 38 studies conducted between 1966 and 2005, reported in 2006 in the *Journal of the American Medical Association* suggests that omega-3s (found in abundance in flaxseed and in many kinds of fish) "have no significant effect" on cancers of the breast, colon, lung and prostate, according to Dr. Catherine MacLean, lead author of the study and a researcher at the Rand Corp.

While the cancer-inhibiting effects of flaxseed in people may be in doubt, some practitioners of alternative medicine continue to recommend the herb as a healthy dietary choice.

The American Institute for Cancer Research reported in 2006 on a study at the University of Pennsylvania examining the role of flaxseed in preventing oxidative lung tissue damage, a side effect of irradiation used in treating **lung cancer**. Early in the first year of a two-year study with mice, flaxseed-treated mice showed a "major increase in survival rates and decrease in lung tissue oxidative damage after radiation," according to the principal investigator in the study.

The therapeutic effects of flaxseed are not limited to people, according to some authorities. Flaxseed is sometimes used as a purgative in horses and sheep. In addition, flaxseed is included in a rapidly expanding list of nutraceutical products for dogs, cats, and other domestic pets. In 2006, the U.S. Department of Agriculture approved Canadian "Omega-3 pork" for sale in U.S. supermarkets. Canadian Omega-3 pork is derived from enhancing the animal feed with flaxseed.

Preparations

Flaxseed products are commercially available as whole or ground seeds, gelatin capsules, and oil. Some herbalists recommend adding the ground or whole seeds to the diet to get the maximum benefit from the herb. Nutritionists advise that the healthy fiber, protein, and lignans of flaxseed are only found in the milled seed and defatted ground flax, though some manufacturers of flaxseed oil return particulate matter containing lignans to the oil. Whole seeds can be stored in a cool, dry place for up to one year. Crushed seeds should be used immediately or frozen for future use. No standard guidelines have been established on how much of these forms should be consumed. Research subjects have been given as much as 1/4 cup of ground flaxseed per day, but a Canadian **nutrition** expert suggests that 1–2 tablespoons per day is enough for most adults.

Several nutraceutical companies have marketed a flaxseed ingredient. The flaxseed ingredient is a fine-milled flour with 5% lignan content, intended for addition to commercial baked goods, snack foods, cereals, dry pet foods, and similar products.

Capsules can be taken according to package directions. Some herbalists believe that the capsules available are highly processed, contain fewer beneficial properties, and may be an expensive alternative to flaxseed oil.

The optimum daily dosage of flaxseed oil has not been established. Usually, 1 tablespoon daily of the oil can be taken for general health. As a remedy, 1–3 tablespoons may be taken daily based on the person's weight and health needs. Some people consume the oil as an ingredient in salad dressing. The oil is often combined with limewater when used to treat burns and scalds.

Precautions

Flaxseed products are not known to be harmful when taken in recommended dosages, though it is important to remember that the long-term effects of taking flax-derived remedies (in any amount) have not been studied as of 2008. Due to lack of sufficient medical study, flaxseed products should be used with caution in children, women who are pregnant or breastfeeding, and people with liver or kidney disease.

Because flaxseed oil tends to become rancid relatively quickly, it should be kept in the refrigerator.

KEY TERMS

Antioxidant—An agent that helps to protect cells from damage caused by free radicals, the destructive fragments of oxygen produced as a byproduct during normal metabolic processes.

Atherosclerosis—Narrowing and hardening of the arteries due to plaque buildup.

Nonsteroidal anti-inflammatory drugs (NSAIDs)—A group of pain-relieving medications that also reduce inflammation when used over a period of time. NSAIDs are often given to patients with osteoarthritis.

Nutraceutical—Any food or food ingredient that is thought to provide health benefits, including the prevention and treatment of disease. Flaxseed is considered a nutraceutical.

Osteoporosis—An age-related disease in which bones become fragile and prone to debilitating fractures.

Purgative—A substance that encourages bowel movements.

Triglyceride—The total amount of fat in the blood. Triglyceride should not be confused with cholesterol, which is technically classified as a steroid and not as a fat.

While the oil may be added to cooked food, it should not be used during cooking because heat can destroy the effectiveness of the oil.

Persons who are adding ground flaxseed to their diet for its fiber content are advised to start off with small amounts and increase them gradually and to drink plenty of water. Otherwise the high fiber content of flaxseed can produce intestinal cramping and **diarrhea**.

Consumers should read the labels of all flaxseed products to insure that the product is for medicinal or nutritional purposes.

Side effects

When taken in recommended dosages, flaxseed products are not associated with any significant side effects.

Interactions

Consumers should consult their healthcare professional for information on flaxseed products and interactions with medications and other remedies. More specifically, the omega-3 fatty acids in flaxseed may increase the blood-thinning effects of such medications as aspirin or warfarin. Flaxseed may help a group of medications known as statins (lovastatin, simvastatin, etc.), which are given to lower blood cholesterol, to work more effectively.

Flaxseed may help to reduce the toxic side effects (kidney damage and high blood pressure) of cyclosporine, which is a drug given to organ transplant patients to prevent rejection of the new organ.

Flaxseed appears to reduce the risk of ulcers from high doses of NSAIDs.

In general, flaxseed oil should not be taken at the same time of day as prescription medications or other dietary supplements, as it will slow down the body's absorption of them.

Resources

PERIODICALS

Deutsch, Suzanne, Lorne McClinton. "Omega 3 Pork Cites Health Benefits." *National Hog Farmer* (November 15, 2006): 12 13.

MacLean, Catherine H. "Effects of Omega 3 Fatty Acids on Cancer Risk, A Systematic Review" *Journal of the Ameri can Medical Association* (January 25, 2006): 403 415.

Thompson, Lilian, U. Thompson, Jian Min Chen, Tong Li, K. Strasser Weippl, and Paul E. Goss. "Dietary Flax seed Alters Tumor Biological Markers in Postmeno pausal Breast Cancer." *Clinical Cancer Research* (May 15, 2005): 3828 3835.

OTHER

Dummert, Erin, and R. D. Dummert. "Flaxseeds Reduce Breast Cancer Risk." *The Diet Channel* January 11, 2007. www.thedietchannel.com/Flaxseed and Health Flaxseeds Reduce Breast Cancer Risk.htm (February 10, 2008).

"Flaxseed Continues to Show Benefits." *Science Now* Fall 2006. American Institute for Cancer Research. www.aicr.org (February 10, 2008).

Horovitz, Bruce. "Omega 3 Pours into Cereal, Orange Juice, Eggs, Pet Food." *USA Today* January 2, 2007. http:// www.usatoday.com/money/industries/health/2007 01 01 omega 3 usat_x.htm (February 10, 2008).

ORGANIZATIONS

American Botanical Council, P.O. Box 144345, Austin, TX, 78714 4345, http://www.herbalgram.org.

National Center for complimentary and Alternative Medi cine (NCCAM), National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, http:// www.nccam.nih.gov.

United States Food and Drug Administration (FDA), Cen ter for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway, College Park, MD, 20740, (888) SAFEFOOD, http://www.cfsan.fda.gov.

Greg Annussek
Clare Hanrahan

Flower remedies

Definition

Flower remedies are specially prepared flower essences, containing the healing energy of plants. They are prescribed according to a patient's emotional disposition, as ascertained by the therapist, doctor, or patients themselves.

Origins

Perhaps the most famous and widely used system is the Bach flower remedies. This system originated in the 1920s when British physician and bacteriologist, Dr. Edward Bach (1886–1936), noticed that patients with physical complaints often seemed to be suffering from **anxiety** or some kind of negative emotion. He concluded that assessing a patient's emotional disposition and prescribing an appropriate flower essence could treat the physical illness. Bach was a qualified medical doctor, but he also practiced **homeopathy**.

As a result of his own serious illness in 1917, Bach began a search for a new and simple system of medicine that would treat the whole person. In 1930, he gave up his flourishing practice on Harley Street at the Royal London Homeopathic Hospital and moved to the countryside to devote his life to this research. It is known that at this point, he ceased to dispense the mixture of homeopathy and allopathic medicine that he had been using. Instead, he began investigating the healing properties of plant essences and discovered that he possessed an "intuition" for judging the properties of each flower. Accordingly, he developed the system of treatment that bears his name, and is also the foundation for all other flower-remedy systems.

The Bach Flower Remedies were ostensibly the only system of significance from the 1920s until in the 1970s, when there was a renewed interest in the subject by doctors working in the field of natural medicine. Perhaps the most notable was Dr. Richard Katz, who was seeking new methods of dealing with modern **stress** and the resulting ailments. He focused on the concept of a psychic, psychological effect and chose to pursue this line of research.

In 1979, Katz founded the Flower Essence Society in California, (FES). This society pledged to further the research and development of Bach's principles. FES hosts a database of over 100 flower essences from more than 50 countries. FES is now an international organization of health practitioners, researchers, students, and others concerned with flower essence therapy.

The Society has connections with an estimated 50,000 active practitioners from around the world, who use flower essence therapy as part of their treatment. FES encourages the study of the plants themselves to determine the characteristics of flower essences. They are compiling an extensive database of case studies and practitioner reports of the use of essences therapeutically, allowing verification and development of the original definitions. They are also engaged in the scientific study of flower essence therapy.

FES says they have developed the theories of Paracelsus and Goethe who researched the "signatures" and "gestures" of botanical specimens, on the premise that the human body and soul are a reflection of the system of nature. FES plant research interprets the therapeutic properties of flower essences according to these insights.

In this regard, they have devised 12 "windows of perception" for monitoring the attributes of plants. Each of these windows reveals an aspect of the plant's qualities, although they maintain that what they are seeking is a "whole which is greater than the sum of its parts." The 12 windows are not considered independent classifications, but more of a blended tapestry of views of the qualities that each plant possesses.

The first window is concerned with the "form" of a plant—its shape classification. The second focuses on its "gesture" or spatial relationship. The third window is a plant's botanical classification; the Flower Essence Society maintains that considering a plant's botanical family is essential to obtaining an overview of its properties as a flower essence. The fourth window concerns the time orientation of a particular specimen regarding the daily and seasonal cycles. Why do some flowers bloom at different times of the day, while others, such as the evening primrose, respond to the moon? The fifth window observes a plant's relationship to its environment. Where a plant chooses to grow, and where it cannot survive, reveals much about its qualities. The sixth window observes a plant's relationship to the Four Elements and the Four Ethers, as FES maintains that plants exist in one of the elemental or etheric forces in addition to their physical life. "Elements" refers to those developed by the Greeks, as opposed to the modern concept of "molecular building blocks." It seems that commonly, two elements predominate in a plant, indicating a polarity of qualities, while two can be said to be recessive. The seventh window relates to a plant's relationship with the other kingdoms of nature: mineral, animal and human, while the eighth relates to the color and color variations of a plant. Katz explains

Bach flower remedies

Name	Remedy For
Agrimony	Upset by arguments, nonconfrontational, conceals worry and pain
Aspen	Fear of the unknown, anxiety, prone to nightmares, and apprehension
Beech	Critical, intolerant, and negative
Centaury	Submissive and weak-willed
Cerato	Self doubting and overly dependent
Cherry plum	Emotional thoughts and desperation
Chestnut bud	Repeats mistakes and has no hindsight
Chicory	Selfish, controlling, attention-seeking and possessive
Clematis	Absorbed, impractical, and indifferent
Crab apple	Shame and self-loathing, cleansing remedy
Elm	Overwhelmed by responsibility and feelings of inadequacy
Gentian	Negative, doubt, and depression
Gorse	Pessimism, hopelessness, and despair
Heather	Self-centered and self-absorbed
Holly	Jealousy, hatred, suspicion, and envy
Honeysuckle	Homesick, living in the past, and nostalgic
Hornbeam	Procrastination, fatigue, and mental exhaustion
Impatiens	Impatience, irritability, and impulsivity
Larch	No confidence, inferiority complex, and despondency
Mimulus	Timid, shy, and fear of the known
Mustard	Sadness and depression of unknown origin
Oak	Obstinate, inflexible, and overachieving
Olive	Exhaustion (following mental or physical effort)
Pine	Guilt and self blame
Red chestnut	Fear and anxiety for loved ones
Rock rose	Nightmares, hysteria, terror, and panic
Rock water	Obsessive, repression, perfectionism, and self denial
Scleranthus	Indecision, low mental clarity, and confusion
Star-of-Bethlehem	Grief and distress, shock
Sweet chestnut	Despair and hopelessness
Vervain	Overbearing and fanatical
Vine	Arrogant, ruthless, and inflexible
Walnut	Difficulty accepting change
Water violet	Pride and aloofness
White chestnut	Worry, preoccupation, and unwanted thoughts
Wild oat	Dissatisfaction and uncertainty over one's directing in life
Wild rose	Apathy and resignation, drifting
Willow	Self pity and bitterness

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Aura—Emanation of light from living things (plants and animals) that can be recorded by Kirlian photography.

Essence—The constituent of a plant that determines its characteristics.

Potentization—The process of transferring the healing energy of a plant into spring water.

Window—A perspective adopted to assess the property of a given plant.

how the language of color tells us so much about the "soul qualities" of a plant. The ninth window concerns all other sensory perceptions of a plant, such as fragrance, texture, and taste. The tenth window involves assessing the chemical substances and properties; the eleventh studies medicinal and herbal uses, as by studying the physical healing properties of plants, their more subtle effects on the soul can be understood. Finally, the twelfth window involves the study of the lore, mythology, folk wisdom, and spiritual and ritual qualities associated with a particular plant. Katz relates how in the past, human beings were more in touch with the natural world, and the remnants of this unconscious plant wisdom live on in the form of folklore, mythology, and so on.

Benefits

Flower remedies are more homeopathic than herbal in the way they work, effecting energy levels rather than chemical balances. They have been described as "liquid energy." The theory is that they encapsulate the flowers' healing energy, and are said to deal with and overcome negative emotions, and so relieve blockages in the flow of human energy that can cause illness.

Description

Because flower remedies operate on approximately the same principles as homeopathy, practitioners quite often prescribe the two therapies in conjunction with each other. They can also be used concurrently with allopathic medicine.

The system consists of 38 remedies, each for a different disposition. The basic theory is that if the remedy for the correct disposition is chosen, the physical illness resulting from the present emotional state can then be cured. There is a **rescue remedy** made up of five of the essences—cherry plum, clematis, impatiens, rock star, and star of Bethlehem—that is recommended for the treatment of any kind of physical or emotional shock. Therapists recommended that rescue remedy be kept on hand to help with all emergencies.

The 38 Bach Remedies are:

- agrimony: puts on a cheerful front, hides true feelings, and worries or problems
- aspen: feelings of apprehension, dark foreboding, and premonitions
- beech: critical, intolerant, picky
- centaury: easily comes under the influence of others, weak-willed
- cerato: unsure, no confidence in own judgement, intuition, and seeks approval from others
- cherry plum: phobic, fear of being out of control, and tension
- chestnut bud: repeats mistakes, does not learn from experience
- chicory: self-centered, possessive, clingy, demanding, self pity
- clematis: absent minded, dreamy, apathetic, and lack of connection with reality
- crab apple: a "cleanser" for prudishness, self–disgust, feeling unclean
- elm: a sense of being temporarily overwhelmed in people who are usually capable and in control
- gentian: discouraged, doubting, despondent
- gorse: feelings of pessimism, accepting defeat
- heather: need for company, talks about self, and concentrates on own problems
- holly: jealousy, envy, suspicion, anger, and hatred
- honeysuckle: reluctance to enter the present and let the past go
- hornbeam: reluctant to face a new day, weary, can't cope (mental fatigue)
- impatiens: impatience, always in a hurry, and resentful of constraints
- larch: feelings of inadequacy and apprehension, lack of confidence and will to succeed
- mimulus: fearful of specific things, shy, and timid
- mustard: beset by "dark cloud" and gloom for no apparent reason
- oak: courageous, persevering, naturally strong but temporarily overcome by difficulties
- olive: for physical and mental renewal, to overcome exhaustion from problems of long–standing
- pine: for self–reproach, always apologizing, assuming guilt
- red chestnut: constant worry and concern for others

EDWARD BACH (1886–1936)

Edward Bach was a graduate of University College Hospital (M.B., B.S., M.R.C.S.) in England. He left his flourishing Harley Street practice in favor of homeopathy, seeking a more natural system of healing than allopathic medicine. He concluded that healing should be as simple and natural as the development of plants, which were nourished and given healing properties by earth, air, water, and sun.

Bach believed that he could sense the individual healing properties of flowers by placing his hands over the petals. His remedies were prepared by floating summer flowers in a bowl of clear stream water exposed to sunlight for three hours.

He developed 38 remedies, one for each of the negative states of mind suffered by human beings, which he classified under seven group headings: fear, uncertainty, insufficient interest in present circumstances, loneliness, over sensitivity to influences and ideas, despondency or despair, and overcare for the welfare of others. The Bach remedies can be prescribed for plants, animals, and other living creatures as well as human beings.

- rock rose: panic, intense alarm, dread, horror
- rock water: rigid–minded, self–denial, restriction
- scleranthus: indecision, uncertainty, fluctuating moods
- star of Bethlehem: consoling, following shock or grief or serious news
- sweet chestnut: desolation, despair, bleak outlook
- vervain: insistent, fanatical, over–enthusiastic
- vine: dominating, overbearing, autocratic, tyrannical
- walnut: protects during a period of adjustment or vulnerability
- water violet: proud, aloof, reserved, enjoys being alone
- white chestnut: preoccupation with worry, unwanted thoughts
- wild oat: drifting, lack of direction in life
- wild rose: apathy, resignation, no point in life
- willow bitter: resentful, dissatisfied, feeling life is unfair

Originally, Bach collected the dew from chosen flowers by hand to provide his patients with the required remedy. This became impractical when his treatment became so popular that production could not keep up with demand. He then set about finding a way to manufacture the remedies, and found that floating the freshly picked petals on the surface of spring water in a glass bowl and leaving them in strong sunlight for three hours produced the desired effect. Therapists explain that the water is "potentized" by the essence of the flowers. The potentized water can then be bottled and sold. For more woody specimens, the procedure is to boil them in a sterilized pan of water for 30 minutes. These two methods produce "mother tinctures" and the same two methods devised by Bach are still used today. Flower essences do not contain any artificial chemical substances, except for alcohol preservative.

Bach remedies cost around $10 each, and there is no set time limit for treatment. It may take days, weeks, or in some cases months. Flower essences cost around $6 each, and there is also no set time for the length of treatment, or the amount of essences that may be taken. These treatments are not generally covered by medical insurance.

Precautions

Bach remedies and flower essences are not difficult to understand, and are considered suitable for self administration. The only difficulty may be in finding the correct remedy, as it can sometimes be tricky to pinpoint an individual's emotional disposition. They are even safe for babies, children, and animals. An important aspect of treatment with flower remedies, is that if you feel instinctively that you need a particular remedy, you are encouraged to act on that instinct. However, it is advisable not to continue a particular remedy once it is no longer needed, and to try a different one if progress is not being made.

The remedies are administered from a stoppered bottle and need to be diluted. Individuals sensitive to alcohol can apply the concentrate directly to temples, wrists, behind the ears, or underarms. When kept in a cool dark place, they should last indefinitely. However, a diluted remedy should not be kept longer than three weeks. Two drops of each diluted remedy should be taken four times a day, including first thing in the morning and last thing at night. If the rescue remedy is being used, four drops should be used instead. Most therapists recommend that they be taken in spring water, but the remedy can be taken directly from the bottle, if care is taken that the

dropper does not touch the tongue, as this would introduce bacteria that would spoil the remedy.

It is not recommended that more than six or seven Bach remedies be used at any one time. Instead, it is preferable to divide a larger amount up into two lots to ensure the optimum effectiveness of the remedies. No combination, or amount of combinations of the remedies can cause any harm, rather they become less effective.

Unlike FES, the Bach Centre does not encourage research to "prove" that the remedies work, preferring that people find out for themselves. They strive to keep the use of the Bach remedies as simple as possible, and to this end they do not keep case records. Bach warned before he died that others would try to change his work and make it more complicated. He was determined to keep it simple so that anyone could use it, and that is why he limited the system to only 38 remedies. The Centre points out that many who have used Bach's research as a starting point have added other remedies to the list, even some that Bach himself rejected.

Side effects

Flower remedies or essences are generally regarded as being totally safe, and there are no known side effects apart from the rare appearance of a slight rash, which is not a reason to discontinue treatment, says the Bach Centre.

Research and general acceptance

Bach flower remedies and flower essences have not yet officially won the support of allopathic medicine, despite the fact that more and more medical doctors are referring patients for such treatments on the strength of personal conviction. However, it is difficult to discount the scores of testimonials. Some practitioners refer skeptics to the research that has been done regarding the "auras" of living things. Theoretically, the stronger the aura, the more alive an organism is. Flower essences have very strong auras.

Among mainstream medical practitioners, psychiatrists and family practitioners appear to be more willing to study flower essences than physicians in other specialties. One pilot study at Penn State Hershey Medical Center found that the **Bach flower essences** were effective in reducing the symptoms of **attention-deficit hyperactivity disorder** (ADHD) in children as measured by two standard assessment instruments for ADHD.

Another area of medicine in which acceptance of Bach flower essences is growing is small-animal veterinary practice. Two full-length books on the use of flower essences for behavioral problems in animals were published in 1999, and some schools of veterinary medicine now include flower essences as part of elective courses in holistic or complementary veterinary treatments.

Training and certification

The official Bach International Education Program training courses are all recognized by the Dr. Edward Bach Foundation, and taught by accredited Bach trainers. These qualifications are not recognized by the medical authorities.

Bach therapy may be self-administered, but for those who would prefer the advice of a practitioner, look for a registered Bach practitioner, or a homeopath or herbalist who also deals with the Bach flower remedies.

Resources

BOOKS

Bach, Edward. *Heal Thyself*. Essex, UK: C.W. Daniel Company, Ltd., 1931.

Graham, Helen, and Gregory Vlamis. *Bach Flower Remedies for Animals*. Tallahassee, FL: Findhorn Press, Inc., 1999.

Howard, Judy, Stefan Ball, and Kate Aldous (illustrator). *Bach Flower Remedies for Animals*. London, UK: The C. W. Daniel Co., Ltd., 1999.

Kaslof, Leslie. *The Traditional Flower Remedies of Dr. Edward Bach*. New Canaan, CT: Keats, 1993

Somerville, R. *Flower Remedies*. New York: Time Life Books.

Vlannis, Gregory. *Flowers to the Rescue*. New York: Thor ras, 1986.

PERIODICALS

Downey, R. P. "Healing with Flower Essences." *Beginnings* 22 (July August 2002): 11 12.

"Flowers to the Rescue." *Women's Health Letter* 8 (July 2002): 3 4.

Mehta, Satwant K. "Oral Flower Essences for ADHD." (Letters to the Editor.) *Journal of the American Acad emy of Child and Adolescent Psychiatry* 41 (August 2002): 895 896.

ORGANIZATIONS

The Dr. Edward Bach Centre, Mount Vernon, Bakers Lane, Sotwell, Oxon, OX10 OPX, UK. centre@bachcentre.com. http://www.bachcentre.com.

The Flower Essence Society. P.O. Box 459, Nevada City, CA 95959. (800) 736 9222 (US & Canada). (530) 265 9163. Fax: (530) 265 0584. mail@flowersociety.org. http://www.flowersociety.org.

National Center for Complementary and Alternative Medicine Clearinghouse. P. O. Box 7923, Gaithersburg, MD 20898. (888) 644 6226. http://www.nccam.nci.nih.gov.

Patricia Skinner
Rebecca J. Frey, PhD

Flu *see* **Influenza**
Fluid retention *see* **Edema**

Fo ti

Description

Fo ti is the American name for the herb *Polygonum multiflorum*. *Polygonum* is a member of the Polygonaceae family of plants and is a perennial flowering vine that reaches heights of 3–6 ft (0.97–1.8 m). It is native to southwestern China, Japan and Taiwan, but can be cultivated in many regions, including parts of North America.

In Chinese herbalism, fo ti (sometimes spelled fo-ti) is called *he shou wu* or *ho shou wu*. Other names are fleeceflower and Chinese cornbind. In Japan, the herb goes by the name *kashuu*. Fo ti is one of the most popular herbs in Oriental medicine. It is used as an overall health tonic, as a tincture to increase longevity, and as a remedy for various health conditions.

Chinese herbalists most frequently use the root of the plant for medicinal purposes, but occasionally draw on the stems for different applications. The root has a sweet and slightly bitter taste. Chinese herbalists claim it has slightly warming effects in the body, and works by increasing levels of blood and vital essence. These are two of three essential substances in the body, according to Chinese medicine. Chinese herbalists also maintain that fo ti strengthens the liver and kidneys. They use fo ti root in conjunction with other herbs in many medicinal tonics.

Research has shown that fo ti has antitumor and antibacterial properties. It also lowers blood pressure (hypotensive effects) and increases circulation (vasodilatory effects), providing an overall protective effect on the cardiovascular system. In addition, it has antioxidant and anti-free radical properties, which may associated with its connection to reported benefits to patients with **atherosclerosis**. A 2005 study in rabbits confirmed that it is "a powerful agent against atherosclerosis." In addition, a 2003 study showed that it contained significant estrogen activity, similar to that found in soy and **red clover**, and therefore may have applications as an alternative-medicine treatment for **menopause** symptoms. A 2005 study confirmed the high estrogen-content of fo ti.

Fo ti contains emodin and rhein, two laxative agents that have shown promising anti-cancer activity as well. Fo ti also contains **lecithin**, a B vitamin that aids in fat metabolism and lowers **cholesterol**. Researchers have isolated a flavonoid in fo ti called catachin, which is also found in **green tea**. Catachin inhibits tumor cells and has antioxidant effects, which may be the source of the anti-aging properties for which the herb is known in China. Researchers who conducted an animal study in 2003 reported improvements in both memory and learning among mice, and suggested that **antioxidants** in fo ti might be the reason for the improvements.

General use

Herbalists use fo ti for many conditions. They recommend it as an overall health strengthener, and to prevent premature **aging** and graying hair. Practitioners of Chinese medicine recommend it to increase sperm quality in men and fertility in women. They also advise its use for diseases associated with weakness in the liver and kidneys. These illnesses are characterized by blurred vision, **dizziness**, weakness in the knees and lower back, intermittent fevers, dull complexion, swollen lymph glands, and sores and **boils** on the skin. **Traditional Chinese medicine** has also used fo ti for non-acute **malaria**, for lowering cholesterol, and for nervous disorders. As fo ti has both laxative and tonic effects, herbalists suggest it for **constipation** in the elderly. They also use it to treat vaginal discharges, and fo ti's slightly sedative effect has led to its application as a treatment for **insomnia**.

Practitioners of Chinese medicine use the vine part of *Polygonum*, which is called *ye jiao teng*, to treat insomnia as well as irritability, and numb or **itching** sensations in the limbs.

Preparations

Fo ti is available for purchase as whole or sliced roots, in tablets, and as a tincture. Consumers can find it in health food stores, as well as in Chinese herb stores and markets. The reader should note that the Chinese do not recognize fo ti as the herb's proper name; in Chinese markets it is known as *he shou wu* or as *Polygonum*.

Consumers will typically find fo ti root available in slices. The older and larger the root, the higher quality and more expensive it is. In addition, herbalists

KEY TERMS

Catachin—A flavonoid found in fo ti that has antioxidant and tumor-inhibiting qualities.

Flavonoids—Pigments found in plants that protect plants against environmental stress. In humans, they appear to have anti-aging effects.

Tonic—Any substance that strengthens and tones the entire system.

Sedative—A substance or medication that calms and lowers bodily activity.

consider dark roots a higher grade than roots that have white streaks in them. An herbalist may recommend eating the root or preparing it as a tea or tincture. The preparation for making tea involves boiling the root for 30 minutes or more to extract all the active ingredients. For one serving of the root or tea, herbalists recommend 5–15 g. The preparation for a tincture entails soaking chopped roots in alcohol for one month or longer, and individuals typically take 30 drops of the tincture daily. Tinctures are also available for purchase in varying concentrations, which causes associated variations in the daily dosages.

For sedative purposes, individuals generally take fo ti vine with the evening meal or before bedtime. Herbalists recommend taking fo ti continuously for up to one month, but then waiting one month before using it again.

Fo ti has uses in many herbal tonics. For longevity and overall health, Chinese herbalists recommend combining it with Asian ginseng. As a tonic for non-acute malaria or for recovery from a long illness, they suggest combining fo ti with Asian ginseng, **dong quai** and **tangerine peel**. For sore knees and lower back problems, herbalists combine fo ti with **cuscuta**, psorolea fruit, and **lycium fruit**. As part of a program of **cancer** treatment, they advise combining fo ti with other tonic and immune-enhancing herbs, including **Korean ginseng**, **astragalus**, milletia, and codonopsis. Experienced herbalists can assist consumers with special preparations and applications.

Precautions

Fo ti is generally a safe herb, but practitioners of Chinese medicine do not recommend it for patients with **diarrhea** or heavy phlegm in the respiratory tract.

Side effects

Reported side effects with fo ti are generally rare. They include diarrhea, abdominal **pain**, **nausea**, numbness in the extremities, flushing of the face, and skin **rashes**. Three case reports of acute **hepatitis** arising in patients following their use of an herbal product called Shou-wu-pian, which is derived from fo ti. In two of the three cases, medical professionals were not able to determine whether the fo ti or a product contaminant contributed to the hepatitis. In the third case, however, medical professionals found no contaminants and attributed the hepatitis to fo ti.

Interactions

Some herbalists advise patients to reduce their intake of onions, **garlic**, and chives while taking fo ti for extended periods.

Resources

BOOKS

Alschuler, Lise, and Karolyn Gazella (eds.). *Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing*. Second edition. Berkeley, CA: Celestial Arts, 2007.

Fan Warner, J.W. *Manual of Chinese Herbal Medicine*. Boston: Shambhala, 2003.

Wood, Matthew. *Vitalism: The History of Herbalism, Homeopathy, and Flower Essences*. Berkeley, CA: North Atlantic Books: 2000.

PERIODICALS

HerbalGram (a quarterly journal of the American Botanical Council). http://content.herbalgram.org/abc/herbalgram/ (accessed February 8, 2008).

Qi: The Journal of Traditional Eastern Health and Fitness. http://www.qi journal.com/ (accessed February 8, 2008).

Douglas Dupler
Leslie Mertz, Ph.D.

Folate *see* **Folic acid**

Folic acid

Description

Folic acid is a water-soluble vitamin belonging to the B-complex group of vitamins. These vitamins help the body break down complex carbohydrates into simple sugars that can be readily used for energy. Excess B vitamins are excreted from the body rather than stored for later use. This is why sufficient daily intake of folic acid is necessary.

Folic acid is also known as folate or folacin. It is one of the nutrients most often found to be deficient in the Western diet, and there is evidence that deficiency

Recommended dietary allowance of folate (folic acid)

Age	mcg/day
Children 0-6 mos.	65 (AI)
Children 7-12 mos.	89
Children 1-3 yrs.	150
Children 4-8 yrs.	200
Children 9-13 yrs.	300
Children 14-18 yrs.	400
Adult ≥ 19 yrs.	400
Pregnant women	600
Breastfeeding women	500

Foods that contain folate	mcg
Cereal, 100% fortified, 3/4 cup	400
Beans, pinto, cooked, 1/2 cup	147
Turnip greens, cooked, 1/2 cup	135
Asparagus, cooked, 1/2 cup	132
Spinach, cooked, 1/2 cup	131
Beans, navy, cooked, 1/2 cup	127
Beans, great northern, cooked, 1/2 cup	90
Broccoli, steamed, 1/2 cup	85
Beets, boiled, 1/2 cup	68
Rice, long-grain white, enriched, cooked, 1/2 cup	65
Corn, yellow, cooked, 1/2 cup	37
Tomato juice, canned, 6 oz.	35
Bread, white, enriched, 1 slice	25
Bread, whole wheat, enriched, 1 slice	25
Raspberries, 1/2 cup	16

AI = Adequate Intake
mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

is a problem worldwide. Folic acid is found in leafy green vegetables, beans, peas and lentils, liver, beets, brussels sprouts, poultry, nutritional yeast, tuna, **wheat germ**, mushrooms, oranges, asparagus, broccoli, spinach, bananas, strawberries, and cantaloupes. In 1998, the U.S. Food and Drug Administration (FDA) required food manufacturers to add folic acid to enriched bread and grain products to boost intake and to help prevent neural tube defects (NTD) in the fetus during **pregnancy**.

General use

Folic acid works together with **vitamin B_{12}** and **vitamin C** to metabolize protein. It is important for the formation of red and white blood cells. Folic acid is necessary for the proper differentiation and growth of cells and for fetal development. It is also used to form the nucleic acid of DNA and RNA. It increases the appetite, stimulates the production of stomach acid for digestion, and aids in maintaining a healthy liver. A folic acid deficiency may lead to megaloblastic **anemia**, in which there is decreased production of red blood cells and the cells that are produced are abnormally large. This condition reduces the amounts of oxygen and nutrients that are able to reach the tissues. Symptoms may include **fatigue**, reduced secretion of digestive acids, confusion, and forgetfulness. During pregnancy, a folic acid deficiency may lead to preeclampsia, premature birth, and increased bleeding after birth.

People who are at high risk for strokes and **heart disease** may benefit from folic acid supplements. An elevated blood level of the amino acid homocysteine has been identified as a risk factor for some of these diseases. High levels of homocysteine have also been found to contribute to problems with **osteoporosis**. Folic acid, together with vitamins B_6 and B_{12}, aids in the breakdown of homocysteine, and may help reverse the problems associated with elevated levels of homocysteine.

Pregnant women have an increased need for folic acid, both for themselves and their unborn child. Folic acid is necessary for the proper growth and development of the fetus. Adequate intake of folic acid is vital for the prevention of several types of birth defects, particularly neural tube defects (NTDs). The neural tube of the embryo develops into the brain, spinal cord, spinal column, and the skull. If this tube forms incompletely during the first few months of pregnancy, a serious—and often fatal—defect such as spina bifida or anencephaly, may occur. Folic acid, taken from one year to one month before conception through the first four months of pregnancy, can reduce the risk of NTDs by 50 to 70%. It also helps prevent cleft lip and palate.

Research shows that folic acid can be used to successfully treat **cervical dysplasia**, a condition that is diagnosed by a Pap smear, and consists of abnormal cells in the cervix. This condition is considered to be a possible precursor to cervical **cancer**. Daily consumption of 1,000 micrograms (mcg) of folic acid for three or more months has resulted in improved cervical cells upon repeat Pap smears.

Studies suggest that long-term use of folic acid supplements may also help prevent lung and colon cancers. However, a study involving over 1,000 individuals, conducted at universities and research centers in the United States, Canada, and Norway, found that folic acid given in a dose of 1 mg per day does not lower the risk of colorectal adenoma. Scientists concluded that additional research in this area is needed.

Alcohol is believed to interfere with the absorption of such important nutrients as folic acid. Researchers have found that alcoholics who have low folic acid levels face a greatly increased chance of developing colon cancer.

Supplements are taken to correct a folic acid deficiency. Since the functioning of the B vitamins is interrelated, it is generally recommended that the appropriate dose of B-complex vitamins be taken in place of single B vitamin supplements. The Recommended Dietary Allowance (RDA) for folate is 400 mcg per day for adults, 600 mcg per day for pregnant women, and 500 mcg daily for nursing women. Medicinal dosages of up to 1,000 to 2,000 mcg per day may be prescribed.

In January 2000, the Chile Ministry of Health required wheat flour (primarily used in bread) to be fortified with folic acid. A study performed at the University of Chile several years after the law was put into effect found that the folate status of Chilean women of childbearing age was improved.

Precautions

Folic acid is not stable. It is easily destroyed by exposure to light, air, water, and cooking. Therefore, the supplement should be stored inside a dark container in a cold, dry place, such as a refrigerator. Many medications interfere with the body's absorption and ability to use folic acid. These medications include sulfa drugs, sleeping pills, estrogen, anti-convulsants, birth control pills, antacids, quinine, and some antibiotics.

The anemia caused by folic acid deficiency is identical to that caused by lack of vitamin B_{12}. Using large amounts of folic acid (e.g., over 5,000 mcg per day) can mask a vitamin B_{12} deficiency, since the anemia will improve but the other effects of vitamin B_{12} deficiency will continue. This condition can lead to irreversible nerve damage. People with megaloblastic anemia should be treated under medical supervision, since regular testing may be required.

Side effects

Folic acid is generally considered safe at levels of 5,000 mcg or less. Side effects are uncommon. However, large doses may cause **nausea**, decreased appetite, bloating, **gas**, decreased ability to concentrate, and **insomnia**. Large doses may also decrease the effects of phenytoin (Dilantin), a seizure medication.

Interactions

As with all B-complex vitamins, it is best to take folic acid with the other B vitamins. Vitamin C is important to the absorption and functioning of folic acid in the body.

KEY TERMS

Homocysteine—An amino acid involved in the breakdown and absorption of protein in the body.

Preeclampsia—A serious disorder of late pregnancy, in which the blood pressure rises, there is a large amount of retained fluids, and the kidneys become less effective and excrete proteins directly into the urine.

Raynaud's disease—A symptom of various underlying conditions affecting blood circulation in the fingers and toes and causing them to be sensitive to cold.

Recommended Daily Allowance (RDA)—Guidelines for the amounts of vitamins and minerals necessary for proper health and nutrition. The RDA was established by the National Academy of Sciences in 1989.

Water-soluble vitamins—Vitamins that are not stored in the body and are easily excreted. These vitamins must be consumed regularly as foods or supplements to maintain health.

Resources

BOOKS

Bender, D. A. *A Dictionary of Food and Nutrition*. New York: Oxford University Press, 2005.

PERIODICALS

Cole, Bernard, F., et al. "Folic Acid for the Prevention of Colorectal Adenomas." *Journal of the American Medi cal Association* 297, no. 21 (June 6, 2007): 2351 2359.

ORGANIZATIONS

Centers for Disease Control and Prevention, 4770 Buford Highway NE, MSF 45, Atlanta, GA, 30341 3724, (888) 232 6789, http://www.cdc.gov/.

Samuel Uretsky, Pharm.D.
Rhonda Cloos, R.N.

Food poisoning

Definition

Food poisoning is a general term for health problems arising from eating food contaminated by viruses, chemicals, or bacterial toxins. Types of food

Seafood with evidence of chemicals and toxins

Fish	Chemicals/Toxins
Bass	Dioxin, chlordane, DDT, PCBs, mercury
Catfish	Chlordane, DDT, dioxin, PCBs, etc.
Caviar	Chlordane, DDT, PCBs
Cod	DDT, PCBs
Maine Lobster	Dioxin, PCBs
Shark	DDT, PCBs, mercury
Striped Bass	PCBs, chlordane, DDT, mercury, etc.
Sturgeon	Chlordane, DDT, dieldrin, mercury, etc.
Swordfish	Mercury, DDT, PCBs
Tilefish	Mercury
Whitefish	Dioxin

(Illustration by Corey Light. Cengage Learning, Gale)

poisoning include bacterial food poisoning, shellfish poisoning, and mushroom poisoning. The medical term for food poisoning is **gastroenteritis**.

Description

The Centers for Disease Control and Prevention (CDC) estimates that there are up to 33 million cases of food poisoning in the United States each year. Many cases are mild, and they pass so rapidly that they are never diagnosed. Occasionally, a severe outbreak creates a newsworthy public health hazard, but these instances are rare. Anyone can get food poisoning, but the very young, the very old, and those with compromised immune systems have the most severe and life-threatening cases.

Causes and symptoms

General indications of food poisoning include **diarrhea**, stomach **pain** or cramps, gurgling sounds in the stomach, **fever**, **nausea**, and **vomiting**. Dehydration is a common complication, since fluids and electrolytes are lost through vomiting and diarrhea. Dehydration is more likely to happen in the very young, the elderly, and people who are taking diuretics.

Bacterial sources of food poisoning

Bacteria are major causes of food poisoning. Symptoms of bacterial food poisoning occur because foodborne bacteria release enterotoxins, or poisons, as a byproduct of their growth in the body. These toxins often diminish the absorptive ability of the intestines and cause the secretion of water and electrolytes that leads to dehydration. The severity of symptoms depends on the type of bacteria, the amount of bacteria and food consumed, and the individual's health and sensitivity to the bacteria's toxin.

SALMONELLA. Symptoms of poisoning begin 12–72 hours after eating food contaminated with *Salmonella*. Classic food poisoning symptoms, including fever, occur for about two to five days. *Salmonella* is usually transmitted through the consumption of food contaminated by human or other animal feces. This contamination is mostly due to lack of hand washing by food handlers.

***ESCHERICHIA COLI* (*E. COLI*).** Symptoms of food poisoning from *E. coli* O157:H7 and similar **strains** of *E. coli* are slower to appear than those caused by some of the other foodborne bacteria. One to three days after eating contaminated food, the victim begins to have severe abdominal cramps and watery diarrhea that usually becomes bloody. The diarrhea may consist mostly of blood and very little stool, so the condition is sometimes called hemorrhagic **colitis**. There is little or no fever, the bloody diarrhea lasts from one to eight days, and the condition usually resolves by itself. Food contamination from *E. coli* O157:H7 has mostly been found in raw or undercooked ground beef. Raw milk has also been a source of food poisoning by *E. coli*.

CAMPYLOBACTER JEJUNI. *C. jejuni* **infections** are most often caused by contaminated chicken, but unchlorinated water and raw milk may also be sources of infection. Classic symptoms of food poisoning, including fever and diarrhea, begin two to five days after consuming food or water contaminated with *C. jejuni*. The diarrhea may be watery and may contain blood. Symptoms last from seven to 10 days, and relapses occur in about one quarter of the people who are infected.

Common pathogens causing food poisoning

Pathogen	Onset of Symptoms	Common Host(s)
Campylobacter	2 - 5 days	Poultry, unpasteurized milk, and contaminated water.
E. coli 0157:H7	1 - 8 days	Undercooked, contaminated ground beef. Can also be found in unpasteurized milk or apple cider, alfalfa sprouts, and contaminated water.
Listeria	9 - 48 hours	Found in a variety of raw foods, such as uncooked meats and vegetables, and in processed foods that become contaminated after processing, such as hot dogs, luncheon meats, and milks and cheeses.
Salmonella	1 - 3 days	Poultry, eggs, meat, milk, inadequately cooked foods.
Shigella	24 - 48 hours	This bacteria is transmitted through direct contact with an infected person or from food or water that become contaminated by an infected person.
Vibrio vulnificus	1 - 7 days	Contaminated seafood, raw or undercooked oysters, mussels, clams, and whole scallops, and contaminated water.

SOURCE: Food and Safety Inspection Service, U.S. Department of Agriculture

(Illustration by Corey Light. Cengage Learning, Gale)

***STAPHYLOCOCCUS AUREUS* (STAPH).** *Staph* is spread primarily by food handlers with *Staph* infections on their skin. However, contaminated equipment and food preparation surfaces may also be at fault. Almost any food can be contaminated, but salad dressings, milk products, cream pastries, and food kept at room temperature, rather than hot or cold, are likely candidates. Classic symptoms of food poisoning appear rapidly, usually two to eight hours after the contaminated food is eaten. Such symptoms usually last only three to six hours and rarely more than two days. Most cases are mild and the victim recovers without any assistance.

SHIGELLA. Symptoms of food poisoning by *Shigella* appear 36–72 hours after eating contaminated food. These symptoms are slightly different from those associated with most foodborne bacteria. In addition to the familiar symptoms of food poisoning, up to 40% of children with severe infections show neurological symptoms. These include seizures, confusion, **headache**, lethargy, and a stiff, sore neck. The disease runs its course in two to three days.

CLOSTRIDIUM BOTULINUM. *C. botulinum* (commonly known as botulism) is the deadliest of the bacterial foodborne illnesses. Sources for adult botulism are often improperly canned or preserved food. Symptoms of adult botulism appear about 18 to 36 hours after the contaminated food is eaten, although there are documented times of onset ranging from four hours to eight days. Unlike other foodborne illnesses, there is no vomiting and diarrhea associated with botulism. Initially, a person with botulism feels weakness, **dizziness**, and double vision. Symptoms progress to difficulty with speaking and swallowing. The toxins from *C. botulinum* are neurotoxins—they poison the nervous system, causing paralysis. If the disease proceeds unchecked, paralysis will move throughout the body. Eventually, without medical intervention, the respiratory muscles will become paralyzed and the victim will suffocate.

With infant botulism, the spores of *C. botulinum* lodge in the infant's intestinal tract. Honey, especially when consumed by infants younger than 12 months, is sometimes the source of these spores. Onset of the symptoms is gradual. The infant initially has **constipation**, followed by poor feeding, lethargy, weakness, drooling, and a distinctive wailing cry. Eventually the

Types of food poisoning

Type	Cause
Traveler's diarrhea	Usually caused by otoxigenic *ESCHERICHIA COLI*, *(E.coli)* bacteria found in contaminated food and water.
Salmonella	Caused by bacteria in contaminated poultry, eggs, meat, and dairy products. Although it can be fatal, most cases are mild.
Botulism	Caused by anaerobic bacteria that is found in home canned products and honey.
Viral	Caused most often by contaminated raw seafood.
Chemical	Caused by pesticides.

(Illustration by Corey Light. Cengage Learning, Gale)

baby loses the ability to control its head muscles. Paralysis then progresses to the rest of the body.

Fish-associated food poisoning

Ciguatera fish poisoning is caused by toxins accumulated in the tissues of certain tropical fish, including groupers, barracudas, snappers, and mackerel. Signs of poisoning occur about six hours after eating the fish. Around the mouth, there may be numbness and tingling, which may spread to other places including the hands and feet. There is often muscle pain and weakness, headache, dizziness, joint pain, sensitivity to temperature, heart arrhythmias, dramatic changes in heart rate, and reduced blood pressure. Reef fish contaminated with ciguatoxin are being exported all over the world, occurrence of ciguatera is becoming more likely in colder climates.

Pufferfish, or *fugu*, is a traditional gourmet dish served mostly in Japan. The skin and other organs of the pufferfish contain a strong poison called tetradotoxin. The first stage of tetradotoxin poisoning is indicated by numbness of the lips and tongue, which may occur 20–180 minutes after eating the fish. This is followed by tingling and numbness of the face, hands, and feet. Classic symptoms of food poisoning are accompanied by other neurological symptoms such as light-headedness, headache, and unsteady gait. The second stage of tetradotoxin poisoning brings on a progressive paralysis. Breathing, talking, and other movement becomes difficult. Cyanosis (bluish or purplish skin discoloration), low blood pressure, and arrhythmias may occur. Convulsions and mental impairment may happen right before death, or the person may be completely lucid, though unmoving. Death usually occurs four to six hours after ingestion of the fish if there is no proper intervention; that time, however, has been known to be as little as 20 minutes.

Shellfish poisoning is caused by toxins made by certain algae eaten by shellfish. The toxins are then accumulated in the bodies of the shellfish. Cockles, mussels, clams, oysters, and scallops are most often affected. Sometimes the toxin-producing algae multiply to such an extent that they cause the waters they live in to take on the reddish color of their bodies. This phenomenon is known as a red tide. Warnings are often given against eating shellfish from such areas. Symptoms of food poisoning show up within a half an hour to two hours of eating the shellfish, depending on the amount and type eaten. There may be burning and tingling in the face and mouth, numbness, drowsiness, muscular pain, dizziness, diarrhea, stomachache, confusion, nausea, vomiting, odd temperature sensations, difficulty breathing, and possibly coma. The symptoms may last from a few hours to a few days.

KEY TERMS

Arrhythmia—A disrupted heartbeat pattern.

Disulfiram-like poison—Disulfiram is a chemical compound that causes a severe physiological reaction to alcohol. This poison behaves like disulfiram.

Electrolytes—Salts and minerals in the body that are important because they control body fluid balance and support all major body reactions.

Nasogastric intubation—Insertion of a tube through the nose and mouth for delivery of food and oxygen.

Neurotoxin—A poison that acts on the central nervous system.

Peristalsis—Waves of contractions, such as through the intestines, forcing the contents onward.

Histamine poisoning can occur from eating fish whose body tissues have begun to produce high levels of histamine. Mackerel, tuna, and mahi mahi are most often the sources. After consumption of the fish, immediate facial flushing and **hives** may occur, as well as classic symptoms of food poisoning becoming evident a few minutes later. Symptoms usually last less than 24 hours.

Mushroom poisoning

Mushroom poisoning is classified by the effects of the poisons. Protoplasmic poisons result in cell destruction, often in the liver, which progresses to complete organ failure. Neurotoxins cause neurological symptoms such as sweating, convulsions, hallucinations, excitement, **depression**, coma, and colon spasms. Gastrointestinal (GI) irritants rapidly bring on the classic symptoms of food poisoning and then resolve just as quickly. Disulfiram-like poisons are generally nontoxic, except when alcohol is consumed within 72 hours of eating them. In these cases, the poisons cause headache, nausea, vomiting, flushing, and cardiac disturbances for two to three hours.

Other possible sources

Other possible sources of food poisoning include ingestion of green or sprouting raw potatoes, ingestion of fava beans by susceptible persons, and ergot poisoning from ingestion of contaminated grain. Chemical contaminant food poisoning may result from the ingestion of unwashed produce sprayed with arsenic, lead, or insecticides. Food served or stored in lead-glazed pottery cadmium-lined containers may also lead to food poisoning.

Diagnosis

An important aspect of diagnosing food poisoning is the clinical interview. A history of the illness should be thoroughly traced to include ingestion of food, recent travel, and contact with those showing similar symptoms of illness. Because it may take 30 minutes to three days for symptoms to develop, it is not necessarily the most recent food eaten that is the cause of the symptoms. Diagnosis is confirmed with a stool culture. Other laboratory tests may be used to examine vomitus, blood, or the contaminated food. A blood chemistry panel may be performed to determine the extent of any tissue damage or electrolyte imbalances. Many cases of food poisoning go undiagnosed, and treatment focuses on the short-lived GI symptoms.

Botulism is usually diagnosed from its distinctive neurological symptoms, since rapid treatment is essential to save the patient's life. Electromyography, a test analyzing the electrical activity of muscles, may later be done to further confirm diagnosis. The test shows abnormal muscle activity in most cases of botulism.

Treatment

People with food poisoning should reduce all sugar and normal food for eight to 24 hours, and increase fluids to avoid dehydration. Charcoal tablets, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, and citrus seed extract are all recommended. For mild cases of food poisoning, the homeopathic remedies *Arsenicum album, Veratrum album, Podophyllum,* or ***Nux vomica*** are recommended. The remedy should be given in 12C potency every three to four hours until symptoms subside. If a ready-made electrolyte replacement is not available, a homemade one can be made by dissolving exactly 1 tsp (5 ml) of salt and 4 tsp (20 ml) of sugar in 1 qt (1 l) of water.

Cinnamon (*Cinnamonum zeylanicum)*, cloves (*Syzigium aromaticum)*, oregano (*Origanum vulgare*), and **sage** (*Salvia officinalis*) are food herbs that are also strong inhibitors of bacteria. Liberal amounts can be added to foods, especially when traveling. **Grapefruit seed extract** has a natural antibiotic effect and may be of help. Large amounts of **garlic**, in food and in supplement form, are also recommended for the same reason.

Allopathic treatment

In serious cases of food poisoning, medications may be given to stop abdominal cramping and vomiting. Medications are not usually given for the diarrhea, since stopping it might keep toxins in the body longer and prolong the illness. Severe bacterial food poisonings are sometimes treated with antibiotics, but their use is controversial. Washing out the stomach contents to remove the toxic substances may be required. This procedure is called gastric lavage, familiarly known as having the stomach pumped. Neurotoxins often interfere with the breathing process. If the ability to breathe is affected, patients may have to be put on a mechanical ventilator to assist their breathing and are fed intravenously until the paralysis passes.

People who show any signs of botulism poisoning must receive immediate emergency medical care. Both infants and adults suffering from food poisoning by *C. botulinum* require hospitalization, often in the intensive care unit. A botulism antitoxin is given to adults, if it can be administered within 72 hours after

symptoms are first observed. If given later, it provides no benefit. Nasogastric intubation is recommended for the feeding of infants with active botulism. As well as supplying **nutrition**, it will stimulate peristalsis, helping in the elimination of *C. botulinum*.

Treatment of food poisoning that is usually not an emergency situation may include drugs such as **ipecac** syrup to induce vomiting or laxatives to empty the intestines. Intravenous fluids containing salts and dextrose may be given to correct dehydration and electrolyte imbalances. Pain medications are given for severe stomach pain. Atropine is given for muscarine-type mushroom poisoning. If illness comes on after eating unidentified mushrooms, vomiting should be induced immediately, and the vomitus saved for laboratory testing. Intravenous mannitol is sometimes used to treat severe ciguatera poisoning. Antihistamines may be effective in reducing the symptoms of histamine fish poisoning. In 2001, Japanese scientists made a synthetic version of ciguatoxin, an important step in developing an antibody to help diagnose ciguatera.

In mild cases of food poisoning, dietary modifications are often the only treatment necessary. During periods of active vomiting and diarrhea, people with food poisoning should avoid solid food for eight to 24 hours, and should increase fluids. Clear liquids should be consumed in small quantities. Once active symptoms stop, a diet of bland, easily digested foods such as broth, eggs, rice and other cooked grains, and toast is recommended for two to three days. Milk products, spicy food, alcohol, sweets, raw vegetables, and fresh fruit should be avoided.

Expected results

Many cases of food poisoning clear up on their own within a week without medical assistance. There are usually few complications once possible dehydration has been addressed. **Fatigue** may continue for a few days after active symptoms stop, however. In the more severe types of poisoning, especially those involving neurotoxins, the respiratory muscles may become paralyzed. In such cases, death will result from asphyxiation unless there is medical intervention. Deaths due to food poisoning are rare and tend to occur in the very young, the very old, and in people whose immune systems are already weakened.

C. botulinum, is likely to cause serious illness or fatalities, even when ingested in very small quantities. Children affected by food poisoning from *E. coli* often need to be hospitalized. In some cases, *E. coli* toxins may be absorbed into the bloodstream where they destroy red blood cells and platelets, which are important in blood clotting. About 5% of patients, regardless of age, develop hemolytic uremia syndrome, which results in kidney failure.

Prevention

Eighty-four percent of adults surveyed in 2001 were unaware that feces on beef and poultry was the main carrier of *Salmonella, Campylobacter*, and *E. coli*. Other than informing the public, food poisoning prevention efforts include:

- hot foods should be kept hot, and cold foods should be kept cold
- meat should be cooked to the recommended internal temperature; eggs should be cooked until no longer runny
- leftovers should be refrigerated promptly and food should never be left to stand at room temperature
- contact of utensils and surfaces with the juices of raw meats should be avoided
- fruits and vegetables should be washed before using
- unpasteurized dairy products and fruit juices should be avoided
- bulging or leaking canned foods or any food that smells spoiled should be discarded
- hands should be washed with soap before food preparation and after using the bathroom
- food preparation surfaces should be sanitized regularly
- infants under 12 months should not be fed honey, which may contain spores of *C. botulinum*
- proper canning and adequate heating of home-canned food before serving are essential (boiling for three minutes is recommended)

Taking *Lactobacillus acidophilus* or *L. bulgaricus* may help prevent food poisoning, especially when traveling. Populating the intestines with these bacteria will make it less likely that harmful bacteria are able to gain a foothold.

Resources

PERIODICALS

"Chicken and Beef are Often Contaminated with Feces." *Health and Medicine Week* (October 1, 2001).

Ramsay, Sarah. "Organic Chemistry Takes on Tropical Sea food Poisoning." *The Lancet* (December 1, 2001): 1878.

OTHER

FDA Center for Food Safety & Applied Nutrition. *Food borne Pathogenic Microorganisms and Natural Toxins Handbook*. [cited October 2002]. http://vm.cfsan.fda.gov/~mow/intro.html.

Merck & Co., Inc. "*E. coli* O157:H7 Infection." *The Merck Manual Online*. [cited October 2002]. http://www.merck.com/pubs/mmanual/section3/chapter28/28b.htm.
Merck & Co., Inc. "Gastroenteritis." *The Merck Manual Online*. [cited October 2002]. http://www.merck.com/pubs/mmanual_home/sec9/106.htm.

Patience Paradox
Teresa Odle

Foxglove *see* **Digitalis**

Fractures

Definition

A fracture is a crack or break in a bone. It results from the application of excessive force through injuries, such as a fall or a hard blow.

Description

Up to the age of 50, more men suffer from fractures than women because of occupational hazards. However, after the age of 50, more women suffer fractures than men because of the osteoperosis. Simple, or closed, fractures are not obvious on the surface because the skin remains intact. Compound, or open, fractures break through the skin, exposing bone. They are generally more serious than closed fractures. When bones are broken, there may be an accompanying soft tissue injury or an infection either in the surrounding tissue or the bone itself. If an artery is damaged, there can be a significant loss of blood. Single and multiple fractures refer to the number of breaks in the same bone. Fractures are termed complete if the break is completely through the bone, and described as incomplete, or greenstick, if the fracture occurs partly across a bone shaft. This latter type of fracture is often the result of bending or crushing on the bone. A **stress** fracture is usually a small break in the bone due to repeated or prolonged force.

Causes and symptoms

Fractures usually result from an injury to a bone that causes the bone tissue or cartilage to be disrupted or broken. Bones weakened by disease or misuse are more likely to break. In some women who have gone through **menopause**, the bones fracture easily due to osteoperosis. This is because the body produces less estrogen at that time of life, and estrogen is a major regulator of bone density through its effects on **calcium** in the body. Moderate **exercise** and weight training is helpful in building and maintaining strong bones; so, the bones of an inactive person may also tend to fracture easier than those who are moderately active. However, individuals with a very high activity level have a greater risk of fractures. This group includes children and athletes participating in contact sports. Because bones start to thin out with the **aging** process, the elderly are also at a high risk of sustaining a fracture. Diseases that may lead to an increased risk of fractures include Paget's disease, rickets, osteogenesis imperfecta, **osteoporosis**, tumors, deficiencies of vitamins A or D, and **stroke** induced paralysis.

Fractures usually begin with intense **pain** and swelling at the site of injury. Obvious deformities, such as a crooked or otherwise misshapen limb, point to a possible fracture. Pain that prevents the use of a limb may also indicate a break. In severe fractures, there may be a loss of pulses below the fracture site and a resultant numbness, tingling, or paralysis in the feet, hands, fingers, or toes below the site. An open fracture is often accompanied by bleeding or bruising. If a leg is fractured, there will usually be difficulty bearing weight on it. If there is **dizziness**, sweating, disorientation, or thirst, the onset of shock may be indicated.

Diagnosis

Diagnosis begins immediately with the individual's own observation of symptoms. A thorough medical history and physical exam completed by a physician often provides enough information to determine if further testing is necessary. An x ray of the injured area is most commonly used to determine the presence of a bone fracture. However, it is important to note that not all fractures are apparent on an initial x ray. Rib fractures are often difficult to diagnose and may require several views at different angles. If the fracture is open and occurs in conjunction with soft tissue injury, further laboratory studies may have to be done.

In the event of stress fractures, a tuning fork can provide a simple, inexpensive test. The tuning fork is a metal instrument with a stem and two prongs that vibrate when struck. If a patient has increased pain when the tuning fork is placed on the bone, such as the lower leg bone or shinbone, the likelihood of a stress fracture is high. Bone scans also are helpful in detecting stress fractures or other difficult-to-detect fractures.

Treatment

Prevention is the most effective way to avoid fractures. Wearing protective gear, such as a helmet, or

KEY TERMS

Bone scan—A diagnostic procedure in which radioactive tracer is injected and images are taken of specific areas or the entire skeleton.

Osteoporosis—Literally meaning "porous bones," this condition occurs when bones lose an excessive amount of their protein and mineral content, particularly calcium. Over time, bone mass and strength are reduced leading to the increased risk of fractures.

Paget's disease—A common disease of the bone of unknown cause usually affecting middle-aged and elderly people, characterized by excessive bone destruction and unorganized bone repair.

Rickets—A condition caused by the deficiency of vitamin D, calcium, and usually phosphorus, seen primarily in infancy and childhood, and characterized by abnormal bone formation.

using protective equipment, such as safety gear, while playing sports may greatly reduce the risk of a fracture.

A daily multivitamin and mineral supplement (for instance, containing calcium, **magnesium**, **boron**, strontium) is recommended to help build and maintain a healthy, resilient skeleton. These, together with an adequate protein intake, will also help rebuild the bone and surrounding tissue. Some physical therapists use electro-stimulation over a fractured site to promote and expedite healing. Chinese traditional medicine seeks to reconnect the qi through the meridian lines along the line of a fracture. **Homeopathy** can enhance the body's healing process. A particularly useful homeopathic remedy for soft tissue is *Arnica* 12c, taken every 10 minutes for the first two hours after injury, and then once every eight hours for two to three days. *Symphytum officinalis* is also a good remedy to help heal the fractured bone.

Calming herbs are often useful for relief of pain and tension. Cups of **chamomile** (*Matricaria recutitca*), **catnip** (*Nepeta cataria*), or **lemon balm** (*Melissa officinalis*) tea can be given freely for a calming effect. Fifteen drops of **skullcap** (*Scutellaria lateriflora*), **St. John's wort** (*Hypericum perforatum*), or **valerian** (*Valeriana officinalis*) tincture can be given every half hour as needed. A tea to encourage the bone tissue to knit and heal can be made by mixing together one ounce each of **comfrey** leaves (*Symphytum officinale*), nettles (*Urtica dioica*), and oatstraw (*Avena sativa*), plus half an ounce each of **horsetail**, skullcap, and **marsh mallow** root (*Althaea officinalis*). One quarter ounce each of **fennel** seeds (*Foeniculum officinalis*) and **peppermint** leaves (*Mentha piperita*) should also be added. A strong tea should be made of one ounce of the mixture in one quart of boiling water, which should steep for at least a half hour. The dosage is two cups taken daily. Frequent soaks or compresses with comfrey root in the water is recommended if there is no broken skin. *Arnica montana*, *Calendula officinalis*, St. John's wort, or comfrey salves or ointments can improve healing when applied externally, as well.

After initial treatments, the application of contrast **hydrotherapy** to a hand or foot below the area of the fracture can be used to assist healing by enhancing circulation. Contrast hydrotherapy uses an alternating series of hot and cold water applications. Either compresses or basins of water may be used. First, hot compress is applied for three minutes. It is followed by cold water for 30 seconds. These applications are repeated three times each, ending with the cold water.

Allopathic treatment

Broken bones need to be treated as soon as possible by a physician. Temporary measures include applying ice packs to injured areas, and the use of aspirin or nonsteroidal anti-inflammatories (NSAIDS) to reduce pain and swelling. Initial first aid for a fracture may include splinting, control of blood loss, and monitoring of vital signs, such as breathing and circulation. Medical treatment will depend on the location of the fracture, its type and severity, and the individual's age and general health status. If an open fracture is accompanied by serious soft tissue injury, it may be necessary to control bleeding and the shock that can accompany it.

Immobilization of the fracture site can be done internally or externally. The primary goal of immobilization is to maintain the realignment of the bone long enough for healing to start and progress. Immobilization by external fixation uses splints, casts, or braces; this may be the primary and only procedure for fracture treatment. Splinting to immobilize a fracture can be done with or without traction. In emergency situations, splinting is a useful form of fracture management, if medical care is not immediately available. It should be done without causing additional pain and without moving the bone segments. In a clinical environment, plaster of Paris casts are used for immobilization. Braces are useful as they often allow movement above and below the fracture site.

Open reduction is surgery that is usually performed by an orthopedist. It allows the surgeon to

examine and correct soft tissue damage while the bones are being repositioned into their normal alignment. Internal fixation devices, such as metal screws, plates, and pins, hold the bones in place as they heal. Fragments are often held together with metal rods. The physician may or may not elect to remove these devices when healing is complete. Open reduction is most often used for open, severe, or comminuted fractures. Fractures with little or no displacement of the bones do not usually require such surgery.

Closed reduction refers to realigning the bones without using surgery. It is accomplished by manually adjusting the bones or using traction, and often requires the use of an anesthetic. Traction is a form of closed reduction that works by applying a steady force to the bones, pulling on them with weights until the proper alignment is achieved. The traction device can also be used to immobilize the affected area while the bone heals. Since traction restricts movement, this treatment means that the patient will be confined to bed rest for an extended period of time.

In external fixation, pins or screws are attached to the bone directly above and below the site of the fracture. They are then connected to a device of metal bars fixed over the skin. These act as a frame, keeping the bones aligned so they can heal properly. With any type of treatment for a fracture, muscle and joint strength and flexibility should be maintained through proper exercises done as the bone tissue heals.

Healing time for fractures varies from person to person, with the elderly generally needing more time to heal completely. Recovery is complete when there is no bone motion at the fracture site, and x rays indicate complete healing.

Expected results

Fractures can normally be cured with proper first aid and after care. Proper realignment of the bones is much more difficult if the break has occurred more than six hours in the past. If broken bones are not properly treated, deformities may occur as the bones heal, and strength and flexibility may be affected.

Prevention

Adequate calcium intake, as well as intakes of other minerals like magnesium, boron, strontium, and others, is necessary for strong bones and can help decrease the risk of fractures. Foods rich in calcium should be eaten. These include fish, dairy products, sardines, broccoli, enriched soymilk, seaweed, tahini, and other sesame seed foods, nuts, molasses, and dark leafy green vegetables. Calcium supplements may be also be useful; however, those with bone meal or oyster shell have been found to often contain toxic heavy metals. Adequate stores of **vitamin D** are needed to help use calcium, therefore, some time should be spent in the sun, as this will activate vitamin D and help decrease fractures. Safety measures to avoid accidents that may bring on fractures include wearing seat belts and protective sports gear, when appropriate. Estrogen replacement combined with exercise and weight training for women past the age of 50 has been shown to help prevent osteoporosis and the fractures that may result from this condition.

Resources

BOOKS

American Red Cross Editors. *First Aid and Safety*. St. Louis: Mosby, 1993.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life, Inc., 1996.

Romm, Aviva Jill. *Natural Healing for Babies and Children*. Freedom, CA: The Crossing Press, 1996.

OTHER

American Academy of Orthopedic Surgeons. http://orthoinfo.aaos.org/brochure/.

drkoop.com. http://www.drkoop.com/conditions/ency/article/ 000001.htm.

Patience Paradox

French green clay

Description

French green clay is a substance that is used for external cosmetic treatments as well as some internal applications by practitioners of alternative medicine. It was used in ancient Egypt, Greece, and Rome to treat a variety of skin problems and digestive disorders.

From the standpoint of mineralogy, French green clay belongs to a subcategory of clay minerals known as illite clays, the other two major groups being kaolinite and smectite clays. Clay minerals in general are important because they make up about 40% of such common rocks as shale, and they are the main components of soil. Illite clays are usually formed by weathering or by changes produced in aluminum-rich minerals by heat and acidic ground water. They often occur intermixed with kaolinite clays—which are typically used in the ceramics industry. Illite clays have been used successfully by environmental managers to

Mixing French green clay with water. The clay's green color comes from a combination of iron oxides and decomposed plant matter, mostly kelp seaweed and other algae. *(BSIP/Phototake, Reproduced by permission.)*

remove such heavy metals as lead, cadmium, and **chromium** from industrial wastewater.

French green clay takes its name from the fact that rock quarries located in southern France enjoyed a virtual monopoly on its production until similar deposits of illite clays were identified in China, Montana, and Wyoming. The clay's green color comes from a combination of **iron** oxides and decomposed plant matter, mostly **kelp** seaweed and other algae. Grey-green clays are considered less valuable than those with a brighter color. The other components of French green clay include a mineral known as montmorillonite, as well as **dolomite**, **magnesium**, **calcium**, **potassium**, **manganese**, **phosphorus**, **zinc**, aluminum, silicon, **copper**, **selenium**, and cobalt.

French green clay is prepared for the commercial market by a process of sun-drying and crushing. After the clay has been mined, it is spread in the sun to remove excess water. It is then ground by large hydraulic crushers and micronized, or finely pulverized. The last stage in the process is a final period of sun-drying to remove the last traces of water. French green clay is available in a dry powdered form for a variety of uses as well as in premixed soaps, scrubs, facial powders, and masks for cosmetic purposes. Prices for an eight-ounce jar of powdered clay range between $4.50 and $11.00 in health food stores. Soaps made with French green clay are priced at about $4.50 a bar.

General use

External

French green clay is most commonly used in the United States and Canada for cosmetic purposes, as distinct from medicinal treatments. It is regarded as a useful treatment for stimulating the skin and removing impurities from the epidermis (outermost layer of skin cells). The clay works by adsorbing impurities from the skin cells, by causing dead cells to slough off, and by stimulating the flow of blood to the epidermis. As the clay dries on the skin, it causes the pores to tighten and the skin to feel firm.

Other external uses for French green clay include poultices to treat arthritis, sore muscles, and **sprains**;

KEY TERMS

Adsorption—A process in which an extremely thin layer of one substance (liquid, gas, or solid) forms on the surface of another substance. French green clay works as a cosmetic treatment by adsorbing toxic substances from the skin.

Epidermis—The outermost layer of skin cells.

Illite—A family of hydrous potassium aluminosilicate clays, characterized by a three-layer structure and a gray, light green, or yellow-brown color. The name is derived from Illinois, where these clays were first classified in 1937. French green clay belongs to this group of clays.

Poultice—A soft cloth filled with a warm moist mass of grains, herbs, or other medications applied to sores or injured parts of the body.

ready-to-use pastes for application to **cuts**, **bruises**, insect **bites**, **stings**, and minor **burns**; and mineral baths for **stress** relief. Some practitioners maintain that the plant matter in French green clay has anti-inflammatory as well as antiseptic or bactericidal properties. It is interesting that a group of Italian researchers reported in 2002 that French green clay powder is as effective as salicylic sugar powder in preventing infection of the umbilical stump in newborns. The clay powder was found to be superior to powders containing **colloidal silver**, antibiotics, or fuchsine.

Internal

Internal uses of French green clay are more popular in Europe than in North America, although some American alternative healers recommend drinking or gargling with solutions of French green clay to cleanse the digestive tract, treat **nausea** or other gastric disorders, ease menstrual cramps, or relieve sore throats. It is claimed that French green clay absorbs toxins from the stomach and intestines as well as neutralizing radioactivity in the body. A French naturopath states that the copper in the clay fights **infections**, the cobalt helps to prevent **anemia**, the selenium aids liver function and slows down the **aging** process, and the other minerals restore the body's overall equilibrium.

Preparations

External

Facial masks: Commercial prepackaged clay masks are generally spread on the face directly from the jar or tube, care being taken to avoid the eye area. After the clay dries—usually about 10–15 minutes—the mask is washed off with warm running water. To make a facial mask from powdered clay, combine 1/2 to 1 tbsp of the powder with 1–2 tbsp of water and apply to the skin; rinse with warm water after 10 minutes. Some users add a few drops of **aloe** vera gel to the clay mixture. A recipe for a facial mask for oily skin consists of mixing 1 tbsp of powdered clay with five drops of **jojoba oil**.

A recipe for a "gourmet spa facial mask" calls for mixing 1/4-cup of French green clay powder with 1/4-cup water. After the clay and water have been well blended, 2 tbsp of honey and 1/4-cup of mashed banana or avocado are added to the mixture. The mask is applied to the face, allowed to remain for 10 minutes, and rinsed off with warm water.

Deodorizing foot treatment: A half-cup of powdered French green clay is mixed with 1/2-cup of water and 2–3 drops of tea tree essential oil. The mixture is applied to the feet, covered loosely with plastic wrap, and rinsed off after 15 minutes with cool water. The feet may then be rubbed with a moisturizing cream.

Poultice: One poultice recipe calls for mixing several tablespoons of powdered clay with enough water to form a thick paste and allowing it to stand in a glass bowl for two hours. The paste is then applied in a layer about 1/4-in thick to a piece of gauze. The poultice is applied to the injured area with the gauze uppermost and held in place with adhesive tape. It can be left in place as long as two hours, but the clay should not be allowed to dry. Up to six drops of essential oil of **lavender**, Roman **chamomile**, **ginger**, or **rosemary** may be added if desired. Poultices should not be reused but discarded after use.

Mineral bath: A half-cup of powdered French green clay can be added to a tub of warm water to soothe sunburned or irritated skin, or relieve arthritis or muscle pains.

Internal

To cleanse the digestive system, mix 1 tsp of powdered clay in an 8–10-oz glass of mineral water and allow to stand overnight. The mixture may be taken the next morning either as the clear liquid that has risen to the top or after stirring to recombine the clay and water. It is to be taken every morning for 21 days. The treatment should not be repeated until a week after the last dose. The clay mixture can also be used to relieve menstrual cramps; it is taken each morning during the first three weeks of the woman's cycle. After the flow begins, a warm clay poultice can be applied to the abdomen in the morning and evening.

A recipe for a **sore throat** gargle consists of 1–2 tsp of clay added to a glass of salt water with 1–2 drops of essential oil of rosemary or lavender. The gargle can be used several times a day until the symptoms are relieved.

A European regimen for treating **hemorrhoids** consists of drinking three glasses of powdered clay in water each day for three weeks, alternating with three weeks without the mixture over a total period of three months. The clay-and-mineral water mixture can also be combined with tinctures of Indian vine and **witch hazel**. In addition, poultices made with green clay can be applied to the affected areas in the morning, followed by a cold bath. The poultices may also be applied at night.

Precautions

Alternative healers state that French green clay should never be mixed with metal spoons or stored in metal containers; the only materials that should be used in preparation or storage are wooden spoons or glass stirrers, and either glass or ceramic containers. It is thought that the clay loses its beneficial qualities through contact with metal. This belief has some scientific basis in the fact that illite clays have been found to be highly effective in removing heavy metals in the wastewater produced by various industries.

External

As a rule, French green clay masks should be used only once a week because the clay tends to dry the skin. In addition, cosmetics containing French green clay are not recommended for naturally dry or sensitive skins, as the mineral content of the clay is an irritant. Soaps made with French green clay should be used only for oily skin.

Internal

French green clay may cause **constipation** when taken internally. Some practitioners recommend drinking only the water without the clay at the bottom of the glass in the morning for this reason.

Side effects

French green clay may cause skin **rashes** or patches of dry flaky skin when used on the face. It may cause constipation when taken internally. No side effects from mineral baths or poultices have been reported.

A group of American toxicologists reported in 2003 that illite clays as a group appear to be safe for short-term internal use in humans as well as external cosmetic applications. There have, however, been isolated reports of lung damage caused in workers exposed to particles of montmorillonite—one of the major components of French green clay—in spray paints and primers.

Interactions

No interactions with prescription drugs or herbal remedies have been reported for French green clay as of 2008. However, because of the adsorptive qualities of French green clay, it may interfere with absorption of medications.

Resources

BOOKS

Dextreit, Raymond. *L'argile qui guérit. Memento de méde cine naturelle*. Paris: Éditions de la revue Vivre en har monie, 1976. Translated into English as *The Healing Power of Clay*. Geneva, Switzerland: Editions Aqua rius, S. A., 1987.

Pough, Frederick H. *A Field Guide to Rocks and Minerals*. Boston: Houghton Mifflin Company, 1988.

PERIODICALS

Elmore, A. R.; Cosmetic Ingredient Review Expert Panel. "Final report on the safety assessment of aluminum silicate, calcium silicate, magnesium aluminum silicate, magnesium silicate, magnesium trisilicate, sodium magnesium silicate, zirconium silicate, attapulgite, bentonite, Fuller's earth, hectorite, kaolin, lithium magnesium silicate, lithium magnesium sodium silicate, montmorillonite, pyrophyllite, and zeolite." *Interna tional Journal of Toxicology* 22 (2003, Supplement 1): 37 102.

Katsumata, H., S. Kaneco, K. Inomata, et al. "Removal of Heavy Metals in Rinsing Wastewater from Plating Factory by Adsorption with Economical Viable Mate rials." *Journal of Environmental Management* 69 (October 2003): 187 191.

Pezzati, M., E. C. Biagioli, E. Martelli, et al. "Umbilical Cord Care: The Effect of Eight Different Cord Care Regimens on Cord Separation Time and Other Out comes." *Biology of the Neonate* 81 (January 2002): 38 44.

ORGANIZATIONS

Cosmetic Ingredient Review (CIR). 1101 17th Street NW, Suite 310, Washington, DC 20036. (202) 331 0651. Fax: (202) 331 0088. http://www.cir safety.org.

Society of Cosmetic Chemists (SCC). 120 Wall Street, Suite 2400, New York, NY 10005 4088. (212) 668 1500. Fax: (202) 668 1504. http://www.scconline.org.

U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857 0001. (888) INFO FDA. http://www.fda.gov.

Rebecca Frey, Ph.D.

Fritillaria

Description

Fritillaria is the processed bulb of *Fritillaria cirrhosa*, a flowering plant in the Liliaceae family. A perennial temperate herb, it grows in mountain slope and sub-alpine meadows, usually on open, stony, and moist hillsides. In the West, fritillaria is most commonly regarded as an ornamental garden plant. By contrast, it is traditionally valued as an herbal remedy in Nepal and China, where it grows in the Gansu, Qinghai, Sichuan, Xizang, and Yunnan provinces. Two related species, *F. thunbergii* and *F. hupehensis*, are also used medicinally, and in some regions, *F. unibracteata, F. przewalski,* and *F. delavayi* are used as botanical substitutes.

In **traditional Chinese medicine**, fritillaria is called *chuan bei mu,* which translates as "Shell mother from Sichuan." English common names include fritillary, tendrilled fritillary bulb, and Sichuan fritillary bulb. Its pharmaceutical name, used to distinguish it as a medicine, is Bulbus Fritillariae Cirrhosae, and it is one of more than 500 plants recognized as official drugs in traditional Chinese medicine.

General use

Practitioners of Chinese medicine believe that fritillaria affects the heart and lung meridians, or energy pathways in the body, and use it primarily to treat various lung conditions, including **asthma**, **bronchitis**, **tuberculosis**, and coughs of any type. In the traditional Chinese medical system, the white color of fritillaria is thought to indicate its usefulness for treating ailments of the lungs, which are associated with the color white. In the categories of Chinese herbal medicine, fritillaria is classified as being bitter, sweet, and mildly cold.

Fritillaria is used for many types of **cough**, particularly chronic cough, cough associated with difficult expectoration, and cough with blood-streaked sputum. Chinese practitioners prescribe it to moisten dry mucous membranes, resolve phlegm, and control coughing. It is thought to be most effective for coughs accompanied by reduced appetite and a stifling sensation in the chest and upper abdomen, symptoms that indicate suppressed qi, or vital energy.

Fritillaria's secondary use is as a lymphatic decongestant to reduce swellings, nodules, fibrocystic breasts, goiter, and swollen lymph glands. In China, it also is used for thyroid and **lung cancer**.

Research on *F. cirrhosa* and its botanical relatives has generally been conducted in China and has focused on pharmacological investigation. These studies show that *F. cirrhosa* and other related species contain compounds that have antitussive and expectorant activity because they inhibit contraction of bronchial smooth muscle and decrease secretion of mucus. Compounds responsible for this activity, as defined in Western chemistry, include several bioactive isosteroidal alkaloids (verticine, verticinone, isoverticine, imperialine, hupehenine, ebeiedine, ebeienine, and ebeiedinone) and two nucleosides (thymidine and adenosine). The discovery of a new diterpenoid ester in fritillaria was reported in 2002.

Animal research has also demonstrated central-nervous-system inhibition, including a prolonged decrease in blood pressure, stimulation of the heart muscle, and dysfunction of breathing. In addition, a study conducted by scientists in Korea in 2007 tested *F. cirrhosa* in a model of asthma in mice. They found that it inhibits airway inflammation by several methods including the suppression of certain types of proteins/peptides called Th2 cytokines, an antibody known as immunoglobulin E (IgE), and the production of histamine.

Preparations

Fritillaria is not generally available in American health food stores, but processed forms are available at Chinese pharmacies and Asian groceries. Consumers can purchase fritillaria-containing Chinese patent medicines in pill, capsule, powder, and syrup form over the Internet. As medicine, fritillaria comes in four categories, based on shape and the location in which it was grown: *song-pei, lu-pei, ching-pei,* and *ming-pei*. Because the raw bulb is toxic, all medicinal forms are processed. Good-quality processed powder is white and has a fine consistency. Small, white, lobed bulbs that have been boiled or steamed and dried also may be available.

The standard dose ranges from 3–12 g daily as a decoction (strong tea) or 1–1.5 g as powder. Pills in equivalent doses are also available, and the herb also may be applied externally as either a powder or cream.

Practitioners of Chinese medicine commonly combine fritillaria in patent formulas along with other Chinese herbs such as ma huang (*Ephedra sinica*) and ballanflower (*Platycodon grandiflorum*). It is also found in many cough medicine formulas in liquid form. The following are the major herbs with which

KEY TERMS

Alkaloids—A diverse group of nitrogen-containing substances that typically taste bitter. Most alkaloids are toxic, although a minority of them are medicinally beneficial.

Cold—In Chinese pathology, the term defines a condition that has insufficient warmth, either objective (hypothermia) or subjective (feeling cold).

Decoction—A strong tea brewed for twenty to thirty minutes; generally used for woodier herbs.

Meridians—Energetic pathways inside the body through which qi flows.

Nucleosides—Any of various compounds consisting of a sugar and a purine or pyrimidine base, especially a compound obtained by hydrolysis of a nucleic acid.

Patent formulas—Chinese herbal formulas that were patented centuries ago and are believed to be proven over centuries of use and study.

Qi—The Chinese medical term for physiological energy or more generally for the life force.

Sputum—Matter coughed up from the respiratory tract, including saliva, mucus, or phlegm.

it is combined and the symptoms for which the combinations are prescribed:

- bitter apricot kernel (*Prunus armeniaca; xing ren*) for cough and wheezing with copious sputum
- loquat leaf (*Eriobotrya japonica; pi pa ye*), dwarf lilyturf root (*Ophiopogon japonicus; mai men dong*) and Solomon's seal root (*Polygonatum odoratum; yu zhu*) for chronic cough with fatigue, irritability, and lack of appetite
- thin-leaf milkwort root (*Polygala tenuifolia; yuan zhi*), hoelen fungus (*Poria cocos; fu ling*), and snakegourd fruit (*Trichosanthes* spp.; *gua lou*) for painful obstruction of the chest with palpitations and insomnia
- Zhejiang fritillary bulb (*F. thunbergii; zhe bei mu*) for scrofula (a form of tuberculosis affecting the lymph nodes) and abscess

Precautions

The unprocessed bulb of fritillaria is toxic, and commercial sources are generally processed. Pregnant women should not use fritillaria unless under the advice of a practitioner trained in the use of the herb. Fritillaria should never be given to children. It is also contraindicated for patients with digestive weakness.

Australian authorities recommend that products containing *F. cirrhosa* include the following label caution: "Warning: Do not exceed the stated dose." Canadian regulations list *F. thunbergii*, a close relative of *F. cirrhosa*, as unacceptable for inclusion in nonmedicinal oral products.

A general precaution to observe when using any Chinese patent medicine is to purchase only well-known brands recommended by a practitioner of traditional Chinese medicine. Cases have been reported of incorrect labeling, contamination with heavy metals, and substitution of Western pharmaceuticals for the Chinese ingredients. Any of these occurrences can present a serious health hazard.

Side effects

Side effects from fritillaria extracts used in Chinese patent medicines are rare, but this is partly because fritillaria is usually a minor ingredient in these formulae, often only 10% of the formula by weight. Even in medicines that list fritillaria as a major ingredient, it is never more than 28% of the compound. Tests of fritillaria extract in human subjects reported no side effects when the extract was taken by mouth. On the other hand, high-dosage intravenous injections of alkaloids isolated from fritillaria produced pupil dilation, **tremor**, slowing of the heart rate, and lowered blood pressure in human subjects.

Interactions

No interactions with standard pharmaceuticals have been described in the literature, but the absence of reported interactions may again be due to the fact that fritillaria extract is not the sole ingredient in any Chinese medicine, and in fact, is often a minor ingredient.

Tradition dictates that fritillaria not be combined with **aconite** root (*wu tou*) or *qin jiao (Gentiana macrophylla)*.

Resources

BOOKS

Bensky, Dan, Steven Clavey, and Erich Stoger. *Chinese Herbal Medicine: Materia Medica*. Third edition. Seattle, WA: Eastland Press, 2004.

Fan, W. *A Manual of Chinese Herbal Medicine: Principles and Practice for Easy Reference*. East Lansing, MI: Shambala, 2003.

Joiner, Thomas. *Chinese Herbal Medicine Made Easy: Effective and Natural Remedies for Common Illnesses*. Alameda, CA: Hunter House, 2001.

PERIODICALS

Atta Ur Rahman, Akhtar M. N., M. I. Choudhary, Y. Tsuda et al. "New Steroidal Alkaloids from *Fritillaria imperialis* and Their Cholinesterase Inhibiting Activ ities." *Chemical and Pharmaceutical Bulletin (Tokyo)* 50 (August 2002): 1013 1016.

Ruan, H., Y. Zhang, J. Wu et al. "Structure of a Novel Diterpenoid Ester, Fritillahupehin from Bulbs of *Fri tillaria hupehensis Hsiao and K.C. Hsia*." *Fitoterapia* 73 (July 2002): 288 291.

Yeum, H., Y. Lee, S. Kim, S. Roh, J. Lee, Y. Seo. "*Fritillaria cirrhosa*, *Anemarrhena asphodeloides*, Lee Mo Tang and cyclosporine a inhibit ovalbumin induced eosino phil accumulation and Th2 mediated bronchial hyper responsiveness in a murine model of asthma." *Basic Clinical Pharmacology and Toxicology;* 100 (3) (March 2007): 360.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine. PO Box 162340, Sacramento, CA 95816. (916) 443 4770 http://www.aaom.org/ (accessed February 8, 2008).

Institute for Traditional Medicine. 2017 SE Hawthorne Blvd., Portland, OR 97214. (503) 233 4907. http:// www.itmonline.org/ (accessed February 8, 2008).

Erika Lenz
Rebecca J. Frey, PhD
Leslie Mertz, Ph.D.

Frostbite and frostnip

Definition

Frostbite is localized tissue injury that occurs because of exposure to freezing or near freezing temperatures. Frostnip is a milder cold injury that does not cause tissue loss.

Description

In North America, frostbite is largely confined to Alaska, Canada, and the northern states. In recent years, there has been a substantial decline in the number of cases. This is probably for several reasons, including better winter clothing and footwear and greater public understanding of how to avoid cold-weather dangers. At the same time, the nature of the at-risk population has changed. Rising numbers of homeless people have made frostbite an urban as well as a rural public health concern. The growing popularity of outdoor winter activities has also expanded the at-risk population.

Frostbite on hand. *(Southern Illinois University / Photo Researchers, Inc.)*

Causes and symptoms

Frostbite

Skin exposed to temperatures a little below the freezing mark can take hours to freeze, but very cold skin can freeze in minutes or seconds. Air temperature, wind speed, and moisture all affect how cold the skin becomes. A strong wind can lower skin temperature considerably by dispersing the thin protective layer of warm air that surrounds our bodies. Wet clothing readily draws heat away from the skin. The evaporation of moisture on the skin also produces cooling. For these reasons, wet skin or clothing on a windy day can lead to frostbite even if the air temperature is above the freezing mark.

The extent of permanent injury, however, is determined more by the length of time the skin is frozen than by how cold the skin and the underlying tissues become. Thus, homeless people and others whose self-preservation instincts may be clouded by alcohol or psychiatric illness face a greater risk of frostbite-related amputation. They are more likely to stay out in the cold when prudence dictates seeking shelter or medical attention. Alcohol also affects blood circulation in the extremities in a way that can increase the severity of injury, as does **smoking**. A review of 125 Saskatchewan frostbite cases found a tie to alcohol in 46% and to psychiatric illness in 17%. Driving in poor weather can also be dangerous: vehicular failure was a predisposing factor in 15% of the Saskatchewan cases.

Frostbite is classified by degree of injury (first, second, third, or fourth), or simply divided into two types, superficial (corresponding to first- or second-degree

KEY TERMS

Amputation—Surgical removal of an extremity.
Edema—Excess tissue fluid.

injury) and deep (corresponding to third- or fourth-degree injury). Most frostbite injuries affect the feet or hands. The remaining 10% of cases typically involve the ears, nose, cheeks, or penis. Once frostbite sets in, the affected part begins to feel cold and, usually, numb; this is followed by a feeling of clumsiness. The skin turns white or yellowish. Many patients experience severe **pain** in the affected part during rewarming treatment and an intense throbbing pain that arises two or three days later and can last days or weeks. As the skin begins to thaw during treatment, **edema** often occurs, causing swelling in the area. In second- and higher-degree frostbite, **blisters** appear. Third-degree cases produce deep, blood-filled blisters and, during the second week, a hard black eschar (scab). Fourth-degree frostbite penetrates below the skin to the muscles, tendons, nerves, and bones. In severe cases of frostbite, the dead tissue can mummify and drop off. Affected areas are also more prone to infection.

Frostnip

Like frostbite, frostnip is associated with ice crystal formation in the tissues, but no tissue destruction occurs and the crystals dissolve as soon as the skin is warmed. Frostnip affects areas such as the earlobes, cheeks, nose, fingers, and toes. The skin turns pale and numb or tingly until warming begins.

Diagnosis

Frostbite diagnosis relies on a physical examination and may also include conventional radiography (x rays), angiography (x-ray examination of the blood vessels using an injected dye to provide contrast), **thermography** (use of a heat-sensitive device for measuring blood flow), and other techniques for predicting the course of injury and identifying tissue that requires surgical removal. During the initial treatment period, however, severity is difficult to judge. Diagnostic tests only become useful 3-5 days after rewarming, once the blood vessels have stabilized.

Treatment

Mechanical treatment

Frostnipped fingers are helped by blowing warm air on them or holding them under one's armpits. Other frostnipped areas can be covered with warm hands. The injured areas should never be rubbed.

By contrast, emergency medical help should always be sought whenever frostbite is suspected. While waiting for help to arrive, one should, if possible, remove wet or tight clothing and put on dry, loose clothing or wraps. A splint and padding are used to protect the injured area. Rubbing the area with snow or anything else is dangerous. The key to prehospital treatment is to avoid partial thawing and refreezing, which releases more mediators of inflammation and makes the injury substantially worse. For this reason, the affected part must be kept away from heat sources such as campfires and car heaters. Experts advise rewarming in the field only when emergency help will take more than two hours to arrive and refreezing can be prevented.

Because the outcome of a frostbite injury cannot be predicted at first, all hospital treatment follows the same route. Treatment begins by rewarming the affected part for 15-30 minutes in water at a temperature of 104-108°F (40-42.2°C). This rapid rewarming halts ice crystal formation and dilates narrowed blood vessels. **Aloe** vera (which acts against inflammatory mediators) is applied to the affected part, which is then splinted, elevated, and wrapped in a dressing. Milky blisters are debrided (cleaned by removing foreign material), and hemorrhagic (blood-filled) blisters are simply covered with aloe vera.

Hydrotherapy

Alternative practitioners suggest several kinds of treatment to speed recovery from frostbite after leaving the hospital. Bathing the affected part in warm water or using contrast **hydrotherapy** can enhance circulation. Contrast hydrotherapy involves a series of hot and cold water applications. A hot compress (as hot as the patient can stand) is applied to the affected area for three minutes followed by an ice-cold compress for 30 seconds. These applications are repeated three times each, ending with the cold compress. For patients who have been hospitalized with frostbite, hydrotherapy should only be performed after checking with a physician to ensure it is done correctly and does not aggravate the condition.

Homeopathy

Homeopathic *Hypericum* (*Hypericum perforatum*) is recommended when nerve endings are affected (especially in the fingers and toes) and *Arnica* (*Arnica montana*) is prescribed for shock and if there is accompanying blunt trauma to the frostbitten area.

Nutritional supplements

Cayenne pepper (*Capsicum frutescens*) can enhance circulation and relieve pain. Drinking hot **ginger** (*Zingiber officinale*) tea also aids circulation.

Other complementary therapies

Other possible approaches include **acupuncture** to avoid permanent nerve damage and **oxygen therapy**.

Allopathic treatment

In addition to the necessary rewarming and debridement, a **tetanus** shot and antibiotics may be used to prevent infection. The patient is given ibuprofen to combat inflammation. Narcotics are needed in most cases to reduce the excruciating pain that occurs as sensation returns during rewarming. Except when injury is minimal, treatment generally requires a hospital stay of several days, during which hydrotherapy and physical therapy are used to restore the affected part to health. Experts recommend a cautious approach to tissue removal, and advise that 22-45 days must pass before a decision on amputation can safely be made.

Expected results

The rapid rewarming approach to frostbite treatment, pioneered in the 1980s, has proved to be much more effective than older methods in preventing tissue loss and amputation. The extreme, throbbing pain that many frostbite patients endure for days or weeks after rewarming is not the only prolonged symptom of frostbite. During the first weeks or months, people often experience tingling, a burning sensation, or a sensation resembling shocks from an electric current. Other possible consequences of frostbite include changes of skin color, nail deformation or loss, joint stiffness and pain, hyperhidrosis (excessive sweating), and heightened sensitivity to cold. For everyone, a degree of sensory loss lasting at least four years—and sometimes a lifetime—is inevitable.

Prevention

With the appropriate knowledge and precautions, frostbite can be prevented even in the coldest and most challenging environments. Appropriate clothing and footwear are essential. To prevent heat loss and keep the blood circulating properly, clothing should be worn loosely and in layers. Covering the hands, feet, and head is also crucial for preventing heat loss. Outer garments need to be wind and water resistant, and wet clothing and footwear must be replaced as quickly as possible. Alcohol and drugs should be avoided because of their harmful effects on judgment and reasoning. Experts also warn against alcohol use and smoking in the cold because of the circulatory changes they produce. Paying close attention to the weather report before venturing outdoors and avoiding unnecessary risks such as driving in isolated areas during a blizzard are also important.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing,1993.

Danzl, Daniel F. "Disturbances Due to Cold." In *Conn's Current Therapy,* edited by Robert E. Rakel. Philadelphia: W.B. Saunders,1998.

McCauley, Robert L., et al. "Frostbite and Other Cold Induced Injuries." In *Wilderness Medicine: Management of Wilderness and Environmental Emergencies,* edited by Paul S. Auerbach. St. Louis: Mosby, 1995.

PERIODICALS

Gill, Paul G., Jr. "Winning the Cold War." *Outdoor Life* (February 1993): 62+.

Phillips, David. "How Frostbite Performs Its Misery." *Canadian Geographic* (January February 1995): 20+.

Reamy, Brian V. "Frostbite: Review and Current Concepts." *Journal of the American Board of Family Practice* (January February 1998): 34 40. http://www.medscape.com/ABFP/JABFP/1998/v11.n01/fp1101.05.ream/fp1101.05.ream.html.

Winkelmann, Terry. "The Cold Facts about Frostbite." *Stride* (Winter 1997). http://www.stridemag.com/db_area/archives/1997/v2n4/frost.html.

Judith Turner

Fructooligosaccharides

Description

Fructooligosaccharides (FOS) are a type of non-digestible oligosaccharide, a short-chain polysaccharide (sugar molecule or type of carbohydrate).

FOS are found naturally in various fruits, vegetables, and grains, including bananas, tomatoes, onions, asparagus, leeks, **garlic**, edible burdock, wheat, rye and barley. FOS are also found in concentrated amounts in **chicory** root and artichokes, particularly the tuber of the Jerusalem **artichoke**. The majority of FOS products are commercially made from sucrose as

a starting carbohydrate material, and use a food-grade fungal enzyme called fructosyltransferase to make the FOS from sucrose. Most of the commercially derived FOS products come from chicory root (*Cichorium intybus)*, which contains significant quantities of inulin, a fiber in many fruits and vegetables.

Both FOS and inulin are recognized as natural food ingredients (not additives) in most European countries and have been labeled generally regarded as safe by the U.S. Federal Drug Administration (FDA). FOS are also considered functional foods, defined by the International Food Information Council as dietary components that provide a health benefit beyond basic **nutrition**. FOS are categorized as prebiotics, non-digestible food ingredients that escape digestion by passing through the stomach into the intestines, where they ferment and selectively stimulate the growth and/or activity of certain colonic bacteria. When FOS are consumed, they aid digestion by encouraging the growth of healthy intestinal microflora (**probiotics** or beneficial bacteria known as bifidobacteria or bifidus), such as *bifidobacteria* and *lactobacilli*. FOS are completely fermented in the colon by certain components of the microflora, so they are not excreted in feces.

Increasing beneficial bacteria in the digestive tract promotes gastrointestinal health, enhancing the digestion and absorption of nutrients and boosting the immune system by reducing the activity of potentially harmful or cancer-promoting bacterial enzymes, such as *E. coli,* clostridia, and coliforms. FOS aid in the synthesis of vitamins B_2 (**riboflavin**), B_3 (**niacin**), B_6 (pyridoxine), **folic acid**, and **biotin** by boosting the bacteria's ability to synthesize these key vitamins. FOS also stimulate the production of lactate and short-chain fatty acids, especially butyrate.

In 2008 research was ongoing to determine the function of prebiotics on the metabolism of ingested and existing microflora in the colon. Studies were also underway to determine how prebiotics affect certain physiological functions such as bowel function, and how they alter certain diseases or reduce the risk of diseases. In addition, labeling terminology, including product health claims, were still being determined for products containing FOS by the FDA under the Nutrition Labeling and Health Education Act of 1995.

General use

FOS have two general uses, as artificial sweeteners and as prebiotics. Because FOS are non-digestible, they provide almost no calories and are used in many foods as artificial sweeteners. They have about half the sweetness of sugar and provide bulk and flavor to certain dairy products, baked goods, and beverages.

Case reports from both animal and human studies have shown a wide variety of health benefits associated with FOS supplementation, including reduced risk of **diarrhea**, **osteoporosis**, **bladder cancer**, and colon **cancer**; improved management for inflammatory bowel diseases, including **Crohn's disease**; lowered total **cholesterol** and LDL cholesterol levels; as well as treatment for lactose intolerance, bacterial vaginosis, vaginal candidiasis (**yeast infection**), **allergies**, and diarrhea associated with antibiotic use. As more data from human trials continue to be published about the beneficial effects of FOS supplementation, scientific evidence will be available to support health risk reduction claims.

Several studies indicate FOS are especially beneficial to infants, reducing the incidence of diarrhea and the risk of infection, including upper respiratory tract **infections**. One study showed a decreased incidence of clinical **eczema** in infants. A November 2007 double-blind, placebo-controlled study published in the *Journal of Nutrition* demonstrated the immune-protective properties of long-chain FOS supplementation in formula-fed infants during the first six months of life. The health benefits of FOS supplementation in this study were comparable to human milk oligosaccharides, indicating the potential for preventing infections and reducing allergies. More research was needed to determine the role of prebiotic supplementation of infant formula for the prevention of allergies and food hypersensitivities.

FOS supplementation also appears to benefit older adults. Results from a December 2007 study published in the *Nutrition Journal* showed that dietary FOS significantly increased fecal bifidobacteria (beneficial bacteria) in adults aged 69 and older, which in turn stimulated the immune system and intestinal immunoglobulin A in the small intestine and colon.

Preparations

Commercial FOS products are available as bulk powder or in capsule form. Preparations may be composed of single FOS components or mixtures of FOS and other oligosaccharides. FOS-containing products include inulin-type fructans, inulin, and oligofructose.

The appropriate doses and mixtures of FOS and oligosaccharides to yield maximum positive health benefits were unknown as of 2008, but studies had shown that a well-tolerated, optimal dosage is 10 g of FOS supplement per day to yield gastrointestinal benefits. A dosage of less than 3 g per day did not appear to increase beneficial colonic bacteria.

KEY TERMS

Inulin—A carbohydrate belonging to a class of compounds known as fructans. Inulin fiber is resistant to digestion in the upper gastrointestional tract, so it reaches the large intestine essentially intact.

Microflora—Beneficial bacteria in the intestines. Microflora reinforce the barrier function of the intestinal mucosa to help prevent the attachment of pathogenic microorganisms and the entry of allergens.

Oligosaccharide—A carbohydrate consisting of three to six units of simple sugars (monosaccharides). A large number of oligosaccharides have been prepared by partially breaking down more complex carbohydrates (polysaccharides).

Polysaccharide—A complex carbohydrate that characterizes most forms of carbohydrates.

Prebiotics—Non-digestible food ingredients that pass through the stomach into the intestines, where they selectively stimulate the growth and/or activity of healthy colonic bacteria.

Probiotics—Live microorganisms or bacteria that, when administered in adequate amounts, confer a health benefit on the host.

Precautions

FOS dietary supplements are generally safe when taken according to proper dosing guidelines. FOS supplementation may not be appropriate for people who have severely weakened immune systems due to disease or cancer treatments, as they can develop serious infections, including bacterial blood infections. People who have recently had bowel surgery, have intestinal damage, or have **inflammatory bowel disease** should not take FOS supplements without first consulting their physician. There is a rare risk of heart valve infections, particularly in people who have artificial heart valves, so patients with heart valve disease should consult their doctor before taking FOS supplements.

Studies have been conducted in pregnant women and infants, and no adverse effects related to fetal development during **pregnancy** or to breastfed infants have been reported.

Side effects

Severe, adverse or toxic effects of FOS supplementation have not been published in the research as of 2008. Ingesting products containing FOS may result in mild gastrointestinal discomfort, including excess **gas**, abdominal cramps, and bloating, which typically subside within two weeks after initiating therapy. Symptoms are dependant on the dosage and appear to be more prevalent with higher doses. To minimize side effects, practitioners recommend starting with a low dose of FOS and increasing it gradually until the desired maximum dose is achieved. People who are sensitive to lactose may develop abdominal discomfort from dairy products containing FOS.

Interactions

Limited research has shown that alcohol interferes with the action of FOS, so practitioners recommend that alcohol be avoided while taking FOS supplements. Some studies have shown that antibiotics damage bifidobacteria, so FOS should be taken two to three hours after antibiotic doses. Other drug interactions have not been determined, as most supplements, including FOS, have not been thoroughly tested for interactions with other herbs, supplements, drugs, or food.

Resources

BOOKS

Bender, D. A. *A Dictionary of Food and Nutrition*. New York: Oxford University Press, 2005.

Berdanier C., and J. T. Dywer, eds. *Handbook of Nutrition and Food,* 2nd ed. Boca Raton, FL: CRC Press, 2006.

Norio S., B. Noureddine, and O. Shuichi, eds. *Recent Advances in Fructooligosaccharides Research*. Kerala, India: Research Signpost, 2007.

PERIODICALS

Arslanoglu, S., G. E. Moro, G. Boehm. "Early Supplemen tation of Prebiotic Oligosaccharides Protects Formula Fed Infants Against Infections during the First 6 Months of Life." *Journal of Nutrition* 137 (November 2007): 25835S 2589S.

Bouhnik Y., et al. "Four Week Short Chain Fructo oligosaccharides Ingestion Leads to Increasing Fecal Bifidobacteria and Cholesterol Excretion in Healthy Elderly Volunteers." *Nutrition Journal* 42, no. 6 (2007): 1475 2891.

Lara Villoslada, F., et al. "Short Chain Fructooligosac charides, in Spite of Being Fermented in the Upper Part of the Large Intestine, Have Anti Inflammatory Activ ity in the TNBS Model of Colitis." *European Journal of Nutrition* 45, no. 7 (October 2006): 418 425.

ORGANIZATIONS

Food and Agricultural Organization of the United Nations, http://www.fao.org/.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agricul ture, 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov/.

International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, DC, 20036, (202) 296 6540, http://www.ific.org/.

Angela M. Costello

Fungal infections

Definition

Fungi are types of parasitic plants that include molds, mildew, and yeast. A fungal infection is an inflammatory condition in which fungi multiply and invade the skin, the digestive tract, the genitals, and other body tissues, particularly the lungs and liver. Fungal **infections** of the skin are often called ringworm or tinea.

Description

Microscopic fungi, which are called dermatophytes, often live exclusively on such dead body tissues as hair, the outer layer of the skin, and the nails. The fungus grows best in moist, damp, dark places with poor ventilation and on skin that is irritated, weakened, or continuously moist. Superficial fungal infections include tinea capitis, an infection of the neck and scalp; tinea barbae, also called barber's itch, along the beard area in adult males; tinea corporis on parts of the body, such as the arms, shoulders, or face; tinea cruris, or **jock itch**, involving the groin; tinea pedis, or **athlete's foot**; tinea versicolor; and tinea unguium, or infection of the nails. The term tinea gladiatorum is sometimes used to describe ringworm infections in athletes. Tinea gladiatorum is most common in swimmers, wrestlers, and athletes involved in other contact sports. Fungal infections of the skin and nails are very common in children, but they can affect all age groups.

Systemic fungal infections occur when spores are touched or inhaled, or there is an overgrowth of fungi in or on the body. Such infections are most often a serious problem in individuals with suppressed immune systems. Candidiasis is a rather common fungal infection. When it occurs in the mouth, it is called thrush. Less often, it occurs in the mucous membranes of other parts of the digestive system, or in the vagina, heart valves, urinary tract, eyes, or blood. Other systemic fungal infections include aspergillosis, which mostly affects the lungs and may also spread to the brain and kidneys; blastomycosis, a lung infection that may spread through the bloodstream; coccidioidomycosis, also known as San Joaquin or valley **fever**; mucormycosis, which can develop into a serious life-threatening infection; and histoplasmosis.

Causes and symptoms

Fungi are widespread in the environment, so it is not unusual that a certain amount of fungi and their spores end up being inhaled into the lungs or landing on the skin. Under conditions of moisture, warmth, irritation, or injury, these fungi grow rapidly and may cause illness. Superficial fungal infections may be due to an overgrowth of fungi already present, or the infection may be the result of contact with an infected person or with contaminated surfaces, bed sheets, towels, or clothing. Fungal infections can be spread from one part of the body to another by scratching or touching. Additionally, tinea unguium infections have been linked to the use of methyl methacrylate, a glue used for attaching acrylic fingernails.

Fungal spores are often present in soil and are likely to be inhaled when the soil is dug up or otherwise disturbed. Systemic fungal infections are commonly contracted in this way. In addition, fungi that normally inhabit the intestines, such as *Candida albicans*, may multiply, causing an infection due to an overgrowth of the fungi.

Tinea infections usually cause itchy, red, scaly, ring-shaped patches on the skin that spread easily. Hairs in the area of infection often fall out or break off, and the skin may crack. The skin may also develop a secondary bacterial infection. In tinea unguium, the nails discolor, crack, and thicken. Tinea versicolor may cause pigment changes in the skin that persist for up to a year.

Systemic fungal infections develop slowly. Symptoms often may be nonexistent, or there may be only the feeling of having a cold or the flu. Coughing, a fever, chest **pain**, **chills**, weight loss, and difficulty with breathing may become evident. Additional symptoms depend on the type and site of the infection.

Fungal infections are more common and more severe in people taking antibiotics, corticosteroids, immunosuppressant drugs, and contraceptives. Such is also the case in people with endocrine disorders, immune diseases, and other conditions such as **obesity**, **AIDS**, **tuberculosis**, major **burns**, **leukemia**, and **diabetes mellitus**. Fungal infections often occur due to the use of antibiotic drugs for other conditions because antibiotics kill off the bacteria that normally keep fungi at bay.

Diagnosis

Fungal infections of the skin, hair, and nails often can be diagnosed based on the characteristic

appearance of affected areas. A **potassium** hydroxide (KOH) prep is a simple laboratory test to confirm the diagnosis. The test uses tissue samples treated with a 20% potassium hydroxide solution to detect fungi. Examining the skin with a Wood's ultraviolet lamp is another easy and convenient method to determine the presence of a fungus. Culture and sensitivity testing can be used if a more definitive diagnosis is required. Systemic fungal infections may be initially diagnosed from blood tests. Confirmation is determined by cultures made from sputum, blood, urine, bone marrow, or infected tissue samples.

Treatment

Among the herbs that slow down or halt the growth of fungus are **goldenseal** (*Hydrastis canadensis*), **myrrh** (*Commiphora molmol*), **garlic** (*Allium sativa*), **pau d'arco** (*Tabeebuia impestiginosa*), **turmeric** (*Curcuma longa*), oregano (*Origanum vulgare*), cinnamon (*Cinnamonum zeylanicum*), jewelweed, **sage** (*Salvia officinalis*), *Impatiens aurea*, **yellow dock** (*Rumex crispus*), the lichen known as old man's beard (*Usnea barbata*), **black walnut** husks and bark (*Juglans nigra*), **licorice** (*Glycyrrhiza glabra*), and *Calendula officinalis*. These herbs can be applied to external fungus as infusions, salves, powders, or vinegars. Many of them can also be taken internally as capsules or tinctures. Antifungal herbs can be quite strong and care should be taken that a given remedy is suitable for internal use.

When an infusion is used, the affected area should be washed or soaked in the herbal water for at least 15 minutes twice daily. Store-bought or homemade tea bags can be soaked in water or vinegar for about 10 minutes and then used as a poultice for the same effect. Herbal vinegars make excellent remedies for fungus, as vinegar is in itself antifungal. Special vinegars with such antifungal ingredients as oregano and garlic are often readily available at grocery stores. The vinegar can be applied a few times daily with cotton or compresses. In addition, a bentonite clay dusting powder can be useful for drying out the environment of moist skin in which fungus thrives. It works best when mixed with powdered antifungal herbs such as myrrh or goldenseal. Dusting powder is especially helpful for athlete's foot.

Many herbs high in **essential oils** also have antifungal action, particularly tea tree (*Melaleuca alternifolia*), oregano, **lavender** (*Lavandula officinalis*), *Eucalyptus* spp., rose geranium (*Pelargonium graveolens*), **peppermint** (*Mentha piperita*), **chamomile** (*Matricaria recutita*), and myrrh. Peppermint oil is especially helpful in relieving the **itching** associated with many fungal infections. The simplest way to use **aromatherapy** to fight fungal infections is to add several drops of any single essential oil or combination of oils to bathwater. Essential oil can also be added to mixtures for soaking or compresses. Tea tree is the herb most frequently recommended for the treatment of superficial fungal infections. As with all essential oils, the full-strength oil should be diluted in a carrier. A dilution of **tea tree oil** can be made by adding the essential oil to a carrier oil. This mixture can be applied directly to the site of a skin infection.

A healthy diet should be maintained. Foods that are high in yeast, such as beer and wine, breads, and baked goods should be avoided. Fermented foods and sugary foods, including honey and fruit juices, should also be avoided until symptoms have cleared. Antifungal culinary herbs such as garlic, turmeric, oregano, sage, and cinnamon should be used liberally in foods. Yogurt containing live cultures can be incorporated into the diet to supply needed gut bacteria and help reduce digestive infections such as candidiasis and thrush. *Lactobacillus acidophilus* and *Lactobacillus bulgaricus* can also be taken directly as supplements.

Supplements that can be taken for fungal infections include vitamins A, B complex, C, and E. Caprylic acid, an extract of the coconut plant, is also recommended as an antifungal, as well as **grapefruit seed extract**. **Essential fatty acids**, contained in **evening primrose oil**, fish liver oil, or **flaxseed** oil, can help reduce the inflammation of systemic or superficial fungal infections. A dose of one of these oils is recommended as a daily supplement.

Allopathic treatment

Superficial fungal infections are usually treated with such antifungal creams or sprays as tolnaftate (Aftate or Tinactin), clotrimazole, miconazole nitrate (Micatin products), econazole, ketoconazole, ciclopirox, naftifine, itraconazole, terbinafine hydrochloride, fluconazole, or Whitfield's tincture made of salicylic acid and benzoic acid. If the infection is resistant, a doctor may prescribe an oral antifungal drug such as ketoconazole or griseofulvin. Drugs used for systemic infections include amphotericin B, which is highly toxic and is used for severe or life-threatening infections; the azoles, particularly fluconazole and itraconazole, which have been found to be the least toxic of these medications; and flucytosine alone or in combination with other antifungal medications. Fungal infections that become inflamed may be treated with a combination antifungal/steroid medication. Certain infections may require surgery.

KEY TERMS

Azole—Any member of a group of chemical compounds with five-membered rings containing one or more nitrogen atoms. Several azoles are used as antifungal medications.

Bentonite clay—A green clay of aluminum silicate containing magnesium and trace minerals. The clay can draw out agents of infection.

Dermatophyte—A type of fungus that is parasitic on skin and causes a skin disease.

Tinea—Any of several fungal infections of the skin, especially ringworm.

Expected results

Infections usually respond to treatment within several weeks. However, many fungal infections are resistant to treatment, and it may take an extended time and repeated treatments to effect a cure. Infections may spread, and secondary bacterial infections may develop. Medications for fungal infections are often strong, and their use may cause such undesirable side effects as **headache**, **dizziness**, **nausea**, **vomiting**, or abdominal pain. Fungal infections are usually not serious in otherwise healthy individuals. However, a systemic fungal infection may be severe and life-threatening for those with compromised immune systems.

Prevention

Good personal hygiene should be maintained. In the case of superficial infections, the skin should be kept clean and dry, and care should be taken to avoid contact with other parts of the body. If someone in the household has a superficial fungal infection, bed sheets, towels, floors, shower stalls, and other contact surfaces should be washed with hot water and disinfected after use.

Resources

PERIODICALS

Cassone, A. "Fungal Vaccines: Real Progress from Real Challenges." *The Lancet Infectious Diseases* 8, no. 2 (February 2008): 114 124.

Nosanchuk, J. D. "Current Status and Future of Antifungal Therapy for Systemic Mycoses." *Recent Patents on Anti Infective Drug Discovery* 1, no. 1 (January 2006): 75 84.

OTHER

"Antifungal Drugs." *Merck Manual of Diagnosis and Ther apy* (November 2005). http://www.merck.com/mmpe/sec14/ch180/ch180b.html#S14_CH180_T001.

ORGANIZATIONS

American Academy of Dermatology, PO Box 4014, Schaumburg, IL, 60618 4014, (866) 503 7546, (847) 240 1280, http://www.aad.org.

American Skin Association, 346 Park Ave. South, 4th floor, New York, NY, 10010, (800) 499 SKIN, (212) 889 4858, http://www.americanskin.org.

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), National Institutes of Health, 1 AMS Circle, Bethesda, MD, 20892 3675, (877) 226 4267, (301) 495 4484, http://www.niams.nih.gov.

Patience Paradox
Rebecca J. Frey, PhD
Angela M. Costello

Furuncles *see* **Boils**

G

Gallstones

Definition

Gallstones are solid crystal deposits that form in the gallbladder, a pear-shaped organ that stores bile until it is needed to help digest fatty foods. These crystals can migrate to other parts of the digestive tract, causing severe **pain** and life-threatening complications. Gallstones vary in size and chemical structure. They may be as tiny as a grain of sand, or as large as a golf ball.

Description

Gallstones usually develop in adults between the ages of 20 and 50. The risk of developing gallstones increases with age. Young women are up to six times more likely to develop gallstones than men in the same age group. In patients over 50, however, the condition affects men and women with equal frequency. Native Americans develop gallstones more often than any other segment of the population, and Mexican Americans have the second highest incidence of this disease. Gallstones tend to be passed down genetically in families.

Eighty percent of gallstones are composed of **cholesterol**. They are formed when the liver produces more cholesterol than the digestive juices can liquefy. The remaining 20% of gallstones are composed of **calcium** and an orange-yellow waste product called bilirubin, which gives urine its characteristic color and sometimes causes **jaundice**.

People who have gallstones may remain without symptoms for an extended period, especially if the stones remain in the gallbladder. In most cases, medical treatment is only deemed necessary if the individual is experiencing symptoms. When symptoms do appear, it is usually because the stones have left the gallbladder and are stuck somewhere else within the biliary system, blocking the flow of bile. If gallstones remain stuck in the biliary system, there can be damage to the liver, pancreas, or the gallbladder itself.

Gallstones bring on several disorders including:

- Cholelithiasis: Gallstones within the gallbladder itself. Pain is caused by the contractions of the gallbladder around the stone.
- Choledocholithiasis: The presence of gallstones within the common bile duct, which is the passage that empties into the small intestine. Once discovered, common duct stones need to be removed in order to avoid further problems.
- Cholecystitis: A disorder marked by inflammation of the gallbladder. It is usually caused by the passage of a stone from the gallbladder into the cystic duct, which connects the gallbladder to the common bile duct. Cholecystitis causes painful enlargement of the gallbladder and is responsible for 10–25% of all gallbladder surgery.

Causes and symptoms

Gallstones are caused by an alteration in the chemical composition of bile, which is a fluid that helps the body break down and absorb fats. It is widely held that a diet high in fats and processed foods, and low in fiber and whole foods, is a strong contributor to gallstone formation. High levels of estrogen, insulin, or cholesterol can increase a person's risk of developing gallstones. If left untreated, the risk of developing **anemia** is also increased.

Gallbladder attacks usually follow a meal of rich foods, typically high in fat. The attacks often occur in the middle of the night, sometimes waking the patient with such intense pain that the episode ends in a visit to the emergency room. Pain often occurs on the right side of the body. The pain of a gallbladder attack begins in the abdomen and may radiate to the chest, back, or the area between the shoulders. Other symptoms of gallstones include inability to digest fats, low **fever**, **chills**

KEY TERMS

Bile—A bitter, greenish liquid secreted by the liver that aids in the digestion and absorption of fats.

Cholecystectomy—Surgical removal of the gallbladder.

Common bile duct—The passage through which bile travels from the cystic duct to the small intestine.

Lithotripsy—A nonsurgical technique for removing gallstones by breaking them apart with high-frequency sound waves.

and sweating, **nausea** and **vomiting**, **indigestion**, **gas**, belching, and clay-colored bowel movements.

Pregnancy or the use of birth control pills slow down gallbladder activity and increase the risk of gallstones, as do diabetes, **pancreatitis**, and **celiac disease**. This is due to an individual's higher levels of cholesterol, insulin, or estrogen from oral contraceptives. Other factors that may encourage gallstone formation are:

- infection
- anemia
- obesity
- intestinal disorders
- coronary artery disease
- multiple pregnancies
- a high-fat, low-fiber diet
- smoking
- heavy drinking
- rapid weight loss

Diagnosis

When gallstones are suspected, blood tests for liver enzyme levels are often given. The levels are usually elevated when the stone cannot pass through the cystic duct or bile duct. Test results, taken together with symptom history and a physical exam, are simple and relatively inexpensive for diagnosing the presence of gallstones. However, ultrasound is the method of choice for a definite diagnosis. It has a high degree of accuracy, except in diagnosing cholecystitis (a stone in the cystic duct). Cholescintigraphy is an alternative method of diagnosis, in which radioactive dye is injected and photographed as it passes through the biliary system.

Treatment

An allergic reaction to certain foods may contribute to gallbladder attacks. These foods should be identified and removed from the diet, or at least seriously limited. Foods that might possibly bring on allergic reactions include eggs, pork, onions, chicken, milk, coffee, citrus, corn, nuts, and beans.

Other dietary changes may help relieve the symptoms of gallstones. Generally, a vegetarian diet is protective against the formation of gallstones. Recurrent attacks can be diminished by maintaining a healthy weight and a healthy diet.

Choleretic herbs encourage the liver to secrete bile. They help maintain the appropriate chemical composition of bile so that it does not form stones. These herbs include:

- A tincture of dandelion (*Taraxacum officinale*), 2–6 ml once daily.
- Milk thistle seeds (*Sylibum marianum*), a dose equivalent to 70–210 mg of silymarin.
- Artichoke leaves (*Cynara scolymus*), 150 mg three times per day.
- Turmeric (*Curcuma longa*), used as a spice; 150 mg three times per day.

Use of the above herbs cause some possible reactions, such as gas, **diarrhea**, nausea, and indigestion.

Other therapeutic approaches that have been found to be helpful in treating gallstones include **homeopathy**, traditional Chinese herbal medicine, and **acupuncture**. Knowledgeable practitioners should be consulted.

Allopathic treatment

Watchful waiting

One-third of all patients with gallstones never experience a second attack. For this reason, many doctors advise an attitude of "wait and see" after the first episode. Changing the diet or following a sensible weight loss plan may be the only treatments required. A person having only occasional mild gallstone attacks may be able to manage them by using nonprescription forms of acetaminophen, such as Tylenol or Anacin. A doctor should be notified if pain intensifies or lasts for more than three hours; if the fever rises above 101°F (38.3°C); or if the skin or whites of the eyes have a yellowish cast.

Surgery

Surgical removal of the gallbladder, called cholecystectomy, is the most common conventional treatment for recurrent or worsening gallstone attacks. However,

surgery is unecessary in most cases where the gallstones remain without symptoms. Laparoscopic cholecystectomy is the technique most widely used. It has mostly replaced traditional open surgery because of a shorter recovery time, decreased pain, and reduced scarring. However, the open surgery procedure is still used in about 5% of cases because of various complications.

Nonsurgical therapy

If surgery is considered inappropriate, gallstones can be dissolved in 30–40% of patients by taking bile acids in tablet form. Dissolution of gallstones by this method may take many months or years depending on the size. Unfortunately, recurrence of stones is common after cessation of the medication.

Lithotripsy uses high-frequency sound waves directed through the skin to break up the stones. The process can be combined with the use of bile acid tablets. Lithotripsy requires special equipment and is not always readily available.

Direct cholangiography can be used to remove gallstones by contact dissolution. The procedure is used to insert a catheter to inject medication into the gallbladder. Stones are often dissolved within a few hours by this method.

Expected results

Forty percent of all patients with gallstones have "silent gallstones" that do not require treatment. If symptoms develop, then medical intervention may become necessary. Gallstone problems requiring treatment may also develop **infections** that require antibiotics. In rare instances, severe inflammation can cause the gallbladder to burst, causing a potentially fatal situation. The gallbladder is not an organ that is required to retain health. It can be successfully removed, with no recurrence of stones. Fat digestion, however, becomes more difficult after surgery, since the gallbladder is no longer there to store and release bile as needed.

Prevention

It is easier, in general, to prevent gallstones than to reverse the process. The best way to prevent gallstones is to minimize risk factors. Since gallstones seem to develop more often in people who are obese, eating a balanced diet, exercising, and losing weight may help keep gallstones from forming. In addition, a diet high in dietary fiber and low in fats, especially saturated fats, is recommended. Processed foods should be replaced by complex carbohydrates, such as whole grains.

Increased intake of fluids will dilute the bile and inhibit gallstone formation. Six to eight glasses of water should be consumed daily, along with plenty of herbal teas and diluted juices.

Recent studies indicate that consumption of about two tablespoons of olive oil per day, which can be mixed with food, helps reduce cholesterol levels in the bloodstream and the gallbladder. Large amounts of olive oil, taken as a so-called liver flush, should be avoided. This method can **stress** the gallbladder and lead to an emergency situation.

Resources

BOOKS

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life, Inc., 1996.

Gottlieb, Bill, ed. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Murray, Michael, N.D., and Joseph Pizzorno. *Encyclopedia of Natural Medicine*. Rocklin, CA: Prima Publishing, 1991.

Shaw, Michael, ed. *Everything You Need to Know About Diseases*. Springhouse, PA: Springhouse Corporation, 1995.

PERIODICALS

Saitz, R. "Exercise Prevents Gallstone Disease." *Journal Watch* (March 27, 1998).

ORGANIZATIONS

National Digestive Diseases Clearinghouse (NDDIC). 2 Information Way, Bethesda, MD 20892 3570. http://www.niddk.nih.gov/health/digest/nddic.htm.

National Institute of Diabetes and Digestive and Kidney Disorders of the National Institutes of Health. Bethesda, MD 20892. http://www.niddk.nih/gov/.

OTHER

Gallbladder Problems. http://www.sleh.com/fact d04 gall.html.

WebMD/Lycos. "How Are Gallstones and Gallbladder Disease Diagnosed?" http://webmd.lycos.com/content/dmk/dmk_article_3961803.

Patience Paradox

Gamma-linoleic acid

Description

Gamma-linoleic acid (GLA) is an omega-6 polyunsaturated fatty acid made in the body from linolenic acid, an essential fatty acid (EFA). GLA is the product

of the body's first biochemical step in the transformation of a major essential fatty acid, linolenic acid (LA), into important prostaglandins. Prostaglandins are essential to the proper functioning of each cell. Every cell's structure in the human body depends on fatty acids formed from GLA.

The amount of GLA found in the seed oils of evening primrose (*Oenothera biennis L.*) is 10%, borage (*Borago officinalis L.*) 17%, and black currant (*Ribes nigrum L.*) 23%.

General use

Evening primrose oil (EPO), very high in GLA, has been used for decades to treat medical conditions. Native American women chewed evening primrose seeds to relieve menstrual problems. Evening primrose was also used by Native Americans and early American settlers from Europe to treat coughs and stomach problems. In the 1800s, the leaves of the plant were used to treat several skin conditions.

EPO was imported to Europe during the 1600s and 1700s, and used to treat **gout**, **rheumatoid arthritis**, headaches, and skin conditions.

In animal studies GLA has been shown to reduce certain inflammations and reduce joint tissue injury. Human studies showed similar findings in its anti-inflammatory effects.

GLA has also been used as a treatment option for a number of conditions, including **alcoholism**, **asthma**, attention deficit/hyperactivity disorder (ADHD), high **cholesterol**, diabetic neuropathy, certain cancers, **eczema** (a skin inflammation), **hypertension** (high blood pressure), **premenstrual syndrome** (PMS), rheumatoid arthritis, and scleroderma (a skin disease).

There is also research data that indicates GLA in combination with other measures may help in treating people with Sjögren's syndrome—a chronic inflammatory disease of the immune system that effects mostly older women.

Other animal studies suggest GLA may enhance **calcium** absorption, helping to reduce calcium loss and osteporosis. **Osteoporosis** is a disease occurring primarily in women after **menopause** in which the bones become very porous, break easily, and heal slowly. It may lead to curvature of the spine after vertebrae collapse.

EPO supplements taken during **pregnancy** may reduce the need for cesarean delivery as studies suggest that EPO may facilitate vaginal delivery when used as a "cervical priming agent."

Among the conditions GLA is most often used for are:

- Rheumatoid arthritis. GLA has been studied for many years for its possible effects in treating arthritis and other inflammatory conditions. GLA has been shown to be most promising in treating people with this crippling condition, due to its anti-inflammatory properties. At least three studies have shown GLA reduces inflammation and joint tissue injury, thereby reducing the pain associated with this condition. In one study, GLA reduced the incidence of tender joints by 36%, and swollen joints by 28%.
- ADHD. Studies suggest that GLA may be helpful (combined with other therapies) for helping to alleviate ADHD symptoms in children.
- Diabetes. Some studies show that GLA can help improve nerve function and help reduce peripheral neuropathy, which causes numbness, tingling, pain, or burning in the feet, legs, and toes and hands, in diabetics. Recent studies have confirmed evening primrose oil as beneficial in the treatment of distal diabetic polyneuropathy, a condition involving multiple nerves.
- High cholesterol. Research indicates that high doses of GLA may improve blood lipid levels in people with high cholesterol. Studies with laboratory animals in 1997 demonstrated the cholesterol-lowering effects of EPO. In one study, rabbits whose diet was supplemented with 15% EPO showed a total cholesterol reduction of 25%. In a 13-week study with rats, EPO dietary supplements of 10–20%, produced lower levels of liver cholesterol than in rats on the same diet, but supplemented with palm oil, soybean oil, sunflower oil, or high-oleic safflower oil.
- Skin conditions. A number of studies have been done regarding GLA and eczema with contradicting results. Several studies showed GLA relieved the symptoms such as itching, redness, and scaling of the skin, to varying degrees. It has also been shown to be helpful in reducing the symptoms of scleroderma and skin inflammations, such as dermatitis.
- Cancer. In vitro or test tube studies have shown GLA has potential to suppress tumor growth and metastasis, the spreading of cancer from the original site to other parts of the body. In one small study, combining vitamin C with the GLA supplement doubled the survival time for 11 patients with liver cancer. GLA has also shown promising results as a cancer therapy when combined with the anticancer drugs tamoxifen and paclitaxol. Research into its effects on cancer are in the earliest stages and GLA cannot

KEY TERMS

Attention deficit/hyperactivity disorder (ADHD)—A condition, occurring mainly in children, characterized by hyperactivity, inability to concentrate, and impulsive or inappropriate behavior.

Corticosteroids—Drugs used to treat inflammation.

Dermatitis—Inflammation of the skin resulting in redness, swelling, itching, or blistering.

Eczema—An inflammation of the skin characterized by redness, itching, and scaly or crusty patches.

Eicosapeniaenoic acid—A type of acid derived from gamma-linoleic acid.

Essential fatty acids—A group of necessary fats that the human body cannot produce on its own and must be obtained through diet.

Femur—The main bone in the human thigh and the strongest bone in the body.

Gout—A painful disease, mainly of the toes and feet, that causes swollen joints.

Hypertension—High blood pressure, which if untreated, can lead to heart disease and stroke.

Lipids—A group of organic compounds consisting of fats, oils, and related substances that, along with proteins and carbohydrates, are the structural components of living cells.

Lumbar vertebrae—Five bones in the lower spine.

Metastasis—The spreading of cancer from the original site to other parts of the body.

Nonsteroidal anti-inflammatory drugs (NSAIDS)—A class of drugs used to treat inflammation and pain.

Omega-6 fatty acids—A group of essential fatty acids that the humans body cannot produce on its own and must be obtained through diet.

Osteoporosis—A disease occurring most commonly in women after menopause in which the bones become very porous, break easily, and heal slowly. It may lead to curvature of the spine after vertebrae collapse.

Paclitaxol—A drug used to treat some forms of cancer.

Peripheral neuropathy—A nerve disease associated with diabetes that causes numbness, tingling, pain, or burning in the feet, legs, and toes.

Polyunsaturated—A group of fats that are less likely to be converted into cholesterol in the body than other fats.

Premenstrual syndrome (PMS)—A group of symptoms, including nervous tension, irritability, tender breasts, and headache, experienced by some women in the days before menstruation caused by changes in hormone levels.

Prostaglandin—An unsaturated fatty acid in humans that helps to control smooth muscle contraction, blood pressure, inflammation, and body temperature.

Rheumatoid arthritis—Inflammation of joints that causes stiffness and damage to joints.

Scleroderma—A skin disease.

Sjögren's syndrome—A chronic inflammatory disease that effects mostly older women, causing dry eyes and mouth.

Tamoxifen—A drug used to treat cancer.

Triglycerides—A chemical compound in many of the fats and oils of animal and vegetable tissues and, like cholesterol, can have an adverse effect on human health in excessive amounts.

Vasodilatation—A widening of the blood vessels.

be said to prevent or cure any type of cancer. However, it has been reported recently that GLA supplementation may restore normal prostaglandin E series metabolism and thus act to inhibit carcinogenesis.

- Hypertension. Several studies suggest GLA may help reduce blood pressure in some people with hypertension and thereby decrease the risk of heart attacks. Results of these studies are not considered conclusive.
- PMS. Studies show GLA is remarkably helpful in treating some PMS symptoms. One study showed that of the women who took the drug Efamol, which contains 9% GLA, 61% experienced complete relief from symptoms while 23% had partial relief. These symptoms included breast tenderness, depression, irritability, swelling, and bloating.

GLA, in combination with eicosapentaenoic acid (EPA), in the form of borage seed and fish oils, significantly reduced the need for breathing support in patients with the lung condition acute respiratory distress syndrome. It cut the average number of days a patient is in a hospital's intensive care unit from 17.5 to 12.8, according to a study published in the August 1999 issue of *Critical Care Medicine*.

Preparations

Gammalinoleic acid is found naturally in fish, animal organs such as liver, and certain plant seed oils. The major sources of GLA are **borage oil** (18–27% GLA), black currant oil (15–20% GLA), and evening primrose oil (7–14% GLA). GLA is not available as a pure extract, but only as an ingredient in combination formulas.

Dosage varies by condition it is used to treat:

- skin conditions: 360–750 mg daily
- PMS: 240–320 mg daily
- rheumatoid arthritis: 750 mg–2.8 g daily for six to 12 months
- diabetic neuropathy: 480 mg daily
- high blood pressure: 1.3 g daily
- high cholesterol: Up to 2 g daily

The United States Food and Drug Administration (FDA) has not established recommended daily allowances (RDA) for GLA.

Patients should consult with a heathcare professional regarding the proper dosage.

Several forms of GLA supplements are available, including a concentrated form. It is also available as evening primrose oil, borage oil, and **black currant seed oil**. It is also available in multi-nutrient formulas that often contain any combination of **fish oil**, flax seed oil, **omega-6 fatty acids**, and **essential fatty acids**. The usual amount of GLA in these is from 200–400 mg per capsule. The cost of a bottle of 30 capsules ranges from $8 to $15. The concentrations of GLA in these oils varies and the number of capsules needed depends on the amount of GLA.

Precautions

GLA should not be used by women who are pregnant or breastfeeding without consulting a physician. Hemophiliacs and people who take the blood-thinning drug warfarin (Coumadin) should consult a physician before taking GLA. It should also not be taken before surgery because it may increase bleeding. Persons with high blood pressure or heart or blood vessel conditions should consult a physician before taking GLA.

Side effects

There is no evidence that GLA is toxic in daily doses of up to 2.8 g. There have been no reports of serious side effects by people taking GLA supplements. It is generally well tolerated by most people. Possible minor side effects include upset stomach, **diarrhea**, soft stool, bloating, and **gas**. Persons who take GLA and experience difficulty breathing, chest or throat tightness, chest **pain**, **hives**, rash, or itchy or swollen skin may be allergic to it. They should stop taking it and consult a physician immediately.

Interactions

No adverse interactions between GLA and other medications, vitamins, or nutritional supplements have been reported.

Resources

BOOKS

Editors of Prevention Health Books. *Outsmart Arthritis* New York, NY: St. Martin's Press, 2003.

Graedon, Teresa, and Joe Graedon. *The People's Pharmacy Guide to Home and Herbal Remedies*. New York: St. Martin's Press, 2002.

McKenna, Dennis J., Kenneth Jones, and Kerry Hughes. *Botanical Medicines: The Desk Reference for Major Herbal Supplements*. Haworth Press: 2002.

Murray, Frank, and Len Saputo. *Natural Supplements for Diabetes: Reduce Your Risk and Lower Your Insulin Dependency With Natural Remedies*. Charlottesville, VA: Hampton Roads Publishing Co., 2003.

Newman, Rosemary K., and C. W. Newman. *Gamma Linolenic Acid: What You Need to Know*. Garden City Park, NY: Avery Penguin Putnam, 2001.

Phaneuf, Holly. *Herbs Demystified: A Scientist Explains How the Most Common Herbal Remedies Really Work*. New York: Marlowe & Company: 2005.

Rayburn, Debra J. *Let's Get Natural With Herbs*. Ozark Mountain Publishing, Inc.: 2007.

PERIODICALS

Baumann, Leslie S. "Cosmeceutical Critique: Evening Prim rose Oil." *Skin & Allergy News* (March 2004): 46 47.

Belch, Jill J.F., and Alexander Hill. "Evening Primrose Oil and Borage Oil in Rheumatologic Conditions." *American Journal of Clinical Nutrition* (January 2000): 352S.

Deineka, V. I. "Triglyceride Composition Seed Oils from Certain Plants." *Chemistry of Natural Compounds* (November 2003): 523 527.

Enig, Mary G., PhD. "Gamma Linolenic Acid." *Wise Traditions in Food, Farming and the Healing Arts*. (Winter 2004). The Weston A. Price Foundation. [cited February 1, 2008]. http://www.westonaprice.org/knowyourfats/gamma linolenic.html.

Essig, Maria G. "Evening Primrose Oil Reverses Some Diabetes Induced Vasodilatation Deficiencies in Rat Model." *Heart Disease Weekly* (November 17, 2002): 24.

Gaby, Alan R. "Could Evening Primrose Oil Decrease the Need for Cesarean Sections?; Literature Review &

Commentary." *Townsend Letter: The Examiner of Alternative Medicine* 291 (October 1, 2007): 48.
Gaby, Alan R. "Evening Primrose Oil for Diabetic Neuro pathy; Literature Review & Commentary." *Townsend Letter for Doctors and Patients* (May 1, 2007): 42.
"Gamma Linolenic Acid (GLA)." *Alternative Medicine Review* (March 2004): 70 79.
Werbach, Melvyn R. "The Influence of Essential Fatty Acids on Cancer; Nutritional Influences on Illness." *Townsend Letter: The Examiner of Alternative Medicine* (August 1, 2007): 164.

Ken R. Wells
Clare Hanrahan

KEY TERMS

Amputation—The surgical removal of a part of the body.

Antitoxin—A vaccine used to stimulate immunity against a specific disease.

Arteriosclerosis—A disease characterized by build-up on the artery walls that can lead to the obstruction of blood flow.

Debridement—The surgical removal of dead tissue.

Raynaud's disease—A condition in which there is poor circulation and decreased oxygen in the hands and feet particularly.

Torsion—The accidental twisting of tissues in the body that may decrease the blood and oxygen supply to the affected area.

Gangrene

Definition

Gangrene is a term used to describe the decay or death of an organ, tissue, or bone caused by a lack of oxygen and nutrients. It is a complication resulting from tissue injuries (such as **frostbite**), the obstruction of blood flow, or the processes of chronic diseases such as **diabetes mellitus**. Externally, the hands and feet are the areas most often affected by gangrene; internally, it is most likely to affect the gallbladder and the intestines. Gangrene is referred to as wet, or moist, if a bacterial infection is involved. In dry gangrene, there is no infection.

Description

Gangrene is often characterized by **pain** followed by numbness. The infection may first go unnoticed, especially in the elderly or those individuals with a loss of sensation. The area affected by gangrene may be cold and pale, especially early in the disease. **Blisters** may be apparent and the patient may experience an increased heart rate and profuse sweating. As the tissue dies, the skin begins to darken. The dead tissue gradually separates and falls away from the healthy tissue.

Dry gangrene is often seen in advanced cases of diabetes and arteriosclerosis. The tissue does not become infected, rather it dries out and shrivels over a period of weeks or months. Wet gangrene progresses much more rapidly. The affected area becomes swollen and gives off a foul smelling discharge. Death may occur within a matter of hours or days. **Fever**, rapid heart rate, rapid breathing, altered mental state, loss of appetite, **diarrhea**, **vomiting**, and vascular collapse may occur as the infection progresses.

Causes and symptoms

The primary cause of gangrene is often an injury to the blood vessels, causing either an interruption of blood flow, the introduction of a bacterial infection, or both. Such injuries may include **burns**, infected **bedsores**, **boils**, frostbite, compound **fractures**, deep **cuts** or gunshot **wounds**. Gangrene can also develop due to the poor circulation and obstructions in the blood vessels associated with abnormal **blood clots**, torsion of organs, and diseases such as diabetes, **heart disease**, and Raynaud's disease. Gangrene of the internal organs may be attributed to a ruptured appendix, internal wounds, or the complications of surgery.

The bloodstream is the body's main transport system. When blood flow is diminished, the flow of the oxygen and nutrients needed to keep tissues healthy is greatly decreased. The white blood cells needed to fight infection are not readily available. In such an environment, invading bacteria thrive and multiply quickly. *Streptococcus* spp. and *Staphylococcus* spp. are the most common agents of external skin infection.

Gas gangrene, also called progressive or clostridial myonecrosis, is a type of moist gangrene most commonly caused by an infection of *Clostridium perfringens*, or other species that are capable of thriving under conditions where there is little oxygen. These bacteria produce gases and poisonous toxins as they grow in the tissues. Gas gangrene causes the death of tissue, the destruction of red blood cells, and the damaging of the walls of the blood vessels and parts of the kidneys. Early symptoms include sweating, fear, and

anxiety. Gas gangrene is a life-threatening condition and should receive prompt medical attention.

Diagnosis

A diagnosis of gangrene will be based on a combination of patient history, a physical examination, blood test results, and other laboratory findings. A physician will look for a history of recent trauma, surgery, **cancer**, or chronic disease. Blood tests will be used to determine whether infection is present and to determine how much the infection has spread. A sample of drainage from a wound or obtained through surgery may be tested to identify the bacteria causing the infection and to aid in determining treatment. In the case of gas gangrene, the gas produced by the bacteria may be detected beneath the skin by pressing into the swollen areas. The crackling sounds of gas bubbles may also be heard in the affected area and the surrounding tissues.

X-ray studies and other imaging techniques, such as computed tomography (CT) scans or magnetic resonance imaging (MRI), may be helpful in making a diagnosis by showing evidence of gas accumulation or muscle tissue death. These techniques, however, are not sufficient alone to provide an accurate diagnosis of gangrene. Precise diagnosis often requires surgical exploration of the wound.

Treatment

Chelation therapy is a treatment that uses an intravenous solution containing the drug ethylenediamine tetra-acetic acid (EDTA), among other substances. In the bloodstream, EDTA binds and removes toxins and plaque formation on arterial walls. It promotes circulation throughout the body, and is reportedly, although not proven, able to reverse the processes leading to gangrene. Early intervention is necessary, however.

Other alternative and complementary treatments are used to treat gangrene. Herbal remedies such as **goldenseal** can be applied topically. **Biofeedback** and hypnosis can increase blood flow. Diabetics receive herbal and **traditional Chinese medicine** remedies and nutritional supplements to help prevent gangrene.

Allopathic treatment

Pain medications and large amounts of intravenous antibiotics are given. Prompt surgical removal of infected and destroyed tissue is required for healing to take place. Gas gangrene is often treated with the antitoxin for clostridium as well. In a number of cases, amputation may have to be used to keep the infection under control.

In hyperbaric oxygen (HBO) therapy the patient is placed in a pressurized chamber and receives 100% pure oxygen to breathe. This has been shown useful in inhibiting the production of toxins in gas gangrene and for getting oxygen quickly to tissues, especially following a crushing injury that might lead to gangrene. HBO therapy must be carried out early in the process and used before any surgical removal. The therapy, though useful, does have adverse side effects. It requires skilled technicians and may not be widely available.

Expected results

The outcomes for gangrene are generally favorable if the infection is recognized and treated early in the progression of the disease. Left untreated, gas gangrene will result in a decrease in blood pressure, kidney failure, and coma. Overall, about 20% of those infected with gas gangrene die from the disease, and another 20% require an amputation. Gangrene is most dangerous to the elderly, those who are immuno-compromised, and those who have internal **infections** and chronic conditions such as diabetes. Individuals suffering from dry gangrene often have multiple health problems that complicate recovery and may prove fatal.

Prevention

Infections and injuries should be thoroughly cleaned and monitored; medical attention should be pursued if symptoms worsen or remain unresolved. Gastrointestinal wounds should be surgically explored, drained, and repaired. Use of antibiotic therapy prior to and directly following surgery has been shown to reduce the rates of infection.

Patients with diabetes or severe arteriosclerosis should take particular care of their hands and feet to avoid the decreased circulation and unchecked infection that may lead to gangrene. Any injury or infection, however slight, should be cared for promptly. There should be a focus on proper foot care, including keeping the feet clean, dry, and warm, wearing well-fitting shoes and not going barefoot. It is important to avoid **smoking**, since tobacco use constricts the blood vessels of the hands and feet, decreasing circulation.

Resources

BOOKS

Bunch, Bryan, ed. *The Family Encyclopedia of Diseases: a Complete and Concise Guide to Illnesses and Symptoms*. New York: Scientific Publishing, Inc., 1999.

The Burton Goldberg Group *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, 1993.

OTHER

"Gangrene." drkoop.com. July 17, 2006 [cited June 9, 2008]. http://www.drkoop.com/ency/93/007218.html.

"Gas Gangrene." *The Merck Manuals Online Medical Library*. February 2003 [cited June 9, 2008]. Merck & Co., Inc. http:// www.merck.com/mmhe/sec17/ch190/ch190g.html.

Patience Paradox

Ganoderma

Description

Ganoderma is the name of the fungus *Ganoderma lucidum*. It is also called the **reishi mushroom** or in Chinese *ling zhi*. It is one of the most popular medicinal mushrooms in China, Japan, and the United States.

Ganoderma grows on logs and tree stumps. It has a shiny, hard, asymmetrical cap that ranges in color from yellow to black. The cap, spores, and mycelium are all used medicinally. Wild ganoderma is rare in Asia.

In ancient China, ganoderma was so rare and so highly prized that it was reserved for the emperors and called the "elixir of life." In 1972, Japanese researchers successfully cultivated the mushroom. There are six different colors of cap: red, green, white, black, yellow, and purple. These researchers showed that all colors are the same species and that the color variations are the result of differences in environmental conditions. Despite this information, some herbalists insist that certain colors of reishi mushroom are more potent or effective in healing certain conditions than others.

General use

Ganoderma is considered one of the most important herbs in Asian healing. Its use extends to almost every system of the body. Not only is it believed to heal physical ailments, it is said to bring about a peaceful state of mind and to increase spiritual potency for Taoists and other Asian spiritual seekers.

Ganoderma has been used in China for over 4,000 years. It is the primary shen tonic in Chinese herbalism. In a broad sense, it is used to help a person adapt both physically and mentally to the world. It is used to strengthen and calm the nerves, improve memory, and prevent or delay senility.

***Ganoderma persum* growing on a tree trunk.** *(©David Chapman / Alamy)*

Herbalists consider ganoderma an adaptogen, or natural regulator, suppressing the immune system if it is overactive and boosting it if it is underactive. Many health claims are made on the effect that ganoderma has on the immune system. These claims are based primarily on the presence of high molecular weight polysaccharides and free radical **antioxidants** in ganoderma extracts. Ganoderma also contains the elements **potassium** (K), **magnesium** (Mg), **calcium** (Ca), and germanium (Ge).

Ganoderma is used in Japan and China to treat **cancer** and to stimulate the immune system after radiation or chemotherapy. It is also used to treat myasthenia gravis and **systemic lupus erythematosus** (SLE), both autoimmune diseases. In Japan and China, ganoderma is also used to treat symptoms of viral diseases such as colds, **influenza**, **canker sores**, and **hepatitis**.

Several research studies on ganoderma extracts have been done at universities in Japan, China, and South Korea. Many of these are test-tube or animal

Ganoderma mushroom. *(The Herald, Stephanie S. Cordle / AP Photo)*

studies. The results are not clear-cut, but they seem to indicate that at least in these non-human systems, ganoderma has an effect on the immune system, some anti-tumor properties, and some anti-viral activity.

Subsequent research in Asian universities investigated the effects of ganoderma on human cells or tissues. One study done in Taiwan indicated that ganoderma inhibits apoptosis (cell self-destruction) in human white blood cells. This finding may help to explain ganoderma's beneficial effects on the immune system.

Ganoderma attracted the attention of Western cancer researchers when a case study report from Columbia University indicated that a Japanese dietary supplement containing ganoderma as well as genistein, a soybean derivative, appeared to be useful in the prevention and treatment of **prostate cancer**. Beginning in the mid 2000s, the National Center for Complementary and Alternative Medicine, funded by the United Sates government, began giving grants to researchers to investigate some of the health claims made for ganoderma. Early results suggested that the herb has some antitumor and antiviral properties.

In Eastern medicine, ganoderma is also used in treating conditions of the nervous system. It is used to calm the nerves, cure **insomnia**, reduce **stress**, eliminate nervous exhaustion, and increase determination and focus. Laboratory studies show fairly conclusively that ganoderma does act as a sedative on cells of the central nervous system and possibly has painkilling and anti-convulsive properties.

Ganoderma is frequently used to treat **allergies**, **hay fever**, bronchial **asthma**, and to reduce skin inflammation. Laboratory studies support these uses and show that some components of ganoderma have a strong antihistamine effect that interrupts the development of allergic reactions.

Many conditions of the blood and circulatory system are treated with ganoderma. These include:

- altitude sickness
- atherosclerosis
- cardiac arrhythmia
- coronary heart disease
- high blood pressure

KEY TERMS

Adaptogen—A substance that regulates, either by stimulating or suppressing, a system to bring it back within its normal, healthy range.

Apoptosis—A type of programmed cell death in which a damaged cell shuts down and, in effect, commits suicide. Ganoderma appears to inhibit apoptosis in human white blood cells.

Atherosclerosis—A disease in which deposits of fatty materials build up on the walls of arterial blood vessels, causing them to narrow or become obstructed. Blood pressure increases, leading to heart disease.

Myasthenia gravis—A muscle weakness that occurs because the body makes antibodies to the natural chemical that facilitates transmission of impulses between the nerve and the muscle.

Mycelium—The part of the fungus that grows into the log and supports the fruiting body or cap. It is analogous to the roots of a plant.

Reishi mushroom—Another name for ganoderma.

Shen—One of the five body energies. It influences mental, spiritual, and creative energy. Shen tonics address deficiencies in this type of energy.

Spores—Fine powder-like reproductive bodies of the mushroom.

Systemic lupus erythematosus (SLE)—A multi-symptom disease caused by failure of the immune system to regulate itself.

- high blood sugar
- high cholesterol
- low blood pressure
- stroke

Scientific research shows that compounds found in ganoderma do lower blood sugar and interfere with the clotting of blood platelets. This reduction in clotting may account for ganoderma's effectiveness against **stroke** and **atherosclerosis**.

Ganoderma is also used to treat a variety of other diseases. These uses are generally backed by little or no scientific evidence. They include:

- gastroenteritis
- diarrhea
- constipation
- gallstones
- ulcer
- acne
- hair loss
- inflammation of the kidneys
- menstrual cramps
- erectile dysfunction
- low sex drive

Preparations

Virtually all ganoderma available commercially come from cultivated mushrooms. Different preparations are made using the cap, the spores, and the mycelium. These preparations are available in the form of fresh and dried whole mushrooms, capsules, concentrated drips, extracts, tablets, tea bags, tea granules, and tinctures. A common dose is 1,800–2,400 mg in capsule form per day. However, doses vary hugely depending on the condition being treated and the strength and part of the mushroom being used.

Precautions

Although no toxic reactions to ganoderma have been reported, people with allergies to other mushrooms may also experience allergic reactions to ganoderma.

Side effects

Large doses (2–9 g) of ganoderma taken regularly over the course of 3–6 months may result in **diarrhea**, upset stomach, and **dizziness**. **Nosebleeds** from high doses of ganoderma have also been reported. Some herbalists claim that large doses of **vitamin C** taken with this herb will control the symptoms of diarrhea.

Interactions

Ganoderma and other Chinese herbs are often used together with no reported interactions; in fact, a new health food supplement is made from reishi mushrooms grown on herbs, in the belief that the mushrooms absorb some of the properties of the herbs on which they are grown.

With regard to Western pharmaceuticals, ganoderma has been reported to produce negative interactions with warfarin, a blood-thinning medication. Because ganoderma extract may cause a drop in blood pressure, persons who are taking prescription antihypertensives (medications to lower blood pressure) should use ganoderma only if they are being monitored by a physician.

Resources

BOOKS

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

PERIODICALS

Paterson, R. R. "Ganoderma A Therapeutic Fungal Bio factory." *Phytochemistry* 67, no. 18 (September 2006): 1985 20018.

Wicks, S. M., R. Tong, C. Z. Wang, et al. "Safety and Tolerability of Ganoderma Lucidum in Healthy Sub jects: A Double Blind Randomized Placebo Controlled Trial." *American Journal of Chinese Medicine* 35, no. 2 (2007): 407 414.

Zhou, X., J. Lin, Y. Yin, et al. "Ganodermataceae: Natural Products and Their Related Pharmacological Func tions." *American Journal of Chinese Medicine* 35, no.4 (2007): 559 574.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

National Center for Complementary and Alternative Med icine Clearinghouse, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, (866) 464 3615, http://nccam.nih.gov.

Tish Davidson, A. M.
Rebecca J. Frey, Ph. D.

Garcinia

Description

Garcinia is a plant genus native to much of Asia and Australia. Although there are many members of the genus, the species *Garcinia cambogia*, also known as *Garcinia gummi-gutta*, is the best known. This species has also been known as *Garcinia hanburyi* and by the common names Cambogia and Gamboge. The plant, which is native to the Indian subcontinent, has a long medicinal use and, at various times, has been included in the *United States Pharmacopoeia, United States National Formulary,* and the *British Pharmacopoeia*. As of 2008, garcinia was the source of two compounds of medicinal interest, one for weight reduction and the other for **cancer** therapy.

Traditionally, the gum resin of the plant has been used and has been called *Gutta gamba, Gummigutta, Tom Rong, Gambodia* and *Garcinia Morella*.

General use

Historical use

At the start of the twentieth century gamboge was used as a laxative, for treatment of congestive heart failure, and to lower blood pressure in cases of enlargement of the pelvic veins in women, which may be a cause of **dysmenorrhea**. By mid-century, it was no longer used for cardiovascular purposes, but it was still used as a powerful laxative and for the elimination of intestinal **worms**. By the 1950s, gamboge was still recognized medicinally, but only as an ingredient in compound mild mercurous chloride pills, which themselves were essentially obsolete.

Weight reduction

The active component of garcinia that may be beneficial in weight reduction programs is hydroxycitric acid, which is found in the rind and pulp of the fruit. There have been small studies indicating that hydroxycitric acid may influence fat utilization and creation of new fat cells; however, these studies were not definitive.

A 2003 study compared the effects of hydroxycitric acid against a placebo in men during **exercise** over a 5-day period. The authors concluded that the supplement increased fat oxidation, an indication of increased fat utilization. A team from Maastricht University in the Netherlands compared the effects of hydroxycitric acid with a placebo during periods of overeating and concluded that the hydroxycitric acid inhibited the creation of new fat cells.

A significant study was conducted at Georgetown University and involved 60 volunteer subjects who were given a controlled diet and hydroxycitric acid supplements. The authors reported: "At the end of 8 weeks, body weight and BMI decreased by 5.4% and 5.2%, respectively. Food intake, total **cholesterol**, LDL, triglycerides, and serum leptin levels were significantly reduced, while HDL and serotonin levels and excretion of urinary fat metabolites (a biomarker of fat oxidation) significantly increased. No significant adverse effects were reported. These results demonstrate the safety, bioavailability and efficacy of HCA-SX in weight management."

Flowering garcinia tree. *(Dr. Carleton Ray / Photo Researchers, Inc.)*

Other studies have shown little or no efficacy or have only shown evidence of efficacy when the material was used in conjunction with **caffeine** or other dietary supplements. A study at Purdue University showed no benefit in terms of caloric restriction, while a Creighton University study failed to confirm claims that garcinia preparations increased fat oxidation or metabolic rate. An excellent review of weight loss preparations that appeared in *American Family Physician* in 2004 concluded that there are significant questions about the safety, efficacy, and product quality of supplements containing either garcinia or hydroxycitric acid. The authors recommended that persons using these supplements should be followed carefully, both because of the risk of toxicity and for gaining information regarding whether the preparations are effective or ineffective.

Claims of efficacy for garcinia and hydroxycitric acid may depend on other aspects of the diet. It has been suggested that a high fiber diet, which is recommended by most clinicians, will inhibit the absorption and efficacy of hydroxycitric acid. The reasons for success or failure in clinical studies were not resolved as of 2008.

Cancer therapy

Garcinia has been studied as a possible treatment or preventative for various types of cancer. Although there have been no well documented clinical trials of garcinia in cancer, initial laboratory studies were promising. A study from the Jiangsu Key Laboratory of Carcinogenesis and Intervention reported that gambogic acid, the major active principal of gamboge, inhibits the formation of blood vessels required to support the growth of solid tumors. Another study, from the University of Texas, reported that gambogic acid promotes apoptosis, programmed cell death. This cell death is a normal biological phenomenon, but it is inhibited in cancerous growths permitting the excessive growth of malignant tumors. Laboratory studies have reported on use of garcinia compounds in breast, liver, and gastrointestinal cancers, indicating that the compounds are good candidates for clinical trials.

Preparations

There are no standardized preparations of garcinia. Garcinia extracts, powdered preparations, or hydroxycitric acid have been included in many commercial

KEY TERMS

Apoptosis—Programmed cell death, the death of individual cells.

Carcinogenesis—Production of cancer.

Congestive heart failure—A condition in which the heart is too weak to maintain an adequate supply of blood to the tissues of the body.

Dysmenorrhea—Painful menstruation.

Fiber—Nutrients in the diet that are not digested by the enzymes in the stomach and/or intestine.

Malignant—Meaning cancerous and tending to spread to surrounding tissues.

Oxidation—Combining with oxygen. In fatty acids, is the process is accomplished with the breakdown of the carbon chain in two-carbon segments.

weight loss preparations, but there are no established dose levels, and no purity rubrics for the natural product.

Precautions

Laboratory studies seem to show that both garcinia and hydroxycitric acid are safe in normal doses. The traditional gamboge of medicine fell into disuse because of severe intestinal griping, which was occasionally fatal, but this was in doses far higher than seen in modern products. Consumption of the fruit of garcinia as part of the diet has been linked to formation of gallstones. While severe adverse effects have been associated with weight loss products containing either garcinia or hydroxycitric acid, these were combination products, and the cause of the adverse effects may have been due to some other component.

Safety of hydroxycitric acid may also depend on the formulation used. It has been suggested that salts of hyroxycitric acid have a high margin of safety, including **sodium**, **potassium**, and **calcium** compounds. The free acid and organic salts of hydroxycitric acid may be more prone to adverse effects.

Resources

PERIODICALS

Jayanthi, V., L. Anand, L. Ashok. "Dietary Factors in Pathogenesis of Gallstone Disease in Southern India: A Hospital Based Case Control Study." *Indian Journal of Gastroenterology* 24, no. 3 (May/June 2005): 97 99.

Kovacs, E. M., and M. S. Westerterp Plantenga. "Effects of ( ) hydroxycitrate on Net Fat Synthesis as de novo Lipogenesis." *Physiology & Behavior* 20, no. 88 (July 2006): 371 381.

Lim, K., S. Ryu, H. Suh, K. Ishihara, and T. Fushiki. "( ) Hydroxycitrate Ingestion and Endurance Exercise Per formance." *Journal of Nutritional Science and Vitami nology (Tokyo)* 51, no. 1 (February 2005): 1 7.

Lu, N., Y. Yang, Q. D. You, and Y. Ling. "Gambogic Acid Inhibits Angiogenesis Through Suppressing Vascular Endothelial Growth Factor Induced Tyrosine Phos phorylation of KDR/Flk 1." *Cancer Letters* 8, no. 258 (December 2007): 80 89.

Pandey, M. K., B. Sung, K. S. Ahn, and A. B. Kunnumak kara. "Gambogic Acid: A Novel Ligand for Transferrin Receptor, Potentiates Tnf Induced Apoptosis through Modulation of the Nuclear Factor Kappab Signaling Pathway." *Blood* 110, no. 10 (November 15, 2007): 3517 3525.

Saito, M., M. Ueno, S. Ogino, K. Kubo, J. Nagata, M. Takeuchi. "High Dose of Garcinia Cambogia is Effec tive in Suppressing Fat Accumulation in Developing Male Zucker Obese Rats, But Highly Toxic to the Tes tis." *Food and Chemical Toxicology* 43, no. 3 (March 2005): 411 419.

Yang, Y., L. Yang, Q. D. You, et al. "Differential Apoptotic Induction of Gambogic Acid: A Novel Anticancer Natural Product on Hepatoma Cells and Normal Hepatocytes." *Cancer Letters* 256, no. 2 (October 28, 2007): 259 66.

Yu, J., Q. L. Guo, Q. D. You, et al. "Gambogic Acid Induced G2/M Phase Cell Cycle Arrest via Disturbing CDK7 Mediated Phosphorylation of CDC2/P34 in Human Gastric Carcinoma BGC 823 Cells." *Carcino genesis* 28, no. 3 (March 2007): 632 638.

Sam Uretsky, PharmD

Garden mint *see* **Spearmint**

Gardenia

Description

Gardenias are members of the madder, or Rubiaceae, family. Though not native to either North or South America, they were named for an eighteenth-century American physician and naturalist, Alexander Garden. Gardenias were originally found only in China and Japan, but today there are over 200 different species of gardenia, mostly hybrid, in existence throughout the world. Gardenias are most prevalent in China, Japan, tropical regions of Southeast Asia and the Pacific islands, and South Africa. With proper conditions, gardenias grow into shrub-like bushes or small trees that can reach 5 ft (1.5 m) in height.

Most species of gardenia, however, are very tender plants that require an average temperature of at least 60°F (28.9°C), sunlight with some protection, and just the right amount of humidity. They often survive far better in greenhouses than outside. Gardenias are often rambling plants that form mounds of glossy dark green foliage. The leaves are oval in shape and very shiny. The flowers vary in color from pale yellow with purple markings to creamy white, and they have a classic, heavy, sweet scent reminiscent of green apple. All gardenia blossoms have an almost wax-like appearance and can be either single or double, depending on the species. Most gardenias flower in the winter or early spring, and the blossom is followed by the appearance of a large, yellowish-red, bitter-tasting berry that contains a crystalline compound called acrocetin.

The most commonly listed botanical species of gardenia include:

- *Gardenia jasminoides*. This species is easily the most common of these rare, fragile plants. It reaches heights of 2 ft (61 cm) and grows into a tall bushy green shrub that produces white, highly fragrant flowers. *G. jasminoides* is a native of China, and the gardenia most commonly used in Chinese herbal medicine. Its name comes from the fact that it was first introduced to the Western world from Cape Colony in Africa, and the aroma of its large white flowers was said to be very like the scent of jasmine.
- *Gardenia jasminoides fortunata*. This plant is a hybrid version of *G. jasminoides* that is somewhat more hardy.
- *Gardenia nitida*. This gardenia is a slightly taller plant that grows up to 3 ft (93 cm) tall and also produces white blossoms.
- *Gardenia radicans floreplena*. This plant is a low spreading dwarf variety from Japan that grows only to heights of 18 in (46 cm), and has double-blossomed flowers.
- *Gardenia thunbergia*. This gardenia grows to 4 ft (1.2 m) tall, and is often cultivated in American greenhouses. It is found as both tree and shrub, and has white flowers with long tube-like necks.
- *Gardenia rothmania*. This plant is also a particular favorite of American botanists, but does not survive well in North America outside of a greenhouse. It also exists as both tree and shrub, and has pale yellow flowers with short, tube-like necks and purple markings.

KEY TERMS

Astringent—Any substance or medication that causes soft tissue to contract or constrict. Some types of gardenia have astringent properties.

Cold-deficiency diarrhea—In Chinese herbal medicine, this condition is described as cold settling in the abdomen when resistance is low, causing cramping, some gas, and loose, watery stools without any burning sensations.

Expectorant—A substance or medication that promotes the coughing up of phlegm.

Hematuria—A condition in which red blood cells are present in the urine. Blood in the urine may be readily visible or small amounts may give the urine a smoky appearance.

Hemostatic—A drug or medication that stops bleeding. Gardenia is used as a hemostatic agent in traditional Chinese medicine.

General use

Gardenias are widely used as exotic ornamental flowers in corsages, as houseplants, and in some regions, as outdoor plants. A yellow silk dye has been made for centuries from the chemical compound acrocetin extracted from the gardenia berry.

Chinese herbal medicine makes the most extensive use of the gardenia. Its Chinese name is *zhi zi*. The traditional medicinal actions attributed to gardenia include calming irritability; cooling blood and clearing away heat (a yin/yang imbalance often characterized by deficient yin); reducing swelling; and moving stagnant blood that has congealed in one place, usually following trauma. Gardenia is considered to be very effective as a hemostatic agent, which means that it stops bleeding; and also effective in treating injuries to the muscles, joints, and tendons. Gardenia is commonly used in Chinese herbal formulas to treat **infections**, particularly bladder infections; abscesses; **jaundice**; and blood in the urine, sputum, or stool. Because of its perceived ability to ease agitation or irritability, it is also used in formulas to treat **anxiety** or **insomnia**. It is also helpful in correcting menopausal imbalances reflected in insomnia and **depression**, nervous tension, **headache**, and **dizziness**.

The United States Department of Agriculture Agricultural Research Service phytochemical and ethnobotanical database lists the following species of gardenia as having specific medicinal properties:

- *Gardenia gummifera*. This species can be helpful in treating digestive problems, including dyspepsia and

diarrhea; or used as an astringent and expectorant for nervous conditions and spasms.

- *Gardenia storckii*. This variety can be used in treating constipation.
- *Gardenia lucida*. This gardenia has antiseptic properties that can kill both bacteria and insects.
- *Gardenia pseudopsidium*. This species has been used to treat smallpox.
- *Gardenia jasminoides*. This gardenia has been found to be helpful in the treatment of pain, nose bleeds, fever, and influenza; in healing wounds and reducing swelling; and in treating mastitis, hepatitis and the hematuria that accompanies bladder infection.
- *Gardenia augusta*. This variety has shown effectiveness in the treatment of headaches, fever, delirium, mastitis, and jaundice related to liver problems.
- *Gardenia campanulata*. This plant is used in healing wounds, burns, and scalds; in reducing swelling; as a treatment for fever and influenza; in treating jaundice associated with liver problems; and in stopping bleeding.
- *Gardenia labifolia*. This gardenia has been found effective in treating the bites of certain snakes.

Preparations

The kernel within the gardenia berry is often removed for use in herbal poultices put on sports injuries such as **sprains**, pulled muscles, or inflammation of nerves. The use of gardenia poultices is particularly common in Chinese medicine. Traditional Chinese practitioners make a paste of the herb with flour and wine. The powdered berry is given in both decoctions and capsules. When gardenia is used to stop bleeding it is usually burned before it is simmered in water.

Precautions

Chinese herbalists state that gardenia should not be used when there is cold deficiency (watery) **diarrhea** present.

It is important to remember that Chinese herbal medicine is based upon individual prescriptions developed for each patient and their unique symptoms. Chinese herbs should not be taken, either individually or in formulas, unless a practitioner of Chinese herbal medicine is first consulted.

Side effects

Gardenia has laxative properties, and can cause loose stools when taken frequently or in large amounts.

Resources

BOOKS

Molony, David, and Ming Ming Pan Molony. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: Berkley Publish ing, 1999.

Phillips, Ellen, and C. Colston Burrell. *Rodale's Illustrated Encyclopedia of Perennials*. Emmaus, PA: Rodale Press, Inc., 1993.

Reid, Daniel P. *Chinese Herbal Medicine*. Boston: Shamb hala, 1993.

OTHER

Dr. Duke's Phytochemical and Ethnobotanical Databases. *http://www.ars grm.gov/cgibm/duke/ethnobot.htm*

Joan Schonbeck

Garlic

Description

Garlic (*Allium sativa*) is a plant with long, flat grass-like leaves and a papery hood around the flowers. The greenish white or pink flowers are found grouped together at the end of a long stalk. The stalk rises directly from the flower bulb, which is the part of the plant used as food and medicine. The bulb is made up of many smaller bulbs covered with a papery skin known as cloves. Although garlic is known as the "stinking rose" it is actually a member of the lily family.

The most active components of fresh garlic are an amino acid called alliin and an enzyme called allinase. When a clove of garlic is chewed, chopped, bruised, or cut, these compounds mix to form allicin, which is responsible for garlic's strong smell. Allicin, in turn, breaks down into other **sulfur** compounds within a few hours. These compounds have a variety of overlapping healing properties.

Garlic also contains a wide range of trace minerals. These include **copper**, **iron**, **zinc**, **magnesium**, germanium, and **selenium**. The integrity of the growers and suppliers of garlic are important to the integrity of the garlic used. A soil rich with the presence of trace minerals will produce a healthful bulb of garlic, full of those minerals. Depleted soils produce a depleted product. In addition, garlic contains many sulfur compounds, vitamins A and C, and various **amino acids**.

General use

The ancient Indians, Chinese, Egyptians, Greeks, Romans, and other peoples have used garlic for thousands of years, both as food and as medicine. One of the most famed usages of garlic occurred during the Middle Ages, when garlic was reputed to have been highly effective against the plague.

As early as 1858, Louis Pasteur (1822–1895) formally studied and recorded garlic's antibiotic properties. Dr. Albert Schweitzer (1875–1965) used the herb to successfully treat cholera, typhus, and dysentery in Africa in the 1950s. Before antibiotics were widely available, garlic was used as a treatment for battle **wounds** during both World Wars.

Garlic can be used in the treatment of a variety of bacterial, viral, and **fungal infections**. It has been shown to be effective against staph, strep, *E. coli*, *Salmonella*, Vibrio cholera, *H. pylori*, *Candida albicans*, and other microorganisms. Garlic also helps prevent **heart disease** and strokes. Modern studies show that garlic can improve immune function and may even help in the prevention of **cancer**. To be of benefit in chronic conditions, garlic should be used daily over an extended period of time.

Heart disease

One of the main causes of heart disease is the buildup of plaque on the walls of the blood vessels. This plaque is mostly made up of **cholesterol** and other fatty substances found in the blood. When large amounts of plaque get stuck on artery walls, they block the flow of blood and cause **blood clots** to form. Parts of the artery wall may even be destroyed completely.

In arteriosclerosis, also known as hardening of the arteries, the major arteries may become so stiff and clogged, that the heart cannot get necessary nutrients and oxygen. This condition usually causes a **heart attack**. High serum cholesterol levels are a major risk factor for having a heart attack.

Studies show that people who eat garlic regularly have improved serum cholesterol levels. Some people with high cholesterol have been able to get within normal levels by eating 1–2 cloves per day. In addition, low-density lipoprotein (LDL) and triglyceride levels are decreased and high-density lipoprotein (HDL) levels are increased. This effect correlates with an overall reduced cholesterol level. These benefits are significant in preventing heart disease as well as strokes. While garlic's contribution to reducing levels of harmful plaques has been known for some time, a 2003 study found that garlic also lowered levels of homocysteine, a type of amino acid that in the early 2000s was considered a major risk factor for heart attacks. Manufactured garlic supplements appear to be equally as beneficial as eating fresh cloves. It takes at least one month of using garlic for laboratory results to be seen.

Hypertension

Hypertension, or high blood pressure, is also a significant cause of heart problems. It is one of the leading causes of disability and death due to **stroke**, heart attack, heart failure, and kidney failure. Garlic can help reduce blood pressure through the actions of its sulfur compounds and its ability to reduce the fatty substances, such as cholesterol, found in the bloodstream. Use of garlic also can help normalize low blood pressure.

Platelet aggregation

Platelets clot the blood in order to repair breaks in the blood vessel walls. When there is an injury, platelets are attracted to the damaged area and become attached to the wall and to other platelets. Platelet aggregation, as this process is called, plugs up the break and prevents further blood loss while the injury is being repaired. This is a good and necessary part of healing an injury.

If there are serious problems with the heart and blood vessels and there is too much injury and clotting, the vessels may become clogged with platelets, which can lead to strokes and heart disease. The sulfur compounds in garlic—particularly ajoene—give the platelets a slippery quality. They are less able to clump together, thus slowing down platelet aggregation. Garlic can be used effectively in the same way as a daily dose of aspirin to reduce or prevent platelet aggregation over an extended time.

Cancer

Studies have found that garlic blocks the formation of powerful carcinogens, called nitrosamines, which may be formed during the digestion of food. This may be why in populations in which people consume a large amount of garlic, there is a decreased incidence of all types of cancer. The **antioxidants** found in garlic may also contribute to this effect by protecting against the cell damage by cancer-causing free radicals. Studies show that use of garlic may also inhibit the growth of a variety of tumors. However, cancer-related studies are not conclusive and relate to consumption of raw or cooked garlic, not garlic supplements.

Infectious conditions

Eating garlic is good for helping the body's immune system resist **infections**. While garlic is not as strong as modern antibiotics, it is believed to kill some **strains** of bacteria that have become resistant to antibiotics. Studies have shown garlic treats yeast infections, and it can kill many of the viruses responsible for colds and flu. While daily consumption of garlic was once highly recommended for HIV-positive individuals, the National Institutes of Health (NIH) reported in 2002 that garlic supplements greatly reduced levels of saquinavir, an HIV protease inhibitor, in patients' blood. The NIH began cautioning patients who used garlic to control cholesterol levels who also used saquinavir or combination therapies, since garlic might interfere with their effectiveness.

Modern doctors, in reconsidering the causes of many diseases, have discovered that bacteria and viruses may be the cause of sicknesses that were formerly not thought to be caused by infections. Included are gastric ulcers, **colitis**, and Kaposi's sarcoma. Garlic may be useful in treating or preventing these due to its antimicrobial properties.

Diabetes

Garlic has the ability to lower and help keep blood sugar stable by helping to increase the amount of insulin available in the bloodstream. This action, together with garlic's ability to lower cholesterol and blood pressure, make it an excellent daily supplement for people with diabetes. A 2003 report showed that long-term use of garlic helped improve the blood vessel systems of diabetic rats.

Cancer

Garlic may also be helpful in reducing the risk for a number of cancers, according to a study by Swiss and Italian researchers published in the November 2006 issue of *American Journal of Clinical Nutrition*. The meta-study looked at a number of previous studies of garlic and onion use among approximately 25,000 people in Italy and Switzerland. In people who ate 15–22 portions of onions and garlic per week, the reduced risk of various types of cancer was: oral and pharynx, 84%, esophageal, 88%, colorectal, 56%, laryngeal, 83%, breast, 25%, ovarian, 73%, prostate, 71%, and kidney, 38%.

Other health conditions

Garlic is effective in the treatment of numerous other conditions. The following list provides some examples:

- The consumption of 1–3 cloves per day is useful for immune support and as a preventive against diseases and infection.
- Warmed garlic oil in the ear canal can be used to treat ear infections.
- Garlic can be used to treat respiratory complaints such as asthma and chronic bronchitis.
- Garlic helps increase the body's ability to handle the digestion of meat and fats.
- Garlic can be used to help kill and expel intestinal worms in both animals and humans.
- When added to a pet's food, garlic helps repel fleas.
- Garlic is helpful in getting rid of athlete's foot.
- Garlic relieves gas and other stomach complaints.
- The sulfur compounds found in garlic can bind to heavy metals and other toxins and help remove them from the body.
- Garlic can be used externally for cuts, wounds, and skin eruptions.
- The taste of garlic in mother's milk stimulates improved nursing. Infants eat more and nurse longer. They appear to relish the taste of slightly garlicky milk. The components of garlic that reach the infant through the mother's milk also may be helpful in relieving colic and infections.

Preparations

Used internally

Garlic can be eaten raw or cooked, taken as tablets or capsules, and used as a tincture or syrup.

The suggested dosage for fresh whole garlic is one to three cloves per day. The cloves can be chewed and held in the mouth or swallowed. Consuming raw garlic can actually be a pleasure if the herb is crushed or grated and mixed with food or a tablespoon of honey. The dosage for tinctures is 2–4 ml or 15–40 drops taken twice daily. One tablespoon of the syrup should be taken three times a day, or as needed to relieve coughing. Garlic oil should be slightly warmed, and 1–3 drops should be put in the affected ear 1–3 times per day.

Tablets and capsules are often more convenient to use than raw garlic, and they are more likely to be tolerated by garlic-sensitive individuals. Garlic pills also minimize the garlic taste and odor. Manufacturers vary on which components of the herb are emphasized.

In general, the following dosages are appropriate, but product labels also should be consulted:

- 400–500 mg of allicin, twice daily

- a dose equaling approximately 4,000 mcg of allicin potential, once or twice daily
- 400–1,200 mg of dried garlic powder
- 1,000–7,200 mg of aged garlic
- a dose equivalent to 0.03–0.12 ml of garlic oil, three times per day

Manufactured garlic pills come in a variety of forms, and a great deal of controversy continued in the early 2000s about what type is best. Studying the manufacturers' literature and other information is important to make a good decision about which preparation to use. The types of garlic preparations include:

- garlic oil capsules
- encapsulated powdered garlic
- odorless garlic pills
- allicin-stabilized pills
- aged garlic extract

Used externally

The raw cloves can be directly applied externally. A poultice can be made using grated or crushed fresh garlic. The herb material should be placed directly on the site of injury or eruption, either as is or mixed with enough honey to make a paste. The poultice can be held in place with a cloth or bandage.

A compress of garlic is less messy than a poultice and may be less irritating to the site of the injury. It is made by wrapping grated or crushed fresh garlic in a single piece of cheesecloth. As with the poultice, the compress is placed directly on the affected area.

Garlic oil can be made by putting a whole bulb of grated or finely chopped garlic into a pint jar of olive oil, and letting it sit undisturbed in a warm place, away from direct sunlight, for at least two weeks. Then it can be strained and refrigerated. The garlic oil will stay fresh in the refrigerator for up to two years.

A garlic suppository can be used to treat vaginal yeast or mild bacterial infections. A clove of fresh garlic should be peeled and slightly crushed or bruised. If crushed garlic irritates the vaginal tissue, an alternative that might lessen the desired antimicrobial effect is to use the whole, uncrushed garlic clove. The clove should be wrapped in a single layer of cheesecloth and inserted into the vaginal canal overnight for 5–10 days. Dental floss or a length of the cheesecloth can be used to make the suppository easier to retrieve. If the garlic causes a burning sensation, this can be eased with the insertion of plain yogurt into the vagina.

KEY TERMS

Anticoagulant—Any substance that reduces or prevents the blood's tendency to clot in order to prevent blockages in the arteries.

Antimicrobial—Having the ability to help the immune system resist or destroy a wide spectrum of disease-causing organisms.

Carcinogens—Chemical substances that cause cell mutations and, ultimately, cancer.

Cholesterol—A fatty substance found only in animals; used in the body to build cell walls and in the forming of bile and sex hormones.

Free radicals—Highly reactive toxins in the body that can bind to cells and damage them. Antioxidants are useful in neutralizing these compounds.

HDL—Beneficial lipoprotein molecules that transport cholesterol to the liver to be processed and excreted, thereby lowering cholesterol levels. Also known as good cholesterol.

LDL—Lipoproteins that transport cholesterol to body tissues for storage and thereby raise cholesterol levels. Also known as bad cholesterol.

Plaque—A buildup of fats, cholesterol, calcium, and fibrous tissue in the blood that tends to attach to and weaken artery walls.

Stroke—A condition caused by the blockage of blood flow and oxygen to the brain. Paralysis, coma, and death may result.

Suppository—Any treatment prepared to be inserted into the vagina or the rectum.

Precautions

Consumers will find a wide variety of garlic preparations on the market. Therefore, it is important to study manufacturers' claims, talk to knowledgeable practitioners, and find out which formulations are most effective for a given condition.

Due to the high concentration of sulfur compounds in garlic, it should be avoided by those allergic to sulfur. Garlic inhibits clotting, thereby causing increased bleeding times. Hemophiliacs and those on anticoagulant medication should consult a physician before taking garlic on a daily basis. This caution also applies to individuals who are preparing to undergo surgery. Medicinal use of garlic should be discontinued for at least 1–2 weeks before surgery. HIV patients receiving protease inhibitor or combination therapy

should check with their physicians before using garlic supplements, as garlic may interfere with the therapy's effectiveness.

Side effects

Raw garlic can be very irritating to the digestive system. Excessive intake (usually, more than three or four cloves a day) can cause bloating, **gas**, cramping, **diarrhea**, and may even damage the red blood cells. When applied to the skin, garlic may cause **itching**, redness, and swelling. Garlic that is cooked, aged, or made into pills is not nearly as harsh on the system. However, these forms may not be as suitable as raw garlic in treating some conditions, particularly infections.

Garlic travels through the lungs and the bloodstream, giving a pungent garlic odor to the breath, skin, and perspiration. The odor will be present for at least 4–18 hours, sometimes even when so-called odorless garlic pills are used.

Interactions

Garlic does well when combined with **coltsfoot** or **lobelia** for treating **asthma** and **bronchitis**. Although onion is not as potent as garlic, it has similar actions, and the two often are combined. Use of garlic is contraindicated in individuals using the anticoagulant drug warfarin or certain HIV therapies.

Resources

BOOKS

Balch, Phyllis A. *Prescription for Nutritional Healing,* 4th ed. New York: Avery Publishing Group, 2007.

Fulder, Stephen. *User's Guide to Garlic: Learn How This Remarkable Food Can Reduce Your Risk of Heart Dis ease and Cancer*. Laguna Beach, CA: Basic Health, 2005.

Teuscher, Eberhard. *Medicinal Spices*. Stuttgart, Germany: MedPharm Scientific, 2005.

PERIODICALS

Bone, Kerry, and Michelle Morgan. "Green Tea and Garlic as Cardiovascular Life Extension Strategies." *Townsend Letter for Doctors and Patients* (December 2005): 51(6).

Borek, Carmia. "Health and Anti Aging Benefits of Aged Garlic Extract." *Townsend Letter: The Examiner of Alternative Medicine* (July 2007): 72(6).

Galeone, Carlotta, et al. "Onion and Garlic Use and Human Cancer." *American Journal of Clinical Nutrition* (November 2006): 1027 1032.

Huber, Lia. "A Brilliant Bulb: Say No to the Common Cold with a Daily Dose of Garlic And Make Your Taste Buds Happy, Too." *Natural Health* (February 2007): 37(5).

Saare, Tiina. "Gorgeous Garlic: The Use of Garlic Dates Back Over 4,000 Years, When It Was Most Often Thought to Keep Evil at Bay. Today Research Shows Garlic Has Many Health Benefits, and It Doesn't Take a Culinary Genius to Know This Vegetable Can Enliven Almost Any Meal." *Swiss News* (January 2006): 50(2).

Toprak, Dilek, and Serap Demir. "Treatment Choices of Hypertensive Patients in Turkey." *Behavioral Medicine* (Spring 2007): 5(6).

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988.

Australian Homeopathic Association, 6 Cavan Ave., Renown Park, SA, 5008, Australia, (61) 8 8346 3961, http://www.homeopathyoz.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Med icine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Patience Paradox
Ken R. Wells

Gas

Definition

Gas, or flatus, is the by-product of the breakdown of food by naturally occurring bacteria in the gastrointestinal tract. Gas can also enter the digestive system when an excess of air is swallowed. The body absorbs some of this air, but the rest is expelled as gas. Gastrointestinal gases include methane, carbon dioxide, nitrogen, and hydrogen.

Description

Gas production is an essential, normal function of the gastrointestinal tract, and most healthy individuals pass up to 1,200 cc (over 40 oz) of gas each day. The odor associated with gas comes from small amounts of **sulfur** released by bacteria. When gas causes excessive **pain** and cramping (**colic**), evaluation and treatment are appropriate.

Causes and symptoms

Gastrointestinal gas production can be increased by certain foods, illnesses, and some medications. Common causes of excessive gas include:

Common remedies for gas

Remedy	Description
Acupressure	Press inward at the point three finger widths below the navel known as Conception Vessel 6.
Exercise	Exercise after meals and regularly to increase digestion and expel gas.
Herbal medicine	Anise water, peppermint or chamomile tea, and fennel may relieve gas.
Homeopathy	Carbo vegetabilis (or vegetable charcoal) is used to relieve gas. Nux vomica is used to treat gas that accompanies constipation. Chamomilla is used to treat gas in infants.
Diet	Increase fiber intake. Do not mix carbohydrates with proteins at the same meal. Avoid beans, peas, cheese, sodas, and alcohol. Do not overeat. Chew food well and eat slowly.
Hydrotherapy	Alternate a warm compress with a vigorous cold friction rub on the abdomen.
Yoga	The Boat, Bow, Cobra, and Pigeon positions all encourage digestion and help relieve gas pain.

(Illustration by Corey Light. Cengage Learning, Gale)

- Gas-producing foods. Onions, beans, the vegetables in the cabbage family, and other fibrous foods can cause excessive gas or intestinal spasms in some individuals. High fat intake also reduces the body's ability to digest carbohydrates and may lead to larger amounts of gas.
- Gastrointestinal diseases and disorders. Increased flatulence is a defining symptom of irritable bowel syndrome, diverticulitis, lactose intolerance, malabsorption problems, dysbiosis (imbalance among the various types of bacteria in the gut), and other gastrointestinal disorders.
- Air swallowing (aerophagia). Swallowing too much air while eating or chewing gum can introduce extra gas to the gastrointestinal tract.
- Medications. Certain prescription and over-the-counter medications may cause gas as a side-effect.
- Stress and food allergies can also cause gas.

Symptoms of excessive gas production include:

- flatulence
- belching or burping
- abdominal cramping or colic
- abdominal pain

Diagnosis

A thorough medical and dietary history and physical examination performed by a healthcare professional can usually identify the cause of gas pains caused by diet or medication. Gas problems triggered by gastrointestinal disease may be harder to diagnose and will typically require additional medical testing such as colonoscopy or an upper and/or lower gastrointestinal (GI) series (x rays of the digestive system).

Treatment

Changes in diet can eliminate most excessive gas caused by a particular food or beverage, reducing the amount of fat in the diet, and eating smaller, more frequent meals. Gas caused by air swallowing can be alleviated by eating more slowly, and avoiding **smoking**, gum chewing, and drinking through a straw.

An herbalist or naturopathic healthcare professional may recommend a preparation of carminative (gas reducing) herbs such as **valerian** (*Valeriana officinalis*) or **peppermint** (*Mentha piperita*). These may be helpful in eliminating discomfort and gas-related bloating.

Homeopathic remedies for excessive intestinal gas include Carbo vegetabilis, Nux vomica, and Chamomilla. The prescription of a specific homeopathic remedy will depend on an individual's overall symptom picture, mood, and temperament, and should be prescribed by a qualified homeopathic physician.

Hydrotherapy, **acupressure**, **acupuncture**, **yoga**, **reflexology**, and mild **exercise** can also help to relieve the pain and discomfort of excessive gas.

Allopathic treatment

Over-the-counter preparations of the enzyme alpha-D-galactosidase (e.g., Beano) can alleviate gas symptoms caused by ingestion of certain foods in some individuals. These preparations are typically

KEY TERMS

Homeopathic—Healthcare practice that uses remedies and treatments that cause similar effects to the symptoms they are intended to treat in an effort to stimulate the natural immune response of the body.

Malabsorption problems—A condition in which the intestinal tract is not able to absorb adequate nutrients from the food that passes through it (e.g., celiac disease, inflammatory bowel disease).

available in liquid or tablet form. Other non-prescription medications such as Gas-X, Phazyme, and Mylanta contain the ingredient simethicone that can reduce gas bubbles within the gastrointestinal tract. Lactase enzyme supplements help some people digest lactose (milk sugar) without producing gas.

Expected results

Mild excess gas is typically easy to treat, especially when triggered by dietary causes. Gas caused by gastrointestinal disease may be more difficult to manage, and successful treatment depends on the type and severity of the disorder.

Prevention

Avoiding fermented foods, drastic increases in fiber intake, and excessive air intake can prevent gas in some individuals. Lactose intolerant individuals should avoid dairy products.

Resources

BOOKS

Brown, Kathleen. *Natural & Herbal Remedies for Indigestion*. Pownal, VT: Storey Books, 2009.

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

OTHER

"What I Need to Know About Gas." National Digestive Diseases Information Clearinghouse. November 2007. http://digestive.niddk.nih.gov/ddiseases/pubs/gas_ez.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://homeopathyusa.org.

National Digestive Diseases Information Clearinghouse (NDDIC), 2 Information Way, Bethesda, MD, 20892 3570, (800) 891 5389, http://digestive.niddk.nih.gov.

Paula Ford-Martin

Gastritis

Definition

Gastritis commonly refers to inflammation of the lining of the stomach, but the term is often used to cover a variety of symptoms resulting from this inflammation, as well as symptoms of burning or discomfort. True gastritis comes in several forms and is diagnosed using a combination of tests. In the 1990s, scientists discovered that the main cause of most gastritis is infection by a bacterium called *Helicobacter pylori*.

Description

Gastritis should not be confused with common symptoms of upper abdominal discomfort. It has been associated with ulcers, particularly peptic ulcers, and in some cases, chronic gastritis can lead to more serious complications.

Nonerosive H. pylori gastritis

Under current theory, the main cause of true gastritis is *H. pylori* infection, which is found in an average of 90% of patients with chronic gastritis. *H. pylori* is a bacterium whose outer layer is resistant to the normal effects of stomach acid in breaking down bacteria. The resistance of *H. pylori* means that the bacterium may remain in the stomach for long periods of times, even years, and eventually cause symptoms of gastritis or ulcers when other factors are introduced, such as the presence of specific genes or the use of nonsteroidal anti-inflammatory drugs (NSAIDs). Studies of the role of *H. pylori* in the development of gastritis and peptic ulcers have disproved the former belief that **stress** leads to most stomach and duodenal ulcers. The newer findings have resulted in improved treatment and reduction of stomach ulcers. *H. pylori* is most likely transmitted between humans, although the

KEY TERMS

Apigenin—A bioflavonoid contained in chamomile that appears to inhibit *H. pylori*.

Atrophic—Characterized by a wasting away of a part of the body.

Capsaicin—A crystalline, bitter compound found in peppers. It may be helpful in treating some forms of gastritis.

Demulcent—A medication or substance that is used to soothe irritated mucosa. Some of the herbs recommended to treat gastritis have demulcent properties.

Helicobacter pylori—The bacterium that is implicated in most cases of nonerosive gastritis.

NSAIDs—An abbreviation for nonsteroidal anti-inflammatory drugs. Heavy use of NSAIDs is the most common cause of erosive gastritis.

specific routes of transmission still are under study. Studies are also underway to determine the role of *H. pylori* and resulting chronic gastritis in the development of gastric cancers.

Erosive and hemorrhagic gastritis

After *H. pylori*, the second most common cause of chronic gastritis is the use of NSAIDs. These commonly used **pain** killers, including aspirin, fenoprofen, ibuprofen and naproxen, can lead to gastritis and peptic ulcers. Other forms of erosive gastritis are caused by alcohol or corrosive agents, or by injuries to the stomach tissues from the ingestion of foreign bodies.

Other forms of gastritis

Clinicians differ on the classification of the less common and specific forms of gastritis, particularly since there is so much overlap with *H. pylori* in development of chronic gastritis and complications of gastritis. Other types of gastritis that may be diagnosed include:

- Acute stress gastritis. This is the most serious form of gastritis. It usually occurs in critically ill patients, such as those in intensive care. Stress erosions may develop suddenly as a result of severe trauma or stresses on the stomach lining.
- Atrophic gastritis. This form of gastritis results from chronic gastritis. It is characterized by atrophy, or a decrease in size and wasting away of the gastric lining. Gastric atrophy is the final stage of chronic gastritis and may be a precursor of gastric cancer.
- Superficial gastritis. This term is often used to describe the initial stages of chronic gastritis.
- Uncommon specific forms of gastritis include granulomatous, eosiniphilic, and lymphocytic gastritis.

Causes and symptoms

Nonerosive H. pylori gastritis

H. pylori gastritis is caused by infection from the *H. pylori* bacterium. It is believed that most infection occurs in childhood. Clinicians think that there may be more than one route for the bacterium. Its prevalence and distribution differs in nations around the world. The presence of *H. pylori* has been detected in 86–99% of patients with chronic superficial gastritis. Physicians are still learning about the link of *H. pylori* to chronic gastritis and peptic ulcers, since many patients with *H. pylori* infection do not develop symptoms or peptic ulcers. *H. pylori* is also seen in 90–100% of patients with duodenal ulcers.

The symptoms of *H. pylori* gastritis include abdominal pain and reduced acid secretion in the stomach. The majority of patients with *H. pylori* infection have no symptoms, even though the infection may lead to ulcers and resulting symptoms. Ulcer symptoms include dull, gnawing pain, often two to three hours after meals; and pain in the middle of the night when the stomach is empty.

Erosive and hemorrhagic gastritis

The most common cause of this form of gastritis is the use of NSAIDs. Other causes may be **alcoholism** or stress from surgery or critical illness. The role of NSAIDs in development of gastritis and peptic ulcers depends on the dose level. Although even low doses of aspirin or other nonsteroidal anti-inflammatory drugs may cause some gastric upset, low doses generally will not lead to gastritis. However, as many as 10–30% of patients on higher and more frequent doses of NSAIDs, such as those with chronic arthritis, may develop gastric ulcers. Patients with *H. pylori* already present in the stomach who are treated with NSAIDs are much more susceptible to ulcers and other gastrointestinal effects of these pain killers.

Patients with erosive gastritis may also show no symptoms. When symptoms do occur, they may include **anorexia nervosa**, gastric pain, **nausea**, and **vomiting**.

Other forms of gastritis

Less common forms of gastritis may result from a number of generalized diseases or from complications of chronic gastritis. Any number of mechanisms may cause various less common forms of gastritis and they may differ slightly in their symptoms and clinical signs. However, they all have inflammation of the gastric mucosa in common. Research recently found that severe gastritis may occur rarely as a result of infectious **mononucleosis**.

Diagnosis

Nonerosive H. pylori gastritis

H. pylori gastritis is easily diagnosed through the use of the urea breath test. This test detects active presence of *H. pylori* infection. Other serological tests, which may be readily available in a physician's office, may be used to detect *H. pylori* infection. Newly developed versions offer rapid diagnosis. New stool antigen tests were developed and made available in 2002. The choice of test will depend on cost, availability and the physician's experience, since nearly all of the available tests have an accuracy rate of 90% or better. Endoscopy, or the examination of the stomach area using a hollow tube inserted through the mouth, may be ordered to confirm the diagnosis. A biopsy of the gastric lining also may be ordered.

Erosive or hemorrhagic gastritis

The patient's clinical history may be particularly important in the diagnosis of this type of gastritis, since its cause is most often the result of chronic use of NSAIDs, alcoholism, or abuse of other substances.

Other forms of gastritis

Gastritis that has developed to the stage of duodenal or gastric ulcers usually requires endoscopy for diagnosis. It allows the physician to perform a biopsy for possible malignancy and for *H. pylori*. Sometimes, an upper gastrointestinal x-ray study with barium is ordered. Some diseases such as Zollinger-Ellison syndrome, an ulcer disease of the upper gastrointestinal tract, may show large mucosal folds in the stomach and duodenum on radiographs or in endoscopy. Other tests check for changes in gastric function.

Treatment

Some alternative treatments for gastritis follow mainstream medical practice in distinguishing between gastritis and other digestive disorders; others treat all disorders originating in the stomach in similar fashion.

Dietary supplements

Of all the alternative treatments for gastritis, dietary supplements of various types are the most likely to have been tested in clinical research. Some alternative practitioners have used the following supplements:

- Capsaicin. Capsaicin is the active ingredient in chili peppers. One study in human subjects indicates that capsaicin offers some protection against gastritis caused by aspirin.
- Antioxidants. Vitamin C and beta-carotene given in combination appear to be beneficial to most patients with chronic atrophic gastritis.
- Amino acids. Several studies indicate that cysteine speeds healing in bleeding gastritis related to NSAIDs and in atrophic gastritis. Glutamine appears to protect against the development of stress-related gastritis.
- Vitamins. Preliminary research suggests that large doses of vitamin A may reduce or eliminate erosive gastritis. Vitamin B_{12} is helpful for patients with prenicious anemia related to atrophic gastritis.
- Gamma oryzanol. In one study, 87% of patients with various types of gastritis reported at least some improvement from a daily dose of 300 mg of gamma oryzanol.

Herbal therapy

Herbs that have been recommended for gastritis include:

- Licorice. Licorice is a traditional remedy for stomach inflammation. It also appears to inhibit the growth of *H. pylori*. People who gain water weight or develop high blood pressure as side effects of taking licorice can be treated with licorice that has had the glycyrrhizin removed.
- Goldenseal. This herb contains berberine, a compound with antibiotic properties. There is some evidence that berberine is active against *H. pylori*.
- Chamomile. Chamomile contains apigenin, a bioflavonoid that inhibits *H. pylori*, and chamazulene, a compound that counteracts free radicals.
- Marsh mallow and slippery elm. These herbs have demulcent properties, which means that they soothe irritated mucous membranes.
- Echinacea and geranium. These herbs are recommended by some practitioners for their antiseptic and analgesic (pain-relieving) properties.

Naturopathic practitioners also advise patients with gastritis to eat certain categories of food separately. Patients are advised to eat protein foods by

themselves or with green leafy vegetables; to eat fruits alone; and to avoid combining proteins and starches.

Acupuncture/acupressure

One source recommends applying gentle pressure to a point on the abdomen known as CV (conception vessel) 12, midway between the navel and the breastbone. Pressure should be applied when the stomach is empty. Trained acupuncturists treat stomach problems by releasing energy from the spleen and from other energy points associated with digestion.

Yoga

The Bow Pose is recommended by some teachers of **yoga** for stomach disorders because it puts pressure on a number of acupoints on the abdomen associated with the digestive process and with the stomach meridian.

Chinese herbal medicine

The Chinese traditionally use a tea made from **ginger** (*Zingiber officinale*) as a stomachic, to improve digestive functions.

Reflexology

A trained reflexologist will gently massage the stomach reflexes located on the hands and feet. On the hands, the stomach reflexes are on the palms, below the pads of the middle and index fingers. On the feet, the stomach reflexes are located on the sole just below the pad of the big toe.

Allopathic treatment

H. pylori gastritis

The discovery of *H. pylori's* role in the development of gastritis and ulcers has led to improved treatment of chronic gastritis. Since the infection can be treated with antibiotics, the bacterium can be completely eliminated up to 90% of the time. The treatment, however, may be uncomfortable for patients and relies heavily on patient compliance. No single antibiotic has been found that would eliminate *H. pylori* on its own, so various combinations of antibiotics have been prescribed to treat the infection.

TRIPLE THERAPY. As of early 1998, triple therapy was the preferred treatment for patients with *H. pylori* gastritis. This treatment regimen usually involves a two-week course of three drugs. An antibiotic such as amoxicillin or tetracycline, and another antibiotic such as clarithromycin or metronidazole are used in combination with bismuth subsalicylate, a substance that helps protect the lining of the stomach from acid. This treatment often fails due to poor patient compliance and quadruple therapy is required.

DUAL THERAPY. Dual therapy involves the use of an antibiotic and a proton pump inhibitor. Proton pump inhibitors help reduce stomach acid by halting the mechanism that pumps acid into the stomach. Dual therapy has not been proven to be as effective as triple therapy, but may be ordered for some patients who can more comfortably handle the use of fewer drugs.

OTHER TREATMENTS. Scientists have experimented with quadruple therapy, which adds an antisecretory drug, or one that suppresses gastric secretion, to the standard triple therapy. One study showed this therapy to be effective with only a week's course of treatment in more than 90% of patients. The goal is to develop the most effective therapy combination that can work in one week of treatment or less.

Treatment of erosive gastritis

Patients with erosive gastritis may be given treatments similar to those for *H. pylori*, especially since some studies have demonstrated a link between *H. pylori* and NSAIDs in causing ulcers. The patient will most likely be advised to avoid NSAIDs.

Other forms of gastritis

Specific treatment will depend on the cause and type of gastritis. These may include prednisone or antibiotics. Critically ill patients at high risk for bleeding may be treated with preventive drugs to reduce the risk of acute stress gastritis. Sometimes surgery is recommended, but is weighed against the possibility of surgical complications or death. Once heavy bleeding occurs in acute stress gastritis, mortality is as high as 60%.

Expected results

The results expected from alternative treatments for gastritis include accelerated healing from some of the dietary therapies, and some symptomatic relief from **acupressure**, yoga, and **reflexology**.

The discovery of *H. pylori* has improved the prognosis for patients with gastritis and ulcers. Since treatment exists to eradicate the infection, recurrence is much less common. The prognosis for patients with acute stress gastritis is much poorer, with a 60% or higher mortality rate among those bleeding heavily. Recent studies have shown that infection with *H. pylori* and resulting gastritis may lead to such

complications as chronic gastritis or as serious as gastric adenoma, a form of stomach **cancer**.

Prevention

The widespread detection and treatment of *H. pylori* as a preventive measure in gastritis has been discussed but not resolved. Until more is known about the routes through which *H.pylori* is spread, specific prevention recommendations are not available. It was estimated in late 2002 that the organism was present in 80% of middle-aged adults in developing countries and about 20% of those in industrialized countries. Erosive gastritis from NSAIDs can be prevented with cessation of use of these drugs. An education campaign was launched in 1998 to educate patients, particularly an **aging** population of arthritis sufferers, about the risk of developing ulcers from NSAIDs and alternative drugs.

Resources

BOOK

Burton Goldberg Group. *Alternative Medicine: The Defini tive Guide*. Puyallup, WA: Future Medicine Publishing, Inc., 1994.

Gach, Michael Reed and Carolyn Marco. *Acu Yoga: Self Help Techniques to Relieve Tension*. Tokyo and New York: Japan Publications, Inc., 1998.

LaMont, J. Thomas. *Gastrointestinal Infections, Diagnosis and Management*. New York: Marcel Dekker, Inc. 1997.

Murray, Michael, N.D., and Joseph Pizzorno, N.D. *Ency clopedia of Natural Medicine*. Rocklin, CA: Prima Publishing, 1991.

PERIODICALS

Graham, David Y. "NSAIDs, Helicobacter Pylori, and Pandora's Box." *The New England Journal of Medicine* (December 26, 2002): 2162.

"Helicobacter Pylori Infection." *Internal Medicine Alert* (December 15, 2002): 179 182.

"Severe Gastritis May Occasionally Result from Infectious Mononucleosis." *Gastroenterology Week* (June 23, 2003): 20.

ORGANIZATION

National Digestive Diseases Information Clearinghouse (NDDIC). 2 Information Way, Bethesda, MD 20892 3570. http://www.niddk.nih.gov.

OTHER

American College of Gastroenterology. http://www.acg.org.

Rebecca J. Frey
Teresa G. Odle

Gastrodia

Description

Gastrodia is a preparation made from the rhizome or tuber of an orchid, *Gastrodia elata*. It is a member of the Orchidaceae family. *Gastrodia elata* is a native of the Far East; its natural areas of distribution include Tibet, western China, Korea, and Japan. While gastrodia appears in the oldest lists of Chinese medicinal herbs, it was not known to Western herbalists.

Gastrodia is first mentioned in the *Shennong Bencao Jing*, which was compiled around A.D. 100. A later Chinese herbalist named Tao Hong placed gastrodia in the category of superior herbs, which meant that it could be taken for long periods of time, and that it could be used to promote longevity as well as to treat illnesses. It was originally called *chiqian*, which means "red arrow" in Chinese, because its stem is red and arrow-shaped. Later it was named *tian ma*, or "heavenly hemp," which is the name that it still bears in Chinese herbal formularies.

Like other wild orchids, *Gastrodia elata* is rare and has been placed on the list of endangered species. The increasing difficulty of finding wild gastrodia in the 1970s led to an interesting discovery about this plant. Chinese herbalists tried to cultivate gastrodia, but failed until biologists discovered that the plant needs two fungi in order to survive and reproduce. It needs the *Armillaria mellea* mushroom on its tuber in order to grow and mature; and it requires a second fungus called *Mycena osmundicola* to help its seeds to sprout. After this complicated relationship was understood, herbalists were able to grow gastrodia.

Another aspect of this discovery was the finding that most of the medicinal benefits associated with gastrodia are actually produced by the *Armillaria* mushroom. Many growers then decided to cultivate the mushroom by itself without the gastrodia tuber. Some herbalists now use the *Armillaria* mushroom in their preparations instead of wild or cultivated gastrodia.

General use

In the categories of Chinese herbal medicine, gastrodia is classified as having a sweet and slightly warm nature with a neutral taste. Herbalists have traditionally used it to calm the liver and to clear the meridians by invigorating the patient's circulation. In the categories of Western medicine, gastrodia is said to have sedative and analgesic properties. The specific conditions that were treated by gastrodia include migraine headaches, **dizziness** or vertigo due to liver inflammations, convulsions

caused by heat excess, paralysis, general **fatigue**, numbness in the hands or feet, and **pain** in the joints. More recently, gastrodia has been used to relieve nervous headaches, pain in the trigeminal nerve, nocturnal emissions, difficult breathing, **insomnia** due to **stress**, and **hypertension**.

Chemical analysis of gastrodia indicates that it contains significant amounts of **calcium**, **magnesium**, and **potassium**. Its active ingredients include gastrodioside, vanillin (from the rhizome), and vanillyl alcohol (from the tuber). These last two compounds are related to vanilla flavoring, which comes from another orchid called *Vanilla plantifolia*. Research indicates that vanillin has anticonvulsive properties. Other research suggests that the gastrodia tuber has analgesic and sedative effects because the compounds in it decrease the level of dopamine in the brain. Studies have shown that gastrodia reduces epileptic seizures, and suggested that is has a protective effect against neuronal damage and may improve the ability of learning memory. A study in 2007 provided insight into the mechanism of gastrodia's anticonvulsive effects. In addition, a 2006 review of the scientific literature on gastrodia noted that various human and animal studies have reported that it affects smooth muscle tone, protects against oxidative damage in nerve and heart-muscle cells, and may serve as an anticoagulant. One study in 2003 also suggested that gastrodia reduces a certain peptide, called amyloid beta peptide, that is believed to play a role in Alzheimer's disease. Therefore, gastrodia may have implications for the treatment of Alzheimer's disease.

KEY TERMS

Analgesic—A substance or medication given to relieve pain.

Meridians—In Chinese medicine, pathways of subtle energy that link and regulate the various structures, organs, and substances in the human body. Gastrodia is recommended to clear the meridians of obstructions caused by dampness and wind.

Rhizome—A root-like underground plant stem, often horizontal in position.

Sedative—A substance or medication given to calm and soothe. In traditional Chinese herbal medicine, gastrodia is used as a sedative to the liver.

Tuber—The thick, fleshy, underground stem of a plant.

Preparations

Single-herb preparations

Gastrodia preparations are made from the tubers and rhizomes, or underground stems, of the plant. The rhizomes are dug in winter or spring. The bark is then removed and the rhizomes are cleaned and boiled, or steamed and baked. They are soaked in water a second time and sliced. In traditional Chinese herbal medicine, gastrodia is given as a decoction (concentration of herb after boiling down), in doses of 3-10 g per day.

The *Armillaria* mushroom that is necessary for the growth of the gastrodia tuber has been given the Chinese name of *tian ma mihuanjun*. It is more potent than the gastrodia tuber because it is the source of the tuber's active compounds. Although exact comparisons have not yet been determined, most Chinese practitioners use about half the customary dosage of gastrodia when they are replacing it with *Armillaria*. The mushroom or the gastrodia tuber are given in powdered form, in doses of 1.0-1.5 g, two or three times per day.

Herbal formulas

Gastrodia has been a favorite herb to use in combination formulas to treat specific conditions. Most of these formulas come in the form of tablets or capsules. A Chinese pharmacology textbook lists the following herbal mixtures containing gastrodia:

- For dizziness and headache caused by a hyperactive liver: gastrodia combined with uncaria and haliotis.
- For disturbances caused by wind-phlegm: gastrodia with pinellia and atractylodes.
- For migraine: gastrodia combined with cnidium.
- For convulsions caused by liver heat: gastrodia with antelope horn and uncaria.
- To clear the meridians and relieve pain or numbness in the limbs: gastrodia combined with achyranthes, *chin-chiu*, and *chiang-huo*.

Precautions

Gastrodia is considered a mild herb by the Chinese, and therefore generally safe to use. It is best to consult an experienced practitioner of Chinese herbal medicine before using gastrodia either as a single herb or in formulas.

Side effects

One source reports that the side effects of gastrodia include skin **allergies**, **hair loss**, and other allergic reactions.

Interactions

Because gastrodia has not been used by Western herbalists, its potential interactions with standard pharmaceutical preparations have not been studied.

Resources

BOOKS

Bensky, Dan, Steven Clavey, and Erich Stoger. *Chinese Herbal Medicine: Materia Medica*. Third edition. Seat tle, WA: Eastland Press, 2004.

Fan, W. *A Manual of Chinese Herbal Medicine: Principles and Practice for Easy Reference*. East Lansing, MI: Shambala, 2003.

PERIODICALS

Kim, Hyeon Ju, Kwang Deog Moon, Dong Seok Lee, and Sang Han Lee. "Ethyl ether fraction of *Gastrodia elata* Blume protects amyloid beta peptide induced cell death." *Journal of Ethnopharmacology* 84 (January 2003): 95 98.

Ojemann, Linda, Wendel Nelson, Donella Shin, Ann Rowe, and Robert Buchanan. "Tian ma, an ancient Chinese herb, offers new options for the treatment of epilepsy and other conditions." *Epilepsy and Behavior* 8 (March 2006): 376 383.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine. PO Box 162340, Sacramento, CA 95816. (916) 443 4770, http://www.aaom.org/ (accessed February 8, 2008).

Alternative Medicine Foundation, Inc., P.O. Box 60016, Potomac, MD 20859. (301) 340 1960, http://www.am foundation.org/tcm.htm (accessed February 11, 2008).

OTHER

Dr. Duke's Phytochemical and Ethnobotanical Databases. United States Department of Agriculture, Agricultural Research Service. http://www.ars grin.gov/duke/ (accessed February 11, 2008).

Rebecca Frey
Leslie Mertz, Ph.D.

Gastroenteritis

Definition

Gastroenteritis is a general term for infection or irritation of the digestive tract, particularly the stomach and intestine. It is frequently referred to as stomach or intestinal flu, although the **influenza** virus does not cause this illness. Major symptoms include **nausea**, **vomiting**, **diarrhea**, and abdominal cramps. **Fever** and overall weakness sometimes accompany these symptoms. Gastroenteritis typically lasts about three days. Adults usually recover without problem, but children, the elderly, and persons with an underlying disease are more vulnerable to complications such as dehydration.

Description

Gastroenteritis is an uncomfortable and inconvenient ailment, but it is rarely life-threatening in the United States and other developed nations. In the United States an estimated 220,000 children younger than age five are hospitalized annually with gastroenteritis symptoms. Of these children, 300 die as a result of severe diarrhea and dehydration. In developing nations, diarrhea-related illnesses are a major source of mortality.

Viral gastroenteritis

Gastroenteritis is usually caused by infection with one of the following viruses: rotavirus, adenovirus, astrovirus, calicivirus, and small round-structured viruses (SRSVs). These viruses are found all over the world and are particularly problematic where sanitation is poor. Typical exposure to these viruses occurs through the fecal-to-oral route, by ingesting food that is contaminated with fecal material or by coming in contact with an infected person's vomit or diarrhea and then inadvertently bringing the contaminant to the mouth. Other routes of transmission are quite likely because exposure to as few as 100 virus particles can cause an infection.

Typically, children are more vulnerable to rotaviruses—the most common cause of acute watery diarrhea. It is estimated that each year rotaviruses cause 800,000 deaths worldwide in children younger than age five. The Centers for Disease Control and Prevention (CDC) estimates that rotavirus results in 55,000 annual hospitalizations in the United States for young children and infants. Adults can be infected with rotaviruses, but these **infections** typically have minimal or no symptoms.

Adenoviruses and astroviruses are minor causes of childhood gastroenteritis, and children may become infected with caliciviruses and SRSVs. Adults experience illness from astroviruses as well, but the major causes of adult viral gastroenteritis are the caliciviruses and SRSVs. The SRSVs are a type of calicivirus and include the Norwalk, Southhampton, and Lonsdale viruses. SRSVs are the most likely to produce vomiting as a major symptom.

Bacterial gastroenteritis

Bacterial gastroenteritis is frequently a result of poor sanitation, the lack of safe drinking water, or contaminated food—conditions that are common in developing nations. Natural or man-made disasters can worsen underlying sanitation and food-safety problems. In developed nations, modern food production, handling, and distribution systems and methods may expose millions of people to disease-causing bacteria. Common types of bacterial gastroenteritis can be linked to *Salmonella* and *Campylobacter* bacteria. In the United States, *Campylobacter* alone affects more than one million people per year; however, *Escherichia coli* O157 and *Listeria monocytogenes* are creating increased concern in developed nations as of 2008. Cholera and shigella remain two diseases of great concern in developing countries, and research to develop long-term vaccines against them was underway as of 2008.

Causes and symptoms

Gastroenteritis arises from ingestion of viruses, certain bacteria, or parasites. Spoiled food may also cause illness. Certain medications and excessive alcohol can irritate the digestive tract to the point of inducing gastroenteritis. Regardless of the cause, the symptoms of gastroenteritis include diarrhea, nausea, vomiting, abdominal **pain**, and cramps. Patients may also experience bloating, low fever, and overall tiredness. Typically, the symptoms last only two to three days, but some viruses may last up to a week.

A typical bout of gastroenteritis should not require a visit to the doctor. However, medical treatment is essential if symptoms worsen or if there are complications. Infants, young children, the elderly, and persons with underlying disease require special attention in this regard.

Dehydration is the greatest danger presented by gastroenteritis. The loss of fluids through diarrhea and vomiting can upset the body's electrolyte balance, leading to potentially life-threatening problems, such as heart beat abnormalities (arrhythmia). The risk of dehydration increases the longer that symptoms are present. Signs of dehydration include a **dry mouth**, increased or excessive thirst, or scanty urination.

Symptoms that do not clear up within a week may point to an infection or disorder more serious than gastroenteritis. Symptoms of great concern include a fever of 102°F (38.9°C) or above, blood or mucus in the diarrhea, blood in the vomit, and severe abdominal pain or swelling. Persons experiencing these symptoms should seek prompt medical attention.

Diagnosis

The symptoms of gastroenteritis are usually sufficient for identifying the illness. Unless there are complications or there is an outbreak that affects several people, identifying the specific cause of the illness is not a priority. If it is necessary to identify the infectious agent, a stool sample will be collected and analyzed for the presence of viruses, disease-causing (pathogenic) bacteria, or parasites.

Treatment

Gastroenteritis is a self-limiting illness that will resolve by itself. Symptoms of uncomplicated gastroenteritis can be relieved with adjustments in diet, herbal remedies, and **homeopathy**. An infusion of meadowsweet (*Filipendula ulmaria*) may be effective in reducing nausea and stomach acidity. Once the worst symptoms are relieved, **slippery elm** (*Ulmus fulva*) can be used to calm the digestive tract.

The homeopathic remedies *Arsenicum album*, **ipecac**, and ***Nux vomica*** are also believed to relieve the symptoms of gastroenteritis. In Chinese herbal medicine, the patent remedies Po Chai and Pill Curing can be effective for relieving nausea and diarrhea.

Supplementing the bacteria that are beneficial to a person's health (**probiotics**) is recommended during the recovery phase of gastroenteritis. Specifically, live cultures of *Lactobacillus acidophilus* are said to be effective in soothing the digestive tract and returning the intestinal flora to normal. In fact, in 2002, a study found it was reasonably effective in treating children with acute infectious diarrhea. *L. acidophilus* is found in live-culture yogurt and in capsule or powder form at health food stores. **Castor oil** packs applied to the abdomen can reduce inflammation, spasms, and discomfort.

It is important to stay hydrated and nourished during a bout of gastroenteritis. In the absence of dehydration, it should be sufficient to drink generous amounts of nonalcoholic fluids, such as water or juice. **Caffeine** should be avoided, since it increases urine output.

The traditional BRAT diet—bananas, rice, applesauce, and toast—is tolerated by the tender gastrointestinal system, but it is not particularly nutritious. Many, but not all, medical researchers recommend a diet that includes complex carbohydrates (rice, wheat, potatoes, bread, and cereal, for example), lean meats, yogurt, fruit, and vegetables. Milk and other dairy products should not create problems if they are part of the normal diet. Fatty foods or foods with a lot of

sugar should be avoided. These recommendations are based on clinical experience and controlled trials but are not universally accepted.

Allopathic treatment

Over-the-counter medications such as Pepto Bismol are useful in relieving the symptoms of gastroenteritis. These medications work by altering the intestine's ability to move or secrete spontaneously, by absorbing toxins and water, or by altering intestinal microflora. Some over-the-counter medicines use more than one element to treat symptoms, and this information should be included on the label.

If over-the-counter medications are ineffective, a doctor may prescribe a more powerful anti-diarrheal drug, such as motofen or lomotil. If pathogenic bacteria or parasites are found in the patient's stool sample, medications such as antibiotics will be prescribed.

The physician may prescribe odansetron (Zofran) to treat nausea and vomiting. In a study done at the Children's Memorial Hospital in Chicago, one dose of odansetron helped relieve the symptoms and promoted rehydration.

Minimal to moderate dehydration is treated with oral rehydrating solutions that contain glucose and electrolytes. These solutions are commercially available under names such as Naturalyte, Pedialyte, Infalyte, and Rehydralyte. If vomiting prevents patients from taking a full dose of solution, they may better tolerate fluid taken in small, frequent amounts. Should oral rehydration fail or severe dehydration occur, medical treatment in the form of intravenous (IV) therapy is required. IV therapy can be followed with oral rehydration as the patients' condition improves. Once normal hydration is achieved, patients can return to a regular diet.

Sometimes, a child's dehydration is so severe that it requires hospitalization with IV therapy. However, a study published in 2002 informed pediatricians that often, rapid intravenous rehydration and rapid nasogastric hydration in the emergency department are safe and effective alternatives to hospitalization for many children with viral gastroenteritis. Doing so saves money and spares children the more frightening experience of being in a hospital overnight and the routine laboratory testing they would endure in the hospital setting.

Expected results

Gastroenteritis usually clears up within two to three days and there are no long-term effects. If dehydration occurs, recovery is extended by a few days.

KEY TERMS

Dehydration—A condition in which the body lacks the normal level of fluids, potentially impairing normal body functions.

Electrolyte—An ion, or weakly charged element, that conducts reactions and signals in the body. Examples of electrolytes are sodium and potassium ions.

Glucose—A sugar that serves as the body's primary source of fuel.

Influenza—A virus that affects the respiratory system, causing fever, congestion, muscle aches, and headaches.

Intravenous (IV) therapy—Administration of fluids through the veins.

Microflora—The bacterial population in the intestine.

Pathogenic bacteria—Bacteria that produce illness.

Probiotics—Bacteria that are beneficial to a person's health, either through protecting the body against pathogenic bacteria or assisting in recovery from an illness.

Prevention

Gastroenteritis can be avoided by practicing good hygiene, which includes washing hands thoroughly after using the bathroom or coming in contact with an infected person, using disinfectants to clean areas the infected person has come in contact with, and washing infected linens in hot water. Making sure that food is well-cooked and unspoiled can prevent bacterial gastroenteritis but may not be effective against viral gastroenteritis.

In 2006, the United States Food and Drug Administration (FDA) approved RotaTeq, a vaccine to prevent rotavirus in infants. The vaccine is given by mouth in liquid form. It is a live vaccine and is given in three doses between the ages of six weeks and 32 weeks.

Resources

BOOKS

Miskovitz, Paul, and Marian Betancourt. *The Doctor's Guide to Gastrointestinal Health: Preventing and Treating Acid Reflux, Ulcers, Irritable Bowel Syndrome, Diverticulitis, Celiac Disease, Colon . . . Pancreatitis, Cirrhosis, Hernias and More*. Hoboken, NJ: Wiley, 2005.

PERIODICALS

Freedman, Stephen B., "Oral Ondansetron for Gastroenteritis in a Pediatric Emergency Department." *New England Journal of Medicine* 354, no. 16 (April 20, 2006), 1698 1705.

OTHER

"FDA Approves New Vaccine to Prevent Rotavirus Gastroenteritis in Infants." FDA News, February 3, 2006. http://www.fda.gov/bbs/topics/news/2006/NEW01307.htm. (April 7, 2008).

Paula Ford-Martin
Teresa G. Odle
Rhonda Cloos, R.N.

KEY TERMS

Alkaloid—One of a group of organic compounds which are generally toxic.

Neuralgia—Severe nerve pain.

Phenacetin—A compound formerly used to ease pain or fever, but withdrawn because of its serious side effects.

Rhizome—A horizontal, underground stem that sends out roots.

Gelsemium

Description

Gelsemium sempervirens is also known as yellow jasmine, false jasmine, wild woodbine, and Carolina jasmine. It is a woody, climbing vine with dark leaves and groups of yellow, bell-shaped flowers that bloom in early spring. The flowers are very fragrant. It is native to the coastal areas extending from Virginia to Florida, and in Mexico, and is the state flower of South Carolina.

Gelsemium contains extremely toxic alkaloid components, and is not in current medical use. Even very small doses may prove lethal. It was reportedly discovered in the nineteenth century as a result of mistaken identity for another herb. A sick farmer took it for an attack of "bilious fever," and became quite ill. When the symptoms resolved, he discovered that his prior illness had also disappeared. It came into use as an agent to treat **fever**, spasmodic disorders, and the **pain** of **neuralgia**.

General use

The herb form of gelsemium has historically been used for migraines resulting from excessive cerebral blood flow, severe **wheezing** attacks of **asthma**, **insomnia**, and nerve pain, particularly trigeminal neuralgia. The latter condition is a disorder of the trigeminal nerve, which causes shooting pain in the area of the lips, gums, cheek, chin, and occasionally around the eye. Use of the herb form has not been recommended for some time due to the extremely toxic potential of the alkaloids this plant contains.

Homeopathic remedies incorporating gelsemium have specific indications. As with other homeopathic treatments, they contain infinitesimal amounts of the active ingredient, so that toxicity is highly unlikely. Some of the recommendations for the use of homeopathic gelsemium include **migraine headache**, **anxiety**, chemotherapy support, dental support, **influenza**, **nausea**, and recovery from surgery.

Homeopathic gelsemium is thought to relieve anxiety in the form of apprehension about particular events, as well as generalized anxiety. The 30C formulation is recommended for this purpose, taken as needed up to three or four times daily, for no longer than one week. The 6C formulation may be used two or three times prior to undergoing chemotherapy treatment. Similar dosing is recommended prior to a visit to the dentist.

True influenza is a respiratory ailment, although symptoms also include aches, fever, **chills**, and **headache**. Homeopathic recommendations for gelsemium due to flu symptoms include mild fever, dull headache at the nape of the neck, and **dizziness**. Gelsemium 6C can be used for as long as five days, once every three to four hours, during the illness.

Migraine headaches that are felt primarily in the back of the head or as constrictive pain may be helped by homeopathic preparations of gelsemium. Visual aura and aching of the neck and shoulders may accompany this type of headache. For best results, gelsemium 30C is taken as soon as symptoms begin, every 30 minutes, for up to three doses if needed.

Homeopathic gelsemium is also recommended to support surgical recovery, particularly for those who are quite apprehensive and restless. The 6C formulation may be taken for a few days preceding the surgery, up to four doses per day.

Consult a practitioner of **homeopathy** to determine the best indicated doses and combinations of remedies for a particular health issue.

Preparations

The dried root, harvested in autumn, is the usable portion of the plant. Gelsemium is currently unavailable in medicinal formulations due to the narrow safety margins and dangerous toxicity.

Precautions

Gelsemium is an extremely toxic herb because of the alkaloid component, related to strychnine, which exists in all parts of the plant. Symptoms can include sweating, nausea, muscular weakness, dilated pupils, lowered temperature, and convulsions. It can excessively depress the nervous system, and can cause death due to respiratory failure. A lethal dose is approximately 2–3 g for an adult, and 500 mg for a child. Ingestion of as little as a single flower has reportedly resulted in the fatality of a child. Accidental ingestion of the plant under any circumstances warrants emergency treatment.

The safety margin of gelsemium is extremely small. It should never be used, especially in children, or in women who are pregnant or lactating. Oral use of preparations from the rhizome or root are also considered unsafe. It is particularly dangerous for people with any sort of **heart disease**.

Side effects

There are no reported side effects, although individual aggravations may occur.

Interactions

The effects of aspirin and phenacetin may be increased by gelsemium.

Resources

BOOKS

Lininger, Schuyler W., Alan R. Gaby, Skye W. Lininger, and Jamie Miller. *The Natural Pharmacy*. Roseville, California: Prima Health, 1998.

OTHER

Grieve, M. *Gelsemium* December 16, 2006. http://www.botanical.com/botanical/mgmh/g/gelsem07.html.

Judith Turner

Gelsemium sempervirons see **Gelsemium**

Gem healing *see* **Crystal healing**

Genital herpes

Definition

Genital herpes is a sexually transmitted disease caused by the herpes simplex virus. The disease is characterized by the formation of fluid-filled, painful **blisters** in the genital area.

Description

Genital herpes is a sexually transmitted disease spread by vaginal, anal, and oral contact. The first herpes infection a person has is called a primary infection. It develops about four to seven days after contact with the disease. Once a person has been infected with the herpes virus, it cannot be completely cured. Instead, the virus can lay latent in the sensory nerve ganglia for days, months, or even years between outbreaks. When the virus becomes activated there is a recurrent infection of the skin. An active herpes infection is then obvious because of the sores that develop. However, an active infection may occur without visible sores. Up to 75% of people with herpes may not know they have the infection.

Newborn babies who are infected with herpes virus experience a very severe, and possibly fatal, disease called neonatal herpes. In the United States, one in 3,000–5,000 babies born are infected with herpes virus. Babies usually become infected during passage through the birth canal, but they also can become infected during **pregnancy** if the membranes rupture early.

Causes and symptoms

Genital herpes results from an infection by herpes simplex virus. There are several different kinds of human herpes viruses. Only two of these, herpes simplex type 1 (HSV-1) and type 2 (HSV-2), can cause herpes. HSV-2 is most often responsible for genital **infections**. HSV-1 usually causes oral herpes, but it can also cause genital herpes about 10–30% of the time. While the herpes virus can infect anyone, not everyone shows symptoms. Risk factors include early age at first sexual activity, multiple sexual partners, and a medical history of other sexually transmitted diseases (STDs).

The first symptoms of a primary herpes infection usually occur within two to seven days after contact with an infected person but may take up to two weeks. Symptoms of a primary infection are usually more severe than those of recurrent infections. For up to 70% of people, a primary infection causes general

symptoms such as tiredness, **headache**, **fever**, **chills**, muscle aches, loss of appetite, and painful, swollen lymph nodes. These symptoms are greatest during the first three to four days of the infection and disappear within a week.

Most people with genital herpes experience prodromes, or symptoms of the oncoming disease. Such symptoms might include **pain**, burning, **itching**, or tingling at the site on the genital area, legs, or buttocks where blisters will form. The prodrome stage may occur anywhere from a few hours, to one or two days before an outbreak of the infection. Following that time, small red bumps appear. These bumps quickly become fluid-filled blisters that may also fill with pus and become covered with a scab. The blisters may burst and become painful sores. Blisters may continue to erupt for a week or longer. Pain usually subsides within two weeks, and the blisters and sores heal without scarring by three to four weeks. It is possible to pass the virus to other parts of the body by touching an open sore and then bringing the fingers into contact with the mouth, the eyes, or a break in the skin. The highest risk for spreading the herpes virus is the time during the appearance of blisters up to the formation of scabs. However, an infected person can spread herpes virus to other people even in the absence of sores.

Women can experience a very severe and painful primary herpes infection. In addition to the vaginal area, blisters often appear on the clitoris, at the urinary opening, in the rectum and around the anus, and on the buttocks and thighs. The cervix is almost always involved, causing a watery discharge. About one in 10 women get a vaginal **yeast infection** as a complication of herpes. In men, the herpes blisters usually form on the penis but can also appear on the scrotum, thighs, around the anus, and in the rectum. Men may also have a urinary discharge with a genital herpes infection. Both men and women may experience painful or difficult urination, swelling of the urethra, **meningitis**, and throat infections, with women experiencing these symptoms more often than men.

As of 2008, scientists did not know the factors that trigger a latent herpes virus to activate, but several conditions seem to be connected with the onset of an active infection. These include illness, **stress**, tiredness, sunlight, **menstruation**, skin damage, food **allergies**, and extreme hot or cold temperatures. Most people with genital herpes experience one or more outbreaks per year. About 40% experience six or more outbreaks per year. Active recurrences of herpes are usually less severe than the primary infection. There are fewer blisters, less pain, and the time period from the beginning of symptoms to healing is shorter than the primary infection.

Diagnosis

Because genital herpes is so common, it can be initially diagnosed by symptoms. A Tzanck test can also be used for a quick initial diagnosis. The test is performed using a sample scraped from the base of an active blister. A confirmation of the diagnosis can be done by making a tissue culture of material scraped from the skin lesions, testing the blood for herpes antibodies, or examining fluid and scrapings from the lesions by a method called direct immunofluorescent assay. Since most infants infected with the herpes virus are born to mothers with no symptoms of infection, newborns and pregnant women are often routinely given blood tests called the TORCH antibody panel, which includes a test for herpes. Babies also need to be checked for signs of herpes infection in their eyes. Skin sores and sores in the mouth should be sampled for the presence of herpes simplex.

Treatment

An imbalance in the **amino acidslysine** and **arginine** is thought to be one contributing factor in herpes virus outbreaks. Supplementation with lysine may help maintain the correct balance and prevent recurrences of herpes. Patients may take 500 mg of lysine daily and increase to 1,000 mg three times a day during an outbreak. Intake of foods that are rich in the amino acid arginine should be avoided, including chocolate, peanuts, almonds, and other nuts and seeds.

Clinical experience indicates a connection between high stress and herpes outbreaks. Many people respond well to stress reduction and **relaxation** techniques. **Acupressure** and massage may relieve tiredness and stress. **Meditation**, **yoga**, **t'ai chi**, **acupuncture**, and **hypnotherapy** can also help relieve stress and promote relaxation. Counseling and support groups are often recommended to deal with the emotional and psychological stress of the disease.

An extract of bovine thymus gland can be taken to improve immune function and help the body fight against viral infections such as herpes. Some herbs are also able to serve as antivirals. They include **echinacea** and **garlic** (*Allium sativum*). **Siberian ginseng**, *Eleutherococcus senticosus,* is useful in relieving the stress response that can bring on recurrent herpes outbreaks. Supplementation with beta-carotene and **vitamin E** is recommended during an outbreak. Homeopathic remedies that may be helpful treatments

for genital herpes include *Rhus tox* 6c and *Apis mellifica* 6c.

There are **traditional Chinese medicine** combinations that are useful for herpes outbreaks. One, called Zhi Bai Lui Wai Di Huang, is a mixture of philodendron and other remedies. Another is Long Dan Xie Gan Tang, a soup made to drain the liver. A traditional Chinese medicine practitioner can help create the right combination specific to the outbreak.

Red marine algae, both taken internally and applied topically, is thought to be effective in treating herpes. Other topical treatments may be helpful in inhibiting the growth of the herpes virus, in minimizing the damage it causes, or in helping the sores heal. **Zinc** may also be used both internally and externally. Oral supplementation coupled with an application of zinc sulfate ointment may help heal sores and fight recurrent outbreaks. Lithium succinate ointment may interfere with viral replication. An ointment made with glycyrrhizinic acid, a component of **licorice** (*Glycyrrhiza glabra*), seems to inactivate the virus. Topical applications of vitamin E oil or **tea tree oil** (*Melaleuca* spp.) help dry up the sores.

Allopathic treatment

There is no cure for a herpes infection. Aspirin may be used to reduce pain and inflammation. Antiviral drugs are available that may lessen the symptoms and decrease the length of outbreaks. There is evidence that some may also help prevent the spreading of the disease and reduce recurrence of future outbreaks. For the best results, treatment with antiviral drugs has to begin during the prodrome stage, before blisters are visible. Depending on the length of the outbreak, drug treatment may continue for up to 10 days.

Acyclovir (Zovirax) is the drug of choice for herpes infection and can be given intravenously, taken by mouth, or applied directly to sores as an ointment. Intravenous acyclovir is given to patients who require hospitalization, usually due to severe primary infections or complications of herpes such as aseptic meningitis or sacral ganglionitis, an inflammation of nerve bundles. Acyclovir reduces the virus shedding period, the duration of the blisters, and the healing time. Patients with herpes outbreaks happening more than six to eight times per year may be given a long-term course of treatment with acyclovir. This is referred to as suppressive therapy. Patients on suppressive therapy have longer periods between herpes outbreaks. Alternatively, patients may use short-term suppressive therapy to lessen the chance of developing an active infection during special occasions such as weddings or holidays. Side effects of acyclovir include **nausea**, **vomiting**, itchy rash, and **hives**. Other drugs that may be used include famciclovir (Famvir), valacyclovir (Valtrex), vidarabine (Vira-A), idoxuridine (Herplex Liquifilm, Stoxil), trifluorothymidine (Viroptic), and penciclovir (Denavir).

Neonatal herpes is a serious condition. Even with treatment, babies may not survive or they may suffer serious damage to the nervous system. Newborns with herpes infections are normally treated with intravenous acyclovir or vidarabine for 10 days. However, infected babies may have to be treated with long-term suppressive therapy. These drugs have greatly reduced deaths and have also increased the number of babies who are relatively healthy by one year of age.

Expected results

Genital herpes is usually not a serious disease, with several major exceptions. Sometimes, a primary infection can be severe and may require hospitalization for treatment. Complications that may arise include aseptic meningitis and nervous system damage. There may also be **constipation**, **impotence**, and difficulty with urination. In addition, people who are immunosuppressed due to disease or medication are at risk for a very severe, and possibly fatal, herpes infection. And even with antiviral treatment, neonatal herpes infections can be fatal or cause permanent nervous system damage.

Prevention

The only way to definitely prevent a genital herpes infection is to avoid contact with infected people, which is not an easy solution because many people are not aware that they are infected. Use of condoms and spermicidal jellies or foams with monoxynol-9 is recommended with all partners whose disease status is questionable or unknown. However, condoms may not protect against herpes when there is skin contact with someone with an open sore that cannot be covered by a condom. Use of dental dams or squares of non-microwaveable plastic wrap is also recommended. Sexual contact should be avoided altogether during a herpes outbreak. Touching affected areas should be avoided, since this can spread the infection to other sites. In order to prevent a child from contracting a herpes infection through contact in the birth canal, doctors usually perform Caesarean sections on women who have active herpes sores when they go into labor.

KEY TERMS

Culture—A laboratory test in which colonies of microorganisms are grown from tissue samples of an infected individual in order to identify the pathogen.

Immunofluorescent assay—A laboratory technique using a fluorescent dye and a special microscope to identify the cause of an infection.

Meningitis—An infection or inflammation of membranes of the brain and spinal cord.

Sensory root ganglion—A bundle of nerves that help conduct physical sensations.

Tzanck test—A laboratory test using a microscope to examine tissue samples that have been stained with certain dyes.

Urethra—The small tube that drains urine from the bladder.

Resources

BOOKS

Forrest, Stuart, and Greg Saulmon. *Genital Herpes*. New York: Rosen, 2006.

PERIODICALS

Conway, Brian. "Genital Herpes: The Undiscovered Pandemic." *Future Virology* (November 2007): 533 536.

Corey, Lawrence, et al. "An Update on Short course Epi sodic and Prevention Therapies for Herpes Genitalis." *Herpes* (September 2007): 5 11.

Halford, William P. "Towards an Effective Genital Herpes Vaccine: Past Lessons and Future Prospects." *Future Virology* (January 2007): 1 6.

Xu, F., et al. "Trends in Herpes Simplex Virus Type 1 and Type 2 Seroprevalence in the United States." *JAMA* (August 23, 2006): 964 973.

ORGANIZATIONS

Centers for Disease Control and Prevention. 1600 Clifton Rd., Atlanta, GA 30333. (800) 311 3435. http://www.cdc.gov/.

OTHER

"Genital Herpes." eMedicineHealth. http://www.emedicinehealth.com/genital_herpes/article_em.htm. (February 7, 2008).

"Genital Herpes." MayoClinic.com. http://www.mayoclinic.com/health/genital herpes/DS00179. (February 7, 2008).

"Genital Herpes." womenshealth.gov. http://www.4women.gov/faq/stdherpe.htm. (February 7, 2008).

ORGANIZATIONS

Centers for Disease Control and Prevention, 1600 Clifton Rd., Atlanta, GA, 30333, (800) 311 3435, http://www.cdc.gov/.

Patience Paradox
David Edward Newton, Ed.D.

Genital warts

Definition

Genital **warts**, or condylomata acuminata, are also called venereal warts. These warts are painless, pink or grayish growths on the skin and mucous membranes of the genitals and anal area. They are usually found in clusters. Genital warts are very contagious and are spread through sexual contact with an infected person.

Description

Genital warts are the second most common sexually transmitted disease (STD), after **chlamydia**, in the general population of the United States. Public health officials estimate that 1% of sexually active people between the ages of 18 and 45 have genital warts. However, studies indicate that approximately 50% of sexually active adults may carry the virus that causes genital warts. Certain **strains** of the virus that cause genital warts may also cause cervical changes and **cancer**.

Causes and symptoms

Genital warts are caused by several subtypes of human papillomavirus (HPV), the same virus that causes warts on other parts of the body. Symptoms develop about one to six months after being exposed to the virus. Once contracted, the virus remains in the infected person's body even though the warts are not visible. In addition to the visible warts, symptoms of the disease may include bleeding, **pain**, odor, **itching**, and redness in affected areas. These symptoms may appear without the warts, and the warts may appear without other symptoms. **Stress** may contribute to recurrent outbreaks.

Genital warts may be difficult to detect. At any given time, at least a quarter of all HPV **infections** are in a state of remission, in which the infection remains dormant in the body, and there are no outbreaks of warts or other readily detected symptoms. In addition,

Man with genital warts. *(Custom Medical Stock Photo. Reproduced by permission.)*

warts that occur deep inside the vagina, on the cervix, or within the anus may go undetected.

HPV can be transmitted through oral, anal, or genital contact with an infected person, even if warts are not visible. The virus may also be transmitted via objects that have been recently exposed to the virus. These objects may include unwashed or improperly cleaned medical equipment, as well as underwear, tanning beds, and sex toys.

Risk factors for contracting genital warts include:

- multiple sex partners
- infection with another sexually transmitted disease (STD)
- pregnancy
- anal intercourse
- poor personal hygiene
- heavy perspiration

Genital warts vary somewhat in appearance. They may either be flat or resemble raspberries in appearance. The warts begin as small, red or pinkish growths. They may grow in clusters as large as 4 in (10 cm) across, and may interfere with intercourse and **childbirth**. The warts grow on warm, moist tissue. In women, they occur on the external genitalia, the cervix, and the walls of the vagina. In men, they develop in the urethra and on the shaft of the penis. The warts may also spread to the area surrounding the anus.

Diagnosis

Genital warts are usually identified and diagnosed by their characteristic appearance. A sexual history should be taken, and tests for other STDs may be administered. If cervical warts are suspected, a colposcopy exam to view the cervix is necessary for diagnosis. A Papanicolaou (Pap) smear may be performed, and the doctor may order a biopsy of the warts to rule out cancer.

Treatment

Genital warts are contagious and should be assessed and treated under the supervision of a healthcare practitioner. A **traditional Chinese medicine** practitioner or an acupuncturist will probably recommend treatments to cleanse the liver and enhance immune functioning. A generally recommended homeopathic remedy is the application of a tincture of *Thuja occidentalis* (common names **thuja**, northern white cedar, and arborvitae, or tree-of-life) directly to the warts. A homeopathic physician should be consulted for a work-up for further treatment.

The direct topical application of **vitamin A**, thuja, **lomatium** (*Lomatium dissectum*) isolate, or **tea tree oil** (*Melaleuca alternifolia*) helps resolve warts and prevent recurrence of outbreaks. With the exception of the tea tree oil, these herbs should also be taken internally in addition to direct application. Some evidence suggests that deficiencies of **folic acid** and vitamins A and C contribute to genital warts. Such deficiencies may be risk factors for a progression to abnormal cervical cells and cancer; therefore, supplementation is recommended. Beta carotene is often suggested as an alternative to taking high dosages of vitamin A.

Treatments that focus on emotional and psychological factors have been shown to be effective in reducing or eliminating outbreaks of warts. **Hypnotherapy** and techniques of stress reduction and **relaxation** are highly recommended.

Allopathic treatment

There is no cure for genital warts, as the virus cannot be destroyed once it enters the body. The warts themselves may be burned off with electrocautery or lasers, frozen with liquid nitrogen for easy removal, or surgically removed. Podophyllum resin, trichloroacetic acid, interferon inducers, 5-fluorouracil cream, bichloroacetic acid, or trichloroacetic acid can be used as a topical treatment. These medications require several weeks of treatment and may irritate the skin. Pregnant women should be sure to inform their healthcare provider of this condition, as some of the medications for warts may cause fetal abnormalities. Genital warts can also be treated with injections of interferon, either into muscle tissue or directly into the lesions.

Unfortunately, regardless of the treatment regime, genital warts have a high rate of recurrence. Several

KEY TERMS

Cervix—The entrance to the uterus that protrudes into the vagina.

Electrocautery—A procedure in which heat from an electric current is used to perform surgical procedures.

Mucous membranes—Thin sheets of tissue that cover and protect body passages that open to the outside. These membranes secrete mucus and absorb water and various salts.

Papanicolaou (Pap) smear—A diagnostic test using a sampling of tissue from the cervix.

Papilloma—A benign growth on the skin or mucous membrane.

courses of treatment may be required. Sexual partners should be diagnosed and treated as well. Because of the connection between certain strains of HPV and cervical cancer, infected women should also have yearly Pap smears.

Expected results

As with many warts, genital warts may spontaneously disappear over time. Although the warts are not cancerous by themselves, HPV infection in women appears to increase the risk of later cervical cancer. Recurrence is common with all methods of treatment.

Prevention

The only reliable method of prevention is sexual abstinence. The use of condoms is often recommended; however, condoms protect only a limited area and should not be relied upon for complete protection from genital warts. Circumcision may sometimes prevent recurrence of the visible warts.

Resources

PERIODICALS

Cuschieri, K. S., et al. "Public Awareness of Human Papil lomavirus." *Journal of Medical Screening* (December 2006): 201 207.

Loureiro, W. R., et al. "Treatment of Genital Warts in Men with Potassium Hydroxide." *British Journal of Derma tology* (January 2008): 180 181.

Sherrard, Jackie, and Lynn Riddell. "Comparison of the Effectiveness of Commonly Used Clinic based Treat ments for External Genital Warts." *International Jour nal of STD & AIDS* (June 2007): 365 368.

"Sinecatechins 15% Ointment [Veregen; Bradley Pharma ceuticals] Has Been Launched in the U.S. for the Treatment of External Genital and Perianal Warts." *Inpharma* (January 5, 2008): 19.

OTHER

"Genital HPV Infection CDC Fact Sheet." Centers for Disease Control and Prevention. http://www.cdc.gov/STD/HPV/sTDFact HPV.htm. (February 8, 2008).

"Genital Warts HPV Infection." eMedicineHealth. http://www.emedicinehealth.com/genital_warts/article_em.htm. (February 8, 2008).

"Human Papillomavirus and Genital Warts." National Institute of Allergy and Infectious Diseases. http://www3.niaid.nih.gov/healthscience/healthtopics/human_papillomavirus/. (February 8, 2008).

Kazzi, A. Antoine. "Warts, Genital." eMedicine.com. http://www.emedicine.com/emerg/topic640.htm. (February 8, 2008).

Patience Paradox
David Edward Newton, Ed.D.

Gentiana

Description

Gentiana is a plant extract made from gentians, which are a group of perennial plants belonging to the Gentianaceae family. There are about 180 species of gentians worldwide. They have a long history of use in healing both in Asian and **Western herbalism**. In the West, the common gentian used in healing is *Gentiana lutea*, or yellow gentian. In China, two different gentians are used in healing, *Gentiana macrophylla*, known in Chinese as *qin jiao*; and *Gentiana scabra*, known in Chinese as *long dan cao*.

G. lutea grows wild or cultivated in many places from Europe to India. It is also cultivated in North America. It grows to a height of about 4 ft (1.2 m), primarily in temperate alpine and subalpine meadows. The plant produces a spike of showy yellow-orange flowers. *G. macrophylla* grows in China and Siberia, and *G. scabra* grows in China and Japan.

There are some differences in height, leaf size, and flower among these three gentians, but the roots and rhizomes (underground stems) used to make gentiana are very similar. Gentians have a single long, strong taproot that can extend as far as 3 ft (1 m) into the earth. The top of the taproot can be as thick as a child's arm and is surrounded by a cluster of rhizomes. The root has an extremely bitter taste. Other names for gentiana include bitter root, bitterwort, and gall weed.

KEY TERMS

Amargogentin—An extremely bitter substance found in gentian that makes it an effective digestive stimulant.

Rhizome—A rootlike underground stem of a plant.

Stomachic—A substance or medication that sharpens the appetite or stimulates digestion.

Tincture—An alcohol-based extract prepared by soaking plant material.

Tonic—Any medicine given to strengthen and invigorate the body or a specific organ.

General use

Gentiana has been used for centuries. It gets its name from Gentius, King of Illyria (a part of Greece) from 180–167 B.C., who is said to have discovered the medicinal value of these plants. Gentian is one of the most intensely bitter herbs ever discovered. It is an ingredient in Angostura™ **bitters**. At one time it was used as a substitute for **hops** in making beer. Gentiana is also used in small amounts as a food flavoring, and is added to many anti-smoking products.

In Western herbalism, gentiana is used for digestive problems. It is an ingredient in aperitifs that are drunk a half-hour or so before eating to stimulate the appetite and digestion. Liqueurs made using fresh gentiana have been used for generations in Europe; in the eighteenth century gentian wine was served before eating as a stomachic, or aid to digestion.

In addition to stimulating digestion and appetite, gentiana is used to relieve **heartburn** and stomach ache, and to treat **vomiting**, **diarrhea**, abdominal fullness, and intestinal **gas**. Western herbalists also use gentiana for treating **fever**, **sore throat**, **jaundice**, and arthritis. It is used externally to treat **wounds**.

In **traditional Chinese medicine**, *G. macrophylla*, or *qin jiao*, is considered to have a neutral nature and a bitter, pungent taste. It is associated with the liver, stomach, and gallbladder. It is used as a tonic for the digestive system, and to treat arthritis; chronic low-grade fever; jaundice; **hepatitis**; and **constipation**. It is also an ingredient of several common formulas.

According to Chinese herbalists, another gentian, *Gentiana scabra*, or *long dan cao*, has a cold nature and a bitter taste. It is associated with the liver, stomach, gallbladder, and bladder. *Long dan cao* is used in formulas to treat pink eye (**conjunctivitis**); high blood pressure; acute urinary **infections**; testicular **pain**; leucorrhea (whitish vaginal discharge); vaginal pain; tantrums in children; fever; and balance problems.

A long history of folk use coupled with modern scientific investigation shows that gentiana works well as a stomach tonic and digestive stimulant. The German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, has approved gentiana for use in Germany. It is considered safe and effective in treating such digestive complaints as loss of appetite, abdominal bloating, and gas.

In laboratory studies gentiana was found to contain a substance called amargogentin, which is possibly the bitterest compound ever found. It can be tasted at dilutions of 1:50,000. Its bitterness triggers the secretion of saliva, thus stimulating the production of gastric juice and bile and preparing the digestive system to process food. This reaction makes gentiana effective in treating almost all conditions related to sluggish digestion.

Other research shows that gentiana has selective antifungal, anti-inflammatory, and antispasmodic activity in laboratory experiments. There is much less scientific evidence to support such other traditional uses as treating pain and fever.

Preparations

Gentian roots are harvested in the autumn. They are used fresh in the production of liqueurs, but are dried for medicinal use. The better roots are dried quickly and remain whitish for several months before they darken. Roots that are dried too slowly will ferment.

Gentiana is available in many forms including an extract, dried powdered rhizome, tea, tincture, and decoction. The liquid remedies are very bitter, and sweetening is often added to make them more palatable. Gentian tea can be made by adding 1 tsp of powdered dried rhizome to every 3 cups (750 ml) of water. One tablespoon of this tea is taken about half an hour before eating. Smaller amounts of tincture and decoction can also be taken before eating.

In traditional Chinese medicine, gentiana is used in a formula (*long dan xie gan wan*) to treat chronic bladder infections, herpes, **blisters** in the mouth, and **dizziness**.

Precautions

German health authorities recommend that gentiana not be used by people who have stomach

(gastric) or intestinal (duodenal) ulcers. In a few sensitive people, gentiana can cause stomach irritation and **headache**. Chinese herbalists recommend that gentiana not be used when there is frequent urination and chronic pain with weight loss.

Side effects

Overdoses of gentiana may cause **nausea** and vomiting.

Interactions

A long history of use in both East and West suggests that there are no interactions with either herbs or modern pharmaceuticals. Few studies, however, have been done to verify these observations.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. New York: DK Publishers, Inc., 1996.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1999.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

ORGANIZATIONS

American Association of Oriental Medicine (AAOM). 433 Front Street, Catasauqua, PA 18032. (610) 266 2433.

OTHER

"Gentiana." Plants for a Future. http://www.pfaf.org.

Tish Davidson

Gentiana lutea see **Gentiana**

Geriatric massage

Definition

Geriatric massage is a form of massage designed to meet the specific needs of the elderly population. It involves the use of hands to manipulate the soft tissues of the body to improve blood circulation, relieve **pain**, and increase range of motion. Active or passive movement of the joints may also be part of geriatric massage.

Old people often have a variety of such age-related diseases as **Parkinson's disease**, arthritis, diabetes, or **heart disease**. As a result, they have poor blood circulation and limited physical activity. Many of them are also anxious, depressed and lonely. Geriatric massage can help them maintain and improve their overall health, as well as regain certain physical functions that have been reduced or lost due to **aging**. In addition, it can relieve **anxiety** and **depression** and provide comfort to touch-deprived elderly patients.

Origins

Modern massage techniques were brought into the United States from Sweden in the 1850s by two brothers, Dr. Charles and Dr. George Taylor. Their massage technique was invented by a Swedish fencing instructor named Per Henrik Ling in the 1830s. When he was injured in the elbows, he reportedly cured himself using tapping movements around the affected area. He later developed the technique currently known as **Swedish massage**. This massage technique involves the application of long gliding strokes, friction, kneading and tapping movements on the soft tissues of the body. Passive or active joint movements are also used.

Benefits

Geriatric massage offers the following benefits:

- Increase in blood circulation, thus preventing such complications of diabetes as leg ulcers or gangrene.
- Improvement in lymphatic flow, which increases the excretion of toxic substances from the body.
- Alleviation of headache and pain.
- Speeding up of healing from injury and illness.
- Partial restoration of mobility lost due to Parkinson's disease or arthritis.
- Mental and physical relaxation.
- Improvement in length and quality of sleep.
- Relief of stress, anxiety, depression, and loneliness.
- Improvement of the patient's quality of life and self-esteem.

Description

Geriatric massage uses the same basic massage techniques as general massage. It is, however, tailored to the specific health conditions and needs of the elderly population. Geriatric massage has the following characteristics:

- Short sessions. A geriatric massage session usually lasts no longer than 30 minutes, as a longer session may be too much for an elderly person.
- Use of gentle hand motions. These motions are comfortable and soothing to the body. They are designed to improve blood circulation and heart function,

KEY TERMS

Massage—A rubbing or kneading with hands or other parts of the body to stimulate circulation, make joints more supple, and relieve tension.

Parkinson's disease—A progressive disease caused by degeneration of the basal ganglia of the brain. Its most common symptoms are tremors and muscular rigidity.

Varicose veins—Swollen and distended veins in the superficial skin layer of the legs.

prevent diabetic complications, relieve muscle tension, and relax the body and the mind.

- Passive movement and gentle stretching of shoulders, legs and feet to improve joint mobility and flexibility.
- Gentle massaging of the hands and feet (if the joints are not inflamed) to prevent stiffness and relieve pain.
- Occasional use of stronger movements such as friction and pressure strokes. These are sometimes used to massage such areas as the shoulders to improve flexibility.

Precautions

Geriatric massage should not be used as a replacement for **exercise** programs or medical treatment in nursing homes. In addition, it should not be given to elderly patients with the following conditions:

- broken bones or body areas that are inflamed, swollen or bruised
- open or unhealed bed sores
- varicose veins
- recent surgery
- severe acute pain
- certain heart conditions
- certain kinds of cancer
- a history of blood clots (The blood clots may become dislodged and travel to the lungs as a result of massage.)
- drug treatment with blood thinners (These medications increase the risk of bleeding under the skin.)

Side effects

Geriatric massage is very gentle and rarely causes adverse effects. More vigorous forms of massage, however, have been associated with bleeding in such vital organs as the liver or with the formation of **blood clots**.

Research and general acceptance

Geriatric massage is gaining acceptance in the medical community. It is being prescribed to elderly patients to improve blood circulation and relieve arthritic symptoms. It is sometimes prescribed for Parkinson's disease patients to help improve mobility. While most patients have to pay for this service, some insurance companies do reimburse prescribed massage treatment.

Training and certification

There are 58 school programs accredited by the Commission for **Massage Therapy** Accreditation/Approval in the United States. The schools provide a minimum of 500 hours of massage training. Certified therapists are graduates of these programs who have passed the national certification examination in therapeutic massage. They are also required to participate in continuing education programs to keep their skills current.

Resources

BOOKS

Beck, Mark F. *Milady's Theory and Practice of Therapeutic Massage,* 3rd ed. Albany, NY: Milady Publishing.

Maxwell Hudson, Clare. *Massage: The Ultimate Illustrated Guide*. New York: DK Publishing, Inc., 1999.

ORGANIZATIONS

American Massage Therapy Association. 820 Davis St., Suite 100, Evanston, IL 60201. (847) 864 0123. Fax: (847) 864 1178. info@inet.amtamassage.org. http://www.amtamassage.org.

Day Break Geriatric Massage Project. P.O. Box 1815, Sebastopol, CA 95473.

National Association of Nurse Massage Therapists. 1710 East Linden St., Tucson, AZ 85719.

National Certification Board of Therapeutic Massage and Bodywork. 8201 Greensboro Dr., Suite 300, McLean, VA 22102. (703) 610 9015 or (800) 296 0664.

Mai Tran

German chamomile *see* **Chamomile**

German measles *see* **Rubella**

Gerson therapy

Definition

Gerson therapy aims to treat the whole person, not just symptoms. It is a general cleansing therapy for the entire body. The therapy can achieve the following: **detoxification**, restoration of metabolic functions, enabling the digestion and elimination of **cancer** masses through the bloodstream, and recovery of the organs, especially the liver.

Origins

Max Gerson was a pioneer in the world of alternative medicine. His therapy proved itself by providing a cure for just about every degenerative disease that plagues modern society, at a time when the first rumblings of disenchantment with so-called "modern medicine" were being heard. Among his initial successes was a 99% cure rate at a sanitarium for **tuberculosis**, unheard of with allopathic medicine. Beginning his work in the 1920s in Germany, he later immigrated to the United States, where in 1938 he was licensed to practice in New York. In 1946 he became the first physician to demonstrate recovered cancer patients before a U.S. Congressional Committee. Gerson had a 50% success rate even with terminal cancer patients that allopathic medicine had given up on. Albert Schweitzer referred to him as "a medical genius that walked among us."

Gerson first began to develop his therapy when he discovered that he could cure himself from terrible migraines by eating nothing but fresh fruit and vegetables.

Benefits

Gerson therapy has reported successes with the following: cancer, migraine, ulcers, **asthma**, **glaucoma**, edemas, **eczema**, diabetes, **schizophrenia**, **emphysema**, **epilepsy**, **allergies**, **psoriasis**, tuberculosis, arteriosclerosis, heart diseases, **rheumatoid arthritis**, kidney diseases, lupus erythematosus, **multiple sclerosis**, and high blood pressure; all of them common diseases and conditions. Gerson demonstrated that dramatic initial improvements can be expected within one week of starting his therapy, which involves taking nothing but absolutely fresh fruit and vegetable juices, coffee, **chamomile** and **castor oil** enemas, and additional nutrients according to the prescription of a practitioner who is conversant with the principles of the Gerson therapy.

KEY TERMS

Healing crisis—When the body is supplied with nutrients it needs to heal itself, the first thing it does is to flush out toxins from the cells. When these toxins are circulating in the bloodstream, they produce symptoms such as nausea, fevers, and extreme sensitivity.

Metabolic—Pertaining to chemical processes within the body that result in growth, production of energy and elimination of waste.

Oxidize—When oxygen reacts with a substance, it causes a decomposition of its living elements.

Toxification—When the body is unable to eliminate poisonous substances, they remain clogged in the system and eventually cause a breakdown of normal function.

Description

Gerson described how our food has been affected by the lowering of the quality of soil with the use of artificial fertilizers and pesticides. He went on to describe the growing of fruits and vegetables as the human being's "external metabolism." He lists numerous examples in his book of people from around the world who were living the same existence that they have lived for centuries, untouched by "civilization." These people, he noted, were living free of the diseases that modern societies considered commonplace.

It is essential that the juices for this therapy are organic; any traces of pesticides will prevent success with diseases such as cancer, for it is only when complete detoxification can be achieved that the body will be able to overcome such scourges.

The length of therapy will probably be between two weeks and two months, depending on the illness. For cancer patients, it may be necessary to follow with an easier form of the diet in order to prevent a recurrence. The cost of therapy varies. If carried out at home under the supervision of a physician, the major expenses will be doctor's visits and organic fruit and vegetables. If clinic treatment is preferred, the Gerson Institute can help and advise.

Preparations

The central theory of the Gerson therapy is fresh juices, which should be drunk immediately after they are prepared. When they are left for longer than 20 minutes, the vital enzymes begin to oxidize, and after

about 40 minutes, will no longer be suitable for the therapy. The following should also be observed:

- A press type juicer should be used; centrifuges do not produce satisfactory juice for this treatment.
- Fresh veal liver should be juiced (under 4 lb) and the juice drunk raw (Gerson could find nothing better for replacing vital enzymes necessary for repairing the human organism).
- Cooking and enema water should be free of chemicals.
- Salt, tobacco, alcohol, and black tea are forbidden.
- No drugs should be taken except aspirin. Gerson's prescription for pain relief consisted of the following: coffee enemas (given every two hours if necessary), 5 g of aspirin, 100 mg of vitamin C and 50 mg of niacin, up to four times in the course of 24 hours. He noted that this also produced restful sleep in even the worst cases.
- Toothpaste or anything containing fluoride should be eliminated.
- Aerosol sprays, air fresheners, insecticides, paint fumes etc., should be avoided completely.
- Deodorants, hair dye, perms, cosmetics and aluminum cooking pans should be eliminated.
- Proteins, fats and oils must be eliminated, along with all smoked, canned and processed foods.
- The diet should be strictly adhered to, along with all medication, and the prescribed enemas.
- Chemotherapy, radiation therapy etc., must be avoided as they damage the immune system and hinder healing.

Precautions

The Gerson therapy is a powerful tool for detoxification, and can produce healing crises. Most patients experience **nausea** and fevers when the initial flush of toxins is released into the bloodstream. Enemas are designed to help with this, and **peppermint** tea is also recommended. In the case of seriously ill patients, it is advisable to have an understanding practitioner on hand to help with this difficult process. Some of the methods used in Gerson therapy have produced bad outcomes. Coffee enemas have been known to cause deaths and patients undergoing Gerson therapy have been admitted to the hospital with bacterial **infections** most likely caused by ingesting raw calf's liver.

Side effects

Patients are warned that after detoxification by the Gerson therapy, the body becomes hypersensitive to drugs, particularly anesthetic. Dentists should be advised of this, and no drugs should be taken without the advice of a physician.

Research and general acceptance

In 1946 Gerson's therapy was out-voted in congress by four votes in favor of surgery, radiation, and chemicals. This situation remains today, despite increased popularity of alternative and complementary medicine. In 1990, two agencies reviewing patient records could find no evidence that the method was effective in treating cancer. However, many alternative practitioners have shown that detoxification can improve the effectiveness of healing techniques.

Training and certification

The Gerson Institute maintains a list of practitioners specializing in the Gerson method.

Resources

BOOKS

Gerson, Max. *A Cancer Therapy, Results of Fifty Cases*. Bonita, CA: Gerson Inst., 1958.

PERIODICALS

"Gerson Method." *Cancer* (July August 1990): 252 255.

Hunter, Beatric Trum. "Improving the Quality of One's Life (Book Corners)." *Townsend Letter for Doctors and Patients* (July 2002): 131.

ORGANIZATIONS

The Gerson Institute. P.O. Box 430, Bonita, CA 92002. (619) 585 7600. Fax: (619) 585 7610. http://www.gerson.org.

Patricia Skinner
Teresa G. Odle

Ginger

Description

Ginger (*Zingiber officinale*) belongs to the Zingiberaceae plant family, which also includes **turmeric** and cardamom. Ginger comes from the Sanskrit word "hornroot." It grows in Jamaica, India, Haiti, Hawaii, and Nigeria. This perennial plant grows 3-4 ft (0.9-1.2 m) tall. It has thin, sharp leaves 6-12 in (15-30 cm) long. The tangled, beige root is used medicinally, and can be 1-6 in (2.5-15 cm) in length. The root has a sharp, pungent taste and aroma.

Ginger contains several chemical components:

KEY TERMS

Atherosclerosis—Artery disorder where plaque forms on the arteries. The plaque is usually made up of cholesterol and lipids.

Duodenum—The beginning of the small intestine.

Eclectics—Nineteenth century herbal scientists in the United States who founded the Reformed Medical School. Their outlook was based on herbal medicines of Europe, Asia, and Indian.

Lactobacillus—The healthy bacteria found in the intestine.

Lipids—Groups of oily substances, such as fatty acids, stored in the body as energy reserves.

Perennial—A plant that lives for many years; comes back yearly without replanting.

Protease—The enzyme that digests proteins.

Protein—Complex groups of substances (including nitrogen, carbon, oxygen, iron, and hydrogen) that contain amino acids. Protein is vital to all animals because it makes up the hormones and enzymes controlling the body's actions.

Starch—Complex carbohydrates.

- starch (50%)
- protein (9%)
- lipids (including glycerides, phosphatidic acid, lecithins, and fatty acids; 6-8%)
- protease (2.26%)
- volatile oils (including gingerol, shogoal, zingiberene, and zingiberol; 1-3%)
- pungent principles
- vitamins A and B_3 (niacin)

The pungent principles (including the volatile oil gingerol) are the most medicinally potent because they inhibit prostaglandin and leukotriene formations (products in the body that influence blood flow and inflammation). They also give ginger its pungent aroma.

General use

Historically, ginger has been used to aid digestion. According to Michael Castleman in *The Healing Herbs*, ancient Greeks wrapped ginger inside their bread and ate it as an after-dinner digestive. This practice led to their invention of gingerbread. English society concocted ginger beer to soothe the stomach. In the 1800s, the Eclectics used ginger powder and tea for several digestive complaints, including **indigestion**, **gas**, **nausea**, and infant **diarrhea**.

Beginning in the 1980s, several studies have shown that ginger is useful in aiding digestion. A 1999 German study reported the results from 12 volunteers who took 100 mg twice daily of ginger extract when **fasting** and then with a meal. In both instances, ginger was linked to increased digestive movement through the stomach and duodenum.

A study in India published in 2000 reported the effects of ginger (in combination with other spices including cumin, **fenugreek**, and mustard) on pancreatic action in rats. During the eight-week study, the combination of spices in more than a single dose stimulated several **digestive enzymes** in the pancreas.

The Japanese use ginger as an antidote for fish poisoning, especially with sushi. Ginger is thought to fight harmful intestinal bacteria (like *E. coli*, *Staphylococcus*, and *Streptococcus*) without killing beneficial bacteria. Ginger aids *Lactobacillus* growth in the intestines while killing the *Schistosoma* and *Anisakis* parasites.

Because ginger is an antibacterial, it can work against ulcers caused by *Helicobacter pylori*. Ginger creates an anti-ulcer environment by multiplying the stomach's protective components. Ginger's anti-inflammatory abilities have also been shown to help reduce hip and **knee pain** in some **osteoarthritis** patients.

According to a 1998 report that reviewed the results from 10 clinical studies, ginger also helps to suppress the nausea and **vomiting** associated with **pregnancy**. However, a 2002 conference presentation cautions family physicians to reconsider recommending ginger to their pregnant patients because of the possibility for miscarriage.

Ginger lowers **cholesterol** levels by impairing cholesterol absorption, helping it convert to bile acids and then increasing bile elimination. In a 1998 study, rabbits were fed both cholesterol and 200 mg of ginger extract. The rabbits had a smaller amount of **atherosclerosis**. Ginger also enhances blood circulation and acts as a blood thinner.

Coughs can be relieved by drinking ginger tea made from dried or powdered ginger. It is ginger's pungent taste that releases secretions to help throat congestion.

Preliminary studies also show ginger may have potential cancer-fighting properties. No definitive results have been reported and research continues.

Preparations

Ginger is used in teas, ginger ale, ginger beer, capsules, broths, and as a spice when cooking Asian and Jamaican dishes. Ginger tea for coughs, nausea, digestion, and arthritis can be made by adding 2 tsp (10 ml) of freshly grated root or powdered root to 1 cup (250 ml) of boiling water and steeping for 10 minutes. A cup of the ginger tea, while still warm, should be sipped every 2-2.5 hours.

A compress for arthritic **pain** can be made by grating an unpeeled ginger root in a clockwise direction, then tying it in a moistened muslin cloth, dropping it in a pot of boiling water, and letting it simmer. When the broth is removed from the stove, a cotton cloth is dipped into the broth and the excess moisture squeezed into the pot. While lying flat on the back, the person places the cloth on the aching body part. The broth can also be added to the bath for soaking.

Ginger comes in 250-500 mg capsules of dried ginger root. One to 2 grams of dry powered ginger equals about 1/3 oz of fresh ginger (10 g). A cup of ginger tea contains 250 mg; an 8 oz glass of ginger ale contains 1,000 mg, and a spiced dish contains 500 mg. To prevent **motion sickness**, German health authorities recommend 2-4 g of powdered ginger daily. Another recommended dose is 250 mg four to six times a day.

To bring more blood circulation to arthritic joints, one to two capsules (250 mg each) per day are recommended initially. If results are good, the amount can be increased to six per day, taken between meals.

Ginger can be taken with onions and **garlic**. These agents work in harmony to stimulate the pancreas and decrease cholesterol.

As a blood thinner, two 250 mg capsules of ginger can be taken between meals up to three times a day.

Precautions

Despite studies showing ginger's aid for pregnancy nausea, the German Commission E has recommended that pregnant women not use ginger. Some studies indicate that high amounts of ginger might cause miscarriages. Researchers cannot follow up their suspicions with human clinical trials because of the danger posed to unborn fetuses. Dosages over 6 g could cause gastric problems and possibly ulcers. Ginger may slow down blood clotting time. Before taking ginger, consumers should check dosages with a healthcare provider.

Consumers should not ingest the whole ginger plant; it has been found to damage the liver in animals. Ginger root is not recommended for people with **gallstones**.

Side effects

Ginger may cause **heartburn**.

Interactions

Ginger can interfere with the digestion of iron- and fat-soluble vitamins. Ginger also interacts with several medications. The herb can inhibit warfarin **sodium**, which is a blood thinner. Ginger can also interfere with absorption of tetracycline, digoxin, sulfa drugs, and phenothiazines. Consumers should check with their healthcare provider for drug or other interactions.

Resources

BOOKS

Castleman, Michael. *The Healing Herbs*. Emmaus, PA: Rodale Press, 1991.

Heinerman, John. *Heinerman's Encyclopedia of Healing, Herbs & Spices*. Upper Saddle River, NJ: Prentice Hall, 1996.

Landis, Robyn, with Karta Pukh Singh Khalsa. *Herbal Defense*. New York: Warner Books, Inc. 1997.

Murray, Michael, N.D. *The Healing Power of Herbs*. 2nd ed. Roseville, CA: Prima Publishing, 1995.

PERIODICALS

Jancin, Bruce. "Ginger for Nausea in Pregancy: Use Cau tion. (Good Efficacy, Lingering Safety Issues)." *Family Practice News* (January 15, 2002): 16.

Tyler, Varro E., Ph.D., Sc.D. "Honest Herbalist: Spotlight on Ginger." *Prevention Magazine* (February 1998): 82 85.

Sharon Crawford
Teresa G. Odle

Gingivitis *see* **Gum disease**

Ginkgo biloba

Description

Ginkgo biloba, known commonly as the maidenhair tree, is one of the oldest trees on Earth, once part of the flora of the Mesozoic period. The ginkgo tree is the only surviving species of the Ginkgoaceae family. This ancient deciduous tree may live for thousands of years. Ginkgo is indigenous to China, Japan, and Korea, but it also thrived in North America and Europe prior to the Ice Age. That drastic climate change destroyed the wild ginkgo tree throughout much of the world. In China, ginkgo was cultivated in temple gardens as a sacred tree known as *bai gou*, thus assuring its survival there for more than 200

million years. Ginkgo fossils found from the Permian period are identical to the living tree, which is sometimes called a living fossil.

Ginkgo trees may grow to 122 ft (37.2 m) tall and measure 4 ft (1.2 m) in diameter. The female trees have a somewhat pointed shape at the top, like a pyramid. The male trees are broader at the crown. The bark of the ornamental ginkgo tree is rough and fissured and may be ash to dark-brown in color. Distinctive, fan-shaped leaves with long stalks emerge from a sheath on the stem. Leaves are bright green in spring and summer and turn golden yellow in the fall. Ginkgo trees may take as long as 30 years to flower. Ginkgo is dioecious, with male and female flowers blooming on separate trees. Blossoms grow singly from the axils of the leaf. The female flowers appear at the end of a leafless branch. The yellow, plum-shaped fruits develop an unpleasant scent as they ripen. They contain an edible inner seed that is available in Asian country marketplaces. Ginkgo's longevity may be due, in part, to its remarkable resistance to disease, pollution, and insect damage. Ginkgo trees are part of the landscape plan in many urban areas throughout the world. Millions of ginkgo trees, grown for harvest of the medicinal leaves, are raised on plantations in the United States, France, South Korea, and Japan, and are exported to Europe for pharmaceutical processing.

General use

Ginkgo leaves, fresh or dry, and seeds, separated from the outer layer of the fruit, are used medicinally. Ginkgo has remarkable healing virtues that have been recorded as far back as 2800 B.C. in the oldest Chinese materia medica. Ginkgo seeds were traditionally served to guests along with alcohol drinks in Japan. An enzyme present in the ginkgo seed has been shown in clinical research to speed up alcohol metabolism in the body, underscoring the wisdom of this folk custom. The leaf extract has been used in Asia for thousands of years to treat **allergies**, **asthma**, and **bronchitis**. It is also valued in Chinese medicine as a heart tonic to aid in the treatment of cardiac arrhythmia. Ginkgo was first introduced to Europe in 1730 and to North America in 1784 where it was planted as an exotic garden ornamental near Philadelphia. Ginkgo medicinal extracts are the primary prescription medicines used in France and Germany.

Ginkgo acts to increase blood flow throughout the body, particularly cerebral blood flow. It acts as a circulatory system tonic, stimulating greater tone in the venous system. The herb is a useful and proven remedy for numerous diseases caused by restricted blood flow. European physicians prescribe the extract for treatment of Raynaud's disease, a condition of impaired circulation to the fingers. It is also recommended to treat intermittent claudication, a circulatory condition that results in painful cramping of the calf muscles in the leg that impairs the ability to walk. German herbalists recommend ingesting the extract for treatment of leg ulcers, and large doses are used to treat **varicose veins**. Ginkgo is widely recommended in Europe for the treatment of **stroke**. The dried leaf extract may also act to prevent hemorrhagic stroke by strengthening the blood capillaries throughout the body. In studies of patients with atherosclerotic clogging of the penile artery, long-term therapy with ginkgo extract has provided significant improvement in erectile function. Ginkgo extract also acts to eliminate damaging free radicals in the body and has been shown to be effective in treatment of **premenstrual syndrome**, relieving tender or painful breasts. Other demonstrated benefits include improved long-distance vision and possible action to reverse damage to the retina of the eye. In addition, the ginkgo extract may provide relief for persons with **headache**, sinusitis, and vertigo.

Ginkgo extract is believed to benefit the elderly. This ancient herb is believed by some to enhance oxygen utilization and thus improve memory, concentration, and other mental faculties, and to relieve mild **depression**. Researchers in Germany, working with patients with mild or severe impairment from **Alzheimer's disease** linked ginkgo use to improvement on certain cognitive tests, and in a French study in 2003, researchers credited ginkgo supplements with long-term benefits that could aid in delaying or preventing the development of Alzheimer's disease. However, in a 2007 Tufts University study, reported in *Tufts University Health and Nutrition Letter*, researchers concluded that ginkgo supplements did not improve the mental performance of elderly persons who were not experiencing **dementia**. Researchers acknowledged that the "null findings" in the study might be due to the already high cognitive functioning of study participants.

The active constituents in the ginkgo tree, known as ginkgolides, interfere with a blood protein known as the platelet activating factor (PAF). Other phytochemicals in ginkgo include flavonoids, **bioflavonoids**, proanthocyanidins, trilactonic diterpenes (including the ginkgolides A, B, C, and M), and bilabolide, a trilactonic sesquiterpene. The therapeutic effects of this herb have not been attributed to a single chemical constituent; rather, the medicinal benefits are due to the synergy between the various chemical constituents. The standardized extract of ginkgo must be taken

consistently to be effective. A period of at least 12 weeks of use may be required before the beneficial results are evident.

Preparations

Ginkgo's active principles are diluted in the leaves. The herb must be processed to extract the active phytochemicals before it is medicinally useful. It would take an estimated 50 fresh ginkgo leaves to yield one standard dose of the extract. Dry extracts of the leaf, standardized to a potency of 24% flavone glycosides and 6% terpenes, are commercially available. A standard dose is 40 mg, three times daily, though dosages as high as 240 mg daily are sometimes indicated.

Ginkgo extracts are widely used in Europe where they are sold in prescription form or over the counter as an approved drug. This is not the case in the United States, where ginkgo extract is sold as a food supplement in tablet and capsule form.

Precautions

Ginkgo is generally safe and non-toxic in therapeutic dosages. Exceeding a daily dose of 240 mg of the dried extract may result in restlessness, **diarrhea**, and mild gastrointestinal disorders. Those on anticoagulants should have their doctor adjust their dose or should avoid ginkgo in order to avoid over-thinning their blood and hemorrhaging. Ginkgo should be avoided two days before and one to two weeks after surgery to avoid bleeding complications. Pregnant women should avoid ginkgo supplements because scientists have discovered a compound called colchicine in the placental blood of women who took ginkgo biloba. A 2002 report cautioned that the compound could cause problems for the growing fetus.

In 2002, a case of ginkgo seed poisoning was reported in a toddler in Japan, but she had ingested 50 or more pieces of roasted ginkgo seeds. She experienced severe **vomiting** and seizures.

Side effects

Severe allergic skin reactions, similar to those caused by poison ivy, have been reported after contact with the fruit pulp of ginkgo. Eating even a small amount of the fruit has caused severe gastrointestinal irritation in some persons. People with persistent headaches should stop taking ginkgo. Some patients on medications for nervous system disease should avoid ginkgo. It can interact with some other medicines, but clinical information is still emerging.

Interactions

The chemically active ginkgolides present in the extract, specifically the ginkgolide B component, act to reduce the clotting time of blood and may interact with antithrombotic medicines, including aspirin.

A study reported in 2007 by Gregory Reed of the Kansas Medical Center examined the possible interactions of ginkgo and ginseng supplements with prescription or over-the-counter drugs with regard to how these drugs are metabolized and eliminated by the body. The scientists concluded that these herbal supplements are "unlikely to alter the pharmacokinetics of the majority of prescription or over-the counter drugs."

Resources

PERIODICALS

Carlson, Joseph J., et al. "Safety and Efficacy of a Ginkgo Biloba containing Dietary Supplement on Cognitive Function, Quality of Life, and Platelet Function in Healthy, Cognitively Intact Older Adults." *Journal of the American Dietetic Association* 107, no. 3 (March 2007): 422 432.

"Experimental Therapeutic: Recommended Doses of Gin seng, Ginkgo Biloba Do Not Interfere with Drug Absorption." *Drug Week* (May 18, 2007).

Clare Hanrahan

Ginseng, American

Description

American ginseng, scientific name *Panax quinquefolius*, is a close relative of **Korean ginseng** (*Panax ginseng*), and belongs to the Araliaceae family, which is the same as **Siberian ginseng** (*Eleutherococcus senticosus*). It is a perennial herb, distinguished by its dark green leaves and clusters of red berries, that grows wild in eastern North America. The root of the plant is used medicinally, particularly in China, where **traditional Chinese medicine** places a high value on it.

Of the traditional ginsengs, American ginseng is probably the least used and researched variety. Americans have never been large consumers of American ginseng. In the past, American ginseng was an uncommon folk remedy used as a mild stimulant, tonic, and digestive aid. Most of this herb was exported to China, where most ginseng is consumed, American ginseng is considered a less potent member of the ginseng family, but it is a highly prized tonic and herbal remedy.

American ginseng was used medicinally by many Native American tribes as a health stimulant and sexual tonic and for various health problems including headaches, female **infertility**, digestive problems, **fever**, and **earache**. American ginseng was introduced by Native Americans to European settlers in North America in the early 1700s. A French Jesuit priest named Jartoux had traveled through China and was convinced of the medicinal powers of Korean ginseng. In 1714, he published a paper in Britain about Korean ginseng and its healing powers, and theorized that the plant may grow wild in the favorable climate of North America. Another Jesuit missionary in Canada, Joseph Lafitau (1681-1746), read the article and began searching the woods near his dwelling. Lafitau found American ginseng plants, which bear a close resemblance to their Asian cousins, and sent samples of them to China. A thriving trade of American ginseng began around 1718, it was sent to the Orient, gathered by Native Americans, French fur traders, and early frontiersmen including Daniel Boone.

American ginseng grows wild in the forests of the eastern United States and southeastern Canada. It grows in shady, moist and hilly regions, but the plant is becoming increasingly scarce due to over-harvesting and logging practices. In Kentucky, Tennessee, Virginia, and Illinois, American ginseng holds status as a threatened or an endangered species. Some botanists believe that pollution and a thinning ozone layer are contributing to its decline. Efforts at protecting wild American ginseng have not been successful, as the demand for it in the Far East makes it a lucrative crop for poachers. It sometimes sells for as much as $600-800 per pound.

The majority of American ginseng on the market is now cultivated, although it is a sensitive plant and difficult to farm. In the United States, Wisconsin grows 80% of the American ginseng crop. Canada grows more American ginseng than any country, and is second only to China in total ginseng production.

Scientific research

The majority of research performed on ginseng has been done on the Korean and Siberian varieties. Clinical and chemical research on American ginseng is yet to be done. One reason for this is the American medical establishment's skepticism of herbal remedies.

American ginseng is classified as an adaptogen, which is a substance that helps the body adapt to **stress** and improves immune response. Adaptogens must also be non-toxic and cause no major physiological changes or side effects. American ginseng root has an array of complex chemicals, and scientists have determined that the active ingredients are saponin triterpenoid glycosides, or chemicals commonly called ginsenocides. American ginseng contains nearly 30 ginsenocides. However, American ginseng has been found to contain higher levels of ginsenocide Rb1, which has a sedative effect on the central nervous system, than other species of ginseng. Thus, scientific research has been consistent with Chinese herbalists' claims that American ginseng is less stimulating than Korean ginseng. The research implies that American ginseng can provide the strengthening and immune-enhancing effects of other ginseng without overstimulation to those people with high levels of stress and mental stimulation. American ginseng may be the best ginseng for Americans, whose fast-paced and energetic lifestyles may call for more calming and balancing herbs.

KEY TERMS

Adaptogen—Substance that helps the body adapt to any stress.

Ginseng intoxication—Possible side effects of taking *Panax ginseng* products.

Ginsenocides—Active chemicals found in American ginseng.

General use

American ginseng can be used by those people who seek the adaptogenic effects (toning, strengthening, and immune enhancing effects) of *Panax ginseng* without the highly stimulating aspects. Chinese herbalists consider American ginseng to be a cooling herb, so it can be used as a tonic and immune strengthener for people who are over-stressed or who have hot conditions like high blood pressure, excess nervous energy, or ulcers. American ginseng, according to Chinese herbalists, is more suitable and balancing for women and children than *Panax ginseng*, and is more applicable for the elderly who wish to avoid stimulants. American ginseng is also used in Chinese medicine for chronic fevers; to aid in the recovery of infectious diseases; for strengthening the lungs in cases of **tuberculosis**, **bronchitis** and **asthma**; and for the loss of the voice associated with respiratory disorders.

Preparations

American ginseng can be purchased as whole roots, powder, capsules, or a liquid tincture. For whole roots, wild ginseng is the highest quality and also the most

expensive. Also available are organically grown cultivated roots, which are free from pesticides and chemicals. The easiest way to prepare ginseng roots is to make a tea from them. Ginseng roots are very hard and brittle. They should be sliced and simmered in water for 45 minutes or longer to extract the majority of ginsenocides. Experts recommend avoiding metal pots, which can reduce its antioxidant properties. Some herbalists recommend boiling **ginger** or **licorice** root with American ginseng to increase its effectiveness. For each serving of tea, two or more teaspoons of ginseng root are recommended.

Ginseng root can also be made into a tincture using alcohol, as ginsenocides are soluble and well-preserved in alcohol. Vodka or clear alcohol can be used, and the ginseng roots should be chopped finely or put in a blender with the alcohol. Enough alcohol should be used to completely saturate and cover the roots, and the solution should be kept in a sealed glass bottle for a month or longer. The solution should be shaken frequently to promote the extraction process. The liquid can be strained from the roots after distilling, and kept for up to three years. Half a teaspoon or more of the solution can be taken as a daily serving.

Ginseng powder is also available and can be made into tea or taken with water or juice. One half to one teaspoon is recommended per serving. Extracts of American ginseng are also available in liquid or tablet form, some of which offer standardized quantities of ginsenocides. Packages of standardized products should be labeled with the appropriate dosage.

American ginseng is usually taken two to three times per day between meals. It should not be taken continuously for long periods of time, unless prescribed by a doctor.

Precautions

Pregnant women should use American ginseng only under a doctor's orders and avoid any products that contain *Panax ginseng*.

Consumers should assure that the American ginseng product they purchase is a reputable one. Because of the high price and demand of American ginseng, some questionable products are on the market. Generally wild American ginseng is of higher quality than the cultivated plant, and the older and larger the root, the higher the quantity of ginsenocides present. In addition, consumers should be careful not to confuse American ginseng with *Panax ginseng*, which has been shown to produce more serious adverse side effects. A 2002 report stated that the effects of *Panax ginseng* seemed more likely when the herb was used in combination with other products than when it was used alone.

Side effects

In general, American ginseng is gentle and side effects are rare. Side effects may occur with American ginseng when taken in the wrong dosages, over too long a time, or by people whose constitutions, **allergies**, or health conditions disagree with the herb. Also, products combining Korean ginseng with American ginseng may increase the chances for side effects.

Interactions

Due to the lack of research done on American ginseng, no known interactions are reported.

Resources

BOOKS

Duke, J.A. *Ginseng: A Concise Handbook*. Algonac, MI: Reference Publications, 1989.

Foster, S., and Y. Chongxi. *Herbal Emissaries*. Rochester, VT: Healing Arts Press, 1992.

Fulder, Stephan. *The Book of Ginseng and Other Chinese Herbs for Vitality*. Rochester, VT: Healing Arts Press, 1993.

Hobbs, Christopher. *Ginseng: The Energy Herb*. Loveland, CO: Botanica Press, 1996.

PERIODICALS

Walsh, Nancy. "Adverse Events Seen with Ginseng Combina tions. (Post Menopausal Bleeding, Agracnulocytosis)." *OB GYN News* (March 1, 2002): 24.

ORGANIZATIONS

American Botanical Council and Herb Research Founda tion. *HerbalGram*. P.O. Box 144345, Austin, TX 78714 4345. (800) 373 7105. http://www.herbalgram.org.

New York Ginseng Association. P.O. Box 127, Roxbury, NY 12474. (607) 326 3005.

Douglas Dupler
Teresa G. Odle

Ginseng, Korean

Description

Korean ginseng is one of the most widely used and acclaimed herbs in the world. Its scientific name is *Panax ginseng*, which is the species from which Chinese, Korean, red, and white ginseng are produced. Chinese and Korean ginseng are the same plant cultivated in different regions, and have slightly different

Dried Korean ginseng. *(Custom Medical Stock Photo. Reproduced by permission.)*

properties according to Chinese medicine. White ginseng is simply the dried or powdered root of Korean ginseng, while red ginseng is the same root that is steamed and dried in heat or sunlight. Red ginseng is said to be slightly stronger and more stimulating in the body than white, according to Chinese herbalism.

Korean ginseng has had a long and illustrious history as an herb for health, and has been used for thousands of years throughout the Orient as a medicine and tonic. Early Chinese medicine texts written in the first century A.D. mention ginseng, and ginseng has long been classified by Chinese medicine as a "superior" herb. This means it is said to promote longevity and vitality. Legends around the world have touted ginseng as an aphrodisiac and sexual tonic. Researchers have found a slight connection between sex drive and consuming ginseng, although a direct link and the mechanism of action are still researched and disputed.

Korean ginseng grows on moist, shaded mountainsides in China, Korea, and Russia. It is a perennial herb that reaches heights of 2 ft (0.8 m) or more, and is distinguished by its dark green leaves and red clusters of berries. The root of the plant is the part valued for its medicinal properties. The root is long and slender and sometimes resembles the shape of the human body. Asian legends claim that this "man-root" has magical powers for those lucky enough to afford or find it, and the roots bearing the closest resemblance to the human body are still the most valuable ones. The word *ren shen* in Chinese means roughly "the essence of the earth in the shape of a man."

Korean ginseng has historically been one of the most expensive of herbs, as it has been in high demand in China and the Far East for centuries. Wars have been fought in Asia over lands where it grew wild. Wild Korean ginseng is now nearly extinct from many regions. Single roots of wild plants have recently been auctioned in China and New York City for sums approaching $50,000. Most of the world's supply of Korean ginseng is cultivated by farmers in Korea and China.

KEY TERMS

Adaptogen—Substance that improves the body's ability to adapt to stress.

Ginsenocide—Active substances found in ginseng.

Because of the number of herbs sold under the name of ginseng, there can be some confusion for the consumer. Korean ginseng is a member of the *Araliaceae* family of plants, which also includes closely related **American ginseng** (*Panax quinquefolius*) and **Siberian ginseng** (*Eleutherococcus senticosus*). Both American and Siberian ginseng are considered by Chinese herbalists to be different herbs than Korean ginseng, and are said to have different effects and healing properties in the body. To add more confusion, there are eight herbs in Chinese medicine that are sometimes called ginseng, including black ginseng, purple ginseng, and prince's ginseng, some of which are not at all botanically related to *Panax ginseng*, so consumers should choose ginseng products with awareness.

General use

The word *panax* is formed from Greek roots meaning "cure-all," and *Panax ginseng* has long been considered to be one of the great healing and strengthening herbs in natural medicine. Ginseng is classified as an *adaptogen*, which is a substance that helps the body adapt to **stress** and balance itself without causing major side effects. Korean ginseng is used as a tonic for improving overall health and stamina, and Chinese herbalists particularly recommend it for the ill, weak, or elderly. Korean ginseng has long been asserted to have longevity, anti-senility, and memory improvement effects in the aged population. As it helps the body to adapt to stress, athletes may use ginseng as herbal support during rigorous training. Korean ginseng generally increases physical and mental energy. It is a good tonic for the adrenal glands, and is used by those suffering from exhaustion, burnout, or debilitation from chronic illness.

Traditional Chinese medicine also prescribes Korean ginseng to treat diabetes, and research has shown that it enhances the release of insulin from the pancreas and lowers blood sugar levels. Korean

ginseng has been demonstrated to lower blood **cholesterol** levels. It has also been shown to have antioxidant effects and to increase immune system activity, which makes it a good herbal support for those with **cancer** and **AIDS** and other chronic conditions that impair the immune system. Further uses of Korean ginseng in Chinese medicine include treatment of **impotence**, **asthma**, and digestive weakness.

Research

Scientists have isolated what they believe are the primary active ingredients in ginseng, chemicals termed *saponin triterpenoid glycosides*, or commonly called *ginsenocides*. There are nearly 30 ginsenocides in Korean ginseng. Much research on Korean ginseng has been conducted in China, but controlled human experiments with it have not been easily accessible to the English-speaking world. Recent research in China was summarized by Dr. C. Lui in the February 1992 issue of the *Journal of Ethnopharmacology*, where he wrote that *Panax ginseng* was found to contain 28 ginsenocides that "act on the central nervous system, cardiovascular system and endocrine secretion, promote immune function, and have effects on anti-aging and relieving stress."

To summarize other research, Korean ginseng has been shown in studies to have significant effects for the following:

- Physical improvement and performance enhancement for athletes: A study performed over three years in Germany showed athletes given ginseng had favorable improvement in several categories over a control group who took a placebo. Another 1982 study showed that athletes given ginseng had improved oxygen intake and faster recovery time than those given placebos.
- Mental performance improvement and mood enhancement: In general, studies show that ginseng enhances mental performance, learning time, and memory. One study of sixteen volunteers showed improvement on a wide variety of mental tests, including mathematics. Another study showed that those performing intricate and mentally demanding tasks improved performance when given Korean ginseng. Finally, a study has shown improvement of mood in people with depression with the use of ginseng.
- Antifatigue and antistress actions: Patients with chronic fatigue who were given ginseng showed a statistically significant improvement in physical tests and in mental attention and concentration, when compared with those given placebos.
- Lowering blood sugar: Animal studies have shown that ginseng can facilitate the release of insulin from the pancreas and increase the number of insulin receptors in the body.
- Antioxidant properties: Scientific analysis of ginseng has shown that it has antioxidant effects, similar to the effects of vitamins A, C, and E. Thus, ginseng could be beneficial in combating the negative effects of pollution, radiation, and aging.
- Cholesterol reduction: Some studies have shown that Korean ginseng reduces total cholesterol and increases levels of good cholesterol in the body.
- Anticancer effects and immune system stimulation: Several tests have shown that Korean ginseng increases immune cell activity in the body, including the activity of T-cells and lymphocytes, which are instrumental in fighting cancer and other immune system disorders like AIDS. A Korean study indicates that taking ginseng may reduce the chances of getting cancer, as a survey of more than 1,800 patients in a hospital in Seoul showed that those who did not have cancer were more likely to have taken ginseng regularly than those patients who had contracted cancer.
- Physical and mental improvement in the elderly: One study showed significant improvement in an elderly test group in visual and auditory reaction time and cardiopulmonary function when given controlled amounts of Korean ginseng. Korean ginseng has also been shown to alleviate symptoms of menopause.
- Impotence: Studies of human sexual function and Korean ginseng have been generally inconclusive, despite the wide acclaim of ginseng as a sexual tonic. Tests with lab animals and ginseng have shown some interesting results, indicating that Korean ginseng promotes the growth of male reproductive organs, increases sperm and testoterone levels, and increases sexual activity in laboratory animals. In general, scientists believe the link between ginseng and sex drive is due to ginseng's effect of strengthening overall health and balancing the hormonal system.

Preparations

Korean ginseng can be purchased as whole roots, powder, liquid extracts, and tea. Roots should be sliced and boiled in water for up to 45 minutes to extract all the beneficial nutrients. One to five grams of dry root is the recommended amount for one serving of tea. Herbalists recommend that ginseng not be boiled in metal pots, to protect its antioxidant

properties. Ginseng should be taken between meals for best assimilation.

Some high quality Korean ginseng extracts and products are standardized to contain a specified amount of ginsenosides. The recommended dosage for extracts containing 4–8% of ginsenosides is 100 mg once or twice daily. The recommended dosage for non-standardized root powder or extracts is 1–2 g daily, taken in capsules or as a tea. It is recommended that ginseng be taken in cycles and not continuously; after each week of taking ginseng, a few days without ingesting the herb should be observed. Likewise, Korean ginseng should not be taken longer than two months at a time, after which one month's rest period should be allowed before resuming the cycle again. Chinese herbalists recommend that ginseng be taken primarily in the autumn and winter months.

Precautions

Consumers should be aware of the different kinds of ginseng, and which type is best suited for them. Red Korean ginseng is considered stronger and more stimulating than white, wild ginseng is stronger than cultivated, and Korean ginseng is generally believed to be slightly stronger than Chinese. Furthermore, American and Siberian ginseng have slightly different properties than Korean ginseng, and consumers should make an informed choice as to which herb is best suited for them. Chinese herbalists do not recommend Korean ginseng for those people who have "heat" disorders in their bodies, such as ulcers, high blood pressure, tension headaches, and symptoms associated with high stress levels. Korean ginseng is generally not recommended for those with symptoms of nervousness, mental imbalance, inflammation, or **fever**. Korean ginseng is not recommended for pregnant or lactating women, and women of childbearing age should use ginseng sparingly, as some studies imply that it can influence estrogen levels. Also, Chinese herbalists typically only prescribe ginseng to older people or the weak, as they believe that younger and stronger people do not benefit as much from it and ginseng is "wasted on the young."

Because of the number of and demand for ginseng products on the market, consumers should search for a reputable brand, preferably with a standardized percentage of active ingredients. To illustrate the mislabeling found with some ginseng products, *Consumer Reports* magazine analyzed 10 nationally-distributed ginseng products in 1995. They found that several of them lacked significant amounts of ginsenocides, despite claims on the packaging to the contrary. Ginseng fraud has led the American Botanical Council to initiate the Ginseng Evaluation Program, a comprehensive study and standardization of ginseng products on the American market. This study and its labeling standards are still under development, and consumers should watch for it.

Side effects

Korean ginseng acts as a slight stimulant in the body, and in some cases can cause overstimulation, irritability, nervousness and **insomnia**, although strong side effects are generally rare. Taking too high a dosage of ginseng, or taking ginseng for too long without a break, can cause *ginseng intoxication*, for which symptoms might include headaches, insomnia, seeing spots, **dizziness**, shortage of breath and gastrointestinal discomfort. Long-term use may cause menstrual abnormalities and breast tenderness in some women.

Interactions

Those taking hormonal drugs should use ginseng with care. Ginseng should not be taken with **caffeine** or other stimulants as these may increase its stimulatory effects and cause uncomfortable side effects. In early 2002, researchers reported that adverse effects and drug interactions from ginseng were more likely to occur when it was used in combination with other products than when ginseng was used alone.

Resources

BOOKS

Duke, J.A. *Ginseng: A Concise Handbook*. Algonac, MI: Reference Publications, 1989.

Foster, S., and Chongxi, Y. *Herbal Emissaries*. Rochester, VT: Healing Arts Press, 1992.

Fulder, Stephan. *The Book of Ginseng and Other Chinese Herbs for Vitality*. Rochester, VT: Healing Arts Press, 1993.

Hobbs, Christopher. *Ginseng: The Energy Herb*. Loveland, CO: Botanica Press, 1996.

PERIODICALS

HerbalGram (a quarterly journal of the American Botanical Council and Herb Research Foundation). P.O. Box 144345, Austin, TX 78714 4345. (800) 373 7105.

Walsh, Nancy. "Adverse Events Seen with Ginseng Combi nations (Effects Reversible and Mild)." *Internal Medi cine News* (January 15, 2002): 17.

Douglas Dupler
Teresa G. Odle

Ginseng, Siberian

Description

Siberian ginseng, *Eleutherococcus senticosus*, is also known as eleuthero ginseng or eleuthero. It is in the same botanical family as **Korean ginseng** (*Panax ginseng*) and **American ginseng** (*Panax quinquefolius*). Siberian ginseng is one of the most widely used herbs in the world.

Siberian ginseng is a thin, thorny shrub that grows up to 15 ft (4.6 m) high. It is native to forests in southeastern Russia, northern China, Japan, and Korea. The root of the plant is used medicinally.

The family of ginseng plants has historically been used for medicinal purposes. Korean ginseng, also called Asian, red, or white ginseng, has been used in China for thousands of years. In China, it is a celebrated herb known to promote strength, energy, and longevity. American ginseng was discovered in North America in the early 1700s, and has since been used as a medicine and tonic. Siberian ginseng has been used in Chinese medicine for more than 2,000 years, to increase energy and vitality and to treat respiratory and other **infections**, although Chinese herbalists use Korean and American ginseng much more frequently. Siberian ginseng was used in Eastern Europe as a folk remedy for hundreds of years, but it was not until the 1940s that it became a popular herb in Russia and Europe.

The Russian physician I. I. Brekhman is credited with making Siberian ginseng popular. Brekhman had studied Korean ginseng in the 1940s and documented some of its effects on the body. He determined that ginseng was an adaptogen. To be classified as an adaptogen, an agent must be shown to help the body adapt to **stress**, improve balance and overall immune function, be non-toxic and cause minimal side effects. Brekhman searched his native Russian forests for an alternative to expensive Korean ginseng, and concentrated on Siberian ginseng. Brekhman discovered that Siberian ginseng was also an adaptogen, offering some of the same benefits of Korean ginseng, although containing a different chemical composition.

During the next 30 years in the Soviet Union, Siberian ginseng became the focus of many studies. It was found to increase endurance and performance of athletes, and many famous Soviet Olympic champions included Siberian ginseng as part of their training programs. Siberian ginseng was so touted that Soviet astronauts carried it into space with them, as opposed to the amphetamines carried by American astronauts.

KEY TERMS

Adaptogen—Substance that helps the body adapt to stress.

Eleutheroside—Active chemical found in Siberian ginseng.

Soviet scientists found that Siberian ginseng strengthened the immune system, and gave Siberian ginseng to highly stressed workers as herbal support. After the Chernobyl nuclear accident, Siberian ginseng was given to people who had been exposed to radiation.

Research

Siberian ginseng's active ingredients are a complex group of chemicals called *eleutherosides*. Eleutherosides are different than the ginsenocides found in the *Panax* varieties of ginseng, which is consistent with Chinese herbalists' claims that Siberian ginseng acts differently in the body than Korean or American ginseng. There has been some debate among herbalists whether Siberian ginseng should be considered a true ginseng at all, due to this difference in active ingredients.

Much of the research done on Siberian ginseng was performed by Soviet scientists in the former Soviet Union. Many of the study results are still unavailable in English. Those that have been translated and more recent studies have corroborated the benefits of Siberian ginseng.

- Siberian ginseng has been documented in many studies to improve physical endurance, oxygen uptake, recovery, and overall performance in athletes, ranging from runners to weightlifters. A 1986 study in Japan showed that eleuthero ginseng improves oxygen uptake in exercising muscle.
- Siberian ginseng normalized blood pressure in patients with high and low blood pressure. Siberian ginseng has been shown to reduce stress symptoms in general. A 1996 study in Japan concluded that Siberian ginseng can protect against gastric ulcers.
- Animal studies showed Siberian ginseng helped fight against toxic chemicals and exposure to harmful levels of radiation. A 1992 Russian study showed that Siberian ginseng reduced the occurrence of tumors in rats when exposed to radiation. Another Russian study showed that women undergoing radiation for breast cancer had a significant reduction of side effects when given Siberian ginseng.

- A 1987 German study, using human subjects in a double-blind test, demonstrated that eleuthero ginseng boosts immune system response and enhances the body's overall resistance to infection. Other studies have shown that Siberian ginseng increases activity of lymphocytes and killer cells in the immune system.

General use

Siberian ginseng can be used as an overall strengthener for the body and immune system. It is an effective herbal support for stress, **fatigue**, and exhaustion; for athletes in training; for prevention of colds and flus; for those undergoing chemotherapy or radiation treatment; and for people with chronic diseases such as chronic fatigue, **fibromyalgia**, or **AIDS**. Siberian ginseng is also used to aid recovery from nervous conditions like **depression**, **anxiety**, or nervous breakdown.

A group of Armenian researchers reported in 2003 that a compound containing Siberian ginseng is safe and effective in treating familial Mediterranean **fever**, an inherited disorder characterized by recurrent attacks of fever and severe abdominal **pain**.

Preparations

Siberian ginseng is available as a fresh root or dried root powder, tea, liquid extract, or capsule/tablet form. The recommended dosage for root powder is 1–2 g daily, taken in capsules or mixed with water or juice. Dosages should be divided and taken two or three times per day, between meals. The dosage for the liquid extract is1–2 ml twice daily. Recently, Siberian ginseng products have been made available that contain standardized percentages of eleutherosides. Siberian ginseng can be taken continuously, but it is generally recommended that for every three months of ginseng use, two- to four-week rest periods should be observed. Siberian ginseng is sometimes combined with other adaptogens, like Korean or American ginseng, **astragalus**, or **schisandra**, to increase its effectiveness.

Precautions

Pregnant women and children should use Siberian ginseng with caution, consulting a practitioner prior to use. Those taking hormonal drugs should use ginseng with care. Furthermore, consumers should be aware of the different medicinal properties of Korean, American, and Siberian ginseng, in order to choose the herb best suited for their constitution and health conditions.

Consumers should choose only high-quality ginseng products made by reputable manufacturers. In a 1995 *Consumer Reports* magazine analysis of 10 nationally distributed ginseng products, several brands were lacking in active ingredients. Ginseng product fraud has led the American Botanical Council to initiate the Ginseng Evaluation Program. Started in 1993, this program provides a comprehensive study of ginseng products and has enacted measures to reduce mislabeling and increase consumer confidence in ginseng products. In 1999, however, the Center for Food Safety and Applied Nutrition of the Food and Drug Administration (FDA) reported several instances of Siberian ginseng products that contained pieces of the roots and leaves of a hazardous plant, *Periploca sepium*.

Side effects

In general, side effects with Siberian ginseng are rare and more mild than those that occur with American and Korean ginseng. Mild **diarrhea** has been reported with its use, and **insomnia** may occur if it is taken too close to bedtime.

Siberian ginseng appears to be less likely than most herbs to interact with other medications. Researchers in South Carolina reported in 2003 that Siberian ginseng did not affect the body's metabolism of such drugs as dextromethorphan and benzodiazepine tranquilizers when the ginseng was taken in recommended dosages.

Resources

BOOKS

Duke, J.A. *Ginseng: A Concise Handbook*. Algonac, MI: Reference Publications, 1989.

Foster, S., and Y. Chongxi. *Herbal Emissaries*. Rochester, VT: Healing Arts Press, 1992.

Fulder, Stephan. *The Book of Ginseng and Other Chinese Herbs for Vitality*. Rochester, VT: Healing Arts Press, 1993.

Hobbs, Christopher. *Ginseng: The Energy Herb*. Loveland, CO: Botanica Press, 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Western Herbalism. New York: Simon & Schuster, 2002.

PERIODICALS

Amaryan, G., V. Astvatsatryan, E. Gabrielyan, et al. "Double Blind, Placebo Controlled, Randomized, Pilot Clinical Trial of ImmunoGuard A Standardized Fixed Combination of *Andrographis paniculata Nees*, with *Eleutherococcus senticosus Maxim*, *Schizandra chinensis Bail.* and *Glycyrrhiza glabra L.* Extracts in Patients with Familial Mediterranean Fever." *Phyto medicine* 10 (May 2003): 271 285.

Donovan, J. L., C. L. DeVane, K. D. Chavin, et al. "Siberian Ginseng (*Eleutheroccus senticosus*) Effects on CYP2D6 and CYP3A4 Activity in Normal Volunteers." *Drug Metabolism and Disposition* 31 (May 2003): 519 522.

ORGANIZATIONS

American Botanical Council. P.O. Box 144345, Austin, TX 78714 4345. (800) 373 7105. http://www.herbalgram.org.

National Center for Complementary and Alternative Medicine (NCCAM) Clearinghouse. P.O. Box 7923, Gaithersburg, MD 20898 7923. (888) 644 6226. http://nccam.nih.gov.

New York Ginseng Association. P.O. Box 127, Roxbury, NY 12474. (607) 326 3005.

U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov.

OTHER

HerbalGram (a quarterly journal of the American Botanical Council and Herb Research Foundation). P.O. Box 144345, Austin, TX 78714 4345. (800) 373 7105.

Douglas Dupler
Teresa G. Odle
Rebecca J. Frey, PhD

Glaucoma

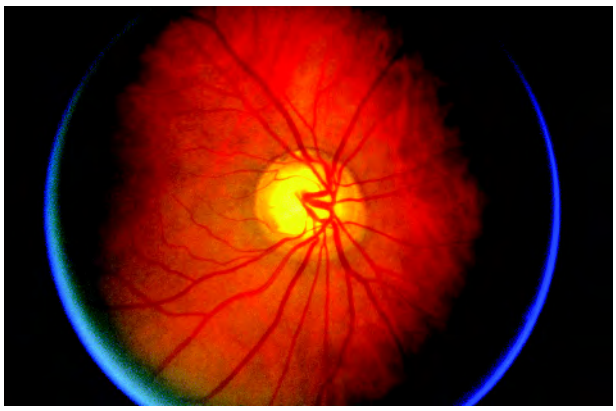
Definition

Glaucoma is a group of slowly progressive disorders that affects the eye and can result in irreversible damage to the optic nerve. Glaucoma represents one of the leading causes of irreversible blindness in the United States and world-wide. It is the leading cause of blindness among African Americans and older adults in the United States. Because there are usually no symptoms early on in the disease, about half of the people with glaucoma do not even know they have it.

Description

More than two million people in the United States have glaucoma, and 80,000 of those are legally blind as a result of the disease. Glaucoma can strike any age group, even newborn infants. Susceptibility to the disease, however, increases with age. African Americans are at a three times higher risk of glaucoma than the rest of the population.

There are at least 20 different types of glaucoma. These can be divided into four main types:



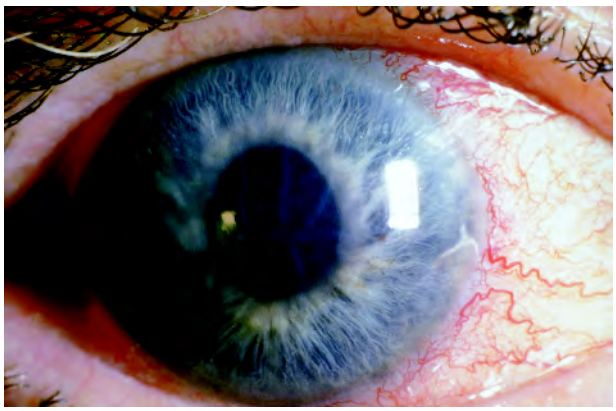
Opthalmoscope view of the retina of an eye with glaucoma. *(Stanford Eye Clinic / Photo Researchers, Inc.)*

- Open-angle glaucoma, which accounts for over 60–70% of all cases, and is usually chronic and often bilateral.
- Closed-angle glaucoma, which is usually an acute condition, as opposed to open-angle glaucoma, which is chronic.
- Congenital glaucoma, which occurs in infants, usually under the age of one.
- Secondary glaucoma, which may be associated with eye diseases, other diseases, and certain types of medications.

Causes and symptoms

Glaucoma is the result of disruptions of normal processes to maintain pressure within the eye tissue. The iris, cornea, and lens of the eye are bathed in a nutritive liquid called the aqueous humor, which is made by cells within the eye. Excess fluid is continually removed by a spongy meshwork of drainage canals. Glaucoma occurs if there is a build up of the aqueous humor due to poor drainage or overproduction. As the fluid builds up there is increased pressure on the retina at the back of the eye. This increased pressure reduces the blood supply to the nerves of the retina and causes the nerves to die, which may distort and destroy the optic nerve. As nerve cells are destroyed, blind spots develop, and there is a progressive loss of vision. A change in the production and strength of collagen may also contribute to the onset of the disease. Collagen is a protein that helps maintain the structure and function of eye tissue. **Stress** and **allergies** may aggravate glaucoma symptoms.

It is probable that most cases of glaucoma are partially due to a genetic predisposition. At least 10 defective genes have been identified that may cause



Acute glaucoma. *(© Medical-on-Line / Alamy)*

glaucoma. Although there are still many unknown factors that trigger the disease, a number of processes have been implicated. They include age-related changes, congenital abnormalities, injuries to the eye tissue, and problems related to other eye diseases. Vision loss in all forms of glaucoma is caused by damage to the optic nerve, the retina, and the collagen protein that makes up eye tissue. Use of certain medications, including antihypertensives, antihistamines, anticholinergics, and antidepressants may also contribute to the development of glaucoma. Corticosteroid eye drops, which are often used for other eye disorders, may destroy the integrity of eye tissue. Other types of eye drops may cause the pupils to dilate, increasing intraocular eye pressure (IOP), which may also lead to glaucoma in those who have a tendency to the disease.

Chronic open-angle glaucoma at first develops without noticeable symptoms. The pressure buildup is gradual, and it does not bring on discomfort. Moreover, the vision loss is too gradual to be noticed at first, and the brain compensates for blind spots. Over an extended period of time, though, the elevated pressure pushes against and damages the optic nerve and the retina. If glaucoma is left untreated, vision loss becomes evident, and the condition becomes painful.

Acute closed-angle glaucoma is obvious from the beginning. The symptoms are blurred vision, severe eye **pain**, sensitivity to light, **nausea** and **vomiting**, dilated pupils, reddened eyes, and halos visualized around lights. The corneas may become hazy in appearance. Acute closed-angle glaucoma is an emergency situation. It needs to be treated immediately. Congenital glaucoma is evident at birth. Symptoms are bulging eyes, cloudy corneas, enlarged corneas, excessive teariness, and sensitivity to light.

Risk factors that increase the probability of developing glaucoma include:

- ocular hypertension, a slightly increased IOP
- age over 40
- diabetic conditions
- high blood pressure
- migraine headaches
- nearsightedness, farsightedness, and other visual disturbances
- a family history of glaucoma
- being of African American or Hispanic ethnicity

Diagnosis

Sometimes glaucoma can be diagnosed with a routine eye exam by an ophthalmologist, who can make a definitive diagnosis of glaucoma. IOP, defects in the field of vision, and the appearance of the optic nerve, are all considered in the diagnosis of glaucoma. Visual field tests can detect blind spots in a patient's field of vision before the patient is aware of them. An instrument, known as a tonometer, is used to measure eye pressure. Since IOP can vary throughout the day, a person may have to return for several visits to measure eye pressure at different times of the day. An ophthalmoscope is used to examine the inner aspects and the back of the eyes, including the optic nerve, for changes and damage. A slit lamp may be used to allow the doctor further examination of the eye. Another test, gonioscopy, can distinguish between narrow-angle and open-angle glaucoma. A gonioscope allows visualization of the angle between the iris and the cornea. A subsequent technology is optical coherence tomography (OCT) that produces high-resolution images of the anterior segment of the eye and is a non-invasive procedure. As of 2007, it was primarily used in conjunction with gonioscopy in diagnosing and assessing glaucoma.

Treatment

There is no cure for glaucoma; however, it can be treated with both traditional and alternative medicine. **Vitamin C**, taken in dosages up to bowel tolerance, is reported to reduce pressure within the eye and restore collagen balance. A vitamin C supplement with **bioflavonoids**, especially rutin and **lutein**, are particularly recommended. **Bilberry** (*Vaccinium myrtillus*) helps maintain collagen balance and prevents the breakdown of vitamin C. Many people with glaucoma have been shown to have deficiencies of **chromium** and **zinc**. Supplementation with these two minerals may, therefore, deter the onset or progression of the disease. Alpha lipoic acid and other **antioxidants** may improve visual functioning.

A naturopathic approach called contrast **hydrotherapy** can be used to stimulate circulation in the eyes. Compresses can be applied over the eyes, alternating three minutes with hot water and one minute with cold water, always ending with the cold. **Biofeedback** can be used to reduce the pressure in the eyes by increasing **relaxation**. **Meditation**, stress reduction, **t'ai chi**, **yoga**, **exercise**, and **acupuncture** also may lower IOP. Remedies used to lower IOP must be taken continually to avoid optic nerve damage. In addition to other treatments, a glaucoma patient should always remain under the care of an ophthalmologist or optometrist who is licensed to treat glaucoma, so that IOP and optic nerve damage can be monitored.

Since the early 1970s, a number of scientific studies reported that the active agents in **marijuana** (*Cannabis sativa*) are effective in lowering intraocular pressure (IOP) in people with glaucoma. One study reported that people with glaucoma who smoked marijuana had a 25% to 30% drop in IOP that lasted three to four hours. Under federal law, the use, possession, or sale of marijuana is illegal in the United States. However, as of 2007, twelve states had legalized the medical use of marijuana. In 2005, the U.S. Supreme Court ruled that federal laws against medical marijuana take precedence over state laws, allowing for continued federal prosecution against people who use marijuana for medical purposes. Despite the ruling, medical marijuana programs continue in several states, including California. The active agents in marijuana are cannabinol, cannabidiol, and delta-9-tetrahydrocannabinol (THC). A synthetic version of THC, dronabinol (Marinol), is available in the United States and can be legally prescribed for a number of conditions, including glaucoma.

KEY TERMS

Alpha-2 agonist—A class of drugs that bind to and stimulate alpha-2 adrenergic receptors, causing responses similar to those of adrenaline and noradrenaline, by inhibiting aqueous humor production.

Beta-blocker—A class of drugs that bind beta-adrenergic receptors and thereby decrease the ability of the body's own natural epinephrine to bind to those receptors, leading to the reduction of aqueous humor secretion.

Cornea—The clear, bowl-shaped structure at the front of the eye located in front of the colored part of the eye. The cornea lets light into the eye and partially focuses it.

Gonioscope—An instrument that consists of a magnifier and a lens equipped with mirrors and sits on the patient's cornea.

Miotic—A drug that causes pupils to contract.

Ophthalmoscope—An instrument, with special lighting, designed to view structures in the eye.

Optic nerve—The nerve that carries visual messages from the retina to the brain.

Retina—The light-sensitive layer of the eye.

Allopathic treatment

The objective of glaucoma treatment is usually to decrease IOP. When glaucoma is diagnosed, drugs, typically given as eye drops, are usually tried before surgery. Several classes of medications are effective at lowering IOP and, thus, at preventing optic nerve damage in chronic and neonatal glaucoma. These include beta-blockers, such as Timoptic, and carbonic anhydrase inhibitors, such as acetazolamide. Alpha-2 agonists, such as Alphagan, inhibit the production of aqueous humor. Miotics, such as pilocarpine, and prostaglandin analogues, such as Xalatan, increase the drainage of aqueous humor. Different medications lower IOP different amounts, and a combination of medications may be necessary. Attacks of acute closed-angle glaucoma are medical emergencies. In such cases, IOP is rapidly lowered by use of acetazolamide, hyperosmotic agents, a topical beta-blocker, and pilocarpine. All of these drugs have side effects, some of which are rare, but serious and potentially life threatening. Patients taking them should be monitored closely, especially for cardiovascular, pulmonary, and behavioral symptoms. IOP should also be monitored and measured three to four times per year.

Laser peripheral iridiotomy or other microsurgery is used to open the drainage canals or to make an opening in the iris to increase the outflow of aqueous humor. These surgeries are usually successful, but effects often last less than a year. Nevertheless, they are an effective treatment for patients whose IOP is not sufficiently lowered by drugs or for those who cannot tolerate the drugs. Surgery is usually used in cases of congenital glaucoma, since the medications are often too harsh for children. Youngsters often respond to surgery better than adults, and have an excellent chance for preserving lifelong good vision.

Expected results

If glaucoma is left untreated, optic nerve damage will result in a progressive loss of vision. Once blindness develops due to glaucoma, it cannot be reversed.

With early treatment and monitoring serious vision loss can usually be prevented.

Prevention

While glaucoma is not preventable, early detection and treatment can help to prevent serious damage to vision. Those with risk factors should have regular eye exams and avoid medicines that tend to be implicated in the development of glaucoma, including some over-the-counter cold and allergy medications. All medications should be checked for their ingredients. Alternatives for drugs that aggravate glaucoma should be discussed with a healthcare provider.

Resources

BOOKS

Bello, Joan. *The Benefits of Marijuana: Physical, Psycho logical, & Spiritual*. Boca Raton, FL: Lifeservices Press, 2007.

Choplin, Neil T., and Diane C. Lundy, eds. *Atlas of Glau coma,* 2nd ed. New York: Informa Healthcare, 2007.

Wauters, Ambika. *The Homeopathy Bible: The Definitive Guide to Remedies*. New York: Sterling, 2007.

PERIODICALS

Fanelli, James L. "Do We Monitor or Medicate? When New Patients May Be At Risk for Glaucoma Development, Should You Initially Monitor Them or Immediately Begin Treatment?" *Review of Optometry* (January 15, 2008): 81(2).

Guttman, Cheryl. "Glaucoma 2007: The Year in Review: Specialists Turn Their Focus to Diagnostics, New Sur gical Modalities." *Ophthalmology Times* (December 15, 2007): 18(8).

Kabat, Alan G., and Joseph W. Sowka. "Just Say No: Ganja for Glaucoma? A Simple Answer Still Works Best for This Difficult Question." *Review of Optometry* (February 15, 2007): 138(2).

Parham, Marti. "What Blacks Must Know About Glau coma." *Jet* (January 21, 2008): 40.

Pirisi, Angela. "Your 20/20 Diet for Eye Health: Focus in on Foods and Supplements that May Keep Your Eyes and Vision at Their Peak." *Better Nutrition* (October 2007): 54(3).

Schwartz, Gail F. "Patience Adherence and Persistence with Glaucoma Therapy." *Ophthalmology Times* (December 15, 2007): S3(3).

Takma, Julia. "Imaging Enhancements Offer Surgeons Greater Precision: Cataract, Refractive, Glaucoma Specialists Enabled to Better Plan for Pre op, Evaluate Post op." *Ophthalmology Times* (November 1, 2007): 59(3).

ORGANIZATIONS

American Academy of Ophthalmology, PO Box 7424, San Francisco, CA, 94120 7424, (415) 561 8500, http://www.aao.org.

Glaucoma Foundation, 80 Maiden Lane, Suite 1206, New York, NY, 10038, (212) 285 0080, http://www.glaucomafoundation.org.

National Eye Institute, 31 Center Dr., MSC 2510, Bethesda, MD, 20892 2510, (301) 496 5248, http://www.nei.nih.gov.

Optometric Glaucoma Society, 5553 Taft Ave., Oakland, CA, 94618, (925) 557 4181, http://www.optometricglaucomasociety.org.

Patience Paradox
Ken R. Wells

Glucosamine

Description

Glucosamine is an amino sugar that occurs naturally in the body. This one-molecule substance consists of glucose and a hydrogen and nitrogen amine. Amino sugars are different from other body sugars, as they form part of carbohydrates. Their function is also different as they are not a source of energy, but rather are included in body tissue structure. Therefore, glucosamine plays a role in forming and maintaining the body's tissues, for example, constructing nails, skin, eyes, bones, ligaments, tendons, heart valves; and discharging mucus from the respiratory system, digestive system, and urinary tract. Glucosamine helps blend **sulfur** into the cartilage. When people grow older, their bodies may lose the capacity to make enough glucosamine, so the cartilage in such weight-bearing joints as the hips, knees, and hands is destroyed. The remaining cartilage then hardens and forms **bone spurs**, causing **pain**, deformed joints, and limited joint movement.

Glucosamine is not readily available from any primary food source. Commercial preparations of glucosamine are derived from chitin, which is a substance found in the outer covering of such shellfish as lobster, crab, and shrimp, as well as in such animal connective tissues as the marrow of chicken bones. Commercially prepared glucosamine comes in three formats: glucosamine sulfate, glucosamine hydrochloride, and N-acetyl-glucosamine (NAG).

General use

Glucosamine works to stimulate joint function and repair. It is most effective in treating **osteoarthritis** (OA), the most prevalent type of arthritis. A number of studies between 1980 and the early 2000s showed that glucosamine is helpful in relieving arthritis

symptoms. For example, a 1982 clinical study compared usage of the NSAID ibuprofen with glucosamine sulfate, for osteoarthritis of the knee. During the first two weeks, ibuprofen decreased pain faster, but by the fourth week the glucosamine group was well ahead in pain relief. The overall results showed 44% of the glucosamine group had pain relief compared to 15% for ibuprofen. A British study published in 2002 reported similar findings regarding the effectiveness of glucosamine in relieving pain associated with arthritis. A team of Japanese researchers suggested that glucosamine relieves the pain of arthritis by suppressing the functions of neutrophils, which are white blood cells that contribute to the joint inflammation found in arthritis. Other researchers speculated that the sulfur content of glucosamine contributes to its healing properties.

Several studies have concluded that over-the-counter preparations of glucosamine sulfate are safe for long-term treatment of osteoarthritis. These are readily available in the dietary supplement sections of most pharmacies. Glucosamine preparations are sometimes classified as nutraceuticals, a term used to refer to foods or food ingredients that are thought to provide medical or health benefits.

Harvard Medical School conducted a somewhat unorthodox study in which patients scheduled for hip surgery were given ground chicken bone supplements. After two weeks of taking these supplements, their pain was reduced considerably.

Glucosamine supplements can also aid in treating sports injuries, **bursitis**, food and respiratory **allergies**, **asthma**, **osteoporosis**, **tendinitis**, **vaginitis**, some skin problems, and candidiasis.

As of 2002, however, updated guidelines issued by the American College of Rheumatology for the treatment of osteoarthritis continued to list glucosamine along with **acupuncture** and electromagnetic therapy as treatments that were still under investigation for treating OA. Although there was considerable clinical experience with glucosamine, the mechanism of action was not determined, and, and analysis of published studies was inconclusive. In one study, sponsored by the National Institutes of Health (NIH), the Glucosamine/Chondroitin Arthritis Intervention Trial (GAIT), which enrolled 1,583 patients with painful knee osteoarthritis, 39 individuals failed to reveal an effect of glucosamine or **chondroitin** alone or in combination when compared to placebo. However, this study tested glucosamine hydrochloride, while more favorable studies have used glucosamine sulfate. Also, the favorable placebo response of 60% made analysis of the data difficult. When so many patients respond favorably to the placebo, it can be difficult to show a significant difference between the active drug and the inactive control. A review by the Arthritis Center of Boston University School of Medicine warned: "Trials of glucosamine and chondroitin preparations for (osteoarthritis) symptoms demonstrate moderate to large effects, but quality issues and likely publication bias suggest that these effects are exaggerated."

One study from the Rheumatology Unit, Department of Clinical and Experimental Medicine of the University of Padova, Italy, offered a mechanism of action explaining the observed physiologic effects of glucosamine. In their observation, glucosamine sulfate has anti-oxidant properties and inhibits natural oxidative stress that can cause unfavorable alterations of cartilage. These observations would explain the clinical reports of glucosamine activity and differentiate it from a placebo response.

Preparations

Although commercially prepared glucosamine comes in three formats (glucosamine sulfate, glucosamine hydrochloride, and N-acetyl-glucosamine (NAG)), not all three work the same. There are also differing opinions on which is best.

One claim states that glucosamine hydrochloride works 50% better than glucosamine sulfate because hydrochloride is the main stomach acid helping the digestive system to put more active ingredients into the body. Another prefers glucosamine sulfate because of its high absorption rate of 98% documented in human studies and its sulfur content. Studies as far back as the 1930s show that people with arthritis usually have low levels of sulfur.

N-acetyl-glucosamine (NAG) can be beneficial to individuals with **Crohn's disease** or ulcerative **colitis**. Individuals with these diseases cannot change glucosamine to NAG as fast as those without the diseases. In one study, cells from patients' intestines were soaked in a solution with a 10:1 ratio of radioactive NAG to glucosamine. These cells consolidated more NAG than did the cells from the intestines of patients without Crohn's disease or ulcerative colitis.

Glucosamine is also sold mixed in formulas with **devil's claw**, pregnenolone, methylsulfonylmethane (**MSM**), and chondroitin sulfate. Chondroitin sulfate is one of the main glycosaminoglycans (GAGs) that is contained in shark cartilage and sea cucumber. Although studies show that chondroitin sulfate has benefits, it is hard to absorb because it contains large molecules.

Further confusion can arise because glucosamine is classified and sold as a dietary supplement, meaning

KEY TERMS

Amino acids—Organic acids containing nitrogen that are the building blocks of proteins.

Carbohydrates—Organic substances, usually from plant sources. They are made up of carbon, hydrogen, and oxygen and are the diet's major source of energy.

Chitin—A transparent horny substance found in the outer coverings of shellfish. Chitin is used to make commercial preparations of glucosamine.

Glucose—Simple sugar that serves as the main energy source for cells.

NSAIDs—Nonsteroidal anti-inflammatory drugs given to suppress inflammation. Ibuprofen is a typical NSAID.

Nutraceutical—A food or food ingredient that is thought to provide medical or health benefits. Glucosamine preparations are classified as nutraceuticals.

Osteoarthritis—Degenerative joint disease that affects the hips, knees, or spine. Pain occurs after exercise and the joints can become stiff and swell. This common type of arthritis occurs in 80% of people over 50.

Placebo—A substance that has no therapeutic effect. A placebo may be prescribed for the psychological benefit of the patient, or it may be used as a control in testing new drugs.

Rheumatology—The medical specialty that studies and treats disorders of the joints and muscles.

Tendinitis—Inflammation of tissues that connect muscles to bones. Tendinitis is usually caused by strain or an injury.

that it had not gone through the FDA approval process.As with any dietary supplement, patients with arthritis who are considering glucosamine formulations should consult their healthcare practitioner.

The standard dosage is 500 mg three times daily. Obese people may need to take higher dosages based on their weight.

Precautions

Persons on potassium-reduced **diets**, with **heart disease**, renal diseases, or high blood pressure related to salt intake should avoid either the regular or salt-free glucosamine supplements.

Diabetics should be aware that glucosamine contains the sugar glucose and can raise blood sugar and insulin levels. A 2000 study of 15 nondiabetic patients at the Los Angeles College of Chiropractic and Meta-Response Science showed that those who took 1,500 mg of glucosamine a day for 12 weeks had raised insulin levels. The conclusion was that the insulin rise would probably be more in diabetics. However, researchers cautioned diabetics that so far there was no need to discard their glucosamine supplements as more controlled studies were required.

Despite the concern regarding the use of glucosamine sulfate in persons with allergies to the sulfa drugs or the sulfite additives in food, sulfur itself is a necessary mineral and human blood contains large amounts of sulfur's sulfate form. Studies show that glucosamine sulfate is safe for long-term use to treat osteoarthritis, with the exception of some medical conditions.

Side effects

High dosages of glucosamine may cause gastric problems, **nausea**, **diarrhea**, **indigestion**, and **heartburn**. Glucosamine should be taken with meals to help avoid these problems

Interactions

Glucosamine should not be taken with heart medications or insulin. Those taking diuretics may require higher amounts of glucosamine on a daily basis.

Resources

PERIODICALS

Clegg, D. O., D. J. Reda, C. L. Harris, et al. "Glucosamine, Chondroitin Sulfate, and the Two in Combination for Painful Knee Osteoarthritis." *New England Journal of Medicine* (2006): 795 808.

Krasnokutsky, S., J. Samuels, and S. Abramson. "Osteo arthritis in 2007." *Bulletin of the NYU Hospital for Joint Diseases* (2007): 222 8.

Valvason, C., E. Musacchio, A. Pozzuoli, R. Ramonda, R. Aldegheri, and L. Punzi. "Influence of Glucosamine Sulphate on Oxidative Stress in Human Osteoarthritic Chondrocytes: Effects on HO 1, p22(Phox) and iNOS expression." *Rheumatology* (January 2008): 31 5.

OTHER

"Glucosamine Trials Show Little Benefit Against Arthritis," 2007. http://www.medicinenet.com/script/main/art.asp?articlekey 82234 (February 8, 2008).

ORGANIZATIONS

American College of Rheumatology, 1800 Century Place, Suite 250, Atlanta, GA, 30345 4300, (404) 633 3777, http://www.rheumatology.org.

Sharon Crawford
Rebecca J. Frey, PhD
Sam Uretsky, PharmD

Glutamine

Description

In healthy individuals, glutamine is a neutral, nonessential amino acid. **Amino acids** are critical to humans, since they form the proteins that are the building blocks for many body tissues, including muscles. Glutamine is the most abundant amino acid in the human body. It performs several important functions in the body and is particularly important when the body is stressed. If not enough glutamine is being created by the body, the body's natural supply can be supplemented with outside sources. Glutamine is sometimes recommended by physicians, and sometimes it is taken as a dietary supplement without physician advice.

General use

Researchers continued as of 2008 to study glutamine's properties and effects. It is the most plentiful amino acid in the bloodstream. In cases of extreme **stress** the body's ability to produce glutamine can be overwhelmed by the body's demand for it. **Cancer**, **burns** or trauma, excessive **exercise**, and other stressors may cause glutamine levels to drop.

Research suggests that when glutamine levels fall and are not replaced, several body functions are affected, particularly within the digestive tract. Glutamine is also believed to be important to overall immunity. Between 1970 and 2000, interest grew for use of glutamine in helping cancer patients. Research continued as of 2008 on using glutamine therapy to help patients with sepsis, burns, trauma, **inflammatory bowel disease**, acquired immune deficiency syndrome (**AIDS**), bone marrow transplants, and many other diseases and conditions.

Some clinical research has reported glutamine aided patients with multiple trauma and burns by helping them fight off **infections**. It may help AIDS patients put on weight at a much lower cost, and with fewer complications, than human growth hormone. Athletes who overtrain have higher rates of infectious diseases and **allergies**; it is thought that a diet high in glutamine can help improve these athletes' immune functions.

As more people began looking for ways to enhance fitness, they turned to protein supplements. Every year, more than one million athletes use some type of performance-boosting supplement. Glutamine is used in the fitness industry as a supplement by bodybuilders who want to reduce muscle breakdown and by athletes on vigorous training schedules who believe the supplement boosts their immune systems.

Preparations

As a protein, glutamine occurs naturally in some foods, including meat, fish, legumes, peanuts, eggs, tofu, and dairy products. It also is highly concentrated in raw cabbage and beets. Cooking can destroy glutamine, particularly in vegetables. Much of a person's glutamine needs, even when exercising hard, can come from food sources. A 3-oz. serving of meat contains about 3 to 4 g of glutamine.

Glutamine supplements come in several forms. Some manufacturers sell tablets that also contain vitamins. The most common forms of glutamine supplements are protein powders that can be added to liquids and prepared protein drinks and shakes. Another amino acid called alanine may be combined with glutamine. The combined protein supplement is called alanyl-glutamine. When glutamine is used for medical purposes in a hospital setting, it may be administered through a tube directly into the intestine.

Recommended doses of glutamine for fitness uses such as bodybuilding vary but generally are 8 to 20 g a day and average about 15 g a day. Cancer patients on glutamine therapy may take a higher dose, about 30 g per day. An average daily dose for the general public is 1.5 to 6 g.

Precautions

The powdered form of glutamine should be dissolved in a liquid and consumed quickly before it breaks down. Some literature recommends taking glutamine immediately before or after meals or at the same time as eating protein, usually twice per day.

Glutamine is marketed as a dietary supplement and, therefore, is not regulated in the same way as prescription drugs. The United States Food and Drug Administration (FDA) is the regulatory body responsible for regulating dietary supplements. Because supplements are regulated in the same way as food, and

KEY TERMS

Digestive tract—The long tubular structure that handles all digestion and the structures that connect to it, including the mouth, esophagus, stomach, and intestines.

Goiter—An enlarged thyroid gland (a hormone-producing gland at the front of the neck). Goiters usually appear as obvious swelling in the neck.

Hypothyroidism—A condition that is characterized by decreased activity of the thyroid gland (a hormone-producing gland at the front of the neck) that often results in weight gain, tiredness, dry skin, and other symptoms.

Sepsis—A bacterial infection of the bloodstream or tissues of the body.

not as medicine, the products do not have to be proven safe or effective before being put on the market. Most FDA regulation of supplements involves only ensuring that false health claims are not made by the supplements. No supplement is allowed to claim that it treats or cures any disease or condition without undergoing scientific study and clinical trials to prove the statement is true. Individuals who take glutamine must be cautioned to carefully read product labels and the research on the products that are being considered. Investigations of dietary supplements have revealed discrepancies between the quantities of active ingredient present in the product and the quantity indicated as present on the label.

While many fitness promoters tout glutamine's effects, some researchers disagree with the science behind the claims. More and larger clinical trails may be able to clear up the controversy over glutamine's ability to increase muscle size and strength in recreational athletes.

Side effects

No side effects are generally reported with glutamine use; however, as of 2008 no significant scientific studies had been done to investigate possible side effects.

Interactions

Glutamine has not been shown to interact with any particular drugs or with other supplements. Before beginning to take glutamine individuals should talk to their physician, pharmacist, or other medical health professional. No significant scientific studies have been done to determine if glutamine negatively interacts with medications, other supplements, or herbs. A medical professional can help individuals determine if the supplement is likely to be safe for them. Consumption of cabbage can worsen goiters and a condition called **hypothyroidism**.

Resources

BOOKS

Di Pasquale, Mauro G. *Amino Acids and Proteins for the Athlete: The Anabolic Edge,* 2nd ed. Boca Raton, FL: CRC Press, 2008.

Driskell, Judy A., ed. *Sports Nutrition: Fats and Proteins.* Boca Raton, FL: CRC Press, 2007.

PERIODICALS

Mok, Elise, et al. "Oral Glutamine and Amino Acid Sup plementation Inhibit Whole Body Protein Degradation in Children with Duchenne Muscular Dystrophy." *American Journal of Clinical Nutrition* 83, no. 4 (April 2006): 823 829.

Nick, Gina L. "The Anti Infective and Anti Inflammatory Effects of Glutamine." *Townsend Letter for Doctors and Patients* 262 (May 2005): 106 113.

ORGANIZATIONS

Center for Science in the Public Interest, 1875 Connecticut Ave. NW, Suite 300, Washington, DC, 20009, (202) 332 9110, http://www.cspinet.org.

National Center for Complimentary and Alternative Medi cine, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Teresa G. Odle
Helen Davidson

Glutathione

Description

Glutathione is a tripeptide, a chemical compound consisting of three **amino acids**, cysteine, glycine, and glutamic acid. It is produced in the human liver and plays a key role in metabolism, immune response, and general health. The precise mechanisms of its biological functions are not, as of 2008, fully understood. Glutathione is also known as gamma-glutamylcysteineglycine and GHS. Glutathione occurs in two forms, a monomer consisting of a single molecule of the tripeptide and a dimmer consisting of two molecules joined through a disulfide bond. The monomer is sometimes called reduced glutathione, while the dimmer is also called oxidized glutathione. The monomer is the active

form of glutathione. Oxidized glutathione is broken down to the single molecule by an enzyme called glutathione reductase.

Glutathione, in purified extracted form, is a white powder that is soluble in water and in alcohol. It is found naturally in many fruits, vegetables, and meats. However, absorption rates of glutathione from food sources in the human gastrointestinal tract are low.

General use

Glutathione was first isolated in yeast by English biochemist Sir Frederick Hopkins (1861–1947) in 1929. Its metabolism in the body was described in 1984, and its role in **cancer** treatment dates from 1984.

Glutathione is a major antioxidant highly active in human lungs and many other organ systems and tissues. It has many reported uses. It has a critical role in protecting cells from oxidative **stress** and maintaining the immune system. Higher blood levels of glutathione have been associated with better health in elderly people, but the exact association between glutathione and the **aging** process has not been determined.

Among the uses that have been reported for glutathione are:

- treatment of poisoning, particularly heavy metal poisons
- treatment of idiopathic pulmonary fibrosis
- increasing the effectiveness and reducing the toxicity of *cis-platinum*, a drug used to treat breast cancer
- treatment of Parkinson's disease
- lowering blood pressure in patients with diabetes
- increasing male sperm counts in humans and animals
- treatment of liver cancer
- treatment of sickle cell anemia

Claims made for glutathione include that it increases energy, improves concentration, slows aging, and protects the skin.

The importance of glutathione is generally recognized, although its specific functions and appropriate clinical use remain under study. Similarly, because ingested glutathione has little or no effect on intracellular glutathione levels, questions remained as of 2008 as to the optimal method for raising the intracellular levels.

In addition to studies ongoing in the late 2000s of the role of glutathione in cancer and cancer therapy, there were clinical trials of glutathione in the treatment of amyotrophic lateral sclerosis (ALS). The U.S. National Cancer Institute included glutathione in a study to determine whether nutritional factors can inhibit development of some types of cancer.

European researchers, with support from the Cystic Fibrosis Foundation, examined the potential uses of inhaled glutathione in cystic fibrosis. Some physicians also use inhaled glutathione in treating airway restriction and **asthma**. Other studies investigated whether administration of alpha-lipoic acid, a material that can elevate intracellular glutathione, may be beneficial in restoring the immune system in **AIDS** patients.

Preparations

Although glutathione is marketed as a nutritional supplement, it does not appear that glutathione supplements actually increase the levels of glutathione inside cells. In human studies, oral doses of glutathione had little effect in raising blood levels of the substance. Further, glutathione is so widely distributed in common foods that supplements are not normally required. Supplements of **vitamin C** are more effective at increasing intracellular glutathione than taking oral glutathione supplements. Oral supplements of whey protein and of alpha-lipoic acid appear to help restore intracellular levels of glutathione.

Glutathione is available as capsules of 50, 100, and 250 mg. It is also included in many multivitamin and multi-nutrient formulations.

Precautions

As of 2008, the only established precautions were sensitivity to any of the inactive ingredients in the preparations of glutathione or the products used to stimulate glutathione levels.

Side effects

There were no established side effects to glutathione or to the substances used to elevate glutathione levels.

Training and certification

Glutathione has been classified as an orphan drug for treatment of AIDS. For this purpose, medical licensure is required. Glutathione has been given intravenously for amelioration of the side effects of cisplatin therapy. Specific training is required to order, prepare, start, and monitor intravenous therapy. No specific training is required to use glutathione or the compounds that have been reported to raise glutathione levels for other purposes.

KEY TERMS

Antioxidant—A substance, such as vitamin E, vitamin C, or beta carotene, thought to protect body cells from the damaging effects of oxidation.

Dimmer—A molecule consisting of two identical simpler molecules.

Heavy metal poison—A metal with a specific gravity greater than about 5.0, that is poisonous, such as lead or mercury.

Intracellular—Inside a cell.

Monomer—A molecule that can combine with others to form a dimmer or a polymer.

Resources

BOOKS

Pizzorno, Joseph E., Michael T. Murray, and Herb Joiner Bey. *The Clinician's Handbook of Natural Medicine*. Oxford: Churchill Livingstone, 2007.

PERIODICALS

Drevet, J. R. "The Antioxidant Glutathione Peroxidase Family and Spermatozoa: A Complex Story." *Molecular and Cellular Endocrinology* (May 2006): 70 79.

Goldfarb, Allan H., Michael J. McKenzie, and Richard J. Bloomer. "Gender Comparisons of Exercise induced Oxidative Stress: Influence of Antioxidant Supplemen tation." *Applied Physiology, Nutrition, and Metabolism* (December 2007): 1124 1131.

Gukasyan, Hovhannes J., et al. "Glutathione and Its Transporters in Ocular Surface Defense." *Ocular Surface* (October 2007): 269 279.

Weber, J. T., et al. "Antioxidants and Free Radical Scav engers for the Treatment of Stroke, Traumatic Brain Injury, and Aging." *Current Medicinal Chemistry* (February 2008): 404 414.

OTHER

"Glutathione: Information for Physicians." *Nutrition Advisor*. http://www.nutritionadvisor.com/glutathione. html. (February 8, 2008).

"Glutathione." *PDRHealth*. http://www.pdrhealth.com/drugs/altmed/altmed mono.aspx?contentFileName ame0400.xml&contentName Glutathione+&con tentId 556. (February 8, 2008).

Sahelian, Ray. "Glutathione Peroxidase." http://www.ray sahelian.com/glutathione.html. (February 8, 2008).

Samuel Uretsky, Pharm.D.
David Edward Newton, Ed.D.

Gluten-free diet

Definition

A gluten-free diet is a diet that is completely free of gluten, which is a generic term for storage proteins found in grains. In **celiac disease** (also referred to as celiac sprue), persons develop an inflammatory immune system response to gluten that results in damage to the small intestine, which inhibits absorption of nutrients. Some persons also develop **dermatitis** herpetiformis, an itchy and blistering skin condition. Because of gluten intolerance, affected persons must completely avoid foods that contain gluten.

Origins

Guidelines for this diet have been developed by dietitians for several organizations associated with celiac disease and dermatitis herpetiformis, including the Gluten Intolerance Group, the Celiac Sprue Association, and the Celiac Disease Foundation. The American Dietetic Association also sponsored the development of a gluten-free diet through a cooperative effort of dietitian experts in celiac disease in Canada and the United States, which was published in October, 2000.

Description

The gluten-free diet is the prescribed medical treatment for gluten intolerance diseases, including celiac disease and dermatitis herpetiformis. Celiac disease is a genetically inherited, chronic digestive disease that results in damage to parts of the small intestine that are responsible for absorption of nutrients. Celiac disease affects almost three million people in the United States, about one percent of the population. Celiac disease is found among North American and European populations, where wheat is a staple food, but is found infrequently among descendants of China and Japan and persons with an African-Caribbean background, where wheat is not as widely consumed.

In addition, dermatitis herpetiformis is an important disorder or complication of gluten-sensitive enteropathy, which is manifested in the form of a skin rash. Approximately 10% of persons with celiac disease have dermatitis herpetiformis, but about 85% of persons with dermatitis herpetiformis also have celiac disease.

When a person with celiac disease consumes gluten, the villi of the small intestine, where absorption of key nutrients takes place, become damaged, resulting in nutrients passing through the digestive system

KEY TERMS

Antibodies—Any of numerous protein molecules produced by the immune system as a primary immune defense to destroy or neutralize foreign objects. Each antibody recognizes a specific target, referred to as the antigen. These antigens may include foreign proteins, microorganisms, or toxins. Some antibodies attack the body's own tissues.

Autoimmune disease —An illness that occurs when the body tissues are attacked by its own immune system.

Enteropathy—A disease of the intestinal tract.

Lymphoma—Any of various usually malignant tumors that arise in the lymph nodes or in other lymphoid tissue.

Osteomalacia—Softening of bone, particularly bone weakened by demineralization (loss of mineral) and most notably by the depletion of calcium from bone. Osteomalacia may be caused by poor dietary intake or poor absorption of calcium and other minerals needed to harden bones. Osteomalacia is a characteristic feature of vitamin D deficiency in adults.

Osteopenia—Mild thinning of the bone mass, but not as severe as osteoporosis. Osteopenia results when the formation of bone is not enough to offset normal bone loss. Osteopenia is generally considered the first step to osteoporosis.

Osteoporosis—A decrease in bone mass and bone density and an increased risk and/or incidence of fracture.

Tropical sprue—A condition of unknown cause whereby abnormalities in the lining of the small intestine prevent the body from absorbing food normally. This disease is not associated with gluten enteropathy. It has been associated with travel and residence in tropical areas.

Villi—The tiny, finger-like projections on the surface of the small intestine that help absorb nutrients.

without being absorbed. The person exhibits gastrointestinal distress and eventually malnutrition. In infancy, celiac disease manifests itself as failure to thrive, **diarrhea**, abdominal distention, developmental delay, and in some infants, as severe malnutrition.

After infancy, the symptoms of celiac disease are less dramatic. Older children may be short or exhibit dental enamel defects. Women comprise about 75% of newly diagnosed adult cases of celiac disease. Symptoms of celiac disease include diarrhea, **constipation** alternating with diarrhea, intestinal **gas**, fatty, greasy, foul-smelling stools, bloating, **nausea**, **vomiting**, skin irritation, weight loss, **anemia**, neurological effects (including seizures, and possibly migraine headaches), **fatigue**, concentration and memory problems. In some cases, there may be intestinal damage without significant gastrointestinal symptoms. Celiac disease is diagnosed by blood tests for certain antibodies and small intestine biopsy. A positive small intestine biopsy, followed by an improvement in health after following a gluten-free diet, is confirmation of celiac disease. A gluten-free diet should not be started before diagnosis is confirmed.

Some individuals may exhibit gluten intolerance, with gastrointestinal symptoms similar to those seen with celiac disease, but without its resulting intestinal damage. Gluten intolerance is diagnosed by following a gluten-free diet, followed by reintroduction of gluten- containing foods, to evaluate health improvement associated with elimination or reduction of gluten from the diet. Some individuals with gluten intolerance maybe be able to tolerate a low-gluten diet under the supervision of a physician or dietitian.

A gluten-free diet may also be helpful for persons with **multiple sclerosis** and other autoimmune disorders, as well as for persons with **autism** spectrum disorders, Attention Deficit Hyperactivity Disorder (ADHD), and some behavioral problems.

The foods of concern for individuals with, or susceptible to, celiac disease are the cereal grains that contain the storage proteins prolamin and glutelin (commonly referred to as glutens in wheat), all varieties of wheat (e.g., durum, spelt, kamut), barley (where the storage proteins are called hordiens), rye (where the storage proteins are called secalins), and their cross-bred hybrids (such as triticale).

Grains and starches that are allowed in a gluten-free diet include: rice, corn, soy, potato, sweet potato, tapioca, beans, garfava, sorghum, quinoa, millet, **arrowroot**, amaranth, tef, nut flours, and buckwheat. However, some commercial buckwheat products are mixtures of wheat and buckwheat flours and should be avoided. Other foods that are allowed (only a partial list) include fresh, canned, and frozen fruit or fruit juices, fresh vegetables, canned and frozen vegetables without gluten-containing additives, milk, aged cheese, all unprocessed meats, poultry, fish, eggs, dried beans, nuts, and seeds. A dietitian should be consulted to develop and monitor a gluten-free diet.

Gluten-free foods can be found in health food stores, through mail order sources, and in some supermarkets. Cookbooks are available to help in food preparation. Many food manufacturers maintain lists of gluten-free products. The Gluten-Free Certification Organization (GFCO) of the Gluten Intolerance Group, in cooperation with the Food Services, Inc., a subsidiary of the Orthodox Union, a kosher certification agency, has developed a gluten-free certification program. This program benefits consumers by giving them confidence that a product is gluten-free through a process whereby products have been tested and the manufacturing site inspected. The program also saves the consumer time that would have been spent calling the manufacturer for the gluten-free status of the product. Certification is a yearly process based on ingredient review, on-site inspection and product testing. The Celiac Sprue Association (CSA) also has the CSA Recognition Seal Program that certifies gluten-free products. Requirements for obtaining the CSA Seal for products include:

- ingredient review and verification by testing to assure products are free of wheat, barley, rye and oats
- provision of written facility procedures and on-site facility audits to assure that procedures are in place to control any cross or outside contamination in processing and packaging

Foods may contain gluten, although gluten will not be indicated on the ingredient list, because it was not included in the formulation of the product. For example, a conveyer belt may be dusted with a gluten-containing material to prevent foods from sticking and may contaminate the finished food product.

Function

The gluten-free diet is used by persons who are gluten-sensitive to prevent damage to their small intestines and to prevent serious complications such as gastrointestinal cancers, iron-deficiency anemia, and decreased bone mineral density.

Benefits

A gluten-free diet has been shown to greatly reduce the risk for **cancer** and overall mortality for individuals with symptomatic celiac disease.

For many people with celiac disease, following a gluten-free diet will stop the symptoms of the disease and result in improved health, usually within several months (for some persons, recovery may take up to one year). However, the health of some people with extensive damage to their small intestines may not improve. Refractory celiac disease (RCD) is a rare syndrome with a poor prognosis, defined by malabsorption due to gluten-related enteropathy after initial or subsequent failure of a strict gluten-free diet and after exclusion of any other disease or disorder mimicking celiac disease. Other treatments may be necessary to treat the RCD, such as the use of corticosteroids and immunosuppressant drugs, but data on their effectiveness is lacking.

Precautions

In addition to gluten-containing grains, gluten can be found in a large variety of foods including soups, salad dressings, processed foods, candy, imitation bacon and seafood, marinades, processed luncheon meats, sauces and gravies, self-basting poultry, soy sauce or soy sauce solids, thickeners, communion wafers, and natural flavorings. Unidentified starch, binders and fillers in medications, supplements, or vitamins and adhesives in stamps and stickers can also be unsuspected sources of gluten. Playdough, which contains wheat, can be harmful if hands are put on or in the mouth after contact or hands are not washed after play.

An individual following a gluten-free diet must read labels every time a food item is purchased or consumed. Ingredients that may contain hidden sources of gluten include unidentified starch, modified food starch, hydrolyzed vegetable or plant protein (HVP or HPP), texturized vegetable protein (TVP), and binders, fillers, and extenders. In addition, manufacturers can change ingredients at any time, and a product may no longer be gluten-free. Ingredients may be verified by contacting a manufacturer and specifying the ingredient and lot number of a food item. If a person cannot verify ingredients in a food product or if the ingredient list is unavailable, the food should not be eaten, to avoid damage to the small intestine that occurs every time gluten is consumed.

Gluten-free recommendations can be difficult to follow. It is recommended that an affected person keeps the diet simple at the beginning by eating fresh fruits and vegetables, milk, unprocessed protein foods such as fresh beef, pork, poultry, fish, and eggs, natural nuts, seeds, and vegetable oils without additives.

Pure, uncontaminated oats eaten in moderation (one cup cooked daily) may be safe for persons with celiac disease. However, in many cases oats can become cross-contaminated with grains containing gluten during growth, harvest, transport, storage, or processing. Some persons with celiac disease who introduce oats to their diet may experience abdominal discomfort, gas, and stool changes until they become

accustomed to the increased fiber levels from the oats. Others with celiac disease may exhibit a hypersensitivity to oats and should avoid their consumption. Recent research published between 2000 and 2004 has indicated that oats may contain a protein similar to gluten that has caused intestinal inflammation in many persons with celiac disease. At this time, because of conflicting information on the effects of oats on persons with celiac disease, excluding oats from the diet may be the best and most risk-free choice. In all cases, persons with celiac disease should consult their health care provider or dietitian before including oats in their diet and should have their antibody levels monitored regularly.

Almost all beers are brewed with barley (some are brewed with wheat) and should not be consumed by a person following a gluten-free diet. Sorghum and buckwheat beers are available but are a specialty product. Most distilled forms of alcohol are gluten-free, unless additives and colorings have been added, which may contain glutens. Wines are also usually gluten-free.

Since celiac disease is an inherited autoimmune disease, screening of family members is recommended. The chances of developing gluten-sensitive enteropathy increases to 10 to 20% in persons who have a first-degree relative with celiac disease. Celiac disease is also associated with other autoimmune syndromes such as Type 1 diabetes.

Risks

A gluten-free diet is difficult to follow, and continued health problems are usually associated with problems adhering to the gluten-free diet. A person can exhibit celiac-related symptoms for months after a single gluten intake. Persons with gluten-sensitivity who do not treat their disease are at a higher risk for enteropathy-associated T-cell lymphoma and other gastrointestinal cancers. However, the maintenance of a long-term gluten-free state reduces the risk of lymphoma to the level seen in the general population. Other complications of gluten-sensitivity include decreased mineral bone density and iron-deficiency. Persons with celiac disease and dermatitis herpetiformis must maintain a gluten-free diet for the rest of their lives, for these diseases cannot be cured.

Persons are more likely to adhere to the diet if a dietitian and support group are involved. If a person is not responding well to a gluten-free diet, the doctor should:

- investigate whether the initial diagnosis of celiac disease was correct
- check for other conditions that can be causing symptoms, such as pancreatic insufficiency, irritable bowel syndrome, bacterial overgrowth, lymphocytic colitis, T-cell lymphoma, fructose intolerance, or tropical sprue
- refer the person to a dietician to check for errors in the diet or for compliance with the diet

To monitor dietary adherence to the gluten-free diet, the dietitian will examine the person's dietary history and habits. Blood tests will be conducted to see if gluten antibody levels have returned to normal levels. If there is clinical concern that a person is not adhering to the gluten-free diet or that the diet is not effective, a biopsy of the small intestine may be conducted.

The gluten-free diet is complex and it cannot be assumed that chefs in restaurants or others who prepare food (including friends and family) are aware of potential sources of gluten contamination. Education of family and friends is important in accomplishing a lifestyle change. In restaurants, simple dishes without sauces should be ordered, and the person should inquire whether grain products are prepared with the same equipment or utensils used to prepare other foods. Although a food may be considered to be gluten-free by the ingredients it contains, it may be gluten-contaminated by the way in which it is prepared or stored. Other difficulties associated with following a gluten-free diet include lifestyle changes such as avoiding travel, finding gluten-free foods (especially those of good quality), determining whether foods are gluten-free, not being invited out because of the diet, with resulting social isolation, and maintaining a gluten-free diet when in the hospital.

As with any restrictive diet, the gluten-free diet has potential for nutritional inadequacy. Persons who are sensitive to gluten are at increased risk for **osteoporosis** and osteomalacia, due to malabsorption of **calcium** and **vitamin D**. Most persons with celiac disease have some degree of osteopenia or osteoporosis. Calcium and vitamin D supplementation along with strict adherence to a gluten-free diet usually results in remineralization of the skeleton. **Iron** or other vitamin deficiencies may also be present and must be treated appropriately. The consumption of gluten-free fiber-rich foods (for example, brown rice, fruits, and vegetables) and adequate fluid intake is recommended to assist in the prevention of constipation.

Women with untreated celiac disease often exhibit a history of miscarriages, anaemia, low birth weight babies, and unfavorable outcome of **pregnancy**. It is suggested that testing for celiac disease be included in

the battery of tests prescribed for pregnant women. Celiac disease is considerably more common than most of the diseases for which pregnant women are routinely screened. Unfavorable events associated with celiac disease may be prevented by a gluten-free diet.

Research and general acceptance

The gluten-free diet is recognized as the required treatment for persons exhibiting gluten-sensitivity.

The National Institutes of Health noted in 2004 that the strict definition of a gluten-free diet remains controversial due to the lack of an accurate method to detect gluten in food products and the lack of scientific evidence for what constitutes a safe amount of gluten ingestion. No international agreement has yet been developed on how much gluten a person with gluten-sensitivity can tolerate. Research is on-going to better identify levels that are acceptable, and health professionals involved in the therapy of celiac disease should keep up-to-date on the latest research. As of 2007, the United States Food and Drug Administration is proposing to set a standard of 20 part per million as the maximum acceptable level of gluten allowed for a product to be labeled as gluten-free.

Research continues on the benefits of a gluten-free diet for persons with multiple sclerosis and other autoimmune disorders, as well as for persons with autism spectrum disorders, ADHD, and some behavioral problems.

In addition, a new enzyme that was being developed for commercial food processing has been found to break down gluten molecules quickly and almost completely. The enzyme is made from *Aspergillis niger*, a common fungus that is the source of other food grade enzymes already being manufactured for human consumption. Fritz Koning of Leiden University Medical Center in the Netherlands is leading the research. He stated that if the enzyme proves itself in clinical trials to eliminate the need for a gluten-free diet, it could be mass produced at a reasonable cost.

Resources

BOOKS

Case, Shelley. *Gluten Free Diet: A Comprehensive Resource Guide*. Regina, Saskatchewan, Canada: Case Nutrition Consulting, 2003.

Celiac Sprue Association. *The CSA Gluten Free Product Listing* 11th Edition. Omaha, NE: Celiac Sprue Asso ciation, 2006.

Children's Digestive Health and Nutrition Foundation. *Gluten Free Diet Guide for Families*. Flourtown, PA: Children's Digestive Health and Nutrition Foundation, 2005. http://www.celiachealth.org/pdf/GlutenFreeDietGuideWeb.pdf.

Hagman, Bette. *The Gluten Free Gourmet Cooks Comfort Foods: Creating Old Favorites with the New Flours*. New York, NY: Henry Holt and Co., 2004.

Korn, Danna. *Kids with Celiac Disease: A Family Guide to Raising Happy, Healthy, Gluten Free Children*. Bethesda, MD: Woodbine House, Inc., 2001.

Korn, Danna. *Living Gluten Free for Dummies*. Hoboken, NJ: Wiley Publishing, Inc., 2006.

Korn, Danna. *Wheat Free, Worry Free: The Art of Happy, Healthy Gluten Free Living*. Carlsbad, CA: Hay House, Inc., 2002.

Lowell, Jax Peters. *The Gluten Free Bible: The Thoroughly Indispensable Guide to Negotiating Life without Wheat*. New York, NY: Owl Books, 2005.

Tessmer, Kimberly A. *Gluten Free for a Healthy Life: Nutritional Advice and Recipes for Those Suffering from Celiac Disease and Other Gluten Related Disorders*. Franklin Lakes, NJ: New Page Books, 2003.

ORGANIZATIONS

Celiac Disease Foundation, 13251 Ventura Boulevard, Suite 1, Studio City, CA, 91604 1838, (818) 990 2354, http://www.celiac.org.

Celiac Sprue Association, P.O. Box 3170, Omaha, NE, 68131 0700, (877) 272 4272, celiacs@csaceliacs.org, http://www.csaceliacs.org.

Gluten Intolerance Group, 31214 124th Avenue SE, Auburn, WA, 98092 3667, (253) 883 6655, http://www.gluten.net.

Gluten Free Living, http://www.glutenfreeliving.com.

The University of Maryland Center for Celiac Research, 20 Penn Street, Room S303B, Baltimore, MD, 21201.

University of Maryland Medical Center, 22 S. Greene Street (N5W40), Baltimore, MD, 21201, (410) 328 6749, (800) 492 5538., http://www.celiaccenter.org/.

Judith L. Sims

Goatweed *see* **St. John's wort**

Goldenrod

Description

Averaging about 4 feet (1.2 m) in height, goldenrod is a perennial with clusters of bright yellow flowers. It has been used for centuries in the treatment of **kidney stones**, urinary tract **infections**, and a variety of other medical conditions. One legend has it that a 10-year-old boy who received an infusion of goldenrod for several months in the late eighteenth century passed 50 gravel stones larger than a pea. Native Americans used goldenrod to alleviate **sore throat**,

Rough-leaf goldenrod. *(© Arco Images / Alamy)*

and blue mountain tea made from goldenrod leaves is sometimes used to combat **fatigue** in the Appalachian Mountains. Goldenrod varieties belong to the plant family Asteraceae. While European goldenrod (*Solidago virgaurea*) is perhaps the most well known variety, other species of the plant (there are over 100 and counting) appear to have roughly equivalent medicinal properties—in particular, the ability to increase the flow of urine. In Europe, *Solidago virgaurea* is often used interchangeably with other species of goldenrod such as *Solidago serotina* and *Solidago canadensis* in the drug of commerce. Only the aboveground parts of the plant, mainly the flowers and leaves, are considered to have medicinal value.

Goldenrod grows in Europe, Asia, northern Africa, and North America, but most medicinal goldenrod originates in Bulgaria, Hungary, Poland, and other eastern European countries. It thrives in a wide variety of habitats, including hills, woods, meadows, and rocky terrain. Contrary to popular belief, goldenrod does not play a significant role in triggering **hay fever** reactions. This myth probably developed due to the fact that goldenrod blooms around the same time and in the same places as the ragweed responsible for most seasonal **allergies**. Studies of goldenrod pollen indicate that it is not a potent allergen for most people. Goldenrod is also a very potent anti-allergic herb for people with hay **fever**.

The genus name *Solidago* is derived from the Latin verb *solidare*, which can be translated "to make whole." Goldenrod received this appellation due to its reputation through the ages as a wound-healing drug. This also explains why goldenrod has sometimes been referred to as "woundwort" during its long history as a folk remedy. While not valued much today as a wound healer, goldenrod has been approved by the authoritative German Commission E as a diuretic, anti-inflammatory, and antispasmodic for the treatment of urinary tract disorders. Research suggests that goldenrod can increase the production of urine, which is often helpful in cases of urinary tract infection or kidney stones, without reducing levels of important electrolytes, such as **sodium** and chloride, the way that some man-made diuretics do. While it is not known exactly how goldenrod produces its therapeutic effects, researchers have focused on several naturally occurring chemicals in the plant. Most experts believe that goldenrod's ability to increase urine production is due to the presence of flavonoids and saponins, which stimulate the kidneys to release fluid. Another chemical in goldenrod, a phenolic glycoside called leiocarposide, may be responsible for goldenrod's anti-inflammatory effects. In one study of *Solidago virgaurea* involving rodents, researchers from Cairo University found that the anti-inflammatory activity of goldenrod was comparable to that of diclofenac, a nonsteroidal anti-inflammatory drug (NSAID) prescribed for conditions such as **rheumatoid arthritis**. The tannins in goldenrod have been associated with astringent properties. The herb also contains a small amount of essential oil.

General use

While not yet popular in the United States or approved for use by the United States Food and Drug Administration (FDA), goldenrod is used widely in Europe to treat urinary tract infections and help eliminate kidney or bladder stones. The Commission E has approved goldenrod as flushing-out therapy for inflammatory diseases of the lower urinary tract and for helping to eliminate and prevent stones. Goldenrod is considered useful in treating these disorders for several reasons. The herb can help to eliminate bacteria and stones by increasing the flow of urine and thereby "washing" them out. As an anti-inflammatory and

KEY TERMS

Antispasmodic—An agent with the ability to prevent or relieve convulsions or muscle spasms.

Astringent—An agent that helps to contract tissue and prevent the secretion of internal body fluids such as blood or mucus. Astringents are typically used to treat external wounds or to prevent bleeding from the nose or throat.

Diuretic—An agent that increases the production of urine.

Edema—Abnormal swelling of tissue due to fluid buildup. Edema, which typically occurs in the legs, liver, and lungs, is often a complication of heart or kidney problems.

Electrolytes—Substances in the blood, such as sodium and potassium, that help to regulate fluid balance in the body.

antispasmodic, goldenrod may help to soothe irritated tissue in the urinary tract and prevent **muscle spasms**.

Goldenrod is not used as a cure for any of these disorders—for example, antibiotics are considered the primary therapy in cases of urinary tract infections—but it can be a helpful component of treatment. In Germany, where goldenrod has government approval as an aid in treating urinary tract disorders, the plant is often combined with java tea leaf, birch leaf, or **uva ursi** leaf. Compared to other herbal diuretics, goldenrod is considered well tolerated due to its lack of side effects and contraindications.

Throughout its history, goldenrod has been used to treat a variety of other medical problems. These include **hemorrhoids**, diabetes, **tuberculosis**, liver enlargement, **gout**, internal bleeding, **diarrhea**, **asthma**, rheumatism, enlarged prostate, infections of the mouth and throat, and external **wounds**. In the Appalachian Mountain region of the United States, goldenrod leaves have been used to prepare blue mountain tea, which is recommended by folk practitioners there to combat fatigue and physical exhaustion. Sufficient scientific evidence to support these additional uses is lacking.

Preparations

Dosage of goldenrod generally ranges from 6–12 g of cut herb per day. The drug, which is recommended for internal use only, can be taken as a tea, liquid extract, or tincture. No matter which preparation is used, it is important to drink plenty of fluids (6–8 glasses a day) while using goldenrod in order to increase its effectiveness as a diuretic.

Goldenrod tea can be prepared by steeping 3–5 g (1 or 2 teaspoonfuls) of the herb in 150 ml of simmering water. The mixture should be strained after about 15 minutes. Dosage is two to four cups of tea a day, taken between meals. The liquid extract preparation is usually taken two to three times a day in doses of 0.5–2.0 ml. Dosage for the tincture is 0.5–1.0 ml two to three times a day.

Precautions

While self-care measures such as goldenrod may be an effective component of treatment for disorders of the urinary tract, these medical conditions can be serious and require consultation with a doctor. People who have **edema** due to reduced heart or kidney function should not use goldenrod without medical supervision. Due to lack of sufficient medical study, goldenrod should be used with caution in children, women who are pregnant or breastfeeding, and people with kidney disease. To ensure optimum effectiveness, protect goldenrod from direct sunlight and moisture during storage.

Most studies of goldenrod's effects as a diuretic, anti-inflammatory, and antispasmodic have been conducted in the test tube or in rodents. Goldenrod's effectiveness in humans is not well demonstrated.

Side effects

When taken in recommended dosages, goldenrod has not been associated with any significant or bothersome side effects. Allergic reactions may occur in some people.

Interactions

No drugs are known to interact adversely with goldenrod. In Germany, goldenrod has been combined with java tea leaf, birch leaf, and uva ursi leaf without apparent harm.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics, 1998.

Sifton, David W. *PDR Family Guide to Natural Medicines and Healing Therapies*. New York: Three Rivers Press, 1999.

Tyler, Varro E. *Herbs of Choice*. Binghamton, NY: Haworth Press, Inc., 1994.

PERIODICALS

el Ghazaly, M., M.T. Khayyal, S.N. Okpanyi, et al. "Study of the anti inflammatory activity of *Populus tremula*, *Solidago virgaurea* and *Fraxinus excelsior*." *Arzneimit telforschung* 42, no. 3 (1992): 333 6.

Leuschner, J. "Anti inflammatory, spasmolytic and diuretic effects of a commercially available *Solidago gigantea* Herb Extract." *Arzneimittelforschung* 45, no. 2 (1995): 165 8.

ORGANIZATIONS

American Botanical Council. P.O. Box 144345, Austin, TX 78714 4345.

Herb Research Foundation. 1007 Pearl Street, Suite 200, Boulder, CO 80302.

OTHER

Herb Research Foundation. http://www.herbs.org.

OnHealth. http://www.onhealth.com.

Discovery Health. http://www.discoveryhealth.com.

Greg Annussek

Goldenseal

Description

Goldenseal (*Hydrastis canadensis*) is a perennial North American native plant found wild in eastern deciduous woodlands and damp meadows as far north as Vermont and Minnesota, and south to Georgia and Arkansas. This versatile herb is sought for its valuable rootstock and inner twig bark. Goldenseal is a member of the Ranunculaceae, or buttercup family. It is a mainstay of **Native American medicine**, and a popular folk remedy. Goldenseal has multiple uses, both internally and externally. It is sometimes called poor man's ginseng. This traditional medicinal herb has been known by many names, including yellow paint root, orange root, eye root, Indian plant, tumeric root, eye balm, jaundice root, yellow puccoon, and ground raspberry. Native American tribes valued this natural antiseptic herb for many medicinal uses and as a clothing dye. Early colonists soon came to appreciate its infection-fighting action. The Native American use of goldenseal as a **cancer** treatment was first mentioned in the herbal, *Essays Toward a Materia Medica of the United States* first published by Benjamin Smith Barton in 1798.

The yellow rootstock is the main, known medicinal part of the herb. In cultivation, goldenseal requires up to four years growth before the rootstock is ready for harvest. The thick and knotty rhizome produces a hairy stem that grows to 2 ft (61 cm) high. Goldenseal has only two large leaves, each five-lobed with double-toothed edges growing atop a forked stem. Leaves are serrated at the top edges. A single flower with greenish-white sepals crowns the hairy stem. The fruit looks like a **raspberry**, hence one of the plant's common names. Pharmaceutical companies harvest goldenseal root in large quantities for use. The herb is fully endangered on extinction risk lists in the wild due to over-collection of the rhizome. An estimated 250,000 lbs (113,400 kg) of rootstock of this popular herbal remedy are sold each year, and most of this has been collected in the wild.

General use

The underground portion of the stem, called the rhizome, as well as the inner twig bark, are the medicinal part of this multiple-use native remedy. The goldenseal rhizome is rich in alkaloids: hydrastine, berberine, and canadine, in addition to other phytochemicals, oils, and resin. Goldenseal has been considered a cure-all medicinal herb because of its wide variety of medicinal applications. It is a bitter herb that is effective when taken internally to promote digestion. The herb is particularly helpful when used to treat inflammation and infection of the mucous membranes lining the upper respiratory tract, and the digestive and genitourinary tract. Its anti-bacterial properties improve all catarrhal conditions, and it is helpful against amoebic infection. Goldenseal potentiates insulin and stimulates liver, kidney, and lung function. The astringent herb may also be used to help control bleeding, so it is helpful in circumstances of excessive and painful **menstruation** or postpartum hemorrhage. It is antiseptic, diuretic, and acts as a mild laxative and internal body cleanser. Goldenseal is used in treatment of peptic ulcers, and stimulates the flow of bile. Applied externally as rhizome bark powder or tincture, the herbal preparations can help treat **gum disease**, vaginal infection, **eczema**, **impetigo**, **conjunctivitis**, inflammations of the ear, and possibly ringworm. Its diuretic and anti-inflammatory effects can help lower blood pressure. The berberine alkaloid in goldenseal stimulates uterine contractions, and the herb is useful to treat **pelvic inflammatory disease** (PID). Goldenseal is high in **iron**, **manganese**, silicon, and other minerals. Goldenseal was once considered a good substitute for quinine. The herb has been used as a remedy for diphtheria, **tonsillitis**, chronic catarrh of the intestines, typhoid **fever**, **gonorrhea**, leucorrea, and **syphilis**. It is no wonder that with all these medicinal benefits, this herb is disappearing in the wild.

Preparations

The rootstock of goldenseal, harvested in spring or fall in the third or fourth year of growth, can be used in decoction, liquid extract, tablet, and tincture. When purchasing commercially prepared remedies, avoid the wild-crafted sources to help protect this valuable herb in its wild habitat.

To prepare an eyewash of goldenseal, mix equal parts of powdered rootstock and boric acid with boiling hot water. Stir well and allow to cool. Strain the mixture and store in a dark glass container. For one dosage, retrieve 1 tsp of the resulting liquid per 1/2c water as a soothing eyewash solution. It is important to keep all equipment totally sterile, apply with a sterilized eyedropper, and discard old liquid eyewash (over 1–2 days).

For an infusion, use 1 tsp of powdered rootstock to a pint of boiling water. Let stand until cold. Dosage is 1–2 tsp, three to six times per day, for up to seven days. The infusion may also be used as a gargle.

To prepare a tincture, combine one part fresh herb to three parts alcohol (50% alcohol/water solution) in glass container. Set aside in dark place. Shake daily for two weeks. Strain through muslin or cheesecloth, and store in dark bottle. The tincture should maintain potency for two years. Standard dosage, unless otherwise prescribed, is 1 tsp, three times daily, for short periods (1–2 weeks).

To make capsules, pulverize the dried root into a fine powder. Place in gelatin capsules. Dosage is two capsules, three times daily for three weeks, then discontinue for the next three weeks.

Precautions

Pregnant and breastfeeding women should not use this herb as it may stimulate uterine contraction. Patients with high blood pressure should also avoid goldenseal. The herb should be taken only for very limited periods, as it builds up in the mucosa of the system and its strong alkaloids are neurotoxic over an extended time (i.e., several months of daily use). Three weeks on and three weeks off is a good routine for dosage. Do not eat the plant fresh, as it can irritate mucous tissues.

Side effects

Goldenseal use can destroy organisms that are beneficial to the body, as well as those that are pathological. It should be used only for limited periods of time.

Interactions

Goldenseal is often combined with other herbs in preparations. **Myrrh** gum (*Commiphora myrrha*) and **echinacea** (*Echinacea augustifolia*) extract may be added to goldenseal in salve preparations. Goldenseal combines well with **mullein** (*Verbascum thapus*) for **earache**, and with **chamomile** (*Matricaria chamomilla*) and meadowsweet (*Filipendula ulmaria*) for stomach aches. Combine in infusion with **gotu kola** (*Centella asiatica*) for a brain tonic.

Resources

BOOKS

Balch, James F., M.D., and Phyllis A. Balch, C.N.C. *Prescription for Nutritional Healing*. New York: Penguin Putnam, Inc., 2000.

Bown, Deni. *The Herb Society of America, Encyclopedia of Herbs & Their Uses*. New York: DK Publishing, Inc., 1995.

Hoffmann, David. *The New Holistic Herbal*. Boston: Element, 1991.

Lust, John. *The Herb Book*. New York: Bantam Books, 1982.

Werbach, Melvyn R., M.D., and Michael T. Murray, N.D. *Botanical Influences on Illness*. Tarzana, CA: Third Line Press, 2000.

OTHER

Foster, Steven. *Goldenseal's Future*. http://www.stevenfoster.com/education/monograph/goldenseal.html.

Clare Hanrahan

Gonorrhea

Definition

Gonorrhea is a highly contagious sexually transmitted disease (STD) caused by the *Neisseria gonorrhoeae* bacterium. The genitourinary tract is the main system that is usually affected, but gonorrhea can also spread to the rectum, the throat, and the eyes. Left untreated, gonorrhea can spread through the bloodstream and infect the brain, heart valves, joints, and the reproductive system. Exposure to an infected mother during birth may cause permanent blindness in the newborn.

Description

Gonorrhea, commonly referred to as "the clap," is the second most prevalent reportable disease in the United States. Adolescents and young adults are in

the highest risk category, with more than 80% of gonorrhea cases affecting the 15–29 year-old age group. Individuals living in urban areas who have multiple sex partners have the highest risk of contracting the disease. Still, the incidence of gonorrhea steadily declined after 1987. This trend appeared to be largely due to increased public awareness about the risks and prevention of contracting STDs such as herpes and HIV. However, in a report on sexually transmitted diseases (2007), the Centers for Disease Control (CDC) expressed concern about rising rates of gonorrhea in certain urban areas during preceding years. The CDC reported that 358,366 new cases of gonorrhea were diagnosed in 2006. Experts believe that the true number of cases of gonorrhea is much greater than this number, however, because many people do not see a health specialist for treatment of the disease.

Causes and symptoms

Gonorrhea is transmitted efficiently. It can be spread merely by coming into contact with the fluids of an infected person as well as by sexual contact. A person runs a 60–90% chance of contracting the disease after just one sexual encounter with an infected person. The symptoms usually begin between one day and two weeks after the initial encounter with the infection.

People who are infected with gonorrhea commonly experience increasingly frequent and painful urination, and the urethra may be painful and swollen. There may be a thick white, yellowish, or bloody discharge from the penis or vagina. Other symptoms may include **nausea**, **vomiting**, **fever**, **chills**, and **pain** during intercourse. In the case of oral infection, there may be a **sore throat** or pain during swallowing. An anal infection may cause rectal **itching**, rectal discharge, and a constant urge to move the bowels. Women who show symptoms of gonorrhea often have abdominal pain and breakthrough bleeding (spotting) between menstrual periods. However, many women who have gonorrhea experience no symptoms.

In infants and children, irritation, redness, swelling with a pus-like discharge, and possibly pain and a change in urination may point to a gonorrhea infection. The infection may be due to child abuse or exposure to infected materials. An in-depth history should be taken if gonorrhea is suspected.

Diagnosis

The initial diagnosis of gonorrhea is based on symptoms, sexual history, and at-risk behavior. One laboratory test for diagnosis involves the observation of a gram-stained sample of the discharge under a microscope. In the gram stain test, the sample is dyed, washed with various solutions, and dyed with a different color. The final color identifies the class of bacteria present in the sample. The advantage of this test is that results can be obtained very quickly so that treatment can commence at the initial visit. In the vast majority of men, it is quite accurate; however, the test is not very accurate for women.

For all women and for men with a questionable gram-stain reading, samples of the discharge from the infected area can be collected and cultured. The sample is incubated for up to two days, which provides enough time for the bacteria to multiply and be accurately identified. This test is highly accurate and specific for gonorrhea, but improper handling can lead to a false-negative reading. Other tests that are also used include the ELISA (enzyme-linked immunosorbent assay) antibody test and DNA probe testing of genetic material from the discharge, both of which are quite accurate in identifying *Neisseria gonorrhoeae*.

Treatment

Although there is nothing that can totally replace antibiotics in the treatment of gonorrhea, certain herbs and minerals may be used to supplement the treatment. These may be used to improve the body's immune function: **zinc**, multivitamins and mineral complexes, **vitamin C**, and **garlic** (*Allium sativum*). *Lactobacillus acidophilus* in supplements and live-culture yogurts help replenish gastrointestinal flora that may be destroyed by the intake of antibiotics.

Several herbs may reduce symptoms and help speed healing. These include **kelp** (*Macrocystis pyrifera* and related species), *Calendula officinalis*, **myrrh** (*Commiphora molmol*), and *Thuja occidentalis*. These herbs can be taken by the mouth or used as a douche. The Chinese herb *Coptis chinensis*, used for damp-heat **infections**, is helpful in treating the genitourinary tract, especially if **pelvic inflammatory disease** (PID) develops. An herbalist should be consulted to make recommendations for further complications. Some recommend a three-day cleansing fast to quicken and support healing. **Fasting** should be done only with the approval and supervision of a physician. Referral to an acupuncturist is also recommended, as there may be **acupressure** and **acupuncture** points that will help with system cleansing.

Allopathic treatment

For many years, the most effective treatment for gonorrhea was one of two antibiotics: penicillin, or one

of its derivatives, and tetracycline. Over time, the *Neisseria gonorrhoeae* bacterium became significantly more resistant to these drugs, and other treatments were developed. In the late 2000s the most popular of those treatments were two broad-spectrum cephalosporins (ceftriaxone and cefixime), and three fluoroquinolones (ciprofloxacin, ofloxacin, and levofloxacin). In its 2006 report on drug-resistant gonorrhea, the CDC reported that approximately 15% of all cases of gonorrhea are resistant to treatment by penicillin and tetracycline, and new **strains** of the bacterium resistant to the fluoroquinolones have also begun to develop. The treatment of gonorrhea continued to be an on-going challenge for researchers and medical workers.

Since other STDs, such as **chlamydia** and **syphilis**, often occur with gonorrhea, patients may also be tested and treated for these related infections. Patients should refrain from sexual intercourse until treatment is complete and should return for follow-up testing. Anyone with whom the patient has had sexual contact during the time of infection should be notified and treated, even if those persons do not show symptoms. Doctors are required to report this disease to public health officials.

More than one healthcare provider may have to be consulted. Physicians trained in obstetrics or gynecology may be involved if gynecological complications occur. Men who experience complications may be referred to a urologist. There are also infectious disease doctors who specialize in the treatment of STDs.

Expected results

The prognosis for patients with gonorrhea varies based on how early the disease is detected and treated. Patients who are treated early and properly can be entirely cured of the disease. The most common complication is pelvic inflammatory disease (PID). PID can occur in up to 40% of women with gonorrhea and may result in damage to the fallopian tubes, an ectopic **pregnancy**, or sterility. If an infected woman is pregnant, gonorrhea can be passed on to the eyes of the newborn during delivery, which can lead to infection and blindness.

Although the risk of **infertility** due to gonorrhea is higher in women than in men, men may also become sterile if urethritis (inflammation of the urethra) develops. Complications of gonorrhea can affect the prostate, testicles, and surrounding glands as well. In either gender, inflammation, abscesses, and scarring can occur. In approximately 2% of patients with untreated gonorrhea, the infection may spread throughout the body and can cause fever, arthritis-like joint pain, and skin lesions.

KEY TERMS

Chlamydia—The most common bacterial sexually transmitted disease in the United States.

Ectopic pregnancy—A pregnancy that occurs outside the uterus, often in the fallopian tubes. The fetus will not survive, and in some cases, the pregnancy can result in the death of the mother.

False-negative—A laboratory result that does not detect the presence of a disease that is actually present.

Pelvic inflammatory disease (PID)—An infection of the upper genital tract.

Sexually transmitted diseases (STDs)—A group of diseases that are transmitted by sexual contact. In addition to gonorrhea, this group generally includes chlamydia, HIV (AIDS), genital herpes, genital warts, and syphilis.

Urethra—The canal leading from the bladder, and in men, also a path for semen.

Urethritis—Inflammation of the urethra.

Prevention

As of 2008, there was no vaccine for gonorrhea. The best prevention is to abstain from having sex or to engage in sex only when in a monogamous relationship in which both partners have been tested for STDs. The next line of defense against gonorrhea is the use of condoms, which have been shown to be highly effective in preventing this disease. The use of a diaphragm can also reduce the risk of infection. Since the risk of contracting gonorrhea increases with the number of sexual partners, those who have sexual contact with more than one partner are advised to be tested regularly for gonorrhea and other STDs.

Resources

BOOKS

Johnson, Henry James. *Clinical Observations on Diseases of the Genito Urinary Organs: Part I, Gonorrhea and Its Consequences*. Whitefish, MT: Kessinger, 2008.

Marr, Lisa. *Sexually Transmitted Diseases: A Physician Tells You What You Need to Know*, 2nd ed. Baltimore: Johns Hopkins University Press, 2007.

Michaud, Christopher. *Gonorrhea*. New York: Rosen, 2006.

PERIODICALS

Vickerman, Peter, et al. "Detection of Gonococcal Infection: Pros and Cons of a Rapid Test." *Molecular Diagnosis* (April 2005): 175 179.

Ressler, Rand W., Melissa Waters, and John Keith Watson. "Contributing Factors to the Spread of Sexually Transmitted Diseases: The Case of Welfare." *American Journal of Economics and Sociology* (October 2006): 943 961.

Tapsall, John. "Antibiotic Resistance in *Neisseria gonorrhoeae* is Diminishing Available Treatment Options for Gonorrhea: Some Possible Remedies." *Expert Review of Anti Infective Therapy* (August 2006): 619 628.

OTHER

Behrman, Amy J. "Gonorrhea." *eMedicine*. http://www.emedicine.com/EMERG/topic220.htm. (February 10, 2008).

"Gonorrhea." *National Institute of Allergy and Infectious Diseases*. http://www3.niaid.nih.gov/healthscience/healthtopics/gonorrhea/. (February 10, 2008).

"Gonorrhea." *womenshealth.gov*. http://www.4women.gov/faq/stdgonor.htm. (February 10, 2008).

ORGANIZATIONS

American Social Health Association, PO Box 13827, Research Triangle Park, NC, 27709, (919) 361 8400, http://www.ashastd.org.

Centers for Disease Control and Prevention, 1600 Clifton Rd., Atlanta, GA, 30333, (800) 311 3435, http://www.cdc.gov/.

Patience Paradox
Teresa G. Odle
David Edward Newton, Ed.D.

Gotu kola

Description

Gotu kola (*Centella asiatica*) is a member of the Apiaceae carrot family. It is also called pennywort, marsh penny, water pennywort, and sheep rot. The name sheep rot comes from the erroneous belief in Europe that gotu kola caused foot rot in sheep. Gotu kola is often mistaken for the **kola nut** plant (*Cola nitida*). However, the two are not related and gotu kola, unlike the kola nut, contains no **caffeine**. Gotu kola is noted in India as a very powerful spiritual herb, and **Ayurvedic medicine** refers to it as *Brahmi* because it helps obtain knowledge of the spiritual being.

Gotu kola, a perennial, grows in India, Sri Lanka, Madagascar, South Africa, China, Indonesia, Australia, and North America. It can grow like a weed, but its description depends on its location. For example, in shallow water, the leaves float; but in dry areas, the plant develops many roots and thin, tiny leaves. The fan-shaped leaves may be smooth or lobed. Red flowers turn into fruit with a diameter of about 0.2 in (5 mm).

Gotu kola's main active components are triterpenoids, although the gotu kola found in India, Sri Lanka, and Madagascar does not have the same properties. Gotu kola's triterpenes can have a concentration from 1.1-8%, with most concentrations in the middle range.

Gotu kola from Madagascar is used for most standardized extracts, and its four main triterpene properties are:

- asiatic acid (29-30%)
- madecassic acid (29-30%)
- asiaticoside (40%)
- madecassoside (1-2%)

Gotu kola also contains the following:

- volatile oil of a terpene acetate (36% of all the volatile oil)
- camphor
- cineole
- glycerides of some fatty acids
- plant sterols (campesterol, stigmasterol, sitosterol)
- polyacetylene compounds
- flavonoids (kampferol, quercetin)
- myo-inositol (glycoside from the flavonoids)
- sugars
- vellarin
- amino acids
- resins

General use

Traditional use of gotu kola in India and Indonesia included wound treatment. In the 1800s, it became part of Indian medicine practice and was used to treat many skin conditions including leprosy, varicose ulcers, and **eczema**, as well as **fever**, **diarrhea**, and absence of menses.

Chinese medicine uses various parts of the plant. The leaves are used for leukorrhea and fevers that are toxic, while other types of fevers and **boils** are treated with gotu kola shoots. Gotu kola used for longevity has become very popular. Chinese herbalist, Li Ching Yun, is supposed to have lived 256 years from drinking a herbal mixture containing gotu kola. An ancient Sinhalese saying, "Two leaves a day will keep old age

Gotu kola. *(©PlantaPhile, Germany. Reproduced by permission.)*

away," also illustrates gotu kola's popularity as an agent for longevity.

The plant enhances brain and peripheral circulation, and is said to enhance memory. In the 1880s, the French began using gotu kola as part of regular pharmaceutical medicines.

Many current uses are similar to traditional uses of the plant. In a 1992 study at Kasturba Medical College, researchers fed rats gotu kola extract. After 14 days, the gotu kola-treated rats showed 3-60 times better retention of learned behavior than did rats who did not receive the extract.

Gotu kola may also play a role in fighting **Alzheimer's disease**, which affects over four million people in the United States. People with this dementia-causing disease have unusual amounts of the protein beta-amyloid (also called plaque) in the brain. A 1999 study conducted by pathology professor Alan Snow at Seattle's University of Washington showed gotu kola's potential for treatment. Snow first mixed a compound from **cat's claw** and tested it in rats and in test tubes. Results showed that cat's claw intervenes with plaque formation. When other extracts were added to the test tubes, including gotu kola and **rosemary**, the results were more pronounced.

Besides its use as a general memory aid, gotu kola has become popular in the Western world for its calming effects as well as for improving concentration. This duality occurs because gotu kola affects both the central nervous system and the brain. It relaxes the nervous system while stimulating the brain to focus better. In a 1999 study at the West Palm Beach Veterans Affairs Medical Center, researchers tested several dietary supplements, including gotu kola, for use in **depression**, **anxiety**, and **sleep disorders**. Researchers found little difference in the results of the natural supplements and low- and high-dose antidepressants. However, the studies indicated patients switch to natural supplements because they think they are safer. The research served as a guideline for healthcare professionals to aid their patients' choice of treatment.

Studies have also shown that gotu kola has positive effects on **varicose veins**, poor blood circulation in the legs and the rest of the circulatory system, leg cramps, and leg swelling. The circulatory improvement occurs

KEY TERMS

Amino acids—Nitrogen compounds that make up the main structure of proteins in the body.

Dementia—Irreversible mental deterioration.

Episiotomy—A surgical incision of the vaginal opening made during childbirth to avoid tearing during delivery.

Flavonoids—Generic term for compounds, such as plant compounds that help in treatment and prevention of diseases. Over 4,000 flavonoids are classified based on their chemical composition. These include citrus bioflavonoids, green tea polyphenols, and quercetin.

Glycoside—Compound containing a sugar component such as glucose and a nonsugar component such as triterpenes.

Leukorrhea—White discharge from the vagina, normally occurring during the menstrual cycle, pregnancy, lactation, and menopause. A change in color, amount, or odor is a symptom of a reproductive tract disorder.

Scleroderma—Immune system disorder where collagen (a protein found in connective tissue, bone, skin, etc.) forms in an abnormal manner. Can affect many body organs and tissues such as the heart, lungs, gastrointestinal tract, joints, kidneys, and skin.

because gotu kola decreases vein hardening, improves the connective tissue around veins, and helps the blood to flow through veins. These circulatory and leg benefits were evident in 80% of patients tested in studies conducted in the late 1980s.

Gotu kola also has positive effects on various skin problems. Animal research has shown that tripenoid asiaticoside may help **wounds** heal quicker. Other studies showed that gotu kola helped in healing surgical wounds of the ear, nose, and throat, and promoted healing of episiotomies, **gangrene**, skin grafts, and some skin ulcers. Asiaticoside can also toughen skin, hair, and nails. Research has shown that asiaticoside may provide treatment for leprosy. Leprosy-causing bacteria are coated in a wax-like substance that the immune system cannot penetrate. However, gota kola disintegrates this substance, allowing the immune system to attack the bateria.

Clinical trials also show that gotu kola's tripenoids, when purified, can lessen the ravages of scleroderma. Gotu kola can reduce hardening of the skin, decrease joint **pain**, and increase finger movement.

Gotu kola extracts can heal second- and third-degree **burns** from boiling water or **gas** explosions if the burn is treated immediately. Either topical application or intramuscular injections can stop the effects of skin **infections** from burns and can stop or reduce skin shrinkage, inflation, and scarring.

Gotu kola extract might be effective in fighting tumors. However, researchers are cautious because animal and human studies need to be completed.

Preparations

Gotu kola is often eaten in a salad. It can also be made into a tea by using 0.5–1 tsp (2.5–5 ml) of gotu kola in 1 cup (250 ml) of boiling water. The plant is steeped for 10–15 minutes and the tea is then drunk. This amount can be consumed up to three times a day. Because of its bitter taste, the tea can be enhanced with honey or lemon to taste.

For a poultice on wounds or skin problems, gotu kola leaves can be crushed and applied, or a tincture may be used. A poultice can also be made from gotu kola tea.

For scleroderma, suggestions include 70 mg twice a day. The usual dosage is 0.5–1 g three times daily, a standardized extract dosage is 60–120 mg a day, and a liquid extract approximately 0.5–1 tsp can be taken daily.

Precautions

Children under two years old, pregnant women, and people with **epilepsy** should avoid gotu kola. Fair-skinned people and others who have had an allergic reaction to sunlight or other ultraviolet light sources should avoid these sources if they take gotu kola.

Side effects

A rash is the most common side effect when gotu kola is taken internally or applied topically. If injected, some pain and bruising may occur at the injection sight. The asiaticoside component could be a mild skin carcinogen. It is not wise to apply gotu kola topically over a long period of time. The plant may also cause mild headaches or **nausea**. As with any supplement, consultation with a healthcare professional should occur before beginning treatment.

Interactions

Gotu kola should not be mixed with oral diabetes medication or drugs such as Lipitor, Lopid, Mevacor, and Zocor, all of which lower **cholesterol**. Gotu kola can raise cholesterol. It is also best not to mix gotu kola with alcohol or sedatives.

Resources

BOOKS

Castleman, Michael. *The Healing Herbs*. Emmaus, PA: Rodale Press, 1991.

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Murray, Michael, N.D. *Encyclopedia of Nutritional Supplements*. Roseville, CA: Prima Publishing, 1996.

Murray, Michael, N.D. *The Healing Power of Herbs*. 2nd ed. Roseville, CA: Prima Publishing, 1995.

Rothenberg, Mikel, M.D., and Charles Chapman. *Dictionary of Medical terms*. 3rd ed. Hauppauge, NY: Barron's Educational Series, 1994.

PERIODICALS

Schar, Douglas, M.C.P.P. Dip.Phyt. "5 Cutting edge Superherbs The Happy Skin Herb Gotu Kola." *Prevention Magazine* (December 1999).

OTHER

Herbal Information Center. http:/www.kcweb.com/herb/gotu.htm.

The People's Pharmacy Guide to Home and Herbal Remedies. http://www.healthcentral.com.

Sharon Crawford

Gout

Definition

Gout is a form of acute arthritis that causes severe **pain** and swelling in the joints. It most commonly affects the big toe, but may also affect the heel, ankle, hand, wrist, or elbow. It affects the spine often enough to be a factor in lower back pain. Gout is often a recurring condition. An attack usually comes on suddenly and goes away after 5–10 days. Gout occurs when there are high levels of uric acid circulating in the blood, and the acid crystallizes and settles in the body. According to the National Institutes of Health (NIH), gout accounts for about 5% of all cases of arthritis reported in the United States.

Gout appears to be on the increase in the American population. According to a study published in November 2002, there was a twofold increase in the incidence of gout over the 20 years between 1977 and 1997. It is not yet known whether this increase is the result of improved diagnosis or whether it is associated with risk factors that have not yet been identified.

Gout

Gout risk factors

- Family history of the disease
- Male
- Overweight
- Excessive alcohol
- Purine-rich diet
- Enzyme defect that makes it difficult for the body to break down purines
- Exposure to lead in the environment
- Organ transplant recipient
- Use of medicines such as diuretics, aspirin, cyclosporine, or levodopa
- Take niacin (vitamin)

Signs of gout

- Hyperuricemia
- Presence of uric acid crystals in joint fluid
- More than one attack of acute arthritis
- Arthritis that develops in a day, producing a swollen, red, and warm joint
- Attack of arthritis in only one joint, often the toe, ankle, or knee

SOURCE: National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health, U.S. Department of Health and Human Services

(Illustration by GGS Information Services. Cengage Learning, Gale)

Description

Uric acid is formed in the bloodstream when the body breaks down waste products, mainly those containing purines. Purines can be produced naturally by the body, and they can be ingested from such high-purine foods as meat. Normally, the kidneys filter uric acid particles out of the blood and excrete it into the urine. If the body produces too much uric acid or the kidneys are not able to filter enough of it out, there is a buildup of uric acid in the bloodstream. This condition is known as hyperuricemia.

Uric acid does not tend to remain dissolved in the bloodstream. Over the course of years, or even decades, hyperuricemia may cause deposits of crystallized uric acid throughout the body. Joints, tendons, ear tips, and kidneys are favored sites. When the immune system becomes alerted to the urate crystals, it mounts an inflammatory response that includes the pain, redness, swelling, and damage to joint tissue that are the hallmarks of an acute gout attack.

The body's uric acid production tends to increase in males during puberty. Therefore, nine out of ten people with gout are men. Since it can take up to 20 years of hyperuricemia to have gout symptoms, men do not

KEY TERMS

Allopurinol—A drug that corrects hyperuricemia by inhibiting urate production.

Colchicine—A drug used to treat painful flare-ups of gout.

Constitutional remedy—A homeopathic medicine prescribed according to each person's character and temperament as well as symptoms.

Corticosteroids—Medications related to a natural body hormone called hydrocortisone, which are used to treat inflammation.

Hyperuricemia—High levels of uric acid in the bloodstream.

Kidney stones—Hard lumpy masses of mineral wastes that are formed in the kidneys and may cause blockages.

Purine—A substance found in foods that is broken down into urate and may contribute to hyperuricemia and gout.

Synovial fluid—Fluid surrounding the joints which acts as a lubricant, reducing the friction between the joints.

Tophus (plural, tophi)—A chalky deposit of a uric acid compound found in gout. Tophi occur most frequently around joints and in the external ear.

commonly develop gout until reaching their late 30s or early 40s. If a woman does develop gout, typically, it will be later in her life. According to some medical experts, this is because estrogen protects against hyperuricemia. It is not until estrogen levels begin to fall during **menopause** that urate crystals can begin to accumulate.

Hyperuricemia does not necessarily lead to gout. The tendency to accumulate urate crystals may be due to genetic factors, excess weight, or overindulgence in the wrong kinds of food. In addition, regular use of alcohol to excess, the use of diuretics, and the existence of high levels of **cholesterol** and triglycerides in the blood can increase the risk of developing the disease. In some cases, an underlying disease such as lymphoma, **leukemia**, or hemolytic **anemia** may also lead to gout.

Causes and symptoms

An acute episode of gout often starts without warning. The needle-like urate crystals may be present in the joints for a long time without causing symptoms. Then, there may be a triggering event such as a stubbed toe, an infection, surgery, **stress**, **fatigue**, or even a heavy drinking binge. Patients in intensive care units (ICUs) may have an acute flare-up of gout. In addition, it is now known that chronic occupational exposure to lead leads to decreased excretion of urates and an increased risk of developing gout.

In many cases, the gout attack begins in the middle of the night. There is intense pain, which usually involves only one joint. Often it is the first joint of the big toe. The inflamed skin over the joint is warm, shiny, and red or purplish, and the pain is often so excruciating that the individual cannot tolerate the pressure of bedcovers. The inflammation may be accompanied by a **fever**.

Acute symptoms of gout usually resolve in about a week, and then disappear altogether for months or years at a time. Eventually, the attacks may occur more frequently, last longer, and do more damage. The urate crystals may eventually settle into hard lumps under the skin around the joints, leading to joint deformity and decreased range of motion. These hard lumps, called tophi, may also develop in the kidneys and other internal organs, under the skin of the ears, or at the elbow. People with gout also have a heightened risk of kidney disease, and almost 20% of people with gout develop **kidney stones**. The relationship between gout and kidney stone formation is still not completely understood.

Diagnosis

Doctors can diagnose gout based on a physical examination and the patient's description of symptoms. In order to detect hyperuricemia, doctors can administer a blood test to measure serum urate levels. However, high urate levels merely point to the possibility of gout. Many people with hyperuricemia do not have urate crystal deposits. Also, it has been shown that up to 30% of people with gout have normal serum urate levels, even at the time of an acute gout attack. The most definitive way to diagnose gout is to take a sample of fluid from an affected joint and test it for the presence of the urate crystals.

Treatment

The symptoms of gout will stop completely a week or so after an acute attack without any intervention. It is important, however, to be diagnosed and treated by a health care practitioner in order to avoid attacks of increasing severity in the future and to prevent permanent damage to the joints, kidneys, and other organs.

During an acute attack, treatment should focus on relieving pain and inflammation. On an ongoing basis, the focus is on maintaining normal uric acid levels, repairing tissue damage, and promoting tissue healing.

Diet

Generally, gout is unheard of in vegetarians. It is a condition that responds favorably to improvements in diet and **nutrition**. Recurrent attacks can be avoided by maintaining a healthy weight and limiting the intake of purine-rich foods. A diet high in fiber and low in fat is also recommended. Processed foods should be replaced by complex carbohydrates, such as whole grains. Protein intake should be limited to under 0.8g/kg of body weight per day.

Nutritional supplements

Vitamin E and **selenium** are recommended to decrease the inflammation and tissue damage caused by the accumulation of urates.

Folic acid has been shown to inhibit xanthine oxidase, the main enzyme in uric acid production. The drug allopurinol is used for this same purpose in the treatment of gout. The therapeutic use of folic acid for this condition should be prescribed and monitored under the supervision of a heath care practitioner. The recommended dosage range is 400-800 micrograms per day.

The **amino acids** alanine, aspartic acid, glutamic acid, and glycine taken daily improve the kidneys' ability to excrete uric acid. **Bromelain**, an enzyme found in pineapples, is an effective anti-inflammatory. It can be used as an alternative to NSAIDs and other prescription anti-inflammatory drugs. It should be taken between meals at a dosage of 200-300 mg, three times per day.

The bioflavonoid **quercetin** helps the body absorb bromelain. It also helps decrease uric acid production and prevents the inflammation that leads to the acute symptoms of gout and the resulting tissue destruction. Quercetin should be taken at the same time and dosage as bromelain: 200-400 mg, between meals at a three times per day.

Herbs

Dark reddish-blue berries such as cherries, blackberries, **hawthorn** berries, and elderberries are very good sources of flavonoid compounds that have been found to help lower uric acid levels in the body. Flavonoids are effective in decreasing inflammation and preventing and repairing the destruction of joint tissue. An amount of the fresh, frozen, dried, juiced, or otherwise extracted berries equal to half a pound (about 1 cup) fresh should be consumed daily.

Devil's claw (*Harpagophytum procumbens*) has been shown to be of benefit. It can be used to reduce uric acid levels and to relieve joint pain.

Gout represents a serious strain on the kidneys. The dried leaves of nettles, *Urtica dioica,* can be made into a pleasant tea and consumed throughout the day to increase fluid intake and to support kidney functions. However, some people are allergic to nettles.

Therapy

Colchicum is a general homeopathic remedy that can be used for pain relief during a gout attack. It is formulated from the same plant, Autumn crocus, as the drug colchicine, used in the conventional treatment of gout. Gout may be improved by having a constitutional remedy prescribed that is based on the tendency to develop the disease and its symptoms.

During the acute phase of gout, **acupuncture** can be helpful with pain relief.

Applications of ice or cold water can reduce pain and inflammation during acute attacks.

Allopathic treatment

Standard medical treatment of acute attacks of gout includes nonsteroidal anti-inflammatory drugs (NSAIDs) such as naproxen sodium (Aleve), ibuprofen (Advil), or indomethacin (Indocin). Daily doses until the symptoms have subsided are recommended. Colchicine (Colbenemid), is also used. Corticosteroids such as prednisone (Deltasone, prednisolone, and corticotropin [ACTH]) may be given orally or may be injected directly into the joint for a more concentrated effect. Because these drugs can cause undesirable side effects, they are used for only about 48 hours so as not to cause major problems. Aspirin and other salicylates should be avoided, because they can impair uric acid excretion and may interfere with the actions of other gout medications.

Once an acute attack has been successfully treated, doctors try to prevent future attacks of gout and long-term joint damage by lowering uric acid levels in the blood. Colchicine is the drug of choice to deter recurrence. This medication can be very hard on the vascular system and the kidneys, however, and it is incompatible with a number of antidepressants, tranquilizers, and antihistamines. It should be avoided by pregnant women and the elderly.

There are two types of drugs used for lowering uric acid levels. Sometimes these drugs resolve the problem completely. However, the use of low-level amounts may be required for a lifetime. Uricosuric drugs, such as probenecid (Benemid) and sulfinpyrazone (Anturane), decrease urates in the blood by increasing their excretion. These drugs may also promote the formation of kidney stones, and they are contraindicated for patients with kidney disease. Xanthine oxidase inhibitors block the production of urates in the body. They can dissolve kidney stones as well as treat gout. Allopurinol is the drug most used in this respect. Its adverse effects include reactions with other medications, and the aggravation of existing skin, vascular, kidney, and liver dysfunction.

Expected results

Gout cannot be cured, but it can be managed successfully. Prompt attention to diet and reducing uric acid levels will rectify many of the problems associated with gout. Kidney problems can also be reversed or improved. Tophi can be dissolved or surgically removed, and with the tophi gone, joint mobility generally improves. Gout is generally more severe in those whose initial symptoms appear before age 30. The coexistence of **hypertension**, diabetes, or kidney disease can make for a much more serious condition.

Prevention

For centuries, gout has been known as the "rich man's disease," a disease of overindulgence in food and drink. While this view is perhaps oversimplified, lifestyle factors clearly influence a person's risk of developing gout. For example, losing weight and limiting alcohol intake can help ward off gout. Since purines are broken down into urates by the body, consumption of foods high in purine should be limited. Foods that are especially high in purines are red meat, organ meats, meat gravies, shellfish, sardines, anchovies, mushrooms, cooked spinach, rhubarb, yeast, asparagus, beer, and wine.

Dehydration promotes the formation of urate crystals, so people taking diuretics, or "water pills," may be better off switching to another type of blood pressure medication. Increased intake of fluids will dilute the urine and encourage excretion of uric acid. Therefore, six to eight glasses of water should be consumed daily, along with plenty of herbal teas and diluted fruit juices.

Consumption of saturated fats impedes uric acid excretion, and consumption of refined carbohydrates, such as sugar and white bread and pasta, increases uric acid production. Both should be seriously limited.

The use of **vitamin C** should be avoided by people with gout, due to the high levels of acidity.

Resources

BOOKS

Parker, James N., M.D., and Philip M. Parker, Ph. D. *The 2002 Official Patient's Sourcebook on Gout*. San Diego, CA: ICON Health Publications, 2002.

PERIODICALS

Arromdee, E., C. J. Michet, C. S. Crowson, et al. "Epi demiology of Gout: Is the Incidence Rising?" *Journal of Rheumatology* 29 (November 2002): 2403 2406.

Conos, Juan J., and Robert Kalish. "Gout: Effective Drug Therapy for Acute Attacks and for the Long Term." *Consultant* (August 1996): 1752 55.

Emmerson, Bryan T. "The Management of Gout." *New England Journal of Medicine* (February 15, 1996): 445 451.

Hsu, C. Y., T. T. Shih, K. M. Huang, et al. "Tophaceous Gout of the Spine: MR Imaging Features." *Clinical Radiology* 57 (October 2002): 919 925.

Lin, J. L., D. T. Tan, H. H. Ho, and C. C. Yu. "Environ mental Lead Exposure and Urate Excretion in the General Population." *American Journal of Medicine* 113 (November 2002): 563 568.

Perez Ruiz, F., M. Calabozo, G. G. Erauskin, et al. "Renal Underexcretion of Uric Acid is Present in Patients with Apparent High Urinary Uric Acid Output." *Arthritis and Rheumatism* 47 (December 15, 2002): 610 613.

Raj, J. M., S. Sudhakar, K. Sems, and R. W. Carlson. "Arthritis in the Intensive Care Unit." *Critical Care Clinics* 18 (October 2002): 767 780.

Shekarriz, B., and M. L. Stoller. "Uric Acid Nephrolithiasis: Current Concepts and Controversies." *Journal of Urology* 168 (October 2002) (4 Pt 1): 1307 1314.

ORGANIZATIONS

Arthritis Foundation. 1330 W. Peachtree Street, P.O. Box 7669, Atlanta, GA 30357 0669. (800) 283 7800. http://www.arthritis.org.

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). National Institutes of Health (NIH), 1 AMS Circle, Bethesda, MD 20892 3675. http://www.niams.nih/gov.

OTHER

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). *Questions and Answers About Gout*. Bethesda, MD: NIAMS, 2002. NIH Publication No. 02 5027. http://www.niams.nih.gov/hi/topics/gout/gout/htm.

Patience Paradox
Rebecca J. Frey, PhD

Grains-of-paradise fruit

Description

Grains-of-paradise fruit is a member of the Zingiberaceae family (**ginger** group), which is a major family of tropical and subtropical fruits. It is also known as Guinea grains, Melegueta pepper, Piper melegueta and *Aframomum melegueta roscoe,* which is its botanical name.

Aframomum melegueta roscoe is a perennial herb that produces a spicy edible fruit commonly found in the tropical regions, particularly of western Africa. It is somewhat palm-like in appearance, forming dense clumps and growing to a height of 4-5 ft (1.2-1.5 m), with divided smooth leaves that can be up to 9 in (23 cm) long.

There are two types of grains-of-paradise fruit. They resemble the spice cardamom in appearance and pungency, and the commercial variety is perhaps even closer in appearance and scent. True grains-of-paradise fruit tends to be less pungent than cardamom once cooked or heated.

The seeds are approximately oval in shape, hard, shiny, and reddish-brown color, whereas cardamom is pale buff-colored. Powdered grains-of-paradise fruit are pale gray. This spice is aromatic and can be distinguished by its hot peppery taste.

General use

In Africa and throughout the tropics, grains-of-paradise fruit (*Aframomum melegueta*) is a cultivated crop and is used as a remedy for a variety of ailments, although it is now rarely used outside these areas. It is one of the plants extensively made use of by African ethnomedicine.

Some confusion surrounds the identity of the true grains-of-paradise fruit, as approximately seven species of fruit are also sometimes mistakenly referred to as grains-of-paradise fruit, particularly *Malabar cardamom, Cardamomum malabaricum*, and *Cardamomum minus*, also the Zanzibar pepper. Grains-of-paradise fruit have even been confused with ***Nux vomica***, which is used as a homeopathic remedy. In fact, it is now recognized that *Aframomum melegueta roscoe* is the authentic species. The name "grains-of-paradise fruit" dates from the Middle Ages, and denotes the fact that it was once a highly valued commodity. The west African coast became known as the Grain Coast because grains-of-paradise fruit was traded there.

KEY TERMS

Antifungal—A drug or compound effective in treating fungal infections.

Antimicrobial—A drug or medication effective against disease-causing micro-organisms.

Aphrodisiac—A food or drug that stimulates sexual desire.

Ethnomedicine—Medicine pertaining to a particular ethnic group.

Phytomedicinals—Medicinal substances derived from plants.

Schistosomiasis—Also called bilharziasis, this is a disease caused by bodily infestation of blood flukes.

Considered to be spicy, hot, and slightly bitter, the active constituents of grains-of-paradise fruit include **essential oils** such as gingerol, paradol, and shagaol. It also contains **manganese**, gum, tannin, starch, and a brown resin. It has been proven to be an effective antifungal and antimicrobial agent.

Like cardamom, it is also used as a condiment, due to its pleasant taste, which is pungent without being intensely bitter. It is mainly used nowadays to flavor wines, spirits and particularly beer, although during the Middle Ages it was a favorite spice in Europe and other parts of the world. This spice, despite its popular beginnings, is hardly known outside of Africa today. Nevertheless, it remains popular as a spice in Arab cuisine, particularly Morocco and Tunisia. It has also been used as a pepper substitute, and may be chewed in cold weather to warm the body. In addition, it is a common addition to veterinary remedies.

The essential oil of grains-of-paradise is available, though not easy to find. Its properties are similar to those of the fruit, but it is often chosen for its fragrance. Grains-of-paradise fruit is used in African countries as an aphrodisiac as well as a treatment for **measles** and leprosy. Interestingly, extract of *Aframomum melegueta* has been shown in laboratory studies to increase sexual arousal and behavior in male rats. It is also used to reduce hemorrhage, particularly associated with **childbirth**.

Other phytomedicinal uses of grains-of-paradise include as a purgative (strong laxative), galactogogue (to increase production of breastmilk), anthelmintic (antiparasitic—it is effective against **worms**, etc.), and

hemostatic agent (purifies the blood). It has even been found to be effective against the dreaded schistosomiasis, which is a major problem to the medical authorities on the African continent.

Grains-of-paradise fruit is also effective against intestinal **infections** and infestations, and is also used to calm **indigestion** and **heartburn**. Interestingly, grains-of-paradise fruit is one of the plants presently being researched as a possible alternative to allopathic medicines in tropical countries, where they are attempting to find cheaper and more readily available local phyto-medicinal alternatives to their common health problems, which are chiefly the effects of tropical diseases. Phyto-medicines have often proved to be more effective than synthetic agents. In addition they have a more sympathetic effect on the body, and their production is compatible with current environmental concerns.

Grains-of-paradise are also used in Chinese herbal medicine, their use being interchangeable with the more readily available cardamom. It is taken for **nausea** and **vomiting**, intestinal discomfort, and **pain** and discomfort during **pregnancy**.

Preparations

The fruit is exclusively the part of the plant used, dried, whole, or powdered. The essential oil can also be obtained. The whole grains may be chewed or can be ground and incorporated into mixtures.

Precautions

As grains-of-paradise fruit is a name given to so many other spices, it is advisable to ensure that the correct species is obtained.

Aframomum melegueta roscoe is included in the FDA's list of botanicals that are generally recognized as safe.

Side effects

No side effects have been reported from grains-of-paradise fruit; however, this spice is not frequently used in the United States. People who are allergic to cardamom or ginger should use grains-of-paradise fruit with caution.

Interactions

No interactions have been reported with standard prescription medications.

Resources

BOOKS

Grieve, Mrs. M. F.R.H.S *A Modern Herbal*. London: Tiger Books International, 1992.

PERIODICALS

Kamtchouing, P., G. Y. Mbongue, T. Dimo, et al. "Effects of *Aframomum melegueta* and *Piper guineense* on Sexual Behaviour of Male Rats." *Behavioral Pharmacology* 13 (May 2002): 243 247.

ORGANIZATIONS

Centre for Economic Botany, Royal Botanic Gardens, Kew; Richmond, Surrey; TW9 3AE, United Kingdom. Fax: +44 (0)20 8332 5768. www.rbgkew.org.uk.
Centre for International Ethnomedicinal Education and Research (CIEER). www.cieer.org.

Patricia Skinner
Rebecca J. Frey, PhD

Grape seed extract

Description

Grape seed extract is the primary commercial source of a group of powerful **antioxidants** known as oligomeric proanthocyanidins (OPCs), also generically called pycnogenol, a class of flavonoids. Laboratory studies have indicated OPCs are much more effective than **vitamin C** and **vitamin E** in neutralizing free oxygen radicals, which contribute to organ degeneration and **aging** in humans. The primary sources of OPCs are **pine bark extract** and grape seed extract. However, the grape seed extract is more widely recommended for its lower cost and because it contains an antioxidant not found in pine bark. Grape skins contain a compound known as **resveratrol**, found to contain protective properties against cardiovascular disease and a variety of cancers.

General use

Grape seed extract is a mixture of complex compounds. It has a wide range of therapeutic uses, from preventing **cancer** and cardiovascular disease to alleviating symptoms of **allergies**, ulcers, and **cataracts**. Its antioxidant properties are believed to help slow the aging process. Procyanidins, a group of compounds found in the extract, are thought to increase the effectiveness of other antioxidants, especially vitamin C and vitamin E, by helping them regenerate after neutralizing free radicals in the blood and tissue. OPCs in the extract are water-soluble, making them easily

absorbed by the body. They also are able to cross the stubborn blood-brain barrier, providing antioxidant protection to the brain and nervous system. Most of the research on grape seed extract has been done in Europe, so many of its reported benefits have not been reviewed or approved by the U.S. Food and Drug Administration. It is available as an over-the-counter supplement. According to Varro E. Tyler, dean emeritus of the Purdue University School of Pharmacy and Pharmacal Sciences, the procyanidin compounds found in grape seed extract are useful in treating vascular disorders. They also are antioxidants, or free-radical scavengers, that help prevent some age-related cancers and **atherosclerosis**. Grape seed extract is a relatively new supplement in the United States, although it has been used in Europe for several decades. Its antioxidant properties were realized in the 1980s with the so-called French paradox, in which researchers discovered that the French had low rates of **heart disease** even though their diet was high in **cholesterol**. This was credited to their widespread consumption of red wine. Further research led to the OPCs concentrated in grape seeds. Subsequent research suggested that grape seed extract may work at the genetic level, activating a gene that stops oxidation of bad cholesterol. A 2003 study found that grape seed extract worked well in replacing estrogen and blunting **hypertension** in postmenopausal women.

Cardiovascular disease

European studies have shown procyanidins to be useful in treating blood vessel disorders, such as fragile capillaries and poor circulation in the veins. Components bind to the walls of the capillaries, making them less likely to break down with the effects of aging. In one European study, researchers found that treatment with grape seed extract quickly relieved a chronic condition of poor circulation in the veins. Grape seed extract also has been beneficial in treating **edema**, an excessive accumulation of fluid in tissue. Another use of grape seed extract is reducing blood pressure in people with hypertension.

Cancer

Researchers at the University of Colorado Health Sciences Center, working with cell cultures and laboratory mice, demonstrated that grape seed extract can inhibit growth of colorectal tumors. Tumors decreased by 44%, according to a 2006 article in *Drug Discovery & Development*. The preclinical study demonstrated that grape seed extract has cancer fighting properties, and the research revealed the molecular mechanism at work in the process. Researchers caution that more studies are needed.

A 2006 study at City of Hope, a cancer treatment facility in California, found that components in grape seed extract and red wine can suppress the production of estrogen, a hormone that contributes to the growth of **breast cancer**. Researchers say that the study demonstrates that grape seed extract may be potentially useful in both the treatment as well as the prevention of hormone-dependent breast cancer. The National Cancer Institute continues to fund studies evaluating whether grape seed extract is effective in preventing breast and prostate cancers.

Respiratory conditions

Grape seed extract has been found to be beneficial in treating several respiratory conditions, including **asthma**, **emphysema**, allergies, and sinusitis. Pycnogenol helps inhibit the production of histamines, which decreases sensitivity to pollens and food allergens, thereby reducing allergic reactions.

High blood pressure

A small-scale, placebo-controlled clinical trial, reported in 2005, studied grape seed extract's effect on high blood pressure in three groups of eight men and women. Two groups received grape seed extract, one in 150 mg daily dosage and the other is a 300 mg daily dosage for the one-month trial period. Researchers found that both groups demonstrated a drop in blood pressure, with the group taking the higher daily dosage also showed a decrease in LDL cholesterol levels.

Other conditions

OPCs in grape seed extract have shown effectiveness in treating a variety of other conditions. As an anti-inflammatory, it helps prevent swelling of joints, heals damaged tissue, and eases **pain** in people with arthritis. Studies have shown OPCs can stop cataract progression, treat and prevent **glaucoma**, and aid in treating several types of retinal disease. One of the extract's most popular uses is in treating the effects of aging, including preventing wrinkles by protecting the skin against ultraviolet radiation damage from **sunburn**, improving skin elasticity and tone, and helping reduce the appearance of scars and stretch marks. A wide range of anecdotal reports tell of grape seed extract helping treat or reduce the effects of headaches, **hemorrhoids**, diabetes, **prostate enlargement**, and **cellulite**, although no clinical research supports these claims.

Resveratrol

In 1992, scientists began exploring potential health benefits of resveratrol, a compound derived from grape skins and found in red wine. Researchers working with cell cultures found that resveratol has cardioprotective and anticancer properties, suppressing the proliferation of a wide variety of tumor cells. However, in a 2004 study at the Medical University of South Carolina, researchers studying the human metabolism of resveratrol found that even when ingesting resveratrol in very high dietary amounts, there may not be high enough levels of the compound remaining in the tissue to bring about the cardioprotective and anticancer effects demonstrated in cell culture studies.

Preparations

Grape seed extract generally is available in 50 mg and 100 mg capsules. The acceptable adult daily dosage has been estimated at up to 150–200 mg, or 50 mg per 50 lb (22.7 kg) of body weight. In Europe, OPCs usually are prescribed at 300 mg a day to treat medical conditions such as **varicose veins**, edema, allergies, inflammation, and skin aging. The extract contains varying amounts of proanthocyanics, although the label should indicate about 75–80% proanthocyanidins to be effective. Products standardized to 95% OPC will maximize potency. Research in the United States and Europe has shown it is most effective when used in combination with other antioxidants, especially vitamin C and vitamin E. Grape seed extract is fully absorbed by the body within one hour after consumption. One-half the original dose is still functional within the body after seven hours.

In 2003, a liquid grape seed extract was made available in the United States. This version can be used in a number of beverages, including bottled water, without changing their taste. A 2003 trial at Ohio State University found that lotions made with grape seed extract helped **cuts** heal more quickly than they would on their own. The lotion helped improve blood flow to the wound site.

Precautions

Persons with serious conditions such as cancer, diabetes, and cardiovascular disease should not substitute grape seed extract for their existing treatments without first consulting with their doctor. There is no clinical evidence that grape seed extract can cure any of these conditions. Since grape seed extract is water-soluble, any excess intake that is not used by the body is eliminated in the urine. Studies have shown it is not carcinogenic, does not cause birth defects, and does not cause cells to mutate. Pregnant women and those with autoimmune conditions should probably avoid grape seed extracts. It is best to check with a clinician to ensure the safest dosage is being taken, as reports may vary on the latest research. Grape seed extract is not recommended for pregnant women. Some researchers caution that grape seed proanthocyanidins may interfere with blood-clotting drugs.

KEY TERMS

Antioxidant—A substance that opposes oxidation damage in the body caused by free oxygen radicals.

Atherosclerosis—A buildup of fatty substances in the inner layers of the arteries.

Flavonoids—Also known as bioflavonoids, a group of about 5,000 substances, mostly derived from food, that have super-antioxidant qualities.

Free oxygen radicals—Also called free radicals, these by-products of oxygen cause oxidative damage to the body's cells.

Histamine—A compound found in tissue that plays a major role in allergic reactions.

Resveratrol—A polyphenolic compound found in various plants, including wine grapes (especially the skins), berries, and peanuts.

Side effects

Nausea and upset stomach have been reported on occasion. More rarely, allergic reactions in the form of temporary skin **rashes** have occurred in persons sensitive to grape products. As of 2008, there were no reported serious side effects associated with taking grape seed extract. It is non-toxic, even at high dosages.

Interactions

As of 2008, there were no reported negative interactions associated with grape seed extract. Several studies done in the United States and Europe show the extract has a positive reaction with vitamin C and vitamin E. Studies have shown that OPCs in grape seed extract are as much as 50 times more potent than those in vitamin E and up to 20 times more potent than OPCs in vitamin C.

Resources

BOOKS

Michaels, Phillip. *Grape Seed Extract (Woodland Health Series)*. Orem, UT: Woodland, 2007.

PERIODICALS

"Fight Free Radicals with this Internationally Celebrated Antioxidant." *Natural Health* 67, no. 5 (May 2005).

"Grape Seed Extract Inhibits Colorectal Tumor Growth." *Drug Discovery & Development* 9, no. 11 (2006): 12.

Hammers, Maryann. "Grape Expectations." *Better Nutrition* 68, no. 11 (November 2006): 20 21.

Kijima, Ikuko, Sheryl Phung, Gene Hur, Sum Ling Kwok, and Shiuan Chen. "Grape Seed Extract is an Aromatase Inhibitor and a Suppressor of Aromatase Expression." *Cancer Research* 66 (June 1, 2006): 5960 5967.

Paula Ford-Martin
Clare Hanrahan

Graves' disease *see* **Hyperthyroidism**

Grape skin

Description

Appearance

Grape skin, the outer layer of the grape (*Vitis vinifera*), is either green, red, or purplish-black in color. The skin, stem, seeds, and juice of the grape are used in making wine. Although the skin, stem, and seeds are often used in making the nutritional supplement, grape skin extract, the extract sometimes contains grape skin only. Generally, the skin of red grapes is used in making nutritional supplements.

History

In 1535, sailors on Jacques Cartier's expedition to Canada became seriously ill with scurvy, a vitamin deficiency. This degenerative disease of connective tissues was caused by the lack of vitamins in the typical seafarer's diet—a menu of dried meat and biscuits. The crew was saved by the advice of a Native American, who recommended drinking tea made from the bark of a particular species of pine tree. In the 1930s, researchers discovered that the ascorbic acid (**vitamin C**) in fruits and vegetables prevented scurvy.

The pine extract, however, contained very little vitamin C. For more than 50 years, European biochemists have been researching the seafarers' more likely rescuer—a family of antioxidant polyphenols (acid compounds) called pycnogenols, whose primary active compounds are pigments called oligomeric proanthocyanidins (OPCs). French chemist Jack Masquelier isolated OPCs from peanut skins in 1947 and coined the term "pycnogenols" to describe the unique class of polyphenols to which OPCs belong.

KEY TERMS

Antioxidant—Agent that helps rid the body of damaging free radicals (unstable oxygen molecules).

Bioflavonoid—A large group of phytochemicals with antioxidant and immune-boosting properties.

Oligomeric proanthocyanidins (OPCs)—Part of a large group of phytochemicals called bioflavonoids.

Polyphenol—Acid compound in plants.

Resveratrol—An enzyme that promotes health and is found in 72 varieties of plants.

Although people have been drinking wine for centuries, scientific research into the health benefits of products derived from red grapes began in Europe in the mid to late twentieth century. Supplemental OPCs have been used in Europe since 1950 to treat weak blood capillaries, postsurgical **edema** (swelling), **cirrhosis** (liver disease), **varicose veins**, and diabetic **retinopathy** (eye disease resulting from diabetes). Early identification of OPCs as useful for treating capillary fragility gave researchers some indication of their potential value in connective tissue disorders. However, this limited focus tended to overlook the additional therapeutic possibilities of OPCs and, until the latter part of the twentieth century, distracted scientists from investigating broader uses for OPCs.

Aside from pine bark, OPCs are concentrated in grape seeds and skins, wine, green and black teas, beans, and the skins of many fruits. Generally, the more intense the color, the more OPCs in the food, which explains why red wine has a greater health benefit than white wine. When red wine is made, the "must" is used—the skins, seeds, and stems. The must is left in the mixture for a long period of time as the wine ferments and the OPCs emerge, giving red wine its characteristic flavor and color.

In the case of white wine, the must is taken out early, so the wine neither darkens nor absorbs as many OPCs. Grape juice also contains OPCs. However, researchers have found that grape juice may not confer the same health benefits as red wine.

Biologic components

Red grape skins contain an array of **bioflavonoids** (**quercetin**, catechins, flavonols, and anthocyanidins) and nonbioflavonoid polyphenols (acid derivatives).

One important nonbioflavonoid in grape skin is called **resveratrol**. Resveratrol is a plant-specific enzyme that exists in 72 plant species, such as grapes, peanuts, and pine trees. Grapes are the most abundant source of this health-promoting enzyme.

Resveratrol's presence in the plant is induced by **stress**, injury, infection or ultraviolet irradiation. It is thought that the injury to the grape skin, produced during the wine-making process, significantly increases resveratrol levels. The relatively high quantities of the enzyme in the grape skins are thought to help the plant resist **fungal infections**, diseases, adverse weather, and insect or animal attack.

General use

There are many possible therapeutic applications of the resveratrol in red grape skin. In clinical studies, resveratrol demonstrated equivalent or better anti-inflammatory effects compared to the well-established anti-inflammatory drugs phenylbutazone and indomethacin. In animal studies, resveratrol inhibited both the acute and chronic phases of inflammation.

In humans, some researchers have found that resveratrol thins the blood more effectively than aspirin, which is often used to decrease the risk of a **heart attack**. In fact, the phrase "French paradox" refers to the idea that although French men consume a high-fat diet, they have one-third as many heart attacks as American men. Moreover, French men have high **cholesterol** and blood pressure levels similar to their American counterparts. Researchers have discovered that the main reason for this phenomenon is the OPCs from the grape skin, not the alcohol content, in the red wine that the French drink.

Preliminary tests in animals also indicate that resveratrol may interfere with the development of **cancer** in three ways: by blocking the action of cancer-causing agents, by inhibiting the development and growth of tumors, and by causing precancerous cells to revert to normal.

Although researchers are uncertain about how much resveratrol is needed to produce beneficial effects in humans, supplementation with red grape skin extract or consuming a glass or two of red wine may prevent or alleviate the following conditions:

- aging
- bruising (capillary fragility)
- cancer (cancer-inhibiting effects)
- diabetes
- fungal infection
- heart disease (hardening of the arteries and high cholesterol)
- inflammation (including bursitis and tendonitis)
- Raynaud's syndrome (a blood vessel disorder)
- varicose veins
- vision problems (including cataracts and glaucoma)
- wound healing

Preparations

Red grape skin extract is prepared in capsule form as a nutritional supplement. For adult maintenance, the therapeutic range is thought to be 200–600 mg at 30% anthocyanins (OPCs), although guidelines have not been definitively established.

The resveratrol found in red grape skin and its extract is also found in red wine and concord grape juice. However, grape juice has been found to have fewer benefits than red wine, due to the technique for processing the grapes. For example, grape juice has only one-third the anti-clotting properties of red wine.

Precautions

Although research is limited, scientific investigators have not issued any precautions regarding the use of grape skin or grape skin extract. However, people should be aware of the known side effects of red wine and resveratrol.

Side effects

There are many potential side effects to consuming excessive quantities of red wine (such as allergic reactions to sulfites, intoxication, and liver damage) in order to obtain the health benefits of resveratrol. Each individual must weigh the risks versus the benefits of consuming alcohol.

Resveratrol itself is also a phytoestrogen (plant estrogen). The estrogenic properties of this chemical may play a role in the beneficial cardiovascular effects in red wine. These positive effects include increasing high-density lipoprotein (HDL), the "good cholesterol." On the other hand, it has been noted that drinking red wine may support the proliferation of certain **breast cancer** cells that require estrogen for growth. Thus, resveratrol may have undesirable side effects in some people, including those women with a history of breast cancer or postmenopausal women taking hormone replacement therapy.

Interactions

Scientific investigation on the interactions of grape skin or grape skin extract with drugs, foods, or diseases is very limited and inconclusive. However, if the resveratrol in grape skin is consumed in red wine, a wide range of adverse interactions with drugs and foods may result. It is advisable to consult a physician before consuming alcohol in combination with any type of prescription or over-the-counter medication.

Resources

PERIODICALS

Broiher, Kitty. "Red Wine's Health Benefits May Be Due in Part to 'Estrogen' in Red Wine." *Food Processing* (April 1999): 58.

Fine, Anne Marie. "Oligomeric Pranthocyanidin Com plexes: History, Structure, and Phytopharmaceutical Applications." *Alternative Medicine Review* 5 no. 2 (2000): 144 151.

"Grape Compound May Inhibit Cancer." *Cancer Weekly Plus* (January 1994): 13 15.

Maxwell, Simon, Alison Cruikshank, and Gary Thorpe. "Red Wine and Antioxidant Activity in Serum." *The Lancet* (July 1994): 193 194.

Tyler, Varro E. "Grape Expectations." *Prevention* (June 1997): 80 84.

Whitehead, Tom P. et al. "Effect of Red Wine Ingestion on the Antioxidant Capacity of Serum." *Clinical Chemis try* 41 (January 1995): 32 35.

ORGANIZATIONS

American Heart Association, National Center. 7272 Greenville Avenue, Dallas, TX 75231. http:// www.americanheart.org.

National Cancer Institute. Public Inquiries Office, Building 31, Room 10A03, 31 Center Drive, MSC 2580, Bethesda, MD 20892. http://www.nci.nih.gov.

Genevieve Slomski

Grapefruit seed extract

Description

Grapefruit seed is prepared in extract form from the seeds, pulp, and white membranes of grapefruits from grapefruit trees (*Citrus paradisi*). The grapefruit tree, first discovered on the Caribbean island of Barbados in the seventeenth century, was brought to Florida in 1823 for commercial cultivation. The plant was probably named grapefruit because its fruits grow in bunches or clusters. Grapefruit seed extract (GSE) is used as a broad spectrum, non-toxic, antimicrobial compound. The extract comes in two forms, liquid and powder.

GSE was developed by Dr. Jacob Harich, a physicist who was born in Yugoslavia in 1919 and educated in Germany. His education in nuclear physics was interrupted by Word War II. After witnessing the horror of war as a fighter pilot, Harich decided to devote the rest of his life to improving the human condition. He then expanded his educational pursuits to include medicine, including gynecology and immunology. He came to the United States in 1957 to study at Long Island University in New York. As an immunologist, he was interested in studying natural substances that might help protect the body from undesirable microorganisms. In 1963, he moved to Florida, the heart of grapefruit country, and began research on the use of grapefruit seeds as a biocide. By 1990, holistic health practitioners began to recommend the use of GSE to their patients. In 1995, Harich was invited to the Pasteur Institute of France, a leading **AIDS** research center. Researchers at the Center have been investigating the potential of GSE as a prophylactic against the HIV virus as well as against some of the secondary **infections** associated with AIDS. He was also honored by farmers in Europe who use a powdered form of GSE in fish and poultry feed to control *Salmonella* and *Escherichia coli*. In 1996, Harich passed away.

General use

GSE is a broad spectrum bactericide, fungicide, antiviral, and antiparasitic compound. When used in vitro, GSE has been shown to be highly effective against a broad spectrum of bacteria, including *Staphyloccus aureus*, *Streptococcus pyogenes*, *Salmonella typhi*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Shigella dysenteriae*, *Legionella pneumoniae*, *Clostridium tetani*, *Diploccus pneumoniae*, and many others. GSE also strongly inhibits many types of pathogenic fungi and yeast.

Examples of external uses of GSE include:

- mouth and lips: mouthwash, mouth ulcers, thrush, bad breath, cracked lips, sunburned lips, and cold sores
- teeth and gums: plaque, tooth decay, toothaches, tooth extraction, gingivitis, and toothbrush cleaner
- nose and sinuses: sinusitis, runny nose (rhinitis), and nasal ulcer
- throat: sore throat, tonsillitis, coughs, hoarseness, and laryngitis

- ears: ear cleaning, earaches, and inflammation of the middle ear (otitis media) in conjunction with internal use
- face: acne and shaving
- scalp and hair: shampoo, dandruff, itching scalp, and head lice
- skin: small cuts, skin abrasions, scratches, minor burns, rashes, dermatitis, psoriasis, shingles, eczema, nettle rash, insect bites and stings, tick and leech bites, leg ulcers, warts, and skin fungi
- feet: athlete's foot, sweaty feet, calluses, corns, blisters, nail fungi, and cuticular infections
- vagina and genitals: vaginitis, yeast infections, vaginal parasites, feminine hygiene, and fungal and parasitic diseases in the male genital area

Examples of internal uses include:

- acute and chronic inflammations in general
- colds and flu
- gastrointestinal infections
- vastritis and gastric and duodenal ulcers
- *Candida albicans* and other fungal diseases
- parasitic diseases
- allergies

Preparations

Grapefruit seeds and pulp contain a combination of **bioflavonoids** and polyphenolic compounds. The polyphenols are unstable but are chemically converted during the GSE synthesis process into more stable substances that belong to a class of compounds called quaternary ammonium compounds. The active quaternary ammonium compound in GSE, believed to be responsible for its antimicrobial properties, is a diphenol hydroxybenzene complex. The antimicrobial activity appears to develop in the cytoplasmic membrane of the microorganisms. The active ingredients disorganize the cytoplasmic membrane so that the uptake of **amino acids** is prevented. At the same time there is a leakage of low molecular weight cellular contents through the cytoplasmic membrane. Studies have also shown that GSE inhibits cellular respiration.

The extract is prepared by grinding grapefruit seeds and pulp into a fine powder. The powder is dissolved into purified water and distilled to remove fiber and pectin. The distilled slurry is spray dried at low temperatures forming a concentrated grapefruit bioflavonoid powder. This concentrated powder is dissolved in vegetable glycerin and heated. Food grade ammonium chloride and ascorbic acid are added. This mixture is heated under pressure where it undergoes catalytic conversion using natural catalysts, including hydrochloric acid and natural enzymes. The slurry is then cooled, filtered, and treated with ultraviolet light. Residual ammonium chloride in the final product is between 15 and 18%; residual ascorbic acid is between 25 and 35 mg/kg. There is no residue of hydrochloric acid in the final product. In the United States, standardized GSE contains 60% grapefruit extract materials and 40% vegetable glycerin. A powdered form of GSE is also available that contains 50% grapefruit extract materials, 30% silicon dioxide, and 20% vegetable glycerine.

To treat infections, 15 drops in 8 oz of water is used. For diaper yeast infections and as a vaginal douche, 10–15 drops of grapefruit seed extract is used in 4 oz of water.

Precautions

GSE has been shown to be non-toxic at levels many times greater than the recommended dosages. Even when taken daily, GSE seldom produces a significant allergic reaction. However, people who are allergic to citrus fruits should exercise caution in the use of GSE.

Citricidal®, the brand name of a GSE product in the United States containing 60% grapefruit seed extract in an aqueous, vegetable glycerine solution, has, in the United States, been labeled as GRAS (Generally Recognized as Safe) in the Code of Regulations. The U.S. Food and Drug Administration (FDA) has approved Citricidal® for cosmetic preparations. In addition, Citricidal® has also been approved by the FDA for the disinfection of foods.

Generally, GSE should never be used at full strength. GSE is extremely irritating to the eyes. If it gets into the eyes, a person should wash the eyes with large amounts of warm water and consult a physician, if necessary.

After an excessive ingestion of GSE, an individual should drink large amounts of water and take up to 3 tsp of **psyllium** husks (or up to 6 psyllium capsules). A doctor should be consulted, if necessary.

Side effects

Since GSE is quite acidic, if it is not properly diluted, it may further irritate already irritated tissues, such as a stomach or intestinal lining.

Interactions

Over 75 different combination herbal preparations containing GSE are available, based on the

assumption of Chinese herbal medicine that combinations of substances are more beneficial than single remedies. In addition, the antimicrobial properties of GSE make it an excellent preservative, thus enabling the herbs it accompanies to retain their potency.

Resources

BOOKS

Sachs, Allan. *The Authoritative Guide to Grapefruit Seed Extract*. Mendocino, CA: Life Rhythm, 1997.

Sharamon, Shalila, and Bodo J. Baginski. *The Healing Power of Grapefruit Seed*. Twin Lakes, WI: Lotus Light Publications, 1995.

Judith Sims

Green tea

Description

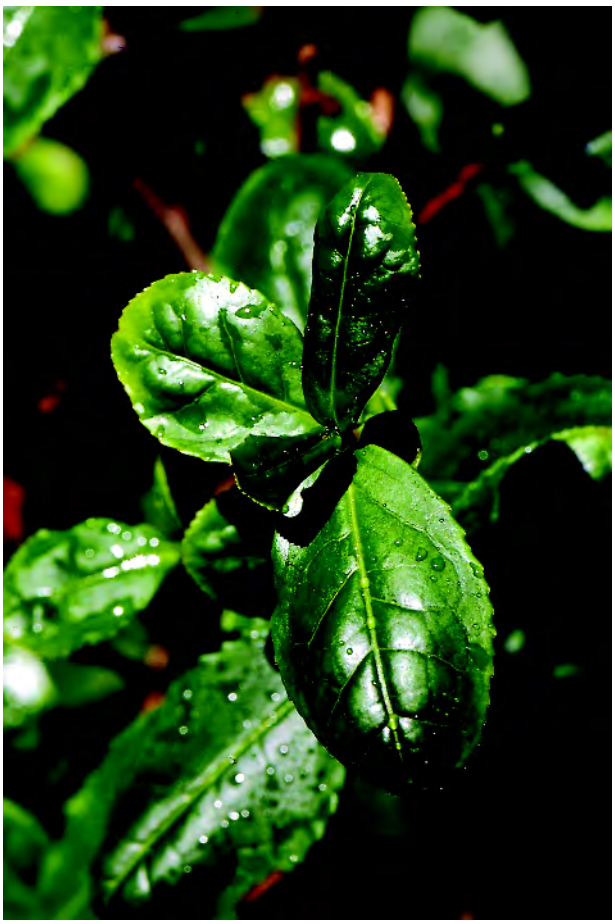
Green tea is produced from the leaves of the *Camellia sinensis*, or tea plant. Oolong and black tea are also produced from the plant but are processed and oxidized in different manners. Of the three, green tea contains the highest levels of polyphenols, the antioxidant substance that is believed to be beneficial in protecting against both **cancer** and **atherosclerosis**.

The tea plant is actually a variation of evergreen bush, with glossy green leaves and small white to pink flowers. The plants can reach a height of 30–40 ft (9–12 m) or taller in the wild, but are generally kept to a height of 6 ft (1.2 m) or less on the tea plantations and gardens where they are grown in China, Argentina, Japan, India, Indonesia, Kenya, Malawi, Sri Lanka, Turkey, Pakistan, Bangladesh, and Tanzania. Tea plants are cultivated in countries where warm, rainy growing conditions are abundant, and they are also frequently grown at high altitude.

When tea plants reach maturity at three or four years of age, the young leaves and leaf buds—the parts of the plant highest in polyphenols—are harvested. Green tea is produced by steaming or roasting the leaves as soon as they are picked and then rolling and drying the tea leaves to remove any moisture.

General use

Approximately 2.5 million tons of tea are grown and produced worldwide on an annual basis. Written records date the use of the plant as a beverage since at least the tenth century B.C. in China, and it is thought to be close to 5,000 years old. Tea is the most consumed beverage worldwide (after water). It is also one of the most popular herbal infusions—drunk regularly by over half the world's population.



Green tea plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

Clinical and laboratory studies continue to demonstrate the benefits of green tea and its major extract, the antioxidant epigallocatechin-3-gallate (EGCG), as an effective treatment for various diseases.

Cancer

The polyphenols in green tea that act as **antioxidants** may actually inhibit the growth of existing cancer cells. In some animal studies, injections of tea extracts reduced the size of cancerous tumors in animals. In 2004, Hasan Mukhtar, Ph.D., of the University of Wisconsin, demonstrated in mice that the green tea extract EGCG is effective in fighting **prostate cancer**. Studies have also indicated that regular use of green tea may reduce the risk of other cancers, including oral, skin, colon, stomach, and rectal. In one clinical trial,

patients with pre-cancerous mouth lesions who were treated with green and black tea extracts achieved a 38% decrease in the number of pre-cancerous cells. Research suggests that green tea can reduce the risk of basal-cell carcinoma and squamous-cell carcinoma. The *Journal of the American College of Surgeons* reported in 2006 that the antioxidants in green tea may block tumor formation and growth and also may inhibit formation of clots and help keep artery walls functioning properly.

Arthritis

One study, reported in 2007 in *Arthritis Today*, examined the anti-inflammatory properties of green tea using the synovial cells from people with **rheumatoid arthritis**. Researchers discovered that the green tea-treated cells acted to block the ability of inflammatory chemicals to cause joint damage.

Alzheimer's disease

In 2005, researchers at the University of South Florida, working with tissue cultures and with mice genetically programmed to develop degenerative brain disease, reported that a concentrated extract of the antioxidant EGCG found in green tea is effective in preventing Alzheimer's-like damage in mice brains. Researchers note that in humans, merely drinking the herbal beverage would not bring about similar benefits. Researchers advise that a daily dosage of 1,500–1,600 mg of EGCG would be required in people to approximate the dosage that benefited the mice.

Muscle damage

Researchers at Baylor University, in a 2006 two-week study with college-age males, tested the ability of EGCG to prevent muscle damage after a physical exertion by heavy lifting. Researchers found that the men receiving the daily dosage of green tea extract had less muscle damage and soreness after heavy exertion than the control group.

Dental health

In addition to polyphenols, green tea contains several minerals, including fluoride and aluminum. The fluoride in green tea may be useful in fighting tooth decay. Green tea is also an antibacterial agent and can help to prevent gingivitis and periodontal disease by killing *E. coli* and streptococcus bacteria. This antibacterial action can also be effective in treating **halitosis**, or bad breath, by killing odor-causing bacteria.

Diabetes

In a study reported in 2006, Japanese researchers studied 17,413 men and women in 25 communities across the country. As many as half of the participants reported having type 2 diabetes. Researchers sought to discover the benefits of drinking green tea and coffee on development of type 2 diabetes. After a five-year follow up with participants, they found that those who reported drinking more green tea and coffee were less likely to get type 2 diabetes. The reliability of the outcome is limited by the accuracy of participants' reports about their tea and coffee consumption.

Preparations

Green tea leaves and tea bags can be purchased at most grocery, drug, and health food stores. It is graded by leaf size, with tea containing whole leaves and leaf tips considered the highest quality tea. Tea grades include Broken Orange, Pekoe, Broken Pekoe Souchong, Broken Orange Pekoe, Fannings, and Dust.

Although green tea is grown from a single plant, slight variations in tea processing (usually in the way the tea is rolled) have created a number of varieties of green tea. Popular green tea varieties include Gunpowder, Hyson, Dragonwell, Sencha, and Matcha.

Tea leaves should be kept in an air-tight container to retain flavor and prevent odors and moisture from being absorbed by the tea. It should also be stored in a cool place for no longer than six months before use.

The most common method of preparing green tea is as an infusion. The tea is mixed with boiling water, steeped for several minutes, and then strained or removed from the infusion before drinking. Approximately two teaspoons of loose tea, or a single tea bag, should be used for each cup of boiling water. A strainer, tea ball, or infuser can be used to immerse loose tea in the boiling water before steeping and separating it.

A second method of infusion is to mix loose tea with cold water first, bring the mixture to a boil in a pan or teapot, and then separate the tea from the infusion with a strainer before drinking.

Flavonoids—polyphenols with antioxidative properties—are released into the infusion as the tea steeps. The longer the steeping time, the more flavonoids are released by the tea leaves, although most will infuse into the water during the first five minutes of brewing. Longer steeping time also results in a higher **caffeine** content in the brewed tea.

Green tea leaves can be used in a poultice for treating insect **bites** and other skin irritations. Green

tea leaves are chopped and boiled in water for two to three minutes. After the excess water is squeezed from the leaves, the green tea is applied to the area to be treated and wrapped in a bandage. Green tea also makes an effective astringent, and tea-soaked cloth or tea leaf poultice may help renew tired and puffy eyes.

The antibacterial activity of green tea also makes it appropriate for use in compresses for **cuts** and abrasions. A quick compress can be made by soaking a pad or bandage in hot tea, wringing out the excess fluid, and holding the pad firmly against the wound. Once the compress cools, the process can be repeated.

Precautions

The U.S. Food and Drug Administration (FDA) includes tea on its list of "Generally Recognized as Safe" substances. However, pregnant women and women who breast feed should consider limiting their intake of green tea because of its caffeine content. Caffeine can pass into breast milk and cause **sleep disorders** in nursing infants. Decaffeinated green tea is available that contains only trace amounts (5 mg or less) of caffeine. Women should check with their healthcare professional about drinking tea when they are pregnant or nursing.

Tea can stimulate the production of gastric acid, and individuals with ulcers may want to avoid drinking green tea for this reason. Those taking warfarin or any blood-thinning drugs should first consult with the physicians before consuming green tea, as it may counter the effects of the drug.

Side effects

Green tea contains caffeine, a central nervous system (CNS) stimulant that can cause restlessness, irritability, difficulty sleeping, **tremor**, heart palpitations, loss of appetite, and upset stomach. To avoid side effects, caffeine intake should be limited to 300 mg or less a day (the equivalent of 4–8 cups of brewed hot tea). Caffeine-free green tea preparations are available commercially.

The tannin in tea can cause **nausea** when drunk on an empty stomach and inhibit the absorption of non-heme **iron**. Individuals with iron-deficiency **anemia** who take iron supplements should avoid drinking green tea several hours before and after taking supplements. Iron absorption with tea can be increased by consuming foods rich in **vitamin C** with tea, such as a slice of lemon.

KEY TERMS

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Atherosclerosis—A type of arteriosclerosis, or hardening of the arteries, caused by fatty deposits of cholesterol and calcium that build up on the interior walls of the blood vessels and arteries.

Chemopreventative—A chemical or drug that is thought to prevent a disease.

Flavonoids—Polyphenol substances in tea that act as antioxidants.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with disease processes such as cancer.

Gingivitis—Inflamed and bleeding gums caused by poor dental hygiene, respiratory diseases, and other disease processes.

Infusion—An herbal preparation made by mixing boiling water with an herb, letting the brew steep for 10 minutes, and then straining the herb out of the mixture.

Non-heme iron—Dietary or supplemental iron that is less efficiently absorbed by the body than heme iron (ferrous iron).

Periodontal disease—Disease of the gums and teeth. Symptoms include bleeding and receding gums, gingivitis, abscesses, and loose teeth.

Phytochemical—A naturally occurring chemical substance in a plant.

Polyphenols—Phytochemicals that act as an antioxidant, protecting cells against damaging free radicals.

Resources

BOOKS

Mitscher, Lester A., and Victoria Toews. *The Green Tea Book*, 2nd rev. ed. New York: Penguin Group (USA), Avery, 2007.

Rouner, Patricia. *Lose Weight with Green Tea: A Safe Weight Loss Method that Works*. St. Paul, MN: Smith House Press, 2005.

PERIODICALS

Adhami V. M., and H. Mukhtar. "Anti oxidants from Green Tea and Pomegranate for Chemoprevention of Prostate Cancer." *Molecular Biotechnology* 37, no. 1 (2007): 52 7.

Dunkin, Mary Anne. "Autoimuni Tea." *Arthritis Today* 21, no 6. (November/December 2007): 69.
Hiroyasu, Iso, et al. "The Relationship between Green Tea and Total Caffeine Intake and Risk for Self Reported Type 2 Diabetes among Japanese Adults." *Annals of Internal Medicine* 144, no. 8 (April 18, 2006): 554 562.
Kerksick, C., et al. "Changes in Muscle Damage Markers, Soreness, and Strength after a 14 day Prophylactic Period of Antioxidant Supplementation Followed by Eccentric Exercise." *Journal of Strength and Condition ing Research* 20, no. 4 (2006).
Stoppani, Jim. "Green to a Tea." *Flex* 25, no. 10 (2007): 310.
University of South Florida Health. "Green Tea Ingredient Prevents Alzheimer's like Brain Damage in Mice." *Sci ence Daily* (September 25, 2005). http://www.sciencedaily.com/releases/2005/09/050928234820.htm (February 27, 2008).

Paula Ford-Martin
Clare Hanrahan

Grippe *see* **Influenza**

Guggul

Description

The mukul **myrrh** tree, or *Commiphora mukul*, is small, thorny, and usually devoid of foliage. It grows naturally throughout India and Arabia. Guggul is the gum resin that comes from this tree, which belongs to the same genus as myrrh and has some similar components and actions. Guggul resin contains steroids, diterpenoids, alipathic esters, and carbohydrates. These factors appear to work together to exert the beneficial effects of this botanical.

Guggul has been traditionally used in **Ayurvedic medicine** to treat arthritis, inflammation, bone **fractures**, obesity, and disorders of lipid metabolism. One ancient Ayurvedic reference describes the power of guggul to treat "coating and obstruction of channels." This description stimulated further research into the properties of this **botanical medicine** for preventing and treating **atherosclerosis**, as well as other conditions resulting from high levels of lipids in the body.

General use

Guggul has been recommended for the treatment of arthritis, hypercholesterolemia, nodulocystic **acne**, and overweight. It is one of the primary therapeutic substances used in Ayurvedic medicine to prevent atherosclerosis, as well as one of the most promising herbs or supplements for the prevention and treatment of this condition. Studies in animals have documented not only the protective effects of guggul against atherosclerosis, but have shown actual regression of the condition in animals that already had it.

The active portion of the plant is the gum resin, which contains guggulsterone, a steroid compound. It appears to be effective in lowering blood levels of both total **cholesterol** and low-density lipoprotein (LDL) cholesterol. In trials lasting one to three months, cholesterol levels were reduced by 14–27% and triglycerides by 22–30%. These results are equal to or better than those of some conventional medications used to lower cholesterol, but with fewer side effects. There are several hypotheses to account for the effectiveness of guggul in decreasing serum lipids. It may decrease the production of cholesterol in the liver. Excretion of cholesterol and bile acids are increased, so that less fat and cholesterol are absorbed. Guggul also increases the production of thyroid hormones, which lower the levels of serum lipids. The lowering of serum lipids is what consequently decreases the risk of atherosclerosis. One of the most important ways that gugulipid lowers cholesterol may be by stimulating the liver to remove LDLs from the bloodstream. The effect on high-density lipoprotein (HDL) cholesterol is undetermined, as two studies yielded different conclusions. To lower cholesterol, one recommended dose of gugulipid is 100–500 mg taken daily. This dosage contains 25 mg of guggulsterone. It may take a month or so for the full effect to be experienced. Similar doses of gugulipid are used to promote weight loss.

The thyroid gland is stimulated by guggulsterone. This effect may play a role both in the ability of the substance to decrease cholesterol levels and to promote weight loss by increasing the body's rate of metabolism.

Guggulsterone has significant anti-inflammatory properties, although they are somewhat overshadowed by its effects on lipid metabolism. This finding supports its traditional use in the treatment of **rheumatoid arthritis** and other inflammatory conditions. Studies have shown guggulsterone to be at least as effective as the conventional medications phenylbutazone and ibuprofen (Advil, Motrin) for both acute and chronic types of inflammation in animal models.

Platelet stickiness appears to be reduced by guggul, which is desirable for decreasing the risk of coronary artery disease. Guggul may also promote fibrinolysis (dissolving the fibrin in **blood clots**) and act as an antioxidant. More research is warranted for

KEY TERMS

Antioxidant— A substance that blocks the destructive action of free radicals.

Ayurveda—An ancient Indian system of holistic healing.

Embolism—Obstruction of a blood vessel by a loose clot.

Fibrinolysis—The breakdown of fibrin, an insoluble protein that is the end product of blood clotting. Fibrinolysis results in the dissolution of small clots.

Nodulocystic acne—A disorder of the sebaceous (oil-secreting) glands in which deep, and sometimes painful, cysts and pustules are formed.

these properties. They have potential benefits in the prevention of strokes and embolisms.

Studies have shown guggulsterone to have approximately the same effectiveness as the antibiotic tetracycline for the treatment of nodulocystic acne. It decreases inflammation and lowers the risk of recurrence of the condition. Guggul is also thought to have astringent, antiseptic, and antisuppurative (preventing pus formation) qualities that lend themselves to the treatment of this severe, and sometimes scarring, form of acne.

Preparations

In India, guggul has been a standard and approved treatment for high cholesterol since 1986. Guggul is most often available in tablet or capsule form, as a purified extract. Formulations should have a standardized concentration of guggulsterone. Most extracts contain from 5–10% guggulsterone. It is readily available in the United States, but available only by prescription, if at all, in the United Kingdom.

Gugulipid is also a component of some combination nutritional products that are being promoted for the support of normal metabolism of cholesterol and triglycerides. Other components may include **inositol** hexaniacinate, **chromium**, and vitamin **antioxidants**.

Precautions

Studies in both humans and animals have demonstrated a wide margin of safety and negligible toxicity for guggul, although some cases of liver toxicity have been reported for very high doses. Although it is apparently not toxic to the embryo or fetus either, guggul gum resin should not be used during **pregnancy** or lactation as it is thought to be a uterine stimulant.

Patients who are taking prescribed medications for **heart disease** should use caution in taking this herb.

Side effects

Crude extracts of guggul are more likely to produce side effects than purer products. In the past, effects included loss of appetite, abdominal **pain**, **diarrhea**, and **rashes**. In studies using purer extracts, significant adverse effects have not occurred. **Headache** and mild **nausea** are sometimes reported.

Interactions

Guggul can be problematic for people being treated for thyroid conditions. Since guggul stimulates production of thyroid hormone, it may alter the dosage requirements for thyroid replacement medication. It can also reduce the availability and effectiveness of the heart medications propranolol (Inderal) and diltiazem (Cardizem). Patients should consult a health care practitioner before taking guggul along with any other herbs or medications.

Resources

BOOKS

Bratman, Steven, and David Kroll. *The Natural Health Bible*. Rocklin, CA: Prima Publishing, 1999.

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. New York: DK Publishing Inc., 1996.

Lininger, Skye, et. al. *The Natural Pharmacy*. Rocklin, CA: Prima Publishing, 1998.

Murray, Michael T. *The Healing Power of Herbs*. Rocklin, CA: Prima Publishing, 1995.

OTHER

Schauss, Alexander, and Suzanne Munson. *Guggul (Com miphora mukul): Chemistry, Toxicology, and Efficacy of a Hypolipidemic and Hypocholesterolemic Agent*. http://www.nat med.com/archives/guggul.htm (2000).

Judith Turner

Guided imagery

Definition

Guided imagery is the use of **relaxation** and mental visualization to improve mood and/or physical well-being.

Benefits

The connection between the mind and physical health has been well documented and extensively studied. Positive mental imagery can promote relaxation and reduce **stress**, improve mood, control high blood pressure, alleviate **pain**, boost the immune system, and lower **cholesterol** and blood sugar levels. Through guided imagery techniques, patients can learn to control functions normally controlled by the autonomic nervous system, such as heart rate, blood pressure, respiratory rate, and body temperature.

One of the biggest benefits of using guided imagery as a therapeutic tool is its availability. Imagery can be used virtually anywhere, anytime. It is also an equal opportunity therapy. Although some initial training in the technique may be required, guided imagery is accessible to virtually everyone regardless of economic status, education, or geographical location.

Guided imagery also gives individuals a sense of empowerment, or control. The technique is induced by a therapist who guides the patient. The resulting mental imagery used is solely a product of the individual's imagination. Some individuals have difficulty imagining. They may not get actual clear images but perhaps vague feelings about the guided journey. However, these individuals' brains and nervous systems responses seem to be the same as those with more detailed imaginings.

Patients who feel uncomfortable "opening up" in a traditional therapist-patient session may feel more at ease with a self-directed therapy like guided imagery.

Description

Guided imagery is simply the use of one's imagination to promote mental and physical health. It can be self-directed, where the individual puts himself into a relaxed state and creates his own images, or directed by others. When directed by others, an individual listens to a therapist, video, or audiotaped exercise that leads him through a relaxation and imagery exercise. Some therapists also use guided imagery in group settings.

Guided imagery is a two-part process. The first component involves reaching a state of deep relaxation through breathing and muscle relaxation techniques. During the relaxation phase, the person closes her eyes and focuses on the slow, in and out sensation of breathing. Or, she might focus on releasing the feelings of tension from her muscles, starting with the toes and working up to the top of the head. Relaxation tapes often feature soft music or tranquil, natural sounds such as rolling waves and chirping birds in order to promote feelings of relaxation.

KEY TERMS

Aromatherapy—The therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological well-being.

Autonomic nervous system—The part of the nervous system that controls so-called involuntary functions such as heart rate, salivary gland secretion, respiratory function, and pupil dilation.

Once complete relaxation is achieved, the second component of the exercise is the imagery, or visualization, itself. There are a number of different types of guided imagery techniques, limited only by the imagination. Some commonly used types include relaxation imagery, healing imagery, pain control imagery, and mental rehearsal.

Relaxation imagery

Relaxation imagery involves conjuring up pleasant, relaxing images that rest the mind and body. These may be experiences that have already happened, or new situations.

Healing imagery

Patients coping with diseases and injuries can imagine **cancer** cells dying, **wounds** healing, and the body mending itself. Or, patients may picture themselves healthy, happy, and symptom-free. Another healing imagery technique is based on the idea of *qi*, or energy flow, an idea borrowed from **traditional Chinese medicine**. Chinese medicine practitioners believe that illness is the result of a blockage or slowing of energy flow in the body. Individuals may use guided imagery to imagine energy moving freely throughout the body as a metaphor for good health.

Pain control imagery

Individuals can control pain through several imagery techniques. One method is to produce a mental image of the pain and then transform that image into something less frightening and more manageable. Another is to imagine the pain disappearing, and the patient as completely pain-free. Or, one may imagine the pain as something over which he has complete control. For example, patients with back problems may imagine their pain as a high voltage electric current surging through their spine. As they use guided imagery techniques, they can picture themselves reaching for an electrical switch and turning down the power on the current to alleviate the pain.

MARTIN ROSSMAN (1945-)

Martin L. Rossman received his B.A. and M.D. degrees from the University of Michigan in Ann Arbor. The Colorado native then set up practice in San Francisco, where he is a Clinical Associate in the Department of Medicine at the University of California Medical Center as well as director and founder of the Collaborative Med icine Center in Mill Valley, and Co Director of the Acad emy for Guided Imagery, also in Mill Valley. Dr. Rossman has been a Diplomat of Acupuncture for the National Commission for the Certification of Acupuncturists since 1986, and, since 1989, has been certified for Interactive Guided Imagery through the Academy for Guided Imagery. He also serves as a member of various medical related associations throughout the United States.

According to Rossman, imagination is the key to understanding the self, and can be used to resolve many issues of mind and body fitness, including stress. Rossman prefers the term complementary medicine to alternative medicine, noting that so many of the therapies have moved into the medical mainstream that they all play a crucial role in health. Rossman's book, *Healing Yourself: A Step by Step Program for Better Health Through Imagery*, is one of many writings he has done on imagery. Rossman is a popular speaker in both professional and public settings, and a television and radio personality discussing the virtues of imagery, acupuncture, and other holistic treatments.

He can be reached through The Collaborative Medi cine Center, Mill Valley, California at (415) 383 3197 or through the Academy for Guided Imagery in Mill Valley at (800) 726 2070.

Mental rehearsal

Mental rehearsal involves imagining a situation or scenario and its ideal outcome. It can be used to reduce **anxiety** about an upcoming situation, such as labor and delivery, surgery, or even a critical life event such as an important competition or a job interview. Individuals picture themselves going through each step of the anxiety-producing event and then successfully completing it.

Preparations

For a successful guided imagery session, individuals should select a quiet, relaxing location where there is a comfortable place to sit or recline. If the guided imagery session is to be prompted with an audiotape or videotape, a stereo, VCR, or portable tape player should be available. Some people find that quiet background music improves their imagery sessions.

The session, which can last anywhere from a few minutes to an hour, should be uninterrupted. Taking the phone off the hook and asking family members for solitude can ensure a more successful and relaxing session.

Imagery combined with other relaxation techniques such as **yoga**, massage, or **aromatherapy** can greatly enhance the effects of these therapies. It can be done virtually anywhere.

Precautions

Because of the state of extreme relaxation involved in guided imagery, individuals should never attempt to use guided imagery while driving or operating heavy machinery.

Side effects

Guided imagery can induce sleepiness, and some individuals may fall asleep during a session. Other than this, there are no known adverse side effects to guided imagery.

Research and general acceptance

Use of guided imagery is a widely accepted practice among mental healthcare providers and is gaining acceptance as a powerful pain control tool across a number of medical disciplines. Results of a study conducted at The Cleveland Clinic Foundation and published in 1999 found that cardiac surgery patients who used a guided imagery tape prior to surgery experienced less pain and anxiety. These patients also left the hospital earlier following surgery than patients who used pain medication only.

Another study conducted by Harvard Medical School researchers found that for more than 200 patients undergoing invasive vascular or renal surgery, guided imagery controlled pain and anxiety more effectively than medication alone.

Training and certification

Guided imagery is used by many licensed therapists, counselors, psychologists, and psychiatrists. There are many self-help books, audiotapes, and videos available that offer instruction in guided imagery techniques.

Resources

BOOKS

Battino, Rubin. *Guided Imagery and Other Approaches to Healing*. Carmarthen, United Kingdom: Crown House Publishing, 2000.

PERIODICALS

Lang, Elvira, et al. "Adjunctive Non pharmacological Anal gesia for Invasive Medical Procedures: A Randomized Trial." *The Lancet* 355, no. 9214, (April 2000): 1486 1490.

ORGANIZATIONS

The Academy for Guided Imagery. P.O. Box 2070, Mill Valley, CA 94942. (800) 726 2070.

OTHER

Brennan, Patricia. "Stress First Aid Kit." (Guided imagery audiotape set.) Available from Inside Out Publishing at (888) 727 3296 or http://www.facingthedawn.com.

Paula Ford-Martin

Gulf War syndrome

Definition

Gulf War syndrome describes a wide spectrum of illnesses and symptoms ranging from **asthma** to **sexual dysfunction** that have been reported by U.S. and U.S. allied soldiers who served in the Persian Gulf War in Operation Desert Shield, Operation Desert Storm, and Operation Iraqi Freedom.

Description

Hundreds of federally funded research studies on Gulf War-related illnesses have been undertaken at a cost of hundred of millions of dollars. Despite this investment and the data collected from veterans who have registered with the Department of Defense and/or Veterans Administration (VA) as having Gulf War-related illnesses, there is still much debate over the existence of Gulf War syndrome. Veterans believed to have the illness experience a wide range of debilitating symptoms that elude a single diagnosis. These symptoms include **fatigue**, trouble breathing, headaches, poor sleep, forgetfulness, and trouble concentrating. Similar experiences among Gulf War veterans have been reported in the United Kingdom and Canada.

Causes and symptoms

As of 2008 the possible causative agent for Gulf War syndrome other than the **stress** of warfare was much debated. The VA and other public and private institutions have investigated a wide range of potential factors. These include chemical and biological weapons, the immunizations and preventive treatments used to protect against them, smoke from oil well fires, exposure to depleted uranium, and diseases endemic to the Arabian peninsula. As of 2008, investigators had not approached a consensus. They even disagreed on the likelihood that a specific agent is responsible, as a combination of these risk factors may have negative health consequences. There is a likelihood that sarin and/or cyclosarin (nerve gases) were released during the destruction of Iraqi munitions at Kharnisiyah, Iraq; however, veterans who served in that area were not found to have a higher rate of illness than veterans serving in the Persian Gulf in general.

Statistical analysis shows that the following symptoms are about twice as likely to appear in Gulf War veterans than in their non-combat peers: **depression**, posttraumatic stress disorder (PTSD), chronic fatigue, cognitive dysfunction (diminished ability to calculate, order thoughts, evaluate, learn, and remember), **bronchitis**, asthma, **fibromyalgia**, alcohol abuse, **anxiety**, and sexual dysfunction. PTSD is the modern equivalent of shell shock (the term used in World War I) and battle fatigue (World War II). It encompasses most of the psychological symptoms of war veterans, including nightmares, panic at sudden loud noises, and inability to adjust to peacetime living.

Chronic fatigue syndrome has a specific medical definition that attempts to separate common fatigue from a more disabling illness in hope of finding a specific cause. Fibromyalgia is another newly defined syndrome, and as such it has arbitrarily rigid defining characteristics. These include a certain duration of illness, a specified minimum number of joint and muscle pains located in designated areas of the body, sleep disturbances, and other associated symptoms and signs. One study comparing unexplained symptoms in Gulf War veterans with symptoms in control subjects found that over half the veterans with unexplained muscle **pain** met the criteria for fibromyalgia, and a significant portion of the veterans with unexplained fatigue met the criteria for chronic fatigue syndrome. Amyotrophic lateral sclerosis (ALS), also known as **Lou Gehrig's disease**, also occurs more frequently in veterans of the Gulf Wars. Gulf War veterans are twice as likely as other veterans to develop ALS, which causes wasting of muscle tissue and is fatal within three to five years.

Researchers identified three distinct syndromes and several variations in Gulf War veterans. Type one

patients suffer primarily from impaired thinking. Type two patients have a greater degree of confusion and ataxia (loss of coordination). Type three patients are the most affected by joint pains, muscle pains, and extremity paresthesias (unnatural sensations such as burning or tingling in the arms and legs). In each of the three types, researchers found different but measurable impairments on objective testing of neurological function. The functioning of the nervous system is much more complex and subtle than other body systems. Measuring it requires an equally complex effort. The tests used in this study carefully measured and compared localized nerve performance at several different tasks against the same values in normal subjects. Brain wave response to noise and touch, eye muscle response to spinning, and caloric testing (stimulation of the ear with warm and cold water, which causes vertigo) were clearly different between the normal and the test subjects. The researchers concluded that there must be a generalized injury affecting the nervous system. Another research group concluded that there was a neurologic injury involving the central, peripheral, and autonomic nervous systems.

After many years of vigorous study, the VA concluded that the signs and symptoms experienced by veterans believed to have Gulf War syndrome are real but that there is no unexplained, underlying single disease or condition affecting the veterans. Although some veterans do have unexplained, undiagnosed illnesses, this does not occur at a rate greater than that of the general population. They have also concluded that there was no area of deployment more likely than any other to produce veterans with the symptoms of Gulf War syndrome. This finding, however, remained extremely controversial. Many people believe that there is an underlying common condition, and many scientists continued as of 2008 doing research to determine if there was a common condition, and if so what the underlying cause may be.

Diagnosis

As there is no clear definition of the disease, diagnosis is primarily an exercise in identifying those Gulf War veterans who have an undefined illness in an effort to learn more about them and their symptoms. Both the Department of Defense (DoD) and the VA have programs devoted to this problem. Both the DoD Comprehensive Clinical Evaluation Program and the VA Persian Gulf Registry provide free, in-depth medical evaluations of Gulf War veterans and their families. In addition to providing individual veterans with critical medical care, these organizations use the cumulative data from these programs to advance research on diseases and disorders more likely to occur in the veteran community.

KEY TERMS

Ataxia—Lack of coordination.

Caloric testing—Flushing warm and cold water into the ear stimulates the labyrinth and causes vertigo and nystagmus (involuntary movement of the eyes in a horizontal direction) if all the nerve pathways are intact.

Endemic—Belonging or native to a particular locality or people.

Paresthesia—An abnormal sensation often described as burning, numbness, tingling, or pin pricks.

Syndrome—Common features of a disease or features that appear together often enough to suggest they may represent a single, as yet unknown, disease entity. When a syndrome is first identified, an attempt is made to define it as strictly as possible, even to the exclusion of some cases, in order to separate out a pure enough sample to study. This process is most likely to identify a cause, a positive method of diagnosis, and a treatment.

Treatment

There is no specific treatment for Gulf War syndrome. Treatment mainly focuses on relieving the symptoms experienced by each individual. The overall key to successful treatment is long-term, ongoing care, which may include medication, **hypnotherapy**, **acupuncture**, **homeopathy**, **nutrition**, vitamin/mineral therapy, and bodywork.

Allopathic treatment

There are many drugs available for symptomatic relief. Psychological counseling by those specializing in this area can be immensely beneficial, even life-saving, for those contemplating suicide. Veterans' benefits are available for those who are impaired by their symptoms.

Expected results

The outlook for war veterans was unclear as of 2008, but improvement was hoped for as more information was gathered about the illness. Gradual return to a functioning life may take many years of work and much help. However, even in the absence of an identifiable and curable cause, recovery is possible.

Resources

BOOKS

Gulf War and Health: Volume 6: Physiologic, Psychologic, and Psychosocial Effects of Deployment Related Stress. Washington, DC: National Academies Press, 2008.

Lee, Harry, and Edgar Jones, eds. *War and Health: Lessons from the Gulf War*. Hoboken, NJ: Wiley, 2007.

Pall, Martin L. *Explaining "Unexplained Illnesses": Disease Paradigm for Chronic Fatigue Syndrome, Multiple Chemical Sensitivity, Fibromyalgia, Post Traumatic Stress Disorder, Gulf War Syndrome, and Others*. New York: Harrington Park Press, 2007.

PERIODICALS

Hoded, Horn, et al. "Is There an Iraq War Syndrome? Comparison of the Health of UK Service Personnel after Gulf and Iraq Wars." *The Lancet* 367, no. 9524 (May 27, 2006): 1742 1747.

Iversen, Amy, Trudie Chalder, and Simon Wessely. "Gulf War Illness: Lessons from Medically Unexplained Symptoms." *Clinical Psychology Review* 27, no. 7 (October 2007): 842 855.

Levine, Paul H., et al. "A Study of Gulf War Veterans with a Possible Deployment Related Syndrome." *Archives of Environmental and Occupational Health* 61, no. 6 (November/December 2006): 271 280.

ORGANIZATIONS

Office of the Special Assistant for Gulf War Illnesses, Four Skyline Place, 51113 Leesburg Pike, Suite 901, Falls Church, VA, 22041, (800) 497 6261, www.gulflink.osd.milc.

Paula Ford-Martin
Rebecca J. Frey, PhD

Gum disease

Definition

Gum disease, also called periodontal disease, is defined as the inflammation of the structures that surround and support the teeth. If left untreated, gum disease may progress to the point where there is destruction of the jawbone. It is one of the most common causes of tooth loss. Periodontal disease is also a risk factor for coronary **heart disease** and preterm low birth weight.

Description

Gingivitis is the earliest stage of a gum infection. It may recur or even become chronic. If gingivitis is not treated properly, it may progress to periodontitis, an inflammation of the periodontal ligament that helps hold the teeth in the bone. Periodontitis is sometimes called pyorrhea, which means a pus discharge.

Chronic periodontis results in the inflammation within the supporting tissues of the teeth, leading to progressive loss of tissue attachment and bone. It is the most frequent form of periodontis and is characterized by pocket formation and receding gum tissue.

Aggressive periodontis is a highly destructive form that causes rapid loss of tissue attachment and jawbone destruction. It often occurs in patients who are otherwise healthy.

Necrotizing periodontal diseases—also known as necrotizing ulcerative gingivitis or Vincent's infection—are **infections** characterized by gingival tissue death, and loss of tissue attachment and bone.

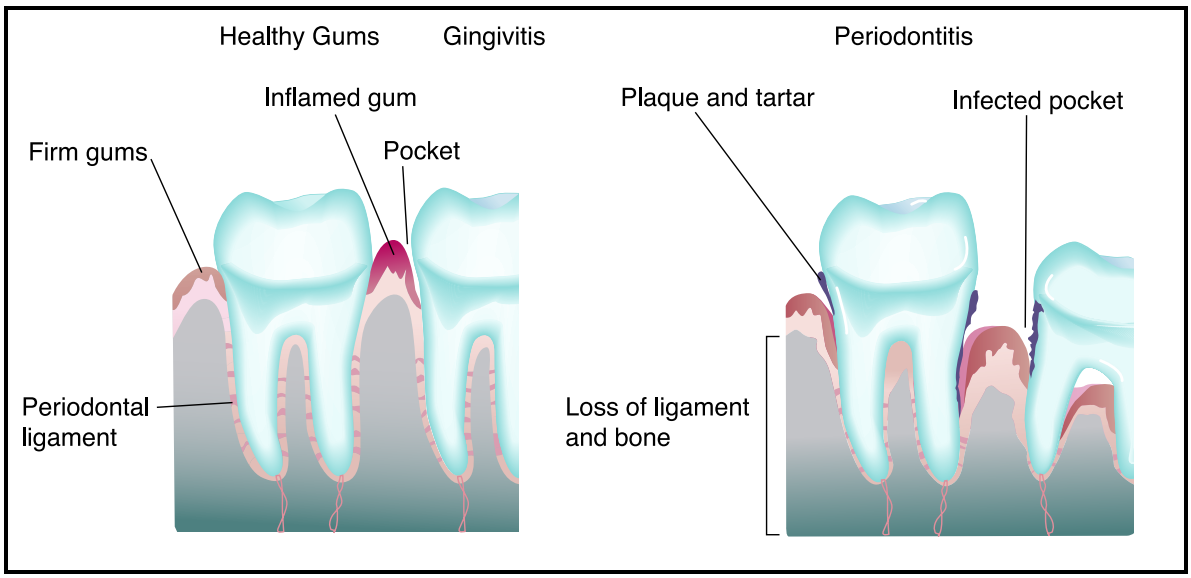
Severe cases of periodontitis may affect the jawbone. Severe sudden onset of gum disease is known as trench mouth. It is caused by an infection of both spirochetes and fusiform bacilli. It was once a major problem for soldiers during World War I. In the late 2000s, trench mouth is particularly common among teenagers and young adults under **stress**, often at examination time. Inflammation from trench mouth can also spread to nearby tissues of the face and neck.

Causes and symptoms

Causes

By far, the most common cause of gum disease is poor dental hygiene. Regular daily brushing and flossing of the teeth generally clears away food and bacteria buildup in the mouth. If the teeth are neglected, bacteria collect, and plaque forms on the teeth and gums. If the plaque is not removed, it mixes with saliva and hardens into tartar. Tartar irritates the gums and causes them to shrink away from the teeth, opening up spaces where more bacteria and plaque can collect. This cycle encourages increasingly severe inflammation and infection.

The mechanisms by which bacteria cause tissue destruction in advanced gum disease are not fully understood. Several bacterial products that diffuse through tissue are thought to play a role in gum disease. Toxins produced by some bacteria can kill cells. Studies show that the amount of endotoxin present correlates with the severity of periodontal disease. Other bacterial products include proteolytic enzymes, which are molecules that digest protein found in cells, thereby causing cell destruction. The human immune response has also been implicated in tissue destruction. As part of a normal immune response, white blood cells enter regions of inflammation to destroy



Healthy gums support the teeth. When gingivitis goes untreated, the gums become weak and pockets form around the teeth. Plaque and tartar build up in the pockets, the gum recedes, and periodontitis occurs. *(Illustration by Argosy, Inc. Cengage Learning, Gale)*

bacteria. In the process of destroying bacteria, periodontal tissue is also destroyed.

Other factors can contribute to the development of gum disease. Patients who have a family history of tooth loss or periodontal disease have an increased risk of developing the condition. Smokers and tobacco users are more than two times as likely as nonsmokers to develop gum disease. Hormone levels contribute to the development of bacteria in the mouth. **Pregnancy**, puberty, **menopause**, and the use of oral or injectable contraceptives may create a climate that promotes the development of gum disease. Additional factors include **diabetes mellitus**, scurvy, pellagra, **allergies**, **leukemia**, **Crohn's disease**, **AIDS**, chemotherapy, nutritional deficiencies, hydrochloric acid deficiency, poorly fitted fillings, radiation treatments, and exposure to heavy metals (mercury, lead, arsenic, and nickel). Medications that may contribute to the development of gum disease include steroids; phenytoin for controlling seizures; cyclosporine, which is taken by people who have had organ transplants; certain **cancer** drugs; and the **calcium** channel blockers used to control blood pressure and heartbeat.

Symptoms

The main symptoms of gingivitis are dark red, swollen, and tender gums that bleed easily. **Pain** is usually minimal. People with periodontitis have the same symptoms. In addition they may also have pain, loose teeth, and persistent bad breath. Abscesses and pus may develop. The symptoms of trench mouth include sudden onset of illness accompanied by pain, bleeding gums, bad breath, and a grayish mucus that covers the gums.

Diagnosis

A dental examination and history are taken. As the disease progresses, a dentist will be able to find hollowed pockets near the gums upon examination with a periodontal probe that gently measures the depth of the pockets surrounding each tooth. Dental x rays may be used to reveal the breakdown of bone. A smear of the gum area may be taken to determine the existence of any bacterial infections. The visualization of spirochetes can be used to confirm the diagnosis of trench mouth.

Treatment

Naturopathic treatment

Zinc, **copper**, **folic acid**, **vitamin E**, **selenium**, and **vitamin A** or beta-carotene are very helpful in slowing the progression of gum disease, especially if the patient has dietary deficiencies. Daily CoQ10 supplementation is also recommended. Mouthwashes that contain either a 0.1% folate solution or a 5% solution of zinc, or both, swished in the mouth and held there for at least a minute, can be taken twice daily.

Flavonoids help reduce inflammation and strengthen the gum tissue. A daily menu that includes foods rich in flavonoids is recommended. These foods include

blueberries, **hawthorn** berries, onions, and grapes. Extracts of these foods may be used as well.

Supplementation with **lycopene** (a phytochemical found in tomato products), in combination with routine preventive care, has been found to decrease the occurence of gingivitis, both as monotherapy and as adjunctive therapy after scaling and root planing procedures.

Homeopathy

The main homeopathic remedy for mild gum disease is *Mercurius solubilis hahnemanni* in a 6c potency. *Natrum muriaticum,* also in a 6c potency, is for more severe disease, especially if there is formation of pus. Homeopathic remedies can be taken four times daily for up to three days.

Ayurvedic medicine

Ayurvedic practitioners recommend a daily cup of water with the juice of a fresh lemon squeezed into it for bleeding gums. Five grams of amla powder in a cup of water daily is also recommended. The teeth can be brushed with catechu or **neem** powder or both.

Traditional Chinese medicine

According to **traditional Chinese medicine**, the gums are nourished by the liver's function. If the level of toxins in the body exceeds the liver's blood-cleansing limits, eventually the gums (and other parts of the body) become a breeding ground for disease. The Chinese also consider the liver as a reservoir of blood; it ensures that adequate blood and Qi (vital energy) are delivered to the muscles, gums, and joints.

Herbal therapies

The teeth can be brushed with a mixture of baking soda and hydrogen peroxide to clean them thoroughly and to fight infection. **Goldenseal** root powder, *Hydrastis canandensis,* can be used in the same way. **Myrrh**, *Commiphora molmol,* can be applied directly to the gums. *Aloe vera* may be applied directly to the gums to reduce pain and inflammation. In addition, a cup of water with a teaspoon of **apple cider vinegar** makes a good daily mouth rinse. An herbal mouth rinse can be prepared from 1 oz hydrastis, 1 oz myrrh, and 1 pint of water. Herbal mouthrinse preparations containing **chamomile**, **echinacea**, myrrh, mint, **sage**, and ratania have been shown to reduce inflammation. Gum products containing oligomeric proanthocyanidins have been shown to have antioxidant and anti-inflammatory properties to relieve symptoms and promote oral health.

Allopathic treatment

Dentists may advise mouth rinses with warm salt water as well as measures for symptom relief, such as over-the-counter anesthetic ointments.

Bone loss may be addressed by a variety of techniques to encourage growth, including bone grafting, splinting, and bite guards or other appliances to stabilize loose teeth. In some cases of advanced disease, the teeth in the affected areas may have to be pulled.

For moderate to severe periodontal disease, the dentist may recommend a procedure called nonsurgical root planing in which damaged gum tissue is scraped away and root surfaces are scraped and deep cleaned. If the gums are badly damaged, gum flap surgery (called excisional new attachment procedure) may be performed to surgically remove diseased gum tissue and underlying diseased tissue. Root surfaces are scraped and sutures are used to repair and tighten the gum tissue.

A less invasive laser technique is available, called laser-assisted new attachment procedure (LANAP). This technique, approved by the U.S. Food and Drug Administration, uses a laser instead of a scalpel to clean away diseased tissue without the need for cutting or stitching. The procedure is less painful with a faster recovery than the excisional technique, as well as a greater predictability for reattachment of gum tissue and bone growth.

Any underlying medical conditions should be assessed and treated, as they may be contributing to the gum disease. Such dental problems as poorly aligned teeth or grinding of the teeth may need to be addressed. **Nutrition** should be improved. If a severe infection such as trench mouth is present, antibiotics are given. The antibiotics may be delivered directly to the infected gum and bone tissues to ensure that high concentrations of the antibiotic reach the infected area.

Physicians have found that the importance of treating serious gum infections with antibiotics spreads from the mouth to affect general health. By looking for markers of inflammation throughout the body after treating some patients with gum infections with antibiotics, and not treating others, researchers have found oral bacteria from gum infections in arterial plaque.

Infected abscesses, especially of bone, are difficult to treat and require long-term antibiotic treatment to prevent recurrence of infection. Patients with gum disease should be reevaluated after three months to assess progress and further treatment needs.

KEY TERMS

Azole—Any member of a group of chemical compounds with five-membered rings containing one or more nitrogen atoms. Several azoles are used as antifungal medications.

Bentonite clay—A green clay of aluminum silicate containing magnesium and trace minerals. The clay can draw out agents of infection.

Dermatophyte—A type of fungus that is parasitic on skin and causes a skin disease.

Gingivitis—A mild form of periodontal disease that causes the gums to become red, swollen, and bleed easily. The condition can be treated with good oral care and with professional treatment.

Spirochetes—A type of spiral-shaped bacteria.

Sulcus—A v-shaped crevice where the gum line meets the teeth. A healthy sulcus measurement is 3 mm. As gum tissues become diseased, this crevice can measure 6 mm and above, allowing bacteria to develop.

Tinea—Any of several fungal infections of the skin, especially ringworm.

Expected results

With good dental habits, most simple cases of gum disease resolve. If the teeth and gums are not cared for or if the disease progresses for other reasons, there may be destruction of bone and a loss of teeth. Research indicates that the bacteria connected with plaque formation and chronic gum disease may enter the bloodstream and cause an infection that may bring on heart disease, **pneumonia**, or premature births.

Prevention

The teeth should be brushed with a fluoride toothpaste and flossed daily, after meals. An antiseptic rinse should be used after brushing and flossing to reduce bacteria. Fifteen minutes per day should be spent massaging the gums with **eucalyptus**, **witch hazel**, or vitamin E, rubbing a finger in a circular motion along the gum line. Toothbrushes should be changed monthly, since there may be a tendency for bacteria to accumulate on them. The toothbrush should also be soft to avoid further injury to the gums. A dentist should regularly check the health of the gums and teeth of people who are prone to gum disease. A dental hygienist should clean the teeth regularly, especially if there is an increased tendency to form plaque.

Patients who smoke or chew tobacco should make efforts to quit. Chemicals from cigarette smoke can slow the healing process and interfere with treatment. A physician can provide a referral to community **smoking** cessation programs and other resources to help patients quit smoking.

A whole foods diet is highly recommended. It should include fresh fruit and vegetables and plenty of dietary fiber. Such processed foods as sugar and white bread and grains contribute to plaque formation and should be avoided. Foods high in **vitamin C** should be consumed daily. Vitamin C is important in maintaining healthy gums, and supplementation may also be needed. As smoking reduces vitamin C absorption, the use of tobacco products should be avoided. Calcium and **magnesium** supplementation is recommended to minimize the loss of bone in progressive gum disease.

Behavioral management approaches to increase adherence to oral hygiene instructions may improve oral hygiene-related behaviors, but further research is needed in this area to determine exact effects.

Resources

BOOKS

Palmer, Carole A. *Diet and Nutrition in Oral Health*. Upper Saddle River, NJ: Prentice Hall, 2006.

PERIODICALS

Chandra, R. V., M. L. Prabhujl, D. A. Roopa, et al. "Effi cacy of Lycopene in the Treatment of Gingivitis: A Randomised, Placebo Controlled Clinical Trial." *Oral Health & Preventive Dentistry* 5, no. 4 (2007): 327 336.

ORGANIZATIONS

Academy of General Dentistry, 211 East Chicago Ave., Suite 900, Chicago, IL, 60611 1999, (888) AGD DENT, http://www.agd.org.

Academy of Laser Dentistry, PO Box 8667, Coral Springs, FL, 33075, (877) 527 3776, (954) 346 3776, http://www.laserdentistry.org.

American Dental Association, 211 East Chicago Ave., Chicago, IL, 60611 2678, (800) 947 4746, http://www.ada.org.

Patience Paradox
Teresa G. Odle
Angela M. Costello

Gymnema

Description

Gymnema (*Gymnema sylvestre*) is a climbing plant that grows in the tropical forests of central and southern India. The woody gymnema plant also grows

in parts of Africa. Leaves of this long, slender plant have been used for more than 2,000 years in India to treat diabetes. Gymnema is also known as gurmar, gurmabooti, periploca of the woods, and meshasringi (ram's horn).

General use

In the past, powdered gymnema root was used to treat snakebites, **malaria**, coughs, **constipation**, stomach complaints, water retention, and liver disease. However, the Hindu word gurmar best describes the primary use of gymnema. Gurmar means "sugar destroyer," and it has been used in **Ayurvedic medicine** for thousands of years to treat adult-onset diabetes, a condition once described as "honey urine."

The plant's sugar-destroying property was thought to be released when a person chewed on one or two leaves. Gymnema was said to paralyze a person's tongue to the taste of sugar and bitter tastes. That taste-blocking reaction lasted for several hours. During that time, leaves supposedly provided a slight block to the taste for salty foods, while the taste for acidic foods was not affected.

By blocking the taste buds from tasting sugar, gymnema blocked sugar in the digestive system, resulting in a decrease in blood sugar, also known as a hypoglycemic effect. This medicinal action has been studied since the 1930s.

Gymnema and diabetes

Diabetes is a condition characterized by high levels of sugar (glucose) in the blood. The glucose is affected by insulin, a hormone created by the pancreas. Insulin is necessary for cells to utilize glucose. Type I diabetes, or juvenile diabetes, is caused by the body's inability to produce enough insulin. Type II diabetes, or adult-onset diabetes, is caused by the body's inability to adequately process insulin. Frequently, the pancreas creates much more insulin than the body requires.

Type I diabetes is also called insulin-dependent **diabetes mellitus**, and Type II diabetes is known as non-insulin-dependent diabetes mellitus. In India, gymnema has been used by both Type I and Type II diabetics.

Contemporary uses of gymnema

Gymnema has been used in folk medicine as a remedy for diabetes, **allergies**, urinary tract inflections, **anemia**, hyperactivity, digestion, **cholesterol** management, and weight control. Most of those treatments did not prove to be effective. However, some studies of rats and mice indicated that gymnema might lower LDL (low-density lipoprotein), which is also known as bad cholesterol. As of early 2008, there were few controlled studies into the effectiveness of gymnema in treating cholesterol in humans.

Research on humans into the use of gymnema for treating diabetes progressed to the double-blind randomized trial stage, according to information posted on the United States National Institutes of Health Web site. The trial that started in India in January 2007 compared the glucose-lowering effect of gurmar (gymnema) with metformin, a prescription drug widely prescribed to control blood sugar. The trial intended to study 100 people whose Type II diabetes was recently detected. The study was open to men and women between the ages 25 and 70.

A possible weight-loss remedy

Although gymnema will not make sugary foods taste bad, the sugar destroyer has been said to curb the desire for sweets. Due to this sugar-blocking property, gymnema is marketed as a weight-loss remedy that people take to help fight the desire for sweet treats. As a weight-loss remedy, gymnema has not been studied extensively. Some in the medical community were dubious about its effectiveness. Instead, the sugar destroyer was acknowledged as a potential treatment for diabetes.

Preparations

In studies of humans involving the use of gymnema to control blood sugar, the daily dosage frequently ranged from 400 mg to 600 mg. The strength of commercial gymnema products varies, so a person should follow the directions on the package.

Gymnema is available commercially in various forms, including capsules, tinctures, and powdered herb. The capsule dosage is usually approximately 250–400 mg per day. Tinctures consist of a liquid such as alcohol and gymnema leaf extract. Tinctures include a product containing 300 mg of gymnema. A 1 ml dosage is mixed into water and consumed once or twice daily.

Gymnema is also available in powdered form. The recommended dosage for powdered gymnema leaves is 0.5–1 tsp (2–4 g) per day. An herbal tea can be prepared by pouring 1 cup (240 ml) of boiling water over the powdered leaves. The mixture is covered and steeped for 10–15 minutes. The tea is strained before it is consumed.

Precautions

The United States Food and Drug Administration (FDA) does not regulate herbal remedies such as gymnema, which means the FDA has not indicated if the remedies have been proven to be safe or effective. Furthermore, ingredients are not standardized to comply with regulations.

The safety of gymnema has not been established for use by children, pregnant women, and nursing mothers. In addition, safety has not been determined for people with severe kidney and liver diseases.

Before beginning any herbal treatment, people should consult a physician or health practitioner. Consulting a medical professional is particularly important before taking gymnema because the remedy could potentially lower blood sugar too much, resulting in a hypoglycemic reaction.

It is especially important for diabetics to consult with a doctor. Gymnema should not be regarded as a substitute for other medications, including insulin. Diabetics take insulin to control their blood sugar; they cannot replace the hormone with gymnema.

In addition, diabetes can go undetected for some time. It may not be diagnosed until a person goes to a doctor after experiencing symptoms such as frequent urination, **dizziness**, and **fatigue**. Diabetes must be treated medically since complications from untreated diabetes include kidney failure, **heart disease**, blindness, and loss of limbs.

Side effects

Gymnema could possibly lower the level of blood sugar, placing the diabetic at risk for **hypoglycemia**.

Interactions

Gymnema could interact with insulin and prescription medications and herbal remedies taken to reduce blood sugar levels. Taking gymnema could cause the drugs or herbals to work better, resulting in hypoglycemia. Diabetes-management drugs include metformin, glipizide, and glyburide. Herbal remedies that could trigger a reaction include **fenugreek**, **kudzu**, and large amounts of **ginger**.

Furthermore, the effects of cholesterol-lowering drugs and remedies could be increased for a person who also takes gymnema.

KEY TERMS

Ayurvedic medicine—Ayurveda is the Sanskrit word for the science of life and longevity. The Ayurvedic treatment is based on the theory that health is a balance between the physical, emotional, and the spiritual.

Glucose—Blood sugar.

Hypoglycemia—Low blood sugar.

Resources

BOOKS

Mayo Clinic. *Mayo Clinic Book of Alternative Medicine*. New York: Time Inc. Home Entertainment, 2007.

PERIODICALS

Bone, Kerry. "The Best of Phytotherapy for 2006: High lights of the Published Research (Phytotherapy Review & Commentary)." *Townsend Letter for Doctors and Patients* (February/March 2007): 626(3).

Gholap, S., and A. Kar. "Gymnemic Acids from Gymnema Sylvestre Potentially Regulates Dexamethasone Induced Hyperglycemia in Mice." *Pharmaceutical Biology* Vol. 43, no. 2 (2005): 192 195.

OTHER

"Double Blind Randomized Trial to Compare Gurmar (Gymnema Sylvestre) with Metformin in Type 2 Dia betes." *National Institutes of Health*. January 2007. http://clinicaltrials.gov/ct2/show/related/NCT00396851 (February 11, 2008).

Holistic Online. http://www.holistic online.com/ (February 11, 2008).

ORGANIZATIONS

American Botanical Council, 6200 Manor Rd., Austin, TX, 78723, (512) 926 4900, http://abc.herbalgram.org.

American Diabetes Association, 1701 N. Beauregard St., Alexandria, VA, 22311, (800) 342 2383, http://www.diabetes.org.

Herb Research Foundation, 4140 Fifteenth St., Boulder, CO, 80304, (303) 449 2265, http://www.herbs.org.

Liz Swain
Teresa G. Odle

Gypsywort *see* **Bugleweed**

H

Hair loss

Definition

Hair loss, or *alopecia*, is total or partial baldness caused by hormonal changes or physical or mental **stress**.

Description

Hair loss occurs for many reasons. Some causes, such as hormonal changes, are considered natural, while others signal serious health problems. Some conditions are confined to the scalp, while others reflect disease processes throughout the body.

Causes and symptoms

Androgenetic alopecia occurs in both men and women, and is considered normal in adult males. Also known as male pattern baldness, it is easily recognized by the distribution of hair loss over the top and front of the head (leaving a horseshoe pattern of hair) and by the healthy condition of the scalp. Women with androgenetic alopecia experience hair thinning, particularly over the top of the scalp. The disorder is thought to be caused by a genetic predisposition that triggers the production of certain enzymes that convert testosterone into the hormone dihydrotestosterone (DHT). DHT is known to shrink hair follicles, and can cause partial or complete hair loss.

Alopecia areata and *alopecia circumscripta* refer to hair loss conditions that can be patchy or extend to complete baldness. The exact cause of alopecia areata is unknown, but it is thought to be triggered by an immune system disorder.

Oftentimes, conditions affecting the skin of the scalp will result in hair loss. The first clue to the specific cause is the pattern of hair loss, whether it be complete baldness (*alopecia capitis totalis*), patchy bald spots, thinning, or hair loss confined to certain areas. Also a factor is the condition of the hair and the scalp beneath it. Sometimes only the hair is affected; sometimes the skin is visibly diseased as well.

Fungal infections of the scalp usually cause patchy hair loss. The fungus, similar to the ones that cause **athlete's foot** and ringworm, often glows under ultraviolet light.

Complete hair loss is a common result of **cancer** chemotherapy, due to the toxicity of the drugs used. Placing a tourniquet around the skull just above the ears during the intravenous infusion of the drugs may reduce or eliminate hair loss by preventing the drugs from reaching the scalp. However, this technique may not be recommended in the treatment of certain types of cancer. An investigational topical gel that may prevent chemotherapy-related hair loss, known as GW 8510, was in clinical trials as of April 2000.

Systemic diseases often affect hair growth either selectively or by altering the skin of the scalp. One example is thyroid disorders. **Hyperthyroidism** (too much thyroid hormone) causes hair to become thin and fine. **Hypothyroidism** (too little thyroid hormone) thickens both hair and skin. Several autoimmune diseases also affect the skin and potentially the hair, notably lupus erythematosus.

Hair loss can also be caused by *trichotillomania*, a mental disorder or compulsion that causes a person to pull out his/her own hair. In some individuals severe mental or physical stress can cause hair loss, including major surgery or illness, significant life changes (i.e., divorce, death of a loved one), and drastic dietary changes. This type of hair loss is called *Telogen effluvium,* and is the second most common type of hair loss.

Diagnosis

Dermatologists are skilled in diagnosis by sight alone. For more obscure diseases, they may have to resort to a skin biopsy, removing a tiny bit of skin using a local anesthetic so that it can be examined

KEY TERMS

Athlete's foot—A fungal infection between the toes, officially known as tinea pedis.

Autoimmune disease—Certain diseases caused by the body's development of an immune reaction to its own tissues.

Chemotherapy—The treatment of diseases, usually cancer, with drugs (chemicals).

Hair follicles—Tiny organs in the skin, each one of which grows a single hair.

Lupus erythematosus—An autoimmune disease that can damage skin, joints, kidneys, and other organs.

Ringworm—A fungal infection of the skin, also known as tinea corporis.

Systemic—Affecting all or most parts of the body.

under a microscope. Systemic diseases will require a complete evaluation by a physician, including specific tests to identify and characterize the problem.

Treatment

Traditional Chinese medicine (TCM) has a particular understanding of baldness that is different from the allopathic view. TCM recommends foods to eat and others to avoid, herbs to treat hair loss, and special hair massage. One Chinese approach is to first understand where there is weak energy in the body and to strengthen the qi (chi) of those organ systems. Treatment is not a one-shot approach but a well-rounded response.

Vitamins B_6 and **biotin** are thought to advocate healthy hair growth, as are the minerals **zinc**, **copper**, and **silica**. Fifty milligrams of silica a day is thought to encourage hair growth in young men with alopecia. The herb **horsetail** (*Equisetum arvense*) contains silica, and can be taken as an infusion, or tea. Copper and zinc have been shown to inhibit growth of the enzyme that causes DHT production. **Iron** supplements may be useful in individuals whose hair loss is caused by **anemia** or an inadequate intake of dietary iron.

The herbal remedies **saw palmetto** (*Serenoa repens*) and pygeum (*Pygeum africanum*) may be prescribed by an herbalist, naturopath, or holistic health-care professional to stop or slow hair loss. Saw palmetto is thought to stop DHT production, and pygeum influences testosterone production. Both can be taken orally as a dietary supplement. The Chinese herb He Shou Wun (*Polygonum multiflorum*) can be taken orally or applied as a topical formula.

For hair loss caused by trichotillomania (hair pulling), **behavioral therapy** may be a useful treatment program. If the hair pulling or hair loss itself is triggered by stress, there are a number of stress reduction therapies that can promote **relaxation**, including **aromatherapy**, muscle relaxation exercises, **yoga**, **guided imagery**, and **biofeedback**.

Allopathic treatment

Successful treatment of underlying causes is most likely to restore hair growth, be it the completion of chemotherapy, effective cure of a scalp fungus, or control of a systemic disease. Drugs such as minoxidil (Rogaine) and finasteride (Propecia, Proscar) promote hair growth in a significant minority of patients, especially those with male pattern baldness and alopecia areata. When used continuously for long periods of time, minoxidil produces satisfactory results in about one-quarter of patients with androgenic alopecia and as many as half the patients with alopecia areata. Both drugs have so far proven to be quite safe when used for this purpose. Side effects of Rogaine include some dryness and irritation of the scalp. Reported side effects of Propecia include infrequent cases of diminished sexual drive and **impotence**. Propecia is not approved for women because it can cause birth defects.

In 2001, a study was made of immunotherapy with diphencyprone to treat alopecia areata. A lag of three months from start of therapy to development of noticeable hair growth occurred. Researchers noted that the extent of the disease prior to therapy and age at time hair loss began, affected treatment success. Patients who were older at onset of baldness had a better success rate than those who were younger. The study concluded that long-term therapy was required for effectiveness.

Over the past few decades, a multitude of hair replacement methods performed by both physicians and non-physicians have appeared. They range from simply weaving someone else's hair in with the remains of an individual's own hair to surgically transplanting thousands of hair follicles one at a time.

Expected results

The prognosis for individuals with hair loss varies with the cause. It is generally much easier to lose hair than to regrow it. Even when it returns, it is often thin and less attractive than the original crop.

Resources

BOOKS

American Society of Health System Pharmacists Inc. *American Hospital Formulary Service Drug Information*. Bethesda, MD: American Society of Health System Pharmacists Inc., 1998.

Bennett, J. Claude, and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders, 1999.

PERIODICALS

Amichai, B., M. H. Grunwald, and R. Sobel. "5 Alpha reductase Inhibitors A New Hope in Dermatology?" *International Journal of Dermatology* (March 1997): 182 4.

Lewis, Eric J., et al. "Some Common and Uncommon Causes of Hair Loss." *Patient Care* (December 15, 1997): 50.

Watson, Fiona. "Dermatologists Must Sift Through Alter native Tx." *Dermatology Times* (November 1997): 5.

Wiseman, Marni C. "Protective Model for Immunotherapy of Alopecia Areata with Diphencyprone." *JAMA, The Journal of the American Medical Association* (Novem ber 21, 2001): 2384.

Paula Ford-Martin
Teresa Odle

Halitosis

Definition

Halitosis, commonly called bad breath, is an unpleasant odor of the breath. Usually it is due to poor hygiene, but it can be an indication of underlying health problems.

Description

Halitosis is likely to be experienced by most adults and many children, at least occasionally. Some people are strongly convinced that bad breath is present when it is not. Bad breath can have a significant impact on a person's social and professional life.

Causes and symptoms

Accumulation of plaque on the teeth is a major cause of halitosis. Plaque is a mucus film that mixes with food particles, saliva, and bacterial residue in the mouth. Halitosis can also be caused by any number of other problems. These include sores in the mouth, infected tonsils, tooth or **gum disease**, fermentation of food particles in the mouth, sinus **infections**, and badly cleaned dentures. Conditions that may cause bad breath are not only limited to the oral and nasal areas. Other possible sources of the problem might be **indigestion**, lung infection, kidney failure, **tuberculosis**, **syphilis**, liver disease, stomach and intestinal problems, **stress**, dehydration, **zinc** deficiency, and **cancer**.

Cigarette **smoking** can also lead to bad breath, not only in the smoker, but also in someone constantly exposed to second-hand smoke. A diet high in fats, spicy foods, or one that includes coffee may contribute to unpleasant breath odors. Medications causing **dry mouth** or dehydration may also be a source of problems, since the flow of saliva helps clean out the mouth. Antihistamines, decongestants, antidepressants, anti-anxiety medications, diuretics, and some heart medications may have a dehydrating effect and could be a cause of bad breath.

According to **traditional Chinese medicine**, halitosis is caused by too much heat in the stomach that affects the mouth. The way to prevent it is by avoiding dairy products, coffee, alcohol, sugar, spicy food, and fried food that disrupt normal acid and enzyme levels in the body. If these foods are eliminated from the diet and halitosis continues, traditional Chinese medicine recommends taking **activated charcoal** tablets.

Diagnosis

The easiest way to determine if one has bad breath is to ask a friend who is trustworthy and discrete or to ask a doctor or dentist. A test that can be attempted on one's own, is to cup a hand over the mouth, exhale, and then inhale through the nose while smelling the breath. A physical examination by a doctor or dentist may be used to diagnose other problems that may be causing the bad breath.

Treatment

Leaves of **parsley**, *Petroselinum crispum;* **wintergreen**, *Gaultheria procumbens;* or **peppermint**, *Mentha piperita;* can be chewed to freshen the breath by the introduction of their aromatic substances into the lungs. A strong tea made of *Echinacea* spp.; **myrrh**, *Commiphora molmol*; and **bloodroot**, *Sanguinaria canadensis*; can be used as a daily mouthwash. Fresh apples, citrus fruits, and celery are also good foods for helping to clean out the mouth. Possible homeopathic remedies that may be useful for bad breath include ***Nux vomica*** and *Kali phosphoricum*. Supplementing with zinc and **vitamin C** may also be of benefit.

Allopathic treatment

The most effective treatment of bad breath is to treat the cause. If bad breath is a continuing problem

or there are other symptoms, such as bleeding gums, a doctor or dentist should be consulted. A medication change may be warranted if a prescription drug is contributing to bad breath. A physician should be consulted any time a change in medication is planned. Over-the-counter mouthwashes and rinses can be used to kill odor-causing bacteria in the mouth.

Expected results

Most bad breath can be treated successfully with good oral hygiene or medical care. Occasionally, a person may develop delusional or obsessive behavior regarding breath odor problems, and mental health counseling may be appropriate.

Prevention

A healthy diet, high in fresh fruits and vegetables and whole grains, should be eaten. Eating crunchy foods such as apples, carrots, or celery after meals can help scrape off plaque. Processed foods such as sugar and white bread and grains contribute to plaque formation and should be avoided. Spicy foods such as onions, peppers, **garlic**, pastrami, salami, pepperoni, anchovies, and others should be avoided. Plenty of water should be consumed throughout the day to avoid dehydration and dry mouth. Water should be consumed after taking any food or drink to wash away residues that may accumulate with plaque.

The teeth should be brushed and flossed daily after meals. Toothbrushes should be changed monthly, since there may be a tendency for bacteria to accumulate on them. Baking soda is a good choice for cleaning the teeth when bad breath is a problem. The baking soda makes the mouth pH less hospitable to odor-causing bacteria. Gentle brushing of the tongue should also be included in the routine of daily oral hygiene, since the tongue itself may harbor tiny particles of food. A device called a tongue blade can be useful for cleaning the tongue. It may be available from a store that sells Asian or Middle Eastern products. An oral irrigation device, such as a Water Pik, is recommended to more thoroughly remove food and debris from the teeth. Mouthwashes are often helpful, especially those containing zinc. A dentist should regularly check the health of the gums and teeth for disease. A dental hygienist should clean the teeth regularly, especially if there is an increased tendency to form plaque.

Resources

BOOKS

Crissey, Pat, and Noah Crissey. *Personal Hygiene? What's That Got to Do with Me?* London: Jessica Kingsley, 2005.

Seton, Herbert M. *Natural Hygiene: Man's Pristine Way of Life*. Gloucester, U.K.: Dodo Press, 2005.

PERIODICALS

Alexander, Antoinette. "Move Over Whiteners, Halitosis Wants Shelf Space." *Retailing Today*(February 12, 2007): 21.

Brechka, Nicole, and Brandy Colbert. "Freshen Up! Bad Breath, Underarm Odor, and Smelly Feet Are No Match for These Natural Hygiene Solutions." *Better Nutrition* (July 2007): 36.

Harms, Kimberly A., et al. "How Can I Beat Bad Breath? Freshen Your Mouth with Herbs and Simple Dietary Changes." *Natural Health*(December 2007): 26.

McPhee, A. T. "Attack of the Killer Breath! What Causes Halitosis and How to Get Rid of It." *Current Health 2, a Weekly Reader Publication* (January 2005): 10(2).

ORGANIZATIONS

American Dental Association, 211 East Chicago Ave., Chi cago, IL, 60611, (312)440 2500, http://www. ada.org.

Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, ON, K1G 3Y6, Canada, (613) 523 1770, http:// www.cda adc.ca.

Patience Paradox
Ken R. Wells

Hangnail *see* **Ingrown nail**

Hangover

Definition

Hangover is the collection of physical and mental symptoms that occur after a person drinks excessive amounts of alcohol. The ingestion of five to seven cocktails over a period of four to six hours usually will lead to hangover. The economic cost of hangover in the United States as of 2008 is $148 billion each year, or $2,000 per working adult, which is related to decreased productivity and absenteeism.

Description

Hangovers have probably been experienced since prehistoric time when alcohol was first discovered. A survey found that about 75% of the persons who drank enough to be intoxicated (drunk) sometimes experienced hangover. Although very prevalent, hangovers have not been extensively studied. It is known that ethanol is the primary chemical component of alcohol to produce the effects associated with drinking.

Whether hangover affects complex mental tasks and the performance of simple tasks is unclear. Studies

on these areas have yielded conflicting results, presumably due to differences in methods. Clearly, alcohol consumption can affect sleep, and sleep deprivation is known to affect performance.

Causes and symptoms

The cause of hangover is believed to be multifactorial. Hangover is likely caused by a combination of direct effects of ethanol, effects of ethanol removal, effects of ethanol breakdown products, effects of other components of the alcoholic beverage, personal characteristics, and behaviors associated with alcohol use.

Direct effects of ethanol

Ethanol can directly affect the body by causing dehydration (loss of fluids), electrolyte (body chemicals) imbalance, stomach and intestinal irritation, low blood sugar, and sleep disruption. In addition, alcohol directly affects the circadian rhythm (internal 24-hour clock) causing a feeling similar to **jet lag**. Ethanol causes vasodilation (enlarged blood vessels) and affects bodily chemicals, such as serotonin and histamine, which may contribute to the **headache** associated with hangover.

Effects of ethanol removal

Because hangover symptoms peak at around the same time that the blood alcohol concentration falls to zero, some researchers propose that hangover is actually a mild form of withdrawal. Excessive drinking causes changes in the chemical messenger system of the brain, and when the alcohol is removed, the system becomes unbalanced. Many of the symptoms of hangover are similar to those associated with mild withdrawal. Some differences exist, however, between hangover and withdrawal; specifically, hangover symptoms do not include the hallucinations, seizures, and the lengthy impairment of withdrawal.

Effects of ethanol breakdown products

In the body, ethanol is first broken down to acetaldehyde and then to acetate. Acetaldehyde is a reactive chemical that, at high concentrations, can cause sweating, rapid pulse, skin flushing, **nausea**, and **vomiting**. Some researchers believe that acetaldehyde causes hangover. Although there is no acetaldehyde in the blood when the blood alcohol concentration reaches zero, the toxic effects of acetaldehyde on the body may still persist.

Other factors

Most alcoholic beverages contain small amounts of other active compounds besides ethanol. These compounds add to the smell, taste, and appearance of the beverage. Gin or vodka, which contain almost pure ethanol, produce fewer hangover symptoms than alcoholic beverages that contain other alcohol compounds (such as red wine, brandy, or whiskey). For example, methanol is implicated in contributing to hangover. Red wine, whiskey, and brandy all contain high levels of methanol.

Some inherent personal traits place persons at risk of experiencing hangover. In some persons, high levels of acetaldehyde accumulate (because of a deficient enzyme), which causes them to experience more severe hangovers. Persons who are neurotic, angry, or defensive, feel guilty about drinking, experience negative life events, or have a family history of **alcoholism** have increased hangover symptoms.

Certain behaviors associated with drinking increase the chance of experiencing hangover. These include drug use, disruption of normal sleep patterns, restricted food intake, and cigarette use.

Hangover symptoms begin within several hours after a person has stopped drinking and may last up to 24 hours. The specific symptoms experienced may vary depending upon the individual, the occasion, and the type and amount of alcohol consumed. The physical symptoms of hangover include headache, **fatigue**, light and sound sensitivity, muscle aches, eye redness, thirst, nausea, vomiting, and stomach **pain**. Hangover can cause rapid heartbeat, **tremor**, increased blood pressure, and sweating. Mental symptoms associated with hangover are decreased sleep, changes in sleep stages, decreased attention, decreased concentration, **depression**, **dizziness**, **anxiety**, irritability, and a sense that the room is spinning (vertigo).

British research at the University of Exeter and University of Plymouth found that complementary and traditional forms of relieving hangover are ineffective, and this research recommends avoiding alcohol or consuming it in moderation as the most effective strategy in avoiding hangover.

Treatment

Eating balanced meals, drinking extra water, and limiting total alcohol intake help to reduce or avoid hangover. There are also many alternative treatments to prevent or reduce hangover symptoms. Drinking additional alcohol to relieve hangover, although it reduces short-term symptoms, is not recommended.

Some experts believe that drinking alcohol to relieve hangover is a sign of impending alcoholism. The primary measure for fighting hangover is to drink plenty of water while drinking alcoholic beverages, before going to bed, and the day after. Sweating from exertion, **exercise**, sauna, or massage may also help.

Food therapy

Hangover symptoms may be reduced by taking in lots of extra water and fluids and by eating foods that are high in **vitamin C** and the B vitamins, which are believed to speed the removal of alcohol from the body. Oranges, guava, grapefruit, and strawberries are rich in vitamin C, and beans, fish, and whole grains are rich in the B vitamins. A cocktail prepared from orange juice (1 cup), pineapple juice (1 cup), kiwi fruit (one), vitamin-B-enriched nutritional yeast (1 tablespoon), and honey (1 tablespoon) provides important nutrients which the body needs to recover from hangover. Juice therapists recommend drinking a mixture of carrot juice (8 oz), beet juice (1 oz), celery juice (4 oz), and **parsley** juice (1 oz) twice during hangover. The Chinese drink fresh tangerine juice and eat 10 strawberries to treat hangover.

Eating bland complex carbohydrates, such as crackers or toast, is easy on the stomach and helps to raise blood sugar levels. Because alcohol can irritate the gastrointestinal tract, bland foods are more easily tolerated. Drinking tea or coffee can relieve fatigue and possibly the headache. Throughout the world, traditional food remedies for hangover have certain ingredients in common. These include eggs, tripe, hot spices, hearty soups, and fruit and vegetable juices. These foods all serve to replenish vitamins, minerals, and other nutrients lost by the body as it detoxifies alcohol.

Ayurveda

Ayurvedic practitioners believe that hangover reflects the symptoms of excess pitta. Immediate relief may be found after drinking water containing lime juice (1 teaspoon), sugar (one half teaspoon), salt (pinch), and baking soda (one half teaspoon). Orange juice containing cumin (pinch) and lime juice (1 teaspoon) helps hangover. Drinking cool lassi, water containing yogurt (1 tablespoon) and cumin powder (pinch), three or four times daily may relieve nausea, headache, and drowsiness.

Herbals

The following herbal remedies are useful in treating hangover symptoms:

- An Ayurvedic remedy is to take one-half teaspoon of a mixture of *shatavari* (5 parts), *shanka bhasma* (one-eighth part), *kama dudha* (one-eighth part), and *jatamamsi* (3 parts) with water 2 to 3 times daily.
- An Ayurvedic antidote for alcohol toxicity is one-half teaspoon of *tikta* (or myrrh, aloe vera, or *sudharshan*) with warm water three times during the day.
- Barberry (*Barberis vulgaris*) tea reduces hangover symptoms.
- Dandelion (*Taraxacum officinale*) and burdock (*Arctium lappa*) tea (with gentian extract, powdered ginger, and honey) can ease the nausea.
- Evening primrose (*Oenothera biennis*) oil helps to replenish lost gamma-linoleic acid.
- Milk thistle (*Silybum marinum*) reduces alcohol toxicity on the liver.
- Nux vomica (*Strychnos nux vomica*) is a homeopathic antidote for alcohol over-consumption.
- Siberian ginseng (*Eleutherococcus senticosus*) helps the body adjust to the stress of alcohol toxicity.
- Wintergreen (*Gaultheria procumbens*) tea with hot pepper (*Capsicum*) sauce relieves the headache.

Other hangover remedies

Other remedies for hangover are as follows:

- Acupressure. Point LI 4 (between the thumb and index finger) relieves headache and stomach ailments and the B2 points (upper edge of the eye socket) relieves headache accompanied by light sensitivity.
- Aromatherapy. The nausea of hangover may be relieved by drinking an aromatic cocktail of water, lemon juice, and a drop of fennel essential oil before breakfast.
- Imagery. The hangover sufferer may visualize being on a ship in a stormy ocean. The ocean gradually becomes calm until the ship is gently bobbing in the water.
- Probiotics. The bacteria *Bifidobacterium bifidus* is able to remove alcohol breakdown products. To fight hangover, naturopaths recommend taking *B. bifidus* before going to bed and again the following day.
- Supplements. Taking 50 mg of vitamin B_3 before going to bed may relieve hangover.
- Hydrotherapy. Drinking a glass of water containing activated charcoal powder before going to bed may absorb alcohol in the stomach and reduce hangover symptoms.

KEY TERMS

Acetaldehyde—An intermediate product in the breakdown pathway of ethanol; believed to cause hangover.

Dehydration—Loss of fluids from the body. Dehydration worsens some of the symptoms of alcohol.

Ethanol—The chemical that causes the effects and aftereffects of drinking alcoholic beverages.

Methanol—A liquid alcohol, used as a solvent or denaturant for ethanol.

Withdrawal—The physical and mental symptoms caused by removal of alcohol or other addictive substance from the body.

Allopathic treatment

Hangover symptoms may be relieved by taking antacids for nausea and stomach pain and aspirin or a nonsteroidal anti-inflammatory drugs (ibuprofen or naproxen) for headache and muscle pains. Acetaminophen (Tylenol) should be avoided while drinking or during hangover because alcohol enhances acetaminophen's toxic effects on the liver. **Caffeine**, usually taken as coffee, is historically used to treat hangover, although this has not been studied as of 2008.

Going for a walk may also relieve the symptoms.

Expected results

There is no cure for hangover. Left untreated, hangover will resolve within several hours. Treatments may reduce the severity of certain symptoms.

Prevention

Hangover may be prevented by limiting the intake of alcohol or drinking alcoholic beverages with a lesser incidence of causing hangover such as gin, vodka, or pure ethanol. Getting adequate sleep may reduce the fatigue associated with hangover. Drinking nonalcoholic beverages, both during and after drinking alcohol, may reduce dehydration and reduce hangover symptoms. Taking 120 mg of **milk thistle** before drinking can help the liver detoxify the alcohol.

Resources

BOOKS

Reed, Ben, and William Lingwood. *Hangover Cures*. New York: Ryland, Peters, and Small, 2005.

PERIODICALS

Pittler, Max H., Joris C. Verster, and Edzard Ernst. "Interventions for Preventing or Treating Alcohol Hangover: Systematic Review of Randomised Controlled Trials." *British Medical Journal* 331 (December 24, 2005): 1515 1518.

OTHER

Farrell, Maureen. "Ten Top Hangover Cures." *Forbes.com* December 13, 2006. http://www.forbes.com/2006/12/12/gatorade excedrin tylenol ent hr cx_mf_1212 hangover.html. (April 7, 2008).

Belinda Rowland
Rhonda Cloos, R.N.

Hardening of the arteries *see* **Atherosclerosis**

Hashimoto's thyroiditis

Definition

Hashimoto's thyroiditis, also known as chronic lymphocytic thyroiditis or autoimmune thyroiditis, is an autoimmune disease characterized by thyroid gland failure due to chronic inflammation.

Description

Hashimoto's thyroiditis is the most common inflammatory thyroid disorder and is the leading cause of **hypothyroidism**, especially in iodine-sufficient regions of the world. An enlarged thyroid gland is characteristic of the disease. During the course of this disease, the cells of the thyroid are unable to convert **iodine** into thyroid hormones.

The term Hashimoto's thyroiditis can be attributed to the Japanese surgeon, Hashimoto Hakaru, who first described this chronic thyroid disorder as struma lymphomatosa in a 1912 pathology report.

Demographics

Hashimoto's thyroiditis is more common in women than in men with a ratio of approximately 7:1. It is most common in women aged 30 to 50. However, the condition can also occur in children.

Causes and symptoms

Causes

Hashimoto's thyroiditis is an autoimmune disease thought to be activated by certain antibodies that

attack the thyroid gland and inhibit the production of thyroid hormones, disrupting the body's natural metabolic processes. However, the exact mechanism of the autoimmunity is unknown.

A low prevalence of Hashimoto's thyroiditis is associated with mild iodine deficiency, although excessive iodine intake is associated with a higher prevalence of the disease.

Medications such as interferon, lithium, and amiodarone increase the risk of the disease. In some cases, treatment for **hyperthyroidism**, including radioactive iodine or surgical resection, can result in hypothyroidism. Environmental radiation exposure also increases the risk.

The condition can develop after **pregnancy** or a viral illness, and it may be related to pituitary or hypothalamus gland dysfunction or to tumors on these glands or the thyroid itself. It is considered a genetic trait, with an increased incidence among first-degree relatives who have the condition.

Symptoms

Visible thyroid enlargement or nodular growths may be signs of Hashimoto's thyroiditis. Symptoms generally develop slowly over several years and include:

- fatigue
- intolerance to cold
- menstrual cycle changes, infertility
- unexplained weight gain
- dry, coarse skin and hair
- yellowish skin
- puffy face
- hoarse voice
- muscle aches or cramps
- joint stiffness
- constipation
- mental and memory impairment, decreased concentration
- depression

Pain is not usually a symptom of Hashimoto's thyroiditis, but some patients do experience prolonged pain and tenderness.

Diagnosis

The results of the patient's medical history are evaluated, and a physical examination, including palpation of the patient's neck to detect enlargement or nodular growths, are performed. The physician may also perform skin and eye exams to rule out other conditions or possible complications.

Because thyroid antibodies are elevated in patients with Hashimoto's thyroiditis, a blood test that measures antithyroid antibody levels can be performed to help identify the disease. Measurement of thyroid-stimulating hormone (TSH or thyrotrophin) in the blood also helps identify the disease, since the level of TSH rises dramatically when the there is an underproduction of the thyroid hormone.

Cardiac function tests and an ultrasound may also be performed. A thyroid biopsy (tissue removal for laboratory analysis) is only performed if a suspicious area or nodule is found upon examination.

Although most physicians can diagnose and treat Hashimoto's thyroiditis, consultation with a clinical endocrinologist is recommended for the following patients, according to the *American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the Evaluation and Treatment of Hyperthyroidism and Hypothyroidism*:

- patients under age 18
- patients unresponsive to therapy
- pregnant patients
- patients with known cardiovascular disease
- patients who have a goiter, nodule, or other structural thyroid changes
- patients with other endocrine diseases

Treatment

Complementary treatment

Natural extracts that contain thyroid-derived hormone from the glands of pigs are alternative treatments for Hashimoto's thyroiditis. One such product, Armour Thyroid, contains both levothyroxine (T4) and triiodothyronine (T3). However, physicians do not recommend natural thyroid hormone extracts for several reasons. According guidelines published by the American Association of Clinical Endocrinologists, the bioequivalence of levothyroxine preparations is based on total measurement of active thyroid hormones (T3 and T4) and not TSH blood levels, so the required therapeutic dosage cannot be accurately assessed. Additionally, the balance of hormones in biological products is not the same as in humans. As of 2008, there were no safety reviews, scientific evidence, or approved therapeutic uses of natural thyroid hormone extracts by the FDA. Lastly, product formulations may

vary, depending on the manufacturer, which could alter TSH to uncertain levels.

Allopathic treatment

Synthetic hormone replacement therapy with oral levothyroxine (synthetic thyroxine, T4) is the standard treatment for Hashimoto's thyroiditis if a deficiency of TSH is confirmed in blood test results. Daily supplementation with levothyroxine can help correct symptoms of thyroid deficiency, reduce the size of the thyroid or goiter, and prevent further enlargement. Improvements in symptoms may not be noted until a few months after treatment because the thyroid hormone acts slowly in the body. The dosage is evaluated within six months after therapy initiation to determine if an adjustment is necessary. The patient's dosage continues to be adjusted until optimal effects are achieved. Blood tests may be performed periodically to monitor the patient's response to the medication.

Contraindications for levothyroxine therapy include prior **heart attack**, thyrotoxicosis, or an untreated adrenal condition. Diabetes medications may need to be adjusted at the onset of levothyroxine therapy. Some foods, including soy products, salt substitutes, and high-iron foods, and nutritional supplements (**calcium**, **iron**, **potassium**, or iodine) may interfere with the body's ability to absorb the synthetic hormone. A registered dietitian can provide specific dietary guidelines for patients taking levothyroxine. Amiodarone should not be taken with thyroxine, and patients should discuss all current medications, including vitamins and supplements, with their physician prior to starting levothyroxine treatment.

If patients develop a **fever**, rash, **jaundice**, or joint pain, they should promptly discontinue their medication and contact their physician, as these may be signs of an allergic reaction or a needed dose adjustment. To make dose adjustments, the physician reviews the results of lab tests to evaluate the patient's response to the medication. Patients should maintain a regular follow-up schedule with their physician for close monitoring.

Antiinflammatory medications, and occasionally steroid therapy, may be prescribed to manage symptoms of pain.

Surgical removal of the thyroid gland, called thyroidectomy, is uncommon but may be necessary in select cases.

KEY TERMS

Endocrinologist—A physician who specializes in the diagnosis and treatment of endocrine system conditions, including thyroid dysfunction.

Goiter—An enlargement of the thyroid gland that is often visible as a lump in the middle of the lower neck.

Hyperthyroidism—High thyroid activity marked by excessive levels of thyroid hormones.

Hypothyroidism—Low thyroid activity marked by low levels of thyroid hormones.

Iodine—A trace mineral used by the body to produce thyroid hormones.

Metabolism—Biochemical processes related to the breakdown of food and its conversion into energy.

Thyroid—A small gland, located in the middle of the lower neck. A properly functioning thyroid maintains a balance of thyroid hormones to sufficiently regulate the body's metabolism.

Thyroditis—Inflammation of the thyroid.

Thyrotoxicosis—High blood levels of the thyroid hormone levels, thyroxine (T4), triiodothyronine (T3), or both.

Prognosis

Hashimoto's thyroiditis is a chronic condition. However, with early diagnosis, proper treatment, and careful monitoring, symptoms can be managed and the patient can lead a normal, healthy life.

Potential complications of untreated Hashimoto's thyroiditis include an increased risk of **heart disease**, due to the increased levels of LDL **cholesterol** from an underactive thyroid, as well as an increased risk of **sleep apnea**. There is also an increased risk of birth defects in babies born to women with untreated hypothyroidism.

Prevention

There is no known prevention for Hashimoto's thyroiditis, although awareness of risk factors can aid early diagnosis and treatment to improve long-term outcomes.

A doctor should be notified if the following occurs:

- A fever, rash, jaundice, or joint pain
- Unfamiliar, unexplained symptoms

Resources

BOOKS

McPhee, Stephen J., and Douglas C. Bauer. "Thyroid Dis ease." In *Pathophysiology of Disease: An Introduction to Clinical Medicine,* 5th ed. By Stephen J. McPhee, Vish wanath R. Lingappa, and William F. Ganong. Colum bus, OH: McGraw Hill, 2005.

OTHER

"American Association of Clinical Endocrinologists Medi cal Guidelines for Clinical Practice for the Evaluation and Treatment of Hyperthyroidism and Hypothyroid ism." AACE Thyroid Task Force. 2006 [cited March 20, 2008]. http://www.aace.com/pub/pdf/guidelines/hypo_hyper.pdf.

ORGANIZATIONS

American Thyroid Foundation, 6066 Leesburg Pike, Suite 550, Falls Church, VA, 22041, (800) THYROID, (703) 998 8890, http://www.thyroid.org.

Thyroid Foundation of America, One Longfellow Place, Suite 1518, Boston, MA, 02114, (800) 832 8321, (617) 534 1500, http://www.allthyroid.org.

Angela M. Costello

Hatha yoga

Definition

Hatha **yoga** is the most widely practiced form of yoga in America. It is the branch of yoga that concentrates on physical health and mental well-being. Hatha yoga uses bodily postures (*asanas*), breathing techniques (*pranayama*), and **meditation** (*dyana*) with the goal of bringing about a sound, healthy body and a clear, peaceful mind. There are nearly 200 hatha yoga postures, with hundreds of variations, which work to make the spine supple and to promote circulation in all the organs, glands, and tissues. Hatha yoga postures also stretch and align the body, promoting balance and flexibility.

Origins

Yoga was developed in ancient India as far back as 5,000 years ago; sculptures detailing yoga positions have been found in India which date back to 3000 B.C. Yoga is derived from a Sanskrit word which means "union." The goal of classical yoga to bring self-transcendence, or enlightenment, through physical, mental and spiritual health. Many people in the West mistakenly believe yoga to be a religion, but its teachers point out that it is a system of living designed to promote health, peace of mind, and deeper awareness of ourselves. There are several branches of yoga, each of which is a different path and philosophy toward self-improvement. Some of these paths include service to others, pursuit of wisdom, non-violence, devotion to God, and observance of spiritual rituals. Hatha yoga is the path that has physical health and balance as a primary goal, for its practitioners believe that greater mental and spiritual awareness can be brought about with a healthy and pure body.

The origins of hatha yoga have been traced back to the eleventh century A.D. The Sanskrit word *ha* means "sun" and *tha* means "moon," and thus hatha, or literally sun-moon yoga, strives to balance opposing parts of the physical body, the front and back, left and right, top and bottom. Some yoga masters (*yogis*) claim that hatha yoga was originally developed by enlightened teachers to help people survive during the Age of Kali, or the spiritual dark ages, in which Hindus believe we are now living.

The original philosophers of yoga developed it as an eight-fold path to complete health. These eight steps include moral and ethical considerations (such as honesty, non-aggression, peacefulness, generosity, and sexual propriety), self-discipline (including purity, simplicity, devotion to God, and self-knowledge), posture, breath control, control of desires, concentration, meditation, and happiness. According to yogis, if these steps are followed diligently, a person can reach high levels of health and mental awareness.

As it has subsequently developed, hatha yoga has concentrated mainly on two of the eight paths, breathing and posture. Yogis believe breathing to be the most important metabolic function; we breathe roughly 23,000 times per day and use about 4,500 gallons of air, which increases during **exercise**. Thus, breathing is extremely important to health, and *prana*, or life-force, is found most abundantly in the air and in the breath. If we are breathing incorrectly, we are hampering our potential for optimal health. *Pranayama*, literally the "science of breathing" or "control of life force," is the yogic practice of breathing correctly and deeply.

In addition to breathing, hatha yoga utilizes asanas, or physical postures, to bring about flexibility, balance and strength in the body. Each of these postures has a definite form and precise steps for achieving the desired position and for exiting it. These postures, yogis maintain, have been scientifically developed to increase circulation and health in all parts of the body, from the muscular tissues to the glands and internal organs. Yogis claim that although hatha yoga can make the body as strong and fit as any exercise program, its

KEY TERMS

Asana—Yoga posture or stance.

Diaphragm breathing—Method of deep breathing using the entire lungs.

Dyana—Yoga meditation.

Meditation—Technique of mental relaxation.

Prana—Yoga term for life-enhancing nutrient found in air, food and water.

Pranayama—Yoga method of breathing.

real benefits come about because it is a system of maintenance and balance for the whole body.

Yoga was brought to America in the late 1800s, when Swami Vivekananda, an Indian yogi, presented a lecture on yoga in Chicago. Hatha yoga captured the imagination of the Western mind, because accomplished yogis could demonstrate incredible levels of fitness, flexibility, and control over their bodies and metabolism. Yoga has flourished in the West. Americans have brought to yoga their energy and zest for innovation, which troubles some Indian yogis and encourages others, as new variations and schools of yoga have developed. For instance, power yoga is a recent Americanized version of yoga which takes hatha yoga principles and speeds them up into an extremely rigorous aerobic workout, and many strict hatha yoga teachers oppose this sort of change to their philosophy. Other variations of hatha yoga in America now include Iyengar, Ashtanga, Kripalu, Integral, Viniyoga, Hidden Language, and Bikram yoga, to name a few. Sivananda yoga was practiced by Lilias Folen, who was responsible for introducing many Americans to yoga through public television.

Iyengar yoga was developed by B.K.S. Iyengar, who is widely accepted as one of the great living yogis. Iyengar uses classical hatha yoga asanas and breathing techniques, but emphasizes great precision and strict form in the poses, and uses many variations on a few postures. Iyengar allows the use of props such as belts, ropes, chairs, and blocks to enable students to get into postures they otherwise couldn't. In this respect, Iyengar yoga is good for physical therapy because it assists in the manipulation of inflexible or injured areas.

Ashtanga yoga, made popular by yogi K. Patabhi Jois, also uses hatha yoga asanas, but places an emphasis on the sequences in which these postures are performed. Ashtanga routines often unfold like long dances with many positions done quickly one after the other. Ashtanga is thus a rigorous form of hatha yoga, and sometimes can resemble a difficult aerobic workout. Ashtanga teachers claim that this form of yoga uses body heat, sweating, and deep breathing to purify the body.

Kripalu yoga uses hatha yoga positions but emphasizes the mental and emotional components of each asana. Its teachers believe that tension and long-held emotional problems can be released from the body by a deep and meditative approach to the yoga positions. Integral yoga seeks to combine all the paths of yoga, and is generally more meditative than physical, emphasizing **spirituality** and awareness in everyday life. Viniyoga tries to adapt hatha yoga techniques to each individual body and medical problem. Hidden Language yoga was developed by Swami Sivananda Radha, a Western man influenced by Jungian psychology. It emphasizes the symbolic and psychological parts of yoga postures and techniques. Its students are encouraged to write journals and participate in group discussions as part of their practice. Bikram yoga has become very popular in the late 1990s, as its popular teacher, Bikram Choudury, began teaching in Beverly Hills and has been endorsed by many famous celebrities. Bikram yoga uses the repetition of 26 specific poses and two breathing techniques to stretch and tone the whole body.

Benefits

In a celebrated 1990 study, *Dr. Dean Ornish's Program for Reversing Heart Disease* (Random House), a cardiologist showed that yoga and meditation combined with a low-fat diet and group support could significantly reduce the blockage of coronary arteries. Other studies have shown yoga's benefit in reducing stress-related problems such as high blood pressure and **cholesterol**. Meditation has been adopted by medical schools and clinics as an effective **stress** management technique. Hatha yoga is also used by physical therapists to improve many injuries and disabilities, as the gentleness and adaptability of yoga make it an excellent rehabilitation program.

Yoga has been touted for its ability to reduce problems with such varying conditions as **asthma**, backaches, diabetes, **constipation**, **menopause**, **multiple sclerosis**, **varicose veins**, and **carpal tunnel syndrome**. A vegetarian diet is the dietary goal of yoga, and this change of lifestyle has been shown to significantly increase longevity and reduce **heart disease**.

Yoga as a daily exercise program can improve fitness, strength, and flexibility. People who practice yoga correctly every day report that it can promote

high levels of overall health and energy. The mental component of yoga can clarify and discipline the mind, and yoga practitioners say its benefits can permeate all facets of a person's life and attitude, raising self-esteem and self-understanding. Once individuals learn the basics of yoga, certain poses can be used to help with particular needs, such as improving memory and concentration or reducing bloating and **gas** after meals.

Description

A hatha yoga routine consists of a series of physical postures and breathing techniques. Routines can take anywhere from 20 minutes to two hours, depending on the needs and ability of the practitioner. Yoga should always be adapted to one's state of health; that is, a shorter and easier routine should be used when a person is fatigued. Yoga is ideally practiced at the same time every day, to encourage the discipline of the practice. It can be done at any time of day; some prefer it in the morning as a wake-up routine, while others like to wind down and de-stress with yoga at the end of the day.

Yoga asanas consist of three basic movements: backward bends, forward bends, and twisting movements. These postures are always balanced; a back bend should be followed with a forward bend, and a leftward movement should be followed by one to the right. Diaphragm breathing is important during the poses, where the breath begins at the bottom of the lungs. The stomach should move outward with the inhalation and relax inward during exhalation. The breath should be through the nose at all times during hatha asanas. Typically, one inhales during backward bends and exhales during forward bending movements.

The mental component in yoga is as important as the physical movements. Yoga is not a competitive sport, but a means to self-awareness and self-improvement. An attitude of attention, care, and non-criticism is important; limitations should be acknowledged and calmly improved. Patience is important, and yoga stretches should be slow and worked up to gradually. The body should be worked with, and never against, and a person should never overexert. A yoga stretch should be done only so far as proper form and alignment of the whole body can be maintained. Some yoga stretches can be uncomfortable for beginners, and part of yoga is learning to distinguish between sensations that are beneficial and those that can signal potential injury. A good rule is that positions should be stopped when there is sharp **pain** in the joints, muscles, or tendons.

Preparations

All that is needed to perform hatha yoga is a flat floor and adequate space for stretching out. A well-ventilated space is preferable, for facilitating proper breathing technique. Yoga mats are available that provide non-slip surfaces for standing poses. Loose, comfortable clothing should be worn. Yoga should be done on an empty stomach; a general rule is to wait three hours after a meal.

Yoga is an exercise that can be done anywhere and requires no special equipment. Yoga uses only gravity and the body itself as resistance, so it is a low-impact activity excellent for those who don't do well with other types of exercise. The mental component of yoga can appeal to those who get bored easily with exercise. By the same token, yoga can be a good stress management tool for those who prefer movement to sitting meditation.

Precautions

As with any exercise program, people should check with their doctors before starting yoga practice for the first time. Those with medical conditions, injuries or spinal problems should find a yoga teacher familiar with their conditions before beginning yoga. Pregnant women, particularly after the third month of **pregnancy**, should only perform a few yoga positions with the supervision of an experienced teacher. Some yoga asanas can be very difficult, and potentially injurious, for beginners, so teachers should always be consulted as preparation for advanced yoga positions. Certain yoga positions should not be performed by those with fevers, or during **menstruation**.

Side effects

Those just beginning hatha yoga programs often report **fatigue** and soreness throughout the body, as yoga stretches and exercises muscles and tendons that are often long-neglected. Some yogic breathing and meditation techniques can be difficult for beginners and can cause **dizziness** or disorientation; these are best performed under the guidance of a teacher.

Training and certification

At this time, there are no generally accepted standards for yoga teacher certification in the United States, unlike in Europe and England, where yoga schools have been standardized. Some schools in the United States require teachers to study for many years, while some will grant beginning certificates in a much shorter time. When choosing teachers, students should search

for qualities they may require, such as understanding, patience, knowledge of certain medical conditions, carefulness, and attention to individual details.

Yoga classes cost around 10 dollars per session. Many communities, schools, and health organizations offer discounted or free yoga classes as part of health awareness programs. Yoga can be reimbursed by insurance when it is part of physical therapy.

Resources

BOOKS

Bodian, Stephan, and Feuerstein, Georg. *Living Yoga* New York: Putnam, 1993.
Christensen, Alice. *20 Minute Yoga Workouts* New York: Fawcett, 1995.
Feuerstein, Georg. *Yoga for Dummies* New York: IDG Books, 1999.
Iyengar, B.K.S. *Light on Yoga*. New York: Schocken, 1975.

PERIODICALS

Schaeffer, Rachel. "Calm Digestive Upset with Yoga: If you Frequently Suffer from Bloating, Cramping, and Gas after Meals, these Poses can Help." *Natural Health* (July 2002):38 42.
Schaeffer, Rachel. "Sharpen Your Memory with Yoga: These Poses can Help you be Less Frazzled and For getful." *Natural Health* (August 2002):40 42.

ORGANIZATIONS

International Association of Yoga Therapists (IAYT), 4150 Tivoli Ave., Los Angeles, CA 90066.
Yoga International Magazine R.R. 1 Box 407, Honesdale, PA 18431. http://www.yimag.com.
Yoga Journal P.O. Box 469088, Escondido, CA 92046. http://www.yogajournal.com.

Douglas Dupler
Teresa G. Odle

Hawaiian massage *see* **Lomilomi**

Hawthorn

Description

Hawthorn is a dense, thorny shrub that grows 5–13 ft (1.5–4 m) high. It has white flowers that look like roses and is considered one of the most beautiful of all the shrubs that flower in the spring. A member of the rose family, it has been planted along hedges to deter trespassers since the Middle Ages. Hawthorn grows throughout the world in moist areas.

Hawthorn is the common name for *Crataegus oxyacantha* or other *Crataegus* species. There are more than 300 species throughout the world. Hawthorn's flowers, leaves, and fruit (berries) are used as medicine, although the flowers have an unpleasant smell and taste slightly bitter. The hawthorn fruit is sour.

Hawthorn leaves. *(Photo by Kelly Quin. Reproduced by permission.)*

Hawthorn is one of the oldest medicinal plants known in Europe, where it has been used since the Middle Ages for heart problems. The ancient Greeks and Native Americans also recognized hawthorn's heart-healthy properties.

Hawthorn also is called *Crataegus* extract, mayflower, maybush, and whitethorn. Common trade names for hawthorn include Cardiplant, Hawthorn Berry, Hawthorn Formula, Hawthorn Heart, Hawthorn Phytosome, and Hawthorn Power.

General use

Hawthorn most commonly is used to treat **heart disease** and to treat and prevent cardiovascular disorders. Herbalists consider hawthorn to be the world's best heart tonic. It increases blood flow to the heart by dilating the coronary arteries; lowers blood pressure and eases the heart's workload by dilating arteries in the arms and legs; and increases the force of the heart's contractions.

In Europe, scientific studies have shown that the hawthorn leaf expands the blood vessels and lets more oxygen-rich blood reach the heart muscles; increases the strength of the heartbeat and slightly increases its speed; and helps the heart by reducing resistance throughout the rest of the circulatory system. Hawthorn leaf is used for **angina** and weak heart.

In addition to praising its benefits for cardiovascular insufficiency, **edema**, and the breathing difficulties associated with circulatory problems, James A.

Duke, writing in his book *Dr. Duke's Essential Herbs* (2000), suggests that dried hawthorn fruit and flowers may also be useful in treating **attention-deficit hyperactivity disorder** (ADHD).

Hawthorn is also a powerful antioxidant. There is strong evidence that **antioxidants** lower the risk of heart attacks, strokes, and deaths from heart diseases, but this has not been proven in studies. Antioxidants are believed to help the coronary arteries dilate and increase blood flow to the heart. They may prevent blockages from coming back after a surgical procedure called angioplasty.

Hawthorn is used, in conjunction with standard medical treatment, for heart failure classified as mild to moderate (stage II) by the New York Heart Association and to prevent angina. Mild to moderate heart failure includes patients with heart disease who do not have any limitations in their physical activities due to the heart disease. They are comfortable when resting and feel symptoms such as **fatigue**, palpitation, shortness of breath, or angina **pain** when performing ordinary physical activities.

Hawthorn has long been used in Europe to treat mild cases of heart failure. In Germany, the Federal Institute for Drugs and Medical Devices has approved the use of hawthorn leaf with flower extracts as a treatment for New York Heart Association functional stage II heart failure. The treatment also is listed in the German Pharmacopeia and approved in the German Commission E monographs.

A 2003 trial of more than 200 patients, consisting of 16 weeks of hawthorne treatment, demonstrated an increased **exercise** capacity and decreased signs and symptoms on heart failure. Hawthorn was slightly more effective at a higher dose (1,800 mg per day).

In two studies of heart attacks in animals, reported in 2004 in the *Journal of Pharmacy and Pharmacology*, hawthorn extract was demonstrated to significantly reduce heart injury and death.

In a 2005 study reported in *Phytomedicine* people diagnosed with orthostatic hypotension (OH) experienced significant improvement in the condition. The one-week study combined hawthorn berry extract and camphor. Patients taking the blend experienced normalized blood pressure and some relief from the rapid drop in blood pressure and the **dizziness** when standing typical in orthostatic hypotension.

The Hawthorne Extract Randomized Blinded Chronic Heart Failure (HERB CHF) trial reported at the 2004 meeting of the Heart Failure Society of America, involved 120 patients diagnosed with chronic mild to moderately severe heart failure. One group was treated with 450 mg of hawthorne extract (WS 1442, Schwabe Pharmaceuticals, Karlsruhe, Germany) twice daily in addition to receiving standard medical therapy for heart failure (ACE inhibitor, beta-blocker, digoxin, and a diuretic as needed). A control group received a placebo in addition to the standard medical therapy. After six months, investigators found no evidence that the hawthorn extract, in 450 mg dosages twice daily, brought functional improvement or relief of symptoms in patients with chronic mild to moderately severe heart failure who are also receiving standard heart failure therapy.

In another trial, known as the Survival and Prognosis Investigation of Crataegus Extract (SPICE) trial, researchers investigated the effects of hawthorn extract (WS 1442 with a 17% to 20% concentration of oligomeric procyanidins) on the mortality of patients with congestive heart failure. According to Steve Stiles, writing in 2007 in the on-line publication *Heart Wire*, "hawthorn failed to show any incremental benefit when given with standard drug therapy to patients with chronic systolic heart failure."

In addition to capsules, hawthorn may be taken in liquid form for **insomnia** and nervous conditions and is used as a gargle for sore throats. In folk medicine, hawthorn is used as a heart tonic and treatment, to regulate blood pressure, and as a sedative, but as of 2008 it had not been proven effective in clinical studies.

Preparations

Hawthorn is most commonly used in liquid or dry extracts or as capsules. It is collected and dried at room temperature. The dosage of hawthorn varies and the manufacturer's directions should always be followed. A typical dose of hawthorn might be 160 to 900 mg of extract given in two or three doses a day or 1 gram of crushed herb taken up to five times a day. Hawthorn is slow acting and should be taken for at least six weeks duration. It should be stored in a tightly sealed container and protected from the light.

Precautions

Hawthorn should only be used for diagnosed heart conditions. Women who are pregnant or breast feeding should take hawthorn only under the advice of a physician. Patients who are sensitive to other types of **Rosacea** plants should not take hawthorn.

Hawthorn leaf only is useful for angina when it is used over a long period of time. It can sometimes prevent angina, but it cannot treat an angina attack.

KEY TERMS

Angina—A type of pain in the chest caused by a temporary inadequate blood supply to the heart. Angina usually occurs after excitement or exertion.

Angioplasty—Surgery to dilate the narrowed or blocked part of a blood vessel.

Arrhythmia—An abnormal rate or rhythm of the heartbeat.

Cardiac glycosides—Drugs that block the enzyme that regulates the electrical activity of the heart.

Cardiovascular—Related to the heart and lungs.

Dyspnea—Shortness of breath.

Palpitation—A feeling of irregular or rapid heartbeat.

Side effects

Hawthorn rarely has side effects. In high doses, hawthorn can cause a severe drop in blood pressure, arrhythmias, and sedation.

Interactions

Since hawthorn performs the same function as some nitrates, cardiac glycosides, central nervous system depressants, and medications for high blood pressure, lower doses of these medications might be needed. Individuals ought to consult a qualified practitioner for appropriate dosages.

Resources

PERIODICALS

Ackerson, Amber D. "This Berry bearing Herb May Help Keep Your Heart Pumping Strong." *Better Nutrition* 68, no. 2 (February 2006).

Stiles, Steve. "Hawthorn Extract for Systolic HF Shows No Clinical Effect in Rare Placebo Controlled Test of Herbal Drug." *Heart Wire,* November 28, 2007. www.theheart.org/article/781747.do (February 27, 2008).

Paula Ford-Martin
Clare Hanrahan

Hay fever

Definition

Hay **fever**, which is also called allergic **rhinitis**, is a common allergic condition. A main feature of the condition is an inflammation of the nasal passages, or rhinitis, caused by an allergic reaction to pollen. Hay fever usually occurs when airborne plant pollens are at their highest levels in the spring, summer, and early fall.

Symptoms of hay fever

Symptoms

Sneezing

Runny nose

Watery eyes

Postnasal drip

Sore throat and roof of mouth

Head congestion

Ear pressure

Sleep disturbances

Nasal discharge

Swollen, blue-colored skin under the eyes (allergic shiners)

Fatigue

Irritability

(Illustration by Corey Light. Cengage Learning, Gale)

Description

Hay fever is one of the most common chronic diseases in the United States. Experts estimate that about 35 million people in the United States are affected. Hay fever can develop at any age, but it shows up most often in childhood through the early 20s. The term "hay fever" is not quite accurate, since the pollen of hay grasses is only one of the many possible allergens involved, and there is no fever. Although an allergy to pollen does not appear to be inherited, the tendency to allergic sensitivity in general may run in families.

Causes and symptoms

Of all the causes of **allergies**, pollen is one of the most widespread. Trees, weeds, and grasses produce pollen in large amounts for seed production. These pollens are dispersed by the wind, and many never

reach the intended targets. Instead, they are inhaled through the nose and throat of animals, including humans. Different plants release their pollen at different times of the year, so the timing of hay fever symptoms varies from person to person, depending on which plants provoke a response.

For people with hay fever, inhaled pollen grains are identified by the body as foreign invaders. This reaction is probably due to a dysfunction in the immune system. The mast cells of the immune system act as storage containers for highly reactive chemical granules, including histamine. Allergens trigger a release of these granules, and the mast cells spill their chemicals into neighboring blood vessels and nerve cells. Histamine dilates the blood vessels, causing fluids to escape into surrounding tissues. This change results in swelling, pooling of fluid in the tissues, and redness of the nose and eyes. Histamine also stimulates **pain** receptors and causes the itchiness and discomfort of the nose, eyes, and throat that are common hay fever symptoms.

Inflammation of the nose, or rhinitis, is the major symptom of hay fever. Inflammation causes **itching**, **sneezing**, runny nose, redness, and tenderness. Swelling of the sinuses can constrict the Eustachian tube that connects the inner ear to the throat, causing a feeling of congestion and popping in the ears. Mucus from the sinuses may run down the back of the throat, leading to throat irritation and redness. Seasonal **fatigue** and sinus headaches may also be indications of hay fever, as well as respiratory congestion and a decreased sense of smell. Severe allergies can lead to dark circles under the eyes, puffy eyelids, and creases under the eyes. Characteristically, children with hay fever may push their noses upward with the palm of their hand or twitch their noses to clear the congestion.

Virtually any type of tree or grass may cause hay fever, although plants with showy flowers usually produce sticky pollen that is much less likely to become airborne. Among North American plants, weeds are the most prolific producers of allergenic pollen. Ragweed is the major culprit, but other plant pollens that routinely affect hay fever sufferers include sagebrush, lamb's quarter, Russian thistle, and English **plantain**. Grasses include timothy grass, Kentucky bluegrass, Johnson grass, Bermuda grass, redtop grass, orchard grass, and sweet vernal grass. Trees that produce allergenic pollen include **oak**, ash, elm, hickory, pecan, box **elder**, and mountain cedar.

Diagnosis

The diagnosis of hay fever is usually simple. A thorough history of the illness is important in diagnosing allergies, including whether the symptoms vary according to time of day or the season, and possible exposures. When symptoms always appear during a particular season and disappear with the onset of cold weather, hay fever is almost certainly the culprit. For a more definitive diagnosis, a skin prick test is used, in which a diluted extract of the suspected allergen is injected superficially or scratched into the skin and the reaction is observed. Another test is a provocative challenge, which is performed by putting an extract of the suspected allergen onto the conjunctiva of the eye or in the nose or lungs. When such direct skin testing is not possible, various methods of testing the blood may be used. Other conditions causing rhinitis, such as infection, may have to be ruled out by a nasal smear, in which a sample of mucus is taken on a swab for examination.

Treatment

Alternative treatments for hay fever often focus on modulation of the body's immune response. They frequently focus on diet and lifestyle adjustments. A healthy diet high in fiber and whole foods, including generous amounts of vegetables, grains, nuts, and raw seeds should be maintained. Plenty of fluids should be consumed. Six to eight glasses of water daily are recommended, along with plenty of herbal teas. Raw vegetable juices are also beneficial, particularly carrot, celery, beet, cucumber, spinach, and **parsley**. Meat, dairy, and foods high in saturated fats may aggravate a hay fever condition and should be limited in the diet. It is also best to avoid dairy products, wheat, eggs, citrus fruits, chocolate, peanuts, shellfish, food colorings, and preservatives, especially sulfites. These foods all contain common food allergens that may worsen hay fever symptoms. **Caffeine**, alcohol, tobacco, and sugar should be avoided, as well.

Beneficial supplements for treating hay fever include vitamins A, E, and B complex. **Vitamin C**, especially the buffered type, is a natural antihistamine. In substantial amounts it can help stabilize the mucous membrane response to allergens. **Bioflavonoids** prevent the release of histamine and can be taken in combination with vitamin C. **Essential fatty acids**, contained in **evening primrose oil**, **fish oil**, or **flaxseed** oil, are also recommended as a daily supplement. **Glutathione** peroxidase is an enzyme that blocks a key inflammatory reaction in the hay fever cycle. It can play a key role in neutralizing the allergic reactions of hay fever. **Selenium** is a trace mineral that may help stop the inflammation due to allergens and reduce other allergy symptoms.

For symptomatic relief, nettles (*Urtica dioica*) have been reported to have the ability to clear the sinuses and to greatly reduce other symptoms. Tincture of **licorice** (*Glycerrhiza glabra*) is also recommended. A good tincture combination for hay fever is comprised of equal parts of **black cohosh** (*Cimicifuga racemosa*), Chinese **skullcap** (*Scutellaria baicalensis*), **pleurisy** root, or butterflyweed (*Asclepias tuberosa*), **catnip** (*Nepeta cataria*), and **cayenne** pepper (*Capsicum frutescens*). In western herbal remedies other herbs found to be effective include **ginger** root (*Zingiber officinale*), **eyebright** (*Euphrasia officinalis*), **goldenseal** (*Hydrastis canadensis*), horseradish (*Amoracia rusticana*), and **mullein** (*Verbascum thapsus*). **Bee pollen** may also be effective in alleviating or eliminating hay fever symptoms. Bee pollen should be taken a few months before the hay fever season starts. It desensitizes the body and can dramatically reduce hay fever symptoms.

Acute attacks of hay fever often respond to homeopathic remedies. Possible hay fever remedies include **Allium cepa**, **Arsenicum album**, **euphrasia**, Ferrum phosphoricum, **gelsemium**, Natrum muriaticum, Nux vomica, sabadilla, and wyethia, depending on the associated symptoms. Since hay fever is often associated with deep-seated health problems, it is often best addressed with a constitutional remedy and the guidance of an experienced homeopathic practitioner.

Indoor allergens can cause increased sensitivity to outdoor allergens. Therefore, allergy testing for allergens other than pollen should be conducted, and those allergens should be removed from the diet or the environment to the greatest extent possible.

Allopathic treatment

The goal of most medical approaches to hay fever treatment is reduction of symptoms. Avoidance of the allergens is best, but this step is often not possible. When it is not possible, drug therapy is the major form of medical treatment used. Care should be taken, however, since a wide variety of antihistamines are available, and they all have potential side effects that affect function. These side effects may include drowsiness, heart problems, and harmful interactions with other medications and medical conditions. The extended use of topical decongestants can cause rebound congestion that is worse than the original problem.

Antihistamines block the action of histamine. They are most effective when used preventively, before symptoms appear. Over-the-counter antihistamines are often sufficient to provide relief for hay fever symptoms. People with severe or frequent symptoms, however, may need stronger prescription antihistamines. Azelastine, an antihistamine nasal spray, is effective and causes fewer side effects than oral antihistamines. When antihistamines do not relieve nasal symptoms, a nasal spray of cromolyn **sodium** is sometimes used. It works by preventing the release of histamine and similar chemicals.

Decongestants constrict blood vessels and counteract the effects of histamine. They may also be helpful in reducing symptoms such as nasal congestion. Nasal sprays are available that can be applied directly inside the nose. Oral decongestants are available as well. Phenylpropanolamine, phenylephrine, or pseudoephedrine are available in many preparations combined with antihistamines to increase the effectiveness of the drugs. Some components of nasal sprays traditionally used to combat the symptoms of hay fever are, however, no longer available as of 2008 without a prescription because of their potential use in the illegal manufacture of methamphetamine and related drugs. Decongestants are stimulants and may cause increased heart rate and blood pressure, headaches, and agitation.

Corticosteroids may be prescribed to reduce severe symptoms. An intranasal corticosteroid spray can be quite useful in reducing inflammation of the mucous membranes. Severe symptoms that do not respond to other treatment may require a course of oral corticosteroids, which are best started before allergy season begins. They are especially effective because they work more slowly and last longer than most other types of medication.

Late in 2001, researchers reported the first of many new drugs that may change treatment of hay fever and **asthma**: omalizumab. A monoclonal antibody, omalizumab works by blocking immunoglobulin E (IgE), an antibody produced in excess in people suffering from hay fever. The U.S. Food and Drug Administration approved the use of omalizumab for the treatment of mild to severe asthma and related disorders in June 2003.

Expected results

Some individuals are able to outgrow hay fever if their immune systems become less sensitive to the pollen that causes their problem. However, while hay fever may improve over time, it may also get worse or even lead to the development of new allergies. Hay fever treatment may sometimes cause uncomfortable and even dangerous side effects. However, most people can achieve acceptable hay fever relief with a combination of preventive strategies and treatment.

KEY TERMS

Allergen—A substance that provokes an allergic response.

Anaphylaxis—A possibly life-threatening allergic reaction causing increased sensitivity to an allergen. It can result in a sharp drop in blood pressure and difficulty breathing.

Antigen—A foreign protein to which the body reacts by making antibodies.

Granules—Small packets of reactive chemicals stored within cells.

Histamine—A chemical released by mast cells that activates pain receptors and causes cells to become leaky.

Mast cells—A type of immune system cell that is found in the lining of the nasal passages and eyelids, displays a type of antibody called immunoglobulin type E (IgE) on its cell surface, and participates in the allergic response by releasing histamine from intracellular granules.

Pollen count—The amount of pollen in the air; often broadcast on the daily news during allergy season. It tends to be lower after a heavy rain that washes the pollen out of the air and higher on warm, dry, windy days.

Prevention

As of the late 2000s there was no known way to prevent development of hay fever, but subsequent attacks may be reduced or prevented. Immunotherapy, also known as desensitization or allergy shots, involves injections of very small but gradually increasing amounts of an allergen over several weeks or months, with periodic boosters. This procedure serves to acclimatize, or familiarize, the body to encountering the allergen without having a major allergic response. Individuals receiving allergy shots are monitored closely following each shot because of the small risk of anaphylaxis. Full benefits of the shots may take up to several years to achieve, and even then about one person in five does not receive any benefit from the immunotherapy.

Reducing exposure to pollen may reduce symptoms of hay fever. Most trees produce pollen in the spring, while most grasses and flowers produce pollen during the summer, and ragweed and other late-blooming plants produce pollen during late summer and early autumn. People with hay fever should be aware of their particular pollen season and remain indoors whenever possible during that time. A pollen count can be used as a general guide for when it is most advisable to stay indoors to avoid contact with the pollen. Unfortunately, moving to a region with consistently low pollen counts is rarely effective, since new allergies to the local flora often develop.

Further strategies to prevent or reduce hay fever attacks include the following:

- Remain indoors with windows closed during the morning hours, when pollen levels are highest.
- Keep car windows rolled up while traveling by car.
- Wear a surgical facemask while outside.
- Forests and fields of grasses should be avoided, especially at the height of the pollen season.
- Wash clothes and hair after being outside.
- Air conditioners or air filters should be used in the home, and their filters should be changed regularly.

Resources

BOOKS

Ring, Johannes. *Allergy in Practice*. New York: Springer, 2005.

PERIODICALS

Aamodt, Anne H., et al. "Is Headache Related to Asthma, Hay Fever, and Chronic Bronchitis? The Head HUNT Study." *Headache: The Journal of Head and Face Pain* (February 2007): 204 212.

Kolhammer, Y., et al. "Influence of Physical Inactivity on the Prevalence of Hay Fever." *Allergy* (November 2006): 1310 1315.

Merrill, Ray M., Ryan T. Isakson, and Robert E. Beck. "The Association between Allergies and Cancer: What Is Currently Known?" *Annals of Allergy, Asthma, and Immunology* (August 2007): 102 117.

OTHER

"Hay Fever." American Lung Association. http://www.lungusa.org/site/pp.asp?c dvLUK9O0E&b 35050. (February 10, 2008).

"Hay Fever." eMedicineHealth. http://www.emedicinehealth.com/hay_fever/article_em.htm. (February 10, 2008).

"Hay Fever." MayoClinic.com. http://www.mayoclinic.com/health/hay fever/DS00174. (February 10, 2008).

Patience Paradox
Teresa Odle
David Edward Newton, Ed.D.

He shou wu *see* **Fo ti**

Head lice *see* **Lice infestation**

Headache

Description

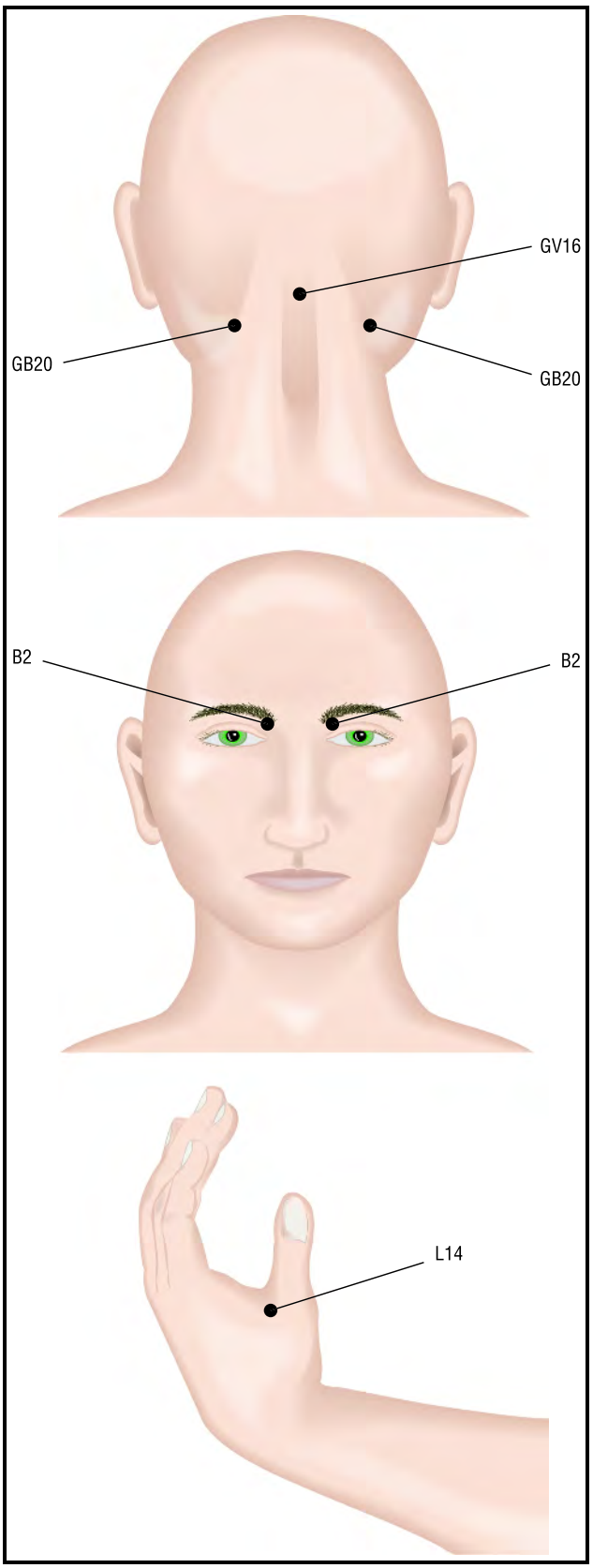
Headaches are divided into two large categories, primary and secondary, according to guidelines established by the International Headache Society (IHS). Primary headaches—accounting for more than 90% of all headaches— are not caused by an underlying medical condition. There are three major types of primary headaches: migraine, cluster, and tension. Secondary headaches are caused by another disease or medical condition and account for fewer than 10% of headaches.

Rebound headaches, also known as analgesic abuse headaches, are a subtype of primary headache caused by overuse of headache drugs. They may be associated with medications taken for tension or migraine headaches.

Secondary headaches are classified as either traction or inflammatory headaches. Traction headaches result from the pulling, pushing, or stretching of pain-sensitive structures, such as a brain tumor pressing upon the outer layer of tissue that covers the brain. Inflammatory headaches are caused by infectious diseases of the ears, teeth, sinuses, or other parts of the head.

Headaches are very common in the North American adult population. The American Council for Headache Education (ACHE) estimates that 95% of women and 90% of men in the United States and Canada have had at least one headache in the past 12 months. Most of these are tension headaches. Migraine headaches are less common, affecting about 11% of the population in the United States and 15% in Canada. Several studies indicate that doctors tend to underdiagnose migraine headaches; thus the true number of patients with migraines may be considerably higher than the reported statistics. Cluster headaches are the least common type of primary headaches, affecting about 0.4% of adult males in the United States and 0.08% of adult females. Cluster headaches occur most commonly in adults between the ages of 20 and 40. An estimated 45 million Americans suffer from chronic headaches each year. About 25% of adolescents aged 16–18 in the United States experience either severe or migraine headaches, according to the American Academy of Neurology. In the United States, 10 million doctor visits a year are for headaches.

It is possible for patients to suffer from more than one type of headache. For example, patients with chronic tension headaches often have migraine headaches as well.



Acupressure points that help relieve headaches. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

Headache therapies

	Description	Type
Acupressure	Press pointer fingers beneath cheekbones and parallel to pupils (Stomach 3) for one minute. Squeeze fleshy area between thumb and pointer finger (Large Intestine 4) for one minute.	Sinus
Acupuncture	Practitioners treat using very thin needles.	Tension
Aromatherapy	Message mixture of lavender oil and sunflower oil in temples, sides of eyes, behind ears, and on the neck. Do same using eucalyptus.	Migraine, tension, and sinus
Chiropractic	Spinal or cervical manipulation to realign posture.	Tension
Diet and exercise	Avoid chocolate, cheeses, citrus, red wine, and foods containing sodium nitrates or MSG. Exercise regularly	Migraine
Herbal remedies	Feverfew, hawthorn, skullcap, ginger, goldenseal, valerian, passionflower, and cayenne.	Migraine and tension
Homeopathy	Belladonna, bryonia, kali bichromicum, and nux vomica	Sinus and tension
Home remedies	Simultaneous ice pack/warm foot soak; drink three cold glasses of water; inhale pure oxygen.	Migraine and cluster
Massage	Scalp massage	All
Mind/body	Mediation and relaxation and biofeedback	Migraine
Osteopathy	Neuromuscular manipulatin and massage of head, neck, and shoulders.	All

(Illustration by Corey Light. Cengage Learning, Gale)

Causes and symptoms

Causes

A person feels headache **pain** when specialized nerve endings, known as nociceptors, are stimulated by pressure on or injury to any of the pain-sensitive structures of the head. Most nociceptors in humans are located in the skin or on the walls of blood vessels and internal organs. The bones of the skull and the brain itself do not contain these specialized pain receptors. The parts of the head that are sensitive to pain include the skin that covers the skull and upper spine; the fifth, ninth, and tenth cranial nerves, and the nerves that supply the upper part of the neck; and the large arteries located at the base of the brain, as well as those that supply the membranes covering the brain and spinal cord.

Tension headaches typically result from tightening of the face, neck, and scalp muscles as a result of emotional **stress**; physical postures that cause the head and neck muscles to tense (e.g., holding a phone against the ear with one's shoulder); emotional **depression** or **anxiety**; temporomandibular joint (TMJ) dysfunction; or arthritis of the neck. The tense muscles put pressure on the walls of the blood vessels that supply the neck and head, which stimulates the nociceptors in the tissues that line the blood vessels.

The causes of migraine headaches have been debated since the 1940s. Some researchers think that migraines are the end result of a **magnesium** deficiency in the brain or of hypersensitivity to a neurotransmitter (brain chemical) known as dopamine. Another theory is that certain nerve cells in the brain become unusually excitable, setting off a chain reaction that leads to changes in the amount of blood flowing through the blood vessels and stimulation of their nociceptors. Specific genes associated with migraines have been discovered. This finding suggested that genetic mutations may be responsible for the abnormal excitability of the nerve cells in the brains of patients with migraine headaches.

Little is known about the causes of cluster headaches or changes in the central nervous system that produce them. Patients with cluster headaches are advised to quit **smoking** and minimize their use of alcohol because nicotine and alcohol appear to trigger these headaches. The precise connection between these chemicals and cluster attacks was as of 2008 not completely understood.

Symptoms

Tension headaches are less severe than other types of primary headache. They rarely last more than a few hours; 82% resolve in less than a day. Patients usually describe the pain of a tension headache as mild to moderate. Doctor do not find anything abnormal in the course of a general physical examination, although they may detect sore or tense areas (trigger points) in the muscles of the patient's forehead, neck, or upper shoulder area.

Migraine headaches are characterized by throbbing or pulsating pain of moderate or severe intensity lasting from four hours to as long as three days. The pain is typically felt on one side of the head; in fact, the English word "migraine" is a combination of two Greek words that mean "half" and "head." Migraine headaches worsen with physical activity and are often accompanied by **nausea** and **vomiting**. Patients with migraine headaches are hypersensitive to lights, sounds, and odors.

Cluster headaches are recurrent brief attacks of sudden and severe pain on one side of the head. The pain is usually most intense in the area around the eye. Cluster headaches may last between five minutes and three hours and may occur once every other day or as often as eight times per day. Some patients describe it as severe enough to make them consider suicide. Patients may pace the floor, weep, rock back and forth, or bang their heads against a wall in desperate attempts to stop the pain. In addition to severe pain, patients often have a runny or congested nose, watery or inflamed eyes, drooping eyelids, swelling in the area of the eyebrows, and heavy facial perspiration. Because of the nasal symptoms and the relative rarity of cluster headaches, they are sometimes misdiagnosed as sinusitis.

Diagnosis

Patient history

The differential diagnosis of headaches begins with a careful patient history that includes information about head injuries or surgery on the head; eye problems or disorders; sinus **infections**; dental problems or extensive oral surgery; and medications that the patient takes regularly. Some primary care physicians give the patient a printed questionnaire that consists of 50–55 brief questions covering such matters as the timing and frequency of the headaches, family history of the same type of headache, signs of depression, and correlation between headaches and weather changes. The doctor may also ask the patient to keep a headache diary to help identify foods, stress, lack of sleep, weather, and other factors that may trigger the pain.

Physical examination

A physical examination helps the doctor identify signs and symptoms that may be relevant to the diagnosis such as **fever**, difficulty breathing, nausea or vomiting, stiff neck, changes in vision or hearing, watering or inflammation of the nose and eyes, evidence of head trauma, skin **rashes** or other indications of an infectious disease, and abnormalities in the structure or alignment of the spinal column, teeth or jaw. In some cases, the doctor may refer the patient to a dentist or oral surgeon for a more detailed evaluation of the mouth and jaw.

Special tests and imaging studies

Laboratory tests are useful in identifying headaches caused by infections, **anemia**, or thyroid disease. These tests include a complete blood count (CBC), erythrocyte sedimentation rate (ESR), and blood serum chemistry profile. Patients who report visual disturbances and other neurologic symptoms may be given visual field tests and screened for **glaucoma** (a condition involving high fluid pressure inside the eye). Imaging studies may include x rays of the sinuses to check for infections, and CT or MRI scans, which can rule out brain tumors and cerebral aneurysms. Patients whose symptoms cannot be fully explained by the results of physical examinations and tests may

be referred to a psychiatrist for evaluation of psychological factors related to their headaches.

Warning symptoms

There are warning signs associated with headache that indicate the need for prompt medical attention. Patients with any of the following symptoms should see a physician immediately:

- Three or more headaches per week
- Need for a headache pain reliever every day or almost every day
- Need for greater than recommended doses of over-the-counter (OTC) headache medications
- Headache accompanied by one-sided weakness, numbness, visual loss, speech difficulty, or other signs
- Headache that becomes worse over a period of six months, especially if most prominent in the morning or if accompanied by neurological symptoms
- Sudden onset of headache accompanied by fever and stiff neck
- Change in the character of the headaches—for example, persistent severe headaches in a person who has previously had only mild headaches of brief duration
- Recurrent headaches in a child
- Recurrent severe headaches beginning after age 50

Treatment

Alternative remedies can lessen the frequency and severity of headaches. Common treatments include:

- Acupressure. The stomach 3 and large intestine 4 points relieve sinus headaches.
- Acupuncture. A National Institutes of Health (NIH) panel concluded that acupuncture may be a useful treatment for headache.
- Aerobic exercise. Regular aerobic exercise reduces the frequency and intensity of headaches.
- Aromatherapy. Massage using the essential oils of lavender, rosemary, or peppermint relieves headache.
- Autogenic therapy. Headache may be relieved by learning to put oneself in a semi-hypnotic state.
- Biofeedback. Several types of biofeedback help relieve headaches, including electromyography (EMG) therapy, thermal hand-warming, and neurofeedback (EEG).
- Chiropractic. Cervical manipulation may relieve tension headaches.
- General exercise. Moderate exercise, such as a brisk daily walk for 20–30 minutes, can help fight migraines since it lowers stress, brings more oxygen to the body and brain, and relaxes tense muscles. Neck exercises are good for relieving tension headaches.
- Heat and/or cold. A hot shower or bath can ease tension headaches. Vascular headache may be relieved by placing an ice pack on the forehead or the feet in hot water and a cold pack on the forehead (hydrotherapy treatment).
- Herbals. Feverfew (*Chrysanthemum parthenium*) can be used for migraine; goldenseal (*Hydrastis canadensis*) for sinus headache; valerian (*Valeriana officinalis*), skullcap (*Scutellaria lateriflora*), or passionflower (*Passiflora incarnata*) for tension headache; and cayenne (in nostrils) for cluster headache. A German remedy made from butterbur root (*Petasites hybridus*) is available in the United States under the brand name Petadolex. The herb, Brahmi (*Bacopa monnieri*) is used in Ayurvedic medicine to treat headaches related to anxiety.
- Holistic medicine. Headaches may be caused by constipation and liver malfunction. Apple-spinach juice relieves constipation, and a blend of carrot, beet, celery, and parsley juices treats the liver.
- Homeopathy. Remedies are chosen for each patient and may include Belladonna (throbbing headache), Bryonia (splitting headache), Kali bichromicum (sinus headache), feverfew and butterbur (migraine headaches),and Nux vomica (tension headache with nausea and vomiting).
- Massage. Firm massage of the forehead, neck, and scalp may relieve headache. Tension headaches respond particularly well to massage.
- Osteopathy. Headache is treated with neuromuscular manipulation and massage of the head, neck, and upper back.
- Pressure. A headband tied tightly around the head may relieve migraines in some patients.
- Reflexology. Headache is treated using the solar plexus, ear, eye, and head points.
- Relaxation techniques. Meditation has been shown to help headache sufferers.
- Supplements. Vitamins B_2 and B_{12}, niacin, and magnesium (a mineral) may help treat or prevent headache.
- Transcutaneous electrical nerve stimulation (TENS). This effective headache treatment electrically stimulates nerves and blocks pain transmission.
- Visualization. This relaxation technique controls the images in the mind, replacing negative thoughts and images with positive ones that enhance relaxation.
- Yoga. Yoga is particularly good for tension headaches, since it quiets the nervous system and reduces stress.

Allopathic treatment

Medical

Tension headaches are usually relieved fairly rapidly by such over-the-counter analgesics as aspirin (300–600 mg every four hours), acetaminophen (650 mg every four hours), or other nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (brands include Advil or Motrin) or naproxen (brands such as Naprosyn or Aleve). For patients with chronic tension headaches, the doctor may prescribe a tricyclic antidepressant or benzodiazepine tranquilizer in addition to a pain reliever. One treatment for chronic tension headaches botulinum toxin (Botox type A) appears to work quite well for some patients.

Nonsteroidal anti-inflammatory drugs, including acetaminophen (e.g. Tylenol), ibuprofen, and naproxen are helpful for early or mild migraines. More severe attacks may be treated with dihydroergotamine, a group of drugs known as triptans, beta-blockers and **calcium** channel-blockers, antiseizure drugs, antidepressants (SSRIs), meperidine (Demerol), or metoclopramide (Reglan). Some of these medications are also available as nasal sprays, intramuscular injections, or rectal suppositories for patients with severe vomiting.

Sumatriptan (known as the brand Imitrex) or indomethacin (Indameth or Indocin) may be prescribed to suppress a cluster headache.

Surgical

Headaches that are caused by brain tumors, head trauma, dental problems, or disorders affecting the spinal discs usually require surgical treatment. In addition, some plastic surgeons have reported success in treating chronic migraine patients by removing some muscle tissue near the eyebrows, cutting a branch of the trigeminal nerve, and repositioning the soft tissue around the temples (sides of the head).

Psychotherapy

Psychotherapy may be helpful to patients with chronic headaches by interrupting the feedback loop between emotional upset and the physical symptoms of headaches.

Expected results

The prognosis for primary headaches varies. Episodic tension headaches usually resolve completely in less than a day without affecting the patient's overall health. The long-term outlook for patients with migraines depends on whether they have one or more of the other disorders associated with migraine. These disorders include Tourette's syndrome, **epilepsy**, ischemic **stroke**, hereditary essential **tremor**, depression, and anxiety. For example, migraine with aura increases a person's risk of ischemic stroke (when an artery to the brain is blocked) by a factor of six.

The prognosis for secondary headaches depends on the seriousness and severity of the cause.

KEY TERMS

Analgesics—A class of pain-relieving medicines, including aspirin and acetaminophen.

Biofeedback—A technique in which a person is taught to consciously control the body's response to a stimulus.

Cephalalgia—The medical term for headache.

Chronic—A condition that occurs frequently or continuously.

Neurotransmitter—Any of a group of chemicals that transmit nerve impulses across the gap (synapse) between two nerve cells.

Nociceptor—A specialized type of nerve cell that senses pain.

Primary headache—A headache that is not caused by another disease or medical condition.

Prophylactic—Treatment that prevents a disorder's symptoms from occurring.

Secondary headache—A headache that is caused by another disease or disorder.

Transcutaneous electrical nerve stimulation (TENS)—A treatment in which a mild electrical current is passed through electrodes on the skin to stimulate nerves and block pain signals.

Prevention

Lifestyle modification is one measure that people can take to lower their risk of tension headaches. They should get enough sleep and eat nutritious meals at regular times. Skipping meals, using unbalanced fad **diets** to lose weight, and insufficient or poor-quality sleep can bring on tension headaches.

Some headaches may be prevented by avoiding substances and situations that trigger them or by employing alternative therapies, such as **yoga** and regular **exercise**. Proper lighting may prevent headaches caused by eyestrain. Because food **allergies** are often linked with headaches, especially cluster strain headaches and migraines, identification and elimination of

the allergy-causing food(s) from the diet can be an important preventive measure. Women with migraines often benefit by switching from oral contraceptives to another method of birth control or by discontinuing estrogen replacement therapy. Prophylactic treatments for migraine include prednisone, calcium channel blockers such as amlodipine (Norvasc), diltiazem (Cardizem), and nifedipine (Adalat, Procardia), and synthetic ergot alkaloids such as methysergide (Sansert).

Resources

BOOKS

Hoffman, Ronald, and Barry Fox. *Alternative Cures That Really Work: They've Passed Scientific Scrutiny Now Discover What These Proven Remedies Can Do for You*. Emmaus, PA: Rodale Books, 2007.

Houlding, Claire. *Managing Migraines: Dealing with Migraines from All Perspectives Something to Help Each Sufferer*. Bloomington, IN: AuthorHouse, 2007.

Kandel, Joseph, and David Sudderth. *The Headache Cure*. New York: McGraw Hill, 2005.

PERIODICALS

Benjamin, Patricia J. "Loosening the Grip: How Massage Can Soothe Chronic Tension Headaches." *Massage Therapy Journal* (Summer 2006): 50(10).

Mahoney, Diana. "High Prevalence of Headaches in Teens." *Family Practice News* (June 15, 2007): 46.

Mauskop, Alexander. "Headache Alternatives: Drug Free Therapies for Preventing, Reducing, and Ending the Pain of Migraines and Other Headaches." *Townsend Letter: The Examiner of Alternative Medicine* (Novem ber 2007): 83(3).

Schweitzer, Sophia V. "Headache Brakes: We Look at Four of the Most Common Causes of Summer Headaches And How to Stop Them." *Natural Health* (June 2007): 90.

Sierpina, Victor, et al. "Mind Body Therapies for Head ache." *American Family Physician* (November 15, 2007): 1518 1522.

Tracey, Pepper. "Headache Help: Yoga Can Quiet Your Nervous System and Ease Pain in Your Head."*Natural Health* (October 2007): 63(3).

ORGANIZATIONS

American Headache Society, 19 Mantua Road, Mount Royal, NJ, 08061, (856) 423 0043, http://www.american headachesociety.org.

National Center for Complementary and Alternative Med icine, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://www.nccam.nih.gov.

National Headache Foundation, 820 N, Orleans, Suite 211, Chicago, IL, 60610, (888) 653 5552, http://www. headaches.org.

World Headache Alliance, 41 Wellbeck St., London, W1G 8EA, United Kingdom, http://www.w h a.org.

Rebecca Frey
Ken R. Wells

Hearing loss

Definition

Hearing loss is any degree of impairment of the ability to apprehend sound.

Description

Sound can be measured accurately. The term decibel (dB) is a measure of loudness and refers to a unit for expressing the relative intensity of sound on a scale from zero, for a nearly imperceptible sound, to 130, which is the level at which sound causes **pain** in the average person. A drop of more than 10 dB in the level of sound a person can hear is significant.

Sound travels as waves through a medium like air or water. These waves are collected by the external ear and cause the tympanic membrane (eardrum) to vibrate. The chain of ossicles (tiny bones) connected to the eardrum—the incus, malleus, and stapes—carries the vibration to the oval window (an opening to the inner ear), increasing its amplitude 20 times on the way. There, the energy causes a standing wave in the watery liquid (endolymph) inside the organ of Corti. (A standing wave is one that does not move.) The frequency of the sound determines the configuration of the standing wave. Many thousands of tiny nerve fibers detect the highs and lows of the standing wave and transmit their findings to the brain, which interprets the signals as sound.

To summarize, sound energy passes through the air of the external ear, the bones of the middle ear, and the liquid of the inner ear. It is then translated into nerve impulses, sent to the brain through nerves, and understood there as sound. It follows that there are five steps in the hearing process:

- air conduction through the external ear to the eardrum
- bone conduction through the middle ear to the inner ear
- water conduction to the organ of Corti
- nerve conduction into the brain
- interpretation by the brain

Hearing can be interrupted in a variety of ways at each of the five steps.

The external ear canal can be blocked with ear wax, foreign objects, infection, and tumors. Overgrowth of the bone can also narrow the passageway, making blockage and infection more likely. This condition can occur when the ear canal has been flushed with cold water repeatedly for years, as is the case with surfers, for whom the condition called "surfer's ear" is named.

Decibel ratings and hazardous levels of noise

Decibel Level	Example of Sounds
30	Soft whisper, quiet library
35	Noise may prevent the listener from falling asleep
40	Quiet office noise level
50	Quiet conversation, moderate rainfall
60	Average television volume, sewing machine, lively conversation
70	Busy traffic, noisy restaurant, vacuum cleaner
80	Heavy city traffic, factory noise, alarm clock
90	Cocktail party, lawn mower, shop tools, subway
100	Pneumatic drill, snowmobile, chain saw
120	Sandblasting, thunder, amplified rock music
140	Jet airplane, firearms, air raid siren
180	Rocket launching pad

Above 110 decibels, hearing may become painful

Above 120 decibels is considered deafening

Above 135 decibels, hearing will become extremely painful and hearing loss may result if exposure is prolonged

Above 180 decibels, hearing loss is almost certain with any exposure

(Illustration by Corey Light. Cengage Learning, Gale)

The eardrum is so thin a physician can see through it into the middle ear. It can be ruptured by sharp objects, pressure from an infection in the middle ear, or even a firm cuffing or slapping of the ear. The eardrum is also susceptible to pressure changes during scuba diving.

Several conditions can diminish the mobility of the small bones (ossicles) in the middle ear. Otitis media, an infection in the middle ear, occurs when fluid cannot escape into the throat because the eustachian tube is blocked. The fluid (pus or mucus) that accumulates prevents the ossicles from moving as efficiently as they normally do, thus dampening the sound waves. In a disease called otosclerosis, spongy tissue grows around the bones of the inner ear. This growth sometimes binds the stapes in the oval window, which interferes with its normal vibration and causes deafness. All the conditions mentioned so far–those that occur in the external and middle ear–are causes of what is known as *conductive* hearing loss.

The second category, sensory hearing loss, refers to damage to the organ of Corti and the acoustic nerve. Prolonged exposure to loud noise is the leading cause of sensory hearing loss. A million people have this condition, many identified during the military draft and rejected as being unfit for duty. The cause is often believed to be prolonged exposure to loud music. Occupational noise exposure is the other leading cause of noise-induced hearing loss (NIHL) and is ample reason for wearing ear protection on the job.

More unusual, but often undetected, is low-frequency hearing loss. Scientists discovered in 2001

KEY TERMS

Cochlea—A snail-shaped structure inside the inner ear, which contains the organ of Corti as well as fluid-filled compartments through which sound waves travel.

Decibel—A unit of the intensity of sound, a measure of loudness.

Meniere's disease—The combination of vertigo and decreased hearing caused by abnormalities in the inner ear.

Organ of Corti—A spiral structure inside the cochlea that converts vibration to signals that are passed to the brain.

Ossicles—A group of tiny bones in the middle ear that conduct sound through vibration. The bones are the malleus (or anvil), incus (or hammer), and stapes (or stirrup).

Otosclerosis—A disease that scars and limits the motion of the small conducting bones in the middle ear.

that people with a particular gene mutation gradually lose their abilities to hear low-frequency sounds. Since those people with this type of hearing loss can still distinguish speech, they often remain unaware of the low-frequency changes in their hearing. The scientists believe that the same gene mutations might make some people more susceptible to high-frequency hearing loss, but further study is needed.

One-third of people older than 65 have presbycusis, which is sensory hearing loss due to **aging**. Both NIHL and presbycusis are primarily loss of the ability to hear high-frequency sounds. In speech, consonants generally have a higher frequency than vowels. Yet in most languages, consonants provide us the clues needed for determining what a person is saying. So these people hear plenty of noise, they just cannot easily make out what it means. They have particular trouble differentiating speech from background noise.

Brain **infections** such as **meningitis**, drugs such as the aminoglycoside antibiotics (streptomycin, gentamycin, kanamycin, tobramycin), and Meniere's disease can also cause permanent sensory hearing loss. Meniere's disease combines attacks of hearing loss with attacks of vertigo. The symptoms may occur together or separately. High doses of salicylates such as aspirin and quinine can cause a temporary high-frequency loss, and prolonged high doses can lead to permanent deafness. There is also a hereditary form of sensory deafness and a congenital form most often caused by **rubella** (German **measles**).

Sudden hearing loss of at least 30 dB in less than three days is most commonly caused by cochleitis, a mysterious viral infection.

The final category of hearing loss is *neural* hearing loss. Permanent neural hearing loss most often results from damage to the acoustic nerve and the parts of the brain that control hearing. Strokes, **multiple sclerosis**, and acoustic neuromas are all possible causes of neural hearing loss.

Hearing can also be diminished by **tinnitus**, which is characterized by extra sounds generated by the ear. These sounds are referred to as tinnitus, and can be ringing, blowing, clicking, or anything else that no one but the patient hears. Tinnitus may be caused by loud noises, medication, **allergies**, or medical conditions—from the same kinds of disorders that can cause diminished hearing.

Diagnosis

Many common causes of hearing loss can be detected through an examination of the ears and nose combined with simple hearing tests performed in the physician's office. An audiogram (a test of hearing at a range of sound frequencies) often concludes the evaluation. These simple tests often produce a diagnosis. If the defect is in the brain or the acoustic nerve, further neurological testing and imaging will be required.

The audiogram has many uses in diagnosing hearing deficits. The pattern of hearing loss across the audible frequencies gives clues to the cause. Several alterations in the testing procedure can give additional information. For example, speech is perceived differently than pure tones. Adequate perception of sound combined with inability to recognize words points to a brain problem rather than a sensory or conductive deficit. Loudness perception is distorted by disease in certain areas but not in others. Acoustic neuromas often distort the perception of loudness.

Treatment

Conductive hearing loss can be treated with alternative therapies that are specific to the particular condition.

Nutritional therapy

The following dietary changes may help improve certain hearing impairment conditions:

- Alleviate accumulated wax in the ear by taking oral supplements with essential fatty acids such as flax oil and omega-3 oil.
- Identify and avoid potential allergenic foods. Children who are allergic to foods have an increased risk of getting chronic ear infections.
- Take nutritional supplements. B-complex vitamins and iron supplements may be helpful in preventing protein deficiency and anemia. These conditions depress immune function and increase the risk of chronic ear infections. Children suffering from frequent ear infections may need supplementation with strong antioxidants such as vitamins A and C, zinc, and bioflavonoids. High-potency multivitamin and mineral supplements should contain most of these helpful nutrients as well as other essential vitamins and minerals.

Herbal therapy

There are several effective herbal treatments for hearing impairments. They include:

- Ginkgo biloba. Ginkgo may be effective in patients with hearing loss who often complain of ringing in the ears.
- Natural antibiotics such as echinacea and goldenseal can help prevent or treat ear infections.
- Certain Chinese herbal combinations can help alleviate tinnitus, ear infections, and chronic sinus infections that can lead to hearing loss.

Homeopathy

Homeopathic therapies may help patients who have sensory hearing loss. An experienced homeopathic physician will prescribe specific remedies based on knowledge of the underlying cause.

Acupuncture

Acupuncture may be able to improve hearing in some patients with sensory-neural deafness. It may be used to improve the circulation of fluids in the head that lead to chronic congestion and noises.

Other therapies

Other therapies that may help improve hearing in some patients include **Ayurvedic medicine**, **craniosacral therapy**, and **auditory integration training**.

Allopathic treatment

Conductive hearing loss can almost always be restored to some degree, if not completely.

- Matter in the ear canal can easily be removed, with a dramatic improvement in hearing.
- Surfer's ear gradually regresses if the patient avoids cold water or uses a special ear plug. In advanced cases, surgeons can grind away the excess bone.
- A middle-ear infection involving fluid is also simple to treat. If medications do not work, fluid may be surgically drained through the eardrum, which heals completely after treatment.
- Traumatically damaged eardrums can be repaired with a tiny skin graft.
- Otosclerosis may be surgically repaired through an operating microscope. In this intricate procedure, tiny artificial parts are substituted for the original ossicles.

Now available for complete conductive hearing loss are bone conduction hearing aids and even devices that can be surgically implanted in the cochlea.

Sensory and neural hearing loss, on the other hand, cannot readily be cured. Fortunately such hearing loss is rarely complete, and hearing aids can fill the deficit. In-the-ear hearing aids can boost the volume of sound by up to 70 dB. (Normal speech is about 60 dB.) Federal law now requires that aids be dispensed only by prescription.

Tinnitus can sometimes be relieved by adding white noise (such as the sound of wind or waves crashing on the shore) to the environment.

Decreased hearing is such a common problem that there are legions of organizations to provide assistance. Special language training, both in lip reading and signing, is available in most regions of the United States, as well as special schools and camps for children.

Prevention

Prompt treatment and attentive follow-up of middle-ear infections in children will prevent this cause of conductive hearing loss. Sensory hearing loss as a complication of epidemic disease has been greatly reduced by control of infectious childhood diseases, such as measles. Laws that require protection from loud noise in the workplace have substantially reduced incidences of noise-induced hearing loss. Surfers, cold-water fishermen, and other people who are regularly exposed to frigid water should use the right kind of ear plugs.

Resources

BOOKS

Alberti, R. W. "Occupational Hearing Loss." *Disorders of the Nose, Throat, Ear, Head, and Neck*, edited by John Jacob Ballenger. Philadelphia: Lea & Febiger, 1991.

Bennett, J. Claude, and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders, 1996.

"Hearing and Ear Disorders." In *Alternative Medicine: The Definitive Guide*, compiled by The Burton Goldberg Group. Tiburon, Calif.: Future Medicine Publishing, 1999.

Tierney, Lawrence M., M.D., et al., eds. *Current Medical Diagnosis and Treatment*. Stamford, CT: Appleton & Lange, 1998.

PERIODICALS

Nadol, J. B. "Hearing Loss." *New England Journal of Med icine* 329 (1993): 1092 102.

"Scientist Identify Gene Linked to Low Frequency Hearing Loss." *Genomics and Genetics Weekly* (December 14, 2001): 6.

Sodipo, Joseph O., and Phillip A. Okeowo. "Therapeutic Acupuncture for Sensory Neural Deafness." *American Journal of Chinese Medicine* 8, no. 4 (1980): 385 390.

ORGANIZATIONS

Alexander Graham Bell Association for the Deaf, 3417 Volta Place NW, Washington, DC 20007 2778, (202) 337 5220, http://www.agbell.org.

National Association of the Deaf, 814 Thayer Ave., Silver Spring, MD 20910 4500, (301) 587 1788. http://www.nad.org.

National Institute on Deafness and Other Communication Disorders, National Institutes of Health, 31 Center Dr., Bethesda, MD 20892, (301) 496 7243. Fax: (301) 402 0018, http://www.nih.gov/nidcd.

Self Help for Hard of Hearing People, Inc. 7910 Woodmont Avenue, Suite 1200, Bethesda, MD 20814, (301) 657 2248, http://www.shhh.org.

OTHER

DeafSource: An Internet Guide to Resources for Helping Professionals Working with Deaf and Hard of Hearing Individuals. http://home.earthlink.net/~drblood.

Mai Tran
Teresa Norris

Heart attack

Definition

A heart attack is the death of, or damage to, part of the heart muscle because its blood supply is severely reduced or stopped.

Description

Heart attack is the leading cause of death in the United States. Approximately every 29 seconds one American will have a heart attack, and once a minute one American will die from a heart attack. More than 1.5 million Americans suffer a heart attack every year, and almost half a million die, according to the American Heart Association. Most heart attacks are the end result of years of silent but progressive coronary artery disease, which can be prevented in many people. A heart attack is often the first symptom of coronary artery disease. According to the American Heart Association, 63% of women and 48% of men who died suddenly of coronary artery disease had no previous symptoms. Heart attacks are also called myocardial infarctions (MIs).

A heart attack occurs when one or more of the coronary arteries that supply blood to the heart are completely blocked and blood to the heart muscle is cut off. The blockage is usually caused by **atherosclerosis**, the build-up of plaque in the artery walls, and/or by a blood clot in a coronary artery. Sometimes, a healthy or atherosclerotic coronary artery has a spasm and the blood flow to part of the heart decreases or stops. Why this happens is unclear, but it can result in a heart attack.

About half of all heart attack victims wait at least two hours before seeking help. This increases their chance of sudden death or being disabled. The longer the artery remains blocked during a heart attack, the more damage will be done to the heart. That is why it is important to recognize the signs of a heart attack and seek prompt medical attention at the nearest hospital with 24-hour emergency cardiac care.

About one fifth of all heart attacks are silent, that is, the victim does not know one has occurred. Although the victim feels no **pain**, silent heart attacks can still damage the heart.

The outcome of a heart attack also depends on where the blockage is, whether the heart rhythm is disturbed, and whether another coronary artery supplies blood to that part of the heart. Blockages in the left coronary artery are usually more serious than in the right coronary artery. Blockages that cause an arrhythmia, an irregular heartbeat, can cause sudden death.

Causes and symptoms

Heart attacks are generally caused by severe coronary artery disease. Most heart attacks are caused by **blood clots** that form on atherosclerotic plaque. This blocks a coronary artery from supplying oxygen-rich blood to part of the heart. A number of factors increase the risk of developing coronary artery disease.

Major risk factors significantly increase the risk of coronary artery disease. Those that cannot be changed are:

KEY TERMS

Angina—Chest pain that happens when diseased blood vessels restrict the flow of blood to the heart. Angina is often the first symptom of coronary artery disease.

Atherosclerosis—A process in which the walls of the coronary arteries thicken due to the accumulation of plaque in the blood vessels. Atherosclerosis is the cause of coronary artery disease.

Coronary arteries—The two arteries that provide blood to the heart. The coronary arteries surround the heart like a crown, coming out of the aorta, arching down over the top of the heart, and dividing into two branches. These are the arteries where coronary artery disease occurs.

Myocardial infarction—The technical term for heart attack. Myocardial means heart muscle and infarction means death of tissue from lack of oxygen.

Plaque—A deposit of fatty and other substances that accumulate in the lining of the artery wall.

- Heredity. People whose parents have coronary artery disease are more likely to develop it as well. African Americans are also at increased risk, due to their higher rate of severe hypertension than whites.
- Gender. Men under the age of 60 years of age are more likely to have heart attacks than women of the same age.
- Age. Men over the age of 45 and women over the age of 55 are considered at risk. Older people (those over 65) are more likely to die of a heart attack. Older women are twice as likely to die within a few weeks of a heart attack than men. This may be because of other co-existing medical problems.

Major risk factors that can be changed are:

- Smoking. Smoking greatly increases both the chance of developing coronary artery disease and the chance of dying from it. Smokers have two to four times the risk of non-smokers of sudden cardiac death and are more than twice as likely to have a heart attack. They are also more likely to die within an hour of a heart attack.
- High cholesterol. Cholesterol is a soft, waxy substance that is produced by the body, as well as obtained from eating foods such as meat, eggs, and other animal products. Cholesterol level is affected by age, sex, heredity, and diet. Risk of developing coronary artery disease increases as blood cholesterol levels increase. Total cholesterol of 240 mg/dL and over poses a high risk, and 200–239 mg/dL a borderline high risk. In LDL cholesterol, high risk starts at 130–159 mg/dL, depending on other risk factors. HDL (healthy cholesterol) can also lower or raise the coronary risk.
- High blood pressure. High blood pressure makes the heart work harder, and over time, weakens it. It increases the risk of heart attack, stroke, kidney failure, and congestive heart failure. A blood pressure of 140 over 90 or above is considered high. As the numbers increase, high blood pressure goes from Stage 1 (mild) to Stage 4 (very severe). When combined with obesity, smoking, high cholesterol, or diabetes, the risk of heart attack or stroke increases several times.
- Lack of physical activity. This increases the risk of coronary artery disease. Even modest physical activity is beneficial if done regularly.
- Use of certain drugs or supplements. Extreme caution is advised in the use of the herbal supplement ephedra. The supplement, which was marketed for weight loss and to improve athletic performance, was found to contribute to heart attack, seizure, stoke and death. In April 2003, the U.S. Food and Drug Administration (FDA) investigated controlling or banning the substance. While it was once believed that hormone replacement therapy (HRT) helped prevent heart disease in women, a large clinical trial called the Women's Health Initiative found the opposite to be true. In 2003, the FDA began requiring manufacturers of HRT to place warnings on the box listing adverse effects of estrogen, including increased risk of heart attack, stroke and blood clots. The labels also must mention that HRT should not be used as a preventive medicine for heart disease.

Contributing risk factors

Contributing risk factors have been linked to coronary artery disease, but their significance and prevalence are not known yet. Contributing risk factors are:

- Diabetes mellitus. The risk of developing coronary artery disease is seriously increased for diabetics. More than 80% of diabetics die of some type of heart or blood vessel disease.
- Obesity. Excess weight increases the strain on the heart, increases blood pressure and blood cholesterol, and increases the risk of developing coronary artery disease, even if no other risk factors are present. In fact, research in 2002 shows that losing weight also reduces inflammation of the arteries in obese women, which is a risk factor equal to that of high cholesterol.

- Stress and anger. Some scientists believe that stress and anger can contribute to the development of coronary artery disease. Stress increases the heart rate and blood pressure, and can injure the lining of the arteries.

More than 60% of heart attack victims experience symptoms before the heart attack occurs. These sometimes occur days or weeks before the heart attack. Sometimes, people do not recognize the symptoms of a heart attack or are in denial that they are having one. Symptoms are:

- Uncomfortable pressure, fullness, squeezing, or pain in the center of the chest. This lasts more than a few minutes, or may go away and return.
- Pain that spreads to the shoulders, neck, or arms.
- Chest discomfort accompanied by lightheadedness, fainting, sweating, nausea, or shortness of breath.

All of these symptoms do not occur with every heart attack. Sometimes, symptoms disappear and then reappear. A person with any of these symptoms should immediately call an emergency rescue service or be driven to the nearest hospital emergency room.

Diagnosis

Experienced emergency care personnel can usually diagnose a heart attack simply by looking at the patient. To confirm this diagnosis, they talk with the patient, check heart rate and blood pressure, perform an electrocardiogram, and take a blood sample. The electrocardiogram shows which coronary artery is blocked. Electrodes covered with conductive jelly are placed on the patient's chest, arms, and legs. They send impulses of the heart's activity through an oscilloscope (a monitor) to a recorder, which traces them on paper. The blood test shows the leak of enzymes or other biochemical markers from damaged cells in the heart muscle. In 2003, the FDA cleared a new test for ruling out heart attacks in people who come to emergency rooms with severe chest pains. It is the first new blood test for evaluation of heart attacks since 1994 and is used along with an electrocardiogram.

Treatment

Heart attacks are treated with cardiopulmonary resuscitation (CPR) when necessary to start and keep the patient breathing and his heart beating. Upon arrival at the hospital, the patient is closely monitored. An electrical-shock device called a defibrillator may be used to restore a normal rhythm if the heartbeat is fluttering uncontrollably. Oxygen is often used to ease the heart's workload or to help a victim of a severe heart attack breathe easier. If oxygen is used within hours of the heart attack, it may help limit damage to the heart.

Alternative therapies aim at preventing the progression of **heart disease** that leads to a heart attack. Changes in lifestyle can also prevent second heart attacks.

Herbal medicine offers a variety of remedies that may have a beneficial effect on coronary artery disease. Oats (*Avena sativa*), **garlic** (*Allium sativum*), and guggul(*Commiphora mukul*) may help reduce **cholesterol**; linden (*Tilia europaea*) and **hawthorn** (*Crataegus spp.*) are sometimes recommended to control high blood pressure, a risk factor for heart disease. Tea (*Camellia sinensis*), especially **green tea**, is high in **antioxidants**, which studies have shown may have a preventative effect against atherosclerosis. A 2003 study found that black tea may reduce the risk of a heart attack by as much as 43% and that black tea's protective effects are even greater in women than in men.

Nutritional therapies have been shown to prevent coronary artery disease and stop, or even reverse, the progression of atherosclerosis. A low-fat, **high-fiber diet** is often recommended. It is essential to reduce the amount of meat and animal products consumed, as they are high in saturated fats. Whole grains, fresh fruits and vegetables, legumes, and nuts are recommended. Vitamin and mineral supplements that reduce, reverse, or protect against coronary artery disease include **chromium**; **calcium** and **magnesium**; B complex vitamins; the antioxidant vitamins B and E; L-carnitine; and **zinc**. These protective effects even work in the elderly, according to a 2003 report. A study revealed that those age 65 and older who ate the most cereal and bread fiber were 21% less likely to develop heart disease than those who ate the least. They also were less likely to have a heart attack or **stroke**.

Yoga and other bodywork, massage, **relaxation** therapies, **aromatherapy**, and **music therapy** may also help by reducing **stress** and promoting physical and mental well-being. A 1996 study in the United Kingdom found that participants who practiced **t'ai chi** had a resulting lowering in blood pressure. By evoking the body's relaxation response through **meditation** and deep breathing, blood pressure, metabolic rate, and hearth rate can all be reduced.

Allopathic treatment

Additional treatment after a heart attack can include close monitoring, electric shock, drug therapy, revascularization procedures, percutaneous transluminal coronary angioplasty and coronary artery bypass surgery.

Drugs to stabilize the patient and limit damage to the heart include thrombolytics, aspirin, anticoagulants, painkillers and tranquilizers, beta-blockers, ace-inhibitors, nitrates, rhythm-stabilizing drugs, and diuretics. Thrombolytic drugs that break up blood clots and enable oxygen-rich blood to flow through the blocked artery increase the patient's chance of survival if given as soon as possible after the heart attack. These include anisoylated plasminogen streptokinase activator complex (APSAC) or anistreplase (Eminase), recombinant tissue-type plasminogen activator (r-tPA, Retevase, or Activase), and streptokinase (Streptase, Kabikinase).

To prevent additional heart attacks, aspirin and an anticoagulant drug often follow the thrombolytic drug. These prevent new blood clots from forming and existing blood clots from growing. Anticoagulant drugs help prevent the blood from clotting. The most common anticoagulants are heparin and warfarin. Heparin is given intravenously while the patient is in the hospital; warfarin, taken orally, is often given later. Aspirin helps to prevent the dissolved blood clots from reforming.

To relieve pain, a nitroglycerine tablet taken under the tongue may be given. If the pain continues, morphine sulfate may be prescribed. Tranquilizers such as diazepam (Valium) and alprazolam (Ativan) may be prescribed to lessen the trauma of a heart attack.

Percutaneous transluminal coronary angioplasty and coronary artery bypass surgery are invasive revascularization procedures which open blocked coronary arteries and improve blood flow. They are usually performed only on patients for whom clot-dissolving drugs do not work, or who have poor **exercise** stress tests, poor left ventricular function, or **ischemia**. Generally, angioplasty is performed before coronary artery bypass surgery.

Percutaneous transluminal coronary angioplasty, usually called coronary angioplasty, is a non-surgical procedure in which a catheter (a tiny plastic tube) tipped with a balloon is threaded from a blood vessel in the thigh or arm into the blocked artery. The balloon is inflated and compresses the plaque to enlarge the blood vessel and open the blocked artery. The balloon is then deflated and the catheter is removed. Coronary angioplasty is successful about 90% of the time. For one third of patients, the artery narrows again within six months after the procedure. The procedure can be repeated. It is less invasive and less expensive than coronary artery bypass surgery.

In coronary artery bypass surgery, called bypass surgery, a detour is built around the coronary artery blockage with a healthy leg or chest wall artery or vein. The healthy vein then supplies oxygen-rich blood to the heart. Bypass surgery is major surgery appropriate for patients with blockages in two or three major coronary arteries or severely narrowed left main coronary arteries, as well as those who have not responded to other treatments. About 70% of patients who have bypass surgery experience full relief from **angina**; about 20% experience partial relief. Long term, symptoms recur in only about three or four percent of patients per year. Five years after bypass surgery, survival expectancy is 90%, at 10 years it is about 80%, at 15 years it is about 55%, and at 20 years it is about 40%.

Expected results

The aftermath of a heart attack is often severe. Two-thirds of heart attack patients never recover fully. Within one year, 27% of men and 44% of women die. Within six years, 23% of men and 31% of women have another heart attack, 13% of men and 6% of women experience sudden death, and about 20% have heart failure. People who survive a heart attack have a chance of sudden death that is four to six times greater than others and a chance of illness and death that is two to nine times greater. Older women are more likely than men to die within a few weeks of a heart attack.

Statistics released in early 2002 revealed that about half of all deaths from heart disease happen before the patient can get to the hospital. Women were slightly more likely than men to die quickly after cardiac arrest and the risk of dying quickly from heart disease increased with age, to 61% of those over age 85. The study authors said that improved prevention and recognition of the warning symptoms of heart attack could lower the number of sudden deaths.

Prevention

Many heart attacks can be prevented through a healthy lifestyle, which can reduce the risk of developing coronary artery disease. For patients who have already had a heart attack, a healthy lifestyle and carefully following doctor's orders can prevent another heart attack. A heart healthy lifestyle includes eating right, regular exercise, maintaining a healthy weight, no **smoking**, moderate drinking, no illegal drugs, controlling **hypertension**, and managing stress.

A healthy diet includes a variety of foods that are low in fat (especially saturated fat), low in cholesterol, and high in fiber; plenty of fruits and vegetables; and

limited **sodium**. Saturated fat raises cholesterol, and, in excessive amounts, it increases the amount of the proteins in blood that form blood clots. Polyunsaturated and monounsaturated fats are relatively good for the heart. Fat should comprise no more than 30 percent of total daily calories. Evidence suggests that a diet rich in **lutein**, the pigment found in dark green leafy vegetables, helps artery walls fight plaque and lessens risk of heart attack.

Cholesterol should be limited to about 300 mg per day. Many popular lipid-lowering drugs can reduce LDL-cholesterol by an average of 25–30% when combined with a low-fat, low-cholesterol diet. Soluble fiber can also help lower cholesterol. Fruits and vegetables are rich in fiber, vitamins, and minerals, and they are low calorie and nearly fat free. **Vitamin C** and beta-carotene, found in many fruits and vegetables, keep LDL-cholesterol from turning into a form that damages coronary arteries. Excess sodium can increase the risk of high blood pressure, and daily intake should be limited to 2,400 mg—about the amount in a teaspoon of salt.

Regular aerobic exercise can lower blood pressure, help control weight, and increase HDL ("good") cholesterol. Moderate intensity aerobic exercise lasting about 30 minutes four or more times per week is recommended for maximum heart health, according to the Centers for Disease Control and Prevention and the American College of Sports Medicine. Three 10-minute exercise periods are also beneficial. Aerobic exercise—activities such as walking, jogging, and cycling—uses the large muscle groups and forces the body to use oxygen more efficiently. It can also include everyday activities such as active gardening, climbing stairs, or brisk housework.

Maintaining a desirable body weight is also important. About one quarter of all Americans are overweight, and nearly one-tenth are obese, according to the Surgeon General's Report on **Nutrition** and Health. People who are 20% or more over their ideal body weight have an increased risk of developing coronary artery disease. Losing weight can help reduce total and LDL cholesterol, reduce triglycerides, and boost relative levels of HDL cholesterol.

Smoking has many adverse effects on the heart. It increases the heart rate, constricts major arteries, and can create irregular heartbeats. It also raises blood pressure, contributes to the development of plaque, increases the formation of blood clots, and causes blood platelets to cluster and impede blood flow. Heart damage caused by smoking can be repaired by quitting—even heavy smokers can return to heart health. Several studies have shown that ex-smokers face the same risk of heart disease as non-smokers within five to 10 years of quitting.

Drinking should be done in moderation. Modest consumption of alcohol can actually protect against coronary artery disease. This is believed to be because alcohol raises HDL ("good") cholesterol levels in some patients. The American Heart Association defines moderate consumption as one ounce of alcohol per day—roughly one cocktail, one 8-ounce glass of wine, or two 12-ounce glasses of beer. Excessive drinking is always bad for the heart. It usually raises blood pressure, and can poison the heart and cause abnormal heart rhythms or even heart failure. Illegal drugs, like cocaine, can seriously harm the heart and should never be used.

High blood pressure, one of the most common and serious risk factors for coronary artery disease, can be completely controlled through lifestyle changes and medication. People with moderate hypertension may be able to control it through lifestyle changes and medication.

Stress management means controlling mental and physical reactions to life's irritations and challenges. Techniques for controlling stress include thinking positively, getting enough sleep, exercising, and practicing relaxation techniques.

Daily aspirin therapy has been proven to help prevent blood clots associated with atherosclerosis. It can also prevent heart attacks from recurring, prevent heart attacks from being fatal, and lower the risk of strokes. Surprisingly, a 2002 study found that aspirin therapy is underused by people at risk for heart attacks. Patients should consult their doctors before taking aspirin regularly.

Resources

BOOKS

American Heart Association. *2000 Heart and Stroke Statistical Update*. Dallas, TX: American Heart Association, 1999.

DeBakey, Michael E., and Antonio M. Gotto Jr. *The New Living Heart*. Holbrook, MA: Adams Media Corporation, 1997.

Notelovitz, Morris, and Diana Tonnessen. *The Essential Heart Book for Women*. New York: St. Martin's Press, 1996.

PERIODICALS

"Aspirin Underused to Prevent Heart Attacks, Strokes." *Diabetes Week* (January 28, 2002): 15.

Cerrato, Paul L. "Tea Consumption May Benefit Heart and Bone." *Contemporary OB/GYN* (January 2003): 101.

"Drugs or Angioplasty After a Heart Attack?" *Harvard Health Letter* 22, no. 10 (August 1997): 8.
Evans, Julie, et al."Popeye's Favorite for Strong to the Finish Arteries."*Prevention* (January 2002): 108.
"First New Blood Test to Evaluate Heart Attacks." *Biomedical Market Newsletter* (January February 2003): 42.
"How Weight Loss May Protect Your Heart"*Environmental Nutrition* (March 2002): 1.
Kirn, Timothy F. "FDA Probes Ephedra, Proposes Warn ing Label (Risk of Heart Attack, Seizure, Stroke)." *Clinical Psychiatry News* (April 2003): 49.
Marble, Michelle. "FDA Urged to Expand Uses for Aspirin, Benefits for Women." *Women's Health Weekly* (Feb ruary 10, 1997).
"More on Anger and Heart Disease." *Harvard Heart Letter*. (May 1997): 6 7.
Mozaffarian, Dariush, et al. "Cereal, Fruit, and Vegetable Fiber Intake and the Risk of Cardiovascular Disease in Elderly Individuals." *JAMA* (April 2, 2003): 1659.
Stephenson, Joan. "FDA Orders Estrogen Safety Warnings: Agency Offers Guidance for HRT Use." *JAMA* (February 5, 2003): 537.
"Too Many Patients Never Make it to the Hospital Alive" *Medical Letter on the CDC & FDA* (March 31, 2002): 7.

ORGANIZATIONS

American Heart Association. National Center. 7272 Greenville Avenue, Dallas, TX 75231 4596. (800) AHA USA1. http://www.americanheart.org
National Heart, Lung, and Blood Institute Information Center. P.O. Box 30105, Bethesda, MD 20824 0105. http://www.nhlbi.gov/nhlbi/nhbli.htm.
Texas Heart Institute Heart Information Service. P.O. Box 20345, Houston, TX 77225 0345. 1 800 292 2221. http://www.tmc.edu/thi/his.html.

Paula Ford-Martin
Teresa G. Odle

Heart disease

Definition

Heart disease is the narrowing or blockage of the arteries and vessels that provide oxygen and nutrient-rich blood to the heart. It is caused by **atherosclerosis**, an accumulation of fatty materials on the inner linings of arteries that restricts blood flow. When the blood flow to the heart is completely cut off, the result is a **heart attack** because the heart is starved of oxygen.

Description

Heart disease, also called coronary heart disease or coronary artery disease, is the leading cause of death for both men and women in the United States. According to the American Heart Association, deaths from coronary heart disease in the United States declined 33 percent from 1994 to 2004, but more than 450,000 people still died from the disease in 2004. About 16 million Americans have active symptoms of coronary artery disease.

Heart disease occurs when the coronary arteries become partially blocked or clogged. This blockage limits the flow of blood through the coronary arteries, the major arteries supplying oxygen-rich blood to the heart. The coronary arteries expand when the heart is working harder and needs more oxygen. If the arteries are unable to expand, the heart is deprived of oxygen (myocardial **ischemia**). When the blockage is limited, chest **pain** or pressure called **angina** may occur. When the blockage **cuts** off the blood flow, the result is heart attack (myocardial infarction or heart muscle death).

Heart healthy diets

	Heart Healthy diet guidelines	Therapeutic Lifestyle Changes diet guidelines	American Heart Association diet guidelines
Saturated fat	8–10% of the day's total calories	Less than 7% of the day's total calories	Less than 7% of the day's total calories
Total fat	30% or less of the day's total calories	25–35% or less of the day's total calories from fat	25–35% or less of the day's total calories from fat
Dietary cholesterol	Less than 300 milligrams a day	Less than 200 milligrams a day	Less than 300 milligrams a day
Sodium	Less than 2,400 milligrams a day	Less than 2,400 milligrams a day	Less than 2,400 milligrams a day
Calories	Enough calories to achieve or maintain a healthy weight and reduce blood cholesterol level	Enough calories to achieve or maintain a healthy weight and reduce blood cholesterol level	Number of calories based on age, gender, height, weight, and physical activity level, and whether trying to lose, gain or maintain weight

A comparison of the dietary guidelines of the Healthy Heart diet, the Therapeutic Lifestyle Changes diet, and the American Heart Association diet. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

Risk factors for heart disease

- Male greater than 45 years of age
- Female greater than 55 years of age
- Female with premature menopause without estrogen replacement
- Family history of premature coronary heart disease having definite myocardial infarction or sudden death before age 55 in father or first-degree male relative, or mother before age 65 years of age
- Currently smoking or history of cigarette smoking
- Blood pressure greater than 140/90 mmHg or on antihypertensive medication
- HDL cholesterol less than 35 mg/dl
- LDL cholesterol greater than 130 mg/dl
- Diabetes mellitus

(Illustration by Corey Light. Cengage Learning, Gale)

Healthy coronary arteries are open, elastic, smooth, and slick. The artery walls are flexible and expand to let more blood through when the heart needs to work harder. The disease process is thought to begin with an injury to the linings and walls of the arteries. This injury makes them susceptible to atherosclerosis and production of **blood clots** (thrombosis).

Causes and symptoms

Heart disease is usually caused by atherosclerosis. **Cholesterol** and other fatty substances accumulate on the inner wall of the arteries. They attract fibrous tissue, blood components, and **calcium**. They then harden into artery-clogging plaques. Atherosclerotic plaques often form blood clots that can also block the coronary arteries (coronary thrombosis). Congenital defects and **muscle spasms** of arteries or heart muscles also block blood flow. Some research indicates that infection from organisms such as **chlamydia** bacteria may be responsible for some cases of heart disease.

A number of major contributing risk factors increase the chance of developing heart disease. Some of these can be changed and some cannot. The greater the number of risk factors, the greater the chance of developing heart disease.

Major risk factors

Major risk factors significantly increase the chance of developing heart disease. These include:

- Heredity. People whose parents have heart disease are more likely to develop it. African Americans are also at increased risk because they experience a high rate of severe hypertension.
- Gender. Men are more likely to have heart attacks than women and to have them at a younger age. Above the age of 60, however, women have heart disease at a rate equal to that of men.
- Age. Men who are 45 years of age and older, and women who are 55 years of age and older are more likely to have heart disease. Occasionally, heart disease may strike men or women in their 30s. People more than 65 years old are more likely to die from a heart attack. Older women are twice as likely as older men to die within a few weeks of a heart attack.
- Smoking. Smoking increases both the chance of developing heart disease and the chance of dying from it. Smokers are more than twice as likely as non-smokers to have a heart attack and are two to four times more likely die from it.
- High cholesterol levels. Dietary sources of cholesterol are meat, dairy food, eggs, and other animal-fat products. Cholesterol is also produced by the body. Age, body fat, diet, exercise, heredity, and sex affect one's blood cholesterol. For typical, healthy patients, the American Heart Association recommends a total blood cholesterol below 200 mg/dL, which puts the person at a comparatively low risk for coronary heart disease. For these individuals, a total cholesterol level of 200–239 mg/dL is considered borderline high-risk, and a level of 240 mg/dL or above is considered high risk and doubles the risk for coronary heart disease. Persons with such risk factors as elevated low-density lipoprotein (LDL cholesterol, or "bad" cholesterol) levels, low high-density lipoprotein (HDL or "good" cholesterol) levels, or high triglyceride levels should consult with their doctor about what their target cholesterol level should be.
- High blood pressure. High blood pressure makes the heart work harder and weakens it over time. It increases the risk of heart attack, stroke, kidney failure, and congestive heart failure. A blood pressure of 140 over 90 or above is considered high. The risk of heart attack or stroke is raised several times for people with high blood pressure combined with

obesity, smoking, high cholesterol levels, or diabetes. Nearly one-third of American adults have high blood pressure.

- Lack of physical activity. Lack of exercise increases the risk of heart disease. Even modest physical activity, such as walking, is beneficial if done regularly.
- Diabetes mellitus. The risk of developing heart disease is seriously increased for diabetics. About two-thirds of people who have type I or type II diabetes die as the result of a heart attack or stroke.

Contributing risk factors

Contributing risk factors have been linked to heart disease, but their significance was not known as of 2008. Contributing risk factors are:

- Obesity. Excess weight increases the strain on the heart and increases the risk of developing heart disease even if no other risk factors are present. Obesity increases blood pressure and blood cholesterol and can lead to diabetes.
- Hormone replacement therapy (HRT). Even though physicians once believed that HRT could help prevent heart disease in women, the Women's Health Initiative (WHI) released information in 2002 and 2003 showing that use of combined hormones (estrogen and progestin) is harmful in women who already have coronary artery disease. As of 2008, it continued to be debated if HRT, and estrogen in particular, can provide some protection against heart disease when a woman takes it soon after going through menopause.
- Stress and anger. Some scientists believe that poorly managed stress and anger can contribute to the development of heart disease and increase the blood's tendency to form clots (thrombosis). Stress increases the heart rate and blood pressure and can injure the lining of the arteries.
- Chest pain (angina). Angina is the main symptom of coronary heart disease, but it is not always present. Other symptoms include shortness of breath, chest heaviness, tightness, pain, a burning sensation, squeezing, or pressure either behind the breastbone or in the left arm, neck, or jaws. According to the American Heart Association, 64 percent of women and 50 percent of men who died suddenly of heart disease had no previous symptoms of the disease.

Diagnosis

Diagnosis begins with a doctor's review of the medical history, discussion of symptoms, listening to the heart, and performing basic screening tests. These tests measure blood lipid levels, blood pressure, **fasting** blood-glucose levels, weight, and other indicators. Other diagnostic tests include resting and **exercise** electrocardiograms, echocardiography, radionuclide scans, and coronary angiography. The treadmill exercise (**stress**) test is an appropriate screening test for those with high risk factors even though they feel well.

An electrocardiogram (ECG) shows the heart's activity and may reveal a lack of oxygen (ischemia). Electrodes covered with conducting jelly are placed on the patient's chest, arms, and legs. They send impulses of the heart's activity through an oscilloscope (a monitor) to a recorder that traces them on paper. Another type of electrocardiogram, known as the exercise stress test, measures how the heart and blood vessels respond to exertion when the patient is exercising on a treadmill or a stationary bike. Both tests can be performed in a physician's office or outpatient facility.

Echocardiography, or cardiac ultrasound, uses sound waves to create an image of the heart's chambers and valves. A technician applies gel to a handheld transducer and then presses it against the patient's chest. The heart's sound waves are converted into an image that can be displayed on a monitor. It does not reveal the coronary arteries themselves but can detect abnormalities in the heart wall caused by heart disease. Typically performed in a doctor's office or outpatient facility, the test takes 30 to 60 minutes.

Radionuclide angiography enables physicians to see the blood flow of the coronary arteries. Nuclear scans are performed by injecting a small amount of radiopharmaceutical, such as thallium, into the bloodstream. As the patient lies on a table, a camera that uses gamma rays to produce an image of the radioactive material passes over the patient and records pictures of the heart. Radionuclide angiography is usually performed in a hospital's nuclear medicine department. The radiation exposure is about the same as that in a chest x ray.

Coronary angiography is considered the most accurate method for making a diagnosis of heart disease, but it is also the most invasive. During coronary angiography the patient is awake but sedated. The cardiologist inserts a catheter into a blood vessel and guides it into the heart. A contrast dye (a radiopaque substance that is visible on x ray) is injected into the catheter and x rays are taken. Coronary angiography is performed in a cardiac catheterization laboratory in either an outpatient or an inpatient surgery unit.

Treatment

Herbal-medicine practitioners recommend a variety of remedies that may have a beneficial effect on

heart disease. They may suggest **garlic** (*Allium sativum*), **myrrh** (*Commiphora molmol*), and oats (*Avena sativa*) to help reduce cholesterol, and **hawthorn** (*Crataegus* spp.), linden (*Tilia europaea*), and **yarrow** (*Achillea millefolium*) to control high blood pressure, a risk factor for heart disease. Tea, especially **green tea** (*Camellia sinensis*), is high in **antioxidants** and studies have shown that it may have a preventative effect against atherosclerosis. Coenzyme Q10 has been shown to be beneficial for patients with congestive heart failure. Taurine, an amino acid found in meat and fish proteins, has also been suggested as a way to treat heart arrhythmia.

Some alternative-medicine practitioners believe that **yoga** and other bodywork, massage, **relaxation**, **aromatherapy**, and music therapies may also help prevent heart disease and stop, or even reverse, the progression of atherosclerosis. Vitamin and mineral supplements that are believed to reduce, reverse, or protect against heart disease include B-complex vitamins, calcium, **chromium**, **magnesium**, L-carnitine, **zinc**, and the antioxidant vitamins C and E. Notably, a study in 2004 showed a relationship between high doses of supplemental **vitamin C** and reduced coronary heart disease but found little risk reduction with supplemental **vitamin E**.

Traditional Chinese medicine (TCM) may recommend herbal remedies, massage, **acupuncture**, and dietary modification. A healthy diet (including cold water fish as a source of **essential fatty acids**) and exercise are important components of both alternative and conventional prevention and treatment strategies.

New reports on diet and heart disease have answered some questions, but others remain unclear. While one study concludes that four servings per day of fruit and vegetables are associated with a slight drop in risk of heart disease, eight or more servings per day can produce a significant drop in risk. Another study showed that consuming legumes at least four times per week lowered risk of heart disease from 11 percent to 22 percent compared with consuming legumes less than once a week. Research on antioxidants continued as of 2008 to produce mixed findings, with some reports showing that vitamins E, C, and other antioxidants can help prevent heart disease, and other studies showing they have no effect. Although scientists and medical professionals had not reached a consensus about the benefits of antioxidants as of 2008, the American Heart Association reported that up to 30 percent of Americans take antioxidant supplements. As of 2008, however, the association did not recommend supplements. Instead, it advised a diet containing a variety of nutrient-rich foods, including fruits, vegetables, whole grains, and nuts.

Allopathic treatment

Heart disease can be treated many ways. The choice of treatment depends on the patient and the severity of the disease. Treatments include lifestyle changes and drug therapy and coronary artery bypass surgery. (Recommendations for persons with coronary artery disease are available through the American Heart Association Web site at http://www.americanheart.org/presenter.jhtml?identifier=3039477.) These, however, are not a cure. Heart disease is a chronic disease requiring lifelong care.

Another treatment option is percutaneous transluminal coronary angioplasty, usually called coronary angioplasty, which is a non-surgical procedure. A catheter tipped with a balloon is threaded from a blood vessel in the thigh into the blocked artery. The balloon is inflated, compressing the plaque and opening the blocked artery. The balloon is then deflated and the catheter removed.

People with moderate heart disease may gain adequate control through lifestyle changes and drug therapy. Drugs such as nitrates, beta-blockers, and calcium channel blockers relieve chest pain and complications of heart disease, but they cannot clear blocked arteries. Nitrates improve blood flow to the heart, and beta-blockers reduce the amount of oxygen required by the heart during stress. Calcium channel blockers help keep the arteries open and reduce blood pressure.

Aspirin helps prevent blood clots from forming on plaques, reducing the likelihood of a heart attack and **stroke**. Cholesterol-lowering medications are also indicated in many cases.

Coronary angioplasty is successful about 90 percent of the time, but for about one-third of patients, the artery narrows again within six months. The procedure can be repeated. It is less invasive and less expensive than coronary artery bypass surgery.

In coronary artery bypass surgery, a healthy vein from an arm, leg, or chest wall is used to build a bypass around the coronary artery blockage. The healthy vessel then supplies oxygen-rich blood to the heart. Bypass surgery is major surgery. It is appropriate for those patients with blockages in two or three major coronary arteries, those with severely narrowed left main coronary arteries, and those who have not responded to other treatments. The majority of patients who have bypass surgery experience full relief from angina, and many of the remainder experience partial relief. A study in 2004 also noted that patients who had serious coronary artery disease had better

five-year survival rates with a bypass than they did with balloon angioplasty or stent procedures.

Three other surgical procedures for unblocking coronary arteries are available. Atherectomy is a procedure in which the cardiologist shaves off and removes strips of plaque from the blocked artery. In laser angioplasty, a catheter with a laser tip is inserted into the affected artery to burn or break down the plaque. A metal coil called a stent can be implanted permanently to keep a blocked artery open. As of 2008, stenting was becoming more common.

Expected results

Advances in medicine and the adoption of healthier lifestyles have caused a substantial decline in death rates from heart disease since the mid-1980s. New diagnostic techniques enable doctors to identify and treat heart disease in its earliest stages. New technologies and surgical procedures have extended the lives of many patients who would have otherwise died. Research on heart disease continued as of 2008.

Prevention

A healthy lifestyle can help prevent heart disease and slow its progress. A heart-healthy lifestyle includes maintaining a healthy diet and weight, performing regular exercise, refraining from **smoking**, engaging in moderate drinking, controlling **hypertension**, and managing stress. Cardiac rehabilitation programs are excellent ways to help prevent recurring coronary problems for people who are at risk and who have had coronary events and procedures.

Eating right

A healthy diet includes a variety of foods that are low in fat, especially saturated fat, low in cholesterol, and high in fiber. It includes plenty of fruits and vegetables and limited salt. According to the American Heart Association, fats should comprise no more than 25 to 35 percent of the total daily calories and should total less than 7 percent saturated fats, less than 1 percent trans fats, and the remainder as monounsaturated and polyunsaturated fats from such sources as nuts, seeds, fish and vegetable oils. Cholesterol intake should be limited to 300 mg per day for the average person. Those individuals who have coronary heart disease or who have an LDL cholesterol level of 100 mg/dL or more, should lower their daily cholesterol intake to less than 200 mg per day. Eating cold-water fish or taking comparable omega-3 polyunsaturated fatty acid supplements can help prevent cardiac death. The American Heart Association advocates eating fish (particularly fatty fish) at least twice a week. It also recommends adding soybeans (including tofu), canola, walnut, and **flaxseed**, and their oils to the diet because these contain alpha-linolenic acid than can transform into omega-3 fatty acid in the body. The association also notes that individuals consult with their doctor before taking omega-3 fatty acid supplements in excess of 3 grams per day because of the potential for bleeding.

Cholesterol, a waxy substance containing fats, is found in foods such as meat, dairy, eggs, and other animal products. It is also produced in the liver. Soluble fiber can help lower cholesterol. Dietary cholesterol should be below 300 milligrams per day. Many popular lipid-lowering drugs can reduce LDL cholesterol by an average of 25 to 30 percent, or more, when used with a low-fat, low-cholesterol diet.

Antioxidants are chemical compounds in plant foods. When people eat antioxidant-rich foods, they may improve the function of the arteries and prevent arterial plaque formation and reduce their risk of **cancer**. Colorful vegetables and fruits are sources of antioxidants and are rich in fiber, vitamins, and minerals. They are low in calories and nearly fat-free. Vitamin C and beta-carotene, found in many fruits and vegetables, keep LDL-cholesterol from turning into a form that damages coronary arteries. Whole grains, especially whole oats and oat bran, reduce cholesterol.

Excess **sodium** can increase the risk of high blood pressure. Many processed foods contain large amounts of sodium. Daily intake should be limited to about 2,300 milligrams, about the amount in a teaspoon of salt.

The Food Guide Pyramid developed by the Center for **Nutrition** Policy and Promotion, an organization of the U.S. Department of Agriculture, provides easy-to-follow guidelines for daily heart-healthy eating.

Exercising regularly

Aerobic exercise can lower blood pressure, help control weight, and increase HDL (good) cholesterol. It also may keep the blood vessels more flexible. The American Heart Association recommends moderate-to-vigorous intensity aerobic activity (50 to 85 percent of the maximum heart rate) for at least 30 minutes on most days of the week. Those 30 minutes can be divided into two 15-minute or three 10-minute sessions throughout the day. People with heart disease or risk factors should consult a doctor before beginning an exercise program.

Maintaining a desirable body weight

People who are 20 percent or more above their ideal body weight have an increased risk of developing heart disease. Losing weight can help decrease total and LDL cholesterol, reduce triglycerides, and boost HDL cholesterol. It may also reduce blood pressure. Eating right and exercising are two essential components of losing weight.

Quitting smoking

Smoking has many adverse effects on the heart. It increases the heart rate, constricts major arteries, and can create irregular heartbeats. It also raises blood pressure, contributes to the development of plaque, increases the formation of blood clots, and causes blood platelets to cluster and impede blood flow. When smokers quit the habit, heart damage can be repaired. Several studies have shown that ex-smokers face the same risk of heart disease as non-smokers within 5 to 10 years after they quit.

Drinking in moderation

Modest consumption of alcohol may actually protect against heart disease because alcohol appears to raise levels of HDL cholesterol. The American Heart Association defines moderate consumption as one to two daily drinks for men and one daily drink for women, or one ounce of alcohol per day. The association defines one drink as 4 ounces of wine, 12 ounces of beer, 1.5 ounces of 80-proof spirits, or 1 ounce of 100-proof spirits.

Seeking diagnosis and treatment for hypertension

High blood pressure, one of the most common and serious risk factors for heart disease, can be completely controlled through lifestyle changes and medication. Seeking diagnosis and treatment is critical because hypertension often exhibits no symptoms, so many people do not know they have it. Moderate hypertension can be controlled by reducing dietary intake of sodium and fat, exercising regularly, managing stress, abstaining from smoking, and drinking alcohol in moderation.

Managing stress

Everyone experiences stress. Stress can sometimes be avoided and, when it is inevitable, it can be managed through relaxation techniques, exercise, and other methods.

KEY TERMS

Angina—Chest pain that occurs when diseased blood vessels restrict the flow of blood to the heart. Angina is often the first symptom of heart disease.

Atherosclerosis—A process in which the openings in the coronary arteries narrow due to the accumulation of plaque on the linings of the blood vessels. Atherosclerosis is the cause of heart disease.

Beta-blocker—A drug that blocks some of the effects of fight-or-flight hormone adrenaline (epinephrine and norepinephrine), slowing the heart rate and lowering the blood pressure.

Calcium channel blocker—A drug that blocks the entry of calcium into the muscle cells of small blood vessels (arterioles) and keeps them from narrowing.

Coronary arteries—The main arteries that provide blood to the heart. The coronary arteries surround the heart like a crown, coming out of the aorta, arching down over the top of the heart, and dividing into two branches. These are the arteries in which heart disease occurs.

HDL cholesterol—High-density lipoprotein cholesterol is a component of cholesterol that helps protect against heart disease. HDL is nicknamed "good cholesterol."

LDL cholesterol—Low-density lipoprotein cholesterol is the primary cholesterol molecule. High levels of LDL increase the risk of coronary heart disease. LDL is nicknamed "bad cholesterol."

Plaque—A deposit of fatty and calcium substances that can accumulate dangerously in the lining of the artery wall.

Triglyceride—A fat that comes from food or is made from other energy sources in the body. Elevated triglyceride levels contribute to the development of atherosclerosis.

Resources

BOOKS

American Medical Association, Martin S. Lipsky, Marla Mendelson, and Stephen Havas. *American Medical Association Guide to Preventing and Treating Heart Disease: Essential Information You and Your Family Need to Know about Having a Healthy Heart*. Indian apolis, IN: Wiley, 2008.

Esselstyn, Caldwell. *Prevent and Reverse Heart Disease*. Garden City Park, NY: Avery, 2007.

PERIODICALS

Dioreto, Stacy. "Legume Intake Lowers CHD Risk." *Patient Care* (January 30, 2002): 41.

Kuriyama, Shinichi, et al. "Green Tea Consumption and Mortality Due to Cardiovascular Disease, Cancer, and All Causes in Japan: The Ohsaki Study." *Journal of the American Medical Association)* 296, no. 10 (September 13, 2006): 1255 1265.

OTHER

"Hormone Therapy: Is It Right for You?" *MayoClinic.com* February 12, 2008. http://www.mayoclinic.com/health/hormone therapy/WO00046. (April 12, 2008).

ORGANIZATIONS

American Heart Association, National Center, 7272 Greenville Avenue, Dallas, Texas, 75231, (800) AHA USA1, http://www.americanheart.org/.

Paula Ford-Martin
Teresa G. Odle
Leslie Mertz, Ph.D.

Heartburn

Definition

Heartburn is a burning sensation in the chest that can extend to the neck, throat, and face. It usually occurs after eating and is worsened by bending, lifting, or lying down.

Description

Heartburn, sometimes called acid **indigestion** or gastroesophageal reflux, is very common. More than one third of the population suffers from occasional heartburn, as do about one half of pregnant women. Some 50 million adult Americans complain of frequent heartburn. The occurrence of heartburn generally increases with age; however, it is common—and often overlooked—in infants and children.

Heartburn occurs when digestive juices from the stomach move back up into the esophagus, the tube connecting the throat to the stomach. The upper third of the esophagus consists of skeletal muscle that propels the food downward. The lower two-thirds of the esophagus is smooth muscle. The lower esophageal sphincter (LES) is a thick band of muscle that encircles the esophagus just above the uppermost part of the stomach. This sphincter is usually tightly closed—opening only when food passes from the esophagus into the stomach—and prevents the contents of the stomach from moving back into the delicate esophageal tissue. The stomach has a thick mucous coating that protects it from the strong hydrochloric acid it secretes to digest food. However the much-thinner esophageal mucous coating does not protect against stomach acid. Thus, if the LES opens inappropriately or fails to close completely, stomach acids can back up and burn the esophagus, causing heartburn.

Occasional heartburn is usually harmless. However, frequent or chronic heartburn (recurring more than twice per week) is called gastroesophageal reflux disease (GERD) and requires early management. Repeated episodes of GERD can lead to esophageal inflammation (esophagitis). If the esophagus is repeatedly subjected to stomach acid and **digestive enzymes**, ulcerations, scarring, and thickening of the esophageal walls can result. This causes a narrowing of the interior of the esophagus that can affect swallowing and the peristaltic movements that send food downward. Repeated esophageal irritation also can result in Barrett's syndrome—changes in the types of cells lining the esophagus. Barrett's esophagus can develop into esophageal **cancer**.

Nighttime heartburn, affecting about 80% of heartburn sufferers, is more damaging to the esophagus than daytime heartburn. It often interferes with sleep and may trigger symptoms in **asthma** sufferers.

Gastroesophageal reflux may occur in children under age one, particularly pre-term babies or those with **cerebral palsy**. It also may be a cause of some migraine headaches. In addition, chronic heartburn can be a symptom of a gastric ulcer or coronary artery disease.

Causes and symptoms

Causes

Heartburn is caused by:

- a relaxed LES that does not close properly
- over-production of stomach acid
- increased stomach pressure
- a damaged esophagus with increased acid sensitivity

Many factors can contribute to LES malfunction:

- irregular eating, skipping meals
- smoking
- caffeine
- stress
- some medications, including diazepam (Valium), meperidine (Demerol), theophylline, morphine, prostaglandins, calcium channel blockers, nitrate heart medications, progesterone, and anticholinergic and adrenergic drugs (drugs that limit nerve reactions)
- paralysis and scleroderma (an autoimmune disease that hardens body organs)

KEY TERMS

Antacid—Common medication that neutralizes stomach acid for the short-term treatment of heartburn.

Barrett's esophagus or Barrett's syndrome—Changes in the type of cells lining the esophagus. Sometimes associated with the development of esophageal cancer.

Digestive enzymes—Proteins that catalyze the breakdown of large molecules (usually food) into smaller molecules.

Endoscopy—Procedure in which a thin, flexible scope is placed down the esophagus to examine, biopsy, and/or suture the tissue.

Esophagitis—Inflammation of the esophagus.

Esophagus—Muscular tube, about 10 in (25 cm) long, connecting the throat to the stomach.

Fundoplication—Surgical procedure that increases pressure on the LES (lower esophageal sphincter), reducing reflux.

Gastroesophageal reflux—Upward flow of stomach contents into the esophagus, causing heartburn.

Gastroesophageal reflux disease (GERD)—Frequent (more than twice a week) gastroesophageal reflux.

Hiatal hernia—Protrusion of part of the stomach through the diaphragm to a position next to the esophagus.

Hiatus—Opening in the diaphragm through which the stomach connects to the esophagus.

Histamine receptor 2 (H2) blocker—Heartburn medication that reduces the production of stomach acid.

Lower esophageal sphincter (LES)—Muscle at the base of the esophagus that opens to allow food to enter the stomach and closes to prevent reflux back into the esophagus.

Manometry—Procedure that measures pressure. In esophageal manometry, a thin, flexible catheter is placed down the esophagus to measure pressure at various points.

Peristalsis—Sequence of muscle contractions that progressively squeezes the digestive tract to push food along.

Proton pump inhibitor (PPI)—Medication that inhibits stomach acid production in severe heartburn.

Ulceration—Wound or abrasion of surface tissue.

- large meals that distend the stomach and prevent the LES from closing
- alcohol, which lowers the pressure on the LES, allowing it to relax and open. Alcohol also may irritate the esophageal lining
- weakening LES and loss of LES muscle tone with increasing age

Hiatal hernias are common among pregnant women, smokers, the obese, and those over age 50. The hiatus is an opening in the diaphragm (the large muscle that separates the chest cavity and the abdomen) through which the esophagus connects to the stomach. If the hiatus loses its tautness and shape, the stomach may protrude through, forming a pocket just below the LES where stomach acid can be trapped. These hiatal hernias can cause the LES to relax and open. Hiatal hernias may result in frequent and severe heartburn and GERD.

Various factors can increase stomach pressure, causing gastroesophageal reflux:

- obesity
- lying down within one or two hours of eating
- tight clothing
- Pregnancy causing the enlarged uterus to displace the stomach, delaying the removal of stomach contents

Eating too fast, chewing insufficiently, and **smoking** all increase stomach acid production. Smoking also dries up saliva that protects the esophagus from acid.

Many foods are known to contribute to heartburn:

- greasy, fried, or fatty foods
- spicy foods
- black pepper
- acidic foods such as tomatoes, pickles, and vinegar
- chocolate
- coffee with or without caffeine
- Peppermint or other mints

Symptoms

Heartburn itself is a symptom of gastroesophageal reflux and GERD. Heartburn sufferers may salivate excessively or regurgitate stomach contents into their mouths, leaving a sour or bitter taste.

Other symptoms of GERD include:

- difficult or painful swallowing
- sore throat
- hoarseness, laryngitis, wheezing, coughing
- pneumonia
- gingivitis, bad breath
- earache

Diagnosis

Heartburn usually is diagnosed by patient histories, symptoms, and clinical assessments. Additional procedures may be used to confirm the diagnosis, assess damage to the esophagus, and monitor the healing progress. The following diagnostic procedures are appropriate for anyone with frequent, chronic, or difficult-to-treat heartburn, or complicating GERD symptoms as listed above.

Esophageal manometry uses a thin, flexible catheter placed down the esophagus. Small openings in the catheter sense pressure at various points on the esophagus while the muscle is at rest and during swallowing. The pressures are transmitted to a computer that analyzes the wave patterns.

An upper gastrointestinal (GI) series, or "barium swallow," can reveal esophageal narrowing, ulcerations, tumors, **hiatal hernia**, or reflux episodes as they occur. X rays are taken after a patient swallows a barium (a chemical element) suspension. This procedure takes about 15 minutes. However it cannot detect structural changes associated with different degrees of esophagitis.

Upper GI endoscopy uses a thin, flexible tube to view the inside of the esophagus directly. It is performed by a gastroenterologist, a physician specializing in diagnosis and treatment of disorders of the gastrointestinal tract, or by a gastrointestinal endoscopist. Upper GI endoscopy enables the physician to distinguish the degree of esophagitis and provides an accurate profile of esophageal damage. This procedure may include a biopsy—the removal of a small piece of tissue—to examine for Barrett's syndrome or malignancies. Patients with Barrett's esophagus may have frequent examinations of the esophageal lining for early detection of precancerous cells.

Other diagnostic tests include measurements of esophageal acidity (pH), usually over a 24-hour period, using an ambulatory acid probe. The patient is given a large capsule containing an acid-sensing probe, a battery, and a transmitter. Acid in the esophagus is measured by the probe, which then transmits the information to a recorder that the patient is wearing on his belt.

Note: A burning sensation in the chest is usually heartburn and is not associated with the heart itself. About 15 percent of the annual six million U. S. emergency room visits for chest **pain** are due to heartburn. However, **angina** (one type of temporary chest pain, pressure, or discomfort) sometimes is mistaken for severe heartburn. Chest pain that radiates into the arms and is not accompanied by regurgitation is a warning sign of a possible serious heart problem. Persistent chest pain should always be evaluated by a physician.

Treatment

Herbal remedies

These herbal remedies may be used to treat heartburn:

- ginger (*Zingiber officinalis*) as a tea or candied. (Ginger may cause heartburn in some people.)
- chamomile (*Matricaria chamomilla*) tea
- slippery elm (*Ulmus fulva*) tea
- cinnamon tea
- anise (*Pimpinella anisum*), caraway, dill, and/or fennel seed tea
- cardamom (*Elettaria cardamomum*) on buttered raisin toast
- turmeric (*Curcuma domestica*) added to warm water
- marsh mallow root (*Althaea officinalis*)
- licorice (*Glycyrrhiza glabra*), especially deglycyrrhizinated licorice (DGL) (The capsules or tablets may be dissolved in the mouth or in tea or two to four chewable 380-mg wafers are taken about 20 minutes before eating. DGL should not be used more than three times per week, as repeated use can be toxic.)
- peppermint tea (Peppermint also can cause heartburn by relaxing the LES.)
- Ayurvedic (traditional East Indian) herbs

Homeopathic remedies

Homeopathic remedies for heartburn include:

- *Calcarea carbonica*
- *Nux vomica* after eating spicy foods
- *Carbo vegetalis* after eating rich foods
- *Arsenicum album* for burning pain
- *Natrum muriaticum* for nervousness, tension, and pain
- *Zinc metallicum* after eating too fast

Other remedies

A variety of other remedies and therapies may be used to treat heartburn:

- Sodium bicarbonate (baking soda) reduces esophageal acidity immediately. However, its effect is short-lived and it should not be used by people on sodium-restricted diets.
- Nutritional remedies include carrots, celery, angelica, fennel, and/or parsley. These can be combined in a juice taken before meals.
- Acupressure points Stomach 36, Spleen 6, Pericardium 6, and Conception Vessel 12. CV 12 should not be pressed just after eating or during pregnancy.
- In Chinese medicine, foods and herbs that balance and cool the qi (Chinese term for universal life energy), including radishes, radish seed, citrus fruit peels, and cardamom.
- Walking after a meal.
- Chewing gum after eating to help produce saliva for soothing the esophagus and washing acid back into the stomach.
- Relaxation therapy, visualization, and deep breathing.

Allopathic treatment

Drugs

Occasional heartburn is commonly treated with nonprescription antacids that neutralize the pH of stomach acid. The neutralized acid does not burn the esophagus. Antacids usually work within 15 minutes and their effects last one to two hours. Liquid or dissolving antacids usually are faster acting than tablets. However, antacids, if taken for too long, can cause side effects including **diarrhea** or **constipation**.

Some antacids interfere with medications for kidney or **heart disease**. Heartburn sufferers with two or more episodes per week, or with an episode lasting longer than three weeks, should not rely on antacids as the sole treatment, since they may be at risk of kidney damage or other metabolic changes.

Common antacids include Maalox, Mylanta, Alka-Seltzer, Pepto-Bismol, Riopan, and Rolaids. The active ingredient in antacids such as Tums is **calcium** carbonate. Alginate (Gaviscon) is a foaming agent that coats the esophagus and the stomach to help prevent reflux. Other antacids are made from aluminum hydroxide, magaldrate, or **magnesium** hydroxide. Some antacids contain baking soda (**sodium** bicarbonate), which may interfere with vitamin and mineral absorption during **pregnancy**.

Histamine receptor (H2) blockers, such as famotidine (Pepcid), ranitidine (Zantac), nizatidine (Axid), and cimetidine (Tagamet), decrease stomach acid secretion. They relieve heartburn in about 75% of users. However, they take 30 to 45 minutes to act and usually are taken two to four times daily for several weeks. H2 blockers are both over-the-counter (OTC) and prescription medicines. They may have side effects or interactions with other medications.

Proton pump inhibitors (PPI) are for severe heartburn. They are the most effective drugs for inhibiting acid production and allowing the esophagus to heal in GERD. It may take up to five days for PPIs to take effect. They cannot be used by people with kidney or liver problems. Although it appears safe to take PPIs for at least 10 years, the lowest effective dosage reduces the risk of side effects that may include **headache**, diarrhea, stomach pain, and interactions with other medications. Common PPIs include lansoprazole (Prevacid), omeprazole (Prilosec), rabeprazole (Aciphex), pantoprazole (Protonix), and esomeprazole (Nexium). Prilosec OTC is available in 20-milligram doses to be taken once a day for 14 days to treat frequent heartburn.

Prokinetics are drugs that strengthen the LES (lower esophageal sphincter) and increase the rate of stomach emptying. These include metoclopramide (Reglan) and bethanechol (Urecholine). These drugs frequently have side effects.

Surgery

Laparoscopic Nissen fundoplication is a surgical procedure to increase pressure on the LES by stretching and wrapping the upper part of the stomach around it. It is performed under a general anesthetic and takes one to two hours. The complete recovery period is less than two weeks.

GERD (gastroesophageal reflux disease) may be treated successfully by endoscopic suturing of the weakened LES to stop acid reflux. Studies have shown that symptoms usually improve with this procedure and the use of medications declines. Another procedure involves using electrodes to make tiny **cuts** in the LES tissues. The resulting scarring tightens the LES. These outpatient procedures take less than an hour. They are not used in cases of hiatal hernia or Barrett's esophagus.

If the esophagus has become narrowed and badly scarred from stomach acid, a procedure that stretches and widens the esophageal tissue may be used along with acid-suppressing medication. Enteryx is a liquid

that can be injected into the LES where it forms a spongy muscle implant that strengthens the LES.

Prognosis

Occasional heartburn, without esophageal damage, has an excellent prognosis. Esophageal damage that is treated with a program that promotes healing also has an excellent prognosis. Infants usually outgrow gastroesophageal reflux by age one.

Untreated heartburn and GERD may lead to bleeding, esophageal ulcers, and **infections**. With treatment, the damaged tissue that forms ulcers can heal. About ten percent of patients with GERD experience esophageal narrowing from acid damage that leads to the formation of scar tissue in the lower esophagus. GERD also can cause **laryngitis**, **bronchitis**, and aspiration **pneumonia**. After five years of heartburn, the risk of developing Barrett's esophagus increases. About five percent of GERD patients have Barrett's syndrome. This condition is incurable and may lead to cancer. The prognosis for esophageal cancer is very poor. There is a strong likelihood of painful illness and a less than five percent chance of survival for more than five years.

Prevention

Due to the risk of GERD, Barrett's syndrome, and esophageal cancer, prevention of heartburn is very important. Heartburn usually is preventable with dietary and lifestyle changes.

Dietary adjustments to eliminate many causes of heartburn include:

- eating smaller, more frequent meals to reduce pressure on the LES
- eating slowly, chew thoroughly, and take deep breaths between bites
- avoiding caffeine, chocolate, onions, spicy foods, and mint, all of which tend to increase stomach acid and relax the LES
- avoiding fatty, fried, and greasy foods. Fatty foods relax the LES and slow stomach emptying, and fat consumption has been linked to GERD
- avoiding milk, garlic, peppers, and carbonated beverages
- avoiding nicotine
- avoiding citrus fruits and juices and tomato-based foods, which are acidic and can irritate an inflamed esophagus
- replacing meat at dinner with carbohydrates and easier-to-digest proteins such as rice, beans, and pastas
- avoiding alcohol
- adding the spice annato (*Bix orellana*) or bouquet garni to foods
- drinking tea made with crushed caraway seeds with meals
- controlling body weight

Lifestyle changes that can alleviate heartburn include:

- avoiding drugs known to contribute to heartburn, including aspirin or other nonsteroidal anti-inflammatories
- avoiding clothing that fits tightly around the abdomen
- not lying down until the stomach is empty—within about three hours of eating
- elevating the head of the bed six to nine inches to prevent nighttime heartburn
- avoiding strenuous exercise for two to three hours after a meal

Resources

BOOKS

Berkson, Lindsey. *Healthy Digestion the Natural Way: Pre venting and Healing Heartburn, Constipation, Gas, Diarrhea, Inflammatory Bowel and Gallbladder Dis eases, Ulcers, Irritable Bowel Syndrome, Food Allergies and More*. New York: Wiley, 2000.

Castleman, Michael. *Blended Medicine: The Best Choices in Healing*. Rodale, 2000.

Cheskin, Lawrence J., and Brian E. Lacy. *Healing Heartburn*. Rodale, 2000.

Goldmann, David R., and David A. Horowitz, editors. *American College of Physicians Complete Home Medi cal Guide*. 2nd ed. New York: DK, 2003.

Litin, Scott C., editor. *Mayo Clinic Family Health Book*. 3rd ed. New York: HarperResource, 2003.

Minocha, Anil, and Christine Adamec. *How to Stop Heart burn: Simple Ways to Heal Heartburn and Acid Reflux*.. New York: Wiley, 2001.

Shimberg, Elaine Fantle. *Coping with Chronic Heartburn: What You Need to Know About Acid Reflux and GERD*. New York: St. Martin's Press, 2001.

Sklar, Jill, and Annabel Cohen. *Eating for Acid Reflux: A Handbook and Cookbook for Those with Heartburn*. Marlowe & Company, 2003.

PERIODICALS

"Gastrointestinal Reflux: New Guidelines Set Standard on Test to Diagnose Acid Reflux, Heartburn." *Heath & Medicine Week* (December 22, 2003): 284 285.

"New Bard Endoscopic Suturing System Treats Chronic Heartburn." *Journal of Clinical Engineering* 28 (April June 2003): 88 90.

Sadovsky, Richard. "Management of Refractory Heart burn: A Review." *American Family Physician* 69 (Feb ruary 1, 2004): 698.

Savarino, Vincenzo and Pietro Dulbecco. "Optimizing Symptom Relief and Preventing Complications in Adults with Gastro Oesophageal Reflux Disease." *Digestion* 69, Supplement 1 (2004): 9 16.

Urbach, David R., et al. "Whither Surgery in the Treatment of Gastroesophageal Relux Disease (GERD)?" *Cana dian Medical Association Journal* 170 (January 20, 2004): 219 221.

ORGANIZATIONS

American Gastroenterological Association (AGA). 4930 Del Ray Avenue, Bethesda, MD 20814. (310 654 2055. http://www.gastro.org/.

National Digestive Diseases Information Clearinghouse. 2 Information Way, Bethesda, MD 20892 3570. (800) 891 5389. (301)654 3810. nddic@info.niddk.nih.gov. http://digestive.niddk.nih.gov/.

The National Heartburn Alliance. 303 East Wacker Drive, Suite 440, Chicago, IL 60601. (877) 471 2081.nhbain formation@heartburnalliance.org. http://www.heart burnalliance.org/.

Margaret Alic, PhD

Heavy metal poisoning

Definition

Heavy metal poisoning is the toxic accumulation of heavy metals in the soft tissues of the body.

Description

The term "heavy metal" has been defined in a number of ways. By one definition, a heavy metal is any chemical element with a specific gravity (a measure of density) greater than 4.0. Any toxic metal, no matter what its specific gravity, may also be called a heavy metal. The heavy metals most often implicated in human poisoning are lead, mercury, arsenic, and cadmium. Some heavy metals, such as **zinc**, **copper**, **chromium**, **iron**, and **manganese**, are required by the body in small amounts but can be toxic in larger quantities. Heavy metals may enter the body through food, water, or air, or by absorption through the skin. Once in the body, they compete with and displace essential minerals such as zinc, copper, **magnesium**, and **calcium**, and interfere with organ system function. People may come in contact with heavy metals in industrial work, pharmaceutical manufacturing, and agriculture. Children may be poisoned as a result of playing in contaminated soil.

Sources of exposure for some heavy metals include the following:

- lead: old paint, leaded gasoline, old pipes
- mercury: contaminated fish and industrial and agricultural wastes
- cadmium: industrial waste, insecticides, old galvanized pipes
- arsenic: insecticides and industrial processes, even drinking water

Causes and symptoms

Symptoms of heavy metal poisoning vary, depending on the nature and quantity of the heavy metal and whether it was ingested or inhaled. Patients who ingest a heavy metal may complain of cramps, **nausea**, **vomiting**, **diarrhea**, stomach **pain**, **headache**, sweating, and a metallic taste in the mouth. Mercury can cause skin **burns** if it has touched the skin, and inhaled mercury vapor can cause severe inflammation of the lungs. If lead is inhaled in the form of lead dust, **insomnia**, headache, mania, and convulsions may occur. In severe cases of heavy metal poisoning, patients exhibit obvious impairment of cognitive, motor, and language skills. The expression "mad as a hatter" comes from the **mercury poisoning** prevalent in seventeenth-century France among hatmakers who soaked animal hides in a solution of mercuric nitrate to soften the hair.

Diagnosis

Heavy metal poisoning may be detected using blood, urine, and stool tests, hair and tissue analysis, or x rays. In children, blood lead levels above 80 mcg/dL generally indicate **lead poisoning**. However, significantly lower levels (30 mcg/dL) can cause mental retardation and other cognitive and behavioral problems in chronically exposed children. The Centers for Disease Control and Prevention considers a blood lead level of 10 mcg/dL or higher in children a cause for concern. In adults, symptoms of lead poisoning are usually seen when blood lead levels exceed 80 mcg/dL for a number of weeks. Blood levels of mercury should not exceed 3.6 mcg/dL, whereas urine levels should not exceed 15 mcg/dL. Symptoms of mercury poisoning may appear when mercury levels exceed 20 mcg/dL in blood and 60 mcg/dL in urine. Some authorities have recommended testing of hair to determine mercury levels in the body. As of 2008, however, such tests were believed to have questionable value at best.

Since arsenic is rapidly cleared from the blood, blood arsenic levels may not be very useful in diagnosis. Arsenic in the urine (measured in a 24-hour collection following 48 hours without eating seafood) may exceed 50 mcg/dL in people with arsenic poisoning. If

acute arsenic poisoning is suspected, an x ray may reveal ingested arsenic in the abdomen (since arsenic is opaque to x rays). Arsenic may also be detected in the hair and nails for months following exposure. Cadmium toxicity is generally indicated when urine levels exceed 10 mcg/dL of creatinine and blood levels exceed 5 mcg/dL.

Treatment

Emergency treatment for acute poisoning, especially in children, can be handled by calling a poison control line at (800) 222-1222, or by dialing 911. Alternative practitioners often rely on the same chelating agents used by medical doctors to treat heavy metal poisoning, but they also use natural supplements and additional techniques to assist the body's own **detoxification** processes. One highly contested issue between alternative medicine and mainstream dentistry concerns mercury poisoning. Alternative practitioners believe that there is a large body of evidence suggesting that silver amalgam tooth fillings, which contain mercury, are a major factor in mercury poisoning. For individuals with high mercury levels in their bodies, they recommend that all mercury-containing tooth fillings be removed by a holistic dentist. A large number of studies have been conducted on the relationship of mercury from dental amalgams and human health. A comprehensive review of such studies conducted between 1996 and 2004 found "little evidence to support a causal relationship between mercury fillings and human health problems." Authors of the report noted, however, that further research was needed to obtain a definitive answer about the issue.

Dietary changes are used to support the treatment of heavy metal poisoning. Detoxification **diets** are predominantly vegetarian and reduce or avoid foods that may **stress** the immune system, such as processed foods, fried foods, sugar, fat, alcohol, **caffeine**, meat, and dairy products. Organic foods are recommended to avoid exposure to pesticides and chemicals. Detoxification diets include plenty of high-fiber foods, including oat bran and **psyllium** seeds, to help cleanse the digestive tract. Apples, pears, and legumes are high in pectins, which are believed to have chelating effects on heavy metals. Foods high in **antioxidants** are recommended, such as fruits, vegetables, and fresh juices. Sulfur-containing foods such as **garlic**, onions, and eggs (organically produced) are utilized, as are dark-green leafy vegetables that contain high amounts of chlorophyll. Foods that may contain heavy metals are avoided, including many fish and shellfish. Factory-farmed chicken and eggs are avoided as well because chickens are often fed fish meal. There is some evidence that eating tofu may reduce lead levels in the blood. Tofu is rich in calcium, which may help reduce the blood's ability to absorb and retain lead.

Nutritional supplements include antioxidant vitamins A, C, and E, and multimineral supplements that contain calcium, iron, magnesium, copper, chromium, **selenium**, and zinc. Cysteine, **methionine**, L-glutathione, and DMSA (dimethyl succinate) are other supplements. Herbal support includes herbs that have detoxification effects, such as **milk thistle**, burdock, and numerous others. **Spirulina** and **chlorella** sea algae are used as well, and **acidophilus** helps rebuild the digestive tract.

Homeopathic remedies, which prompt the body's detoxification mechanisms, have shown success with heavy metal poisoning. Detoxification therapies are also highly recommended, including **fasting**, sweating, colonics, and therapeutic vomiting. **Ayurvedic medicine** has an intensive detoxification and healing program called **panchakarma**.

Allopathic treatment

In an emergency, patients should call 911 or a poison control hotline at (800) 222-1222. The treatment for most heavy metal poisoning is **chelation therapy**. A chelating agent specific to the metal involved is given orally, intramuscularly, or intravenously. The three most common chelating agents are edetate calcium disodium (CaEDTA), dimercaprol (BAL), and penicillamine. Succimer (DMSA) is used for children suffering from lead poisoning. The chelating agent encircles and binds to the metal in the body's tissues, forming a complex, which is then released from the tissue and travels in the bloodstream. The complex is filtered out of the blood by the kidneys and excreted in the urine. This process may be lengthy and painful and typically requires hospitalization. Chelation therapy is effective in treating lead, mercury, and arsenic poisoning, but it is not useful in treating **cadmium poisoning**. To date, no treatment has been proven effective for cadmium poisoning. In cases of acute mercury or arsenic ingestion, vomiting may be induced. Washing out the stomach (gastric lavage) may also be useful. The patient may also require treatment such as intravenous fluids for complications of poisoning such as shock, **anemia**, and kidney failure.

Expected results

The chelation process can only halt further effects of the poisoning; it cannot reverse neurological damage already sustained.

KEY TERMS

Chelation—The process by which a molecule encircles and binds to a metal and removes it from tissue.

Heavy metals—Chemical elements that have a specific gravity (a measure of density) at least four times that of water, generally with harmful effects on the human body.

Prevention

Because exposure to heavy metals is often an occupational hazard, protective clothing and respirators should be provided and worn on the job. Protective clothing should then be left at the work site and not worn home, where it could transfer toxic dust to family members. Industries are urged to reduce or replace the heavy metals in their processes wherever possible. Exposure to environmental sources of lead, including lead-based paints, plumbing fixtures, vehicle exhaust, and contaminated soil, should be reduced or eliminated. In the late 2000s, the use of lead was banned in most applications in the United States, such as in leaded fuels and most types of paints.

Resources

BOOKS

Flomenbaum, Neal E., et al. *Goldfrank's Toxicologic Emergencies,* 8th ed. New York: McGraw Hill Professional, 2006.

Olson, Kent R. *Poisoning and Drug Overdose,* 5th ed. New York: McGraw Hill Medical, 2006.

PERIODICALS

Clifton, J. C. "Mercury Exposure and Public Health." *Pediatric Clinics of North America* (April 2007): 237 269.

Lynes, Michael A., et al. "Heavy Metal Ions in Normal Physiology, Toxic Stress, and Cytoprotection." *Annals of the New York Academy of Sciences* (October 2007): 159 174.

"Traditional Chinese, Indian Meds Linked to Heavy Metal Poisoning." *Reactions* (February 10, 2007): 2.

OTHER

"Heavy Metal Poisoning." Alternative Doctor Anti Ageing Pages. http://www.alternative doctor.com/anti ageing/heavy_metal.html. (February 11, 2008).

Hoekman, Theodore B. "Heavy Metal Toxicology." http://www.hbci.com/~wenonah/hydro/heavmet.htm. (Feb ruary 11, 2008).

Soghoian, Samara. "Toxicity, Heavy Metals." http://www.emedicine.com/EMERG/topic237.htm. (February 11, 2008).

ORGANIZATIONS

American Association of Poison Control Centers, 3201 New Mexico Ave., Suite 310, Washington, DC, 20016, (800) 222 1222, http://www.aapcc.org.

American Holistic Medical Association, One Eagle Valley Court, Suite 201, Broadview Heights, OH, 44147, (440) 838 1010, http://www.holisticmedicine.org.

Center for Occupational and Environmental Medicine, 7510 Northforest Dr., North Charleston, SC, 29420, (843) 572 1600, http://www.coem.com.

Douglas Dupler
Teresa G. Odle
David Edward Newton, Ed.D.

Heel spurs

Definition

A heel spur is a bony projection on the sole (bottom) of the heel bone. This condition may accompany or result from severe cases of inflammation to the structure called *plantar fascia*. The plantar fascia is a fibrous band of connective tissue on the sole of the foot, extending from the heel to the toes.

Description

Heel spurs are a common foot problem resulting from excess bone growth on the heel bone. The bone growth is usually located on the underside of the heel bone, and may extend forward toward the toes. A painful tear in the plantar fascia between the toes and heel can produce a heel spur and/or inflammation of the plantar fascia. Because this condition is often correlated to a decrease in the arch of the foot, it is more prevalent after the ages of six to eight years, when the arch is fully developed.

Causes and symptoms

One frequent cause of injury to the plantar fascia is *pronation*. Pronation is defined as the inward and downward action of the foot that occurs while walking, so that the foot's arch flattens toward the ground (fallen arch). A condition known as excessive pronation creates a mechanical problem in the foot, and the portion of the plantar fascia attached to the heel bone can stretch and pull away from the bone. This can occur especially while walking and during athletic activities.

Some symptoms at the beginning of this condition include **pain** and swelling, and discomfort when pushing off with the toes during walking. This movement of the

KEY TERMS

Genu valgus—Deformity in which the legs are curved inward so that the knees are close together, nearly or actually knocking as a person walks with ankles widely apart.

Plantar fascia—A tough fibrous band of tissue surrounding the muscles of the sole of the foot.

Plantar fascitis—Inflammation of the plantar fascia.

Pronation—The lowering or descending of the inner edge of the foot while walking.

foot stretches the fascia that is already irritated and inflamed. If this condition is not treated, pain will be noticed in the heel when a heel spur develops in response to the **stress**. This is a common condition among athletes and others who run and jump a significant amount.

An individual with the lower legs turning inward, a condition called *genu valgus* or "knock knees," can have a tendency toward excessive pronation. This can lead to a fallen arch and problems with the plantar fascia and heel spurs. Women tend to suffer from this condition more than men. Heel spurs can also result from an abnormally high arch.

Other factors leading to heel spurs include a sudden increase in daily activities, an increase in weight, or less cushion on the bottom of the heel due to old age. A significant increase in training intensity or duration may cause inflammation of the plantar fascia. High heel shoes, improperly fitted shoes, and shoes that are too flexible in the middle of the arch or bend before the toe joints will cause problems with the plantar fascia and possibly lead to heel spurs.

Bone spurs may cause sudden, severe pain when putting weight on the affected foot. Individuals may try to walk on their toes or ball of the foot to avoid painful pressure on the heel spur. This compensation during walking or running can cause additional problems in the ankle, knee, hip, or back.

Diagnosis

A thorough history and physical exam is always necessary for the proper diagnosis of heel spurs and other foot conditions. X rays of the heel area are helpful, as excess bone production will be visible.

Treatment

Acupuncture and **acupressure** can be used to address the pain of heel spurs, in addition to using friction massage to help break up scar tissue and delay onset of bony formations. Physical therapy may help relieve pain and improve movement. **Feldenkrais** method could be especially helpful for retraining some of the compensation movements caused by the pain from the spur. **Guided imagery** or a light massage on the foot may help to relieve some of the pain. Other treatments include low-gear cycling and pool running. Some chiropractors approve of moderate use of aspirin or ibuprofen, or other appropriate anti-inflammatory drugs. **Chiropractic** manipulation is not recommended, although chiropractors may offer custom-fitted shoe orthotics and other allopathic-type treatments outlined below.

Allopathic treatment

Heel spurs and plantar fascitis (inflammation of the plantar fascia) are usually controlled with conservative treatment. Early intervention includes stretching the calf muscles while avoiding reinjury to the plantar fascia. Decreasing or changing activities, losing excess weight, and improving the fit of shoes are all important measures to decrease foot pain. Modification of footwear includes well padded shoes with a raised heel and better arch support. Shoe inserts recommended by a healthcare professional are often very helpful when used with exercises to increase the strength of the foot muscles and arch. The inserts prevent excessive pronation and continued tearing of the plantar fascia.

To aid in the reduction of inflammation, applying ice for 10–15 minutes after activities and the use of anti-inflammatory medications, such as aspirin or ibuprofen, can be helpful. Corticosteroid injections may also be used to reduce pain and inflammation. Physical therapy can be beneficial with the use of heat modalities, such as ultrasound, that create a deep heat and reduce inflammation. If the pain caused by inflammation is constant, keeping the foot raised above the heart and/or compressed by wrapping with a bandage will help. Taping can help speed the healing process by protecting the fascia from reinjury, especially during stretching and walking.

In 2000, a number of U.S. podiatrists experimented with a new technology known as Extracorporeal Pressure Wave Treatment (EPWT). This technology is similar to lithotripsy, which uses sound waves to break up **kidney stones**. Cost of EPWT was roughly comparable to that of surgery. Initial reports from practitioners using the treatment were positive.

Heel surgery

When chronic heel pain fails to respond to conservative treatment, surgical treatment may be necessary.

Heel surgery can provide pain relief and restore mobility. The type of procedure used is based on examination and usually consists of releasing the excessive tightness of the plantar fascia, called a plantar fascia release. The procedure may also include removal of heel spurs.

Expected results

Usually, heel spurs are curable with conservative treatment. If not, heel spurs are curable with surgery, although there is the possibility of them growing back. About 10% of those who continue to see a physician for plantar fascitis have it for more than a year. If there is limited success after approximately one year of conservative treatment, patients are often advised to have surgery.

Prevention

To prevent this condition, wearing properly fitted shoes with good arch support is very important. If a person is overweight, weight loss can help diminish stress on the feet and help prevent foot problems. For those who **exercise** frequently and intensely, proper stretching is always necessary, especially when there is an increase in activities or a change in running technique. It is not recommended to attempt to work through the pain, as this can change a mild case of heel spurs and plantar fascitis into a long-lasting and painful condition.

In 2002, researchers attempted to compare the effects of various running techniques on pronation and resulting injuries like stress **fractures** and heel spurs. They suggested that it is possible to teach runners to stride in such a way as to minimize impact forces. One way is to lower running speed. Another is to take longer rest periods following a run.

Resources

BOOKS

Perkins, Kenneth E. "Lower Extremity Orthotics in Geriat ric Rehabilitation." In *Geriatric Physical Therapy,* edited by Andrew Guccione. St. Louis, Mo.: Mosby Year Book Inc., 1993.

PERIODICALS

Feeny, Tracy. "If The Shoe Fits." *Advance Magazine for Physical Therapists.* (July 1997): 7.

Hreljac, Alan. "Technique Impacts Overuse Injuries in Runners Research Suggests Impact Forces and Rate of Pronation Influence Risk of Injury." *Biomechanics.* (September 1, 2002): 51.

ORGANIZATIONS

American Orthopedic Foot and Ankle Society. 222 South Prospect, Park Ridge, IL 60068.

American Podiatry Medical Association. 9312 Old George town Road, Bethesda, MD 20814.

OTHER

Roberts. *Plantar Fascitis*. www.heelspurs.com (1998).

David Helwig

Heliotrope *see* **Valerian**

Hellerwork

Definition

Hellerwork is a system of bodywork that combines deep tissue massage, body movement education, and verbal dialogue. It is designed to realign the body's structure for overall health, improvement of posture, and reduction of physical and mental **stress**.

Origins

Joseph Heller (1940–) developed Hellerwork, a system of structural integration patterned after **Rolfing**. Although Heller received a degree in engineering and worked for NASA's Jet Propulsion Laboratory in Pasadena, CA, he became interested in humanistic psychology in the 1970s. He spent two years studying bioenergetics and Gestalt therapy as well as studying under architect and futurist Buckminster Fuller (1895–1983), flotation tank therapy developer John Lilly, family therapist Virginia Satir, and body movement pioneer Judith Aston.

During this period, he trained for six years with Dr. Ida P. Rolf (1896-1979), the founder of Rolfing, and became a certified Rolfer in 1972. After Heller developed his own system of bodywork, he founded Hellerwork in 1979 and established a training facility in Mt. Shasta, California, where he continues his work.

Benefits

Hellerwork improves posture and brings the body's natural structure into proper balance and alignment. This realignment can bring relief from general aches and pains; improve breathing; and relieve physical and mental stress. Hellerwork has also been used to treat such specific physical problems as chronic back, neck, shoulder, and joint **pain** as well as repetitive stress injuries, including **carpal tunnel**

KEY TERMS

Bioenergetics—A system of therapy that combines breathing and body exercises, psychological therapy, and the free expression of emotions to release blocked physical and psychic energy.

Bodywork—A term that covers a variety of therapies that include massage, realignment of the body, and similar techniques to treat deeply ingrained stresses and traumas carried in the tissues of the body.

Chronic—A disease or condition that progresses slowly but persists or reoccurs over time.

Fascia—The sheet of connective tissue that covers the body under the skin and envelops the muscles and various organs.

Gestalt therapy—A form of therapy that focuses on helping patients reconnect with their bodies and their feelings directly, as contrasted with verbal intellectual analysis.

Kinesiology—The study of the anatomy and physiology of body movement, particularly in relation to therapy.

Rolfing—A deep-tissue therapy that involves manipulating the body's fascia to realign and balance the body's structure.

syndrome. Hellerwork is also used to treat and prevent athletic injuries.

Description

Hellerwork is based largely on the principles of Rolfing, in which the body's connective tissue is manipulated or massaged to realign and balance the body's structure. Because Heller believes that physical realignment is insufficient, however, he expanded his system to include movement education and verbal dialogue as well as deep tissue massage.

Connective tissue massage

The **massage therapy** aspect of Hellerwork is designed to release the tension that exists in the deep connective tissue, called fascia, and return it to a normal alignment. The fascia is plastic and highly adaptable; it can tighten and harden in response to the general effects of gravity on the body, other ongoing physical stresses, negative attitudes and emotions, and periodic physical traumas. One example of ongoing physical stress is carrying a briefcase, which pulls down the shoulder on one side of the body. Over time, the connective tissue becomes hard and stiff; the body becomes adapted to that position even when the person is not carrying a briefcase. In trying to adjust to the uneven weight distribution, the rest of the body becomes unbalanced and out of proper alignment.

Heller believes that as people age, more of these stress and trauma patterns become ingrained in the connective tissue, further throwing the body out of alignment. As stress accumulates, the body shortens and stiffens, a process commonly attributed to **aging**. Hellerwork seeks to recondition the body and make the connective tissue less rigid.

Movement education

The second component of Hellerwork, movement education, trains patients in the proper physical movements needed to keep the body balanced and correctly aligned. Movement education focuses on common actions, such as sitting, standing, and walking. Hellerwork practitioners also teach better patterns of movement for activities that are specific to each individual, such as their job and favorite sports or social activities.

Verbal dialogue

Verbal dialogue is the third aspect of Hellerwork. It is designed to teach awareness of the relationships among emotions, life attitudes, and the body. Hellerwork practitioners believe that as patients become responsible for their attitudes, their body movements and patterns of self-expression improve. Dialogue focuses on the theme of each session and the area of the body that is worked on during that session.

Hellerwork consists of eleven 90-minute sessions costing about $90–100 each. The first three sessions focus on the surface layers of the fascia and on developmental issues of infancy and childhood. The next four sessions are the core sessions and work on the deep layers and on adolescent developmental issues. The final four treatments are the integrative sessions, and build upon all the previous ones, while also looking at questions of maturity.

Preparations

No advance preparations are required to begin Hellerwork treatment. The treatment is usually done on a massage table with the patient wearing only undergarments.

Precautions

Since Hellerwork involves vigorous deep tissue massage, it is often described as uncomfortable and

sometimes painful, especially during the first several sessions. As it requires the use of hands, it may be a problem for people who do not like or are afraid of being touched. It is not recommended as a treatment for any disease or a chronic inflammatory condition such as arthritis, and can worsen such a condition. Anyone with a serious medical condition, including **heart disease**, diabetes, or respiratory problems, should consult a medical practitioner before undergoing Hellerwork.

Side effects

There are no reported serious side effects associated with Hellerwork when delivered by a certified practitioner to adults and juveniles.

Research and general acceptance

As most alternative or holistic treatments, there is little mainstream scientific research documenting the effectiveness of Hellerwork therapy. Since the deep tissue massage aspect of Hellerwork is similar to Rolfing, however, several scientific studies of Rolfing may be useful in evaluating Hellerwork. A 1988 study published in the *Journal of the American Physical Therapy Association* indicated that Rolfing stimulates the parasympathetic nervous system, which can help speed the recovery of damaged tissue. A 1997 article in *The Journal of Orthopaedic and Sports Physical Therapy* reported that Rolfing can provide effective and sustained pain relief from lower back problems.

Training and certification

Hellerwork practitioners are certified by Hellerwork and must complete 1,250 hours of training, including courses in anatomy, psychology, massage, and kinesiology.

Resources

BOOKS

Bradford, Nikki, ed. *Alternative Healthcare*. San Diego, CA: Thunder Bay Press, 1997.

Claire, Thomas. *Bodywork: What Type of Massage to Get and How to Make the Most of It*. New York: William Morrow and Co., 1995.

Golten, Roger. *The Owner's Guide to the Body*. London: Thorsons, 1999.

Heller, Joseph. *Bodywise*. Berkeley, CA: Wingbow Press, 1991.

Levine, Andrew S., and Valerie J. Levine. *The Bodywork and Massage Sourcebook*. Lincolnwood, IL: Lowell House, 1999.

Nash, Barbara. *From Acupressure to Zen: An Encyclopedia of Natural Therapies*. Alameda, CA: Hunter House, Inc., 1996.

ORGANIZATIONS

Hellerwork. 406 Berry St. Mt. Shasta, CA 96067. (530) 926 2500. http://www.hellerwork.com.

Ken R. Wells

Hemorrhoids

Definition

Hemorrhoids, which are also called piles, is a condition of weakened and swollen veins in the anus or lower rectum. They often go unnoticed and usually clear up after a few days, but can also cause long-lasting discomfort of the rectum such as **pain**, **itching**, and bleeding. Hemorrhoids can be divided into two types: Internal hemorrhoids lie inside the anus or lower rectum; external hemorrhoids lie outside the anal opening. Both can be present at the same time. Sometimes a blood clot forms in an external hemorrhoid and inflammation and a painful lump develops. This condition is called a thrombosed hemorrhoid.

Description

Hemorrhoids are a very common medical complaint. More than 75% of Americans have hemorrhoids at some point in their lives, typically after age 30. Men are more likely than women to suffer from hemorrhoids that are serious enough to require professional treatment.

During a bowel movement, veins in the anus are protected from damage by expanding to drain blood away from the area. The veins are normally somewhat elastic, and they snap back to their regular size after defecation is finished. However, repeated straining due to **constipation** or hardened stools causes the veins to be swollen and stretched out of shape. The swelling also triggers nerves in the area, causing itchiness and a sensation of fullness in the bowel. In addition, straining may cause the rupture of blood vessels and bleeding at the anus.

Causes and symptoms

Aging, **obesity**, **pregnancy**, chronic constipation or chronic **diarrhea**, excessive use of enemas or laxatives, straining during bowel movements, and spending too much time on the toilet are all factors that can

contribute to the development of hemorrhoids. In some people there is also a genetic tendency to have fragile veins that are prone to developing hemorrhoids and **varicose veins**.

The most common symptom of internal hemorrhoids is bright red blood in the toilet bowl or on one's feces or toilet paper. When hemorrhoids remain inside the anus they are almost never painful, but they can protrude outside the anus and become irritated and sore. Such hemorrhoids are called prolapsed hemorrhoids. These sometimes move back into the anal canal on their own or can be pushed back inside; however, they may remain permanently outside the anus until treated by a doctor. Small external hemorrhoids usually do not produce symptoms. Larger ones, however, can be painful and interfere with sitting, walking, defecating, and cleaning the anal area after a bowel movement.

Diagnosis

Diagnosis of hemorrhoids begins with a visual examination of the anus, followed by an internal manual examination. The doctor may also insert an anoscope, a small tube with a light that can be used to view the anal canal. More serious problems may be ruled out using a sigmoidoscope or colonoscope to inspect the colon.

Treatment

An herbal sitz bath using **witch hazel**, *Hamamelis virginiana,* may shrink hemorrhoids and ease discomfort. A strong infusion should be prepared by adding a gallon of boiling water to eight ounces of the dry herb, and then letting this mixture steep overnight. The infusion can be used several times as a 15-minute soak. Witch hazel can also be wiped directly over external hemorrhoids. In addition, an ointment formulated of **plantain**, *Plantago* spp. and **yarrow**, *Achillea millefolium,* will reportedly reduce pain and swelling.

Chinese herbal medicine may be formulated to treat Spleen Qi deficiency or heat in the lower burner. Hemp seeds are recommended for constipation. Daily helpings of foods that soften the stools and make them easier to pass is recommended by **traditional Chinese medicine** (TCM); examples of these include carrots, broccoli, dried persimmons and unripe figs. **Acupuncture** and **acupressure** are also recommended.

Homeopathy offers a gentle treatment solution for hemorrhoids. It is, therefore, especially appropriate for use during pregnancy. Suggested remedies include Aesculus hippocastanum 30c, Hamamelis virginiana 6c, and Calcarea fluorica 6c. Homeopathic and herbal rectal suppositories are available.

KEY TERMS

Anus—The opening at the lower end of the rectum. The anus and rectum are both part of the large intestine.

Constipation—Difficulty passing stools, infrequent stools, or insufficient stools.

Defecate—Pass feces through the anus for elimination.

Heat—In traditional Chinese medicine (TCM), a disease condition characterized by intolerance for cold, deficient fluids, and irritability, among other things.

Ligation—Tying off a blood vessels or other tube with wire or suture, usually during surgery.

Lower burner—A TCM term for the kidneys.

Prolapsed—Referring to an organ fallen down from its normal body position.

Qi—In TCM, the vital energy that is the foundation for all physical and mental activity.

Rectum—The lower section of the large intestine. After food has passed through the stomach and intestines and been digested, the leftover material, in the form of feces, enters the rectum, where it stays until defecation.

Sitz bath—A warm water bath, sometimes including medications or herbs, that is taken in the sitting position, with water covering only the hips and buttocks.

Spleen—In TCM, all the organs considered necessary for extracting and using nutrients.

Varicose veins—Swollen veins that can no longer maintain proper blood pressure.

Allopathic treatment

Hemorrhoids can often be effectively dealt with by dietary and lifestyle changes. Avoiding constipation is important, therefore adding fiber to the diet is recommended. Bulk laxatives and fiber supplements such as Metamucil or Citrucel may be suggested. After each bowel movement, wiping with a moistened tissue or pad sold for that purpose helps lessen irritation. A warm sitz bath for about 10 or 15 minutes two to four times a day can ease hemorrhoid pain. A cool compress or ice pack to reduce swelling is also recommended. Many people

find temporary relief using over-the-counter hemorrhoid creams and foams. These products, however are not receommended during pregnancy.

When painful hemorrhoids do not respond to home-based remedies, professional medical treatment is necessary. Rubber band ligation is probably the most widely used of the many treatments for internal hemorrhoids. It is also the least costly for the patient. This procedure is performed on an outpatient basis. An applicator is used to place one or two small rubber bands around the base of the hemorrhoid, cutting off the blood supply. After 3 to 10 days in the bands, the hemorrhoid falls off, leaving a sore that heals in a week or two. Because internal hemorrhoids are located in a part of the anus that does not sense pain, anesthesia is unnecessary and the procedure is painless in most cases. The procedure may need to be repeated a few weeks later. After five years, 15–20% of patients experience a recurrence of internal hemorrhoids, but in most cases all that is needed is another banding.

External hemorrhoids, and some prolapsed internal hemorrhoids, are removed by conventional surgery in a hospital. Depending on the circumstances, this may require anesthesia. Full healing takes two to four weeks, but most people are able to resume normal activities at the end of a week. Hemorrhoids seldom return after surgery.

Expected results

Hemorrhoids are rarely life-threatening. Most clear up after a few days without medical treatment. However, because **colorectal cancer** and other digestive system diseases can cause anal bleeding and other hemorrhoid symptoms, people should always consult a healthcare practitioner when hemorrhoid symptoms occur.

Prevention

A **high-fiber diet**, daily **exercise**, and losing excess weight are recommended to maintain healthy digestion and elimination. To prevent hemorrhoids by strengthening the veins of the anus, rectum, and colon and increasing circulation, blackberries, blueberries, cherries and **vitamin C** are recommended. Tinctures of **butcher's broom** (*Ruscus aculeatus*, and **horse chestnut** (*Aesculus hippocastanum*), plant pigments (called flavonoids) found in fruit and fruit products, tea, and soy also are recommended. It should be noted that horse chestnut, along with commercial hemorrhoid preparations, is contraindicated during pregnancy.

Drinking water with a high-fiber meal or supplement will cause the stools to be softer and easier to pass, reducing straining. Constipation should be avoided, and good toilet habits should be cultivated. Promptly responding to the urge to defecate will help encourage regular bowel movements. Defecation should be done without rushing or straining. A squatting position over the toilet or having the feet raised on a small bench or footstool will also improve elimination. Reading, working or watching television are discouraged, because they entail prolonged sitting on the toilet, which increases the strain placed on anal and rectal veins. Perfumed soaps or toilet waters may irritate the anal area and should be avoided, as should excessive cleaning, rubbing, or wiping.

Resources

BOOKS

The Burton Goldberg Group, eds. *Alternative Medicine: The Definitive Guide*. Washington: Future Medicine Pub lishing, 1993.

Lininger, D.C., Skye, editor in chief, et al. *The Natural Pharmacy*. California: Prima Health, 1998.

Simons, M.D., Anne, Bobbie Hasselbring, and Michael Castleman. *Before You Call the Doctor: Safe, Effective Self Care for Over 300 Common Medical Problems*. New York: Fawcett Columbine, 1992.

PERIODICALS

Pfenninger, John L. Modern Treatments for Internal Hae morrhoids. *British Medical Journal*, 1997.

Surrell, James. Nonsurgical Treatment Options for Internal Hemorrhoids. *American Family Physician* (September 1995).

ORGANIZATIONS

National Digestive Diseases Information Clearinghouse. 2 Information Way, Bethesda, MD 20892 3570. http://www.niddk.nih.gov/health/digest/nddic.htm

Patience Paradox

Hepar sulphuris

Description

Hepar sulphuris is a homeopathic remedy that was created by Samuel Hahnemann, the father of **homeopathy**. Hahnemann combined the inner layer of oyster shells (*Calcium carbonica*) with flowers of **sulfur** and burned them to create *Hepar sulphuris calcareum*, or *Hepar sulph*. as it is commonly called. It is also known as **calcium** sulfide or Hahnemann's calcium sulfide. *Hepar* is the Latin word for liver, and as certain compounds of sulfur had the color of liver, the remedy was so named.

Calcium sulfide was once used as a treatment for **mercury poisoning**, **gout**, **itching**, rheumatism, goiter, and swellings from **tuberculosis**. Now it is used in veterinary medicine, and in the manufacture of medicine, luminous paint, and hair removal products.

Although *Hepar sulph.* has the chemical properties of two other remedies, *Calcium carbonica* and sulfur, the actions of the remedies are different.

General use

Homeopaths prescribe *Hepar sulph.* for colds, coughs, sore throats, **croup**, abscesses, earaches, inflamed **cuts** and **wounds**, **asthma**, arthritis, **emphysema**, herpes, **constipation**, conjunctivitis, *Candida albicans* **infections**, **syphilis**, sinusitis, and skin infections.

The main indications for *Hepar sulph.* are as follows. The patient is overly sensitive to **pain**, touch, and cold. Pains are sharp, as if a splinter or piece of glass were being poked into the skin. A **sore throat** may feel like a fish bone is stuck in it and the pain increases upon swallowing. The slightest pressure causes much pain and the patient may faint from the pain. The patient cannot tolerate the cold and any exposure to cold air causes **chills**. If a hand or foot slips outside the bedcovers the patient will become chilled. Any slight exertion will cause the patient to perspire. The patient's sweat is cold and profuse and smells sour and offensive, like rotten cheese. Bodily discharges are yellow and thick and also smell offensive. If a **cough** is present, it is a dry, hacking cough with rattling of mucus in the chest.

The typical *Hepar sulph.* patients are delicate, oversensitive persons who tend to be scrawny in build and have enlarged glands. They are slow persons with flabby muscles, and often have light hair. They catch cold easily, dislike the cold, crave sour foods such as pickles and vinegar, and may dislike fats.

Mentally they are irritable, impulsive, angry, obstinate, anxious, fearful, impatient, sad, and depressed. They are very hard to get along with. Nothing pleases them and they dislike company. Often the desire to commit violence is present. They have poor memories. The *Hepar sulph.* patient is usually in a hurry—he drinks and eats fast and talks rapidly.

Hepar sulph. ailments generally arise from exposure to cold dry wind, suppression of perspiration and skin eruptions. Typical patients suffer from a lack of internal warmth, so all symptoms are made worse from exposure to cold conditions: cold air, cold weather, and cold wind. Fresh air, lying on the painful side, any pressure or touch, or being uncovered also aggravate the symptoms. Symptoms are worse in the morning and at night. Bed warmth and heat tend to make the symptoms better. The patient craves warmth and can often be found wrapped up in the bedcovers or wearing several layers of clothing.

Specific indications

The action of *Hepar sulph.* prevents the formation of pus and hastens healing of abscesses. In fact, *Hepar sulph.* is one of the best remedies for abscesses, but is useful only before the **abscess** is open. The *Hepar sulph.* abscess is swollen and painful, with needle-like pains.

Hepar sulph. colds are frequently brought on by exposure to cold, dry weather. A cold wind causes **sneezing** and a runny nose. At first the mucus is watery, then it becomes thick, yellow, and offensive smelling. The nose is swollen, red, and tender and the sense of smell may be lost. A hoarse voice, sore throat, and cough may develop. The patient may also be constipated.

The *Hepar sulph.* cough is of a dry, barking nature with thick, sticky, yellow mucus. The chest becomes sore from coughing. The cough is worse in the evening, and the patient may cough straight through to midnight or sometimes all night long. The patient may gag or choke while coughing. *Hepar sulph.* may be used in the treatment of croup when the symptoms for cough are exhibited. Croup coughs are generally worse in the morning, and the patient may have difficulty bringing up mucus.

The sore throat is accompanied by a splinter-like pain and swollen tonsils. The patient may feel as if there were a fish bone caught in the throat. The throat becomes worse from coughing or swallowing cold drinks.

Fevers are hot and often are accompanied by chills. A cold, sour sweat may be present, although it doesn't give any relief to the patient. If **diarrhea** is present, it is accompanied by a rumbling sensation in the abdomen.

Earaches with sharp, tearing pains may occur suddenly and be accompanied by abscesses in the ears. If the eardrum ruptures there may be a bloody, offensive discharge.

Eye irritations may indicate this remedy. The eyes are red and inflamed and may discharge a fluid. Toothaches are accompanied by bleeding gums and mouth abscesses.

Slow-to-heal cuts and wounds may be cured by *Hepar sulph.* The tissues surrounding the wound are inflamed and the pain is splinter-like.

Pains in the finger, hip, and shoulder joints are caused by exposure to the cold and are of a sore, bruised nature.

Hepar sulph. has a positive effect on many skin problems such as **eczema**, **boils**, and herpes. The eczema is crusty, scabby, and oozing and generally appears in the bends of joints. Other eruptions may be moist, dry, itchy, and filled with pus. The boils are red, inflamed, and sore.

This remedy is often indicated in liver problems. Symptoms include stitching pains in the right side, a soreness that is aggravated by pressing on the area, sensitive **hemorrhoids**, and constipation.

A burning in the bladder or frequent urge to urinate may be present. The urine flows in a slow stream or in drops.

Preparations

Finely powdered oyster shell is mixed with flowers of sulfur and heated in an airtight container. The resulting white powder is dissolved in hot hydrochloric acid, mixed with milk sugar and diluted.

Hepar sulph. is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, the patient should consult a homeopath or health-care practitioner. Do not exceed the recommended dose.

Side effects

There are no side effects, but individual aggravations may occur.

Interactions

When taking any homeopathic remedy, the patient should not use **peppermint** products, coffee, or alcohol. These products are known as antidotes in homeopathy. They counteract the homeopathic remedies.

Resources

BOOKS

Cummings, Stephen, M.D., and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Hepatitis

Definition

Hepatitis is inflammation of the liver. Infectious or viral hepatitis is caused by a viral infection. The three most common forms of viral hepatitis recognized to cause liver disease are hepatitis A, hepatitis B, and hepatitis C (previously called hepatitis non-A, non-B). Other recognized types of hepatitis are hepatitis D, hepatitis E, and hepatitis G. A hepatitis F virus was reported in the 1990s, but its existence had not been confirmed as of the late 2000s.

Description

Hepatitis A

Hepatitis A is an inflammation of the liver caused by the hepatitis A virus (HAV). It is usually not very severe, generally starting within two to six weeks after contact with the virus and lasting no longer than two months.

Hepatitis A is commonly known as infectious hepatitis because it spreads relatively easily from those infected to close contacts. Once the infection ends, there is no lasting, chronic phase of illness. However, it is not uncommon to have a second episode or relapse of symptoms about a month after the first.

Epidemics of HAV infection can infect dozens and even hundreds of persons. Major outbreaks of hepatitis A have been linked to infected food handlers contaminating prepared foods. Many types of food also can be infected by sewage containing HAV, and shellfish is a common culprit.

Certain groups have an increased risk of contracting hepatitis A. These include:

- children and employees at daycare centers
- individuals living in crowded and/or unsanitary conditions
- sexually active individuals
- tourists visiting an area where hepatitis A is common

Hepatitis B

More than 300 million people throughout the world are infected by the hepatitis B virus (HBV). Hepatitis B occurs in both rapidly developing (acute) and long-lasting (chronic) forms and is one of the most frequent chronic infectious diseases worldwide. Commonly called serum hepatitis, hepatitis B ranges from mild to very severe. Some people who are infected by HBV develop no symptoms, but they may carry HBV

in their blood and pass the infection on to others. In its chronic form, HBV infection may destroy the liver through a scarring process, called **cirrhosis**.

When a person is infected by HBV, the virus enters the bloodstream and body fluids and is able to pass through tiny breaks in the skin, mouth, or the genital area. This infection can occur during birth, when a mother with hepatitis B may pass HBV on to her infant. The virus also may be transmitted through contaminated needles and through unprotected sex with an HBV-infected individual. Casual contact cannot transmit hepatitis B.

Hepatitis C

Hepatitis C, or HCV, causes a rapidly developing, and often long-lasting disease. Spread mainly by contact with infected blood, HCV is the major cause of transfusion hepatitis, which can develop in patients who are given blood, although today, donated blood is regularly tested for hepatitis C. The existence of a third hepatitis virus (in addition to the A and B viruses) became clear in 1974, but HCV was first identified in 1989.

Hepatitis C is generally mild in its early, acute stage, but it is much more likely to produce chronic liver disease than hepatitis B. About two of every three persons who are infected by HCV may continue to have the virus in their blood and become carriers, who can transmit the infection to others.

The most common way of transmitting hepatitis C is when blood containing the virus enters another person's bloodstream through a break in the skin or the mucosa (inner lining) of the mouth or genitals. HCV may be passed from an infected mother to the infant she is carrying (however, the risk of infection from breast milk is very low). It also can be spread through sexual intercourse, especially if one partner is acutely infected at the time.

Hepatitis D

Hepatitis D (or delta) occurs only in patients who also are infected by the hepatitis B virus. Infection by the hepatitis delta virus (HDV) either occurs at the same time as hepatitis B or develops later when infection by HBV has entered the chronic stage.

Delta hepatitis can be quite severe, but it is seen only in patients already infected with HBV. In the late 1970s, Italian physicians discovered that some patients with hepatitis B had another type of infectious agent in their liver cells. Later the new virus, HDV, was confirmed by experimentally infecting chimpanzees. When both viruses are present, acute infection tends to be more serious. Furthermore, patients with both **infections** are more likely to develop chronic liver disease than those with HBV alone, and, when it occurs, it is more severe.

Hepatitis E

Hepatitis E also is known as epidemic non-A, non-B hepatitis. Like hepatitis A, it is an acute and short-lived illness that sometimes can cause liver failure. HEV, discovered in 1987, is spread by the fecal-oral route. It is present in countries where human waste has contaminated the drinking water supply. Large outbreaks (epidemics) have occurred in Asian and South American countries where there is poor sanitation. In the United States and Canada no outbreaks have been reported as of the late 2000s, but persons traveling to a region where it is present may return with HEV.

Hepatitis G

The hepatitis G virus was first described in early 1996. It has been designated as GBV-C by the International Commmittee on Taxonomy of Viruses. As of 2008, little was known about the frequency of GBV-C infection, the nature of the illness, or how to prevent it. What is known is that transfused blood containing GBV-C has caused some cases of hepatitis. For this reason, patients with hemophilia and other bleeding conditions who require large amounts of blood or blood products are at risk of hepatitis G. GBV-C has been identified in 1-2% of blood donors in the United States. Also at risk are patients with kidney disease who undergo hemodialysis treatments and those who use intravenous drugs. It is possible that an infected mother can pass on the virus to her newborn infant or that sexual transmission can occur.

Often patients with hepatitis G are infected at the same time by the hepatitis B or C virus, or both. In about three of every thousand patients with acute viral hepatitis, GBV-C is the only virus present. There is some indication that patients with hepatitis G may continue to carry the virus in their blood for many years, and so they might be a source of infection for others.

Causes and symptoms

Hepatitis A

The time between exposure to HAV and the onset of symptoms ranges from two to seven weeks and averages about one month. The virus is passed in the feces, especially late in the incubation period, before symptoms first appear. It can live for several hours on

the skin surface and during this time may be transmitted to others. Infected persons are most contagious starting about a week before symptoms develop and remain contagious until the time **jaundice** (yellowing of the skin and/or eyes) is noted.

Often the first symptoms to appear are **fatigue**, muscle and joint aches, **nausea**, and a loss of appetite. Low grade **fever** is common, and the liver often enlarges, causing **pain** or tenderness in the right upper part of the abdomen. Jaundice then develops, typically lasting seven to ten days.

Hepatitis B

In the United States, a majority of acute HBV infections occur in teenagers and young adults. Half of these youth never develop symptoms, and only about 20% of infected patients develop severe symptoms and jaundice. The remaining 30% of patients have only flu-like symptoms and will probably not even be diagnosed as having hepatitis unless certain tests are done. Acute hepatitis B is characterized by loss of appetite, nausea, and pain or tenderness in the right upper part of the abdomen. Compared to patients with hepatitis A or C, those with HBV infection require more bed rest.

An HBV infection lasting longer than six months is said to be chronic. After this time it is much less likely for the infection to disappear. Not all carriers of the virus develop chronic liver disease; in fact, most have no symptoms. However, about one in every four HBV carriers develop cirrhosis. Patients are also likely to have an enlarged liver and spleen. The most serious complication of chronic HBV infection is liver **cancer**.

Hepatitis C

More than half of all patients who develop hepatitis C have no symptoms or signs of liver disease. Some, however, may have a minor illness with flu-like symptoms. About one in four patients with hepatitis C will develop jaundice, and some patients lose their appetite and frequently feel tired. Patients also may experience nausea.

In most patients, HCV can still be found in the blood six months after the start of acute infection, and these patients are considered carriers. If the virus persists for one year, it is unlikely to disappear completely. About 20% of chronic carriers develop cirrhosis (scarring) of the liver when the virus damages or destroys large numbers of liver cells, which are then replaced by scar tissue. Cirrhosis may develop only after a long period of time—as long as 20 years—has passed. Many patients will not develop cirrhosis and instead have a mild, chronic form of infection called chronic persistent hepatitis.

Hepatitis D

The delta virus is a small and incomplete viral particle. Perhaps this is why it cannot cause infection on its own. Its companion virus, HBV, actually forms a covering over the HDV particle. In chronically ill patients (those whose virus persists longer than six months), cirrhosis typically occurs.

When HBV and HDV infections develop at the same time—a condition called coinfection—recovery is the rule. Only 2–5% of patients become chronic carriers (the virus remains in their blood more than six months after infection). It may be that HDV actually keeps HBV from reproducing as rapidly as it would if it were alone, making chronic infection less likely.

When HBV infection occurs first and is followed by HDV infection, the condition is called superinfection. Between one-half and two-thirds of patients with superinfection develop severe acute hepatitis. Once the liver cells contain large numbers of HBV viruses, HDV tends to reproduce more actively. Massive infection and liver failure are more common in superinfection. The risk of liver cancer, however, is no greater than from hepatitis B alone.

As with other forms of hepatitis, the earliest symptoms are nausea, loss of appetite, joint pains, and fatigue. There may be fever and an enlarged liver may cause discomfort or pain in the right upper part of the abdomen. Jaundice may develop later.

Hepatitis E

There are at least two strains of HEV, one found in Asia and another in Mexico. The virus may start dividing in the gastrointestinal tract, but it grows mostly in the liver. After an incubation period of two to eight weeks, infected persons develop jaundice, fever, nausea, a loss of appetite, and discomfort or pain in the right upper part of the abdomen. Most often the illness is mild and disappears within a few weeks with no lasting effects.

Hepatitis E never becomes a chronic illness, but on rare occasions the acute illness damages and destroys so many liver cells that the liver can no longer function. This condition, called fulminant liver failure, may cause death. The great majority of patients who recover from acute infection do not continue to carry HEV and cannot pass the infection on to others. The most serious outbreaks of hepatitis E occurred in

China (100,000 cases between 1986 and 1988) and India (79,000 cases in 1991).

Hepatitis G

Some researchers believe that there may be a group of GBV-C viruses, rather than just one. Others remain doubtful that GBV-C actually causes illness. If it does, the type of acute or chronic illness that results is not clear. When diagnosed, acute GBV-C infection has usually been mild and brief. There is no evidence of serious complications, but it is possible that, like other hepatitis viruses, GBV-C can cause severe liver damage, resulting in liver failure. The virus has been identified in as many as 20% of patients with long-lasting viral hepatitis, some of whom also have hepatitis C.

Diagnosis

A healthcare professional takes a thorough medical history and performs a physical examination of the patient when hepatitis is suspected. Blood tests for specific antigens and antibodies that are present in the different subtypes of hepatitis confirm the diagnosis, although these tests cannot detect all types of hepatitis. Liver function tests that measure enzyme levels may also be performed.

Treatment

Once symptoms appear, no antibiotics or other medicines will shorten the course of infectious hepatitis. Patients should rest in bed as needed, follow a healthy diet, and avoid drinking alcohol or taking any medications that could further damage the liver. Any medication that can cause liver damage should be avoided, and non-critical surgery should be postponed.

An herbalist or naturopathic healthcare professional may recommend a preparation of **milk thistle** (*Silybum marianum*) for the treatment of hepatitis. Milk thistle is thought to promote the growth of new liver cells and to prevent toxins from penetrating through healthy liver cells by binding itself to the cell membranes. It is frequently prescribed by herbalists for the treatment of cirrhosis, hepatitis, and other liver disorders. As of 2008, the National Center for Complementary and Alternative Medicine (NCCAM) reported that studies with laboratory animals suggested that milk thistle may have various benefits for the liver, although those studies did not examine the effects of the product specifically on hepatitis C. Studies on humans had, as of 2008, shown no beneficial effects of milk thistle on hepatitis C. The NCCAM also found mixed results for the use of **licorice** (*Glycyrriza glabra*), ginseng, and other herbal remedies in the treatment of hepatitis. In general, these products may show benefits in studies with cell cultures and experimental animals, although they have limited or no effects in the treatment of hepatitis in humans.

Vitamin C may be taken as a nutritional supplement, and it has been shown to help diminish acute hepatitis and help prevent hepatitis in hospitalized patients. Liver extracts are effective in liver regeneration and were used throughout the twentieth century. Thymus extracts enhance the immune system, which may help the body fight a hepatitis virus.

A practitioner of Chinese herbal medicine may recommend Fructus Schisandrae Chinensis, which improves liver function; Fructus Citrulli Vulgaris, which helps to expel jaundice; or other herbs for hepatitis symptoms.

Allopathic treatment

The U.S. Food and Drug Administration (FDA) has approved a class of genetically engineered products called recombinant alpha interferons for the treatment of hepatitis B and C. These drugs are sold under trade names such as Intron A, Roferon, Infergen, Pegasys, and Peg-Intron. They tend to lessen the symptoms of infection and improve liver function. Approximately half of all patients respond positively to the drugs, although only about 20% receive lasting effects. Fever and flu-like symptoms, fatigue and low energy levels, nausea, lack of appetite, **vomiting**, **diarrhea**, **depression**, and hair thinning (alopecia) are frequent side effects of the drugs. A variety of other antiviral medications, including telbivudine (Tyzeka), entecavir (Baraclude), lamivudine (Epivir-HBV), and adefovir dipivoxil (Hepsera) may also be effective in treating chronic HBV infection. Most cases of hepatitis A and acute hepatitis B are treated on an outpatient basis in which patients are encouraged to have as much bed rest as possible and remain hydrated by drinking as much liquid as possible. When hepatitis destroys most or all of the liver, the only hope may be a liver transplant. However, even when the procedure is successful, disease often recurs and cirrhosis may actually develop more rapidly than before.

Expected results

Hepatitis A

Most patients with acute hepatitis A, even when severe, begin feeling better in two to three weeks and recover completely in four to eight weeks. After recovering from hepatitis A, a person no longer carries the

virus and remains immune for life. In the United States, serious complications are infrequent and deaths are rare. In the United States, as many as 75% of adults over the age of 50 have blood test evidence of previous hepatitis A.

Hepatitis B

Each year an estimated 150,000 persons in the United States get hepatitis B. More than 10,000 require hospital care, and as many as 5,000 die from complications of the infection. About 90% of those infected have only acute disease. A large majority of these patients recover within three months. It is the remaining 10%, with chronic infection, who account for most serious complications and deaths from HBV infection. In the United States, perhaps only 2% of all infected individuals become chronically ill. People infected with both HIV and hepatitis B are most likely to die than from either disease alone. Even when no symptoms of liver disease develop, chronic carriers remain a threat to others by serving as a source of infection.

Hepatitis C

In roughly one-fifth of patients who develop hepatitis C, the acute infection subsides, and they recover completely within four to eight weeks and have no later problems. Other patients face two risks: they themselves may develop chronic liver infection and possibly serious complications such as liver cancer, and they continue carrying the virus and may pass it on to others. The overall risk of developing cirrhosis is about 15% for all patients infected by HCV. Liver failure is less frequent in patients with chronic hepatitis C than it is for those with other forms of hepatitis. In those people who also have **AIDS**, hepatitis C infection increases the chance for liver cancer.

Hepatitis D

A large majority of patients with coinfection of HBV and HDV recover from an episode of acute hepatitis. However, about two-thirds of patients chronically infected by HDV go on to develop cirrhosis of the liver. If severe liver failure develops, the chance of a patient surviving is no better than 50%. A liver transplant may improve this figure to 70%.

Hepatitis E

In the United States hepatitis E is not a fatal illness, but elsewhere 1–2% of those infected die of advanced liver failure. In pregnant women the death rate is as high as 20%. It is not clear whether having hepatitis E once guarantees against future HEV infection.

KEY TERMS

Antibody—A substance made by the body in response to a foreign body, such as a virus, which is able to attack and destroy the invading body.

Antigen—Part of an invading microorganism, which causes tissue damage and which also stimulates the body's immune system to produce antibodies.

Cirrhosis—The end result of many forms of liver disease, the condition of the liver when its cells have been damaged or destroyed and are replaced by scar tissue.

Jaundice—Yellowing of the skin and whites of the eyes when pigments normally eliminated by the liver collect in high amounts in the blood.

Vaccine—A substance prepared from a weakened or killed virus which, when injected, helps the body to form antibodies that attack an invading virus and may prevent infection altogether.

Hepatitis G

What little is known about the course of hepatitis G suggests that illness is mild and does not last long. When more patients have been followed up after the acute phase, it will become clear whether GBV-C can cause severe liver damage.

Prevention

The best way to prevent any form of viral hepatitis is to avoid contact with blood and other body fluids of infected individuals. The use of condoms during sex is advisable. Travelers should avoid water and ice if unsure of their purity, or they can boil water before drinking it. All foods eaten should be packaged, well cooked, or, in the case of fresh fruit, peeled. Caution should be exercised when getting tattoos or body piercing, since a 2003 report stated that only about one-half of tattoo and piercing shops follow governmental guidelines concerning infection control. These practices can pass hepatitis and HIV infection.

Two vaccines are available for protection against hepatitis A and hepatitis B. The hepatitis A vaccine, distributed under the trade name Havrix, consists of inactivated HAV viruses. The hepatitis B vaccine, Engerix-B, is a recombinant (genetically modified) product containing a surface antigen of the HBV virus. Individuals in a high risk group and travelers should be vaccinated for hepatitis A, and much of the general population can be vaccinated for hepatitis B.

Resources

BOOKS

Cohen, Misha Ruth, Robert Gish, and Kalia Doner. *The Hepatitis C Help Book: A Groundbreaking Treatment Program Combining Western and Eastern Medicine for Maximum Wellness and Healing*. New York: St. Mar tin's Griffin, 2007.

Everson, Gregory T., and Hedy Weinberg. *Living with Hepatitis C: A Survivor's Guide,* 4th ed. Long Island City, NY: Hatherleigh Press, 2006.

Fabry, Stephen. *100 Q&A About Hepatitis C: A Lahey Clinic Guide*. Sudbury, MA: Jones & Bartlett, 2007.

Paul, Nina L. *Living with Hepatitis C for Dummies*. Indian apolis: For Dummies, 2005.

PERIODICALS

Deutsch, M., and S. J. Hadziyannis. "Old and Emerging Therapies in Chronic Hepatitis C: An Update." *Journal of Viral Hepatitis* (January 2008): 2 11.

Férir, Geoffrey, et al. "Antiviral Treatment of Chronic Hepatitis B Virus Infections: The Past, the Present and the Future." *Reviews in Medical Virology* (January 2008): 19 34.

Hann, H. W., et al. "Symptomatology and Health Attitudes of Chronic Hepatitis B Patients in the USA." *Journal of Viral Hepatitis* (January 2008): 42 51.

Mallette, Carol, Maura A. Flynn, and Kittichai Promrat. "Outcome of Screening for Hepatitis C Virus Infection Based on Risk Factors." *American Journal of Gastro enterology* (January 2008): 131 137.

Modi, A. A., and T. J. Liang. "Hepatitis C: A Clinical Review." *Oral Diseases* (January 2008): 10 14.

Yuan, He Jun, and M. William Lee. "Nonresponse to Treatment for Hepatitis C: Current Management Strategies." *Drugs* (January 2008): 27 42.

OTHER

"Viral Hepatitis." National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, December 8, 2006. http://www.cdc.gov/ncidod/diseases/hepatitis/. (Feb ruary 11, 2008).

"Viral Hepatitis." women'shealth.gov, December 2005. http://forwomen.gov/faq/hepatitis.htm (February 11, 2008).

ORGANIZATIONS

Hepatitis Foundation International, 504 Blick Dr., Silver Spring, MD, 20904, (800) 891 0707, http://www.hepfi. org/.

National Hepatitis C Coalition, PO Box 5058, Hemet, CA, 92544, (951) 766 8238, http://nationalhepatitis c.org/.

Paula Ford-Martin
Teresa G. Odle
David Edward Newton, Ed.D.

Herbalism, traditional Chinese

Definition

Chinese herbalism is one of the major components of **traditional Chinese medicine** (TCM), or Oriental medicine (OM). In TCM, herbs are often used in conjunction with other techniques, such as **acupuncture** or massage. Chinese herbalism is a holistic medical system, meaning that it looks at treating a patient as a whole person, looking at the mental and spiritual health, as well as the physical health, of the individual. Illness is seen as a disharmony or imbalance among these aspects of the individual. Chinese herbalism has been practiced for over 4,000 years.

One of the earliest and certainly the most important Chinese herbal text is the *Huang Ti Nei Ching*, or *Yellow Emperor's Classic of Internal Medicine*. It is believed to have been authored by Huang Ti during his reign over China, which started about 2697 B.C. Since that time, herbal practices have been more extensively documented and refined. In modern China, traditional Chinese herbalism is taught alongside conventional Western pharmacology. Chinese herbal remedies have been used in the West only relatively recently, over the past two decades. These remedies are more gentle and natural than conventional medicines. In addition, they have fewer unpleasant side effects. Individuals with chronic disorders in particular are increasingly drawn to the holistic aspect of Chinese herbalism and TCM in general.

Origins

Historical background

Traditional Chinese medicine originated in the region of eastern Asia that today includes China, Tibet, Vietnam, Korea, and Japan. Tribal shamans and holy men who lived as hermits in the mountains of China as early as 3500 B.C. practiced what was called the "Way of Long Life." This regimen included a diet based on herbs and other plants; kung-fu exercises; and special breathing techniques that were thought to improve vitality and life expectancy.

After the Han dynasty, the next great age of Chinese medicine was under the Tang emperors, who ruled from A.D. 608–906. The first Tang emperor established China's first medical school in A.D. 629. Under the Song (A.D. 960–1279) and Ming (A.D. 1368–1644) dynasties, new medical schools were established, their curricula and qualifying examinations were standardized, and the traditional herbal prescriptions

KEY TERMS

Absorption spectrometry—A scientific procedure to determine the chemical composition of an unknown substance.

Interferon—A substance proved to be necessary in the body to help fight cancer cells.

Immune function—The body's defense system against bacteria, viruses and fungi, and any malfunction of the organism.

Pharmacodynamics—The study of the relationships and interactions of herbs.

Platelet aggregation—The clumping together of blood cells, possibly forming a clot.

Qi—The Chinese term for life force or vital energy.

Thrombocyte—Another name for platelet.

were written down and collected into encyclopedias. One important difference between the development of medicine in China and in the West is the greater interest in the West in surgical procedures and techniques.

Philosophical background: the cosmic and natural order

In Taoist thought, the Tao, or universal first principle, generated a duality of opposing principles that underlie all the patterns of nature. These principles, yin and yang, are mutually dependent as well as polar opposites. They are basic concepts in traditional Chinese medicine. Yin represents everything that is cold, moist, dim, passive, slow, heavy, and moving downward or inward; while yang represents heat, dryness, brightness, activity, rapidity, lightness, and upward or outward motion. Both forces are equally necessary in nature and in human well-being, and neither force can exist without the other. The dynamic interaction of these two principles is reflected in the cycles of the seasons, the human life cycle, and other natural phenomena. One objective of traditional Chinese medicine is to keep yin and yang in harmonious balance within a person.

In addition to yin and yang, Taoist teachers also believed that the Tao produced a third force, primordial energy or qi (also spelled chi or ki). The interplay between yin, yang, and qi gave rise to the Five Elements of water, metal, earth, wood, and fire. These entities are all reflected in the structure and functioning of the human body.

The human being

Traditional Chinese physicians did not learn about the structures of the human body from dissection because they thought that cutting open a body insulted the person's ancestors. Instead they built up an understanding of the location and functions of the major organs over centuries of observation, and then correlated them with the principles of yin, yang, qi, and the Five Elements. Thus wood is related to the liver (yin) and the gall bladder (yang); fire to the heart (yin) and the small intestine (yang); earth to the spleen (yin) and the stomach (yang); metal to the lungs (yin) and the large intestine (yang); and water to the kidneys (yin) and the bladder (yang). The Chinese also believed that the body contains Five Essential Substances, which include blood, spirit, vital essence (a principle of growth and development produced by the body from qi and blood), fluids (all body fluids other than blood, such as saliva, spinal fluid, sweat, etc.), and qi.

Benefits

Because it is a safe and inexpensive solution to health problems of all kinds, Chinese herbalism is very popular in China. In recent years, herbalism has been modernized with the introduction of quality control. For example, herbs are subjected to absorption spectrometry to determine levels of heavy metals found in some. Because they are standardized, Chinese herbs are safer for self-treatment. This approach puts the individual, not the physician, in charge of the individual's health; that is a basic goal of Chinese herbalism.

Chinese herbalism offers unique advice regarding what foods can help and what can hinder, and a herbalist can help an individual discover what he is allergic to. In addition, Chinese herbs stimulate the immune system and provide beneficial nutrients, aside from their role in curing illness.

At M.D. Anderson Hospital in Texas, medical research has confirmed that patients undergoing chemotherapy were shown to have an improved degree of immune function when they took the tonic herb **astragalus** (*huang qi*). (It is well known that chemotherapy suppresses the immune system.) Research also showed that T-cell and macrophage activity and interferon production was increased in patients using the Chinese herbs **ganoderma**, lentinus, and polyporus, helping the body fight **cancer** cells. Agents also found in ganoderma were found to inhibit platelet aggregation

and thrombocyte formation, which would be helpful to counter circulation and heart problems.

An ingredient of ginseng was found to promote adrenal function, which would give the herb properties of enhancing many hormone functions in the body.

Description

Chinese herbal treatment differs from **Western herbalism** in several respects. In Chinese practice, several different herbs may be used, according to each plant's effect on the individual's Qi and the Five Elements. There are many formulas used within traditional Chinese medicine to treat certain common imbalance patterns. These formulas can be modified to fit specific individuals more closely.

A traditional Chinese herbal formula typically contains four classes of ingredients, arranged in a hierarchical order: a chief (the principal ingredient, chosen for the patient's specific illness); a deputy (to reinforce the chief's action or treat a coexisting condition); an assistant (to counteract side effects of the first two ingredients); and an envoy (to harmonize all the other ingredients and convey them to the parts of the body that they are to treat).

Methods of diagnosis

A Chinese herbalist will not prescribe a particular herb on the strength of symptoms only, but will take into consideration the physical condition, emotional health, and mental state of the patient. He or she may look at the condition of the patient's hair, skin, and tongue, as well as the appearance of the eyes, lips, and general complexion. The practitioner then listens to the sounds the body makes when breathing. He or she may smell the breath, **body odor**, or sputum in diagnosis.

TCM practitioners take an extensive medical history of a patient. He or she may ask about dietary habits, lifestyle, and sleep patterns. The patient will be questioned about chief medical complaints, as well as on his or her particular emotional state and sexual practices.

Chinese herbalists employ touch as a diagnostic tool. They may palpate the body or use light massage to assess the patient's physical health. Another chief component of Chinese medical diagnosis is **pulse diagnosis**, or sphygmology. This is a very refined art that takes practitioners years to master. Some practitioners can detect 12 different pulse points that correspond to the 12 major organs in Chinese medicine. There are over 30 pulse qualities that practitioners are able to detect on each point. The strength, speed, quality, and rhythm of the pulse, to name a few, will be determined before a diagnosis is given.

Herbs

Chinese herbs may be used alone or in combination. Relatively few are used alone for medicinal purposes. Practitioners believe that illness can be effectively treated by combining herbs based on their various characteristics and the patient's overall health. Every herb has four basic healing properties: nature, taste, affinity, and effect.

An herb's nature is described according to its yin or yang characteristics. Yang, or warming, herbs treat cold deficiencies. They are frequently used in the treatment of the upper respiratory tract, skin, or extremities. Yin, or cooling, herbs, treat hot excess conditions. They are most often used to treat internal conditions and problems with organs. Herbs can also be neutral in nature.

An herb's taste does not refer to its flavor, but to its effect on qi, blood, fluids, and phlegm. Sour herbs have a concentrating action. They are prescribed to treat bodily excess conditions, such as **diarrhea**, and concentrate qi. Bitter herbs have an eliminating or moving downward action. They are used to treat coughs, **constipation**, and heart problems. Sweet or bland herbs have a harmonizing action. They are used as restorative herbs and to treat **pain**. Spicy herbs have a stimulating action. They are prescribed to improve blood and qi circulation. Salty herbs have a softening action. They are used to treat constipation and other digestion problems.

An herb's affinity describes its action on a specific bodily Organ. (Note that Chinese medicine does not have the anatomical correlation for organ names. They correspond more closely to the organ's function.) Sour herbs have an affinity for the Liver and Gallbladder. Bitter herbs act on the Heart and Small Intestine. Sweet and bland herbs affect the Stomach and Spleen. Spicy herbs have an affinity for Lungs and Large Intestine, whereas salty herbs act on the Kidneys and Bladder.

Chinese herbs are lastly classified according to their specific actions, which are divided into four effects. Herbs that dispel are used to treat an accumulation, sluggishness, or spasm by relaxing or redistributing. Herbs with an astringent action are used to consolidate or restrain a condition characterized by discharge or excessive elimination. Herbs that purge treat an obstruction or "poison" by encouraging elimination and **detoxification**. Tonifying herbs nourish, support, and calm where there is a deficiency.

Treatment of diabetes

The incidence of diabetes has increased quite dramatically in recent years, especially in the United States, where in general people take less **exercise**, and food is taken in greater quantity with a general reduction in quality. This increase has led to a scramble to find new solutions to the problem, and many researchers have focused their interest on Chinese herbal remedies. In the search for more effective and more convenient treatments, the alkaloid berberine has come under close scrutiny for its many uses, among them the treatment of diabetes. In trials, rats given a mixture of berberine and alloxan showed less likelihood of incurring a rise in blood sugar. Patients suffering from type II diabetes who were given between 300 and 600 mg of berberine daily for between one and three months, showed a reduction in blood sugar levels, when taken in conjunction with a controlled diet.

Treatment of AIDS and cancer

Independent researchers are investigating indications that Chinese herbalism can reduce the toxicity of chemotherapy and other medications, in addition to stimulating immune responses.

Treatment of diarrhea associated with cholera

A team of researchers in Japan has found that some traditional Chinese herbal formulations inhibit the toxin produced by *Vibrio cholerae*, the microorganism that causes cholera. These preparations appear to be helpful when given in addition to oral rehydration treatment for diarrhea associated with cholera.

Treatment of atopic dermatitis

Some physicians have found Chinese herbal remedies useful in relieving the symptoms of atopic **dermatitis**, a chronic disorder of the skin that is difficult to treat. Herbal remedies have the advantage of relieving the **itching** and inflammation associated with atopic dermatitis without the long-term toxic side effects of conventional medications.

Preparations

Those who are unfamiliar with Chinese herbs and their uses should consult a practitioner before starting any treatment. Once a remedy is prescribed, it may be purchased at Oriental markets or health food stores. Most Chinese remedies prepared for Western markets are standardized and sold in ready-to-use formulations, with instructions for dosage. A Chinese herbalist may prescribe herbs to be made into tea, or taken as capsules.

Precautions

It is best to avoid Chinese herbs that are not sold in a standardized form. Herbs can vary considerably in potency, depending on the time and place of their harvesting. In addition, cases have been reported in Europe as well as the United States of dried Chinese herbs contaminated by sewage or other forms of pollution.

When treating a patient, the herbalist will aim to gently "nudge" the system into shape, rather than producing any immediate reaction. A return to health, therefore, may take time, and it is important that the patient realizes the principles underlying the treatment. Some practitioners estimate that treatment will take a month for every year that a chronic condition has existed. The advantage of the slow pace is that if there is a bad reaction to any herb, which is rare, it will be mild because the treatment itself is gentle.

As with most naturopathic therapies, Chinese herbal remedies work best when taken in conjunction with a healthy lifestyle and program of exercise.

Side effects

Some Chinese herbs are incompatible with certain prescription drugs or foods. Others should not be taken during **pregnancy**. Because of possible interactions, persons who are interested in taking traditional Chinese herbal remedies should not try to diagnose or treat themselves with these preparations.

Recent studies indicate that some herbs used in Chinese medicines may cause liver damage. Women appear to be more susceptible to such reactions than men. Damage to the liver may range from minor problems involving higher levels of certain enzymes called transaminases, to chronic **hepatitis**, **cirrhosis**, and acute liver failure requiring transplantation. Because of these risks, persons considering Chinese herbal treatments should consult a medical doctor before going to the herbalist. It is essential for patients to inform their doctors about all medications or preparations they are taking, including alternative and over-the-counter remedies as well as prescription drugs.

Research and general acceptance

At present, there is renewed interest in the West in traditional Chinese medicine and Chinese herbalism. Of the 700 herbal remedies used by traditional Chinese practitioners, over 100 have been tested and found effective by the standards of Western science. Several United States agencies, including the National Institutes of Health, the Office of Alternative Medicine,

and the Food and Drug Administration are currently investigating Chinese herbal medicine as well as acupuncture and *Tui na* massage. In general, however, Western studies of Chinese medicine focus on the effects of traditional treatments and the reasons for those effects, thus attempting to fit traditional Chinese medicine within the Western framework of precise physical measurements and scientific hypotheses.

Training and certification

Practitioners of Oriental medicine can obtain certification in Chinese herbalism through the National Commission for the Certification of Acupuncture and Oriental Medicine, (NCCAOM). Some states have adopted the NCCAOM examination as all or part of their criteria for licensing. In California, the standards are higher, and these qualifications are not accepted. The licensing titles given by states varies, but herbalists are required to be a doctor of oriental medicine (OMD or DOMO). In 1990, the U.S. Secretary of Education recognized the National Accreditation Commission for Schools and Colleges of Acupuncture and Oriental Medicine as an accrediting agency.

Resources

BOOKS

Molony, David. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: Berkeley Publishing Group, 1998.

PERIODICALS

Oi, H., D. Matsuura, M. Miyake, et al. "Identification in Traditional Herbal Medications and Confirmation by Synthesis of Factors That Inhibit Cholera Toxin Induced Fluid Accumulation." *Proceedings of the National Academy of Sciences of the USA* 99 (March 5, 2002): 3042 3046.

Stedman, C. "Herbal Hepatotoxicity." *Seminars in Liver Disease* 22 (2002): 195 206.

Vender, R. B. "Alternative Treatments for Atopic Derma titis: A Selected Review." *Skin Therapy Letter* 7 (Feb ruary 2002): 1 5.

ORGANIZATIONS

National Center for Complementary and Alternative Med icine. http://nccam.nih.gov/nccam/.

The California Association of Acupuncture and Oriental Medicine. http://www.CAAOM.ORG/medicine/overview.htm

For help with herbs and a list of practitioners: http://www.craneherb.com/.

Institute of Chinese Materia Medica, China Academy of Traditional Chinese Medicine. Beijing, 100700.

Patricia Skinner
Rebecca J. Frey, PhD

Herbal cold remedies

Definition

Herbal cold remedies are over-the-counter medications that contain herbs in their formulas, sometimes along with vitamins and minerals.

Description

Colds have been around for centuries; yet as of 2008, there was no cure for a cold or a vaccine to prevent them. However, walk into any pharmacy or chain supermarket and there is almost certain to be an entire section devoted to over-the-counter (OTC) products that claim to treat or prevent colds. Many of these are herbal formulas or individual herbs. OTC **cough** and cold medications accounted for nearly $3 billion in sales in the United States in 2007. Homeopathic cold remedies, many of which are herbal, account for more than $100 million in annual sales and are growing each year.

Herbal cold remedies took on an increased significance when in January 2008, the U.S. Food and Drug Administration (FDA) banned the use of OTC cold medications in children under the age of 2, and was considering raising the age limit to 5 and younger. The FDA also said it would issue recommendations on OTC cold products for children 12 and younger, which was expected in late 2008. In enacting the ban, the FDA said there was no scientific evidence that OTC cold products provided any relief to infants and that they may actually be harmful, citing reports of increased heart rates, unconsciousness, convulsions, and even death associated with their use. The ban prompted drug makers to discontinue all cold medications with the word "infant" or pictures of babies on their packaging. There were about 800 children's cold products marketed in the United States and dozens were affected by the ban. The ban specifically targeted cold products for children that contain one or more of certain types of drugs, including decongestants, expectorants, antihistamines, and antitussives. Several months before the ban, a number of drug makers voluntarily withdrew products from the market, including such brand names as Dimetapp, Little Colds, Pediacare, Robitussin, Triaminic, and Tylenol.

More than 200 different viruses are known to cause the symptoms of the **common cold**. Some, such as the rhinoviruses, seldom produce serious illnesses. Others, such as parainfluenza and respiratory syncytial virus, produce mild **infections** in adults but can cause severe lower respiratory infections in young

children. The causes of 30 to 50% of adult colds, presumed to be viral, remain unidentified as of 2008. Although the common cold is usually mild, with symptoms lasting one to two weeks, it is a leading cause of doctor visits and of school and job absenteeism, according to the National Institute of Allergy and Infectious Diseases (NIAID). Colds are most prevalent among children, and seem to be related to youngsters' relative lack of resistance to infection and to contacts with other children in day-care centers and schools. Children have about six to ten colds a year. In families with children in school, the number of colds per child can be as high as 12 a year. Adults average about two to four colds a year, although the range varies widely. Women, especially those aged 20 to 30 years, have more colds than men, possibly because of their closer contact with children. On average, individuals older than 60 have fewer than one cold a year, according to the NIAID.

Among the most popular herbal/homeopathic cold remedy formulas are Zicam, Airborne, and Cold-Eeze. Airborne received a huge boost in 2004 when it was featured on Oprah Winfrey's television talk show. Airborne is an effervescent (like an Alka-Seltzer tablet) dietary supplement that was allegedly created by a school teacher as an immune system booster to help ward off colds. Airborne claims to contain 17 ingredients, including seven herbal extracts, **antioxidants**, electrolytes, and **amino acids**. It costs $7 to $8 for a tube of 10 tablets. One critic of Airborne is Mark Crislip, a specialist in internal medicine and infectious disease and an outspoken skeptic of alternative and complementary medicine. In a very carefully worded article in the March 2007 issue of *Pediatrics for Parents*, Crislip questions the legitimacy and effectiveness of Airborne. He lists seven warning signs that indicate a product, such as Airborne, is "not worth your hard-earned money." One is when a product is advertised directly to the public and not through the medical community. He notes that Airborne is not subject to FDA regulation and has not been proven in clinical studies to be safe or effective. He also wrote that Airborne makes conflicting statements about its product's ability to boost the immune system and reduce the duration of cold symptoms. He claims that Airborne's ingredients—with the exception of zinc—do nothing to treat or prevent a cold. He also questions the legitimacy of a cold remedy created by a school teacher rather than a physician or scientist.

Another Airborne critic is James Steckelberg, an infectious disease specialist at the Mayo Clinic. In an April 19, 2007, article on the Mayo Clinic Web site (http://www.mayoclinic.com), Steckelberg wrote: "there's no conclusive evidence that this product (Airborne) or any of its ingredients prevent colds or shorten their duration." Both Zicam and Airborne state that they have clinical studies that show the products are safe and effective. However, critics note that the studies were paid for by Zicam and Airborne and that their safety and effectiveness have not been determined by the FDA. Cold-Eeze, Zicam, and Airborne can be marketed as homeopathic remedies simply because they contain small amounts of **zinc**, which has been shown in some clinical trials to reduce cold symptoms. However, other clinical trials have concluded that zinc showed no benefit in reducing cold symptoms, according to a 2008 report from researchers at the Mayo Clinic.

General use

Most herbal cold remedies were not affected by the FDA ban. There are dozens of herbs that are used in herbal cold formulas. Among them are **andrographis**, ashwa ghanda, ginseng, **echinacea**, eleuthero, **astragalus**, cat's claw, **garlic**, fo-ti, black cumin, **green tea**, ligustrum, **maitake**, **noni**, white cedar, wild indigo, and black elderberry. Herbal cold remedies treat single or multiple cold symptoms, such as coughing, **fever**, nasal congestion, **sore throat**, **headache**, and **sneezing**.

Preparations

The most popular herb to prevent and treat cold and flu is echinacea, which has been shown in some studies to bolster the immune system. It has been used for centuries by Native Americans for a variety of health conditions. A number of studies reported it is effective in treating and preventing colds. Garlic and onions both have antiviral chemicals and have been used to counteract the effects of colds. Cinnamon is another natural cold remedy that has been used for centuries to treat colds, flu, and sinus conditions. Another herbal cold remedy, **ginger**, has a dozen antiviral compounds and is a powerful digestive herb. Ginger root is a plant native to southeast Asia and is also grown in the United States and other countries. It fights colds by relieving congestion and soothing sinus **pain** and sore throats. Herbal cold remedies also include inhaling the steam from **chamomile**, **thyme**, or **eucalyptus** teas, which are known to loosen mucus and help soothe the throat, nasal passages, and bronchial tubes. Many herbal formulas also contain **vitamin C** and zinc.

Recommended dosage

There are few, if any, standard dosing recommendations for herbs and herbal cold formulas. However, some general dosing guidelines for several of the most popular herbs are as follows:

- Echinacea—As a powdered extract, take at least 2,000 milligrams (mg) a day in three doses; as a liquid, take three to four milliliters (ml) three times daily.
- Andrographis—A common dose is an extract of 400 mg three times a day. Some alternative medicine practitioners recommend it be used with eleutherococcus, a Chinese herb.
- Black elderberry—As an extract or in capsules, take 15 ml four times a day for five days to treat a cold.
- Maitake—An extract from the maitake mushroom, the suggested dose is 1,800 mg once a day as a treatment and preventative.
- Black cumin—An extract, the usual dosage is 50 to 75 mg once a day as a preventative and three times a day as a treatment.
- Chamomile, thyme, and eucalyptus—Steep one to two teaspoons in hot or boiling water for three to five minutes. Inhale the steam for 15 minutes three times a day in the acute stage of a cold and in the evening before bed in the end stage of a cold to help the bronchial passages heal.

Precautions

The primary precautions are that not all herbal cold remedies contain the ingredients that are listed on the package, that they contain ingredients not listed, or they do not contain the dosage listed on the package or insert. In 2007, the non-profit consumer research group ConsumerLab.com (http://www.consumerlab.com) tested 66 herbal cold remedy products and found that only 44% contained the correct dosages and four were contaminated with lead, a toxic substance that in high amounts can cause serious illness and even death. Only one of six echinacea products tested had the correct ingredients and one had lead. Only six of 14 cold prevention products with garlic had the correct ingredients and two had lead contamination. Of the 13 ginseng cold remedies tested, only seven contained the correct ingredients and two contained lead. Recommendations by ConsumerLab.com for people purchasing herbal cold remedies are:

- Cold remedies with echinacea—Look for products that contain at least 1% of phenols and at least 2,000 mg of echinacea and as a treatment, use for one to two weeks.

KEY TERMS

Antihistamine—A drug that blocks the action of histamine (a substance that produces an allergic reaction) and is used to control allergies.

Antitussive—A drug that is used to control coughing.

Decongestant—A drug that relieves nasal congestion.

Expectorant—A medicine that stimulates the production of mucus and is used to treat coughing.

Over-the-counter (OTC)—A medication that does not require a doctor's prescription.

- Cold remedies with garlic—Buy products that contain at least 3,600 micrograms (mcg) of allicin (garlic extract) per day. Garlic does not treat cold symptoms, but as a preventative, it reduces the number of colds by 66% if used regularly.
- Cold remedies with ginseng—Use products with at least 1.5 to 2% total ginsenosides (3 to 4% for extracts). Take 400 mg per day regularly to reduce the number of colds during the winter.

Side effects

Most herbs and herbal formulas have no adverse side effects when taken in normal or usual doses. People with concerns should check with their doctor or pharmacist before taking any herbal cold remedy.

Interactions

Interactions are rare but can occur. Products containing garlic should not be used with blood thinners. Ginseng can affect blood glucose (sugar) levels. It is best to check with a doctor or pharmacist for possible interactions between herbs or between herbs and other OTC or prescription medications the patient is taking.

Resources

BOOKS

Feingold, Ellen. *The Complete Self Care Guide to Homeo pathy, Herbal Remedies & Nutritional Supplements.* Albany, NY: Whitston, 2008.

McIntyre, Anne. *The Top 100 Herbal Remedies: Safe, Effective Remedies for 100 Common Ailments.* Dorset, UK: Duncan Baird, 2006.

Phaneuf, Holly. *Herbs Demystified: A Scientist Explains How the Most Common Herbal Remedies Really Work.* New York: Marlowe, 2005.

PERIODICALS

"Care Advised with Natural Cold Remedies: ConsumerLab.com Finds Few Products with Proper Quality and Directions." *Townsend Letter: The Examiner of Alternative Medicine* (November 2007): 33.

Crislip, Mark. "Deconstructing Airborne: How to Recognize Medical Nonsense." *Pediatrics for Parents*(March 2007): 13(2).

Guthrie, Catherine. "Hold the Cold: Preventing Seasonal Colds Is Tough, but These Herbal Remedies Can Reduce the Suffering Time." *Natural Health* (October 2007): 99(3).

Harris, Gardiner. "Renewed Warning on Cold Medicines." *New York Times* (January 18, 2008): A15.

Johnsen, Michael. "Slow Cold Season Plus FDA Ban Impact Sales." *Drug Store News* (March 3, 2008): 60(2).

Johnson, Carla K. "Herbal, Homeopathic Treatments Share Space with Cold Medicines." *Seattle Times* (March 13, 2005): N/A.

ORGANIZATIONS

American Herbal Products Association, 8484 Georgia Ave., Suite 370, Silver Spring, MD, 20910, (301) 588 1171, http://www.ahpa.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Australian Traditional Medicine Society, PO Box 1027, Meadowbank, NSW 2114, Australia, 61 2 9809 6800, http://www.atms.com.au.

Canadian Association of Naturopathic Doctors, 1255 Sheppard Ave. East, Toronto, ON, M2K 1E3, Canada, (800) 551 4381, http://www.cand.ca.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, http://www.ods.od.nih.gov.

Ken R. Wells

Herbalism, Western

Definition

Western herbalism is a form of the healing arts that draws from herbal traditions of Europe and the Americas, and that emphasizes the study and use of European and Native American herbs in the treatment and prevention of illness. Western herbalism is based on physicians' and herbalists' clinical experience and traditional knowledge of medicinal plant remedies preserved by oral tradition and in written records over thousands of years. Western herbalism, like the much older system of **traditional Chinese medicine**, relies on the synergistic and curative properties of the plant to treat symptoms and disease and maintain health.

Western herbalism is based upon pharmocognosy, the study of natural products. Pharmocognosy includes the identification, extraction methods, and applications of specific plant constituents responsible for specific therapeutic actions, such as the use of digoxin from **Digitalis** leaf for heart failure. These constituents are extracted, purified and studied in clinical research. They may be concentrated to deliver standardized, set doses. Sometimes, the natural constituent can be synthesized in the lab, or changed and patented. Practitioners may choose to use fresh medicinal plants, simple extracts, or standardized extracts.

In standardized extracts, a specific quantity of a constituent is called a marker compound, and it may or may not be the active constituent(s) in the plant medicine. The products should be produced under good manufacturing processes and according to the traditional *National Formulary U. S. Dispensatory* or *U. S. Pharmacopeia*.

Origins

Over 2,500 years ago Hippocrates wrote, "In medicine one must pay attention not to plausible theorizing but to experience and reason together." This Greek physician and herbalist from the fourth century B.C. is considered the father of western medicine. He stressed the importance of diet, water quality, climate, and social environment in the development of disease. Hippocrates believed in treating the whole person, rather than merely isolating and treating symptoms. He recognized the innate capacity of the body to heal itself, and emphasized the importance of keen observation in the medical practice. He recommended simple herbal remedies to assist the body in restoring health.

Ancient Greek medicine around the fifth century B.C. was a fertile ground for contrasting philosophies and religions. Greek physicians were influenced by the accumulated medical knowledge from Egypt, Persia, and Babylon. Medical advances flourished and practitioners and scholars were free to study and practice without religious and secular constraints. In the fourth century B.C., Theophrastus wrote the *Historia Plantarum*, considered to be the founding text in the science of botany.

During the first century A.D. Dioscorides, a Greek physician who traveled with the Roman legions, produced five medical texts. His herbal text, known as the *De Materia Medica* is considered to be among the most influential of all western herbal texts. It became a standard reference for practitioners for the next

KEY TERMS

Phyto-, as in phytochemical, phytomedicinal, and phytotherapy—Meaning, or pertaining to, a plant or plants.

Wildcrafting—Gathering of herbs or other natural materials.

1,500 years. This influential book also included information on medicinal herbs and treatments that had been used for centuries in Indian **Ayurvedic medicine**. Galen of Pergamum, who also lived in the first century A.D., was a Roman physician and student of anatomy and physiology. He authored a recipe book containing 130 antidotes and medicinal preparations. These elaborate mixtures, known as galenicals, sometimes included up to 100 herbs and other substances. This complex approach to herbal medicine was a dramatic change from the simple remedies recommended by Hippocrates and employed by traditional folk healers. Galen developed a rigid system of medicine in which the physician, with his specialized knowledge of complex medical formulas, was considered the ultimate authority in matters of health care. The Galenic system, relying on theory and scholarship rather than observation, persisted throughout the Middle Ages. The galenical compounds, along with bloodletting, and purging, were among the drastic techniques practiced by the medical professionals during those times; however, traditional herbal healers persisted outside the mainstream medical system.

During the eighth century a medical school was established in Salerno, Italy, where the herbal knowledge accumulated by Arab physicians was preserved. The Arabian Muslims conducted extensive research on medicinal herbs found in Europe, Persia, India, and the Far East. Arab businessmen opened the first herbal pharmacies early in the ninth century. The *Leech Book of Bald*, the work of a Christian monk, was compiled in the tenth century. It preserved important medical writings that had survived from the work of physicians in ancient Greece and Rome.

The Middle Ages in Europe were a time of widespread death by plagues and pestilence. The Black Plague of 1348, particularly, and other health catastrophes in later years, claimed so many lives that survivors began to lose faith in the dominant Galenic medical system. Fortunately, the knowledge of traditional herbal medicine had not been lost. Medieval monks who cultivated extensive medicinal gardens on the monastery grounds, also patiently copied the ancient herbal and medical texts. Folk medicine as practiced in Europe by traditional healers persisted, even though many women herbalists were persecuted as witches and enemies of the Catholic Church and their herbal arts were suppressed.

The growing spice trade and explorations to the New World introduced exotic plants, and a whole new realm of botanical medicines became available to Europeans. Following the invention of the printing press in the fifteenth century, a large number of herbal texts, also simply called herbals, became available for popular use. Among them were the beautifully illustrated works of the German botanists Otto Brunfels and Leonhard Fuchs published in 1530, and the Dutch herbal of Belgian physician Rembert Dodoens, a popular work that was later reproduced in English. In 1597, the physician and gardener John Gerard published one of the most famous of the English herbals, still in print today. Gerard's herbal, known as *The Herball or General Historie of Plantes* was not an original work. Much of the content was taken from the translated text of his Belgian predecessor Dodoens. Gerard did, however, include descriptions of some of the more than one thousand species of rare and exotic plants and English flora from his own garden.

The correspondence of astrology with herbs was taught by Arab physicians who regarded astrology as a science helpful in the selection of medicines and in the treatment of diseases. This approach to Western herbalism was particularly evident in the herbal texts published in the sixteenth and seventeenth centuries. One of the most popular and controversial English herbals is *The English Physician Enlarged* published in 1653. The author, Nicholas Culpeper, was an apothecary by trade. He also published a translation of the Latin language *London Pharmacopoeia* into English. Culpeper was a nonconformist in loyalist England, and was determined to make medical knowledge more accessible to the apothecaries, the tradesmen who prescribed most of the herbal remedies. Culpeper's herbal was criticized by the medical establishment for its mix of magic and astrology with **botanical medicine**, but it became one of the most popular compendia of botanical medicine of its day. Culpeper also accepted the so-called "Doctrine of Signatures," practiced by medieval monks in their medicinal gardens. This theory teaches that the appearance of plants is the clue to their curative powers. Plants were chosen for treatment of particular medical conditions based on their associations with the four natural elements and with a planet or sign. The place where the plant grows, its dominant physical feature, and the

smell and taste of an herb determined the plant's signature. Culpeper's herbal is still in print in facsimile copies, and some pharmocognosists and herbalists in the twenty-first century voice the same criticisms that Culpeper's early critics did.

European colonists brought their herbal knowledge and plant specimens to settlements in North America where they learned from the indigenous Americans how to make use of numerous nutritive and medicinal plants, native to the New World. Many European medicinal plants escaped cultivation from the early settlements and have become naturalized throughout North America. The first record of Native American herbalism is found in the manuscript of the native Mexican Indian physician, Juan Badianus published in 1552. The American Folk tradition of herbalism developed as a blend of traditional European medicine and Native American herbalism. The pioneer necessity for self-reliance contributed to the perseverance of folk medicine well into the twentieth century.

In Europe in the seventeenth century, the alchemist Paracelsus changed the direction of Western medicine with the introduction of chemical and mineral medicines. He was the son of a Swiss chemist and physician. Paracelsus began to apply chemicals, such as arsenic, mercury, **sulfur**, **iron**, and **copper** sulfate to treat disease. His chemical approach to the treatment of disease was a forerunner to the reliance in the twentieth century on chemical medicine as the orthodox treatment prescribed in mainstream medical practice.

The nineteenth and twentieth centuries brought a renewed interest in the practice of Wwestern herbalism and the development of natural therapies and health care systems that ran counter to the mainstream methods of combating disease symptoms with synthetic pharmaceuticals.

In the late eighteenth century, the German physician Samuel Hahnemann developed a system of medicine known as **homeopathy**. This approach to healing embraces the philosophy of "like cures like."homeopathy uses extremely diluted solutions of herbs, animal products, and chemicals that are believed to hold a "trace memory" or energetic imprint of the substance used. Homeopathic remedies are used to amplify the patient's symptoms with remedies that would act to produce the same symptom in a healthy person. Homeopathy holds that the symptoms of illness are evidence of the body's natural process of healing and eliminating the cause of the disease.

In 1895, the European medical system known as naturopathy was introduced to North America. Like homeopathy, this medical approach is based on the Hippocratic idea of eliminating disease by assisting the body's natural healing abilities. The naturopath uses nontoxic methods to assist the body's natural healing processes, including nutritional supplements, herbal remedies, proper diet, and **exercise** to restore health.

Western herbalism is regaining popularity at a time when the world faces the **stress** of overpopulation and development that threatens the natural biodiversity necessary for these valuable medicinal plants to survive. The American herb market is growing rapidly and increasing numbers of individuals are choosing alternative therapies over mainstream allopathic Western medicine.

Though research into the efficacy and safety of traditional herbal remedies is increasing, it has been limited by the high costs of clinical studies and laboratory research, and by the fact that whole plants and their constituents are not generally patentable (therefore, there is no drug profit after market introduction). Outside the United States, herbalism has successfully combined with conventional medicine, and in some countries is fully integrated into the nations' health care systems. At the beginning of the twenty-first century, 80% of the world's population continues to rely on herbal treatments. The World Health Organization promotes traditional herbal medicine for treatment of many local health problems, particularly in the Third World where it is affordable and already well integrated into the cultural fabric.

In the United States, the re-emergence in interest in holistic approaches to health care is evident. Citizens are demanding access to effective, safe, low-cost, natural medicine. Legislative and societal change is needed, however, before natural therapies can be fully integrated into the allopathic health care system and provide citizens with a wide range of choices for treatment. If the current trend continues, U. S. citizens will benefit from a choice among a variety of safe and effective medical treatments.

Benefits

The benefits of botanical medicine may be subtle or dramatic, depending on the remedy used and the symptom or problem being addressed. Herbal remedies usually have a much slower effect than pharmaceutical drugs. Some herbal remedies have a cumulative effect and work slowly over time to restore balance, and

others are indicated for short-term treatment of acute symptoms. When compared to pharmaceutical drugs, herbal remedies prepared from the whole plant have relatively few side effects. This is due to the complex chemistry and synergistic action of the full range of phytochemicals present in the whole plant, and the relatively lower concentrations. They are generally safe when used in properly designated therapeutic dosages, and less costly than the isolated chemicals or synthetic prescription drugs available from Western pharmaceutical corporations.

Description

Herbs are generally defined as any plant or plant part that may be used for medicinal, nutritional, culinary, or other beneficial purposes. The active constituents of plants (if known) may be found in varying amounts in the root, stem, leaf, flower, and fruit, etc. of the plant. Herbs may be classified into many different categories. Some Western herbalists categorize herbal remedies according to their strength, action, and characteristics. Categories may include sedatives, stimulants, laxatives, febrifuges (to reduce **fever**), and many others. One system of classification is based on a principle in traditional Chinese medicine that categorizes herbs into four classes: tonics, specifics, heroics, or cleansers and protectors. Within these broad classifications are the numerous medicinal actions of the whole herb which may be due to a specific chemical or combination of chemicals in the plant.

- Tonics. Herbs in this classification are also known as alteratives in Western herbalism. They are generally mild in their action and act slowly in the body, providing gentle stimulation and nutrition to specific organs and systems. Tonic herbs act over time to strengthen and nourish the whole body. These herbs are generally safe and may be used regularly, even in large quantities. These tonic herbs are known as "superior" remedies in traditional Chinese medicine. The therapeutic dose of tonic remedies is far removed from the possible toxic dose. American ginseng is an example of a tonic herb.
- Specifics. Herbs in this classification are strong and specific in their therapeutic action. They are generally used for short periods of time in smaller dosages to treat acute conditions. Herbs classified as specifics are not used beyond the therapeutic treatment period. Echinacea is a specific herb.
- Heroic. These herbs offer high potency but are potentially toxic, and should not be used in self-treatment. Because the therapeutic dosage may be close to the lethal dosage, these herbs are presented cautiously and closely monitored or avoided by trained clinicians. They should not be used continuously or without expert supervision. Poke (*Phytolacca americana*) is an example of a heroic remedy.
- Cleansers and protectors. These herbs, plants, and plant tissues remove wastes and pollutants, while minimally affecting regular body processes. An example of a cleanser is pectin. Pectins are the water-soluble substances that bind cell walls in plant tissues, and some believe that they help remove heavy metals and environmental toxins from the body.

Preparations

Herbal preparations are commercially available in a variety of forms including tablets or capsules, tinctures, teas, fluid extracts, douches, washes, suppositories, dried herbs, and many other forms. The medicinal properties of herbs are extracted from the fresh or dried plant parts by the use of solvents appropriate to the particular herb. Alcohol, oil, water, vinegar, glycerin, and propylene glycol are some of the solvents used to extract and concentrate the medicinal properties. Steam distillation and cold-pressing techniques are used to extract the **essential oils**. The quality of any herbal remedy and the potency of the phytochemicals found in the herb depends greatly on the conditions of weather and soil where the herb was grown, the timing and care in harvesting, and the manner of preparation and storage.

Precautions

Herbal remedies prepared by infusion, decoction, or alcohol tincture from the appropriate plant part, such as the leaf, root, or flower are generally safe when ingested in properly designated therapeutic dosages. However, many herbs have specific contraindications for use when certain medical conditions are present. Not all herbal remedies may be safely administered to infants or small children. Many herbs are not safe for use by pregnant or lactating women. Some herbs are toxic, even deadly, in large amounts, and there is little research on the chronic toxicity that may result from prolonged use. Herbal remedies are sold in the United States as dietary supplements and are not regulated for content or efficacy. Self-diagnosis and treatment with botanical medicinals may be risky. A consultation with a clinical herbalist, Naturopathic physician, or certified clinical herbalist is prudent before undertaking a course of treatment.

Essential oils are highly concentrated and should not be ingested as a general rule. They should also be diluted in water or in a non-toxic carrier oil before application to the skin to prevent **contact dermatitis**

or photo-sensitization. The toxicity of the concentrated essential oil varies depending on the chemical constituents of the herb.

The American Professor of Pharmacognosy, Varro E. Tyler, believes that "herbal chaos" prevails in the United States with regard to herbs and phytomedicinals. In part he blames the herb producers and marketers of crude herbs and remedies for what he terms unproven hyperbole, poor quality control, deceptive labeling, resistance to standardization of dosage forms, and continued sale of herbs determined to be harmful.

A new warning about Western herbalism has been made necessary by technology. The Internet has a number of sites available with unregulated and often unhealthy advice about use of herbal remedies. Many herbalists and allopathic physicians urge patients to use caution when seeking Internet information on herbal treatments. One cancer-related study found that only 36% of the web sites found in a search offered information that complied with regulatory guidelines about unsubstantiated claims about treatment or cure of disease.

Side effects

Herbs contain a variety of complex phytochemicals that act on the body as a whole or on specific organs and systems. Some of these chemical constituents are mild and safe, even in large doses. Other herbs contain chemicals that act more strongly and may be toxic in large doses or when taken continuously. Drug interactions are possible with certain herbs when combined with certain pharmaceutical drugs. Some herbs are tonic in a small amount and toxic in larger dosages.

In 2002, a report to the American Academy of Pediatrics cautioned members to watch for signs of adverse effects to the cardiovascular system of children from certain herbal remedies that are often not revealed by their families. For example, **ephedra** causes increases in heart rate and blood pressure. Other examples of child and adolescent patients with heart complications from herbs given to them that their parents assumed would be harmless were given by the presenter. Another report said that even adult patients fail to inform their physicians about herbal products they are using, and that patients do not think of them as medicines. Yet many herbal products can interact with allopathic medicines and either cancel their effects or cause adverse effects. For example, **garlic**, ginseng, ginkgo, **feverfew**, **licorice**, and other common remedies have anticoagulant properties that can put patients as risk of bleeding during surgery.

Research and general acceptance

Western herbalism is experiencing a revival of popular and professional interest. The number of training schools and qualified herbal practitioners is growing to meet the demand. Western herbalism is incorporated into the medical practice of licensed Naturopathic doctors, who receive special training in clinical herbalism. Folk herbalists, heir to the continuing oral traditions passed from generation to generation in many rural areas, as well as amateur, self-taught herbalists, keep the practice of botanical medicine alive at the grassroots level. Traditional Western herbalism relies on traditional use and materia medica, folk wisdom, and recent clinical research and advances in the extraction processes. These advances provide increased quality control on the concentration and potency of the active ingredients. Western physicians, educated in allopathic medicine, typically receive no training in the use of herbs. These doctors rely on pharmaceutical drugs for their patients, and some cite the following reasons for continuing to do so: lack of standardized dosages, lack of quality control in the preparation of herbal medicinals, and the dearth of clinical research verifying the safety and effectiveness of many traditional herbal remedies.

Herbalism is widely practiced throughout Europe, particularly in England, France, Italy, and Germany where phytomedicinals are available in prescription form and as over-the-counter remedies. In Germany, plant medicines are regulated by a special government body known as the Commission E. In the United States, however, despite increasing popularity, traditional herbalism is not integrated into the allopathic medical system. Phytomedicinals are sold as dietary supplements rather than being adequately researched and recognized as safe and effective drugs. The Dietary Supplement Health and Education Act of 1994 circumvented a U. S. Food and Drug Administration (FDA) effort to effectively remove botanicals from the marketplace and implement regulations restricting sale. Massive popular outcry against the proposed regulations on the sale of herbs and phytomedicinals resulted in this Congressional action. In 2000, U.S. President Bill Clinton, by executive order, created the White House Commission on Alternative Medicine in an effort to hold alternative medicine therapies "to the same standard of scientific rigor as more traditional health care interventions." That Commission is charged with recommending federal guidelines and legislation regarding the use of alternative medical therapies in the twenty-first century.

Training and certification

In the United States, courses of study in Western herbalism are available in almost all 50 states. The study of traditional herbalism is part of the course curriculum in Naturopathic medical colleges that offer four-year degree programs leading to licensure as a Doctor of Naturopathy. The oldest of these institutions is the National College of **Naturopathic Medicine**, established in 1956. Western clinical herbalism is taught through a growing number of institutions and organizations offering training and certification through residential and apprenticeship programs, and by correspondence. Some programs are comprehensive, with curricula in physiology, clinical diagnosis and treatment, ethnobotany, pharmacognosy, phytotherapy, plant identification, ethical wildcrafting and cultivation, and preparation and application of herbal remedies. Other programs are brief, geared more to the amateur herbalist and gardener. The Southwest School of Botanical Medicine in Bisbee, Arizona, is one of the oldest herbal schools, established in 1978. No licensing body yet exists in the United States to regulate the practice of herbal medicine.

In the United States herbal remedies are sold as dietary supplements. They are not regulated as to content and efficacy, and few are prepared in standardized dosages. Many of the supplements commercially available base claims for efficacy on traditional use and anecdotal evidence that has not been duplicated by clinical studies. In Germany, Commission E evaluates the safety and efficacy of the 300 herbs and herb combinations sold in that country. No equivalent regulatory commission exists in the United States. Permits are required in some states for the wildcrafting of rare and endangered herbs, such as **goldenseal** and **American ginseng**, two commercially valuable herbs in high demand in the growing medical botanicals industry.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine, The Definitive Guide*. Washington: Future Medicine Pub lishing, Inc., 1993.

Kowalchik, Claire, and Hylton, William H. *Rodale's Illus trated Encyclopedia of Herbs*. Pennsylvania: Rodale Press, 1987.

Lust, John. *The Herb Book*. New York: Bantam Books, 1974.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, Inc., 1997.

Murray, Michael T. *The Healing Power of Herbs, 2nd ed.* California: Prima Publications, Inc., 1995.

Weiss, Gaea and Shandor Weiss. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Deneen, Sally, with Rembert, Tracey. "Uprooted, The Worldwide Plant Crisis Is Accelerating." *E Magazine* (July/August 1999) : 36 40.

Liebmann, Richard, N.D. "United Plant Savers Planting the Future."*PanGaia* 22 (Winter 1999 2000) : 23 26.

McNamara, Damian. "Warn Patients About Bad Herbal Advice on Web."*Family Practice News* (January 1, 2002): 8.

McNamara, Damian. "Alternative Therapies Can Cause Serious Problems (Cardiovascular Effects, Drug Inter actions)."*Pediatric News* (February 2002) : 38.

Torpy, Janet M. "Integrating Complementary Therapy Into Care."*JAMA, The Journal of the American Medical Association* (January 16, 2002): 306.

ORGANIZATIONS

National Center for the Preservation of Medicinal Herbs. 3350 Beech Grove Road, Rutland, Ohio 45775. (740)742 4401.

United Plant Savers. P.O. Box 98, East Barre, Vermont 05649. (802)479 9825. http://www.plantsavers.org.

OTHER

Hobbs, Christopher. "Specific and Tonic Immune Herbs: Exploring a Practical System of Western Herbalism." Health World. http://www.healthy.net/asp/templates/article.asp?PageType Article&ID 960.

Oracle Tree New Age Mall. "Western Medical Astrology: A Brief History." http://ww.oracletree.com/avalon physics/wesmedas.html.

Tyler, Varro E., Ph.D. *Herbs and Health Care in the Twenty first Century*. http://www.richters.com/newdisplay.cgi?page OttoRichter/1995.html.

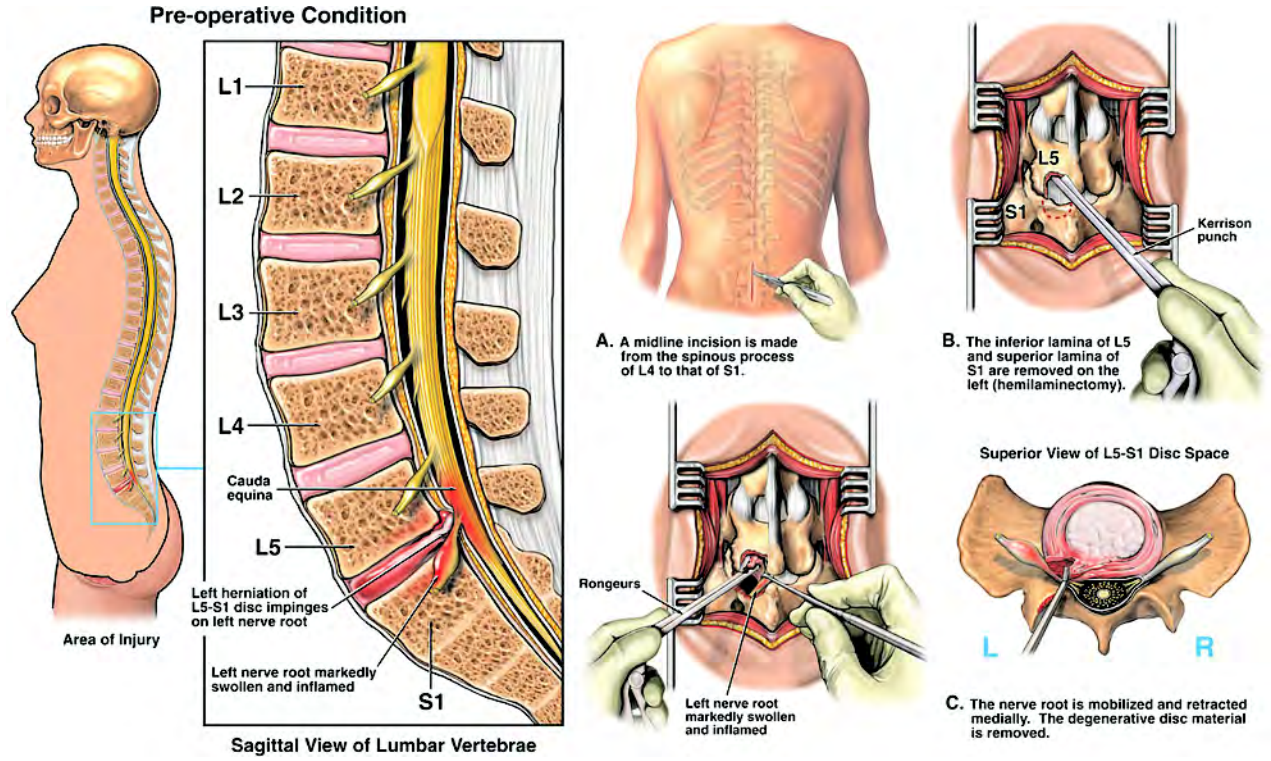
Wicke, Roger, Ph.D. "A World History of Herbology and Herbalism: Oppressed Arts." Rocky Mountain Herbal Institute. http://www.rmhiherbalorg/a/f.ahrl.hist.html.

Clare Hanrahan
Teresa G. Odle

Herniated disk

Definition

Disk herniation is a breakdown of a fibrous cartilage material (annulus fibrosus) that makes up the intervertebral disk. The annulus fibrosus surrounds a soft gel-like substance in the center of the disk called the nucleus pulposus. Pressure from the vertebra above and below may cause the nucleus pulposus to be forced against the sides of the annulus. The constant pressure of the nucleus against the sides of the annulus will cause the fibers of the annulus to break down. As the fibers of the annulus breakdown, the nucleus will push toward



Back surgery, Disk Herniation with Hemilaminectomy and Discectomy. *(© Nucleus Medical Art, Inc. / Alamy)*

the outside of the annulus and cause the disk to bulge in the direction of the pressure. This condition most frequently occurs in the lumbar region and is also commonly called a herniated nucleus pulposus, prolapsed disk, ruptured disk, or a slipped disk.

Description

The spinal column is made up of 24 vertebrae that are joined together and permit forward and backward bending, side bending, and rotation of the spine. There are seven cervical (neck), twelve thoracic (chest region), and five lumbar (low back) vertebrae. There are intervertebral disks between each of the 24 vertebrae as well as a disk between the lowest lumbar vertebrae and the large bone at the base of the spine called the sacrum.

Disk herniation most commonly affects the lumbar region. However, disk herniation can also occur in the cervical spine. The incidence of cervical disk herniation is most common between the fifth and sixth cervical vertebrae. The second most common area for cervical disk herniation occurs between the sixth and seventh cervical vertebrae. Disk herniation is uncommon in the thoracic region.

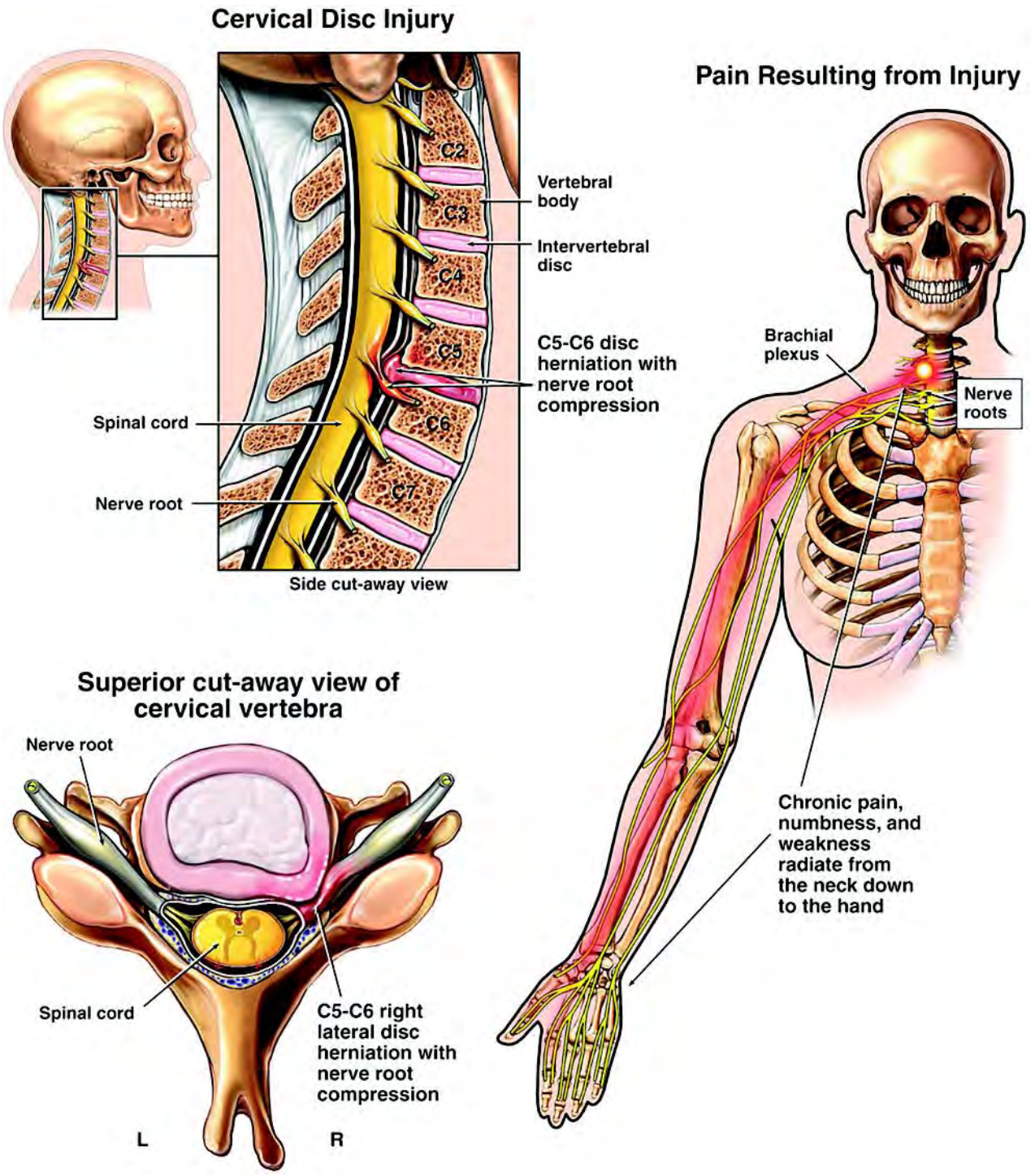
The peak age for occurrence of disk herniation is between 20 and 45 years of age. Studies have shown that males are more commonly affected than females in lumbar disk herniation by a 3:2 ratio. Long periods of sitting or a bent-forward work posture may lead to an increased incidence of disk herniation.

There are four classifications of disk pathology:

- A protrusion occurs when a disk bulges without rupturing the annulus fibrosus.
- A prolapse occurs when the nucleus pulposus pushes to the outermost fibers of the annulus fibrosus but does not break through them.
- An extrusion occurs when the outermost layer of the annulus fibrosus is torn and the material of the nucleus moves into the epidural space.
- A sequestration occurs when fragments from the annulus fibrosus or the nucleus pulposus have broken free and are outside the confines of the disk.

Causes and symptoms

Any direct or forcefulpressure on the disks in a vertical directioncan cause the disk to push its nucleus into the fibers of the annulus or into the intervertebral canal. A herniated disk may occur suddenly from lifting, twisting, or direct injury, but more often it will occur from constant compressive loads over time. There may be a single incident that causes symptoms



Herniated disk. *(© Nucleus Medical Art, Inc. / Alamy)*

to be felt, but very often the disk was already damaged and bulging prior to any one particular incident.

Depending on the location of the herniation, the herniated material can also press directly on nerve roots or on the spinal cord. Pressure on the nerve roots or spinal cord may cause a shock-like **pain** sensation down the arms if the herniation is in the cervical vertebrae or down the legs if the herniation is in the lumbar region.

KEY TERMS

Annulus fibrosis—The outer portion of the intervertebral disk made primarily of fibrocartilage rings.

Epidural space—The space immediately surrounding the outer most membrane of the spinal cord.

Excision—The process of excising, removing, or amputating.

Fibrocartilage—Cartilage that consists of dense fibers.

Nucleus pulposus—The center portion of the intervertebral disk that is made up of a gelatinous substance.

In the lumbar region a herniation that presses on the nerve roots or the spinal cord may also cause weakness, numbness, or problems with bowels, bladder, or sexual function. It is unclear if a herniated disk causes pain by itself without pressing on neurological structures. It is likely that irritation of the disk or the adjacent nerve roots may cause muscle spasm and pain in the region of the disk pathology.

Diagnosis

Several radiographic tests are useful for confirming a diagnosis of disk herniation and locating the source of pain. X rays show structural changes of the lumbar spine. Myelography is a special x ray of the spine in which a dye or air is injected into the patient's spinal canal. The patient lies strapped to a table as the table tilts in various directions and spot x rays are taken. X rays showing a narrowed dye column in the intervertebral disk area indicate possible disk herniation.

Computed tomography scan (CT scans) exhibit the details of pathology necessary to obtain consistently good treatment results. Magnetic resonance imaging (MRI) analysis of the disks can accurately detect the early stages of disk **aging** and degeneration. Electromyograms (EMGs) measure the electrical activity of the muscle contractions and possibly show evidence of nerve damage.

A number of physical examination procedures may be used to determine if a herniated disk is pressing on a nerve root. While these tests may not identify the definitive presence of a herniated disk, they are very useful for indicating if there is pressure on a nerve root from some structure such as a herniated disk. The straight leg raise test may be used to identify pressure on nerve roots in the lumbar region while the Spurling's test (involving neck motion) may be used to identify compression of nerve roots in the cervical region. Compression of nerve roots in the cervical, thoracic, or lumbar regions may be apparent with the slump test.

Treatment

It is unclear if herniated disks cause pain themselves, or if they must be pressing on a nerve root to cause pain. Pain may also occur with herniated disks as a result of mechanical or neurological irritation of surrounding structures such as muscles, tendons, ligaments, or joint capsules. Therefore, many treatment strategies will be primarily focused on managing symptoms that occur in conjunction with a herniated disk. Unless a serious neurological problem exists, most symptoms of a herniated disk will resolve on their own. Yet, the interventions listed below may greatly speed the time required to resolve symptoms associated with a herniated disk.

Chiropractic manipulations are often used to treat herniated disks. There is often significant joint restriction that accompanies a herniated disk and the manipulative therapy is effective at helping to mobilize movement restrictions in the spine. Mobilizing the spine will help the patient get back to moderate activity levels sooner and the earlier an individual can return to moderate activity levels, the quicker they can expect a resolution of their symptoms. Chiropractic manipulations are generally done with a greater frequency when a condition is in an acute stage. The frequency of treatments will be reduced as the condition progresses.

Osteopathic therapy, considered by some to be an alternative treatment, may use manipulations or manual therapy techniques very similar to chiropractors. However, osteopathic physicians often employ more manual therapy techniques that focus on the role of the muscles and other soft tissues in producing pain sensations with herniated disks. Osteopathic physicians may also recommend use of the same medications prescribed by allopathic physicians. Some osteopaths also perform surgery for herniated disks.

Acupuncture involves the use of fine needles inserted along the pathway of the pain to move energy through the body and relieve the pain. Neurological irritation is considered to be a frequent source of pain with a herniated disk. Many believe acupuncture is particularly effective for pain management and addressing this neurological irritation. Acupuncture can also help break the cycle of pain and muscle spasm that often accompanies a herniated disk.

Massage therapists focus on muscular reactions to the herniated disk. Neurological irritation that comes with a herniated disk will often cause excessive **muscle spasms** in the lower back muscles. These spasms will perpetuate dysfunctional movements in the joints of the spine and may exaggerate compressive forces on the intervertebral disk. By relaxing the muscles, massage therapists will attempt to manage the symptoms of disk herniation until proper movement can be restored. Proper movement and avoidance of aggravating postures, like sitting for long periods, will often be a great help in completely resolving the symptoms.

Allopathic treatment

Unless serious neurologic symptoms occur, herniated disks can initially be treated with pain medication. Pain medications, including anti-inflammatories, muscle relaxers, or in severe cases, narcotics, may be used if needed. Bed rest is sometimes prescribed. However, bed rest is frequently discouraged as a treatment for herniated disks unless movement is severely painful. It has become apparent that prolonged periods of bed rest may aggravate symptoms, slow down the healing time, and cause other complications.

Epidural steroid injections have been used to decrease pain by injecting an anti-inflammatory drug, usually a corticosteroid, around the nerve root to reduce inflammation and **edema** (swelling). This partly relieves the pressure on the nerve root as well as resolves the inflammation.

Physical therapists are skilled in treating acute back pain caused by disk herniation. The physical therapist can provide noninvasive therapies, such as ultrasound or **diathermy** to project heat deep into the tissues of the back or administer manual therapy, if mobility of the spine is impaired. They may help improve posture and develop an **exercise** program for recovery and long-term protection. Traction can be used to try to decrease pressure on the disk. A lumbar support can be helpful for a herniated disk at this level as a temporary measure to reduce pain and improve posture.

Surgery may be used for conditions that do not improve with conservative treatment. There are several surgical approaches to treating a herniated disk. A number of surgical procedures may be used to remove a portion of the intervertebral disk that may be pressing on a nerve root. When a portion of the disk is removed through a surgical procedure it is called a discectomy. Sometimes a spinal fusion will be performed after disk material has been removed. In this process a portion of bone is taken from the pelvis and placed between the bodies of the vertebrae. A spinal fusion will limit motion at that vertebral segment, but may be helpful in the event that significant disk material has been removed.

Chemonucleolysis is an alternative to surgical removal of the disk. Chymopapain, a purified enzyme derived from the papaya plant, is injected into the disk space to reduce the size of the herniated disks. The reduction in size of the disk relieves pressure on the nerve root. In 2002, Tokyo doctors produced evidence that a growth factor called vascular endothelial growth factor (VEGF) could speed up the process of injured disk resorption.

In September 2002, a noted orthopedic and spine authority named John Engelhardt became the first American to receive an artificial disk replacement (using the Bristol disk) in an operation in Switzerland. The artificial disk technology was still in clinical trials in the United States.

Expected results

Only a small percentage of patients with unrelenting neurological involvement, leading to chronic pain of the spine, need to have a surgical procedure performed. This strongly suggests that many patients with herniated disks respond well to conservative treatment. Alternative therapies can play a significant role in managing the pain and discomfort for the majority of patients with a herniated disk. In fact, magnetic resonance imaging (MRI) studies of the lumbar spine have indicated that many people without any back pain at all have herniated disks. This means it is unclear what role the herniated disk plays in many back pain cases. For many of these patients, proper symptom management of pain and improvement in joint motion and mobility through manual therapies will be enough to fully resolve their symptoms. For those patients who do require surgery, options are available for newer, less invasive procedures that will allow a quicker healing time.

Prevention

Proper exercises to strengthen the lower back and abdominal muscles are key in preventing excess **stress** and compressive forces on lumbar disks. Good posture will help prevent problems on cervical, thoracic, and lumbar disks. A good flexibility program is critical for prevention of muscle spasm that can cause an increase in compressive forces on disks at any level. Proper lifting of heavy objects is important for all muscles and levels of the individual disks. Good posture in sitting, standing, and lying down is helpful for the spine. Losing weight, if needed, can prevent weakness and unnecessary stress on the disks caused by **obesity**.

Alternative treatments such as chiropractic, **massage therapy**, or acupuncture may play a very important role in prevention of herniated disk problems. Regular use of these approaches may help maintain proper muscular tone and reduce the cumulative effects of postural strain that may lead to the development of disk problems.

Resources

BOOKS

Hammer, W. *Functional Soft Tissue Examination and Treatment by Manual Methods,* second ed. Gaithers burg, MD: Aspen, 1999.

Kessler, R.M. *Management of Common Musculoskeletal Disorders: Physical Therapy Principles and Methods.* Philadelphia: J.B. Lippincott Co., 1990.

Liebenson, C. *Rehabilitation of the Spine*. Baltimore: Wil liams & Wilkins, 1996.

Maciocia, G. *Foundations of Chinese Medicine*. London: Churchill Livingstone, 1989.

Magee, D.J. *Orthopedic Physical Assessment*. Philadelphia: W.B. Saunders,1992.

Waddell, G. *The Back Pain Revolution*. London: Churchill Livingstone, 1998.

PERIODICALS

"Factor could Speed Absorption of Herniated Disks."*Pain & Central Nervous System Week* (July 29, 2002): 2.

"Industry Authority Becomes First American to Receive Artificial Cervical Disk."*Medical Devices & Surgical Technology Week* (September 22, 2002):3.

Jensen, M., et al. "Magnetic Resonance Imaging of the Lumbar Spine in People Without Back Pain."*New England Journal of Medicine* 331 (July 14, 1994): 69.

Whitney Lowe
Teresa G. Odle

Herpes genitalis *see* **Genital herpes**

Herpes simplex *see* **Canker sores; Cold sores**

Herpes zoster *see* **Shingles**

Hesperidin

Definition

Hespiridin is a citrus flavonoid found primarily in orange, lemon, and grapefruit peel.

Description

Flavonoids, also called **bioflavonoids**, are a type of antioxidant found primarily in fruits, vegetables, and other plant-based foods, including teas and wines. More than 5,000 individual flavonoids have been identified in plants, and several hundreds are known to occur in frequently consumed foods. Flavonoids are the most common subgroup of polyphenol phytochemicals, or natural bioactive compounds in plant-based foods that have a variety of health maintenance and disease-fighting properties.

Because of the antioxidant properties of flavonoids, these phytochemicals are thought to reduce the risk of **cancer** and **heart disease** by repairing cellular damage and protecting the body from environmental toxins. Ultraviolet (UV) wavelengths can generate molecules called free radicals that can damage living cells. Free radicals are molecules, or fragments of molecules, that are unstable and highly reactive. Free radicals are produced as the result of a normal molecule losing or gaining an electron. In normal, stable molecules, electrons associate in pairs. However, radiation from the sun can result in the removal of an electron from a molecule and the formation of free radical. Flavonoids as **antioxidants** limit free radical damage by donating electrons to quench, or neutralize, the oxidant radicals.

In human **nutrition**, the antioxidant properties of flavonoids serve to protect cells from the danger of free radicals that may be produced by the body during metabolism or by cigarette smoke, sunlight, radiation, pollutants, or even **stress**. Tens of thousands of free radicals are created in the body every second. When a free radical captures an electron from another molecule, a new free radical is created as the second molecule has a lone, unpaired electron. This new free radical seeks to capture another electron and become normal again. This continual process of forming free radicals becomes a chain reaction. Unless quenched, these free radicals can damage DNA, fats, and proteins. However, the body has a defense against these free radicals. With proper nourishment, the body can make sufficient quantities of antioxidant enzymes and substrates for those enzymes that can facilitate the quenching of free radical reactions by antioxidants. These enzymes include superoxide dismutase, catalase, and **glutathione** peroxidase. In addition to these enzymes produced by the body, antioxidant nutrients taken into the body through foods or through dietary supplements also can surrender electrons to the free radicals without adding to the chain reaction, thus terminating the free radical reactions. Antioxidant nutrients include bioflavonoids; vitamins A, C, and E; lipoic acid; and **carotenoids**.

General use

Several research studies have reported a reduced risk of heart disease associated with flavonoid intake.

In one 2007 study, daily treatment with 270 mg citrus flavonoids plus 30 mg tocotrienols improved cardiovascular parameters compared to placebo, with significant reductions in total **cholesterol**, LDL, apolipoprotein B, and trigilycerides. The exact cardioprotective properties of flavonoids were still being defined in the medical literature as of 2008, but these actions are thought to aid in the defense against cardiovascular disease:

- reduce oxidation of LDL cholesterol
- inhibit platelet activation, which may affect the relaxation capabilities of blood vessels
- balance levels of eicosanoids

Other published benefits of citrus flavonoids, particularly diosmin, include improvement of venous tone, increased **lymphatic drainage**, inhibition of inflammatory reactions, and protection against microcirculatory damage, making it a promising and effective treatment for peripheral vascular and venous diseases, such as chronic venous insufficiency and venous ulceration. Additionally, hespiridin and ascorbic acid combination has been shown to reduce symptoms of **hot flashes** in menopausal women.

Preparations

Although not classified as essential nutrients, flavonoids are important substances in human food sources, especially in citrus fruits, vegetables, nuts, and wine, that provide many health benefits. A diet that includes many types of fruits, vegetables, and nuts supplies the essential flavonoids and their associated health benefits. Five servings of a variety of fruits and vegetables is the recommended daily intake. The more common flavonoids are also available as dietary supplements.

Diosmin is a hespiridin-derivitive extracted from citrus rinds, although it has different molecular properties than hespiridin.

While preliminary research shows promise for the health benefits of flavonoids, more research is needed to quantify the amount of supplementation that yields health benefits. There are no recommended daily allowances for flavonoid supplements, but 500 mg two to three times per day is the suggested daily dosage. When taken with **vitamin C**, flavonoids help to increase the absorption of this vitamin and prolong its effects.

Precautions

Daily dosage on the product label should not be exceeded.

In the United States, dietary supplements are not required to be standardized. Although regulated under the 1994 Dietary Supplement Health and Education Act (DSHEA), there are no safety reviews or approved therapeutic uses for citrus flavonoid supplements by the U.S. Food and Drug Administration (FDA). After the product is marketed, the FDA must prove the dietary supplement unsafe before it can be removed from the shelves.

Manufacturing guidelines for herbal remedies are not standardized; therefore, preparations can vary widely from one brand to another and within the same brand from one purchase to the next, making inconsistency in the concentration of ingredients a potential risk. Anyone using herbal products should be careful and try to use well-known brands because these products are largely unregulated.

Many people associate the term "natural" with "safe," yet that is not always the case. Anyone taking herbal products of any kind should be certain to read labels carefully and discuss the products with a physician to evaluate potential interactions with other medical conditions and/or prescription medications.

Side effects

Citrus flavonoid dietary supplements are generally safe and do not produce side effects when taken according to proper dosing guidelines.

Interactions

There are no documented interactions between citrus flavonoid supplements and other herbal remedies. Citrus flavonoid supplements derived from grapefruit may interfere with the action of anticoagulant medications such as warfarin (Coumadin) and other pharmaceutical preparations. Patients should discuss their interest in using citrus flavonoid supplements with their doctor to identify any potential interactions with current prescription medications.

Flavonoids seem to work best together in a complementary and synergistic manner to provide antioxidant and other health benefits; they also seem to work well with other antioxidants. Therefore, the use of a mixed citrus flavonoid supplement in combination with a multi-antioxidant formula, along with a diet rich in a variety of fruits, vegetables, and nuts is most desirable. As of 2008 research was ongoing to gain a better understanding of potential interactions.

KEY TERMS

Antioxidant—A substance that protects against the oxidative processes that may lead to cellular damage. Antioxidants are associated with a reduced risk of cancer, cardiovascular disease, and other medical conditions. Flavonoids are a type of antioxidant.

Eicosanoids—Hormone-like compounds thought to protect against cardiovascular disease.

Free radicals—Molecules, or fragments of molecules, that are unstable and highly reactive. Antioxidants appear to provide protection against free radicals.

Resources

BOOKS

Duyff, Roberta Larson. *American Dietetic Association Complete Food and Nutrition Guide*. Hoboken, NJ: Wiley, 2006.

Halliwell, Barry, and John Gutteridge. *Free Radials in Biol ogy and Medicine,* 3rd ed. New York: Oxford University Press, 2007.

PERIODICALS

Kelm, M. A., J. F. Hammerstone, and H. H. Schmitz. "Identification and Quantitation of Flavanols and Proanthocyanidins in Foods: How Good Are the Datas?" *Clinical & Developmental Immunology* 12, no. 1 (March 2005): 35 41.

Roza, James M., Zheng Xian Liu, and Najia Guthrie. "Effect of Citrus Flavonoids and Tocotrienols on Serum Cholesterol Levels in Hypercholesterolemic Subjects." *Alternative Therapies in Health & Medicine* 13, no. 6 (November/December 2007): 44 48.

Vita, J. A. "Polyphenols and Cardiovascular Disease: Effects on Endothelial and Platelet Function." *Ameri can Journal of Clinical Nutrition* 81, Suppl. 1 (January 2005): 292S 297S.

OTHER

"Bibliography of Significant Advances in Dietary Supple ment Research 2005." Office of Dietary Supplements, National Institutes of Health, 2005. http://ods.od.nih. gov/pubs/ODS_Research_Advances_Bibliography_ 2005.pdf.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www. amfounda tion.org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agricul ture, 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http:fnic.nal.usda.gov.

International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, 20036, (202) 296 6540, http://www.ific.org.

National Center for Complementary and Alternative Med icine, National Institutes of Health, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Angela M. Costello

Hiatal hernia

Definition

A hiatal hernia is an abnormal protrusion of the stomach up through the diaphragm and into the chest cavity.

Description

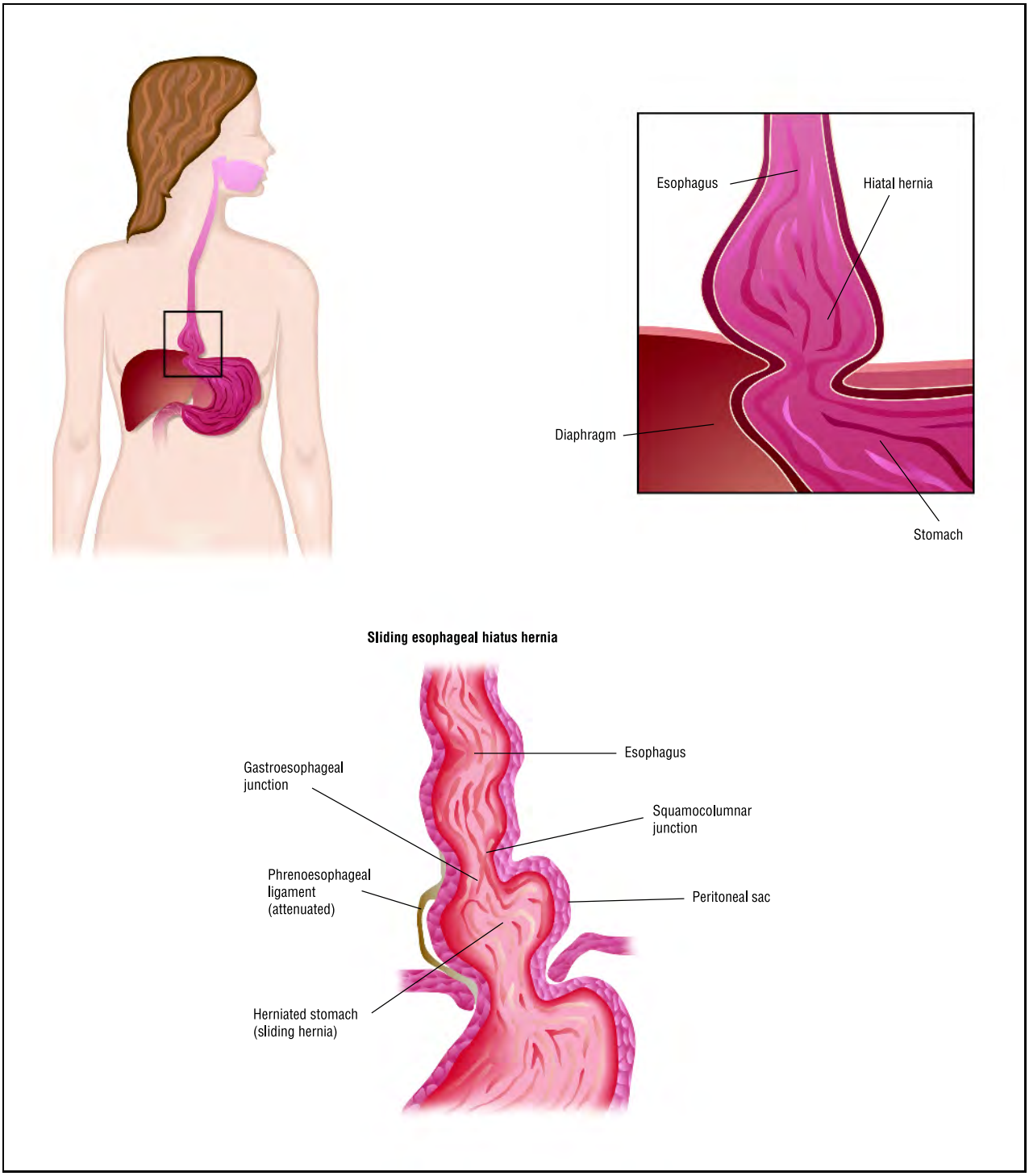
A hiatal or diaphragmatic hernia is different from abdominal hernias in that it is not visible on the outside of the body. With a hiatal hernia, the stomach bulges upward through the esophageal hiatus (the hole through which the esophagus passes) of the diaphragm. This type of hernia occurs more often in women than in men, and it is treated differently from other types of hernias.

Causes and symptoms

A hiatal hernia may be caused by **obesity**, **pregnancy**, **aging**, or previous surgery. About half of all people with hiatal hernias do not have any symptoms. For those who do, symptoms include **heartburn**, usually 30 to 60 minutes after a meal, or mid-chest **pain** due to gastric acid from the stomach being pushed up into the esophagus (gastroesophageal reflux disease, or GERD). The pain and heartburn are usually worse when lying down. Frequent belching and feelings of abdominal fullness may also occur.

Diagnosis

The diagnosis for a hiatal hernia is based on a person's reported symptoms. The doctor may then order tests to confirm the diagnosis. If a barium swallow is ordered, the person drinks a chalky white barium solution that helps any protrusion through the diaphragm to show up more clearly on the x ray



View and position of hiatal hernia in the body. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

that follows. As of 2008, a diagnosis of hiatal hernia was more frequently made by endoscopy. This procedure is done by a gastroenterologist (a specialist in digestive diseases). During an endoscopy the person is given an intravenous sedative and a narrow tube is inserted through the mouth and esophagus, into the stomach where the doctor can visualize the hernia. The procedure takes about 30 minutes and may cause

some discomfort, but usually no pain. It is done on an outpatient basis.

Treatment

Dietary and lifestyle adjustments to control a hiatal hernia include:

- avoiding reclining after meals
- avoiding spicy foods, acidic foods, alcohol, and tobacco
- eating small, frequent, bland meals to keep pressure on the esophageal sphincter
- eating a high-fiber diet
- raising the head of the bed several inches with blocks to improve both the quality and quantity of sleep

Visceral manipulation, done by a trained therapist, can help return the stomach to its proper position. **Deglycyrrhizinated licorice** (DGL) helps balance stomach acid by improving the protective substances that line the stomach and intestines and by improving blood supply to these tissues. DGL does not interrupt the normal function of stomach acid.

Allopathic treatment

There are several types of medications that help to manage the symptoms of a hiatal hernia. Antacids are used to neutralize gastric acid and decrease heartburn. Drugs that reduce the amount of acid produced in the stomach (H2 blockers) are also used. This class of drugs includes famotidine (sold under the name Pepcid), cimetidine (Tagamet), and ranitidine (Zantac). Omeprazole (Prilosec) is not an H2 blocker, but is another drug that suppresses gastric acid secretion and is used to treat symptoms caused by hiatal hernias. Another option may be metoclopramide (Reglan), a drug that increases the tone of the muscle around the esophagus and causes the stomach to empty more quickly.

Expected results

Hiatal hernias are treated successfully with medication and diet modifications 85% of the time. The prognosis remains excellent even if surgery is required in adults who are otherwise in good health.

Prevention

Some hernias can be prevented by maintaining a reasonable weight, avoiding heavy lifting and **constipation**, and following a moderate **exercise** program to maintain good abdominal muscle tone.

KEY TERMS

Endoscopy—A diagnostic procedure in which a tube is inserted through the mouth, into the esophagus and stomach. It is used to visualize various digestive disorders, including hiatal hernias.

Resources

BOOKS

Miskovitz, Paul, and Marian Betancourt. *The Doctor's Guide to Gastrointestinal Health: Preventing and Treating Acid Reflux, Ulcers, Irritable Bowel Syndrome, Diverticulitis, Celiac Disease, Colon . . . Pancreatitis, Cirrhosis, Hernias, and More*. Hoboken, NJ: Wiley, 2005.

The Official Patient's Sourcebook on Hiatal Hernia: A Revised and Updated Directory for the Internet Age. San Diego, CA: ICON, 2002.

OTHER

"Hiatal Hernia." *Mayo Clinic* February 8, 2008 [cited April 18, 2008]. http://www.mayoclinic.com/health/hiatal hernia/DS00099.

"Hiatal Hernia." *WebMD* September 1, 2006 [cited April 18, 2008]. http://www.webmd.com/heartburn gerd/hiatal hernia.

Marks, Jaw W. "Hiatal Hernia." *MedicineNet.com* February 19, 2008 [cited April 18, 2008]. http://www.medicinenet.com/hiatal_hernia/article.htm.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

American College of Gastroenterology, PO Box 342260, Bethesda, MD, 20827 2260, (301) 263 9000, http://www.acg.gi.org.

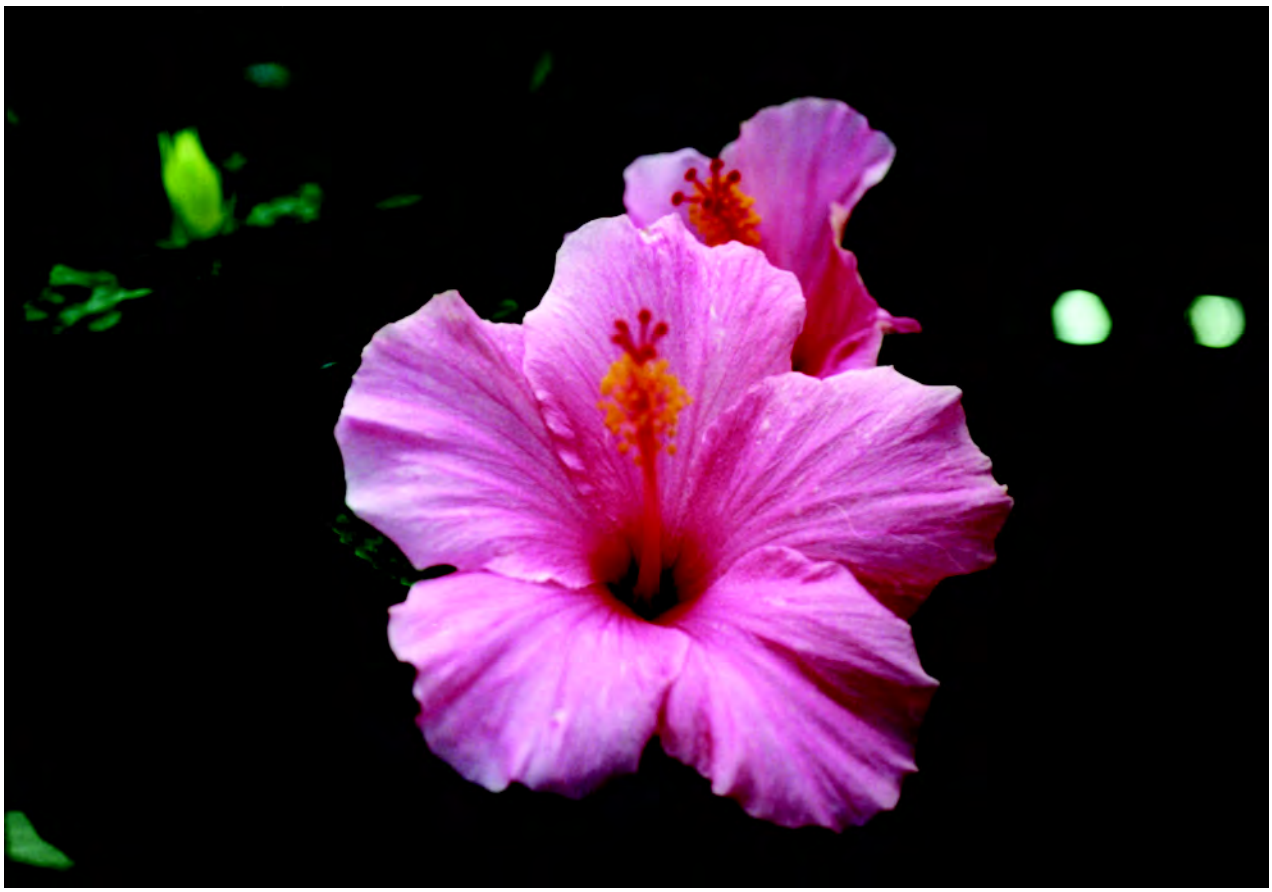
American Gastroenterological Association, 4930 Del Ray Avenue, Bethesda, MD , 20814, (301) 654 2089, http://www.gastro.org.

Paula Ford-Martin
Tish Davidson, A. M.

Hibiscus

Description

Hibiscus is the name given to more than 250 species of herbs, shrubs, and trees of the mallow or Malvaceae family. The most commonly used species



Hibiscus flower. *(Photo by Kelly Quinn. Reproduced by permission.)*

of hibiscus for medicinal purposes are *Hibiscus sabdariffa*, commonly known as the roselle; *Hibiscus rosa-sinensis*, also called China rose and common hibiscus; and *Hibiscus syriacus*, known as the Rose of Sharon. These three shrubs are native to tropical climates, but are now grown around the world. Hibiscus is renowned for its beauty as well as its medicinal uses, and gardeners cultivate the plant for its showy flowers.

General use

Hibiscus is used for a variety of ailments partly because there are so many species. Roselle lowers fevers and high blood pressure, increases urination, relieves coughs, and has been found to have antibacterial properties. All parts of the plant are used, from the seeds to the roots. Common hibiscus is used mainly for respiratory problems, but is also widely used for skin disorders or to treat fevers. Rose of Sharon is used externally as an emollient, but is also taken internally for gastrointestinal disorders.

Fever

As a natural febrifuge, roselle contains citric acid which is a natural coolant. In Pakistan and Nepal, it is the flowers that are used as a treatment for **fever**. Common hibiscus has been found to be particularly useful for children's fevers.

Respiratory disorders

Common hibiscus is used to treat coughs by placing extracts from the plant in the patient's bath or in water used for steam inhalations. Hibiscus is often combined with other herbs to make a **cough** syrup. Hibiscus is used widely in Cuba, where the tropical climate contributes to respiratory illnesses, and where hibiscus is readily found.

Hypertensive conditions

Roselle and rose of Sharon contain hypotensive compounds that lower the blood pressure. Roselle's ability to lower blood pressure may be due to its

KEY TERMS

Abortifacient—A substance that induces abortions.

Anthelminthic—A medication that destroys or expels parasitic worms from the digestive tract.

Antispasmodic—A medication that prevents or relieves involuntary muscular cramps.

Emollient—A substance that softens and smoothes the skin.

Febrifuge—A substance or medication that lowers or dispels fevers.

diuretic and laxative effects. The plant contains ascorbic and glycolic acid, which increase urination.

Skin conditions

Hibiscus is a natural emollient, used for softening or healing the skin. The leaves and flowers of the roselle are used all around the world for their emollient qualities. When the leaves are heated, they can be placed on cracked feet or on **boils** and ulcers to promote healing. Since the herb is a cooling herb, when applied externally it cools the surface of the skin by increasing blood flow to the epidermis and dilating the pores of the skin. A lotion made from a decoction of hibiscus leaves can be used to soothe **hemorrhoids**, **sunburn**, open sores, and **wounds**.

Other conditions

Hibiscus has been credited with a wide range of healing properties. In Colombia, the plant is used to treat **hair loss** and scurvy; in Samoa, it is commonly given to women who are suffering from menstrual cramps or who are in **childbirth**, as the leaves ease labor pains. In the Cook Islands and the Philippines, the flowers are used to induce abortions. In a 1962 study, hibiscus was confirmed to be hypotensive, as well as antispasmodic, anthelminthic, and antibacterial. In subsequent studies, the plant was found to effectively work against such diseases as ascariasis and **tuberculosis**. Studies in France, Malaysia, and Egypt have found that the plant has anticarcinogenic effects.

Preparations

A decoction of hibuscus can be made by pouring 1 cup of boiling water over 2 tsp of dried blossoms or 1 tsp of crumbled blossom. Steep for 10 minutes. In addition, many commercial herbal teas contain hibiscus.

Precautions

Since there are over 250 species of hibiscus, it is essential to identify the species of the herb before taking it. Since some species of hibiscus are used as abortifacients, the plant should not be used by women who are pregnant or nursing.

Side effects

Some drinks made from roselle can have alcoholic effects. The plant can also be mildly hallucinogenic.

Interactions

There are no known interactions between hibiscus and standard pharmaceutical preparations. Because it is a tart plant, however, it may not mix harmoniously with other tannic herbs. Mint leaves or rose hips are good to blend with hibiscus.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. London: Dorling Kingsley Publishers, 1996.

Keys, John D. *Chinese Herbs*. New York: Charles E. Tuttle Co., 1976.

Katherine Y. Kim

Hiccups

Definition

Hiccups are the result of an involuntary, spasmodic contraction of the diaphragm followed by the closing of the throat.

Description

Virtually everyone experiences hiccups, but they rarely last long or require a doctor's care. Occasionally, a bout of hiccups will last longer than two days, earning it the name "persistent hiccups." Very few people will experience intractable hiccups, in which hiccups last longer than one month.

A hiccup involves the coordinated action of the diaphragm and the muscles that close off the windpipe (trachea). The diaphragm is a dome-shaped muscle separating the chest and abdomen. It is normally responsible for expanding the chest cavity for inhalation. Sensation from the diaphragm travels to the spinal cord through the phrenic nerve and the vagus

KEY TERMS

Innervate—To supply a part of the body with nerves. For example, the vagus nerve supplies nerve function to the eardrum; therefore, we say that the eardrum is innervated by the vagus nerve.

Nerve—Fibers that carry sensory information, movement stimuli, or both from the brain and spinal cord to other parts of the body and back again. Some nerves, including the vagus nerve, innervate distantly separated parts of the body.

nerve, which pass through the chest cavity and the neck. Within the spinal cord, nerve fibers from the brain monitor sensory information and adjust the outgoing messages that control contraction. These messages travel along the phrenic nerve.

Irritation of any of the nerves involved in this loop can cause the diaphragm to undergo involuntary contraction, or spasm, pulling air into the lungs. When this occurs, it triggers a reflex in the throat muscles. Less than a tenth of a second afterward, the trachea is closed off, making the characteristic "hic" sound.

Causes and symptoms

Hiccups can be caused by disorders of the central nervous system, by injury or irritation to the phrenic and vagus nerves, and by toxic or metabolic disorders affecting the central or peripheral nervous systems. They may be of unknown cause or may be a symptom of psychological **stress**. Hiccups often occur after drinking carbonated beverages or alcohol. They may also follow overeating or rapid temperature changes. Persistent or intractable hiccups may be caused by any condition that irritates or damages the relevant nerves, including:

- overstretching of the neck
- laryngitis
- heartburn (gastroesophageal reflux)
- irritation of the eardrum (which is innervated by the vagus nerve)
- general anesthesia
- surgery
- bloating
- tumor
- infection
- diabetes

Diagnosis

Hiccups are diagnosed by observation and by hearing the characteristic sound. Diagnosing the cause of intractable hiccups may require imaging studies, blood tests, pH monitoring in the esophagus, and other tests.

Treatment

Most cases of hiccups will disappear on their own. Home remedies, which interrupt or override the spasmodic nerve circuitry, are often effective. Such remedies include:

- Holding one's breath for as long as possible.
- Breathing into a paper bag.
- Swallowing a spoonful of sugar or peanut butter.
- Bending forward from the waist and drinking water from the wrong side of a glass.

Acupressure techniques can also be helpful in eliminating hiccups. Acupressure is a Chinese medicine treatment that involves placing pressure on different points of the body, called acupoints. It is based on the premise that good health is based on a harmony of energy flow, or *qi*, throughout the body. By placing pressure on acupoints, qi is balanced and harmony—and health—is restored to the patient.

To treat hiccups through acupressure, rest the heels of the palms on both cheekbones while placing hands over the eyes. Massage the temples by pulling the thumbs in towards the palm. After massaging, remove the hands from the eyes and lightly press the tip of the nose with a fingertip.

Allopathic treatment

Treating any underlying disorder will usually cure the associated hiccups. Chlorpromazine (Thorazine) relieves intractable hiccups in 80% of cases. Metoclopramide (Reglan), carbamazepam, valproic acid (Depakene), and phenobarbital are also used. As a last resort, surgery to block the phrenic nerve may be performed, although it may lead to significant impairment of respiration.

Expected results

Most cases of hiccups last no longer than several hours, with or without treatment.

Prevention

Some cases of hiccups can be avoided by drinking in moderation, avoiding very hot or very cold food, and avoiding cold showers. When carbonated beverages are

drunk through a straw, more **gas** is delivered to the stomach than when they are sipped from a container; therefore, avoid using straws.

Resources

BOOK

Hurst, J. Willis, ed. *Medicine for the Practicing Physician*. 4th ed. Stamford, Conn.: Appleton & Lange, 1996.

Paula Ford-Martin

High-protein diet *see* **Atkins diet**
High blood pressure *see* **Hypertension**
High cholesterol *see* **Cholesterol**

High-fiber diet

Definition

Fiber is the material that gives plants texture and support. Dietary fiber is found in many plant foods such as fruits, vegetables, beans, nuts, and whole grains. Although it is primarily made up of carbohydrates, it does not have a lot of calories and usually is not broken down by the body for energy. Fiber is sometimes called roughage.

Dietary fiber belongs to one of two types, depending on whether or not it is able to dissolve in water. Fiber that dissolves in water is called *soluble*, while fiber that cannot be dissolved in water is known as *insoluble*. Upon ingestion, soluble fiber dissolves in the fluids secreted by the digestive tract, forming a gel. This gel moves slowly through the digestive tract, thus slowing the rate of digestion and absorption. **Diets** containing large amounts of soluble fiber have been shown to stabilize blood sugar levels in people with diabetes, and have been shown to reduce blood levels of unhealthy (LDL) **cholesterol**. Foods high in soluble fiber include beans, lentils, oats, **psyllium**, citrus fruits, barley and apples. In contrast, insoluble fiber acts as roughage. It contributes to stool bulk and promotes regularity. Foods rich in insoluble fiber include wheat bran, whole grains, dried beans, nuts, seeds, and those fruits and vegetables with an edible outer skin or seeds.

Adequate intake of fiber

Age	g/day
Children > 1 yr.	Not established
Children 1-3 yrs.	19
Children 4-8 yrs.	25
Boys 9-13 yrs.	31
Girls 9-13 yrs.	26
Boys14-18 yrs.	38
Girls 14-18 yrs.	26
Men 19-50 yrs.	38
Women 19-50 yrs.	25
Men > 50 yrs.	30
Women > 50 yrs.	21
Pregnant women	28
Breastfeeding women	29

Foods that contain fiber	mcg
Beans, lima, fresh, cooked, 1/2 cup	6.6
Beans, baked, canned, plain, 1/2 cup	6.3
Beans, black, cooked, 1/2 cup	6.1
Beans, kidney, fresh, cooked, 1/2 cup	5.7
Winter squash, cooked, 1 cup	5.7
Spaghetti, whole wheat, plain, 1 cup	5.6
Cereal, bran flake, 3/4 cup	5.3
Cereal, shredded wheat, 1 cup	5.2
Pear, raw, 1 med.	5.1
Turnips, cooked, 1/2 cup	4.8
Rice, brown, cooked, 1 cup	3.5
Apple, raw, with skin, 1 med.	3.3
Oatmeal, plain, cooked, 3/4 cup	3.0
Broccoli, fresh, cooked, 1/2 cup	2.6
Summer squash, cooked, 1 cup	2.5
Carrot, fresh, cooked, 1/2 cup	2.3
Potato, fresh, cooked, 1	2.3
Spinach, fresh, cooked, 1/2 cup	2.2
Brussels sprouts, fresh, cooked, 1/2 cup	2.0
Bread, whole-wheat, 1 slice	1.9
Tangerine, raw, 1 med.	1.9
Cauliflower, fresh, cooked, 1/2 cup	1.7
Cabbage, fresh, cooked, 1/2 cup	1.5
Peach, raw, 1 med.	1.5
Asparagus, fresh, cooked, 4 spears	1.2
Romaine lettuce, 1 cup	1.2
Peanuts, dry roasted, 1 tbsp	1.1
Tomato, raw, 1	1.0
Rice, white, cooked, 1 cup	0.6
Almonds, slivered, 1 tbsp.	0.6

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

Origins

High-fiber diet therapy is actually a return to nature and the plant-based diets used by our ancestors since the beginning of time. In fact, our ancestors consumed large quantities of fiber-containing foods such as fruits, vegetables and whole grain products every day. As technology advanced, however, people began to turn away from these unprocessed healthful foods and began eating more highly processed and fat-

laden foods. As a result, the incidence of coronary **heart disease**, diabetes and cancers has steadily risen.

No single person developed the high-fiber diet. Over the years, researchers have compared the rate of various chronic diseases in populations that had high-fiber diets with those that had lower dietary fiber intake. They found, for example, that native Africans who ate a high-fiber, plant-based diet are rarely bothered **constipation**. However, in industrialized countries where a lot of animal products are consumed, constipation is common. Observations like this encouraged researchers to look at other roles that dietary fiber might play in health. From their findings came a consensus that a high-fiber diet is a healthy diet. This is reflected in the Dietary Guidelines for Americans 2005, which encourage people to eat more high-fiber foods such as whole grains.

Benefits

A high-fiber diet helps prevent or treat the following health conditions:

- High blood cholesterol levels. Fiber effectively lowers blood cholesterol levels. It appears that soluble fiber binds to the cholesterol molecule and moves it through the digestive tract so that it can be excreted from the body. This mechanism prevents cholesterol from being reabsorbed into the bloodstream.
- Constipation. A high-fiber diet is a useful non-drug treatment for constipation. Fiber in the diet adds more bulk to the stools, making them softer. Fiber also shortens the length of time that foods remain in the digestive tract. It is important, however, for people increasing their fiber intake to drink more water as well, in order to get the benefit of using dietary fiber to relieve constipation.
- Hemorrhoids. Fiber in the diet adds more bulk and softens the stool, thus reducing the pain and bleeding associated with hemorrhoids.
- Diabetes. A common problem for diabetics is the rapid rise of insulin levels following meals. Soluble fiber in the diet delays the emptying of the stomach contents into the intestines. This delay helps to slow the rise of blood sugar levels following a meal and thus gives diabetics greater control over their condition.
- Obesity. Dietary fiber makes a person feel full more rapidly. It can thus help a person lose weight by making the appetite easier to control.
- Colon cancer. Claims have been made that a diet high in fiber reduces the risk of colon cancer. The theory is that fiber speeds up the elimination of waste from the colon. This decreases the time that cells lining the intestinal wall are exposed to potential cancer-causing agents. However, in the mid-2000s, a study that followed 80,000 nurses for 16 years found no relationship between dietary fiber and colon cancer. More research remains to be done in this area.
- Breast cancer. A high dietary consumption of fats is associated with an increased risk of breast cancer. Because fiber reduces fat absorption in the digestive tract, it may prevent breast cancer. In 2003, a study confirmed these findings and showed that women who consumed more fiber and vitamin E also had a lower risk of developing benign breast disease, a condition which can lead to breast cancer.
- Prostate cancer. Though research is still relatively new, Dr. Dean Ornish presented data in April 2002 on a study that showed how a high-fiber vegan diet could slow or even stop prostate cancer for men in early stages of the disease. Men who submitted to an extremely low-fat, vegan diet consisting of fruits, vegetables, whole grains, beans and soy products instead of dairy, and who gave up alcohol and agreed to exercise three hours a week, relax and meditate one hour a day showed improvements in markers for prostate cancer indicators. Patients should not try this regimen unless they first discuss it with their doctors and it should complement other physician–ordered treatments.

Description

The United States Institute of Medicine (IOM) of the National Academy of Sciences has set dietary reference intakes (DRIs) for fiber based on research data that applies to American and Canadian populations. DRIs provide **nutrition** guidance to both health professionals and consumers. The current daily DRIs for fiber are as follows:

- children ages 1–3 years: 19 grams
- children ages 4–8 years: 25 grams
- men ages 14–50: 38 grams
- men age 51 and older: 30 grams
- girls ages 9–18: 26 grams
- adult women ages 19–50: 25 grams
- women age 51 and older: 21 grams
- pregnant women: 28 grams
- breastfeeding women: 29 grams

An individual can generally get 25–35 g of fiber daily by eating two to three servings of fruits and three to five servings of vegetables every day. To increase fiber intake, an individual should eat more of the following high-fiber foods: whole grains, beans, fruits (preferably with skins on), roots and leafy vegetables,

broccoli or carrots. As an added bonus, he or she will also receive other health benefits provided by the vitamins, minerals, **antioxidants** and cancer-fighting phytochemicals in these foods.

Preparations

For the greatest benefit to health, people should have both soluble and insoluble fiber in their diet, preferably in a 50:50 ratio. The following foods are good sources of insoluble fiber:

- wheat bran
- whole wheat products
- cereals made from bran or shredded wheat
- crunchy vegetables
- barley
- grains
- whole wheat pasta
- rye flour

Good sources of soluble fiber include:

- oats
- oat bran
- oatmeal
- apples
- citrus fruits
- strawberries
- dried beans
- barley
- rye flour
- potatoes
- raw cabbage
- pasta

Precautions

Few risks are associated with a high-fiber diet in healthy individuals. However, in people with gastrointestinal disorders such as **irritable bowel syndrome** and **inflammatory bowel disease**, a high-fiber diet may irritate the bowel and worsen their symptoms. Likewise, people who have had a surgical weight-loss procedure may be unable to tolerate a high-fiber diet. Adding bran fiber to foods is not recommended due to the risk of poor intakes of some vitamins that bind with phytates and oxalates in many high-fiber foods.

High-fiber therapy must be part of a balanced diet that includes adequate water intake and also provides the proper amounts of essential vitamins and minerals, including **calcium**, **iron** and **zinc**.

KEY TERMS

Cellulose—The primary substance composing the cell walls or fibers of all plant tissues.

Hemorrhoid—A varicose vein in the area around the anus. Hemorrhoids sometimes cause pain and bleeding.

Naturopathy—A school of alternative medicine that focuses on natural healing. Therapies provided by practitioners of naturopathy often include diet, exercise, supplement and hydrotherapy and may also include osteopathic and chiropractic treatments.

Roughage—Another name for dietary fiber.

Fiber supplements such as psyllium may reduce the absorption of certain medications when taken at the same time. In general, medications should be taken at least one hour before or two hours after fiber supplements.

Side effects

Fiber should be increased in the diet gradually. If fiber intake increases suddenly, abdominal **pain**, **gas**, and **diarrhea** may result. Also, when eating a high-fiber diet, it is important to drink at least 8 glasses (64 oz or 2 L) of water or other fluids daily. People whose fluid intake must be restricted for medical reasons should avoid a high-fiber diet.

Research and general acceptance

As a result of the large volume of scientific evidence supporting the use of fiber in disease prevention and treatment, high-fiber diet treatments have been accepted and advocated by practitioners of alternative and conventional medicine alike. High-fiber diets have been endorsed by the American Heart Association, the American Dietetic Association, the National **Cancer** Institute, the National Research Council, and the United States Department of Health and Human Services.

Resources

BOOKS

Murray, Michael, and Joseph Pizzorno. *Encyclopedia of Natural Medicine,* revised 2nd edition. Rocklin, CA: Prima Health, 1998.

Spiller, Gene A. and Monica Spiller. *What's with Fiber?* Laguna Beach, CA: Basic Health Publications, 2005.

Watson, Brenda and Leonard Smith. *The Fiber35 Diet: Nature's Weight Loss Secret*. New York: Free Press, 2007.
Winick, Myron. *The Fiber Prescription*. New York: Fawcett Columbine, 1992.

PERIODICALS

"Fight Prostate Cancer with High Fiber Vegan Diet." *Nat ural Life* (July August 2002): 8.
"High fiber Diet Increases Triglycerides in Type 2 Dia betics." *Diabetes Week* (March 24, 2003): 17.
Mangels, Reed. "High Fiber Diet without the Worry of Discomfort." *Vegetarian Journal* (July August 2002): 20 21.
Sullivan, Michele G. "More Fiber, Less Fat may Reduce Breast Cancer Risk." *Family Practice News* (January 15, 2003): 30.
Ward, Elizabeth. "The Incredible Bulk: Fiber is a Nutri tional Scouring Pad. Here are 31 Ways to Keep it From Tasting Like One." *Men's Health* 18 (June 2003): 102 103.

ORGANIZATIONS

American Association of Naturopathic Physicians, P.O. Box 20386, Seattle, WA, 98102, (206) 323 7610
American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.
American Heart Association, 7272 Greenville Avenue, Dal las, TX, 75231, (800) 242 8721, http://www. americanheart.org.

Mai Tran
Teresa G. Odle
Helen Davidson

High sensitivity C-reactive protein test

Definition

The high sensitivity C-reactive protein (CRP) test is a blood assay used to estimate an individual's risk for **heart disease** and **stroke**. The test also measures the presence of inflammation or infection.

Origins

In the late twentieth century, the primary methods of measuring a person's risk of heart disease included traditional factors such as age, family history of heart disease or stroke, past heart disease, **smoking**, **obesity**, and tests that measured lipids in the bloodstream, including low-density lipoprotein (LDL). Low-density lipoproteins ("bad" **cholesterol**) were previously considered the gold standard in risk factor prediction.

In the 1990s and early twenty-first century, several new tests came into widespread use. These tests are considered better predictors of heart disease risk. They include blood tests to measure the levels of homocysteine, lipoprotein(a), fibrinogen, and highly sensitive C-reactive protein. They are called emerging or non-traditional risk factors.

Benefits

Knowing one's highly sensitive C-reactive protein levels can help a person manage and lower his or her risk for heart disease. Factors that lower highly sensitive CRP levels include weight loss, regular **exercise**, a healthy diet, and smoking cessation. Medicines may also be needed. Medications include a class of drugs called statins, with brand names such as Lipitor, Zocor, Crestor, and Pravachol. Other interventions may include Zetia, a cholesterol absorption inhibitor, and a class of drugs called thiazoladinediones, such as the diabetes brand name medications, Avandia and Actos.

According the American Heart Association, the three risk levels associated with high sensitivity CRP levels are:

- Low risk: under 1 milligram per liter of blood.
- Average risk: 1 to 3 milligrams per liter of blood.
- High risk: More than 3 milligrams per liter of blood.

Description

C-reactive protein is produced by the liver, and is not normally found in the blood in high amounts. It is rapidly produced following an injury, bacterial or fungal infection, or inflammation. It disappears quickly once the injury, illness, or inflammation heals or resolves. High CRP levels following surgery or an injury are a good indication that an infection is present. Until early this century, the blood test used to detect CRP levels could only measure them down to 3 milligrams per liter of blood or higher. Improvements in technology have permitted more precise measurements of CRP levels ranging from less than 0.3 milligrams to 3 milligrams per liter of blood. The more precise measurement is called the high sensitivity C-reactive protein (hsCRP) test.

While levels under 3 milligrams per liter of blood do not necessarily indicate an infection, they do indicate the presence of an inflammatory reaction. Researchers found that these lower amounts of CRP in the body are extremely useful in predicting coronary

KEY TERMS

Anticoagulant— Medication that prevents blood clotting.

C-reactive protein—A protein produced in the liver that is not normally found in the blood in high amounts. It is elevated when infection or inflammation are present. A test that measures this substance in the bloodstream serves as a predictor of heart disease or stroke.

Centrifuge—A machine that rotates rapidly and uses centrifugal force to separate substances of different densities.

Cholesterol—A compound found in animal tissue and blood, of which high levels in the blood are linked to clogged arteries, heart disease, and gallstones.

Cholesterol absorption inhibitor—A substance that decreases the absorption of cholesterol in the intestines.

Diabetes—Several metabolic disorders in which the body produces insufficient insulin or is resistant to the insulin it does produce, causing glucose levels to rise in the blood.

Fasting—Avoiding food for a period of time.

Fibrinogen—A protein that is important in blood clotting.

Homocysteine—An amino acid, derived from protein in food, that can build up in the blood and contribute to the development of heart disease.

Lipids—Organic compounds that are greasy, insoluble in water, but soluble in alcohol. Fats, waxes, and oils are examples of lipids.

Lipoprotein(a)—A type of bad cholesterol that increases the risk of heart attack or stroke.

Low-density lipoprotein—LDL, the so-called bad cholesterol.

Plasma—A clear yellowish fluid that is a component of blood.

Statins—A class of drugs used primarily, but not exclusively, to treat high cholesterol.

Thiazoladinediones—A class of drugs typically used to treat diabetes and insulin resistance.

heart disease (CHD). However, since CRP levels vary on different days, at least two separate measurements are needed to adequately determine a person's CHD risk level.

To take the high sensitivity CRP test, a healthcare worker draws blood from a vein, and into a tube. In the laboratory, the tube of blood spins at high speed within a machine called a centrifuge. The blood cells sink to the bottom and the liquid stays on the top. This straw-colored liquid on the top is the plasma. To measure the high sensitivity CRP, a person's plasma is combined with other substances. From the resulting reaction, the amount of CRP in the plasma is determined.

A study released in 2003 by the College of American Pathologists found varying outcomes when it compared results from five different methods in identifying hsCRP. A 2001 study by several university medical departments found that six out of nine hsCRP testing methods did not produce results as accurate as the manufacturers claimed. In 2003, the Centers for Disease Control and Prevention announced it would attempt to address these issues.

Preparations

Unlike some blood tests that require **fasting**, the high sensitivity C-reactive protein test can be done either before or after eating. No other preparations are needed.

Each high sensitivity CRP test requires a 5-milliliter blood sample. A healthcare worker usually ties a tight band (tourniquet) on the person's upper arm. The blood is drawn from a vein in the arm, usually at the inside of the elbow or on the back of the hand. The needle insertion site is cleaned with antiseptic. A small needle is inserted through the skin and into the vein, allowing the blood sample to flow into a collection tube or syringe. Once the blood is collected, the needle is removed from the puncture site. Collecting the blood sample takes several minutes or less.

Precautions

The primary risk to the patient is a mild stinging or burning sensation during the drawing of blood, with minor swelling or bruising afterward. Some patients may feel faint or lightheaded when blood is drawn.

Side effects

There are generally no side effects associated with the test. Any weakness, fainting, sweating, or other unusual reaction should be immediately reported.

Research and general acceptance

Several large-scale scientific studies have shown that high sensitivity C-reactive protein levels are a strong predictor of future heart attacks and strokes among apparently healthy men and women. Research has also shown that hsCRP test will play an important role in preventing heart disease, according to an article in the March 2001 issue of *Circulation*. The Centers for Disease Control and Prevention, and the American Heart Association, recommend limited use of hsCRP testing for assessing heart disease risk. The two groups recommend the test only when a physician is undecided about a course of treatment for a patient who is considered at intermediate risk for CHD. According to an article in the February 2003 issue of the *Harvard Health Letter*, a growing number of physicians believe everyone should be tested, and this test may eventually supplant cholesterol testing as a predictor of CHD.

Training and certification

Nurses are usually the health care professionals that administer high sensitivity CRP tests. Nurses can also help educate patients regarding the role that a proper diet and regular exercise can play in reducing the risk of CHD. However, the physician that recommends specific treatment and prescribes needed medication.

Resources

BOOKS

Deron, Scott J. *C Reactive Protein: Everything You Need to Know About it and Why It's More Important Than Cholesterol to Your Health*. New York, NY: McGraw Hill, 2003.

Hirsch, Anita. *Good Cholesterol, Bad Chloresterol: An Indispensable Guide to the Facts About Cholesterol*. New York, NY: Marlowe and Co., 2002.

Myers, Robert. *Heart Disease: Everything You Need to Know (Your Personal Health)*. Richmond Hill, ON: 2004.

Rosenfeld, Isadore. *Dr. Isadore Rosenfeld's Breakthrough Health 2004: 167 Up to the Minute Medical Discoveries, Treatments, and Cures that Can Save Your Life, From America's Most Trusted Doctor!* Emmaus, PA: Rodale, 2004.

PERIODICALS

"AHA/CDC Panel Issues Recommendations on CRP test ing." *Medical Laboratory Observer* (March 2003): 6.

Futterman, Laurie G., and Louis Lemberg. "High Sensitivity C Reactive Protein is the Most Effective Prognostic Measurement of Acute Coronary Events." *American Journal of Critical Care* (September 2002): 482 6.

Rifai, Nader, and Paul M. Ridker. "High Sensitivity C Reactive Protein: A Novel and Promising Marker of Coronary Heart Disease." *Clinical Chemistry* (March 2001): 403 11.

Roberts, William L., et al. "Evaluation of Nine Automated High Sensitivity C Reactive Protein Methods: Impli cations for Clinical and Epidemiological Applications. Part 2." *Clinical Chemistry* (March 2001): 418 25.

Sandovsky, Richard. "Inflammatory Markers in Coronary Artery Disease." *American Family Physician* (March 1, 2004): 1245.

Seppa, N. "Early Warning? Inflammatory Protein is Tied to Colon Cancer Risk." *Science News* (Feb. 7, 2004): 84 5.

"Why Do We Need Another Test?" *Harvard Health Letter* (February 2003)

ORGANIZATIONS

American Heart Association National Center. 7272 Green ville Avenue, Dallas, TX 75231 4596. 800 242 8721. http://www.americanheart.org.

Ken R. Wells

HIV infection *see* **AIDS**

Hives

Definition

Hives are an allergic skin reaction causing localized redness, swelling, and **itching**.

Description

Hives are a reaction of the body's immune system that causes areas of the skin to swell, itch, and become reddened. (The areas are called wheals.) When the reaction is limited to small areas of the skin, it is called urticaria. Involvement of larger areas, such as whole sections of a limb, is called angioedema.

Causes and symptoms

Causes

Hives are an allergic reaction. The body's immune system is normally responsible for protection from foreign invaders. When it becomes sensitized to normally harmless substances, the resulting reaction is called an allergy. An attack of hives is set off when such a substance, called an allergen, is ingested, inhaled, or otherwise contacted. It interacts with immune cells called mast cells, which reside in the skin, airways, and digestive system. When mast cells encounter an allergen, they release histamine and other chemicals, both locally and into the bloodstream. These chemicals cause blood

KEY TERMS

Allergen—A substance capable of producing an immediate type of hypersensitivity, or allergy.

Wheal—A smooth, slightly elevated area on the body surface, which is redder or paler than the surrounding skin.

vessels to become more porous, allowing fluid to accumulate in tissue and leading to the swollen and reddish appearance of hives. Some of the chemicals released sensitize **pain** nerve endings, causing the affected area to become itchy and sensitive.

A wide variety of substances may cause hives in sensitive people. Common culprits include:

- prescription and nonprescription drugs (Aspirin and penicillin are the two most commonly known causes of allergic reactions in adults.)
- nuts, especially peanuts, walnuts, and Brazil nuts
- fish, mollusks, and shellfish
- eggs
- wheat
- milk
- strawberries
- food additives and preservatives
- flu vaccines
- tetanus toxoid vaccine
- gamma globulin
- bee, wasp, and hornet stings
- bites of mosquitoes, fleas, and scabies.

In addition, hives may also be the body's response to certain physical conditions such as emotional **stress**, rubbing, cold wind, heat contact (**prickly heat** rash), wearing tight clothing, or **exercise** after a heavy meal.

Symptoms

Urticaria is characterized by redness, swelling, and itching of small areas of the skin. These patches usually grow and recede in less than a day, but may be replaced by others in other locations. Angioedema is characterized by more diffuse swelling. Swelling of the airways may cause **wheezing** and respiratory distress. In severe cases, airway obstruction may occur.

Diagnosis

Hives are easily diagnosed by visual inspection. The cause of hives is usually apparent, but may require a careful medical history in some cases.

Treatment

Home remedies

To deal with the symptoms of hives, an oatmeal bath may help to relieve itching. **Chickweed**, (*Stellaria media*), applied as a poultice (crushed or chopped herbs applied directly to the skin) or added to bath water, may also help relieve itching.

Nutritional therapy

Naturopaths or nutritionists will try to determine what allergic substance is causing the reaction and help the patient eliminate or minimize its effects. They may also recommend **vitamin C**, **vitamin B_{12}**, and **quercetin** (a flavonoid) supplements to help control acute or chronic hives.

Homeopathic therapy

The following homeopathic remedies have been used to relieve itching, redness or swelling associated with hives:

- urtica urens
- apis (Apis mellifica)
- sulfur

Allopathic treatment

Mild cases of hives are treated with antihistamines, such as diphenhydramine (Benadryl). More severe cases may require oral corticosteroids, such as prednisone. Topical corticosteroids are not effective. In 2002, the Food and Drug Administration (FDA) approved the allergy drug Claritin for over-the-counter use for patients with urticaria. The drug comes in tablet and syrup form and carries low risks. Its release for over-the-counter use was delayed until the company that manufactures the drug could add instructions for patients about self-diagnosis of hives. They cautioned it should only be used for recurrent hives that had already been diagnosed by a physician, not for acute or severe urticaria. Airway swelling may require emergency injection of epinephrine (adrenaline).

Expected results

Most cases of hives clear up within one to seven days without treatment, provided the cause (allergen) is found and avoided.

Prevention

Preventing hives depends on avoiding the allergen causing them. Analysis of new items in the diet or new drugs taken may reveal the likely source of the reaction. Chronic hives may be aggravated by stress, **caffeine**, alcohol, or tobacco; avoiding these may reduce the frequency of reactions.

Resources

BOOKS

Jonas, Wayne B. and Jennifer Jacobs."Skin Rashes." *Healing with Homeopathy: The Doctor's Guide*. New York, NY: Warner Books, 1996.

Lawlor, G. J., Jr., T.J. Fischer, and D.C. Adelman. *Manual of Allergy and Immunology*. Little, Brown and Co., 1995.

Murray, Michael T., and Joseph E. Pizzorno. "Hives." *Encyclopedia of Natural Medicine*. Revised 2nd ed. Rocklin, CA: Prima Publishing, 1998.

Novick, N. L. *You Can Do Something About Your Allergies*. MacMillan, 1994.

PERIODICALS

Franklin, Deanna. "FDA Panel Recommends OTC Approval of Claritin (Urticaria Indication Debated)." *Family Practice News* (June 15, 2002): 26 31.

Mai Tran
Teresa G. Odle

Hodgkin's disease

Definition

Hodgkin's disease, also called Hodgkin's lymphoma, is a type of **cancer** involving tissues of the lymphatic system, or lymph nodes. Its cause is unknown, although some interaction between individual genetic makeup, family history, environmental exposures, and infectious agents is suspected.

Description

Hodgkin's lymphoma can occur at any age, although the majority of these lymphomas occur in people age 15–34, and over the age of 60. Lymphoma is a cancer of the lymphatic system. Depending on the specific type, a lymphoma can have any or all of the characteristics of cancer: rapid multiplication of cells, abnormal cell types, loss of normal arrangement of cells with respect to each other, and invasive ability.

KEY TERMS

Biopsy—The removal of a small sample of tissue, in order to carefully examine it under a microscope. This helps in the diagnosis of cancer, and can also reveal infection or inflammation.

Chemotherapy—Treatment for a disease involving various chemical or drug preparations; this term tends to refer to treatment for forms of cancer in particular.

Constitutional—Involving the whole body. A constitutional symptom, for example, is one that is not focused entirely in the diseased organ system, but affects the whole system (such as fever).

Radiation therapy —Also called radiotherapy, the treatment for a disease involving carefully measured exposure to radiation.

Staging—Using various methods of diagnosis to determine the extent of disease present in an individual. Staging is important as a way of determining the appropriate type of treatment for a particular disease, as well as helping to predict an individual's chance for cure from a particular disease.

Causes and symptoms

Hodgkin's lymphoma usually begins in a lymph node. The node enlarges and—similar to enlarged lymph nodes due to infectious causes—may or may not cause any **pain**. Hodgkin's lymphoma progresses in a fairly predictable way, traveling from one group of lymph nodes to another, unless it is treated. More advanced cases of Hodgkin's involve the spleen, liver, and bone marrow.

The features and prognosis of patients with Hodgkin's disease and non-Hodgkin's lymphoma (NHL) differ significantly. However, research in 2001 found that among patients with human immunodeficiency virus (HIV), Hodgkin's disease appears very similar to HIV-related non-Hodgkin's lymphoma. NHL occurs much more often in patients with HIV, but in recent years, a small but significant increase in Hodgkin's disease has been seen in HIV-infected patients.

Constitutional symptoms—symptoms that affect the whole body—are common. They include **fever**, weight loss, heavy sweating at night, and **itching**. Some patients note pain after drinking alcoholic beverages.

As nodes swell, they may push against nearby structures, resulting in other local symptoms. These symptoms include pain from pressure on nerve roots,

as well as loss of function of specific muscle groups served by the compressed nerves. Kidney failure may result from compression of the ureters, the tubes which carry urine from the kidneys to the bladder. The face, neck, or arms may swell due to pressure slowing the flow in veins that should drain blood from those regions (superior vena cava syndrome). Pressure on the spinal cord can result in leg paralysis. Compression of the trachea and/or bronchi (airways) can cause **wheezing** and shortness of breath. Masses in the liver can cause the accumulation of certain chemicals in the blood, resulting in jaundice—a yellowish discoloration of the skin and the whites of the eyes.

As Hodgkin's lymphoma progresses, a patient's immune system becomes less and less effective at fighting infection. Thus, patients with Hodgkin's lymphoma become increasingly more susceptible to both common **infections** caused by bacteria and unusual (opportunistic) infections caused by viruses, fungi, and protozoa.

Diagnosis

Diagnosis of Hodgkin's lymphoma requires the removal of a sample of a suspicious lymph node (biopsy) and careful examination of the tissue under a microscope. In Hodgkin's lymphoma, certain characteristic cells—Reed-Sternberg cells—must be present in order to confirm the diagnosis. These cells usually contain two or more nuclei—oval, centrally-located structures within cells that house their genetic material. In addition to the identification of these Reed-Sternberg cells, other cells in the affected tissue sample are examined. The characteristics of these other cells help to classify the specific subtype of Hodgkin's lymphoma.

Once Hodgkin's disease has been diagnosed, staging is the next important step. This involves computed tomography (CT) scans of the abdomen, chest, and pelvis, to identify areas of lymph node involvement. In rare cases, a patient must undergo abdominal surgery so that lymph nodes in the abdominal area can be biopsied (staging laparotomy). Some patients have their spleens removed during this surgery, both to help with staging and to remove a focus of the disease. Bone marrow biopsy is also required unless there is obvious evidence of vital organ involvement. Some physicians also order a lymphangiogram—a radiograph of the lymphatic vessels.

Staging is important because it helps to determine what kind of treatment a patient should receive. On one hand, it is important to understand the stage of the disease so that the treatment chosen is sufficiently strong to provide the patient with a cure. On the other hand, all the available treatments have serious side effects, so staging allows the patient to have the type of treatment necessary to achieve a cure, and to minimize the severity of short and long-term side effects from which the patient may suffer.

Treatment

Hodgkin's disease is a life-threatening disease, and a correct diagnosis and appropriate treatment with surgery, chemotherapy, and/or radiation therapy is critical to controlling the illness.

Acupuncture, **hypnotherapy**, and **guided imagery** may be useful tools in treating pain symptoms associated with Hodgkin's. Acupuncture involves the placement of a series of thin needles into the skin at targeted locations on the body known as acupoints in order to harmonize the energy flow within the human body.

In guided imagery, the patient creates pleasant and comfortable mental images that promote **relaxation** and improve a patient's ability to cope with discomfort and pain symptoms. Other guided imagery techniques involve creating a visual mental image of pain. Once the pain can be visualized, the patient can adjust the image to make it more pleasing, and thus more manageable, to them.

A number of herbal remedies are also available to lessen pain symptoms and promote relaxation and healing. However, individuals should consult with their healthcare professionals before taking them. Depending on the preparation and the type of herb, these remedies may interact with or enhance the effects of other prescribed medications.

Allopathic treatment

Treatment of Hodgkin's lymphoma has become increasingly effective over the years. The type of treatment used for Hodgkin's depends on the information obtained by staging, and may include chemotherapy (treatment with a combination of drugs), and/or radiotherapy (treatment with radiation to kill cancer cells).

Both chemotherapy and radiation therapy have unfortunate side effects. Chemotherapy can result in **nausea**, **vomiting**, **hair loss**, and increased susceptibility to infection. Radiation therapy can cause **sore throat**, difficulty in swallowing, **diarrhea**, and growth abnormalities in children. Both forms of treatment, especially in combination, can result in sterility (the permanent inability to have offspring), as well as heart and lung damage. A 2003 study showed a link between radiation therapy for Hodgkin's disease and increased risk for later **breast cancer**. However, adding chemotherapy to

the regimen decreased the chance for breast cancer, perhaps by inducing premature **menopause**.

Expected results

Hodgkin's is one of the most curable forms of cancer. Current treatments are quite effective, especially with early diagnosis. Children have a particularly high rate of cure from the disease, with about 75% still living cancer-free 20 years after their original diagnosis. Adults with the most severe form of the disease have about a 50% cure rate. In 2003, research noted that even after complete remission, some patients showed signs of thyroid dysfunction, most likely from the immune problems caused by Hodgkin's disease. They recommended thyroid examinations every year during follow-up of the disease.

Prevention

While Hodgkin's disease cannot be prevented, researchers continue to study risk factors for the disease. In 2003, a study showed a possible link between exposure to the **measles** virus around the time of **pregnancy** or birth. As research continues, these and other discoveries may help people control certain risk factors for Hodgkin's disease and other cancers.

Resources

BOOKS

Dollinger, Malin, et al. *Everyone's Guide to Cancer Therapy*. Kansas City: Andrews McMeel Publishing, 1997.

Freedman, Arnold S. and Lee M. Nadler. "Hodgkin's Dis ease." In *Harrison's Principles of Internal Medicine,* edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

PERIODICALS

"Chemotherapy May Suppress Breast Cancer Risk in Hodgkin Disease Survivors." *Women's Health Weekly* (July 31, 2003): 52.

"HIV Positive Hodgkin Patients' Disease Looks Like NHL." *Cancer Weekly* (December 18, 2001): 22.

"The Risk of Hodgkin Disease May be Association with Exposure to Infections."*Blood Weekly* (June 12, 2003): 10.

"Thyroid Should be Examined Once a Year During Follow up for Hodgkin Disease." *Clinical Trials Week* (March 24, 2003): 70.

ORGANIZATIONS

The Lymphoma Research Foundation of America, Inc. 8800 Venice Boulevard, Suite 207, Los Angeles, CA 90034. (310) 204 7040. http://www.lymphoma.org.

Paula Ford-Martin
Teresa G. Odle

Holistic dentistry

Definition

Holistic dentistry, also referred to as biologic dentistry, is an alternative approach that focuses on the use of non-toxic restorative materials for dental work and emphasizes the unrecognized impact that dental toxins and dental **infections** may have on a person's overall health. While traditional dentistry focuses only on the areas above the neck, holistic dentistry looks at the patient as a whole system and how the mouth relates to the rest of the body.

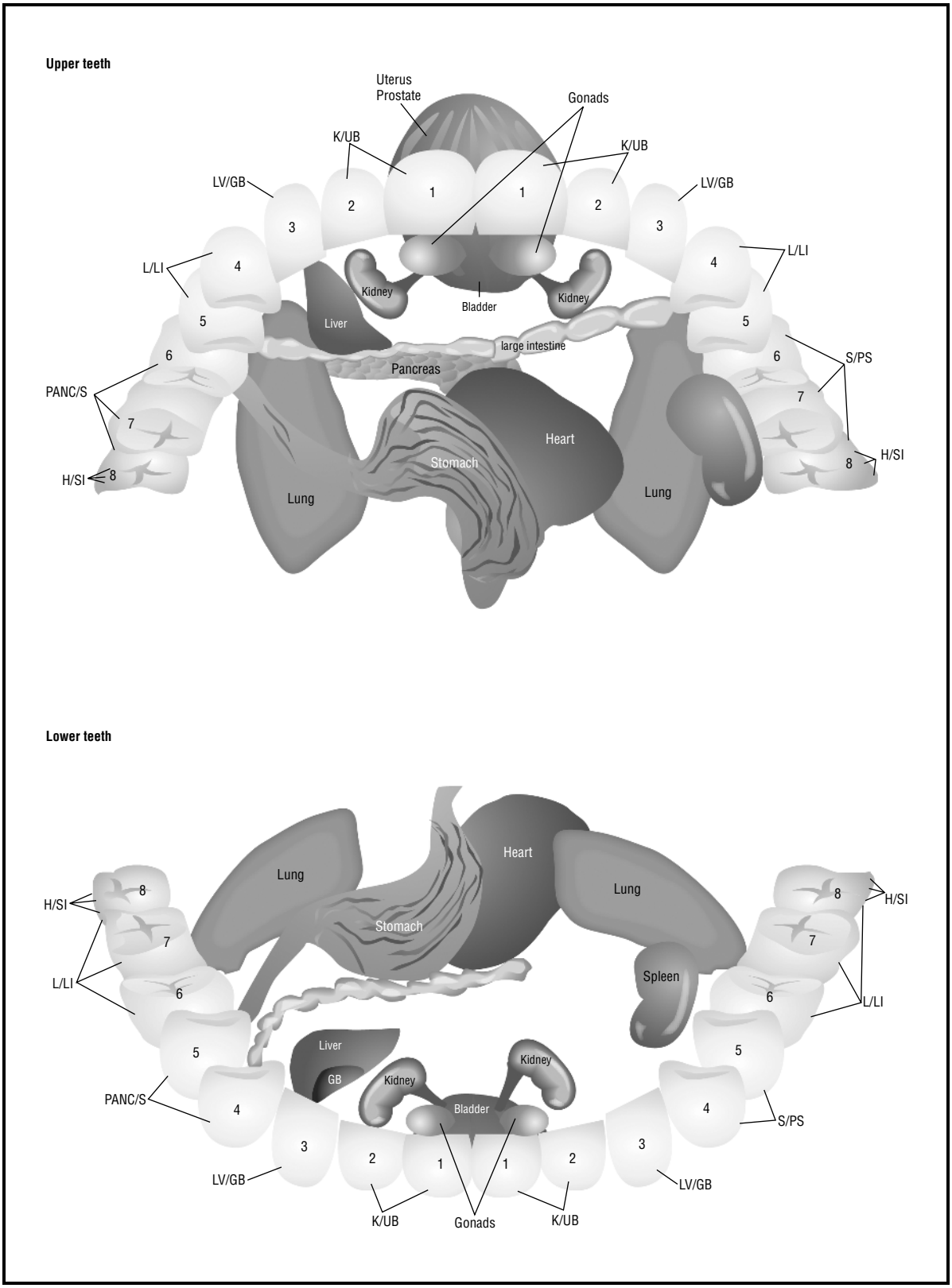
Origins

Applying a biological concept to the practice of dentistry began in the late 1800s when the National Dental Association recognized the harmful effects of mercury (amalgam) fillings and mandated that members of the association not use these on their patients. As of 1997, this warning had been recognized and acted upon by several foreign countries that have either banned the use of mercury fillings or were in the process of doing so. Supporters of holistic dentistry state that mercury in amalgam fillings causes ill effects when placed as an implant in the body.

Further beginnings of holistic dentistry are linked to a 1925 article by dentist Weston A. Price (1870–1948). A former director of research for the American Dental Association, Price claimed in an article for the *Journal of the American Medical Association* that degenerative diseases such as heart troubles, kidney and bladder disorders, arthritis, rheumatism, mental illness, lung problems, and several kinds of bacterial infections arise from root canal therapy, or endodontics. To come to this conclusion, Price conducted research that involved implanting teeth from root canals of individuals with symptoms such as severe heart problems and kidney disease under the skin of healthy rabbits. These same conditions arose in the rabbits, and within three days they died. Price then implanted the same tooth in another rabbit and found a similar response, but he also found that implanting a normal extracted tooth did not affect the rabbits.

Price's root canal research became known as the "focal infection" theory and because of its popularity, it led to the extraction of millions of endodontically treated teeth. Further research conducted during the 1930s ridiculed Price's theory calling it invalid, ending the once-recommended extractions.

Price also maintained that sugar causes not only tooth decay but is responsible for physical, mental,



Acupuncture points of teeth that correspond to major organs. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

moral, and social decay. This judgment came about as he and anthropologist Francis Pottenger observed primitive areas throughout the world whose natives did not have cavities. Although concluding that the lack of sugar in their **diets** led to good oral health, critics have since pointed out that Price overlooked the fact that malnourished people do not typically get many dental cavities.

Support of Price's theories continued, especially from a dentist named Melvin Page. Page coined the phrase "balancing body chemistry" and considered tooth decay an "outstanding example of systemic chemical imbalances." In an attempt to aid these problems, Page marketed a mineral supplement with claims that widespread mineral deficiencies were an underlying cause of several health conditions, including goiter, heart trouble, **tuberculosis**, and diabetes. He also claimed that drinking cow's milk was unnatural and the underlying cause of colds, sinus infections, **colitis**, and cancer.There is no research supporting Price's statements, and his mineral supplement was never supported by the Federal Trade Commission (FTC).

The origins of holistic dentistry remain with Price's manuscripts and photographs at the Price-Pottenger **Nutrition** Foundation in La Mesa, California. Founded in 1965, the Foundation promotes nutrition, megavitamin therapy, **homeopathy**, and **chelation therapy**.

Founded in 1978, the Holistic Dental Association provides support to holistic dentists. Through a program of continuing education, the organization furthers the knowledge of alternative practices in dentistry. The International Academy of Biological Dentistry and Medicine supports the efforts of holistic dentists and medical doctors. The group was founded in 1985 by two California dentists and was renamed in 2005. Among its programs are professional educational seminars, presented to its members, covering topics related to holistic dentistry and medicine.

Since the late 1800s, supporters of holistic dentistry have continued to state their concerns regarding several procedures and recommendations of conventional dentistry, including the use of fluoride in drinking water and in teeth cleansers.

Benefits

Holistic dentistry is said to be an emerging new field of probiotic dental medicine—a type of medicine that supports the life process. Those who practice this form of biologic dentistry claim that it is aesthetic, relatively nontoxic, and individually biocompatible, or life supporting. A holistic dentist uses physiologic and electronic methods to locate areas of chronic disease that are difficult to locate by current standard methods.

The benefits of holistic dentistry are said to be the result of its incorporation of hypnosis, homeopathy, **aromatherapy**, nutrition, and herbology.

Hypnosis

When hypnosis is used, patients are able to relax their bodies and minds by concentrating on suggestions of **relaxation**. Patients are fully aware of what is happening during their treatment and no drugs are used. Many holistic dentists employ specialist hypnotherapists to provide treatment that is highly effective and cannot cause any harm or produce any side effects.

Homeopathy

Homeopathy is used by holistic dentists as a natural approach to their practice. The therapy is a safe and natural alternative that is nonaddictive and effective with both adults and children. Homeopathic remedies are used to improve the psychological or emotional condition of patients without the drugging effects of conventional tranquilizers. The three main remedies considered by holistic dentists are: **aconite** (**foxglove**); **gelsemium** (yellow jasmine); and *argentum nitricum* (silver nitrate).

Aromatherapy

Aromatherapy uses the pure oil essences from plants and flowers that act as hormone-like stimulants to improve a patient's health balance. Used because they are natural and gentle, oils such as **lavender**, bergamot, sandalwood, and basil are beneficial in their power to soothe, relax, and calm. Some holistic dentists use these oils to make their offices more inviting to patients.

Nutrition

Holistic dentists believe that **stress** and tension are often linked to diet. Dietary excesses or deficiencies increase the body's needs for essential vitamins and minerals, and the stress and tension accelerate any fears or **phobias** of the patient.

Botanical medicine & herbal medicine

Holistic dentistry may use herbs to promote relaxation. The sedative properties of **chamomile**, limeflower, vervain, **rosemary**, and **valerian** are relied upon in place of conventional drugs.

Holistic dentists may incorporate **acupuncture** and physical therapy into their use of clinical dentistry. The more modern sciences of **neural therapy**, hematology, immunology, and **electroacupuncture** may also be incorporated into a holistic dental practice.

Description

Biological dentistry's main concern is the toxicity of metals and their release from fillings and replacement appliances (such as metal partials and crowns that have nickel) used in dentistry. According to supporters of holistic dentistry, the metal ions separate from their original structures to diffuse, migrate to, and become absorbed in the tissues of the body, affecting the overall integrity of the immune system. An additional biological concern is what is called oral galvanism, or the direct electrical currents generated by separated metals throughout fluids and tissues in the body. Hidden or residual infection, or the abnormal changes in the soft connective tissue containing dental material that cannot be processed, is believed to cause local and general defenses that put the body in a continuous state of active conflict, often leading to chronic disease.

According to those who practice holistic dentistry, there may be several major types of dental problems that can cause illness or dysfunction in the body:

- silver (amalgam) fillings that typically contain 50% mercury silver
- root canals
- cavitations, or neuralgia-inducing cavitational osteonecrosis (NICO), a term coined by the oral pathologist J. E. Bouguot in the 1980s
- electro-oral galvanism from dissimilar metals
- temporomandibular joint syndrome (TMJ), a painful condition of the jaw and its supporting muscles used for chewing

The main goals of a holistic dentist are identifying areas that need treatment and providing treatment to patients that will not create stress. Holistic dentists work in conjunction with other healthcare providers to investigate whether a hidden infection of dental origin exists and whether it may be the source of or contributing factor to overall health problems. A biological approach to dentistry ensures the use of treatment and therapies that cause the least disturbance to the immune system. In order to determine the appropriate method of treatment, a holistic dentist must thoroughly review the patient's medical and dental background.

Preparations

While the method of biological dentistry varies for each holistic dentist, the keys to preparing their patients remain education and communication. Treatment is individualized.

A typical initial visit consists of an interview process, exam and x rays. Pictures of the patient's mouth are often collected with state-of-the-art equipment that uses film providing 50% less radiation than standard systems. The second meeting is typically called a Review of Findings appointment that educates the patient about the mouth and proactive treatment choices.

Precautions

Although proponents of holistic dentistry continue to increase, so do critics of these alternative methods. Believers in biologic dentistry claim that root canal-treated teeth cause NICO and other chronic systemic diseases and require removal of all these teeth and the healthy teeth surrounding them. Critics state that these extreme measures are bizarre and dangerous. According to a 1994 article in *Milwaukee Magazine*, a group of local patients filed suit against several holistic practitioners who had removed several of their perfectly healthy teeth after guaranteeing improvement of their diseases. These patients experienced no relief from their ongoing health problems after the extractions.

Side effects

Certain side effects have been reported as a result of treatments used by holistic dentists. Patients who were treated with **auriculotherapy**, or acupuncture of the ear, have experienced complications from unsterile needles.

When correcting a bad bite, holistic dentists often place a plastic appliance called a mandibular orthopedic repositioning appliance (MORA) between the teeth. The long-term use of MORAs has been reported to cause the patient's teeth to move out of proper alignment, leading to the need for orthodontics or facial reconstructive surgery to correct the deformity.

Since amalgam fillings are one of the main concerns of holistic dentists, many have turned to using nontoxic composite materials, but these too have come under scrutiny. The plastics used in the composites have been linked to leaching compounds that may be dangerous to health.

KEY TERMS

Homeopathy—The principal known as like cures like, the use of minute quantities of remedies that if used in large doses would produce the effects of the disease being treated.

Mercury—A metallic element appearing as a silver-colored liquid at ordinary temperatures.

Probiotic—Favoring the support of life; related to promoting life and life conditions.

Toxins—Poisonous substances of animal or plant origin having a protein structure.

Research and general acceptance

While dentistry has been reportedly undergoing a quiet revolution with the emergence of holistic dentists, their complementary methods remain under criticism. The nutritional supplements they prescribe to balance the body chemistry and the methods holistic dentists use to reach their recommended treatment continually attract negative comments. Hair analysis, computerized dietary analysis, or blood chemistry screening tests are used by some practitioners as a basis for recommending supplements. Critics state that hair analysis is not a reliable tool for measuring the body's nutritional state, and computer analysis, while useful for determining the composition of a person's diet, is being used by dentists who may not be qualified to perform dietary counseling. Blood chemistry screenings are processed in laboratories, but while the results may indicate a normal reading, holistic dentists use a narrower range to read the results, indicating to patients that their bodies are out of balance and need treatment.

Although supportive research is limited regarding the alternative methods used by holistic dentists, advocates of the complementary treatment continue to grow. With the formation of the Holistic Dental Association in 1978, a shift to treating the entire patient's health needs emerged from dentists, dental hygienists, and healthcare practitioners from all fields who endorse these ideas.

Many of the medical services provided by holistic dentists are paid for by healthcare insurance in the United States (excluding HMOs and Medicare). Insurance typically pays for what is termed usual and customary treatments, such as laboratory tests, doctor visits, medical treatment, and x rays, but it will not cover experimental drugs.

Training and certification

Holistic dentists are those who have been trained as authorized practitioners of dentistry through a school of medicine acquiring a degree as a doctor of dental surgery (DDS). Their focus is one that combines conventional teachings with new, complementary methods to treat their patients' health needs.

Resources

PERIODICALS

Bellinger, David C., et al. "Neuropsychological and Renal Effects of Dental Amalgam in Children: A Randomized Clinical Trial." *Journal of the American Medical Asso ciation* 295 (April 19, 2006): 1775 1783.

DeRouen, Timothy A., et al. "Neurobehavioral Effects of Dental Amalgam in Children: A Randomized Clinical Trial." *Journal of the American Medical Association* 295 (April 19, 2006): 1784 1792.

OTHER

Academy of Holistic Dentistry. http://www.biologicaldentists.org/index.html.

Barrett, Stephen. "Cavitational Osteopathosis (NICO) and Biological Dentistry," February 13, 2008. http://www.quackwatch.org/01QuackeryRelatedTopics/cavitation.html (February 27, 2008).

Barrett, Stephen. "Stay Away from 'Holistic' and Biological Dentists'," February 4, 2008. http://www.quackwatch.com (February 27, 2008).

ORGANIZATIONS

Holistic Dental Association, PO Box 151444, San Diego, CA, 92175, (619) 923 3120, http://www.holisticdental.org.

International Academy of Biological Dentistry and Medicine, 17222 Red Oak Dr., Ste. 101, Houston, TX, 77090, (281) 651 1745, http://www.iabdm.org.

Beth Kapes
Teresa Odle
Rhonda Cloos, RN

Holistic medicine

Definition

Holistic medicine is a term used to describe therapies that attempt to treat the patient as a whole person. That is, instead of treating an illness, as in orthodox allopathy, holistic medicine looks at an individual's overall physical, mental, spiritual, and emotional well-being before recommending treatment. A practitioner with a holistic approach treats the symptoms of illness as well as looking for the underlying cause of the

illness. Holistic medicine also attempts to prevent illness by placing a greater emphasis on optimizing health. The body's systems are seen as interdependent parts of the person's whole being. The body's natural state is one of health, and an illness or disease is an imbalance in the body's systems. Holistic therapies tend to emphasize proper **nutrition** and avoidance of substances—such as chemicals—that pollute the body. Their techniques are noninvasive.

Some of the world's health systems that are holistic in nature include **naturopathic medicine**, **homeopathy**, and **traditional Chinese medicine**. Many alternative or natural therapies have a holistic approach, although that is not always the case. The term complementary medicine is used to refer to the use of both allopathic and holistic treatments. It is more often used in Great Britain, but is gaining acceptance in the United States.

There are no limits to the range of diseases and disorders that can be treated in a holistic way, as the principle of holistic healing is to balance the body, mind, spirit, and emotions so that the person's whole being functions smoothly. When an individual seeks holistic treatment for a particular illness or condition, other health problems improve without direct treatment due to improvement in the performance of the immune system, which is one of the goals of holistic medicine.

Origins

The concept of holistic medicine is not new. In the 4th century B.C. Socrates warned that treating one part of the body only would not have good results. Hippocrates considered that many factors contribute to the health or otherwise of a human being, including weather, nutrition, emotional factors. In our time, a host of different sources of pollution can interfere with health. And of course, holistic medicine existed even before ancient Greece in some older healing traditions, such as those from India and China, which date back over 5,000 years. However, the term "holistic" only became part of everyday language in the 1970s, when Westerners began seeking an alternative to allopathic medicine.

Interestingly, it was only at the beginning of the twentieth century that the principles of holistic medicine fell out of favor in Western societies, with the advent of major advances in what we now call allopathic medicine. Paradoxically, many discoveries of the twentieth century have only served to confirm many natural medicine theories. In many cases, researchers have set out to debunk holistic medicine, only to find that their research confirms it, as has been the case, for example, with many herbal remedies.

KEY TERMS

Detoxification—Treating the body in such a way that it eliminates poisons accumulated in the cells.

Healing crisis—An uncomfortable condition that occurs When the body begins to eliminates toxins at an accelerated rate.

Benefits

Many people are now turning to holistic medicine, often when suffering from chronic ailments that have not been successfully treated by allopathic means. Although many wonderful advances and discoveries have been made in modern medicine, surgery and drugs alone have a very poor record for producing optimal health because they are designed to attack illness. Holistic medicine is particularly helpful in treating chronic illnesses and maintaining health through proper nutrition and **stress** management.

Description

There are a number of therapies that come under the umbrella of "holistic medicine." They all use basically the same principles, promoting not only physical health, but also mental, emotional, and spiritual health. Most emphasize quality nutrition. Refined foods typically eaten in modern America contain chemical additives and preservatives, are high in fat, **cholesterol**, and sugars, and promote disease. Alternative nutritionists counter refinded foods by recommending whole foods whenever possible and minimizing the amount of meat—especially red meat—that is consumed. Many alternative therapies promote **vegetarianism** as a method of **detoxification**.

The aim of holistic medicine is to bring all areas of an individual's life, and most particularly the energy flowing through the body, back into harmony. Ultimately, of course, only the patient can be responsible for this, for no practitioner can make the necessary adjustments to diet and lifestyle to achieve health. The practice of holistic medicine does not rule out the practice of allopathic medicine; the two can complement each other.

A properly balanced holistic health regimen, which takes into consideration all aspects of human health and includes noninvasive and nonpharmaceutical healing

methods, can often completely eradicate even acute health conditions safely. If a patient is being treated with allopathic medicine, holistic therapies may at least support the body during treatment, and alleviate the symptoms that often come with drug treatments and surgery. In addition, holistic therapies focus on the underlying source of the illness, to prevent recurrence.

Here are some of the major holistic therapies:

- herbal medicine
- homeopathy
- naturopathic medicine
- traditional Chinese medicine
- Ayurvedic medicine
- nutritional therapies
- chiropractic
- stress reduction
- psychotherapy
- massage.

Because holistic medicine aims to treat the whole person, holistic practitioners sometimes may advise treatment from more than one type of practitioner. This precaution ensures that all aspects of health are addressed. Some practitioners also specialize in more than one therapy and so may be able to offer more comprehensive assistance.

Preparations

To choose a holistic practitioner, a person should consider the following questions:

- How did you hear of this therapist? A personal referral can sometimes be more reliable than a professional one. What do other professionals say about this therapist? What qualifications, board certification, or affiliations does this practitioner have?
- How do you feel personally about this practitioner? Do you feel comfortable in his/her office and with his/her staff? Is your sense of well being increased? Are you kept waiting for appointments?
- Do you have confidence in this practitioner, does he/she respect you as a person? Does he/she show an interest in your family, lifestyle, and diet? Are various treatment options explained to you?
- Is your personal dignity respected?
- Do you feel that this practitioner is sensitive to your feelings and fears regarding treatment?
- Is this practitioner a good advertisement for his/her profession? Signs of stress or ill health may mean that you would be better off choosing another practitioner.
- Do you feel that you are rushed into decisions, or do you feel that you are allowed time to make an informed choice regarding treatment?
- Are future health goals outlined for you? And do you feel that the practitioner is taking your progress seriously?
- Do you feel unconditionally accepted by this practitioner?
- Would you send your loved ones to this practitioner?

If you answered yes to all the above, then you have found a suitable practitioner. The cost of treatment by a holistic therapist varies widely depending on the level of qualification and the discipline, so it is best to discuss how much treatment can be expected to cost with a practitioner before beginning a course of therapy. Some forms of holistic treatment may be covered by health insurance.

Precautions

Many people who try holistic therapies focus on one area of their health only, often detoxification and nutrition. However, practitioners stress that it is only when all areas of a person's potential well-being are tackled that total health and happiness can be achieved. They stress that the spiritual and emotional health contribute just as much as physical and mental health to a person's overall state of well-being.

When seeking treatment from a holistic practitioner, it is important to ensure that they are properly qualified. Credentials and reputation should always be checked. In addition, it is important that allopathic physicians and alternative physicians communicate with one another about a patient's care.

Side effects

One of the main advantages of holistic therapies is that they have few side effects when used correctly. If a reputable practitioner is chosen, and guidelines are adhered to, the worst that typically happens is that when lifestyle is changed, and fresh nutrients are provided, the body begins to eliminate toxins that may have accumulated in the cells over a lifetime.

Often holistic therapy results in what is known in alternative medicine circles as a "healing crisis." This comes about when the cells eliminate poisons into the blood stream all at the same time, throwing the system into a state of toxic overload until it can clear the "backlog." Symptoms such as **nausea**, headaches, or sensitivities to noise and other stimulations may be experienced.

The answer to most patients who are otherwise healthy patients is often just to lie quietly in a darkened room and take herbal teas. However, in the case of someone who has a serious illness, such as arthritis, **colitis**, diabetes, or **cancer**, it is strongly advised that they seek the help of a qualified practitioner. Therapists can help patients achieve detoxification in a way that causes the least stress to their bodies.

Research and general acceptance

Traditionally, holistic medicine, in all its different forms, has been regarded with mistrust and skepticism on the part of the allopathic medical profession. This situation is gradually changing. As of 2008, many insurance companies will provide for some form of alternative, or complementary treatment.

In addition, many allopathic physicians, recognizing the role alternative medicine can play in overall health and well being, are actually referring patients to reputable practitioners, particularly chiropractors and **relaxation** therapists, for help with a varied range of complaints.

Training and certification

Holistic or alternative medicine practitioners are usually affiliated with an organization in their field. Training varies widely with the category, and ranges from no qualifications at all—experience only—to holding a Ph.D. from an accredited university. Again, credentials and memberships should be checked by prospective patients.

An excellent source for qualified practitioners is the American Board of Holistic Medicine (AHBM), which was incorporated in 1996. Also, the American Holistic Medicine Association has a comprehensive list of practitioners in all types of therapies across the United States, which they call "the holistic doctor finder." However, these groups stress that it is the responsibility of the patient to check each practitioner's credentials prior to treatment.

The ABHM has established the core curriculum upon which board certification for holistic medicine will be based. It includes the following twelve categories:

Body

Physical and environmental health

- nutritional medicine
- exercise medicine
- environmental medicine

Mind

Mental and emotional health

- behavioral medicine

Spirit

Spiritual health

- spiritual attunement
- social health

The six specialized areas:

- biomolecular diagnosis and therapy
- botanical medicine
- energy medicine
- ethnomedicine—including traditional Chinese medicine, Ayurveda, and Native American medicine
- homeopathy
- manual medicine

Founded in 1978 for the purpose of uniting practitioners of holistic medicine, membership of the AHMA is open to licensed medical doctors (MDs) and doctors of osteopathic medicine (DOs) from every specialty, and to medical students studying for those degrees. Associate membership is open to health care practitioners who are certified, registered or licensed in the state in which they practice. The mission of the AHMA is to support practitioners in their personal and professional development as healers, and to educate physicians about holistic medicine.

Resources

BOOKS

Goldberg, Burton. *Alternative Medicine: The Definitive Guide*. Future Medicine Publishing, 1993.

Jensen, Dr. Bernard. *Foods That Heal*. Garden City, New York: Avery Publishing Group Inc., 1993.

Murray, Michael, and Joseph Pizzorno. *Encyclopedia of Natural Medicine, 2nd edition*. Rocklin, CA: Prima Health, 1998.

ORGANIZATIONS

American Holistic Medicine Association. http://www.holisticmedicine.org/index.html.

Holistic medicine Website. http://www.holisticmed.com/whatis.html.

American Holistic Health Association. Dept. R, P.O. Box 17400, Anaheim, CA, 92817 7400. (714) 779 6152. ahha@healthy.net. http://www.healthy.net/pan/chg/ahha/rosen.html.

Patricia Skinner

Holy thistle *see* **Blessed thistle**

Homeopathy

Definition

Homeopathy, or homeopathic medicine, is a holistic system of treatment that originated in the late eighteenth century. The name homeopathy is derived from two Greek words that mean "like disease." The system is based on the idea that substances that produce symptoms of sickness in healthy people will have a curative effect when given in very dilute quantities to sick people who exhibit those same symptoms. Homeopathic remedies are believed to stimulate the body's own healing processes. Homeopaths use the term "allopathy," or

Homeopathic remedies

Name	Description
Aconite	Commonly known as monkshood, aconite is highly toxic. A nontoxic, diluted extract of aconite is used in homeopathy to treat symptoms similar to that of poison.
Allium cepa	Commonly known as red onion, homeopathic physicians use a dilute extract of red onion to treat symptoms similar to that of hay fever - watery eyes, burning, etc.
Apis	Commonly known as the honeybee, apis as a homeopathic remedy is made from the body of the bee. It is used to treat symptoms similar to that of a bee sting - redness, swelling, etc.
Arnica	Commonly known as the mountain daisy, arnica is used by homeopathic physicians as an ingredient in anti-inflammatory preparations, mainly to treat bruises, sprains, and strains.
Arsenicum album	Also known as *ars alb*, *arsenicum album* is a diluted form of arsenic, a metallic poison. It is used by homeopathic physicians to treat symptoms similar to the effects of arsenic poisoning - dehydration, burning pain, etc.
Belladonna	Commonly known as deadly nightshade, belladonna is used in homeopathy to treat symptoms of dry mouth, nausea, delirium, etc., and is also thought to be an anti-spasmodic.
Bryonia	Commonly known as wild hops, bryonia is used in homeopathy to treat vomiting, diarrhea, inflammation, etc.
Calcarea carbonica	Also known as calcium carbonate or *calc carb*, it is used in homeopathy to treat symptoms of exhaustion, depression, and anxiety.
Cantharis	Commonly known as Spanish fly, cantharis is used in homeopathy to treat conditions with symptoms of abdominal cramps, vomiting, diarrhea, convulsions, etc.
Chamomilla	Derived from German chamomile, it is used in homeopathy to treat irritability, impatience, etc. It is most often prescribed to children.
Ferrum phosphoricum	Also known as *ferrum phos* or iron phosphate, it is used to treat symptoms of low energy and anemia.
Gelsemium	Also known as yellow jasmine, it is used to treat conditions that affect vision, balance, thought, and locomotion.
Hepar sulphuris	Derived from the inner layer of oyster shells, *hepar sulphuris* is used to treat infection.

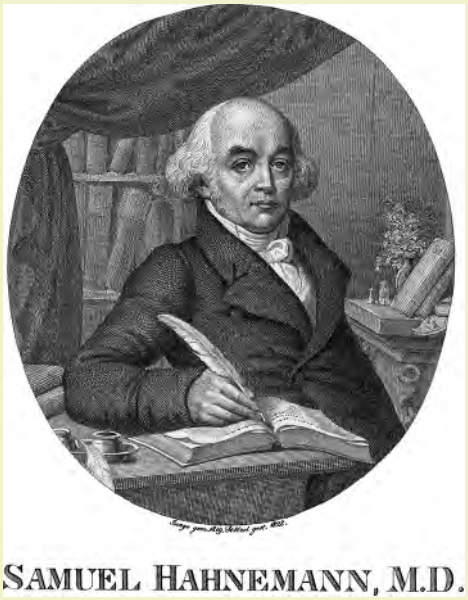
(Illustration by Corey Light. Cengage Learning, Gale)

Homeopathic remedies (CONTINUED)

Name	Description
Hypericum	Commonly known as St. John's wort, hypericum has historically been used to treat nerve damage and mental disorders, and is often used today to treat depression, anxiety, and sleep disorders.
Ignatia	Derived from seeds of a tree native to the Philippines, this homeopathic remedy is prescribed to treat conditions with symptoms such as headache, cramping, tremors, and nervous complaints.
Ipecac	Ipecac induces vomiting and causes gastrointestinal distress. Homeopaths prescribe it to treat similar symptoms.
Kali bichromicum	Commonly known as potassium bichromate, *kali bichromicum* is a poison used in textile dyes, wood stain, etc., as well as an oxidizing agent in photography. Homeopaths use it to treat localized pain.
Lachesis	Derived from the venom of the bushmaster snake, this homeopathic remedy is used to treat conditions that cause the same symptoms as the venom itself, which can include delirium tremen, tension and constriction, pressure, or even paralysis.
Ledum	Also known as marsh tea, ledum is used to treat infections, most often from animal bites, stings, cuts, etc.
Lycopodium	Commonly known as club moss, lycopodium is used to treat diarrhea, digestive upset, etc.
Mercurius vivus	Also known as quicksilver, it is used to treat symptoms of sweats, shaking, nausea, etc.
Natrum muriaticum	Commonly known as salt, it is used to treat conditions that cause excessive thirst and salt cravings.
Nux vomica	It is used to treat symptoms caused by overeating and too much caffeine or alcohol.
Phosphorus	It is used to treat symptoms of excessive thirst, fatigue, and nervousness.
Pulsatilla	It is used to treat conditions that are accompanied by discharge, such as bedwetting, sinusitis, etc.
Rhus toxicodendron	Commonly known as poison ivy, homeopaths use it to treat conditions with symptoms of fever, swollen glands, and restlessness.
Ruta	It is used to treat conditions with joint pain and tenderness and with bruising, such as tennis elbow, sciatica, etc. Also used to treat certain problems of the eyes and uterus, such as eyestrain and menstrual pain.
Sepia	Sepia is the discharge used by the cuttlefish to disappear from a predator. Homeopaths use sepia to treat symptoms of apathy and weakness.
Silica	Also called flint, silica is used by homeopaths to treat conditions that cause weakness, sweating, and sensitivity to cold.
Sulphur	It is used to treat conditions with symptoms of itching, burning pains, and odor.

(Illustration by Corey Light. Cengage Learning, Gale)

SAMUEL HAHNEMANN (1755–1833)



(Corbis Corporation. Reproduced by permission.)

Samuel Christian Hahnemann created and developed the system called homeopathy. It is also known as *similia similibus curentor* or like cures like. Although his new methods initially met with ridicule and criticism, by the time of his death they were accepted the world over as a result of the great success he had with his new cure.

Hahnemann was born in Meissen, Saxony (now part of Germany) into a financially challenged middle class family. His parents initially educated him at home, where his father taught him never to accept anything he learned without first questioning it. He graduated as a physician at Erlangen in 1779 after studying at Leipzig and Vienna. He was also fluent in English, German, Italian, French, Greek, Arabic, Latin and Hebrew.

At age 27 he married his first wife, Johanna Henriette Kuchler, the daughter of an apothecary, with whom he had 11 children.

Living in poverty, Hahnemann began practicing medicine in 1781 and translating scientific texts to supplement his income. However, disillusioned with medicine, he eventually gave it up entirely.

He discovered the concept of homeopathy when considering the effect of quinine on malaria, and went on to cure soldiers and then sufferers of a typhus epidemic with astounding success. He documented his discoveries in the *Organon*, a treatise on his work. Homeopathy also proved it's worth in 1831 when there was an outbreak of cholera. Hahnemann used homeopathic treatment with a 96% success rate, compared to the 41% of allopathic medicine. He also wrote his *Materia Medica Pura.*

In 1834, Hahnemann met his second wife, Marie Melanie d'Hervilly. Despite a great difference in age, they were happily married until his death in Paris on July 2, 1843, at the age of 88.

"different disease," to describe the use of drugs used in conventional medicine to oppose or counteract the symptom being treated.

Origins

Homeopathy was founded by the German physician Samuel Hahnemann (1755-1843), who was much disturbed by the medical system of his time, believing that its cures were crude and some of its strong drugs and treatments did more harm than good to patients. Hahnemann performed experiments on himself using Peruvian bark, which contains quinine, a **malaria** remedy. He concluded that in a healthy person, quinine creates the same symptoms as malaria, including fevers and **chills**, which is the reason why it is effective as a remedy. He then began to analyze the remedies available in nature by what he called provings. Provings of homeopathic remedies are still compiled by dosing healthy adults with various substances and documenting the results, in terms of the dose needed to produce the symptoms and the length of the dose's effectiveness. The provings are collected in large homeopathic references called *materia medica* or materials of medicine.

Hahnemann formulated these principles of homeopathy:

- Law of Similars (like cures like)
- Law of the Infinitesimal Dose (The more diluted a remedy is, the more potent it is.)
- Illness is specific to the individual.

Hahnemann's Law of Similars was based on thinking that dated back to Hippocrates in the fourth century B.C. It is the same thinking that provided the basis for the vaccines discovered by Edward Jenner and Louis Pasteur. These vaccines provoke a reaction in the individual that protects against the actual disease. Allergy treatments work the same way. By

KEY TERMS

Aggravation—Temporary increase in symptoms due to homeopathic remedy.

Antidote—Substance which cancels the effect of homeopathic remedies

Homeopath—A homeopathic physician.

Proving—Case study of the effect of a homeopathic medicine.

Repertory—Reference manual of homeopathic remedies.

Vital force—Innate wisdom and energy of the body.

exposing a person to minute quantities of the allergen, the person's tolerance levels are elevated.

The Law of the Infinitesimal Dose has always caused controversy among those outside the field of homeopathy. Hahnemann contended that as he diluted his remedies with water and alcohol and succussed, or shook, them, the remedies actually worked more effectively. In fact, diluted homeopathic remedies may have no chemical trace of the original substance. Practitioners believe that the electromagnetic energy of the original substance is retained in the dilution, but the toxic side effects of the remedy are not. It is this electrochemical "message" that stimulates the body to heal itself.

Homeopathic practitioners believe that illness is specific to an individual. In other words, two people with severe headaches may not receive the same remedies. The practitioner will ask the patient questions about lifestyle, dietary habits, and personality traits, as well as specific questions about the nature of the **headache** and when it occurs. This information gathering is called profiling or case-taking.

In the early 1900s, homeopathy was popular in America, with over 15 percent of all doctors being homeopaths. There were 22 major homeopathic medical schools, including Boston University and the University of Michigan. However, with the formation of the American Medical Association, which restricted and closed down alternative practices, homeopathy declined for half a century. When the 1960s revived back-to-nature trends and distrust of artificial drugs and treatments, homeopathy began to grow again dramatically through the next decades. In 1993, *The New England Journal of Medicine* reported that 2.5 million Americans used homeopathic remedies and 800,000 patients visited homeopaths in 1990, and homeopathy has continued to grow. Homeopathy is much more popular in Europe than in the United States. French pharmacies are required to make homeopathic remedies available along with conventional medications. Homeopathic hospitals and clinics are part of the national health system in Britain. Homeopathy is also practiced in India and Israel, among other countries.

Benefits

Homeopathic physicians seek to cure their patients on the physical, mental and emotional levels, and each treatment is tailored to a patient's individual needs. Homeopathy is generally a safe treatment, as it uses medicines in extremely diluted quantities, and there are usually minimal side effects. Its nontoxicity makes some consider it a good choice for the treatment of children. Another benefit of homeopathy is the cost of treatments; homeopathic remedies are inexpensive, often a fraction of the cost of conventional drugs.

Homeopathic treatment has been shown to be effective in treating many conditions. Colds and flu may be effectively treated with **aconite** and **bryonia**. **Influenza** sufferers in a double-blind study found that they were twice as likely to recover in 48 hours when they took homeopathic remedies. Studies have been published in British medical journals confirming the efficacy of homeopathic treatment for **rheumatoid arthritis**. Homeopathic remedies are considered effective in treating **infections**, circulatory problems, respiratory problems, **heart disease**, **depression** and nervous disorders, migraine headaches, **allergies**, arthritis, and diabetes. Homeopathy is a treatment to explore for acute and chronic illnesses, particularly if these are found in the early stages and where there is not severe damage. Homeopathy can be used to assist the healing process after surgery or chemotherapy.

Description

A visit to a homeopath is usually a different experience from a visit to a regular physician. Surveys have shown that homeopathic doctors spend much more time during initial consultations than conventional doctors spend. This is because a homeopath does a thorough case-taking to get a complete picture of a person's general health and lifestyle, as well as particular symptoms, on the physical, mental and emotional levels. Some symptoms can be so subtle that the patient is not always completely aware of them, and the doctor must spend time getting to know the patient.

The initial visit often includes a long questionnaire about a patient's medical and family history,

and then a long interview with the doctor, who prompts the patient with many questions. Sometimes a homeopathic doctor will use lab tests to establish a patient's general level of health. The initial interview usually lasts between one and two hours.

The purpose of homeopathy is the restoration of the body to homeostasis, or healthy balance, which is its natural state. The symptoms of a disease are regarded as the body's own defensive attempts to correct its imbalance, rather than as enemies to be defeated. Because a homeopath regards symptoms as positive evidence of the body's inner intelligence, he or she will prescribe a remedy designed to stimulate this internal curative process rather than suppress the symptoms.

In homeopathy, the curative process extends beyond the relief of immediate symptoms of illness. Healing may come in many stages, as the practitioner treats layers of symptoms that are remnants of traumas or chronic disease in the patient's past. The stages are related to Hering's Laws of Cure, named for Constantine Hering, the father of homeopathy in America. Hering believed that healing starts from the deepest parts of the body to the extremities, and from the upper parts of the body to the lower parts. Hering's Laws also state that homeopaths should treat disease symptoms in reverse chronological order, from the most recent to the oldest, restoring health in stages. Sometimes, the patient may feel worse before feeling better. This temporary worsening is called a healing crisis.

When prescribing a remedy, homeopaths will match a patient's symptoms with the proper remedy in a repertory or *materia medica* that has been compiled throughout the history of homeopathy. Classical homeopaths prescribe only one remedy at a time. However, it is becoming more common, especially in Europe, to use combination formulas of several remedies for the treatment of some combinations of symptoms.

The cost of homeopathic care can vary. The cost of visits will be comparable to conventional medicine, with initial visits ranging from $50 to $300. Non-M.D. homeopaths can charge from $50 to $250. Follow-up visits are less, at about $35 to $100. Homeopathic medicine is significantly cheaper than pharmaceuticals, and most remedies cost between $2 and $10. Some doctors provide remedies without charge. Homeopaths rarely use lab tests, which reduces the cost of treatment further. In general, homeopathy is much more economical than conventional medicine. In 1991, the French government did a study on the cost of homeopathic medicine, and found that it costs half as much to treat patients, considering all costs involved.

When homeopaths are licensed professionals, most insurance companies will pay for their fees. Consumers should consult their insurance policies to determine individual regulations. Insurance usually will not cover homeopathic medicine, because it is sold over-the-counter.

Precautions

Although homeopathic remedies sometimes use substances that are toxic, they are diluted and prescribed in nontoxic doses. Remedies should be prescribed by a homeopathic practitioner. Those preparing to take homeopathic remedies should also avoid taking antidotes, which are substances that homeopathic doctors believe cancel the effects of their remedies. These substances include alcohol, coffee, prescription drugs, **peppermint** (in toothpaste and mouthwash), camphor (in salves and lotions), and very spicy foods. Homeopathic medicine should also be handled with care, and should not be touched with the hands or fingers, which may contaminate it.

Side effects

A homeopathic aggravation sometimes occurs during initial treatment with homeopathic remedies. This term means that symptoms can temporarily worsen during the process of healing. Although this is usually mild, the aggravation can sometimes be severe. Homeopaths see aggravation as a positive sign that the remedy is a good match for the patient's symptoms. The healing crisis, which happens when the patient is undergoing treatment for layers of symptoms, may also cause the patient to feel worse before feeling better. Some patients can experience emotional disturbances like weeping or depression, if suppressed emotional problems led to the illness in the first place.

Research and general acceptance

Since the early 1900s, when the American Medical Association and pharmacists waged a battle against it, homeopathy has been neglected and sometimes ridiculed by mainstream medicine. Aside from politics, part of the reason for this hostility is that there are some aspects of homeopathy that have not been completely explained scientifically. For instance, homeopaths have found that the more they dilute and succuss a remedy, the greater effect it seems to have on the body. Some homeopathic remedies are so diluted that not even a single molecule of the active agent remains in a solution, yet it still works; studies have demonstrated this paradox, yet can't explain it. Also, homeopathy puts an emphasis on analyzing symptoms and then applying remedies to these symptoms, rather than

working by classifying diseases. Thus, some people with the same disease may require different homeopathic medicines and treatments. Furthermore, conventional medicine strives to find out how medicines work in the body before they use them; homeopathy is less concerned with the intricate biochemistry involved than with whether a remedy ultimately works and heals holistically. For all these reasons, conventional medicine claims that homeopathy is not scientific, but homeopaths are quick to reply that homeopathy has been scientifically developed and studied for centuries, with much documentation and success.

There continue to be many studies that affirm the effectiveness of homeopathic treatments. Among the most celebrated, the *British Medical Journal* in 1991 published a large analysis of homeopathic treatments that were given over the course of 25 years. This project involved more than 100 studies of patients with problems ranging from vascular diseases, respiratory problems, infections, stomach problems, allergies, recovery from surgeries, arthritis, trauma, psychological problems, diabetes, and others. The study found improvement with homeopathic treatment in most categories of problems, and concluded that the evidence was "sufficient for establishing homeopathy as a regular treatment for certain indications."

For example, a study in early 2002 was reported on in a pediatric journal that showed symptom improvement for children with uncomplicated acute otitis media (**ear infection**) who received individualized homeopathic remedies. Although the authors concluded that more research was needed, results were positive enough to justify a larger study.

Training and certification

The Council on Homeopathic Education is the only organization that accredits training programs in classical homeopathy. To date, it has accredited five institutions: Bastyr University of Natural Health Sciences in Seattle, Ontario College of **Naturopathic Medicine** in Toronto, Hahnemann Medical Clinic in Albany, California, the National College of Naturopathic Medicine in Portland, and the International Foundation for Homeopathy, also in Seattle. Other well-known training programs include the Pacific Academy of Homeopathic Medicine in Berkeley, California, and the New England School of Homeopathy in Amherst, Massachusetts.

There are several organizations that certify homeopathic practitioners:

- The National Center for Homeopathy is the largest homeopathic organization, with more than 7,000 members. It also runs the Council on Homeopathic Education, and provides a listing of all its members and their credentials. Address: 801 N. Fairfax St., #306, Alexandria, VA 22314, phone (703) 548-7790.
- The American Institute of Homeopathy is the oldest national medical body. It provides a list of D.Ht.s (Diplomate in Homeopathy) certified by the American Board of Homeotherapeutics. Address: 1585 Glencoe, Denver, CO 80220, phone (303) 898-5477.
- The Council for Homeopathic Certification was created in 1992 to establish a certification exam and a code of ethics. It confers upon qualified practitioners a C.C.H. (Certification in Classical Homeopathy). Address: P.O. Box 157, Corte Madera, CA 94976.
- The Homeopathic Academy of Naturopathic Physicians offers a certification based on a competency exam, the "Diplomate in the Homeopathic Academy of Naturopathic Physicians" (D.H.A.N.P.).
- The North American Society of Homeopaths certifies non-physician homeopaths. Address: 10700 Old County Rd. 15, #350, Minneapolis, MN 55441, phone (612) 593-9458.

Resources

BOOKS

Castro, Miranda. *The Complete Homeopathy Handbook*. New York: St. Martin's, 1990.

Jonas, Wayne B., M.D., and Jacobs, Jennifer, M.D. *Healing With Homeopathy*. New York: Warner, 1996.

Ullman, Dana, M.P.H. *The Consumer's Guide to Homeopathy*. New York: Putnam, 1996.

Weiner, Dr. Michael. *The Complete Book of Homeopathy*. New York: Avery, 1996.

PERIODICALS

Homeopathy Today. 801 N. Fairfax St. #306, Alexandria, VA 22314, phone (703) 548 7790.

Similimum. P.O. Box 69565, Portland, OR 97201, phone (503) 795 0579.

Walsh, Nancy. "Homeopathy Shows Some Promise in AOM (Obstacles to Study this Therapy Remain)." *Pediatric News* (January 2002): 16.

OTHER

Ayurvedic Institute. http://www.ayurveda.com/ (December 28, 2000).

National Center for Homeopathy. http://www.healthy.net/nch/ (December 28, 2000).

North American Society for Homeopaths. http://www.homeopathy.org/ (December 28, 2000).

Homeopathy, acute prescribing

Definition

Acute homeopathic prescribing is that part of **homeopathy** that treats illnesses of abrupt onset requiring immediate attention. In homeopathic medicine, acute refers primarily to the speed of onset and self-limiting character of the disorder rather than its seriousness. Colds, **influenza**, sore throats, insect **stings**, **cuts**, **bruises**, **vomiting**, **diarrhea**, **fever**, muscle aches, and short-term **insomnia** are all examples of conditions that are treated by acute prescribing. The remedies given in acute homeopathic prescribing are intended to stimulate the body's internal ability to heal itself; they do not kill germs or suppress symptoms. Acute prescribing can be done—within limits—by patients at home, as well as by homeopathic practitioners. Study courses, self-treatment guides, and homeopathic home medicine kits are now available by mail order from homeopathic pharmacies and educational services.

Origins

Homeopathy is a gentle, painless, holistic system of healing developed during the 1790s by Samuel Hahnemann, a German physician. Experimenting on himself with the anti-malarial drug quinine, Hahnemann noticed that large doses of the medicine actually caused malaria-like symptoms, while smaller doses cured the symptoms. From this, he advanced his concept of *Similia similibus curentur*, or "let like be cured with like." Hahnemann then developed an extensive system of medicine based on this concept. He named it homeopathy, from the Greek words *homoios* (the same) and *pathos* (suffering).

Homeopathic remedies are almost always made from natural materials—plant, animal, or mineral substances—that have been treated to form mother tinctures or nonsoluble powders. Liquid extracts are then potentized, or increased in power, by a series of dilutions and succussions, or shakings. It is thought that succussion is necessary to transfer the energy of the natural substance to the solution. In addition, the potency of the remedy is regarded as increasing with each dilution. After the tincture has been diluted to the prescribed potency, the resulting solution is added to a bottle of sucrose/lactose tablets, which are stored in a cool, dark place. If the remedy is not soluble in water, it is ground to a fine powder and triturated with powdered lactose to achieve the desired potency.

KEY TERMS

Acute prescribing—Homeopathic treatment for self-limiting illnesses with abrupt onset.

Allopathy—Conventional medical treatment of disease symptoms that uses substances or techniques to oppose or suppress the symptoms.

Law of similars—The basic principle of homeopathic medicine that governs the selection of a specific remedy. It holds that a substance of natural origin that produces certain symptoms in a healthy person will cure those same symptoms in a sick person.

Modalities—The factors and circumstances that cause a patient's symptoms to improve or worsen.

Mother tincture—The first stage in the preparation of a homeopathic remedy, made by soaking a plant, animal, or mineral product in a solution of alcohol.

Potentization—The process of increasing the power of homeopathic preparations by successive dilutions and succussions of a mother tincture.

Succussion—The act of shaking diluted homeopathic remedies as part of the process of potentization.

Trituration—The process of diluting a nonsoluble substance for homeopathic use by grinding it to a fine powder and mixing it with lactose powder.

Proponents of homeopathy over the years have included Louisa May Alcott, Charles Dickens, Benjamin Disraeli, Johann Wolfgang Goethe, Nathaniel Hawthorne, William James, Henry Wadsworth Longfellow, Pope Pius X, John D. Rockefeller, Harriet Beecher Stowe, William Thackeray, Daniel Webster, and W. B. Yeats. England's royal family has employed homeopathic practitioners since the 1830s.

Benefits

Homeopathic physicians seek to cure their patients on physical, mental, and emotional levels, and each treatment is tailored to a patient's individual needs. Homeopathy is generally a safe treatment, as it uses medicines in extremely diluted quantities, and there are usually minimal side effects. Its non-toxicity makes it a good choice for the treatment of children. Another benefit of homeopathy is the cost of treatments; homeopathic remedies are inexpensive, often a fraction of the cost of conventional drugs.

Acute homeopathic prescribing is thought to benefit a wide range of ailments. These include altitude sickness, Bell's palsy, the **common cold**, **allergies**,

coughing, dengue fever, dysentery, earaches, migraine headaches, fever, **food poisoning**, grief, influenza, **motion sickness**, shock, **sore throat**, surgical complications, and reactions to vaccinations and drug therapy. Acute remedies may also be prescribed for treat insect stings, animal **bites**, and problems related to poison **oak** and poison ivy. It may be further employed in treating injuries including black eyes, **burns**, bruises, concussions, cuts, damaged tendons and ligaments, dislocations, **fractures**, herniated discs, **nosebleeds**, puncture **wounds**, **sprains**, and **strains**.

Description

Homeopathic prescribing differs in general from allopathic medicine in its tailoring of remedies to the patient's overall personality type and totality of symptoms, rather than to the disease. Whereas a conventional physician would prescribe the same medication or treatment regimen to all patients with the common cold, for example, a homeopathic practitioner would ask detailed questions about each patient's symptoms and the modalities, or factors, that make them better or worse. As a result, the homeopath might prescribe six different remedies for six different patients with the same illness. In acute prescribing homeopathy, consultations are more brief compared to constitutional homeopathic prescribing. A typical patient might spend just 10–15 minutes with the practitioner, compared to more than an hour for constitutional prescribing.

Homeopathic classification of symptoms

Homeopathic practitioners use the word symptom in a more inclusive fashion than traditional medicine. In homeopathy, symptoms include any change that the patient experiences during the illness, including changes in emotional or mental patterns.

Homeopaths classify symptoms according to a hierarchy of four categories for purposes of acute prescribing:

- Peculiar symptoms. These are symptoms unique to the individual that do not occur in most persons with the acute disease. Homeopaths make note of peculiar symptoms because they often help to determine the remedy.
- Mental and emotional symptoms. These are important general symptoms that inform the homeopath about the patient's total experience of the disorder.
- Other general symptoms. These are physical symptoms felt throughout the patient's body, such as tiredness, changes in appetite, or restlessness.
- Particular symptoms. Particular symptoms are localized in the body; they include such symptoms as nausea, skin rashes, headache, etc.

During homeopathic case-taking, the practitioner will evaluate the intensity of the patient's symptoms, assess their depth within the patient's body, note any peculiar symptoms, evaluate the modalities of each symptom, and make a list of key symptoms to guide the selection of the proper medicine.

Homeopathic remedies

There are several hundred homeopathic remedies. Homeopathic medicines are usually formulated from diluted or triturated natural substances, including plants, minerals, or even venom from snakes or stinging insects. Some remedies may be given in a spray, ointment, or cream, but the most common forms of administration are liquid dilutions and two sizes of pellets, or cylindrical tablets (for triturated remedies). A dose consists of one drop of liquid; 10–20 small pellets; or 1–3 large pellets. Since the remedies are so dilute, the exact size of the dose is not of primary importance. The frequency of dosing is considered critical, however; patients are advised not to take further doses until the first has completed its effect.

Homeopathic remedies can be kept indefinitely with proper handling. Proper handling includes storing the remedies in the original bottles and discarding them if they become contaminated by sunlight or other intense light; temperatures over 100°F (37.8°C); vapors from camphor, mothballs, or perfume; or from other homeopathic remedies being opened in the same room at the same time.

Preparations

Case-taking

The first step in acute prescribing is a lengthy interview with the patient, known as case-taking. In addition to noting the character, location, and severity of the patient's symptoms, the homeopath will ask about their modalities. The modalities are the circumstances or factors (e.g., weather, time of day, body position, behavior or activity, etc.) that make the symptoms either better or worse. Case-taking can be done by the patient or a family member as well as by a homeopath.

Selection and administration of a remedy

The choice of a specific remedy is guided by the patient's total symptom profile rather than by the illness. Homeopathic remedies are prescribed according

to the law of similars, which holds that a substance that produces specific symptoms in healthy people cures those symptoms in sick people when given in highly diluted forms. For example, a patient with influenza who is irritable, headachy, and suffering from joint or muscle pains is likely to be given *bryonia* (wild **hops**), because this plant extract would cause this symptom cluster in a healthy individual.

Patients are instructed to avoid touching homeopathic medicines with their fingers. The dose can be poured onto a piece of white paper or the bottle's cap and tipped directly into the mouth. Homeopathic remedies are not taken with water; patients should not eat or drink anything for 15–20 minutes before or after taking the dose.

Precautions

Homeopathic acute prescribing is not recommended for the treatment of chronic conditions requiring constitutional prescribing, for severe **infections** requiring antibiotic treatment, or for conditions requiring major surgery. It is also not recommended for the treatment of mental health problems.

Persons who are treating themselves with homeopathic remedies should follow professional guidelines regarding the limitations of home treatment. Most homeopathic home treatment guides include necessary information regarding symptoms and disorders that require professional attention.

Homeopathic remedies may lose their potency if used at the same time as other products. Some homeopathic practitioners recommend the avoidance of mint and mentholated products (toothpastes, candies, chewing gum, mouth rinses), as well as camphor and camphorated products (including **eucalyptus** and Tiger Balm), patchouli and other **essential oils**, moth balls, strong perfumes, aftershaves, scented soaps, **stress**, x rays, coffee, nicotine, recreational drugs (**marijuana**) and certain therapeutic drugs (most notably cortisone and prednisone) during treatment. Patients are also advised to avoid electric blankets and dental work, as these are thought to adversely affect homeopathic therapy. Homeopathic remedies should never be placed near magnets.

Practitioners caution that high-potency preparations should be used only under the supervision of a homeopathic practitioner.

Side effects

Homeopathic medicines are so diluted that sometimes no trace of the original substance can be detected. These medicines are therefore considered non-toxic and generally free of harmful side effects. There may, however, be individual reactions to homeopathic medicine.

An intensified healing response may occur as treatment begins, which causes symptoms to worsen, but the phenomenon is temporary. In some patients, old symptoms may reappear from past conditions from which recovery was not complete. Such phenomena are taken as positive indications that the healing process has commenced.

Research and general acceptance

As Samuel Hahnemann's healing system grew in popularity during the 1800s, it quickly attracted vehement opposition from the medical and apothecary professions. Since the early 1900s, when the American Medical Association and pharmacists waged a battle against it, homeopathy has been neglected and sometimes ridiculed by mainstream medicine. Aside from politics, part of the reason for this hostility is that there are some aspects of homeopathy which have not been completely explained scientifically. For instance, homeopaths have found that the more they dilute and succuss a remedy, the greater effect it seems to have on the body. Some homeopathic remedies are so diluted that not even a single molecule of the active agent remains in a solution, yet homeopaths maintain it still works. Also, homeopathy puts an emphasis on analyzing symptoms and then applying remedies to these symptoms, rather than working by classifying diseases. Thus, some people with the same disease may require different homeopathic medicines and treatments. Furthermore, conventional physicians strive to find out how medicines work in the body before they use them; homeopathy is less concerned with the intricate biochemistry involved than with whether a remedy ultimately works and heals holistically. For all these reasons, conventional medicine claims that homeopathy is not scientific, while homeopaths are quick to reply that homeopathy has been scientifically developed and studied for centuries with much documentation and success.

There continue to be many studies on the effectiveness of homeopathic treatments. Among the most celebrated, the *British Medical Journal*, published a large analysis of homeopathic treatments in 1991 that were given over the course of 25 years. This project involved more than 100 studies of patients with problems ranging from vascular diseases, respiratory problems, infections, stomach problems, allergies, recovery from surgeries, arthritis, trauma, psychological problems, diabetes, and others. The study found improvement with homeopathic treatment in most categories of

problems, and concluded that the evidence was "sufficient for establishing homeopathy as a regular treatment for certain indications."

A 2002 pediatric journal article reported on a study that showed some individualized homeopathic remedies eased the symptoms of uncomplicated acute otitis media (ear infections) in children. While the authors admitted more research was needed, they said the positive results justified further study on homeopathic remedies for childhood ear infections.

In the United Kingdom and other countries where homeopathy is especially popular, some medical doctors incorporate aspects of acute prescribing homeopathy into their practices. Countries in which homeopathy is popular include France, India, Pakistan, Sri Lanka, Brazil, and Argentina. Large homeopathic hospitals exist in London and Glasgow, and homeopathic medical centers can be found in India and South America.

Training and certification

It takes three to four years of training to become a qualified homeopath. Naturopathic physicians study homeopathy during their four-year medical school programs, and other practitioners may study homeopathy in post-graduate courses. The Council on Homeopathic Education is the only organization that accredits training programs in classical homeopathy. To date, it has accredited five institutions: Bastyr University of Natural Health Sciences in Seattle, Washington; Ontario College of **Naturopathic Medicine** in Toronto; Hahnemann Medical Clinic in Albany, California; the National College of Naturopathic Medicine in Portland, Oregon; and the International Foundation for Homeopathy, also in Seattle. Other well-known training programs include the Pacific Academy of Homeopathic Medicine in Berkeley, California, and the New England School of Homeopathy in Amherst, Massachusetts.

There are several organizations that certify homeopathic practitioners:

- The National Center for Homeopathy is the largest homeopathic organization, with more than 7,000 members. It also runs the Council on Homeopathic Education, and provides a listing of all its members and their credentials.
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- The North American Society of Homeopaths certifies non-physician homeopaths.

Resources

BOOKS

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. Los Angeles, Jeremy P. Tarcher, Inc., 1991.

MacEoin, Beth. *Homeopathy*. New York: HarperCollins Publishers, 1994.

Strohecker, James. *Alternative Medicine: The Definitive Guide*. Tiburon, Calif.: Future Medicine Publishing, Inc., 1999.

Ullman, Dana. *Discovering Homeopathy: Your Introduction to the Science and Art of Homeopathic Medicine*. Ber keley, Calif.: North Atlantic Books, 1991.

Vithoulkas, George. *Homeopathy: Medicine of the New Man*. New York: Fireside Books (Simon & Schuster), 1992.

PERIODICALS

Walsh, Nancy. "Homeopathy Shows Some Promise in AOM (Obstacles to Study this Therapy Remain)." *Pediatric News* (January 2002): 16.

ORGANIZATIONS

The American Institute of Homeopathy. 1585 Glencoe, Denver, CO 80220. (303) 898 5477.

The Council for Homeopathic Certification. P.O. Box 157, Corte Madera, CA 94976.

The International Foundation for Homeopathy. 2366 East lake Avenue East, #301, Seattle, WA 98102. (425)776 4147.

The National Center for Homeopathy. 801 North Fairfax Street, Suite 306, Alexandria, VA 22134. (703) 548 7790.

The North American Society of Homeopaths. 10700 Old County Rd. 15, #350, Minneapolis, MN 55441. (612) 593 9458.

Homeopathy, constitutional prescribing

Definition

Constitutional homeopathic prescribing, also called classical prescribing, is a holistic system of medicine that has been practiced for more than 200 years.

Unlike acute homeopathic prescribing, constitutional prescribing refers to the selection and administration of homeopathic preparations over a period of time for treatment related to what practitioners call miasmic disorders, those caused by an inherited predisposition to a disease. The term miasm comes from a Greek word meaning stain or pollution. As in acute prescribing, constitutional prescribing is holistic in that it is intended to treat the patient on the emotional and spiritual levels of his or her being as well as the physical. Constitutional prescribing is also aimed at eventual cure of the patient, not just suppression or relief of immediate symptoms.

Origins

Homeopathy was developed during the 1790s by Samuel Hahnemann, a German physician. Experimenting on himself with the antimalarial drug quinine, Hahnemann noticed that large doses of the medicine actually caused malaria-like symptoms, while smaller doses cured the symptoms. From this, he advanced his concept of *Similia similibus curentur*, or "let like be cured with like." Hahnemann then developed an extensive system of medicine based on this concept. He named it homeopathy, from the Greek words *homoios* (the same) and *pathos* (suffering).

There are several hundred homeopathic remedies. They are almost always made from natural materials—plant, animal, or mineral substances—that have been treated to form mother tinctures or nonsoluble powders. Liquid extracts are then potentized, or increased in power, by a series of dilutions and succussions, or shakings. It is thought that succussion is necessary to transfer the energy of the natural substance to the solution. In addition, the potency of the remedy is regarded as increasing with each dilution. After the tincture has been diluted to the prescribed potency, the resulting solution is added to a bottle of sucrose/lactose tablets, which are stored in a cool, dark place. If the remedy is not soluble in water, it is ground to a fine powder and triturated with powdered lactose to achieve the desired potency.

Proponents of homeopathy over the years have included Louisa May Alcott, Charles Dickens, Benjamin Disraeli, Johann Wolfgang Goethe, Nathaniel Hawthorne, William James, Henry Wadsworth Longfellow, Pope Pius X, John D. Rockefeller, Harriet Beecher Stowe, William Thackeray, Daniel Webster, and W. B. Yeats. England's royal family has employed homeopathic practitioners since the 1830s.

KEY TERMS

Aggravation—Another term used by homeopaths for the healing crisis.

Allopathy—Conventional medical treatment of disease symptoms that uses substances or techniques to oppose or suppress the symptoms.

Constitutional prescribing—Homeopathic treatment for long-term or chronic disorders related to inherited predispositions to certain types of illnesses.

Healing crisis—A temporary worsening of the patient's symptoms during successive stages of homeopathic treatment.

Law of similars—The basic principle of homeopathic medicine that governs the selection of a specific remedy. It holds that a substance of natural origin that produces certain symptoms in a healthy person will cure those same symptoms in a sick person.

Laws of cure—A set of three rules used by homeopaths to assess the progress of a patient's recovery.

Materia medica—In homeopathy, reference books compiled from provings of the various natural remedies.

Miasm—In homeopathic theory, a general weakness or predisposition to chronic disease that is transmitted down the generational chain.

Modalities—The factors and circumstances that cause a patient's symptoms to improve or worsen, including weather, time of day, effects of food, and similar factors.

Repertories—Homeopathic reference books consisting of descriptions of symptoms. The process of selecting a homeopathic remedy from the patient's symptom profile is called repertorizing.

Benefits

Homeopathic physicians seek to cure their patients on physical, mental, and emotional levels, and each treatment is tailored to a patient's individual needs. Homeopathy is generally a safe treatment, as it uses medicines in extremely diluted quantities, and there are usually minimal side effects. Its non-toxicity makes some consider it a good choice for the treatment of children. Another benefit of homeopathy is the cost of treatments; homeopathic remedies are inexpensive, often a fraction of the cost of conventional drugs.

Classical homeopathy has been used to treat a wide range of diseases and conditions, most of which tend to be long-term. These include: **alcoholism**, **allergies**, **anxiety**, arthritis, **asthma**, bladder conditions, **chronic fatigue syndrome**, **depression**, drug dependencies, gastrointestinal problems, Gulf War sickness, **headache**, hearing problems, herpes, hypersensitivity, immune disorders, **insomnia**, joint problems, kidney conditions, liver problems, **Lyme disease**, lower back problems, **malaria**, **menopause**, menstrual problems, migraine, **multiple sclerosis**, paralysis, **phobias**, **shingles**, sinus problems, skin disorders, repetitive **stress** injury, rheumatism, vertigo, vision problems, and yeast **infections**.

Description

Constitutional prescribing is based on the patient's symptom profile and specific aspects of homeopathic theory.

Homeopathic classification of symptoms

Homeopathic practitioners use the word symptom in a more inclusive fashion than traditional medicine. In homeopathy, symptoms include any change that the patient experiences during the illness, including changes in emotional or mental patterns.

Homeopaths classify symptoms according to a hierarchy of four categories:

- Peculiar symptoms. These are symptoms unique to the individual that do not occur in most persons. Homeopaths make note of peculiar symptoms because they often help to determine the remedy.
- Mental and emotional symptoms. These are important general symptoms that inform the homeopath about the patient's total experience of the disorder.
- Other general symptoms. These are physical symptoms felt throughout the patient's body, such as tiredness, changes in appetite, or restlessness.
- Particular symptoms. Particular symptoms are localized in the body; they include such symptoms as nausea, skin rashes, or headaches.

Miasms

Homeopaths regard the patient's symptom profile as a systemic manifestation of an underlying chronic disorder called a miasm. Miasms are serious disturbances of what homeopaths call the patient's vital force that are inherited from parents at the time of conception. Hahnemann believed that the parents' basic lifestyle, their emotional condition and habitual diet, and even the atmospheric conditions at the time of conception would affect the number and severity of miasms passed on to the child. Hahnemann himself distinguished three miasms: the psoric, which he considered the most universal source of chronic disease in humans; the syphilitic; and the sycotic, which he attributed to **gonorrhea**. Later homeopaths identified two additional miasms, the cancernic and the tuberculinic. The remaining major source of miasms is allopathic medicine. It is thought that specific allopathic treatments—particularly smallpox vaccinations, cortisone preparations, major tranquilizers, and antibiotics—can produce additional layers of miasms in the patient's constitution. Constitutional prescribing evaluates the person's current state or miasmic picture, and selects a remedy intended to correct or balance that state. The homeopath may prescribe a different remedy for each miasmic layer over time, but gives only one remedy at a time directed at the person's current state. The basic principle governing the prescription of each successive remedy is the law of similars, or "like cures like."

Hering's laws of cure

The homeopathic laws of cure were outlined by Constantine Hering, a student of Hahnemann who came to the United States in the 1830s. Hering enunciated three laws or principles of the patterns of healing that are used by homeopaths to evaluate the effectiveness of specific remedies and the overall progress of constitutional prescribing:

- Healing progresses from the deepest parts of the organism to the external parts. Homeopaths consider the person's mental and emotional dimensions, together with the brain, heart, and other vital organs, as a person's deepest parts. The skin, hands, and feet are considered the external parts.
- Symptoms appear or disappear in the reverse of their chronological order of appearance. In terms of constitutional treatment, this law means that miasms acquired later in life will resolve before earlier ones.
- Healing proceeds from the upper to the lower parts of the body.

Healing crises

Homeopaths use Hering's laws to explain the appearance of so-called healing crises, or aggravations, in the course of homeopathic treatment. It is not unusual for patients to experience temporary worsening of certain symptoms after taking their first doses of homeopathic treatment. For example, a person might notice that arthritic pains in the shoulders are better but that the hands feel worse.

Hering's third law would indicate that the remedy is working because the symptoms are moving downward in the body. In constitutional prescribing, a remedy that removes one of the patient's miasmic layers will then allow the symptoms of an older miasm to emerge. Thus the patient may find that a physical disease is followed by a different set of physical problems or by emotional symptoms.

Preparations

The most important aspects of preparation for constitutional prescribing are the taking of a complete patient history and careful patient education.

Case-taking

Homeopathic case-taking for constitutional prescribing is similar to that for acute prescribing, but more in-depth. The initial interview generally takes one to two hours. The practitioner is concerned with recording the totality of the patient's symptoms and the modalities that influence their severity. Also included are general characteristics about the patient and his or her lifestyle choices. For example, a practitioner might ask the patient if he or she likes being outside or is generally hot or cold. There is also an emphasis on the patient's lifetime medical history, particularly records of allopathic treatments.

Patient education

Homeopaths regard patients as equal partners in the process of recovery. They will take the time to explain the theories underlying constitutional prescribing to the patient as well as taking the history. Patient education is especially important in constitutional prescribing in order to emphasize the need for patience with the slowness of results and length of treatment, and to minimize the possibility of self-treatment with allopathic drugs if the patient has a healing crisis.

Homeopathic remedies

In constitutional prescribing, one dose of the selected remedy is given. Patients then wait two to six weeks before following up with the homeopath, while the body begins the healing process. At the follow-up visit, the remedy may be repeated, or a different remedy prescribed. The preparation, selection, administration, and storage of remedies for constitutional prescribing are the same as for acute prescribing. These procedures are described more fully in the article on acute prescribing.

Precautions

Constitutional homeopathic prescribing is not appropriate for diseases or health crises requiring emergency treatment, whether medical, surgical, or psychiatric. In addition, constitutional prescribing should not be self-administered. Although home treatment kits of homeopathic remedies are available for acute self-limited disorders, the knowledge of homeopathic theory and practice required for constitutional evaluation is beyond the scope of most patients.

Patients are instructed to avoid touching homeopathic medicines with their fingers. The dose can be poured onto a piece of white paper or the bottle's cap and tipped directly into the mouth. Homeopathic remedies are not taken with water; patients should not eat or drink anything for 15–20 minutes before or after taking the dose.

Homeopathic remedies may lose their potency if used at the same time as other products. Some homeopathic practitioners recommend the avoidance of mint and mentholated products (toothpastes, candies, chewing gum, mouth rinses), as well as camphor and camphorated products (including **eucalyptus** and Tiger Balm), patchouli and other **essential oils**, moth balls, strong perfumes, aftershaves, scented soaps, stress, x rays, coffee, nicotine, recreational drugs (**marijuana**) and certain therapeutic drugs (most notably cortisone and prednisone) during treatment. Patients are also advised to avoid electric blankets and dental work, as these are thought to adversely affect homeopathic therapy. Homeopathic remedies should never be placed near magnets.

Side effects

Homeopathic medicines are so diluted that sometimes no trace of the original substance can be detected. These medicines are therefore considered non-toxic and generally free of harmful side effects. The primary risks to the patient from constitutional homeopathic treatment are the symptoms of the healing crisis and individual reactions to homeopathic medicine. The complexity of constitutional prescribing requires homeopaths to have detailed knowledge of the *materia medica* and the repertories, and to take careful and extensive case notes.

An intensified healing response may occur as treatment begins, which causes symptoms to worsen, but the phenomenon is temporary. In some patients, old symptoms may reappear from past conditions from which recovery was not complete. Such phenomena are taken as positive indications that the healing process has commenced.

Research and general acceptance

As Samuel Hahnemann's healing system grew in popularity during the 1800s, it quickly attracted vehement opposition from the medical and apothecary professions. Since the early 1900s, when the American Medical Association and pharmacists waged a battle against it, homeopathy has been neglected and sometimes ridiculed by mainstream medicine. Aside from politics, part of the reason for this opposition is that there are some aspects of homeopathy which have not been completely explained scientifically. For instance, homeopaths have found that the more they dilute and succuss a remedy, the greater effect it seems to have on the body. Some homeopathic remedies are so diluted that not even a single molecule of the active agent remains in a solution, yet homeopaths maintain that it still works. Also, homeopathy puts an emphasis on analyzing symptoms and then applying remedies to these symptoms, rather than working by classifying diseases. Thus, some people with the same disease may require different homeopathic medicines and treatments. Furthermore, conventional medicine strives to find out how medicines work in the body before they use them; homeopathy is less concerned with the intricate biochemistry involved than with whether a remedy ultimately works and heals holistically. For all these reasons, conventional medicine claims that homeopathy is not scientific, while homeopaths are quick to reply that homeopathy has been scientifically developed and studied for centuries, with much documentation and success.

There continues to be many studies on the effectiveness of homeopathic treatments. Among the most celebrated, the *British Medical Journal* in 1991 published a large analysis of homeopathic treatments that were given over the course of 25 years. This project involved more than 100 studies of patients with problems ranging from vascular diseases, respiratory problems, infections, stomach problems, allergies, recovery from surgeries, arthritis, trauma, psychological problems, diabetes, and others. The study found improvement with homeopathic treatment in most categories of problems, and concluded that the evidence was "sufficient for establishing homeopathy as a regular treatment for certain indications."

In early 2002, a study in England sought to prove homeopathy's effect on treating chronic **fatigue** syndrome. Homeopathic consultations with patients took place monthly and the homeopaths in the study were allowed to choose any remedies they deemed appropriate and changed them as needed. Patients who received homeopathic treatments reported feeling more rested, less tired, and fitter than those in the placebo control group. Overall, nearly two-thirds of chronic fatigue patients reported some improvement.

In the United Kingdom and other countries where homeopathy is especially popular, some medical doctors incorporate aspects of **acute prescribing homeopathy** into their practices. Countries in which homeopathy is popular include France, India, Pakistan, Sri Lanka, Brazil, and Argentina. Large homeopathic hospitals exist in London and Glasgow, and homeopathic medical centers can be found in India and South America.

Training and certification

It takes three to four years of training to become a qualified homeopath. Naturopathic physicians study homeopathy during their four-year medical school programs, and other practitioners may study homeopathy in post-graduate courses. The Council on Homeopathic Education is the only organization that accredits training programs in classical homeopathy. As of 2005, it had accredited five institutions: Bastyr University of Natural Health Sciences in Seattle, Washington; Ontario College of **Naturopathic Medicine** in Toronto; Hahnemann Medical Clinic in Albany, California; the National College of Naturopathic Medicine in Portland, Oregon; and the International Foundation for Homeopathy, also in Seattle. Other well-known training programs include the Pacific Academy of Homeopathic Medicine in Berkeley, California, and the New England School of Homeopathy in Amherst, Massachusetts.

There are several organizations that certify homeopathic practitioners:

- The National Center for Homeopathy is the largest homeopathic organization, with over 7,000 members. It also runs the Council on Homeopathic Education, and provides a listing of all its members and their credentials.
- The American Institute of Homeopathy is the oldest national medical body. It provides a list of D.Ht.s (Diplomate in Homeopathy) certified by the American Board of Homeotherapeutics.
- The Council for Homeopathic Certification was created in 1992 to establish a certification exam and a code of ethics. It confers upon qualified practitioners a C.C.H. (Certification in Classical Homeopathy).
- The Homeopathic Academy of Naturopathic Physicians offers a certification based on a competency exam, the "Diplomate in the Homeopathic Academy of Naturopathic Physicians" (D.H.A.N.P.).
- The North American Society of Homeopaths certifies non-physician homeopaths.

Resources

BOOKS

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. Los Angeles, Jeremy P. Tarcher, Inc., 1991.
MacEoin, Beth. *Homeopathy*. New York: HarperCollins Publishers, 1994.
Strohecker, James. *Alternative Medicine: The Definitive Guide*. Tiburon, Calif.: Future Medicine Publishing, Inc., 1999.
Ullman, Dana. *Discovering Homeopathy: Your Introduction to the Science and Art of Homeopathic Medicine*. Ber keley, Calif.: North Atlantic Books, 1991.
Vithoulkas, George. *Homeopathy: Medicine of the New Man*. New York: Fireside Books (Simon & Schuster), 1992.

PERIODICALS

Walsh, Nancy."Homeopathy May Help Patients with Chronic Fatigue Syndrome."*Clinical Psychiatry News*.(March 2002):27.

ORGANIZATIONS

American Institute of Homeopathy. 1585 Glencoe, Denver, CO 80220. (303) 898 5477.
Council for Homeopathic Certification. P.O. Box 157, Corte Madera, CA 94976.
International Foundation for Homeopathy. 2366 Eastlake Avenue East, #301, Seattle, WA 98102. (425)776 4147.
National Center for Homeopathy. 801 North Fairfax Street, Suite 306, Alexandria, VA 22134. (703) 548 7790.
North American Society of Homeopaths. 10700 Old County Rd. 15, #350, Minneapolis, MN 55441. (612) 593 9458.

Honeysuckle

Description

Honeysuckle is a large volubilate shrub of the genus *Lonicera*. There are more than 300 species of honeysuckle in the Caprifoliaceae family, found from Asia to North America. The shrub reaches heights of 20–30 ft (6–9 m), with thin, hairy branches. It has ovoid leaves that range 1.2–3.2 in (3–8 cm) long by 0.6–1.6 in (1.5–4.0 cm) wide. The plant flowers in late spring or early summer, depending on the species. Japanese honeysuckle (*Lonicera japonica*) blooms in the spring from April to May, with fragrant white flowers touched with a shade of purple that fade to yellow as they mature. The species of honeysuckle that is found in North America, the United Kingdom, and western Asia, *Lonicera caprifolium*, flowers in June. Generally, honeysuckle flowers are 1.2–1.6 in (3–4) cm long, with an inner tube of approximately the same length. All varieties of honeysuckle are famous for this tube, which is extracted and sucked for its sweet nectar. The shrub also produces a black berry. Despite the sweetness of its fragrance and nectar, the medicinal parts of the plant are bitter, due to the saponin in its stem, the 8% tannin in the leaves and the 1% insitol in its flowers.

Honeysuckle. *(©PlantaPhile, Germany. Reproduced by permission.)*

General use

Japanese honeysuckle (*L. japonica*, also called Japanese *jin yin hua*, which means gold and silver flower) and common honeysuckle (*L. caprifolium*, also called Italian honeysuckle, Dutch honeysuckle, and woodbine) are both widely used for their medicinal qualities. Although the Chinese most commonly use the bud of the flower in their medical practice, in other countries it is mostly the flowers and leaves that are used for their healing properties. Japanese honeysuckle works well as a detoxifier, and is best used for acute **infections** and inflammations. As an alterative, which cleanses and purifies the blood, and an antipyretic, which reduces **fever** with its cooling properties, Japanese honeysuckle is best used for such ailments as sore throats, swollen eyes, headaches, etc.

Acute infections and inflammations

Japanese honeysuckle is most useful in treating acute illnesses, infections and inflammations. At the onset of a cold, honeysuckle should be taken in combination with chrysanthemum flowers. Several popular Chinese formulas, such as *yin chaio* and *ganmaoling*, contain this herbal combination. Because it is a natural antibiotic, honeysuckle can also be used to treat infections caused by staphylococcal or streptococcal bacteria. Honeysuckle should be used for

KEY TERMS

Alterative—A substance that cleanses and purifies the blood.

Antipyretic—A substance or medication that combats fever with cooling properties.

Antispasmodic—A substance or medication that prevents spasms or cramps.

Vasodilatory—Having the effect of relaxing or widening the blood vessels.

acute conditions, and is not meant to be used in the treatment of chronic illnesses.

Skin infections

Honeysuckle works well against internal infections, and it can also be used externally for skin irritation and infections. Honeysuckle has been found useful in alleviating **rashes** ranging from skin diseases to poison **oak**. For these types of skin ailments, honeysuckle is best used as a poultice. For **cuts** and abrasions that may become infected, a honeysuckle infusion can be applied externally. It is in treating skin infections that the stems of honeysuckle are used.

Circulatory system

John Gerard, a master herbalist of the sixteenth century, said that honeysuckle's "floures, be steeped in oile, and set in the Sun, are good to annoint the body that is bennumed, and growne very cold." Indeed, *L. caprifolium* as a fixed oil is good for the circulatory system. When it is heated and smoothed onto the skin, it has been shown to have a vasodilatory effect, causing the blood to flow into the dermis, which is the thick layer of skin beneath the epidermis.

Asthma and coughs

L. caprifolium can be used for **asthma** on account of its antispasmodic properties. An herbal infusion of the leaves is the best method for treating asthma. A decoction of honeysuckle flowers can be used for coughs.

Other uses

The seeds of *L. caprifolium* can be used as a diuretic. *L. villosa*, also known as American honeysuckle, has been used as a kidney stimulant. *L. japonica* has been used to treat dysentery, and **diarrhea**.

Preparations

Three teaspoons of the leaf infusion can be taken three times a day. For skin irritation, honeysuckle should be made into an infusion or poultice and applied externally to the skin. When honeysuckle is compounded in capsule form, 10–17 g can be taken daily.

Precautions

Although honeysuckle poultices are used for skin irritations, there have been cases of contact dermititis reported from pulling up Japanese honeysuckle. A patient that had come into contact with *L. japonica* reported developing a line of itchy **blisters**. People often taste honeysuckle tubes for their nectar; however, several cases of plant poisoning have been reported in children. The symptoms include gastrointestinal discomfort and **muscle cramps**.

Side effects

There are no known side effects from using honeysuckle.

Interactions

No known adverse drug interactions have been reported with honeysuckle.

Resources

BOOKS

Hallowell, Michael. *Herbal Healing*. Avery Publishing Group, 1994.
Mabey, Richard. *The New Age Herbalist*. Gaia Books, 1988.
Ritchason, Jack. *The Little Herb Encyclopedia*. Woodland Health Books, 1995.

Katherine Y. Kim

Hoodia

Description

Hoodia is a genus of succulent plants, native to the Namib Desert, along the Atlantic Coast of Namibia. Although the plant looks like a cactus, it is properly part of the *Apocynaceae* or *Dogbane* family. Common names are Bushman's Hat and Queen of the Nam. Although there are several species of hoodia, *Hoodia gordonii* has gained interest as an appetite suppressant. Other species have been traditionally used as ornamental plants. There is no evidence that species other than *gordonii* have appetite suppressant effects.

General use

Hoodia has a history of use in folk medicine by the San bushmen of Africa. According to the United States Department of Agriculture, wild hoodia is an endangered species, and international trade in hoodia is restricted under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In the 2000s, Phytopharm, a British firm which applied for patents for hoodia, reported that it was developing hoodia plantations to assure a sustainable supply.

Although hoodia has been widely promoted as an appetite suppressant, there have been no published human studies documenting the safety or efficacy of hoodia products. Although Phytopharm claimed to have completed a double blind study showing both safety and efficacy, the details of this study were not available as of 2008. According to documents submitted to the United States Food and Drug Administration, Phytopharm apparently considered these results to be proprietary information and was unwilling to release details.

One published study, sponsored by the Council for Scientific and Industrial Research (CSIR, South Africa), documented efficacy in rats. In this study, hoodia extracts fed to rats over an eight-day period resulted in reduction in caloric intake and loss of body mass. In a subsequent study, rats were given either hoodia extract or the weight loss drug *fenfluramine*. In this study, hoodia was more effective than the traditional drug. A 2004 publication from the Hallett Center for Diabetes and Endocrinology of Brown University Medical School reported that the active principle of hoodia, a glycoside commonly called P57, when injected into the brains of rats, induced biochemical changes resulting in appetite reduction.

In one widely publicized report, Lesley Stahl of the CBS television program *60 Minutes* went to Africa and tried the plant. Although she commented favorably on its safety and efficacy, her report was anecdotal, based on a single day's use and cannot be considered significant.

Preparations

Although there are many products claiming to contain hoodia in various forms, they do not appear to be standardized. Adulterants may be present.

Side effects

There are no established side effects associated with hoodia; however, this is due to lack of information and documentation rather than an evidence of safety. In a letter to the Editor of the *New York Times,* a researcher who had been working with Pfizer Laboratories to develop a commercial form of hoodia, wrote: "An early clinical trial indeed showed that hoodia could be a potent appetite suppressant. But there were indications of unwanted effects on the liver caused by other components, which could not be easily removed from the supplement. Clearly, hoodia has a long way to go before it can earn approval from the Food and Drug Administration. Until safer formulations are developed, dieters should be wary of using it."

KEY TERMS

Anorectic—A drug that reduces the appetite.

Fenfluramine—An anorectic drug, withdrawn from the United States market in 1997 due to toxic effects.

Succulent—Any plant with fleshy stems or leaves.

Interactions

There are no established interactions with hoodia. Because preparations labeled as hoodia may contain **chromium**, persons using insulin for diabetes control should show extra caution, since this adulterant may affect the activity of insulin.

Resources

BOOKS

DerMarderosian, Ara, Lawrence Liberti, John Beutler, Constance Grauds, and David S. Tatro, eds. *Review of Natural Products,* 4th ed. Philadelphia: Lippincott Williams & Wilkens, 2005.

PERIODICALS

Bindra, Jasjit S. "A Popular Pill's Hidden Danger (letter)." *New York Times* (April 26, 2005).

Brody, Jane. "Personal Health Weight Loss Drugs: Hoopla and Hype." *New York Times* (April 24, 2007).

Van Heerden, F. R., R. Marthinus Horak, V. J. Maharaj, et al. "An Appetite Suppressant from Hoodia Species." *Phytochemistry* 68, no. 20 (October 2007): 2545 2553.

ORGANIZATIONS

Phytopharm Plc, Corpus Christi House, 9 West St., God manchester, Cambridgeshire, PE29 2HY, U.K., 44 (0) 1480 437697, http://www.phytopharm.co.uk/contacts/headoffice/.

Sam Uretsky, PharmD

Hops

Description

Hops derive from the large perennial vine *Humulus lupulus*. This plant is native to North America and Europe but is cultivated in many other places. The vine grows to a height of 25 ft (8 m). It has heart-shaped dark green leaves and yellowish green flowers. Each plant produces either male or female flowers. Only the female flowers, called strobiles, are used medicinally. Strobiles are picked in autumn and either used fresh or dried.

General use

Hops have been cultivated to be used in the brewing of beer since at least A. D. 1000, but they also have a mixed history of use in healing. Ancient Hebrews used hops to help ward off plague. In North America, several Native American tribes independently discovered the healing properties of hops and used it as a sedative and sleep aid, to relieve **toothache**, and to improve digestion. By the end of the 1800s, hops were being used routinely in mainstream medicine in the United States as a sedative and digestive tonic. Although hops were sometimes used as a sleep aid in Europe, until relatively recently their major use in Europe was in the brewing of beer, to which they add a bitter flavor and act as a preservative. In the mid-2000s, European herbalists were much more enthusiastic about the healing properties of hops. They are used in three ways: as a sedative, as an aid in digestion, and as an antibiotic.

The best-known medicinal function of hops is as a mild sedative and sleep aid. For centuries pillows filled with hops have been prescribed for people who have difficulty falling asleep. Hops extracts taken orally are also said to promote sleep. Hops are chemically complex and contain many different compounds. Scientists have separated out several components that are sedative in nature, although it is not clear whether hops contain enough of these compounds to actually make a person sleepy. Some modern studies have given support to hops as an effective treatment for **insomnia**. The German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, has approved hops for sleep problems, restlessness, and **anxiety**. Hops belong to the same family of herbs as **marijuana**, and some people claim it produces a mild, relaxed, euphoric feeling when smoked. There is no scientific evidence for this claim.

The second major use of hops is as an aid to digestion. Hops have been used for centuries in both **traditional Chinese medicine** and Native American healing to stimulate the appetite, ease digestion, and aid in relieving **colic**. It is believed that hops stimulate the secretions of the stomach.

The German E Commission has also concluded that hops may act as a digestive aid. Scientists have isolated another extract from the plant that in the laboratory inhibits spasms in the digestive tract and other smooth muscle.

Chinese healers use hops to treat **tuberculosis** and as an antibiotic. Test-tube studies show that the bitter acids in hops inhibit the growth of certain bacteria and fungi, including the common bacteria *Staphylococcus aureus* (responsible for staph **infections**) and *Bacillus subtilis*, but they do not inhibit *Escherichia coli*, a bacterium that causes digestive upsets. This antibacterial action may account for the preservative effect of hops in brewed beer. A 1999 study also showed that some compounds isolated from hops were effective in test-tube studies in reducing the proliferation of certain types of human breast and **ovarian cancer** cells. As of 2007, hops extract was being studied as a possible **cancer** chemopreventive.

In the early 2000s, researchers confirmed that hops contain compounds called phytoestrogens that are related to or easily converted into estrogen, the main female hormone. Some herbalists believe that the presence of an estrogenic compound accounts for the dampening of male sexual arousal and the control of sexual nervous tension ascribed to ingesting fresh hops. Other herbalists disagree, maintaining that those effects are related to the relaxing or sedative properties of hops only.

In addition to their use in healing, hops are used as an ingredient in perfume and occasionally as a tobacco or food flavoring. Their main food use and commercial value is in beer.

Preparations

Fresh and dried hops have different properties and are used to treat different symptoms. Fresh or newly dried hops, usually dampened with glycerin to reduce the rustling noise, are used in sleep pillows to help ease a restless or anxious person into sleep. As the hops age, they change in chemical composition. For this reason, the hops in pillows should be changed every few months. Fresh hops can also be made into a tea that is taken to combat insomnia. The tea is made by steeping about two teaspoons of fresh hops in one cup (250 ml) of boiling water for five minutes.

KEY TERMS

Phytoestrogen—Any of several compounds found in plants that possess estrogen-like activity.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Dried hops change in composition when exposed to light, heat, or moisture. They should be stored in a container that excludes moisture and light and should be kept at room temperature. Dried hops are used to treat digestive and other complaints. They can be prepared various ways. As a tincture, about 1/2 tsp (2 ml) can be taken three times a day. Capsules are available commercially to take before meals to aid digestion. Dry extract or powder can be added to boiling water to make a tea. Compresses are made by soaking a pad in the infusion or diluted tincture. An essential oil is produced by steam distillation. Hops are also used in combination with other herbs in commercially available remedies.

Precautions

Hops are not recommended for people suffering from **depression**. Their sedative action may accentuate depressive symptoms in these people. Some herbalists recommend that pregnant women and those with estrogen sensitive **breast cancer** avoid hops because of the possibility that they contain an estrogenic compound. Hops are included on the United States Food and Drug Administration's list of foods "Generally Recognized as Safe"(GRAS).

Side effects

There are no known side effects if hops are used in the recommended dosages. Some people who pick fresh hops may develop a skin rash (**contact dermatitis**).

Interactions

As of 2008, there had been little scientific study of the interaction of hops and pharmaceuticals. As noted above, however, people who are depressed or who are taking medications for depression should consult a doctor before using hops.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

PERIODICALS

Brattstrom, A. "Scientific Evidence for a Fixed Extract Combination (Ze 91019) from Valerian and Hops Tra ditionally Used as a Sleep Inducing Aid." *Wiener Medizinische Wochenschrift* Vol. 157, Nos. 13 14 (2007): 367 370.

Gerhauser, C. "Beer Constituents as Potential Cancer Che mopreventive Agents." *European Journal of Cancer* Vol. 42, no. 13 (September 2005): 1941 1954.

Gerhauser, C. "Broad Spectrum Anti Infective Potential of Xanthohumolf from Hop (Humulus Lupulus L.) in Comparison with Activities of Other Hop Constituents and Xanthohumol Metabolites." *Molecular Nutrition & Food Research* Vol. 49, no. 9 (September 2005): 827 831.

Meolie, A. L., C. Rosen, D. Kristo, et al. "Oral Nonpre scription Treatment for Insomnia: An Evaluation of Products with Limited Evidence." *Journal of Clinical Sleep Medicine*. Vol. 1, no. 2 (April 15, 2005): 173 187.

OTHER

"Hops Oral." *Medicine.Net*. March 2, 2005. http://www.medicinenet.com/hops oral/article.htm (February 10, 2008).

Tish Davidson, A. M.
Rebecca J. Frey, Ph. D.

Horehound

Description

Horehound (*Marrubium vulgare L.*), commonly known as white horehound, is a European native of the Lamiaciae or mint family. Other names for this ancient remedy include houndsbane, marrubium, eye of the star, seed of Horus, marvel, bulls' blood, and houndsbane. Horehound is a hardy perennial that has naturalized throughout North America; it may be found in sunny, wayside places, thriving even in poor, dry soil. The common name horehound comes from the Old English words *har* and *hune*, meaning downy plant. This descriptive name refers to the white hairs that give this herb its distinctive hoary appearance. Another suggested derivation is from the name of the Egyptian god of sky and light, Horus. Horehound is one of the oldest known **cough** remedies. It was one of the herbs in the medicine chests of the Egyptian pharaohs. In Roman times, Caesar's

antidote for poison included horehound. The generic name is believed to be derived from the Hebrew word *marrob*, meaning bitter juice. Horehound is one of the bitter herbs used in the Jewish Passover rites. Throughout its long history, white horehound has been valued not only as a folk remedy for coughs and congested lungs, but also as a magic herb for protection against the spells attributed to witches.

Black horehound (*Ballota nigra*), also known as black stinking horehound, is the smelly relative of white horehound. It belongs to the same family of plants as white horehound and is credited with some of the same medicinal applications. Both black and white horehound have been used to treat the **bites** of snakes and mad dogs, to rid the system of intestinal **worms**, and as antidotes to vegetable poisons. Black horehound is considered to be especially useful in quelling the **nausea** associated with **motion sickness**, or to stop the **vomiting** brought on by nervous tension. It also acts as an emmenagogue, restoring a healthy balance to the menstrual cycle.

White horehound is a bushy plant that grows nearly 2 ft (61 cm) tall from a short, stout, and woody root. The small oval leaves are bitter to the taste, with a musky aroma. They are wrinkled and dark green on top, and pale with downy white hairs on the underside. The leaves are opposite and deeply veined, growing on hairy, square, branching stems also covered with downy white hairs. The lower leaves of white horehound have long stalks, while the upper leaves are smaller and stalkless. The small white flowers form dense whorls at the leaf axils, blooming in the second year of growth from June to August. Flowers are tubular with two lips. Four small shiny dark brown seeds are carried in each nutlet after flowering. Horehound seeds have tiny barbs to attach to animal fur and clothing, while horehound blossoms attract bees to the garden.

General use

White horehound is best known as a time-honored cough remedy, found in syrup, candy and tea preparations. The aerial parts of the plant are used medicinally. The active ingredients include sesquiterpene **bitters**, marrubin, volatile oil, tannins, flavonoids, and mucilage. White horehound is antiseptic. An infusion used as a wash, or a preparation of horehound salve is useful to disinfect **wounds**. A cold infusion of white horehound acts as a bitter digestive tonic and will stimulate the flow of bile from the gall bladder. It is diuretic and may also relieve flatulence and stimulate appetite. White horehound stimulates discharge of bronchial mucus, loosening and expelling phlegm. It is beneficial in the treatment of **croup**, **bronchitis**, and **whooping cough**, and has been used in the past in the treatment of **tuberculosis**, once known as consumption. White horehound is also said to normalize cardiac arrhythmias. A warm infusion is diaphoretic, meaning that it will promote sweating. It has been used to break fevers and to treat **jaundice** and typhoid **fever**. The finely chopped leaves, mixed with honey and chewed slowly, will ease a **sore throat** and relieve hoarseness. The herb was also used following **childbirth** to promote expulsion of the placenta. White horehound combines well with other herbs in medicinal infusions, including elecampane (*Inula helenium L.*) and **licorice** (*Glycyrrhiza glabra*).

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue.

Diaphoretic—A medication given to induce sweating.

Emmenagogue—A substance or medication given to bring on a woman's menstrual period.

Infusion—The most potent form of extraction of an herb into water. Infusions are steeped for a longer period of time than teas.

Mucilage—A gummy or gelatinous substance found in some plants, including horehound.

Tincture—The extraction of an herb into an alcohol solution for either internal or external use.

Many of the time-tested traditional uses for this safe herbal remedy have not been clinically proven. White horehound has been approved for treatment of bronchial problems and as an appetite stimulant by the German E Commission—an advisory group on herbal medicines in that country. The U.S. Food and Drug Administration (FDA), however, has declared horehound ineffective for its traditional medicinal use as a sore throat remedy, while approving it as a safe food additive.

It is possible, however, that horehound may prove to be useful in herbal treatments for inflammation. In 2002, French researchers reported isolating new glycoside compounds in horehound, one of which has anti-inflammatory activity. In addition, a group of American researchers studying traditional Mexican herbal remedies for **headache**, **asthma**, arthritis, fever, and menstrual cramps found that horehound has a high

antioxidant content that may explain its inclusion in folk remedies for these conditions.

Preparations

Tincture: Combine 4 oz of finely-cut fresh horehound leaf (or 2 oz of dry powdered herb) with 1 pt of brandy, gin, or vodka in a glass container. There should be enough alcohol to cover the plant parts and have a 50/50 ratio of alcohol to water. Cover and store the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly-capped dark glass bottle. A standard dose is 10–15 drops of the tincture in water, up to three times a day.

Infusion: Place 2 oz of fresh horehound leaves in a warmed glass container. Bring 2.5 cups of fresh, non-chlorinated water to the boiling point and add it to the herbs. Cover. Infuse the tea for about ten minutes. Strain and sweeten to taste. Drink warm or cold, depending on the intended results. The prepared tea will store for about two days in the refrigerator. Drink three cups a day.

Syrup: Using fresh leaves, prepare a strong infusion of horehound using twice the amount of fresh herb. Combine the infusion with a 50/50 mixture of honey and brown sugar. Use 24 oz of sweetener for each 2.5 cups of the herbal infusion. Heat the mixture in a glass or enamel pot and stir frequently as the mixture thickens. Cool and pour into clearly-labeled glass bottles. Refrigerate for storage. One teaspoonful of syrup may be taken three times a day, or every two hours if needed in acute illness.

Precautions

Pregnant women should not self-medicate with horehound herbal preparations. Lactating women should also consult with a qualified herbalist before using the herb internally. Infants and children under two years of age should not be given horehound. Do not use horehound medicinally if there is chronic disease of the gastrointestinal tract, such as ulcers, esophageal reflux, **colitis**, or diverticulosis. Large doses of horehound may have a purgative action. Very large doses may cause irregular heartbeat.

Side effects

When horehound is taken internally, it may interfere with the absorption of **iron** and other minerals.

Interactions

No interactions have been reported between horehound and standard pharmaceutical preparations. However, some anesthesiologists recommend that patients scheduled for any surgery requiring total anesthesia should discontinue all herbal preparations for 1–2 weeks before the operation. The reason for this precaution is that some herbal preparations appear to interfere with the action of inhaled anesthetics.

Resources

BOOKS

Bremnes, Lesley. *The Complete Book of Herbs*. New York: Henry Holt, 1995.

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Hoffmann, David. *The New Holistic Herbal,* 2nd ed. Boston: Element, 1986.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies. Emmaus, PA: Rodale Press, Inc., 1997.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Weiss, Gaea, and Shandor Weiss. *Growing & Using the Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Sahpaz, S., et al. "Isolation and Pharmacological Activity of Phenylpropanoid Esters from *Marrubium vulgare*." *Journal of Ethnopharmacology* 79 (March 2002): 389 392.

Sahpaz, S., T. Hennebelle, and F. Bailleul. "Marruboside, a New Phenylethanoid Glycoside from *Marrubium vul gare L.*" *Natural Product Letters* 16 (June 2002): 195 199.

Vanderjagt, T. J., R. Ghattas, D. J. Vanderjagt, et al. "Comparison of the Total Antioxidant Content of 30 Widely Used Medicinal Plants of New Mexico." *Life Sciences* 70 (January 18, 2002): 1035 1040.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.

New York Botanical Garden. Bronx River Parkway at Fordham Road, Bronx, NY 10458. (718) 817 8700. www.nybg.org.

OTHER

Grieve, M. "A Modern Herbal." http://www.botanical.com.

Clare Hanrahan
Rebecca J. Frey, PhD

Horse chestnut

Description

The European horse chestnut, *Aesculus hippocastanum*, is the horse chestnut most frequently used in herbal medicine. It is a member of the Hippocastanaceae family. Horse chestnuts are in an entirely different botanical family from the well-known sweet chestnut tree, *Castanea vesca*. Horse chestnuts exist in nature as both a tree and a shrub, and are found in all temperate regions of Europe, Asia, and North America.

There are 15 recognized species of horse chestnut. The European horse chestnut is believed to have originated in the Balkan region of eastern Europe but is now grown in every country in the Northern Hemisphere.

The name *Aesculus* is actually a misnomer, coming originally from the word *esca*, meaning food. It was applied by ancient peoples to a certain species of oak; and somehow the name was transferred over the years to the horse chestnut. The name *hippocastanum* is thought to refer to the horse chestnut's ability to heal horses and cattle of respiratory illnesses. Another possibility may be that it is named for the small horseshoe-like markings that are present on the branches of the horse chestnut tree.

Horse chestnut trees grow in nearly any soil but seem to prefer a sandy loam. They grow very rapidly into tall straight trees that can reach heights of over 100 ft (approximately 30 m) tall, with widely spreading branches. The bark is grayish-green or grayish-brown in color, and the tree limbs are thick and have corky, elongated, wart-like eruptions that appear from a distance like ribbing. The interior of horse chestnut bark is pinkish-brown, with fine lines running its length. It is odorless and its taste is very bitter and astringent.

The characteristic horseshoe markings found on the branches are actually the scars from where leaves previously grew. Horse chestnut wood is seldom if ever used for lumber due to its soft and spongy character. Large leaf and flower buds are clearly visible even during winter months but are encased in a scaly, resinous protective covering that prevents damage from frost or damp. This thick sticky coating melts with the beginning of warm weather in spring, and flowers and leaves appear with remarkable rapidity, usually within three to four weeks.

The leaves are dark green, rough in texture, and large, with minutely serrated edges. Horse chestnut leaves can be nearly 1 ft (0.3 m) in length. They somewhat resemble a hand with five to nine leaf sections emerging from a palm-like base to form the finger-like projections. European horse chestnuts produce clusters of white flowers with a pale scarlet tinge at the throat or yellow mottling. American horse chestnut flowers can be white, pale pink, or yellow, depending upon the species. All types of horse chestnut trees, with their graceful wide limbs and showy flowers, are grown for their ornamental beauty.

The fruit of the horse chestnut is a dark brown smooth-surfaced nut approximately 2 in (5 cm) in diameter. It has a polished appearance except for the rounded dull tan-colored scar on the side that was attached to the seed vessel. Horse chestnuts are encased in a light green spine-covered coating that divides into three parts and drops away prior to the nut dropping from the tree. Horse chestnut nuts contain mostly carbohydrates which are generally indigestible until boiled. They also contain saponins, tannin, flavones, two glycosides, aesculin and fraxin, some crude protein, a fatty oil, ash and water.

Horse chestnuts native to North America are called buckeyes because of their large seeds resembling the eye of a buck, or male deer.

American horse chestnuts are divided into four types:

- Ohio buckeye, or *Aesculus glabra*, is a medium-sized tree which grows from the southern United States to the prairies of western Canada. It is the state tree of Ohio, hence the state's nickname of the Buckeye State.
- Yellow buckeye, *Aesculus octandra*, or *Aesculus flava*, is a tree that grows to heights of 40 ft (12 m) or more. It is fairly common across the central portion of the United States. Its leaves are somewhat smoother than those of other horse chestnuts.
- Red buckeye, or *Aesculus pavia*, is a shrub or small tree that generally is found in the southern United States. In early summer it develops brilliantly scarlet flowers in large clusters, and has dense foliage. The tree species of red buckeye grows to heights of between 15–20 ft (5–7 m) tall.
- California buckeye, or *Aesculus californica*, is a horse chestnut tree found all along the Pacific coast.

General use

Horse chestnuts have been used as fodder for feeding farm animals, and some Native American peoples have included them in their diet. However, the outer covering of the horse chestnut nut is toxic, and the nut itself has to be boiled prior to being eaten

safely. Its wood, which is too soft for furniture-making or construction, is used in building crates and other packing cases.

Both the bark and the fruit from horse chestnut trees are used medicinally to strengthen and tone the circulatory system, especially the venous system. It is used both internally and externally to treat varicose veins, **phlebitis**, and hemorrhoids. Horse chestnut preparations are particularly effective in treating varicose ulcers. Due to its ability to improve circulation, it is also helpful for the relief of leg cramps. Its bark also has narcotic and fever-reducing properties. A compound known as aescin, which is present in the horse chestnut fruit, is now often added to external creams and preparations used for the treatment of **varicose veins**, varicose ulcers, bruises, and sports injuries.

Horse chestnut preparations using the seed, bark, twigs, and leaves are all utilized in traditional Chinese medicine. Chinese herbalists consider horse chestnut to be a part of treatment not only for circulatory problems, but use it as an astringent, as a diuretic, for reduction of **edema** or swelling, to reduce inflammation, as an expectorant in respiratory problems, and to fight viruses.

Preparations

Horse chestnut bark is removed in the spring, in strips 4 or 5 in (10–13 cm) long, about 1 in (2.5 cm) thick and broad. The fruit of the horse chestnut is gathered in the autumn, when they fall from the tree. Both the bark and the fruit are dried in sunlight or with artificial heat, and are either kept whole or ground to a powder for storage. A decoction, made of 1 or 2 tsp of the dried, pulverized bark or fruit left to simmer for 15 minutes in 1 cup of water can be either taken internally three times a day or used externally as a lotion. Horse chestnut preparations are also available as tinctures, extracts, capsules, and external ointments and lotions.

Precautions

The outer husks of the horse chestnut fruit are poisonous. There are also reported cases of poisoning from eating raw horse chestnuts.

Side effects

There have been reported cases of gastrointestinal irritation, **nausea**, and **vomiting** from taking large doses of horse chestnut. There are also rare reports of rash and **itching**, and even rarer cases of kidney problems.

Interactions

Horse chestnut's ability to reduce blood coagulation, or clotting, indicates that it should not be given to those with bleeding disorders or who are taking anticoagulant drugs. It is known to add to the action of blood thinning drugs such as warfarin or aspirin.

Resources

BOOKS

Grieve, M. and C.F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes and Noble Publishing, 1992.

Hoffman, David and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. Barnes and Noble Publishing, 1999.

Taber, Clarence Wilbur. *Taber's Cyclopedic Medical Dic tionary*. F.A.Davis Co., 1997.

OTHER

Hobbs, Christopher. "Herbal Advisor."http://www2.all herb.com/.

Healing People. http//www.healingpeople.com. Support@healingpeople.com.

Joan Schonbeck

Horsetail

Description

Horsetail is a perennial plant that is found in or near watery areas such as marshes, streams, or rivers. Horsetail grows in temperate northern hemisphere areas of Asia, Europe, North America, and North Africa. It flourishes where it can root in water or clay soil.

Horsetail is a derivative of larger plants that grew 270 million years ago during the carboniferous period. It belongs to the Equisetaceae family and is a relative of the fern.

There are over 20 species of horsetail. The species most commonly used medicinally is field horsetail (*Equisetum arvense*). *E. arvense* grows up to 1.5 ft (0.5 m) in corn fields and wet meadows. Wood horsetail (*E. sylvaticum*) grows in copses and on hedgebanks, usually to a height of 1-2 ft (0.3-0.6 m). This species is used as food for horses in parts of Sweden. River horsetail (*E. maximum*) is the largest of the European species of horsetail. Found in bogs, ditches,

KEY TERMS

Decoction—An herbal tea created by boiling herbs in water. Roots, bark, and seeds are used in decoctions; boiling the herbs brings out their medicinal properties.

Diuretic—A substance that promotes urination.

Edema—A condition that occurs when fluid accumulates in the tissues of the body.

Incontinence—The inability to control urination.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Perennial—A plant that lives for many years and comes back yearly without replanting.

Sitz bath—A bath in which only the hips and buttocks are soaked.

and on banks of rivers and ponds, *E. maximum* grows to a height of 3-6 ft (1-2 m).

Horsetail has no leaves or flowers and grows in two stages. The first stage occurs during the early spring. At this time, a fertile hollow stem appears that resembles asparagus. After these stems have withered and died, the second stage begins. During this stage, which occurs during the summer months, thin green barren stems branch out from the plant. It is during this stage that horsetail is gathered for medicinal use.

Horsetail was named for its bristly appearance. The genus name *Equisetum* is derived from the Latin words *equus*, meaning horse, and *seta*, meaning bristle. Other names for horsetail include shave-grass, bottlebrush, and paddock-pipes.

Horsetail contains silicon, **potassium**, aluminum, **manganese**, saponins, phytosterols, phenolic acids, cafeic acids, alkaloids, and tannins. Fifteen types of **bioflavonoids** are also present. These bioflavonoids are believed to be responsible for horsetail's strong diuretic action. The high silicon content of the herb strengthens connective tissue, ligaments, bones, hair, and fingernails.

Origins

The medicinal use of horsetail dates back to ancient Roman and Greek times. The Greeks used horsetail as a wound healer, a diuretic, and an agent to stop bleeding. Nicholas Culpeper, a popular seventeenth-century herbalist, wrote of horsetail's beneficial properties in stopping bleeding, and treating ulcers, **kidney stones**, **wounds**, and skin inflammation. In the nineteenth century, horsetail was also used to treat **gonorrhea**, prostatitis, and **urinary incontinence**.

The North American native peoples used horsetail to treat a number of kidney and bladder ailments. The Cherokee used horsetail to aid the kidneys. Chippewa natives made a decoction out of horsetail stems and used it to treat painful or difficult urination. The Okanagan-Colville and Potowatami peoples made a horsetail infusion as a diuretic to aid kidney function.

Horsetail's reedy exterior and **silica** content have made it a popular metal polisher and natural abrasive cleanser. One species is so rich in silica that it was imported from Holland for the purpose of polishing metal, hence the nickname Dutch rushes. Another nickname is pewterwort, so named because it was used to scour pewter. Dairy maids of England used horsetail to scour their milk pails, while early Americans used it to scrub their metal pots and pans.

Horsetail has been used internally and externally as a folk medicine to treat rheumatism and **gout**, coughs and **asthma**, **acne**, brittle hair and fingernails, and as a blood purifier. Shoots of a larger species of horsetail were sometimes eaten by the poorer classes, although the food lacked taste and wasn't very nutritious.

General use

Herbalists still use horsetail to treat a variety of kidney and bladder problems. Horsetail has properties that help bladder and kidney tissue. Its tonifying effects help to reduce inflammation in conditions such as kidney stones, bladder and **kidney infections**, weak bladder, weak kidney, and urinary incontinence.

The German Commission E has approved horsetail as an effective treatment for kidney and bladder inflammations, **edema**, urinary tract **infections**, and bacterial infections. It is also used as a component in diuretic drugs.

Silica and horsetail

Horsetail is rich in minerals, particularly silica deposited in its stems. Silica helps to promote the body's absorption of **calcium**, an important component in tissue repair and bone and cartilage formation. Horsetail's silica and silicic acid content ranges from 5-8%, making it a good source for strengthening weak connective tissues, and healing bones, **fractures**, and torn ligaments. Horsetail is also used to treat arthritis and **osteoporosis**, as the silicon in horsetail may replace lost silicon in the affected bones.

Horsetail may be a possible remedy for senility. Senility often occurs when there is more aluminum in the blood than silica. One theory suggests that when the silicon and aluminum levels are balanced, the symptoms of senility will disappear.

Wound healer

Horsetail's ability to stop blood flow has made it useful in treating **nosebleeds**, internal bleeding, heavy menstrual bleeding, bleeding **hemorrhoids**, and bleeding wounds. Often a compress made from fresh horsetail juice is placed on the wound to stop the flow of blood. The healing effect may be strongest when horsetail is taken both internally and externally.

Other uses

Horsetail is also used to remedy brittle nails, bleeding wounds, **hair loss**, cystic ulcers, **rheumatoid arthritis**, gout, gonorrhea, digestive disturbances, **bronchitis**, lung disorders, **tuberculosis**, poor teeth and gums, **varicose veins**, and fallen arches. Skin ailments such as **sties**, **rashes**, itchy **eczema**, or eye inflammation may be treated with an external compress made from horsetail tea.

Preparations

Horsetail is gathered in the spring and early summer, after the fertile stems have died and the barren shoots have grown. The plant is cut above the root and the stems are used dried or fresh. Horsetail is available in dried bulk, powder, capsules, tablets, or tincture forms.

It is recommended that commercial preparations of horsetail contain no more than 3% blackish rhizome fragments and no more than 5% stems or branches from other horsetail species. Standard preparations generally contain 10% silicic acid and 7% silica.

Taken as a dietary supplement, horsetail is a good source of calcium and silica. Horsetail can be made into a tea (infusion or decoction) and consumed internally. Horsetail may also be used in full body baths, sitz baths, foot baths, compresses, hair rinses, and poultices.

For the capsule form, two capsules can be taken with water up to two times daily.

To make a tea, 1 cup of boiling water can be poured over 2 tsp of dried horsetail and steeped for 15 minutes. Up to 4 cups of the cold tea can be drunk daily for bladder or kidney ailments. The tea may be used externally as a hair rinse for **dandruff** or an oily scalp.

About 10-60 drops of the tincture can be used daily.

Precautions

Pregnant or nursing women and people with severe kidney or liver disease should consult their health practitioner before using horsetail. People with high blood pressure or heart problems should not take horsetail. Horsetail contains low levels of nicotine and may not be safe for young children. Horsetail shouldn't be taken internally for more than three days, and people should not take more than the normal dosage. Long-term use or high doses of horsetail have caused irreversible kidney damage due to too much silica. It is best to follow dosage guidelines and use properly harvested horsetail since the older shoots are higher in silica.

Commercial preparations that are processed at high temperatures are recommended since the heat destroys a potentially harmful enzyme, thiaminase, found in crude horsetail.

When horsetail is gathered for medicinal use, plants with brown spots aren't collected. Brown spots may indicate the presence of a toxic fungus. Horsetail that grows near an industrial or waste site or in heavily fertilized areas should not be harvested since it can pick up nitrates and **selenium** from the soil. The correct species of horsetail should be collected. Marsh horsetail (*E. palustre*) is poisonous.

Side effects

Mild side effects include **diarrhea**, upset stomach, and increased urination.

Severe side effects that may require medical attention are kidney **pain**, lower back pain, pain while urinating, **nausea**, or **vomiting**. These symptoms may signal kidney damage. Heart palpitations can occur if horsetail is overused. If this happens, immediate medical attention is required.

Interactions

People taking digitalis-type drugs should consult their health practitioner before taking horsetail.

Resources

BOOKS

American Herb Association. *Complete Book of Herbs*. Illinois: Publications International, Ltd., 1997.

Fischer Rizzi, Susanne. *Medicine of the Earth*. Rudra Press, 1996.

Jennifer Wurges

Hot flashes

Definition

Hot flashes, experienced by large numbers of women and some men as a result of surgical, chemical, or age-induced changes in estrogen levels, are characterized by a rapid rise and discharge of heat with perspiration, discomfort, and possible redness. Ranging from mild to severe in intensity, they may be preceded by an aura-like experience and may be followed by a subsequent feeling of chill. With natural, age-related **menopause**, hot flashes may begin as early as two years prior to the cessation of menses and continue as long as five or more years afterward. Statistically, the average experience is approximately four years of varying intensities.

Description

Approximately 20% of women without **breast cancer** and 50 to 75% of women taking tamoxifen subsequent to breast **cancer** reportedly seek a doctor's advice for the management of hot flashes. For women without breast cancer, this seems to be a conservative estimate, given that another source notes that as many as 85% of women experience hot flashes at some time during menopause. Statistics are mixed with regard to overall duration. One study reported that only 20% of women reported still having hot flashes after four years, while another reported 25 to 50% of women continue having them as long as five years. Hot flashes appear to be more common among African American women than white, Japanese, Hispanic, or Chinese women, while Mayan Indian women report no symptoms associated with menopause at all.

Hot flashes may be preceded by a prodromal experience, or set of signs, of rapid heart rate, **anxiety**, and **dizziness** or weakness. There is considerable variation in the experience of hot flashes. As the flash comes on, there is a feeling of sudden heat that may produce as little as a beading of perspiration on the upper lip or a sudden and uncontrollable drenching. The sudden heat may be followed by a cold, clammy sensation and coldness, as evaporation of perspiration occurs. Hot flashes generally last from 30 seconds to five minutes, although in some cases they may last as long as half an hour. Although hot flashes can occur at any time, the most common time of onset is between six and eight in the morning and six and ten at night.

A stressful incident may precede the hot flash, and keeping a journal of these events as a means of identifying triggers may be helpful. Depending on the intensity, severity, and timing, embarrassment may also accompany the hot flash when others witness the sudden, unmistakable experience. Breast cancer, premature onset of menopause, faster onset rate of menopause, tamoxifen therapy in women and antiandrogenic therapies in women and men may contribute to more severe and longer durations of hot flashes. Each person's experience with hot flashes is different, and each person can experience a wide variation of symptoms over time.

Causes and symptoms

The exact cause and mechanism of hot flashes is not well understood. What is recognized is that as estrogen levels are depleted, whether due to surgical, chemical, or natural age-related changes, the hypothalamus in the brain, which regulates several functions, including body temperature, becomes confused. The core body temperature set point is lowered, and the threshold between acceptable and non-acceptable body heat levels is more easily crossed. When that occurs, signals are sent to the rest of the body of a sudden need to discharge heat, accomplished through the sudden release of perspiration from the sweat glands. Studies reveal measurable rises in skin temperature. Other hypothalamic signals cause awakenings from sleep, changes in blood pressure and heart rate, and anxiety states (alertness), as if the body is in fight-or-flight mode.

Common accompanying symptoms include:

- sleep disruptions
- fatigue
- night sweats
- heart palpitations
- irritability
- short-term memory loss
- attention span changes
- depression and weepiness
- uncharacteristic rage or impatience
- dryness of eyes and vagina
- reduced libido and interest in sex
- accelerated bone loss

Diagnosis

In most cases, diagnosis of hot flashes is not difficult. What may be difficult is assessing existing levels of hormones, anticipating the duration of menopause and menopausal symptoms, and finding safe, effective treatment options. Family history, personal medical history, including history of pregnancies and births, a physical examination, diagnostic assessments such as

blood tests for thyroid and adrenal (**stress** coping) function, and hormonal assays (blood or saliva) may be recommended. Bone density testing and, depending on history, more regular mammograms and Pap tests, though not diagnostic of hot flashes, may become advisable.

Treatment

Several alternative treatments are effective.

Phyto- (plant-derived) hormones

The most widely proclaimed remedies in this category include **black cohosh** (*Cimicifuga racemosa*), wild yam (*Dioscorea villosa*), **dong quai** (*Angelica sinensis*), **red clover** (*Trifollium pratense*), and **licorice** (*Glycyrrhiza glabra*). Also in this category are soy and two soy isoflavones: genistein and daidzein. Of all of these, black cohosh, wild yam, and soy have shown the greatest efficacy. They have also incited controversy.

Black cohosh may be the most well-studied of all the phyto-estrogens. In North America, Native American women have traditionally used it. The German Commission E, whose stamp of approval makes prescriptive use of black cohosh reimbursable, recommends, according to one source, use for no longer than six months at doses of 20 to 40 mg daily [of the concentrate]. Although black cohosh is a common alternative treatment for hot flashes, an extensive 2006 study funded by the National Institutes of Health, found no difference in effectiveness between black cohosh supplements and a placebo. However, many women continue to give personal testimony to its effectiveness.

A study examining the reduction of hot flashes from use of soy flour showed a 40% reduction, 15% greater than placebo. However, considerable controversy about an estrogen additive effect in women at risk or with a history of breast or **uterine cancer**, and in men at risk of **prostate cancer**, warrants caution. One study noted that the soy isoflavones stimulated tumor growth and opposed any beneficial effects tamoxifen might have.

Dong quai was reported to be equivalent to placebo with regard to hot flashes, with an advisory caution. Dong quai belongs to a family of herbs that contain warfarin (Coumadin)-like substances and is, therefore, contraindicated for use in persons on warfarin (Coumadin) or other blood thinning therapies.

Wild yam and licorice have both been used and recommended for their progesterone-like qualities. Many of the progesterone creams available without prescription have wild yam as a basic source ingredient. Many of these creams also contain pharmaceutical grade (concentrated and standardized) amounts of progesterone. Without monitoring use by saliva sampling a worsening of hot flashes may be provoked by progesterone's estrogen suppressive capacity. Licorice has been historically included in many combination herbals in **traditional Chinese medicine** as a synergistic (exponentially additive) element; however, caution is advised for persons with high blood pressure.

A red clover study of 252 women divided into three groups, two each using a separate red clover supplement for 12 weeks and one control group, reported a 40% improvement and no significant side effects. An average of eight hot flash episodes was reduced to an average of five in the two trial groups. Women who have had breast cancer should be cautious about the use of red clover because it has some effects that are similar to estrogen.

Traditional Chinese medicine (TCM)

TCM divides menopause into "hot" and "cold" menopause, on the basis of a thorough history taking and examination of the tongue and pulses (six different pulses). Both **acupuncture** and Chinese herbology may be employed to reduce stress, facilitate the movement of chi (or Xi—the body's internal energy flow), and balance body systems. While some critics claim TCM no more effective than placebo in controlling hot flashes or the symptoms of menopause, with few documented benefits, others point to the survival of this tradition in medicine for thousands of years and believe that something more than a **placebo effect** is shown.

Vitamins and vitamin E therapy

Vitamin E therapy is perhaps one of the most historically recommended therapies in North America for hot flashes, in a dosing range from 400 to 1,000 International Units (IU), daily. Since the 1940s, vitamin E has been believed to be useful in reducing hot flashes and another common symptom of estrogen deficiency: vaginal dryness. However, after rigorous scientific study vitamin E was found to be only as effective as placebo, and as of 2008 the Mayo Clinic reported that it was no longer recommended for use in treating hot flashes.

Dietary changes

Weight and fitness have been demonstrated to be factors in the management of hot flashes. Weight is recommended to be height proportionate. Women with less body fat may have as difficult a time as

women with too much body fat. Fitness is especially important, and **exercise** has been demonstrated to improve stamina and attitude, which contribute to tolerance.

Nuts, whole grains, apples, celery, **alfalfa**, and beans have all been recommended as useful dietary adjuncts. One source reports that a general, dietary "housecleaning back to basics," eliminating highly refined and processed foods, including fast foods and junk food, reducing or eliminating sugar and sugar-substitute products such as aspartame, eating more vegetables and fruit, and including in the diet **essential fatty acids** such as flax or fish oils, may go a long way toward stabilizing the nervous system and supporting more normal activity in the hypothalamus.

Natural hormone replacement therapy

Licensed practitioners and others in the healthcare community have recognized for some time that there is a relationship between high estrogen (estradiol or E2) levels and **fibrocystic breast disease**, **uterine fibroids**, **endometriosis**, and fertility dysfunction. Saliva sampling was developed as an alternate means of effectively monitoring not just the levels of circulating hormone but the amount of biologically active circulating hormone. The pioneer lab, DiagnosTechs, of Kent, Washington, developed a female hormone profile that tracks the interplay of estrogen and progesterone across the span of a menstruating woman's cycle. They also developed a postmenopausal panel to assess the more static balances of women after **menstruation** ceases, and a testosterone panel for men. Information from these kinds of tests are valuable aids in assessing an individual's existing hormone values, especially when compared to statistical data of physiologically effective ranges. This information allows for safer, more precise and individual—not one size fits all—use of hormone replacement therapy.

A special class of pharmacist, known as a compounding pharmacist, is able to formulate a hormone replacement of molecularly identical phyto-hormones (usually soy and wild yam), standardized to a calculated milligram strength, for use by prescription. These natural estrogen replacements make broadest use of the weakest, most gentle fraction of estrogen, estriol (E3). The other fractions are estradiol (E2)—the most potent—and estrone (E1). Although natural hormones are available in capsules, the most commonly recommended forms are sublingual (under the tongue) drops, or a topical cream or gel, in order to avoid adding further burden to the liver. The liver is responsible for metabolizing the chemistry of the body, and by the time hormone replacement therapy is usually needed, the liver has been hard at work for many years. Drops and creams also allow individual tailoring. **Natural hormone replacement therapy**, however, must be used with the same caution as pharmaceutical synthetics. But some people believe that because of their molecularly pure identity they may be safer and reduce the health risks that have become associated with synthetic hormone replacement therapy. Without clinical trials, statistical proof and good data remain unavailable. The International Academy of Compounding Pharmacists (IACP) maintains a Web site to help locate compounding pharmacists (http://www.iacprx.org/about_iacp/). The American Association of Naturopathic Physicians also maintains a Web site of licensed members (http://www.naturopathic.org).

Liver support and detoxification

Because the liver is the primary organ for metabolizing hormones, therapies that may include a liver support or **detoxification** may assist in a smooth transition through menopause. This might be especially important in persons whose hot flashes are surgically or chemically induced because the need for both of these kinds of interventions was likely preceded by hormone-related illness. Colon cleansing and increased intake of dietary and soluble fibers may also be recommended. Sources of dietary and soluble fiber include whole grains and grain brans, most vegetables, many fruits and fruit pectin, **psyllium**, and guar gum.

Allopathic treatment

Premarin and Prempro

For many years, the standard remedy for relief of hot flashes was premarin, a product derived from the urine of pregnant mares. During **pregnancy**, levels of the most potent fraction of estrogen, estradiol (E2), are down graded to a less potent fraction, estrone (E1). (Estrone is more potent than estriol, or E3.) Mares were kept pregnant, catheterized for urine collection, and dehydrated for more concentrated urine. That fact alone was enough to dissuade some women from using it. However, no other single remedy had been shown to have the efficacy (96%) of reducing or eliminating hot flashes like estrogen (as premarin) hormone replacement therapy.

Mares have similar but not identical estrogens compared to humans. One of the substances specific to mare estrogen is genetically toxic to humans. Furthermore, in

the normal female's physiology, estrogen is opposed by progesterone, another female reproductive hormone. Supplementing estrogen using premarin, unopposed by progesterone, resulted frequently in a condition known as hyperestrogenism and increased risks and rates of breast and uterine cancer. Ignoring a possible genetic toxicity of premarin, subsequent prescriptions for hormone replacement therapy concentrated on opposing Premarin's estrogen in a combination patented hormone drug called Prempro. In the summer of 2002, results of the Women's Health Initiative study were released; these data statistically demonstrated the increased health risks (breast cancer, **stroke**, and **heart attack**) of these modalities. Along with results of other studies suggesting that estrogen replacement therapy was also not as protective against **osteoporosis** as had once been believed, serious reconsideration of hot flashes management was prompted. As of 2008 the general recommendations for hot flash management are to reduce the hot flashes as much as possible using non-hormone therapies and if necessary to use the lowest dose of hormone replacement found to be effective for the shortest amount of time reasonable.

The progestins

Depomedroxyprogesterone acetate (MPA) has been reviewed and found, at doses of 150 mg every one to two months (as an injection), for women with endometrial cancer to be 85% effective in reducing hot flashes when compared with estrogen. Oral doses of 10 mg/day were 87% effective. Reported side effects included: irregular vaginal bleeding, weight gain and bloating, breast tenderness, and mood swings.

Blood pressure medications (antihypertensives)

Blood pressure medications—alpha-adrenergic agonist antihypertensives—that inhibit the stress trigger pathways involved in hot flashes, reduce hot flashes 20% to 65%. Drugs and dosages used include: clonidine (0.05–0.2 mg/day); lefoxidine (0.1 mg/day); and methyldopa (250 mg three times daily). Side effects of dizziness and **dry mouth** were reported.

Bellergal

The twice daily use of 40 mg of bellergal—a potent hypnotic-sedative combination of ergotamine tartrate, belladona alkaloids, and phenobarbitol—reduces hot flashes by 60% when compared to the placebo rate of 22%. This drug is one of the older synthetic remedies prescribed for hot flashes, due to its effects on the nervous system. It has the very undesirable effect of being addictive, and avoidance of alcohol is strongly advised.

Megestrol acetate

One of the newer drugs for relief of hot flashes, studied under rigorous clinical trial according to one source, in a 20 mg twice daily oral dose, megestrol acetate is considered to show high promise for use in both men and women. It is considered as a treatment for breast cancer in high continuous doses. Initial dosing is reported to start at 40 mg daily and then tapered up or down after a month with a maximum of 80 mg daily. Side effects noted were fluid retention and bloating.

Selective serotonin reuptake inhibitors (SSRIs)

As of 2008, attention was being paid to this class of drugs, especially to fluoxetine (Prozac), paroxetine (Paxil), and venlafaxine (Effexor). Venlafaxine is sometimes also notated as an norepinephrine serotonin reuptake inhibitor (NSRI). Norepinephrine is an adrenal hormone related to feelings of ambition and **depression**. By relieving deficits that may affect mood and hot flashes, these reuptake inhibitors were showing a 50% to 75% efficacy in decreasing hot flashes in 60% of women, making them better than trial placebo (22% to 30%) by about half. Eighty percent of the benefit was achieved in the first week. The noted dose on Paxil is 10 mg daily for the first week, followed by 20 mg daily thereafter. Dosing for Effexor was noted at 75 mg twice daily of a time released formula. The study using 75 mg followed studies using considerably less, 12.5 mg twice daily. Side effects include **sexual dysfunction**, and, according to one source, possible weight gain from increased carbohydrate craving.

Prognosis

Though some hot flashes for some women may be severe, occur over several years, be embarrassing, disruptive, mood altering, **fatigue** inducing, and correlated with other age-related deficiencies, they are not life threatening. The statistics, according to one source, that hot flashes respond to placebo in one-third to a half of all women, may mean that an average 40% reduction in hot flashes may be obtained by visiting a healthcare professional, allopathic or alternative, talking about concerns, and instituting lifestyle changes representing a kind of pampering or self care. In other words, hot flash sufferers may feel statistically justified in adopting new ways of living they might have been contemplating previously but have not yet adopted.

Prevention

Hot flashes may represent an invitation or opportunity to experiment with new modalities. Prevention, in the strictest sense, is not a likely option unless one is a Mayan Indian woman or healthy male. However, many suggestions offer significant improvements in quality of life that may be helpful, including the following:

- Saliva sampling: Consider working with a healthcare professional who can offer advice and hormone testing of the bio-available levels through saliva sampling and who may also be able to quantitatively advise and monitor natural hormone replacement therapy. A postmenopausal saliva panel may be covered by insurance. Sampling intervals may vary according to need.
- Obtaining and maintaining optimum body weight: Adipose (fat) tissue stores estrogen which may complicate safe hormone replacement therapy, while making heat distribution more difficult. A deficiency of adipose tissue may add to stress and a lower immunity.
- Exercising regularly: Exercise not only tones the muscles and improves distribution of all hormones, it also reduces stress, builds endorphins (hormones related to feeling well), and quiets the nervous system.
- Avoiding dietary triggers: Sugar, spicy foods, caffeine, and alcohol may all adversely affect the ability of the hypothalamus to more normally regulate temperature.
- Avoiding life style triggers: Diet pills, sauna, hot tubs, hot showers, and smoking are all advised to be avoided.
- Wearing layered cotton clothing and using cotton bed linens: Breathable natural fibers or sport fibers that wick away perspiration may help transfer heat; layering more easily allows quicker responses to flashing and chilling.
- Meditating and breathing deeply: Also included in this category are yoga, hypnosis, massage, biofeedback techniques, visualization, and relaxation exercises. These techniques reduce stress and oppose or quiet the nerve pathways involved in increased triggering of hot flashes.
- Air conditioning: One source suggested liberal use of the air conditioner and even the freezer (at home and supermarket) when a hot flash happens; turning down the thermostat of the furnace in winter, as possible, was also suggested.

KEY TERMS

Bellergal—A potent combination of ergotamine tartrate (a blood vessel constricting substance often used for migraines), belladona alkaloids (a potentially poisonous substance with sedative and antispasmodic effects), and phenobarbitol (an hypnotic, long-acting sedative and anti-convulsant). Bellergal is one of the early synthetic patented formulations prescribed for relief of hot flashes due to its actions on the central nervous system, but as of 2008, avoided due to its addictive capacity.

Estrogen—One of the primary reproductive hormones in women and present in men. Three fractions of estrogen have been identified: E1 or estrone is moderately active; E2 or estradiol is the most potent; and, E3 or estriol is the least potent and most often recommended for use in natural hormone replacement therapy, often in an 80% to 10% to 10% combination of E3 to E1 and E2.

Hormone replacement therapy (HRT)—A term used for the supplementation of hormones in the treatment of hormone deficiency related symptoms and illnesses. HRT often uses synthetic, patented hormonal drugs. Natural soy or wild yam based hormone replacement therapy is also available using hormones molecularly identical to human hormones and, therefore, unpatentable.

Progesterone—A primary reproductive hormone in women that has an estrogen suppressing and pregnancy term supporting role. Natural progesterone levels often decline long before declining estrogen levels may produce hot flashes. Prior to estrogen replacement therapy, progesterone therapy may be recommended to balance estrogen and reduce the risk of estrogen related health risks like fibroids of breast and uterus, and breast or endometrial cancer.

Standardized—A process by which active ingredients in compounds are quantified to insure a desired level of potency.

Synergy—A condition in which the action of a sum of parts is greater than the individual actions of those parts added together, something like "one plus one is greater than two."

Resources

BOOKS

Manson, Joann E., and Shari Bassuk. *Hot Flashes, Hormones, & Your Health*. New York: McGraw Hill, 2007.

Parker Pope, Tara. *The Hormone Decision: Untangle the Controversy, Understand Your Options, Make Your Own Choices*. Emmaus, PA: Holtzbrinck, 2007.
Seaman, Barbara, and Laura Eldrigge. *No Nonsense Guide to Menopause*. New York: Simon & Schuster, 2008.

PERIODICALS

Carpenter, Janet S., et al. "Cognitive Behavioral Interven tion for Hot Flashes." *Oncology Nursing Forum* 34, no. 1 (January 2007): 1S 9S.
Nir, Yael, et al. "Acupuncture for Postmenopausal Hot Flashes." *Maturitas* 56, no. 4 (April 20, 2007): 383 396.
Smith DiJulio, Kathleen, et al. "Hot Flash Severity in Hor mone Therapy Users/Nonusers Across the Menopausal Transition." *Maturitas* 58, no. 2 (October 20, 2007): 191 201.

Katherine E. Nelson, N.D.

Hou xiang *see* **Agastache**
Houndsbane *see* **Horehound**

Hoxsey formula

Definition

The Hoxsey formula is an herbal mixture named for the man who developed it and marketed it as a **cancer** cure during the 20th century. Harry Hoxsey developed a tonic that was taken internally and a powder that was applied to the skin. His treatment also included a special diet. Although supporters maintained that the Hoxsey treatment was effective, Hoxsey was sued by the American Medical Association for practicing medicine without a license. In addition, the United States Food and Drug Administration (FDA) in 1960 forced Hoxsey to stop selling the medicine and close his clinics in the United States. The treatment has been illegal in the United States since then but as of 2008 was offered at clinics in Tijuana, Mexico.

Origins

While Harry Hoxsey (1901–1974) is most associated with the herbal combination that bears his name. Hoxsey said that the formula was based on a remedy created by other family members. In 1840, his great-grandfather John Hoxsey observed the effect of wild plants on a horse that had a cancerous tumor on its leg. According to Harry, the horse ate wild plants, and the tumor disappeared in three months. The great-grandfather collected the herbs and mixed them with remedies that were used at the time to treat cancer. Those remedies included arsenic. Harry's father John was a veterinarian who began using the herbal formula to treat people for cancer.

Son Harry was a former coal miner with an eighth-grade education. During the 1920s, he began promoting the cancer remedy, a brown liquid tonic consisting of nine herbs and **potassium** iodide. Although he had no medical training, Hoxsey staged healing sessions and advertised the remedy in newspapers. He opened his first clinic in Taylorsville, Illinois, during the 1920s. In 1936, Hoxsey opened a clinic in Dallas, Texas. He also obtained a naturopath license. Dallas became the headquarters for the clinic that eventually operated branches in 17 states.

Cancer claims

Hoxsey claimed that the herbal combination worked well on **skin cancer** but was also effective on cancers affecting internal tumors in areas such as the lungs and bladder. The Hoxsey tonic supposedly eliminated toxins from the body, strengthened the immune system, and eliminated internal cancer. The powder applied to the skin was supposedly able to distinguish between malignant and nonmalignant skin. The treatment would come to include a diet that restricted foods that were said to interfere with the healing effects of the Hoxsey formula.

The Hoxsey formula was challenged for decades by organizations, including the American Medical Association (AMA). Criticism from the local AMA forced Hoxsey to close his first clinic in Illinois. The association was among the groups that accused Hoxsey of practicing medicine without a license. He closed the clinic and moved to another state. That set a pattern. Hoxsey was convicted and fined numerous times for practicing medicine without a license, according to the American Cancer Society.

Court cases

For decades, litigation pitted Hoxsey against what his supporters regarded as the establishment medical community. Some cases were dropped due to the testimony of people who said they were cured. Critics of the Hoxsey treatment pointed to cases in which reportedly cured people never had cancer. In a 1931 case, a man testified that he had received the treatment and learned later that he actually had barber's itch, according to *Time* magazine.

In 1949, Hoxsey responded to a negative article and sued the AMA, the editor of the *Journal of the American Medical Association*, and Hearst publications. Hoxsey

sued for libel and slander. Although Hoxsey won the suit claiming that his character was harmed, the judge only awarded $1 to him.

The FDA also challenged Hoxsey, who long refused to reveal the ingredients of his formula. In 1950, court decisions about labeling requirements gave the FDA power to block the interstate shipping of Hoxsey's products. During a court hearing, Hoxsey revealed the ingredients, which led to cases in which researchers said the treatment was not effective. Hoxsey supplied case histories, but these did not satisfy the courts or the medical community. They maintained that full clinical research was needed.

By 1960, Hoxsey faced FDA lawsuits in the states where he had clinics. He closed the U.S. clinics and gave the formula to Mildred Nelson, his nurse. Nelson said that the Hoxsey treatment cured her mother's cancer in 1946. In 1963, the nurse opened a Hoxsey cancer clinic, the Bio-Medical Center, in Tijuana, Mexico.

Hoxsey was diagnosed with **prostate cancer** in 1967. According to the American Cancer Society, Hoxsey did not respond to his treatment and underwent traditional surgery. He died seven years later.

Aftermath

During the 1990s, the Bio-Medical Center treated about 1,200 people each year for cancer and other conditions, according to the University of Texas M. D. Anderson Cancer Center.

The Hoxsey formula was again the subject of litigation in 2005 when authorities learned that Virginia teenager Starchild Abraham Cherrix refused chemotherapy for **Hodgkin's disease**. Instead, Cherrix's family took him to Mexico where he received the Hoxsey treatment. His father told the *Washington Post* that after several months of treatment that the teenager's tumor growth had slowed.

The court case charged the teenager's parents with neglect. For some people, the litigation became an issue about whether the parents and teenager had the right to decide on a treatment. During litigation that went from juvenile court to county circuit court, the teenager stopped the Hoxsey treatment. The circuit court in 2006 ruled that the teenager did not have to undergo chemotherapy. In 2007, a Mississippi radiation oncologist reported that a final small tumor in the boy's lung appeared to be gone, according to the Associated Press.

Benefits

Although supporters maintained that the Hoxsey formula was an effective treatment for cancer, organizations, including the American Cancer Society and the University of Texas M. D. Anderson Cancer Center cautioned that additional scientific research was needed to determine whether the treatment was safe and effective for treating cancer in people.

Description

The Hoxsey treatment consists of a tonic for internal cancer and a topical mixture for skin cancer. During treatment, people follow a special diet.

The herbal ingredients of the Hoxsey brown tonic are: **licorice**, **red clover**, **burdock root**, stillingia root, **barberry**, cascara, prickly ash bark, **buckthorn** bark, and pokeroot.

The skin cancer treatments include a paste made of antimony trisulfide, **zinc** chloride, and **bloodroot**. The powder applied to the skin contains **sulfur** and talc.

People undergoing the Hoxsey treatment eliminate certain items from their diet because they supposedly block the effectiveness of the formula. They are supposed to avoid pork, vinegar, tomatoes, flour, carbonated beverages, and alcohol.

Preparation

The type of preparation and treatment depend on the type of cancer. That would also determine the length of the treatment.

Precautions

No clinical trials have been performed to determine whether the Hoxsey formula is a safe and effective method for treating cancer. Some ingredients in the formula could produce side effects that include burning and **nausea**. The Hoxsey treatment is illegal in the United States, and organizations, including the American Cancer Society, warn people not to undergo it. Medical organizations in the United States caution that the treatment should not take the place of conventional treatment.

Furthermore, women who are pregnant and nursing mothers should not use any form of the Hoxsey treatment. Moreover, red clover has an estrogenic activity, meaning that it produces estrogen. Women with estrogen-positive **breast cancer** should not take red clover.

Side Effects

The ingredients in the Hoxsey formula may cause side effects ranging from the internal reaction of **diarrhea** to the external reaction of scarred skin.

Sloan-Kettering Memorial Hospital labeled buckthorn a "violent laxative" that could cause nausea, **vomiting**, diarrhea, abdominal **pain**, dehydration, **anxiety**, decreased respiration, and trembling.

Cascara is also a laxative that Sloan-Kettering cautioned may cause diarrhea, abdominal pain, cramping, vomiting, discoloration of urine, fluid and electrolyte imbalance, osteomalacia (softening of bones), steatorrhea (fat in feces), and vitamin and mineral deficiencies.

Licorice may interact with a person's hormones and cause imbalances in the retention of water, **sodium**, and potassium, according to Sloan-Kettering. This reaction leads to high blood pressure, **fatigue**, muscle pain, cardiac arrhythmia, low levels of potassium in the blood, and decreased libido, according to numerous reports in the scientific literature. Also, when taken regularly it can cause pregnant women to give birth too early.

Pokeweed is a poisonous plant that could cause nausea, vomiting, diarrhea, and stomach cramps, according to the American Cancer Society. Sloan-Kettering warned that consuming pokeweed has been associated with illnesses that required hospitalization. It also caused the deaths of children.

Red clover could increase the risk of bleeding for people who take blood-thinning medications.

Organizations, including the American Cancer Society, caution that the Hoxsey paste and powder are escharotics, substances that could burn, scar, or disfigure the skin.

High levels of **iodine** from potassium iodide may cause pimples, excessive secretion from the eyes of nose, **impotence**, and inflammation of the salivary glands, according to Sloan-Kettering.

Furthermore, ingredients in the Hoxsey formula may interact with medications. For example, potassium iodide could decrease the effectiveness of anticoagulant medications.

Research and general acceptance

As of February 2008, the American Cancer Society and Sloan-Kettering had pointed out that diet is an important component of preventing cancer. Currently, it is unknown if diet will reverse the course of cancer, according to Sloan-Kettering. Both organizations warned against the treatment.

The Hoxsey treatment has been the subject of study at the M. D. Anderson Cancer Center. That study includes the review of research and reports. The center pointed out that the congressional Officer of Technology Assessment (OTA) noted that animal research indicated that many herbs in the Hoxsey tonic had anti-tumor effects. However, the OTA and other organizations maintained that there was not sufficient acceptable scientific evidence that the Hoxsey treatment was effective as a cancer treatment for people. The OTA also cautioned about the side effects of some formula ingredients.

KEY TERMS

Escharotic—A corrosive or caustic substance.

Training and Certification

The Hoxsey treatment was illegal in the United States as of February 2008. As a result, there was no training and certification program in the United States for people who provide the treatment.

Resources

BOOKS

Mayo Clinic Book of Alternative Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines. London: Thomson/Healthcare, 2005.

PERIODICALS

Markon, Jerry. "UPDATE: Teen Who Fought Cancer Regimen Feeling 'Amazing.'" *Washington Post* (October 15, 2006): C2.

OTHER

Ausbel, Kenny. *Hoxsey: How Healing Became a Crime*. DVD. Wellspring Media, 2005.

"Constituents of the Hoxsey Formula." University of Texas M. D. Anderson Cancer Center. http://www.mdanderson.org/pdf/hoxseyconstit.pdf. (February 27, 2008).

"Hoxsey Herbal Treatment." American Cancer Society. http://documents.cancer.org/6516.00. (February 26, 2008).

"Hoxsey Herbal Therapy." Memorial Sloan Kettering Cancer Center. http://www.mskcc.org/mskcc/html/69258.cfm. (February 27, 2008).

"Hoxsey Summary Table for Results of Human Studies." University of Texas M. D. Anderson Cancer Center. http://www.mdanderson.org/pdf/hoxseystudiestable.pdf. (February 27, 2008).

ORGANIZATIONS

American Cancer Society, (800) 227 2345, www.cancer.org.
Herb Research Foundation, 4140 Fifteenth St., Boulder, CO, 80304, (303) 449 2265, http://www.herbs.org.
Memorial Sloan Kettering Cancer Center, 1275 York Ave., New York, NY, 10065, (212) 639 2000, http://www.mskcc.org.

Liz Swain

Huang qi *see* **Astragalus**
Huckleberry *see* **Bilberry**

KEY TERMS

Aura—An energy field surrounding the human body, discernible by its various colors.

Gesundheit—A German expression wishing good health, usually used when a person sneezes.

Immunosuppressive—Anything that acts to suppress or weaken the body's immune system, thus making it more susceptible to disease.

Humor therapy

Definition

Humor therapy is the art of using humor and laughter to help heal people with physical or mental illness.

Origins

The benefits of humor therapy were acknowledged as far back as the book of Proverbs in the Old Testament, which contains verses like Prov. 17:22: "A cheerful heart is a good medicine, but a downcast spirit dries up the bones." The earliest historical reference to humor therapy is from the fourteenth century, when French surgeon Henri de Mondeville wrote, "Let the surgeon take care to regulate the whole regimen of the patient's life for joy and happiness, allowing his relatives and special friends to cheer him, and by having someone tell him jokes." In the sixteenth century, Martin Luther used a form of humor therapy as part of his pastoral counseling of depressed people. He advised them not to isolate themselves but to surround themselves with friends who could joke and make them laugh. Many of Luther's own letters to other people include playful or humorous remarks.

Modern humor therapy dates from the 1930s, when clowns were brought into hospitals to cheer up children hospitalized with polio. In his 1979 book, *Anatomy of an Illness*, author Norman Cousins brought the subject of humor therapy to the attention of the medical community. Cousins, himself a physician, details how he used laughter to help ease his **pain** while undergoing treatment for rheumatoid arthritis of the spine (ankylosing spondylitis.) The benefits of laughter in treating the sick captured the public's attention in the 1998 movie *Patch Adams*, starring Robin Williams as real-life doctor Hunter "Patch" Adams. The movie is based on Adams' experiences treating the poor in rural West Virginia as related in his 1983 book *Gesundheit!*

Benefits

It may seem difficult to measure the benefits of laughter in medicine but a number of clinical studies have helped verify the adage that laughter is the best medicine. In general, laughter improves the physical, mental, emotional, and spiritual health of individuals. Laughter appears to release tension in the diaphragm and relieve pressure on the liver and other internal organs. It stimulates the immune system, reduces stress, and helps balance the body's natural energy fields, or auras. People who have developed a strong sense of humor generally have a better sense of well-being and control in their lives.

A strong advocate of humor therapy is Dr. Michael R. Wasserman, president and chief medical officer of GeriMed Of America, Inc., a primary care physician management company for seniors. "A few years ago I came down with **pneumonia**, pulled out videotapes of *I Love Lucy* reruns and laughed myself back to good health," he said. "Clearly, humor and laughter have a positive effect on one's attitude and health overall. While we don't know all of the specifics, our immune system appears to benefit from these emotions."

Description

Humor therapy is used in both mainstream and alternative medicine. It can take many forms but generally it is simply the recognition by physicians, nurses, and other health care practitioners of the value of mixing humor and laughter with medication and treatment. It is especially important with children and the elderly. Patients can also help themselves to heal by adding more humor and laughter to their lives.

Hospitals, hospices, nursing homes, and other medical care facilities can also turn to professionals for help in bringing humor to their patients. One example is the Big Apple Circus Clown Care Unit, which has programs in hospitals throughout the New York metropolitan area and major children's hospitals throughout the United States, including Children's Hospital in Boston. Professional clowns perform three days a week at the bedsides of hospitalized children to help ease the **stress** of serious illnesses. The clowns use juggling, mime, magic tricks, music, and gags to promote the healing power of humor. Instead of stethoscopes, thermometers, and hypodermics, the "doctors of delight" make their "clown rounds" with Groucho Marx disguises, funny hats, and rubber chickens.

Preparations

No advance preparation is required, except possibly a good repertoire of jokes and gags for the therapist.

Precautions

Not everyone will appreciate humor therapy. Some people may consider humor for the sick or injured as inappropriate or harmful. Therefore, it is important to know or sense when humor will be therapeutic and when it will be inappropriate. It should be used cautiously at first in situations in which the sensitivity of the person it is directed at is uncertain or unknown.

Side effects

The only adverse side effects of humor therapy is that it can cause mental hurt, sadness, and alienation in persons who are not receptive to it, or if it is used insensitively.

Research and general acceptance

Humor therapy is widely accepted in the alternative health community and is finding growing acceptance with mainstream health practitioners, especially registered nurses. Numerous scientific studies done in a clinical setting support the benefits of humor therapy. Two 1989 studies done at the Loma Linda (CA) University School of Medicine showed that laughter stimulates the immune system, counteracting the immunosuppressive effects of stress. These findings have been supported by other studies at the UCLA Medical School Department of Behavioral Medicine, Ohio State University School of Medicine, and the VA Medical Center in San Diego.

While several studies have demonstrated that humor therapy raises the level of salivary immunoglobin A, they have also been challenged. Other research focuses on the effects of humor therapy on natural killer (NK) cell assays, which are considered to give clearer and more replicable results. The general conclusion is that laughter has the potential to reduce stress and stress hormone levels, consequently reducing their effects on the immune system. Humor therapy may well be a useful complementary therapy for oncology patients.

Training and certification

Although no official training or certification is required, there are a few institutions that teach humor therapy. Further information is available from the American Association for Therapeutic Humor listed below.

Resources

BOOKS

Adams, Patch and Maureen Mylander. *Gesundheit!: Bring ing Good Health to You, the Medical System, and Soci ety Through Physician Service, Complementary Therapies, Humor, and Joy*. Rochester, VT: Inner Tra ditions International Ltd., 1998 (Revised).

Klein, Allen. *The Courage to Laugh: Humor, Hope, and Healing in the Face of Death and Dying*. Boston: J.P. Tarcher, 1998.

Wooten, Patty. *Compassionate Laughter: Jest for Your Health!* Salt Lake City: Commune A Key, 1996.

ORGANIZATIONS

American Association for Therapeutic Humor. 222 S. Mer amec, Suite 303. St. Louis, MO 63105. (314) 863 6232. http://www.aath.org.

International Center for Health & Humor. 2930 Hidden Valley Road, Edmond, OK 73013. (405) 341 8115. http://www.humorandhealth.com.

OTHER

Humor and Health Journal. Bimonthly newsletter. P.O. Box 16814. Jackson, MS 39236. (601) 957 0075.

Jest for the Health of It Services. Consultant. Patty Wooten. P.O. Box 8484. Santa Cruz, CA 95061. (831) 460 1600. http://www.jesthealth.com.

Ken R. Wells

Huna

Definition

Huna is an esoteric Polynesian psychology that claims to use the powers of the mind to accomplish healing and spiritual development. Max Freedom

Long, who rediscovered Huna in the 1920s, defined it as a system of religious psychiatry because it contains elements of religion, psychology, and psychic science.

Origins

Huna practitioners believe their teachings are ancient and sacred, although at least one writer has claimed they actually have modern origins. In the Hawaiian language, the word *huna* means "secret" or "that which is hidden," referring to a tradition of concealing these teachings. The word is also said to be taken from *kahuna*, a priest or teacher who was the "keeper of the secret." Huna has traditionally been passed on through oral communication and in chants rather than in writing.

Christian missionaries to the Hawaiian Islands outlawed Huna in the 19th century. Max Freedom Long, who founded the Huna Fellowship in 1945, spent years decoding the language of Huna knowledge. He published eight books on Huna between the 1920s and his death in 1971. Serge Kahili King, a non-Polynesian kahuna, founded One Order of Huna International in 1973.

Benefits

Huna claims to offer the following benefits to its adherents:

- Becoming a complete person psychologically.
- Solving personal problems, including financial or social issues.
- Having a higher level of physical, emotional, and spiritual energy.
- Handling the demands and stresses of daily life more effectively.
- Acquiring the ability to heal oneself and others.
- Learning how to accumulate mana (vital force) in order to attain personal goals.
- Growing spiritually.
- Changing one's future.

Description

The specific teachings and customs associated with Huna vary somewhat from island to island. All agree, however, on the concept of three spirits or minds in the human being. According to Huna, the complete being consists of a physical body inhabited by two of the three minds: the "low self" which is below the level of consciousness, and the "middle self" which is the conscious mind. The middle self is what others perceive as one's personality. The third spirit or mind, the High Self, is outside the body. Each person has a transparent shadow body that completely duplicates the physical body. This shadow body is called the aka. The aka is like a pattern or blueprint that connects the three selves. It has a sticky and stretchy quality that allows it to form connections between an individual and another person or object. When someone touches, looks at, or even thinks of something, a thread or cord from the aka attaches to it, forming an energy channel between the person and another person or object. Illness develops when a conflict exists between the conscious mind and the patterns of the aka.

The third mind or self, the High Self, is not God but a person's divine connection with God. Ideally all three selves or minds in a person are in continual contact with one another. The low self is the communication link between the middle self and the High Self. It obtains information directly from the senses and is the seat of the emotions. It has a limited ability to reason and reacts to events only on the basis of previous programming, even if this programming has been incorrect or negative. Fear, anger, or negative programming can lead to blockages in the low self, and this can interrupt communication with the High Self. The function of the kahuna is to remove these interferences. Kahunas use a wide range of techniques including telepathy, rituals, massage, body stroking, herbs, dream work to clear the mind of limiting beliefs and fears, meditative movements known as *kalana hula,* and a variety of other self-development techniques to establish harmony among people, objects, locations, and circumstances. One such self-development technique is *Ho'oponopono*, which refers to counseling and mediation to balance relationships.

The three minds or selves use a form of subtle energy called mana, which is stored in the aka. The low self takes energy from food and turns it into mana, or basic life energy. The kahunas, who serve as conduits for the healing qualities of mana, use breathing techniques to increase a person's mana. The basic breathing technique involves drawing a deep breath, holding it, and willing the mana into a body part that needs healing, into the hands, or into an object like a crystal or talisman. A person can also increase his or her mana by living correctly. Huna emphasizes the importance of living and speaking positively, and of doing no harm to others.

Practitioners of Huna also emphasize that their way of life is accessible to and may be practiced by everyone. In other words, it does not depend on having unusual psychic gifts or on joining a small group of

KEY TERMS

Aka—In Huna, the shadow body of the low self. The aka forms threads or cords between the low self and other persons, objects, or the High Self. These aka threads serve as energy channels.

High Self—The Huna term for the level of the personality that functions as a guardian spirit and forms the person's connection with God.

Kahuna—A native Hawaiian priest or healer.

Low self—The Huna term for the subconscious mind. The word "low" does not mean inferior in value, but refers only to what is below the level of consciousness.

Mana—The Hawaiian word for life energy. According to Huna, mana can be transferred from the conscious mind into parts of the body needing healing or into talismans or crystals to charge them with energy.

Middle self—The Huna term for the conscious mind, including the ability to reason. The middle self is what others recognize as an individual's personality.

"chosen" initiates. All humans have the basic capacity to practice and benefit from Huna.

Precautions

As of 2008, Huna is considered an unproved therapy for major physical disorders and should not be used to the exclusion of proven medical treatments. Huna is said to promote general wellness, and should therefore be used only in conjunction with other healing methods in cases of potentially serious illness.

Side effects

Huna healing has no known physical side effects. The system's emphasis on speaking only positive things, being of service to others, and not hurting others might well have beneficial side effects in a person's life. In addition, the Huna Fellowship maintains that Huna does not require anyone to give up other religious affiliations or belief systems. This understanding minimizes the possibility of emotional **stress** caused by conflicting loyalties.

Research and general acceptance

The healing methods of Huna are unproved by medical research, although medical practitioners acknowledge that benefits may be achieved through a **placebo effect**.

Training and certification

Training consists of brief courses (usually less than one week) offered in Hawaii and elsewhere. Individuals can also self-teach the method through the use of books, videos, and other teaching materials that are available from Huna Research. Huna healers and teachers can be found in many countries of the world.

Resources

BOOKS

Morrell, Rima. *The Sacred Power of Huna: Spirituality and Shamanism in Hawaii*. Rochester, VT: Inner Traditions, 2005.

ORGANIZATIONS

Aloha International/Hawaiian Huna Village. P.O. Box 426, Volcano, HI 96785. 808 985 8880. http://www.huna.org/ (accessed February 11, 2008).

Huna Research, Inc. 1760 Anna Street. Cape Girardeau, MO 63701 4504. (573) 334 3478. http://www.angelfire.com/mo/huna/ (accessed February 11, 2008).

David Helwig
Leslie Mertz, Ph.D.

Hydrotherapy

Definition

Hydrotherapy, or water therapy, is the use of water (hot, cold, steam, or ice) to relieve discomfort and promote physical well-being.

Origins

The therapeutic use of water has a long history. Ruins of an ancient bath were unearthed in Pakistan and date as far back as 4500 B.C. Bathhouses were an essential part of ancient Roman culture. The use of steam, baths, and aromatic massage to promote well being is documented since the first century. Roman physicians Galen and Celsus wrote of treating patients with warm and cold baths in order to prevent disease.

By the seventeenth and eighteenth centuries, bathhouses were extremely popular with the public throughout Europe. Public bathhouses made their first American appearance in the mid 1700s.

In the early nineteenth century, Sebastien Kneipp, a Bavarian priest and proponent of water healing,

VINZENZ PRIESSNITZ (1799–1851)

(Betmann/CORBIS. Reproduced by permission.)

Hydrotherapy inventor Vinzenz Priessnitz was the son of a Silesian farmer from a remote Austrian territory in the Jeseniky Mountains. From the age of 12, Priessnitz dutifully provided for his blind father, his elderly mother, and his sister. His formal education was sporadic at best. However, Priessnitz possessed a level head and a high degree of intelligence along with a keen and active mind. As he matured he became extremely aware of his sur roundings in nature.

At age 16, Priessnitz fell from a horse and was seriously hoofed by the animal. He received the morbid prognosis that he might be crippled at best, or might die at worst. He set to treating his own chest wound with cold packs, in emulation of a doe that he had once observed bathing a wound in a cool mountain stream. The hydrotherapy regi men proved highly effective and drew considerable atten tion to his small hometown of Gräfenberg. In 1822 he rebuilt the family home, renovating its wooden frame into a solid brick spa structure. The spa, known as the castle, housed as many as 1,500 guests each year by 1939. Among the guests were medical professionals who were intent upon exposing the therapy as a sham.

Detractors notwithstanding, word of the simple and effective treatment spread to Vienna, where Priessnitz trav eled on occasion to provide counsel at the emperor's court. Priessnitz, for his remarkable discovery, received the Austrian Gold Civil Merit Medal First Class, the highest civilian honor of the Austrian government.

Priessnitz died on November 28, 1851. He was sur vived by a wife, Zofie Priessnitz, and a young son, Vinzenz Pavel. Joseph Schindler took over the operation of the spa at Gräfenberg following the death its founder.

began treating his parishioners with cold water applications after he himself was cured of **tuberculosis** through the same methods. Kneipp wrote extensively on the subject, and opened a series of hydrotherapy clinics known as the Kneipp clinics, which are still in operation today. Around the same time in Austria, Vincenz Priessnitz was treating patients with baths, packs, and showers of cold spring water. Priessnitz also opened a spa that treated more than 1,500 patients in its first year of operation, and became a model for physicians and other specialists to learn the techniques of hydrotherapy.

Benefits

Hydrotherapy can soothe sore or inflamed muscles and joints, rehabilitate injured limbs, lower fevers, soothe headaches, promote **relaxation**, treat **burns** and **frostbite**, ease labor pains, and clear up skin problems. The temperature of water used affects the therapeutic properties of the treatment. Hot water is chosen for its relaxing properties. It is also thought to stimulate the immune system. Tepid water can also be used for **stress** reduction, and may be particularly relaxing in hot weather. Cold water is selected to reduce inflammation. Alternating hot and cold water can stimulate the circulatory system and improve the immune system. Adding herbs and **essential oils** to water can enhance its therapeutic value. Steam is frequently used as a carrier for essential oils that are inhaled to treat respiratory problems.

Since the late 1990s, hydrotherapy has been used in critical care units to treat a variety of serious conditions, including such disorders of the nervous system as Guillain-Barré syndrome.

Description

Water can be used therapeutically in a number of ways. Common forms of hydrotherapy include:

- Whirlpools, Jacuzzis, and hot tubs. These soaking tubs use jet streams to massage the body. They are frequently used by physical therapists to help injured

KEY TERMS

Contact dermatitis—Skin irritation as a result of contact with a foreign substance.

Episiotomy—An incision made in the perineum during labor to assist in delivery and to avoid abnormal tearing of the perineum.

Essential oil—A volatile oil extracted from the leaves, fruit, flowers, roots, or other components of a plant and used in aromatherapy, perfumes, foods, and beverages.

Hubbard tank—A large water tank or tub used for underwater exercises.

Jacuzzi—A trademark name for a whirlpool bath.

Sitz bath—A bathtub shaped like a chair, which allows a person to bathe in a sitting position so that only the hips and buttocks are immersed. The name comes from the German word for "sit."

patients regain muscle strength and to soothe joint and muscle pain. Some midwives and obstetricians also approve of the use of hot tubs to soothe the pain of labor.

- Pools and Hubbard tanks. Physical therapists and rehabilitation specialists may prescribe underwater pool exercises as a low-impact method of rebuilding muscle strength in injured patients. The buoyancy experienced during pool immersion also helps ease pain in such conditions as arthritis. The Arthritis Foundation has put together a set of Aquatic Program exercises that have been shown to improve isometric strength and range of motion in osteoarthritis patients.
- Baths. Tepid baths are prescribed to reduce a fever. Baths are also one of the oldest forms of relaxation therapy. Aromatherapists often recommend adding essential oils of lavender (*Lavandula angustifolia*) to a warm to hot bath to promote relaxation and stress reduction. Adding Epsom salts (magnesium sulfate) or Dead Sea salts to a bath can also promote relaxation and soothe rheumatism and arthritis.
- Showers. Showers are often prescribed to stimulate the circulation. Water jets from a shower head are also used to massage sore muscles. In addition, showering hydrotherapy has been shown to be preferable to immersion hydrotherapy for treating burn patients.
- Moist compresses. Cold, moist compresses can reduce swelling and inflammation of an injury. They can also be used to cool a fever and treat a headache. Hot or warm compresses are useful for soothing muscle aches and treating abscesses.
- Steam treatments and saunas. Steam rooms and saunas are recommended to open the skin pores and cleanse the body of toxins. Steam inhalation is prescribed to treat respiratory infections. Adding botanicals to the steam bath can increase its therapeutic value.
- Internal hydrotherapy. Colonic irrigation is an enema that is designed to cleanse the entire bowel. Proponents of the therapy say it can cure a number of digestive problems. Douching, another form of internal hydrotherapy, directs a stream of water into the vagina for cleansing purposes. The water may or may not contain medications or other substances. Douches can be self-administered with kits available at most drug stores.

Preparations

Because of the expense of the equipment and the expertise required to administer effective treatment, hydrotherapy with pools, whirlpools, Hubbard tanks, and saunas is best taken in a professional healthcare facility, and/or under the supervision of a healthcare professional. However, baths, steam inhalation treatments, and compresses can be easily administered at home.

Bath preparations

Warm to hot bath water should be used for relaxation purposes, and a tepid bath is recommended for reducing fevers. Herbs can greatly enhance the therapeutic value of the bath for a variety of illnesses and minor discomforts.

Herbs for the bath can be added to the bath in two ways—as essential oils or whole herbs and flowers. Whole herbs and flowers can be placed in a muslin or cheesecloth bag that is tied at the top to make an herbal bath bag. The herbal bath bag is then soaked in the warm tub, and can remain there throughout the bath. When using essential oils, add five to 10 drops of oil to a full tub. Oils can be combined to enhance their therapeutic value. Marjoram (*Origanum marjorana*) is good for relieving sore muscles; **juniper** (*Juniperus communis*) is recommended as a detoxifying agent for the treatment of arthritis; **lavender**, ylang ylang (*Conanga odorata*), and **chamomile** (*Chamaemelum nobilis*) are recommended for stress relief; cypress (*Cupressus sempervirens*), **yarrow** (*Achillea millefolium*), geranium (*Pelargonium graveolens*), clary **sage** (*Savlia sclaria*), and myrtle (*Myrtus communis*) can promote

healing of **hemorrhoids**; and spike lavender and juniper (*Juniperus communis*) are recommended for rheumatism.

To prepare salts for the bath, add one or two handfuls of Epsom salts or Dead Sea salts to boiling water until they are dissolved, and then add them to the tub.

A sitz bath, or hip bath, can also be taken at home to treat hemorrhoids and promote healing of an episiotomy. There is special apparatus available for taking a seated sitz bath, but it can also be taken in a regular tub partially filled with warm water.

Steam inhalation

Steam inhalation treatments can be easily administered with a bowl of steaming water and a large towel. For colds and other conditions with nasal congestion, aromatherapists recommend adding five drops of an essential oil that has decongestant properties, such as **peppermint** (*Mentha piperita*) and **eucalyptus** blue gum (*Eucalyptus globulus*). Oils that act as expectorants, such as myrtle (*Myrtus communis*) or **rosemary** (*Rosmarinus officinalis*), can also be used. After the oil is added, the individual should lean over the bowl of water and place the towel over head to trap the steam. After approximately three minutes of inhaling the steam, with eyes closed, the towel can be removed.

Other herbs and essential oils that can be beneficial in steam inhalation include:

- Tea tree oil (*Melaleuca alternaifolia*) for bronchitis and sinus infections.
- Sandalwood (*Santalum album*), virginian cedarwood (*Juniperus virginiana*), and frankincense (*Boswellia carteri*) for sore throat.
- Lavender (*Lavandula angustifolia*) and thyme (*Thymus vulgaris*) for cough.

Compresses

A cold compress is prepared by soaking a cloth or cotton pad in cold water and then applying it to the area of injury or distress. When the cloth reaches room temperature, it should be resoaked and reapplied. Applying gentle pressure to the compress with the hand may be useful. Cold compresses are generally used to reduce swelling, minimize bruising, and to treat headaches and **sprains**.

Warm or hot compresses are used to treat abscesses and muscle aches. A warm compress is prepared in the same manner as a cold compress, except steaming water is used to wet the cloth instead of cold water. Warm compresses should be refreshed and reapplied after they cool to room temperature.

Essential oils may be added to moist compresses to increase the therapeutic value of the treatment. Peppermint, a cooling oil, is especially effective when added to cold compresses. To add oils to compresses, place five drops of the oil into the bowl of water the compress is to be soaked in. Never apply essential oils directly to a cloth, as they may irritate the skin in undiluted form.

Precautions

Individuals with paralysis, frostbite, or other conditions that impair the nerve endings and cause reduced sensation should take hydrotherapy treatments only under the guidance of a trained hydrotherapist, physical therapist, or other appropriate healthcare professional. Because these individuals cannot accurately sense temperature changes in the water, they run the risk of being seriously burned without proper supervision. Diabetics and people with **hypertension** should also consult their healthcare professional before using hot tubs or other heat hydrotherapies.

Hot tubs, Jacuzzis, and pools can become breeding grounds for bacteria and other infectious organisms if they are not cleaned regularly, maintained properly, kept at the appropriate temperatures, and treated with the proper chemicals. Individuals should check with their healthcare provider to ensure that the hydrotherapy equipment they are using is sanitary. Those who are using hot tubs and other hydrotherapy equipment in their homes should follow the directions for use and maintenance provided by the original equipment manufacturer.

Certain essential oils should not be used by pregnant or nursing women or by people with specific illnesses or physical conditions. Individuals suffering from any chronic or acute health condition should inform their healthcare provider before starting treatment with any essential oil.

Such essential oils as cinnamon leaf, juniper, lemon, eucalyptus blue gum, peppermint, and **thyme** can be extremely irritating to the skin if applied in full concentration. Oils used in hydrotherapy should always be diluted in water before they are applied to the skin. Individuals should never apply essential oils directly to the skin unless directed to do so by a trained healthcare professional and/or aromatherapist.

Colonic irrigation should be performed only by a healthcare professional. Pregnant women should never douche, as the practice can introduce bacteria

into the vagina and uterus. They should also avoid using hot tubs without the consent of their healthcare provider.

The vagina is self-cleansing, and douches have been known to upset the balance of vaginal pH and flora, promoting **vaginitis** and other **infections**. Some studies have linked excessive vaginal douching to increased incidence of **pelvic inflammatory disease** (PID).

Side effects

Most forms of hydrotherapy are well tolerated. There is a risk of allergic reaction (also known as **contact dermatitis**) for some patients using essential oils and herbs in their bath water. These individuals may want to test for allergic sensitization to herbs by performing a skin patch test (i.e., rubbing a small amount of diluted herb on the inside of their elbow and observing the spot for redness and irritation). People who experience an allergic reaction to an essential oil should discontinue its use and contact their healthcare professional for further guidance.

The most serious possible side effect of hydrotherapy is overheating, which may occur when an individual spends too much time in a hot tub or Jacuzzi. However, when properly supervised, this is a minimal risk.

Research and general acceptance

Hydrotherapy treatments are used by both allopathic and complementary medicine to treat a wide variety of discomforts and disorders. Not as well accepted are invasive hydrotherapy techniques, such as colonic irrigation, enemas, and douching. These internal cleansing techniques can actually harm an individual by upsetting the natural balance of the digestive tract and the vagina. Most conventional medical professionals agree that vaginal douches are not necessary to promote hygiene in most women, and can actually do more harm than good.

Training and certification

Hydrotherapy is practiced by a number of physical therapists, medical doctors (especially those specializing in rehabilitation), nurses, and naturopathic physicians. Medical doctors, physical therapists, and nurses are licensed throughout the United States. Naturopaths are licensed in a number of states. Aromatherapists, who frequently recommend water-based treatments with herbs and essential oils, are not licensed, although there are certification programs available for practitioners.

Resources

BOOKS

Chaitow, Leon. *Hydrotherapy: Water Therapy for Health and Beauty*. Boston: Element Books, 1999.

Lawless, Julia. *The Complete Illustrated Guide to Aroma therapy*. Boston: Element Books, 1997.

Pelletier, Dr. Kenneth R. *The Best Alternative Medicine, Part I: Naturopathic Medicine*. New York: Simon and Schuster, 2002.

PERIODICALS

Baird, Carol L. "First Line Treatment for Osteoarthritis: Part 2: Nonpharmacologic Interventions and Evalua tion." *Orthopaedic Nursing* 20 (November December 2001): 13 20.

Barker, K. L., H. Dawes, P. Hansford, and D. Shamley. "Perceived and Measured Levels of Exertion of Patients with Chronic Back Pain Exercising in a Hydrotherapy Pool." *Archives of Physical Medicine and Rehabilitation* 84 (September 2003): 1319 1323.

Cider, A., M. Schaufelberger, K. S. Sunnerhagen, and B. Andersson. "Hydrotherapy A New Approach to Improve Function in the Older Patient with Chronic Heart Failure." *European Journal of Heart Failure* 5 (August 2003): 527 535.

Johnson, Kate. "Hydrotherapy Greatly Eases Delivery Stress, Pain." *OB GYN News* 34 (November 1999): 27.

Keegan, L. "Therapies to Reduce Stress and Anxiety." *Critical Care Nursing Clinics of North America* 15 (September 2003): 321 327.

Mayhall, C. G. "The Epidemiology of Burn Wound Infec tions: Then and Now." *Clinical Infectious Diseases* 37 (August 15, 2003): 543 550.

Molter, N. C. "Creating a Healing Environment for Critical Care." *Critical Care Nursing Clinics of North America* 15 (September 2003): 295 304.

Taylor, S. "The Ventilated Patient Undergoing Hydrother apy: A Case Study." *Australian Critical Care* 16 (August 2003): 111 115.

ORGANIZATIONS

American Association of Naturopathic Physicians. 8201 Greensboro Drive, Suite 300, McLean, Virginia 22102. (206) 298 0126. http://naturopathic.org

Canadian Naturopathic Association/Association canadi enne de naturopathie. 1255 Sheppard Avenue East at Leslie, North York, ON M2K 1E2. (800) 551 4381 or (416) 496 8633. http://www.naturopathicassoc.ca.

Paula Ford-Martin
Rebecca J. Frey, PhD

Hyperactivity *see* **Attention-deficit hyperactivity disorder**

Hypercortisolemia

Definition

Cortisol is an essential glucocorticoid hormone, a sub-group of steroid hormones, the major hormone secreted by the adrenal glands. Hormones are messenger substances, substances produced in one gland or area of the body that move through the blood and stimulate activity in other glands or areas. Glucocorticoid hormones affect carbohydrate and protein metabolism. Steroid hormones are hormones related to **cholesterol**. Hypercortisolemia is high amounts of circulating cortisol and may be a pathological or non-pathological condition.

Description

Pathological hypercortisolemia, or Cushing's Syndrome, named after the United States surgeon, Harvey Cushing (1869–1939), may result from a **lung cancer**, tumor of the pituitary or adrenal glands, or from kidney failure. Non-pathological hypercortisolemia is a normal response of **pregnancy**, and to traumas, such as accidents or surgery (including circumcision, studies show), some forms of **depression** and **stress**. Over time, continued exposure to trauma and stress may produce chronic hypercortisolemia, and result in serious, long term, debilitating illness.

Causes and symptoms

The natural regulation of cortisol is governed by a circular feedback response system. Output is initiated when pituitary gland secretions of adrenocorticotropin hormone (ACTH) travel to and stimulate the adrenal glands, located atop the kidneys near the middle of the upper back. From the adrenals, cortisol travels to its target tissues, initiating a series of reactions known as the "flight-or-fight" response. Information from these target tissues is monitored by the brain. If the messages received tell the brain that more help is needed, the pituitary gland is stimulated to secrete more ACTH, which stimulates increased secretion of cortisol. The most significant feedback factor is stress. When stress levels are reported to the brain as high, high levels of cortisol are released in response. When stress remains high indefinitely, cortisol may also remain high indefinitely, producing a series of biochemical, physiological and even anatomical reactions.

Normally, cortisol output has a diurnal and circadian rhythm, rising in the morning, falling at night, and changing with the seasons. Changes are work-sleep cycles affect this rhythm, and changes in the rhythm affect night time sleep patterns. Changes in the length of daylight hours, blindness and loss of consciousness also affects the rhythm.

Cortisol target tissues include:

- liver
- bone
- blood vessels
- kidney
- muscle
- brain
- immune system

Long term exposure to cortisol, whether natural or synthetic—from steroid drugs such as Prednisone, Dexamethasone (Decadron), and Methylprednisone (Medrol)—may eventually result in changes such as **osteoporosis**, muscle weakening and wasting, high blood pressure, increased abdominal fat deposition, immune dysfunction, steroid-induced diabetes, and cardiovascular disease. Another serious consequence may be the eventual **fatigue** and failure of the adrenal glands. Cushing's syndrome classic symptoms include,

KEY TERMS

Circadian—Events that occur on a 24 hour rhythmic cycle; a biological clock.

Diurnal—Events that happen in the daytime, daily; associated with circadian rhythms.

Feedback response—A response to information carried back to the brain, or to other areas or glands from target tissues that generates a follow up response.

Ketoconazole—An antifungal medication.

Osteoporosis—A condition referring to bone which is thinned and weakened; loss of bone mass. It results from the process of osteopenia, or bone loss.

Pathological, or, non-pathological—Terms indicating whether a condition is considered a disease state.

Prognosis—Referring to the expected outcome of a disease and its treatment.

Target tissues—Tissues specifically receptive to a given hormone.

Tricyclics—A type of antidepressant; Elavil, for example.

in addition to "normal" longterm symptoms, a "moon face" (rounded), thinning of the skin accompanied by purple or pink stretch marks and easy bruising, **acne**, increased facial and body hair and decreased scalp hair in women, and fatigue.

Diagnosis

Initial diagnosis may be made through the office of a family practice physician or internist on the basis of signs and symptoms, physical examination, and lab work including testing levels of circulating cortisol. Three types of testing are available to check cortisol levels: 24-hour urine collection; blood testing; and, saliva sampling. The 24-hour urine collection test is done at home, beginning after the first urination of the morning and finishing after the first urination of the following day. This test can be done on infants. No special preparation is necessary. The test is described as not uncomfortable. Special considerations were reported to include emotional or physical stress, and medications: lithium, diuretics, estrogen, tricyclic antidepressants, ketoconazole, and glucocorticoids. Blood testing requires a visit to a lab, where blood is drawn and then analyzed. This test can be performed on infants, children and adults. Preparation for the test may include discontinuation of medications, similar to those medications listed above, as advised by one's healthcare provider. Some people experience **pain** or trauma with a blood draw, which may effect test results. Results may also be affected by the timing of the blood draw, since cortisol normally varies rhythmically. Risks of a blood draw include bruising, pain, excessive bleeding, infection, fainting or the need for multiple punctures. Saliva sampling is done at home by collecting four samples at specific times of day. Unlike the urine collection method that produces a daily average, or the blood test that produces a single spot sampling, saliva sampling produces a time-wave pattern for a more amplified diagnosis. Preparation includes discontinuation of medications listed with the other two methods, as well as a short list of foods and drinks, antacids, tooth brushing, and **smoking** prior to sampling. Cost comparisons were not reported. Test results may suggest follow up care with an endocrinologist, a specialist in glandular and hormonally related disease, for further testing and diagnosis.

Treatment

Preventive alternative care may focus on stress reduction, primarily. Since stress may be induced by emotional demands, dietary and nutritional imbalances, sub-clinical illness (illness which may not have fully shown itself), and physical inactivity, an alternative minded medical doctor, a licensed naturopathic physician, or other professional alternative healthcare provider may first work to re-establish balance through lifestyle changes specific to individual need. Treatment may include counseling; dietary and nutritional therapies; energy therapies, such as **Reiki**, Tai-chi, Qi Gong, **chakra balancing** or Healing Touch; **Traditional chinese medicine**, including chinese herbals and **acupuncture**; **chiropractic**; **Ayurvedic medicine**; environmental medicine; **homeopathy**; **relaxation** therapy; **biofeedback**; craniosacral work; massage; **exercise** therapies; **shamanism**; and, faith based therapies, including **prayer**, **meditation**, **yoga** and other spiritual exercises. Dietary supplement products to block cortisol or correct underlying dietary and nutritional insufficiencies are also being advertised. Assistance from a professional healthcare provider is recommended.

Allopathic treatment

Initial allopathic care may focus on antidepressants, hypoglycemics (blood sugar lowering), sedatives, or anti-hypertensives (blood pressure lowering), medications to correct underlying or related imbalances. Discontinuance of steroidal medications such as Prednisone, Dexamethasone (Decadron), and Methylprednisone (Medrol) may be warranted or advised. Treatment may also include higher protein recommendations to combat muscle wasting, or therapies that support kidney function.

Prognosis

In hypercortisolemia that has not progressed to serious disease, prognosis may be very good when committed changes in lifestyle are made. Prognosis may be further improved when medications are avoided that either add further imbalance, or overlook or disguise an underlying cause, thereby adding further stress. In Cushing's syndrome, or where hypercortisolemia has progressed to chronic disease, prognosis may be complicated by a need for difficult surgery, chemotherapy, or radiation. Follow up supplemental administration of cortisol may be required. Where surgery or other direct control of adrenal output is not an option, administration of cortisol output suppressing medications may be necessary.

Prevention

Given that stress is the single most influential feedback signal to the brain, a reasonable conclusion is that stress reduction is the single most influential prevention. Lifestyle changes, strategies, and therapies

that reduce or eliminate stress, directly by reducing burden, or indirectly by improving underlying health, are key. One theory in medicine is that if preventive intervention can be made before an organ or gland is exhausted, especially if supportive, strengthening or tonifying remedies and therapies are also employed, good health can be restored, and a higher quality of life preserved.

Resources

BOOKS

Berne, Robert M., and Matthew N. Levy, Bruce M. Koep pen, Bruce A. Stanton. *Physiology, 4th ed.* Mosby, Inc., 1998.

Ferri, Fred. *Ferri's Clinical Advisor, Instant Diagnosis and Treatment*. Mosby, Inc., 2003.

Ganong, William F. *Review of Medical Physiology, 18th ed.* Appleton & Lange. 2003.

OTHER

Ball, David. "Hypercortisolemia Cited in Link Between Depression and Cardiovascular Disorders." *Psychoso matic Medicine* April 9, 2002. [Cited May 5, 2004]. http:// www.docguide.com/news/content.nsf/NewsPrint.

"Glucocorticoid Hormones." *UCSF Division of Endocrinol ogy and Metabolism*. March 24, 2000 [Cited May 5, 2004]. http://mountzion.ucsfmedicalcenter.org/ endocrinology/adrenal/gluco.html

Gunnar, Megan R. et al. "The Effects of Circumcision on Serum Cortisol and Behavior." *Psychoneuroendocrino logy*. February 23, 1981. [Cited May 5, 2004]. http:// www.cirp.org/library/pain/gunnar.

Gur, Ali. "Cortisol and Hypothalamic pituitary gonadal Axis Hormones in Follicular phase Women with Fibromyalgia and Chronic Fatigue Syndrome and Effect of Depressive Symptoms on these Hormones." *Arthritis Research Therapy* 2004. [Cited May 5, 2004] http://arthritis research.com/content/6/3/R232

Katy Nelson, ND

Hypericum *see* **St. John's wort**

Hyperopia

Definition

Hyperopia (farsightedness) is an eye condition in which incoming rays of light reach the retina before they converge into a focused image.

Description

When light passes through the lens and cornea of the eye, its velocity decreases. The surfaces of the lens and cornea are not perpendicular to the incoming light, so the direction of the light changes. The greater the curvature of the lens system, the greater the change in the direction of the light.

When parallel light rays pass through the lens system of the eye, they are bent so they converge at a point some distance behind the lens. With perfect vision, this point of convergence where the light rays are focused is on the retina. Hyperopia is the condition in which the point of focus of parallel light rays from an object is behind the retina. This condition exists when the eyeball depth is too short for the curvature of its lens system.

There is a connection between the focusing of the lens of the eye (accommodation) and convergence of the eyes (the two eyes turning in to look at a close object). A good example is during reading, when the lens accommodates to make the close-up material clear and the eyes turn in to look at the print and keep it from doubling. Because of this connection between accommodation and convergence, if the lens needs to accommodate and focus for distance (to bring the image back onto the retina), the eyes may appear to turn in.

Causes and symptoms

Babies are generally born slightly hyperopic, but this tends to decrease with age. There is normal variation in eyeball length and curvature of the lens and cornea, and some combinations of these variables give rise to eyes in which the cornea is too flat for the distance between the cornea and the retina. If the hyperopia is not too severe, the lens may be able to accommodate and bring the image back onto the retina. This results in clear distance vision, but the constant focusing could cause headaches or eyestrain. If the lens cannot accommodate for the full extent of the hyperopia, the distant image is blurry. If the eyes are focused for distance and the person is looking at a nearby object, the lens needs to accommodate further. This may result in blurry nearby objects or headaches during close work.

Symptoms depend on the degree of hyperopia. Some individuals may have no symptoms, while others have blurry near vision and clear distance vision, and those with the most severe cases have blurry near and distance vision. Headaches and eyestrain may also occur, particularly when doing close work. An eye turned in (esotropia) may be a result of hyperopia, particularly in children. A turned eye could also signal a more serious problem, so a physician should be consulted.

KEY TERMS

Close work—Tasks that cause the eyes to focus on something close at hand, such as reading, writing, computer work, and sewing.

Cornea—The clear, dome-shaped outer covering of the front of the eye.

Iris—The colored ring of muscle that controls the amount of light allowed to reach the retina.

Pupil—The black hole in the center of the iris through which light enters on the way to the lens and retina.

Refraction—Method of determining the optical status of the eyes. Lenses are placed before the patient's eyes while the patient reads from an eye chart.

Retina—The inner, light-sensitive layer of the eye that transforms images into electrical messages which are sent to the brain.

Diagnosis

Because it is possible to have good visual acuity with some degree of hyperopia, it is important to relax accommodation before an eye exam. This is done with the use of eye drops and is called a cycloplegic exam, or cycloplegic refraction. The patient's visual status can be determined with a hand-held instrument called a retinoscope and/or by having the patient read from an eye chart while placing different lenses in front of the patient's eyes. The patient should be driven home after such an exam because the drops cause blurred vision.

Treatment

Herbals

Bilberry (*Vaccinium myrtillus*) increases the flow of blood through the vessels of the eye. Eye drops of **eyebright** (*Euphrasia officinalis*) tea can relieve eyestrain and, taken orally with rosemary (*Rosemarinus officinalis*) in white wine, can improve vision. **Schisandra** (*Schisandra chinensis*) improves visual clarity.

Homeopathy

Rue (*Ruta graveolens*) can be prescribed for eyestrain. A homeopathic practitioner should be consulted for a proper recommendation.

Supplements

Vitamins A and C, **magnesium**, zinc, and **selenium** can help strengthen the retina and improve vision. Flavonoids—present in bilberry and eyebright—improve visual clarity.

Deconditioning

Persons whose vision changes according to their emotional state may have vision problems because of negative conditioning. Exploration and deconditioning may improve their vision.

Ayurveda

Head massage and nasya (placing drops in the nose) using warm Jivantal taila oil (which contains *Asparagus racemosus*, *Glycyrrhiza glabra*, *Leptadenia reticulata*, *Sida cordifolia*, *Sida retusa*, and **sesame oil**) may improve vision in persons who are hyperopic.

Chinese medicine

Performing qiqong eye exercises significantly reduced hyperopia in children. In another study, children with hyperopia were cured following treatment with plum-blossom needle tapping plus external application of Huoxue Zengshi Ye (Infusion for Promoting Blood Circulation and Improving Eyesight) and Huoxue Zengshi Dan (Pellets for Promoting Blood Circulation and Improving Eyesight).

Bates method

The **Bates method** involves the use of therapeutic eye exercises to help strengthen and train the eye muscles. Some patients have found the eye exercises to help, although the method has not been tested in a clinical setting.

Other

Other movement exercises or disciplines can be useful including massage, **Feldenkrais movement therapy**, **yoga** and t'ai chi. A practitioner should be consulted to determine what would be most helpful for particular individuals.

Allopathic treatment

The usual treatment for hyperopia is corrective lenses (spectacles or contact lenses). Special contact lenses (vision orthotics) that are worn overnight temporarily reshape the cornea for ideal vision on the following day.

There are now several different surgical methods used to correct hyperopia. One approach is to implant corrective contact lenses behind the patient's iris. Another approach, called laser in situ keratomileusis (LASIK), is to surgically increase the curvature of the eye's existing cornea or lens using a laser. Many surgeries are successful, but complications, including worsening of vision, may occur.

In mid-2002, the Food and Drug Administration (FDA) approved a new surgical technique to correct hyperopia. Called conductive keratoplasty, it involves no cutting or removal of tissue. An ophthalmologist uses a small probe about the size of a human hair to pass radiofrequency waves that produce heat into the corneal tissue. They shrink the tissue and reshape the cornea.

Expected results

The prognosis for fully corrected vision is excellent for patients with low to moderate degrees of hyperopia. Patients with very high hyperopia may not achieve full correction.

Hyperopia increases the chances of chronic glaucoma, but vision loss from **glaucoma** is preventable.

Prevention

Hyperopia is usually present at birth and cannot be prevented. Eye strain may be prevented by resting the eyes when they become overworked, blinking often, and periodically changing the eyes' focus while driving or doing close work for extended periods of time.

Resources

BOOKS

Newell, Frank W. *Ophthalmology: Principles and Concepts*. 8th edition. St. Louis: Mosby, 1996.

PERIODICALS

"Eye Zapper for Hyperopia." *Chemistry and Industry* (May 6, 2002):7.

"Eyes Wide Open About LASIK." *Harvard Health Letter* 24 (October 1999): 1+.

Hongfeng, Cheng and Ma Yuying. "Treatment of Juvenile Ametropia by Auricular Plaster Therapy Combined with Plum Blossom Needle Tapping: A Report of 200 Cases." *Journal of Traditional Chinese Medicine* 18 (1998): 47 48.

Lieberath, Frederik. "High Tech Eyes." *Harper's Bazaar* (September 1999): 529+.

Preboth, Monica."FDA Approves Surgical Device to Treat Farsightedness." *American Family Physician* (June 1, 2002): 2389.

ORGANIZATIONS

American Academy of Ophthalmology. PO Box 7424, San Francisco, CA 94120 7424. (415) 561 8500. http://www.eyenet.org/.

American Optometric Association. 2420 North Lindburgh Boulevard, St. Louis, MO 63141. (800) 365 2219. http://www.aoanet.org/.

OTHER

Edmiston, D. "Hyperopia." http://eyeinfo.com/hyperopia.html/.

"Treating Vision Disorders." AlternativeMedicine.com. http://www.alternativemedicine.com

Belinda Rowland
Teresa G. Odle

Hyperparathyroidism

Definition

Hyperparathyroidism is the overproduction by the parathyroid glands of a hormone called parathyroid hormone (parathormone). Parathyroid glands are four pea-sized glands located just behind the thyroid gland in the front of the neck. Parathyroid hormone (parathormone) helps regulate **calcium** and phosphorous in the body.

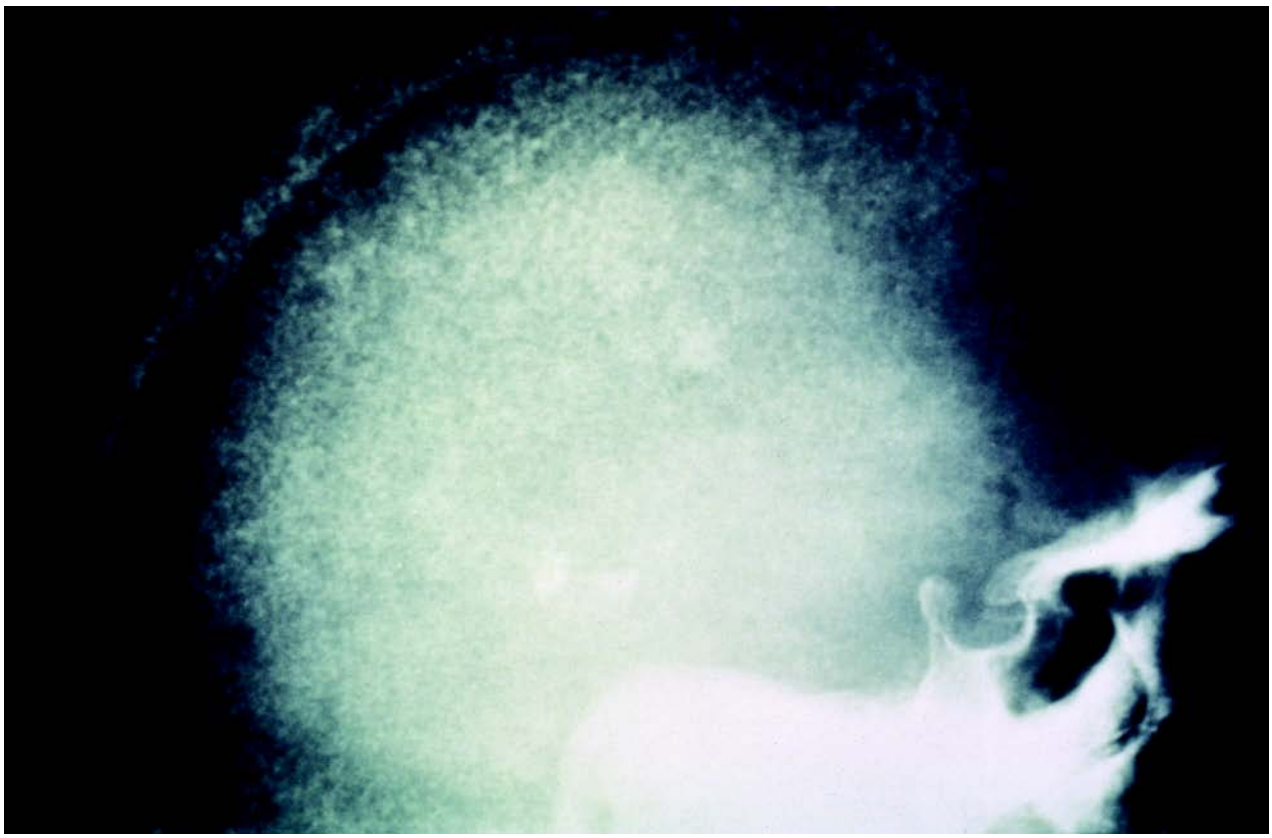
Description

Thyroid glands and parathyroid glands, despite their similar names and proximity, are entirely separate, and each produces hormones with different functions.

Hyperparathyroidism may be primary or secondary. It most often occurs in patients over age 30, and most commonly in patients 50 to 60 years old. It rarely occurs in children or the elderly. Women are affected by the disease up to three times more often than men. It is estimated that 28 of every 100,000 people in the United States will develop hyperparathyroidism each year.

Normally, parathyroid glands produce the parathormone as calcium levels drop and lower to meet the demands of a growing skeleton, pregnancy, or lactation. However, when one or more parathyroid glands malfunction, it can lead to overproduction of the hormone and elevated calcium level in the blood. Therefore, a common result of hyperparathyroidism is hypercalcemia, or an abnormally high level of calcium in the blood.

Primary hyperparathyroidism occurs as a malfunction of one of the glands, usually as a result of a benign tumor called an adenoma. Secondary hyperparathyroidism occurs as the result of an abnormality outside the parathyroid glands related to the body's metabolism, or chemical changes in living cells that help provide the body's energy. This causes a



X ray of skull showing lighter areas of bone demineralization. *(Custom Medical Stock Photo. Reproduced by permission.)*

resistance to the function of the parathyroid hormones. Primary hyperparathyroidism is one of the most common endocrine disorders, led only by diabetes and **hyperthyroidism**.

Causes and symptoms

Often, there are no obvious symptoms to give rise to suspicion of hyperparathyroidism, and it is first diagnosed when a patient is discovered to be hypercalcemic during a routine blood chemistry profile. Patients may believe they have been feeling fine, but realize improvements in sleep, irritability, and memory following treatment. When symptoms are present, they may include development of gastric ulcers or **pancreatitis** because high calcium levels can cause inflammation and **pain** in the linings of the stomach and pancreas.

Most of the symptoms of hyperparathyroidism are those present as a result of hypercalcemia, such as **kidney stones**, **osteoporosis**, or bone degradation resulting from the bones giving up calcium. Muscle weakness, central nervous system disturbances such as **depression**, psychomotor and personality disturbances, and rarely, even coma, can occur. Patients also may experience heartburn, **nausea**, constipation, or abdominal pain. In secondary hyperparathyroidism, patients may show signs of calcium imbalance, such as deformities of the long bones. Symptoms of the underlying disease also may be present.

Most commonly, hyperparathyroidism occurs as the result of a single adenoma, or benign tumor, in one of the parathyroid glands. About 90 percent of all cases of hyperparathyroidism are caused by an adenoma. The tumors seldom are cancerous. They will grow to a much larger size than the parathyroid glands, often to the size of a walnut. Genetic disorders or multiple endocrine tumors also can cause a parathyroid gland to enlarge and oversecrete hormone. In 10 percent or fewer of patients with primary hyperparathyroidism, there is enlargement of all four parathyroid glands. This condition is called parathyroid hyperplasia.

Diagnosis

Diagnosis of hyperparathyroidism most often is made when a blood test (radioimmunoassay) reveals

KEY TERMS

Demineralization—A loss or decrease of minerals in the bones.

Endocrine—Glands and hormone secretions in the body circulation.

Phosphorous—Referring to a chemical element occurring in all living cells.

high levels of parathyroid hormone and calcium. A blood test that specifically measures the amount of parathyroid hormone has made diagnosis simpler. Hypercalcemia is mild or intermittent in some patients, but persistent hypercalcemia is an excellent indicator of primary hyperparathyroidism. Dual energy x-ray absorptiometry (DEXA or DXA), a tool used to diagnose and measure osteoporosis, may be used once the diagnosis is made to show reduction in bone mass for primary hyperparathryroidism patients. Once a diagnosis of hyperparathyroidism is reached, the physician will probably order further tests to evaluate complications. For example, abdominal radiographs might reveal kidney stones.

For secondary hyperparathyroidism, normal or slightly decreased calcium levels in the blood and variable phosphorous levels may be visible. Patient history of familial kidney disease or convulsive disorders may suggest a diagnosis of secondary hyperparathyroidism. Other tests may reveal a disease or disorder that is causing the secondary hyperparathyroidism.

Treatment

Nutritional therapy

Limiting intake of soft drinks can prevent hyperparathyroidism. Soda drinks contain high levels of phosphorus. High **phosphorus** intake can cause hypocalcemia that leads to secondary hyperparathyroidism. In patients with hyperparathyroidism, forcing fluids and reducing intake of calcium-rich foods can help decrease calcium levels prior to surgery or if surgery is not necessary. These patients should not take any supplements that contain calcium without a doctor's approval.

Allopathic treatment

Hyperparathyroidism cases will usually be referred to an endocrinologist, a physician specializing in hormonal problems, or a nephrologist, who specializes in kidney and mineral disorders.

Patients with mild cases of hyperparathyroidism may not need immediate treatment if they have only slight elevations in blood calcium level and normal kidneys and bones. These patients should be regularly checked, probably as often as every six months, by physical examination and measurement of kidney function and calcium levels. A bone densitometry—a test to diagnose and monitor osteoporosis or thinning of bones—measurement should be performed every one or two years. After several years with no worsened symptoms, the length of time between exams may be increased.

Patients with more advanced hyperparathyroidism usually will have all or half of the affected parathyroid gland or glands surgically removed. This surgery is relatively safe and effective. The primary risks are those associated with general anesthesia. There are some instances when the surgery can be performed with the patient under regional, or cervical (neck) block, anesthesia. Often studies such as ultrasonography—a test with high-frequency sound waves (ultrasound) that are bounced off tissues and echoes are converted to pictures called sonograms— prior to surgery help pinpoint the affected areas.

Treatment of secondary hyperparathyroidism involves removing or treating the underlying cause. In 2004, a new drug therapy was shown to lower parathyroid levels and improve calcium and phosphorous function in patients receiving dialysis (a blood-purifying activity often performed on people with kidney diseases) who had uncontrolled secondary hyperparathyroidism. The drug, called Cinacalcet, was approved by the U.S. Food and Drug Administration for people who have chronic kidney disease with secondary hyperparathyroidism.

Expected results

Removal of the enlarged parathyroid gland or glands (parathyroidectomy) cures the disease 95 percent of the time, and relief of bone pain may occur in as few as three days. In 2004, a study showed that parathyroidectomy improved depression in patients with hyperparathyroidism. As many as 54 percent of patients who had the procedure no longer needed antidepressant medications after having the surgery. In up to five percent of patients undergoing surgery, chronically low calcium levels may result, and these patients will require calcium supplements or **vitamin D** treatment.

Damage to the kidneys as a result of hyperparathyroidism often is irreversible. Prognosis is generally good; however, complications of hyperparathyroidism such as osteoporosis, bone **fractures**, kidney stones,

peptic ulcers, pancreatitis, and nervous system difficulties may worsen prognosis.

Prevention

Secondary hyperparathyroidism may be prevented by early treatment of the disease causing it. Early recognition and treatment of hyperparathyroidism may prevent hypercalcemia. Since the cause of primary hyperparathyroidism, the adenoma which causes parathyroid enlargement, is largely unknown, there are no prescribed prevention methods.

Resources

BOOKS

Murray, Michael T. "Calcium." In *Encyclopedia of Nutritional Supplements: The Essential Guide for Improving Your Health Naturally*. Rocklin, CA: Prima Publishing, 1996.

Trattler, Ross. *Better Health Through Natural Healing*. New York, NY: McGraw Hill Book Company, 985.

PERIODICALS

Allerheiligen, David A., Joe Schoeber, Robert E. Houston, Virginia K. Mohl, and Karen M. Wildman. "Hyper parathyroidism."*American Family Physician* 58 (April 15, 1998): 1795 1803.

"Parathyroidectomy Improves Depression in Patients with Hyperparathyroidism." *Drug Week* (April 23, 2003): 161.

"Positive New Data for Amgen's Sensipar for Secondary Hyperparathyroidism." *Pharma Marketletter* (April 12, 2004).

Taniegra, Edna D. "Hyperparathyroidism." *American Family Physician* (January 15, 2004): 333.

ORGANIZATIONS

Osteoporosis and Related Bone Diseases National Resource Center. 1150 17th S. NW, Ste. 500, Washington, DC 20036. (800) 624 BONE.

The Paget Foundation. 200 Varick Street, Suite 1004, New York, NY 10014 4810. (800) 23 PAGET.

OTHER

"Endocrine disorder and endocrine surgery." Endocrine Web. http://www.endocrineweb.com.

Mai Tran
Teresa G. Odle

Hypertension

Definition

Hypertension is high blood pressure. Blood pressure is the force of blood pushing against the walls of arteries as it flows through them. Arteries are the blood vessels that carry oxygenated blood from the heart to the body's tissues.

Description

As blood flows through arteries, it pushes against the inside of the artery walls. The more pressure the blood exerts on the artery walls, the higher the blood pressure. The size of small arteries also affects the blood pressure. When the muscular walls of arteries are relaxed, or dilated, the pressure of the blood flowing through them is lower than when the artery walls are narrow, or constricted.

Blood pressure is highest when the heart beats to pump blood out into the arteries. When the heart relaxes to fill with blood again, the pressure is at its lowest point. Blood pressure when the heart beats is called systolic pressure. Blood pressure when the heart is at rest is called diastolic pressure. When blood pressure is measured, the systolic pressure is stated first and the diastolic pressure second. Blood pressure is measured in millimeters of mercury (mm Hg). For example, if a person's systolic pressure is 120 and diastolic pressure is 80, it is written as 120/80 mm Hg. The label "mm Hg" is usually omitted when expressing blood pressure. The American Heart Association considers blood pressure above 140 over 90 as high for adults.

Hypertension is a major health problem, especially because it often has no symptoms. Many people have hypertension without knowing it. In the United States, about 50 million people age six and older have high blood pressure. Hypertension is more common in men than women and in people over the age of 65 than in younger persons. More than half of all Americans over the age of 65 have hypertension. It is also more common among African Americans than among white Americans.

Hypertension is a serious medical problem because people with the condition are at higher risk for **heart disease** and other medical problems than people with normal blood pressure. Serious complications can be avoided by getting regular blood pressure checks and treating hypertension as soon as it is diagnosed.

If left untreated, hypertension can lead to the following medical conditions:

- arteriosclerosis, also called atherosclerosis
- blindness
- heart attack
- stroke
- enlarged heart
- kidney damage

Arteriosclerosis is hardening of the arteries. The walls of arteries have a layer of muscle and elastic tissue that make them flexible and able to dilate and constrict as blood flows through them. High blood pressure can make the artery walls thicken and harden. When artery walls thicken, the inside of the blood vessel narrows. **Cholesterol** and fats are more likely to build up on the walls of damaged arteries, making them even narrower. **Blood clots** can also get trapped in narrowed arteries, blocking the flow of blood.

Arteries narrowed by arteriosclerosis may not deliver enough blood to organs and other tissues. Reduced or blocked blood flow to the heart can cause a **heart attack**. If an artery to the brain is blocked, a **stroke** can result.

Hypertension makes the heart work harder to pump blood through the body. The extra workload can make the heart muscle thicken and stretch. When the heart becomes too enlarged it cannot pump enough blood. If hypertension is not treated, the heart may fail.

The kidneys remove the body's wastes from the blood. If hypertension thickens the arteries to the kidneys, less waste can be filtered from the blood. As the condition worsens, the kidneys fail and wastes build up in the blood. Dialysis or a kidney transplant are needed when the kidneys fail. About 25% of people who receive kidney dialysis have kidney failure caused by hypertension.

Causes and symptoms

Many different actions or situations can cause an increase in blood pressure. Physical activity can temporarily raise blood pressure. Stressful situations can make blood pressure go up. When the **stress** goes away, blood pressure usually returns to normal. These temporary increases in blood pressure are not considered hypertension. A diagnosis of hypertension is made only when a person has multiple high blood pressure readings over a period of time.

The cause of hypertension is not known in 90–95% of the people who have it. Hypertension without a known cause is called primary or essential hypertension. When a person has hypertension caused by another medical condition, it is called secondary hypertension. Secondary hypertension can be caused by a number of different illnesses. Many people with kidney disorders have secondary hypertension. The kidneys regulate the balance of salt and water in the body. If the kidneys cannot rid the body of excess salt and water, blood pressure goes up. **Kidney infections**, a narrowing of the arteries that carry blood to the kidneys, called renal artery stenosis, and other kidney disorders can disturb the salt and water balance.

Cushing's syndrome and tumors of the pituitary and adrenal glands often increase levels of the adrenal gland hormones cortisol, adrenalin, and aldosterone, which can cause hypertension. Other conditions that can cause hypertension are blood vessel diseases, thyroid gland disorders, some prescribed drugs, **alcoholism**, and **pregnancy**.

Even though the cause of most hypertension is not known, some people have risk factors that give them a greater chance of getting hypertension. Many of these risk factors can be changed to lower the chance of developing hypertension or as part of a treatment program to lower blood pressure.

Risk factors for hypertension include:

- age over 60
- male sex
- race (African Americans have a higher incidence of hypertension.)
- heredity
- salt sensitivity
- obesity
- inactive lifestyle
- heavy alcohol consumption
- use of oral contraceptives

Some risk factors for getting hypertension can be changed, whereas others cannot. Age, male sex, and race are risk factors that a person cannot alter. Some people inherit a tendency to get hypertension. People with family members who have hypertension are more likely to develop it than those whose relatives are not hypertensive. People with these risk factors can avoid or eliminate the other risk factors to lower their chance of developing hypertension.

Diagnosis

Because people with hypertension are often asymptomatic, it is important to have blood pressure checked regularly. Blood pressure is measured with an instrument called a sphygmomanometer. A cloth-covered rubber cuff is wrapped around the upper arm and inflated. When the cuff is inflated, an artery in the arm is squeezed to stop the flow of blood momentarily. Then, the air is let out of the cuff while a stethoscope placed over the artery is used to detect the sound of the blood spurting back through the artery. This first sound is the systolic pressure, the pressure when the heart beats. The last sound heard as the rest of the air

is released is the diastolic pressure, the pressure between heart beats. Both sounds are recorded on the mercury gauge on the sphygmomanometer.

A number of factors such as **pain**, stress, or **anxiety** can cause a temporary increase in blood pressure. For this reason, hypertension is not diagnosed on the basis of one high blood pressure reading. If a blood pressure reading is 140/90 or higher for the first time, the physician will have the person return for another blood pressure check. Diagnosis of hypertension is usually made based on two or more readings after the first visit. Sometimes, patients have high blood pressure only while in the doctor's office. This phenomenon, called "white-coat hypertension" has usually been dismissed as mere anxiety over visiting the doctor. Some studies have raised questions about the dismissal of these patients as not being hypertensive, suggesting that further study is necessary to resolve the issue.

Systolic hypertension of the elderly is common and is diagnosed when the diastolic pressure is normal or low, but the systolic is elevated (e.g., 170/70 mm Hg). This condition usually co-exists with hardening of the arteries (**atherosclerosis**).

Blood pressure measurements are classified in stages, according to severity:

- normal blood pressure: less than 130/85 mm Hg
- high normal: 130–139/85–89 mm Hg
- mild hypertension: 140–159/90–99 mm Hg
- moderate hypertension: 160–179/100–109 mm Hg
- severe hypertension: 180–209/110–119
- very severe hypertension: 210/120 or higher

A typical physical examination to evaluate hypertension includes:

- medical and family history
- physical examination
- ophthalmoscopy (examination of the blood vessels in the eye)
- chest x ray
- electrocardiograph (ECG)
- blood and urine tests

Medical and family history help a physician determine if a patient has conditions or disorders that might contribute to or cause hypertension. A family history of hypertension might suggest a genetic predisposition for the disorder.

The physical examination may include several blood pressure readings at different times and in different positions. The physician uses a stethoscope to listen to sounds made by the heart and blood flowing through the arteries. The individual's pulse, reflexes, height, and weight are checked and recorded. Internal organs are palpated, or felt, to determine if they are enlarged.

Because hypertension can cause damage to the blood vessels in the eyes, the eyes may be checked with an instrument called an ophthalmoscope. The physician looks for thickening, narrowing, or hemorrhages in the blood vessels.

A chest x ray can detect an enlarged heart, other heart abnormalities, or lung disease.

An electrocardiogram (ECG) measures the electrical activity of the heart. It can detect enlargement of the heart muscle and damage to the heart muscle from blocked arteries.

Urine and blood tests may be done to evaluate health and to detect the presence of disorders that might cause hypertension.

Treatment

There is no cure for primary hypertension, but blood pressure can almost always be lowered with the correct treatment. The goal of treatment is to lower blood pressure to levels that will prevent heart disease and other complications of hypertension. In secondary hypertension, the disease that is responsible for the hypertension is treated in addition to the hypertension itself. Successful treatment of the underlying disorder may cure the secondary hypertension.

Treatment to lower blood pressure usually includes changes in diet and getting regular **exercise**. Patients with mild or moderate hypertension who do not have damage to the heart or kidneys may first be treated primarily with lifestyle changes.

Lifestyle changes that may reduce blood pressure by about 5–10 mm Hg include:

- reducing salt intake
- reducing fat intake
- losing weight
- getting regular exercise
- quitting smoking
- reducing alcohol consumption
- managing stress

Natural remedies approved by a physician may also lower or even prevent hypertension. **Aromatherapy** as a treatment option uses **essential oils** either inhaled from a bottle in times of anxiety or massaged daily into the skin at bedtime in the area beneath the collarbone. Blue **chamomile** and **lavender** are known for their stress relief and **relaxation** effects. Research

has suggested that one of the most potent supplements for treatment of hypertension may be the amino acid **arginine** (also known as L-arginine).

Food therapy has also been shown to affect blood pressure. Muscles that regulate blood pressure have been noted to dilate with the intake of celery; celery juice has also been found to have a mild diuretic effect. Eating fresh fruits and vegetables, high in **potassium** and **magnesium**, lowers systemic **sodium** and fluid levels in the circulatory system. A 2001 study showed that reducing intake of sodium decreases blood pressure in participants with or without hypertension. **Garlic** intake has also been linked with lowering blood pressures. Taken either via enteric coated capsules or fresh garlic cloves, allicin is thought to bring down blood pressure.

Relaxation and **meditation** can help lower blood pressure. Focusing on relaxing music can also slow the heart rate and lower blood pressure, as can imagery (e.g., envisioning coolness seeping into the pores and throughout the body, sensing that blood pressure is within normal range). **Yoga** experts cite two specific poses, the corpse and the knee squeeze, when used in combination with breathing exercises, as being particularly helpful in relieving tension and improving blood flow.

Allopathic treatment

Patients whose blood pressure remains higher than 139/90 will most likely be advised to take antihypertensive medication. Numerous drugs have been developed to treat hypertension. The choice of medication depends on the stage of hypertension, side effects, other medical conditions the patient may have, and other medicines the patient is taking.

Patients with mild or moderate hypertension are initially treated with monotherapy, a single antihypertensive medicine. If treatment with a single medicine fails to lower blood pressure enough, a different medicine may be tried or another medicine may be added to the first. Patients with more severe hypertension may initially be given a combination of medicines to control their hypertension. Combining antihypertensive medicines with different types of lifestyle changes often controls blood pressure with smaller doses of each drug than would be needed for monotherapy.

Antihypertensive medicines fall into several classes of drugs:

- diuretics
- beta-blockers
- calcium channel blockers
- angiotensin converting enzyme inhibitors (ACE inhibitors)
- alpha-blockers
- alpha-beta blockers
- vasodilators
- peripheral acting adrenergic antagonists
- centrally acting agonists

Diuretics help the kidneys eliminate excess salt and water from the body's tissues and the blood, which helps reduce the swelling caused by fluid buildup in the tissues. The reduction of fluid dilates the walls of arteries and lowers blood pressure.

Beta-blockers lower blood pressure by acting on the nervous system to slow the heart rate and reduce the force of the heart's contraction. They are used with caution in patients with heart failure, **asthma**, diabetes, or circulation problems in the hands and feet.

Calcium channel blockers block the entry of calcium into muscle cells in artery walls. Muscle cells need calcium to constrict, so reducing their calcium keeps them more relaxed and lowers blood pressure.

ACE inhibitors block the production of substances that constrict blood vessels. They also help reduce the build-up of water and salt in the tissues. They are often given to patients with heart failure, kidney disease, or diabetes. ACE inhibitors may be used together with diuretics.

Alpha-blockers act on the nervous system to dilate arteries and reduce the force of the heart's contractions.

Alpha-beta blockers combine the actions of alpha and beta blockers.

Vasodilators act directly on arteries to relax their walls so blood can move more easily through them. They lower blood pressure rapidly and are injected in hypertensive emergencies when patients have dangerously high blood pressure.

Peripheral acting adrenergic antagonists act on the nervous system to relax arteries and reduce the force of the heart's contractions. They usually are prescribed together with a diuretic. Peripheral acting adrenergic antagonists can cause slowed mental function and lethargy.

Centrally acting agonists also act on the nervous system to relax arteries and slow the heart rate. They are typically used with other antihypertensive medicines.

In 2001, the U.S. Food and Drug Administration (FDA) approved the use of a medical device called RESPeRATE, developed by the health services

KEY TERMS

Arteries—Blood vessels that carry oxygenated blood to organs and other tissues of the body.

Arteriosclerosis—Hardening and thickening of artery walls.

Cushing's syndrome—A disorder in which too much of the adrenal hormone, cortisol, is produced; caused perhaps by a pituitary or adrenal gland tumor.

Diastolic blood pressure—Blood pressure when the heart is resting between beats.

Hypertension—High blood pressure.

Renal artery stenosis—Disorder in which the arteries that supply blood to the kidneys constrict.

Sphygmomanometer—An instrument used to measure blood pressure.

Systolic blood pressure—Blood pressure when the heart contracts (beats).

Vasodilator—Any drug that relaxes blood vessel walls.

Ventricle—One of the two lower chambers of the heart.

company InterCure, that adjusts a patient's breathing patterns as a way of dealing with hypertension. By helping patients alter breathing patterns to lengthen the phase in which they exhale, the device slows breathing and produces beneficial effects on blood pressure. InterCure recommends the use of RESPeRATE in conjunction with antihypertensive medications.

Expected results

There is no cure for hypertension. However, it can be well controlled with proper treatment. The key to avoiding serious complications of hypertension is to detect and treat the disorder before damage occurs to the cardiovascular system. Because antihypertensive medicines control blood pressure but do not cure it, patients must continue taking the medications to maintain reduced blood pressure levels and avoid complications.

Prevention

Prevention of hypertension centers on avoiding or eliminating known risk factors. Even persons at risk because of age, race, or sex or those who have an inherited risk can lower their chance of developing hypertension.

The risk of developing hypertension can be reduced by making the same lifestyle changes recommended for treating hypertension.

Resources

BOOK

Heller, Marla. *The DASH Diet Action Plan: Based on the National Institutes of Health Research: Dietary Approaches to Stop Hypertension*. Northbrook, IL: Amidon Press, 2007.

Izzo, Joseph L., and Domenic Sica, eds. *Hypertension Primer: The Essentials of High Blood Pressure: Basic Science, Population Science, and Clinical Man agement*. Philadelphia: Lippincott Williams & Wil kins, 2007.

Kaplan, Norman M. *Kaplan's Clinical Hypertension*. Phila delphia: Lippincott Williams & Wilkins, 2005.

Wilson, Bruce C., and Doc Childre. *The Heartmath Approach to Managing Hypertension: The Proven, Nat ural Way to Lower Your Blood Pressure*. Oakland, CA: New Harbinger, 2007.

PERIODICALS

Balsamo, A., V. Calderone, and S. Rapposelli. "New Emerging Prospects in the Pharmacotherapy of Hypertension." *Cardiovascular & Hematological Agents in Medicinal Chemistry* (January 2008): 1 19.

Ferrara, L. A., et al. "Fast Food Versus Slow Food and Hypertension Control." *Current Hypertension Reviews* (February 2008): 30 35.

Ramakrishna, Harish. "Recent Advances in Pulmonary Hypertension Therapy." *Recent Patents on Cardiovas cular Drug Discovery* (January 2008): 28 36.

Scheffers, Ingrid, et al. "Rheos Baroreflex Hypertension Therapy System to Treat Resistant Hypertension." *Expert Review of Medical Devices* (January 2008): 33 39.

Varon, Joseph. "Treatment of Acute Severe Hypertension: Current and Newer Agents." *Drugs* (March 2008): 283 297.

ORGANIZATIONS

American Heart Association, 7272 Greenview Ave., Dallas, TX, 75231 4596, (800) AHS USA1, http://www.amhrt.org.

National Heart, Lung, and Blood Institute, Information Center, PO Box 30105, Bethesda, MD, 20824 0105, (301) 251 1222, http://www.nhlbi.nih.gov/.

Kathleen Wright
Teresa Norris
David Edward Newton, Ed.D.

Hyperthermia

Definition

Hyperthermia involves raising the body's core temperature as a means of eradicating tumors. The treatment simulates **fever**. Some therapies actually bring on fever through the introduction of fever-causing organisms, while others raise body temperature by directly heating the blood. The term hyperthermia also refers, in general, to any condition in which the body's temperature is significantly higher than normal.

Origins

The concept of hyperthermia dates back to investigations begun in 1883 by William B. Coley, a general surgeon at New York City's Memorial Hospital. Coley was intrigued by a paper published in 1868 by an American family physician named Peter Busch. Busch's paper described a patient with an untreatable sarcoma of the face. Though Busch had been unable to help the patient overcome her **cancer**, the patient went into remission spontaneously after suffering a bout of the skin infection erysipelas. The erysipelas resulted in a high fever ranging from 104°F to 105.8°F (40°C to 41°C). Over the next 20 years, Coley performed a series of experiments to study the effects of elevated temperature on various forms of cancer. After experimenting on animals, Coley moved to treating human cancer patients, injecting them with bacteria to induce high fevers. The bacteria he used are known as Coley's toxins. He reported much success with his method, especially against soft tissue sarcomas and sarcomas of the bone. Yet his treatment also had serious side effects due to the **infections** he introduced.

In spite of its drawbacks, Coley's work intrigued a few other researchers. A study published in *Cancer Research* in 1957 showed that in a review of 450 cases of supposed spontaneous remissions of cancer, 150 of the patients had suffered acute infections that raised their body temperatures. In the 1960s, a Cleveland surgeon and **breast cancer** specialist, George Crile Jr., published several studies of his experiments in eliminating tumors in mice using heat. Another doctor, Harry Leveen, of South Carolina, began building machines that used radio frequencies to heat either the whole body or affected parts. But Leveen's machines were not approved by the Food and Drug Administration (FDA), and Leveen took his inventory to the University of Bangor in Wales. Hyperthermia did not receive much attention in the United States after this point, but practitioners in other countries, particularly Germany, Italy, and Mexico, reported good results with it. An international congress on hyperthermia was held each year from 1977 to 2000.

Benefits

Hyperthermia has been shown in several studies to reduce malignant tumors either alone or in combination with chemotherapy. A 1998 study of patients with breast and **ovarian cancer** found that hyperthermia therapy increased the effectiveness of chemotherapy. This study suggested that patients undergoing hyperthermia might be successfully treated with lower doses of chemotherapy. A 2003 study demonstrated that women with breast cancer were less likely to experience spread of the cancer to distant lymph nodes or the lungs if they received a combination of whole-body hyperthermia and chemotherapy. A form of localized hyperthermia used to treat benign enlarged prostates can be performed in a doctor's office in as little as an hour, and this method does not have the side effects, such as **impotence** and incontinence, that often accompany traditional prostate surgery. In 2007, researchers reported at the annual meeting of the American Society of Clinical Oncology that patients with certain types of soft tissue sarcomas who had hyperthermia experienced significantly better progress with chemotherapy treatments than those who had no such ancillary treatment.

Newer methods of hyperthermia involving noninvasive (no penetration of skin) microwave technology have been introduced in other countries and made their way to the United States in early 2002. This technology offered excellent results for some cancer patients in improving five-year survival rates for some aggressive forms of cancer when combined with other cancer therapy procedures. In 2007, BSD Medical Corporation announced the development of specialized capsules used to deliver chemicals for the treatment of breast cancer through the bloodstream. The capsules not only release chemicals to tumors, but also become heated at the point of infection, increasing the efficiency of the chemicals attack on the tumor.

Description

Hyperthermia therapy involves raising the body's internal temperature, a process that can be achieved by several methods. Hyperthermia can be used to heat the whole body or an affected local region. For reducing an enlarged prostate, doctors use a device approved by the FDA in 1996 that delivers microwaves to the prostate, while water cools the surrounding tissue to prevent **burns**. For whole body hyperthermia, a method used in Europe employs a

KEY TERMS

Sarcoma—A malignant growth in the connective tissue, bone, cartilage or muscle; usually the most lethal form of cancer.

tent-like device that delivers infrared light to the body. The patient is injected with toxins to provoke a mild fever and then monitored under lights. The lights produce a slow rise in temperature, optimally to 107.6°F (42°C). A prominent practitioner of hyperthermia in Mexico heats the patient's blood directly. Under sedation, the doctor inserts a catheter into each leg near the groin. The two catheter tubes are connected to a heat exchanger. The heat exchanger heats the patient's blood, raising the entire body temperature. The patient is monitored by thermometers in the esophagus and rectum. Body temperature is raised to 107.6°F (42°C) for about one hour.

Side effects

The side effects of hyperthermia depend on the method by which it is delivered. Cardiac problems are possible. The patient should be closely monitored during the procedure and after. For treatment of the prostate, localized hyperthermia seems to be without the side effects of traditional prostate surgery.

Research and general acceptance

Although research into hyperthermia as a cancer treatment began in the United States, many practitioners in the late 2000s were working in Europe or Mexico. Localized hyperthermia has been studied for treatment of a variety of conditions, including menorrhagia (heavy menstrual periods) and malignant tumors of the liver and rectum. As of 2008, whole body hyperthermia continued to be studied and tested for its impact on cancers.

Training and certification

Practitioners performing hyperthermia are certified medical doctors and trained assistants such as nurses and anesthesiologists.

Resources

BOOKS

Baronaio, Gian F., and E. Dieter Hager, eds. *Hyperthermia in Cancer Treatment: A Primer*. New York: Springer, 2006.

PERIODICALS

Campbell, Robert B. "Battling Tumors with Magnetic Nanotherapeutics and Hyperthermia: Turning Up the Heat." *Nanomedicine* (October 2007): 649 652.

Kouloulias, Vasilios E., et al. "The Efficacy of Caelyx and Hyperthermia for Anticancer Treatment." *Recent Pat ents on Anti Cancer Drug Discovery* (November 2007): 246 250.

Mitsumori, Michihide, et al. "Regional Hyperthermia Combined with Radiotherapy for Locally Advanced Non small Cell Lung Cancers: A Multi institutional Prospective Randomized Trial of the International Atomic Energy Agency." *International Journal of Clin ical Oncology* (June 2007): 192 198.

Miyazaki, Shinichi, et al. "Novel Hyperthermia for Meta static Bone Tumors with Magnetic Materials by Gen erating an Alternating Electromagnetic Field." *Clinical and Experimental Metastasis* (May 2007): 191 200.

Angela Woodward
Teresa G. Odle
David Edward Newton, Ed.D.

Hyperthyroidism

Definition

Hyperthyroidism is the overproduction of thyroid hormones by an overactive thyroid gland.

Description

Located in the front of the neck, the thyroid gland produces the hormones thyroxine (T_4) and triiodothyronine (T_3) that regulate the body's metabolic rate by regulating the production of protein and increasing oxygen absorption in every cell. In turn, the production of these hormones is controlled by thyroid-stimulating hormone (TSH) that is produced by the pituitary gland. When production of the thyroid hormones increases despite the level of TSH being produced, hyperthyroidism occurs. The excessive amount of thyroid hormones in the blood increases the body's metabolism, creating both mental and physical symptoms.

The term hyperthyroidism covers any disease that results in an overabundance of thyroid hormone. Other names for hyperthyroidism, or specific diseases within the category, include Graves' disease, diffuse toxic goiter, Basedow's disease, Parry's disease, and thyrotoxicosis. Hyperthyroidism affects 2.5 million people in the United States but could affect up to 4.5 million people because more than half of the people with thyroid

Symptoms of hyperthyroidism

- Goiter
- Weight loss with increased appetite/food intake
- Trembling hands
- Heightened blood pressure
- Excessive nervousness, anxiety or anxiety attacks
- Increased bowel movements
- Accelerated heart rate
- Sweating
- Fatigue, muscle weakness
- Increased sensitivity to heat
- Changes in menstrual patterns

(Illustration by Corey Light. Cengage Learning, Gale)

disease do not know they have it. Although it occurs at all ages, hyperthyroidism is most likely to occur after the age of 15. There is a form of hyperthyroidism called neonatal Graves' disease, which occurs in infants born of mothers with Graves' disease. Occult hyperthyroidism may occur in patients over age 65 and is characterized by a distinct lack of typical symptoms. Diffuse toxic goiter occurs in as many as 80% of patients with hyperthyroidism.

Causes and symptoms

Hyperthyroidism is often associated with the body's production of auto-antibodies in the blood that cause the thyroid to grow and secrete excess thyroid hormone. This condition, as well as other forms of hyperthyroidism, may be inherited. Regardless of the cause, hyperthyroidism produces the same symptoms, including weight loss with increased appetite, shortness of breath and **fatigue**, intolerance to heat, heart palpitations (strong, very fast heartbeats), increased frequency of bowel movements, weak muscles, tremors, **anxiety**, and difficulty sleeping. Women also may notice decreased menstrual flow and irregular menstrual cycles.

Patients with Graves' disease often have a goiter (visible enlargement of the thyroid gland), although as many as 10% do not. These patients also may have bulging eyes. Thyroid storm, a serious form of hyperthyroidism, may show up as sudden and acute symptoms, some of which mimic typical hyperthyroidism but with the addition of **fever**, substantial weakness, extreme restlessness, confusion, emotional swings or psychosis, and perhaps even coma.

Diagnosis

Physicians look for physical signs and symptoms indicated by patient history. On inspection, the physician may note symptoms such as a goiter or eye-bulging. Other symptoms or family history may be clues to a diagnosis of hyperthyroidism. An elevated basal (lowest range of normal) body temperature above 98.6 degrees Fahrenheit (37 degrees Centigrade) may be an indication of a heightened basal metabolic rate (which measures the energy used to maintain vitality) and hyperthyroidism. A simple blood test can be performed to determine the amount of thyroid hormone in the patient's blood. The diagnosis usually is straightforward with this combination of clinical history, physical examination, and routine blood hormone tests. Radioimmunoassay, or a test to show concentrations of thyroid hormones with the use of a radioisotope (a chemical element that emits particles or energy) mixed with fluid samples, helps confirm the diagnosis. A thyroid scan is a nuclear medicine procedure involving injection of a radioisotope dye that tags the thyroid and helps produce a clear image of inflammation or involvement of the entire thyroid.

Other tests can determine thyroid function and thyroid-stimulating hormone levels. Ultrasonography (a test whereby high-frequency sound waves [ultrasound] are bounced off tissues and echoes are converted to pictures [sonograms]), computed tomography (CT) scan (an x-ray computer procedure that produces a detailed picture of a cross-section of the body), and magnetic resonance imaging (MRI; an x-ray technique that produces a detailed image of the inner body using a powerful magnet, radio waves, and a computer) may provide visual confirmation of a diagnosis or help to determine the extent of involvement.

Treatment

Alternative treatments for hyperthyroidism include nutritional therapy, herbal therapy, and **homeopathy**, the use of tiny doses of diluted and harmless remedies to catalyze healing.

Nutritional therapy

Consumption of foods such as broccoli, brussels sprouts, cabbage, cauliflower, kale, rutabagas, spinach, turnips, peaches, and pears can help naturally suppress thyroid hormone production. Dairy products and any stimulants such as tea, coffee, soda, and other caffeinated drinks should be avoided. Under the supervision of a trained physician, high dosages of certain vitamin/mineral combinations can help alleviate hyperthyroidism.

Homeopathy

An experienced homeopath may give patients specific remedies tailored to their overall personality profile as well as their specific symptoms. Symptomatic treatments may include Iodium or Natrum muriaticum.

Other therapies

Alternative treatments that may help relieve hyperthyroidism symptoms include **traditional Chinese medicine** and Western herbal medicine. **Stress** reduction techniques such as **meditation** also may prove beneficial. Patients should contact experienced herbalists for specific preparations and treatment.

Allopathic treatment

Allopathy is the theory or system of medical practice that combats disease by use of remedies that produce effects different from those produced by the disease. Treatment depends on the specific disease and individual circumstances such as age, severity of disease, and other conditions affecting a patient's health.

Anti-thyroid drugs

Anti-thyroid drugs often are administered to help the patient's body cease overproduction of thyroid hormones. Some drugs used to interfere with the thyroid gland's uptake of **iodine** are propylthiouracil (PTU) and methimazole (Tapazole). Medication may work for young adults, pregnant women, and others. Women who are pregnant should be treated with the lowest dose required to maintain thyroid function in order to minimize the risk of **hypothyroidism** (underactive thyroid gland function) in the infant.

Radioactive iodine

Radioactive iodine is often prescribed to damage cells that make thyroid hormone. The cells need iodine to make the hormone, so they absorb any iodine found in the body. The patient may take an iodine capsule daily for several weeks, resulting in the eventual shrinkage of the thyroid in size, reduced hormone production, and a return to normal blood levels. A single large oral dose of radioactive iodine simplifies treatment but should be given only to patients who are not of reproductive age or are not planning to have children, since a large amount can concentrate in the reproductive organs (gonads).

KEY TERMS

Goiter—Chronic enlargement of the thyroid gland.

Gonads—Organs that produce sex cells the ovaries and testes.

Metabolic—Pertaining to metabolism, or the chemical processes that take place in the body, which result in growth, energy, elimination of waste, and other body functions.

Palpitations—Rapid and forceful heartbeat.

Radioisotope—A form of a chemical element that emits radiation in the form of energy or small particles.

Thyroidectomy—Removal of the thyroid gland.

Surgery

Patients treated with thyroidectomy, in the form of partial or total removal of the thyroid, most often suffer from large goiter and have suffered relapses, even after repeated attempts to address the disease through drug therapy with iodine. Following thyroidectomy or iodine therapy, patients must be carefully monitored for years to watch for signs of hypothyroidism, or insufficient production of thyroid hormones, which can occur as a complication of thyroid production suppression.

Expected results

Hyperthyroidism generally is treatable and carries a good prognosis. Most patients lead normal lives with proper treatment. The majority of patients who receive radioactive iodine report feeling better within about three to six weeks of treatment. Thyroid storm, however, can be life-threatening and can lead to heart, liver, or kidney failure. Some patients who undergo radioactive iodine treatment or surgery become hypothyroid.

Prevention

As of 2008, there were no known prevention methods for hyperthyroidism, since its causes are

either inherited or not completely understood. The best prevention tactic is knowledge of family history and close attention to symptoms and signs of the disease. Careful attention to prescribed therapy can prevent complications of the disease.

Resources

BOOKS

Shomon, Mary J. *Living Well with Graves' Disease and Hyperthyroidism: What Your Doctor Doesn't Tell You . . . that You Need to Know*. Doughcloyne, Wilton, Cork, Ireland: Collins Press, 2005.

PERIODICALS

Idris, Iskandar, et al. "Effects of Maternal Hyperthyroidism during Early Gestation on Neonatal and Obstetric Outcome." *Clinical Endocrinology* (July 2006): 133 135.

"In Addition to Antithyroid Therapy, Some Patients with Graves' Hyperthyroidism May Require Treatment for Psychiatric and Ocular Symptoms." *Drugs & Therapy Perspectives* (September 2007): 13 16.

Martin, Teri, David A. Chiasson, and Stephen J. Kish. "Does Hyperthyroidism Increase Risk of Death Due to the Ingestion of Ecstasy?" *Journal of Forensic Sciences* (July 2007): 951 953.

Weeman, Anthony P. "Radioiodine Treatment for Benign Thyroid Diseases." *Clinical Endocrinology* (June 2007): 757 764.

OTHER

"Endocrine Disorders and Endocrine Surgery." Endocrine Web.com. http://www.endocrineweb.com. (March 9, 2008).

ORGANIZATIONS

Thyroid Foundation of America, One Longfellow Place, Suite 1518, Boston, MA, 02114, (800) 832 8321, http://www.tsh.org/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Hypnotherapy

Definition

Hypnotherapy is the treatment of a variety of health conditions by hypnotism or by inducing prolonged sleep.

Origins

Hypnotherapy is thought to date back to the healing practices of ancient Greece and Egypt. Many religions such as Judaism, Christianity, Islam, and others have attributed trance-like behavior to spiritual or divine possession.

Franz Mesmer *(Corbis-Bettmann. Reproduced by permission.)*

Austrian physician, Franz Mesmer (1734–1815), is credited with being the first person to scientifically investigate the idea of hypnotherapy, in 1779, to treat a variety of health conditions. Mesmer studied medicine at the University of Vienna and received his medical degree in 1766. Mesmer is believed to have been the first doctor to understand the relationship of psychological trauma to illness. He induced a trance-like state, which became known as mesmerism, in his patients to successfully treat nervous disorders. These techniques became the foundation for modern-day hypnotherapy.

Mesmer's original interest was in the effect of celestial bodies on human lives. He later became interested in the effects of magnetism, and found that magnets could have tremendous healing effects on the human body. Mesmer believed that the human body contained a magnetic fluid that promoted health and well being. It was thought that any blockage to the normal flow of this magnetic fluid would result in illness, and that the use of the Mesmerism technique could restore the normal flow.

Mesmer performed his technique by passing his hands up and down the patient's body. The technique was supposed to transmit magnetic fluid from his hands to the bodies of his patients. During this time period, there was no clear delineation between health conditions that were physical or psychological in

nature. Although Mesmer did not realize it at that time, his treatments were most effective for those conditions that were primarily psychosomatic.

Mesmer's technique appeared to be quite successful in the treatment of his patients, but he was the subject of scorn and ridicule from the medical profession. Because of all the controversy surrounding mesmerism, and because Mesmer's personality was quite eccentric, a commission was convened to investigate his techniques and procedures. A very distinguished panel of investigators included Benjamin Franklin, the French chemist Antoine-Laurent Lavoisier, and physician Jacques Guillotin. The commission acknowledged that patients did seem to obtain noticeable relief from their conditions, but the whole idea was dismissed as being medical quackery.

Other pioneers in this field, such as James Braid and James Esdaile discovered that hypnosis could be used to successfully anesthetize patients for surgeries. James Braid accidentally discovered that one of his patients began to enter a hypnotic state while staring at a fixed light as he waited for his eye examination to begin. Since mesmerism had fallen out of favor, Braid coined the term hypnotism, which is derived from the Greek word for sleep. Braid also used the techniques of monotony, rhythm, and imitation to assist in inducing a hypnotic state. These techniques are generally still in use.

Around 1900, there were very few preoperative anesthetic drugs available. Patients were naturally apprehensive when facing surgery. One out of 400 patients would die, not from the surgical procedure, but from the anesthesia. Dr. Henry Munro was one of the first physicians to use hypnotherapy to alleviate patient fears about having surgery. He would get his patients into a hypnotic state and discuss their fears with them, telling them they would feel a lot better following surgery. Ether was the most common anesthetic at that time, and Dr. Munro found that he was able to perform surgery using only about 10% of the usual amount of ether.

It took more than 200 years for hypnotherapy to become incorporated into medical treatment. In 1955, the British Medical Association approved the use of hypnotherapy as a valid medical treatment, with the American Medical Association (AMA) giving its approval in 1958.

Benefits

Hypnotherapy is used in a number of fields including **psychotherapy**, surgery, dentistry, research, and medicine. Hypnotherapy is commonly used as an alternative treatment for a wide range of health conditions, including weight control, **pain** management, and **smoking** cessation. It is also used to control pain in a variety of conditions such as **headache**, facial **neuralgia**, arthritis, **burns**, musculoskeletal disorders, **childbirth**, and many more. Hypnotherapy is being used in place of anesthesia, particularly in patients who prove to be allergic to anesthetic drugs, for surgeries such as hysterectomies, cesarean sections, certain cardiovascular procedures, thyroidectomy, and others. Dentistry is using hypnotherapy with success on patients who are allergic to all types of novocaine drugs. Hypnotherapy is also useful in helping patients overcome **phobias**.

Hypnotherapy is used for nonmedical patients as well as those who wish to overcome bad habits. Hypnotherapy has been shown to help those who suffer from performance **anxiety**, such as in sports, and speaking in public. In academic applications, it has also been shown to help with learning, participating in the classroom, concentrating, studying, focusing attention span, improving memory, and helping remove mental blocks about particular subjects.

In more general areas, hypnotherapy has been found to be beneficial for problems such as motivation, procrastination, decision making, personal achievement and development, job performance, buried or repressed memories, **relaxation**, and **stress** management.

Description

Hypnotherapy involves achieving a psychological state of awareness that is different from the ordinary state of consciousness. While in a hypnotic state, a variety of phenomena can occur. These phenomena include alterations in memory, heightened susceptibility to suggestion, paralysis, sweating, and blushing. All of these changes can be produced or removed in the hypnotic state. Many studies have shown that roughly 90% of the population is capable of being hypnotized.

This state of awareness can be achieved by relaxing the body, focusing on breathing, and shifting attention away from the external environment. In this state, the patient has a heightened receptivity to suggestion. The usual procedure for inducing a hypnotic trance in another person is by direct command repeated in a soothing, monotonous tone of voice.

Preparations

Ideally, the following conditions should be present to successfully achieve a state of hypnosis:

- willingness to be hypnotized
- rapport between the patient or client and the hypnotherapist
- a comfortable environment that is conducive to relaxation

Precautions

Hypnotherapy can have negative outcomes. When used as entertainment, people have been hypnotized to say or do things that would normally embarrass them. There have been instances where people already dangerously close to psychological breakdown have been pushed into an emotional crisis during what was supposed to be a harmless demonstration of hypnosis. A statement from the World Hypnosis Organization (WHO) warns against performing hypnosis on patients suffering from psychosis, organic psychiatric conditions, or antisocial personality disorders. Because there are no standard licensing requirements, in the wrong hands, there is a risk that the hypnotist will have difficulty in controlling or ending a hypnotic state that has been induced in the patient.

There is a commonly held belief that a person cannot be coerced into doing things that he or she would not normally do while under hypnosis. The hynotherapist should take care however, not to give suggestions during hypnosis that are contrary to the patient's moral code.

Many religions do not condone the practice of hypnotherapy. Leaders of the Jehovah's Witnesses and Christian Science religions oppose the use of hypnotherapy and advise their members to avoid it completely, whether for entertainment or therapy. The Church of Jesus Christ of Latter-Day Saints approves it for medical purposes, but cautions members against allowing themselves to be hypnotized for entertainment or demonstration purposes.

In 1985, The AMA convened a commission that warned against using hypnotherapy to aid in recollection of events. The commission cited studies that showed the possibility of hypnotic recall resulting in confabulation or an artificial sense of certainty about the course of events. As a result, many states limit or prohibit testimony of hypnotized witnesses or victims.

Side effects

Experiments have been conducted to determine any side effects of hypnotherapy. Some subjects have reported side effects such as headache, stiff neck, drowsiness, cognitive distortion or confusion, **dizziness**, and anxiety. However, most of these effects cleared up within several hours of the hypnotherapy session.

Research and general acceptance

Research on the effectiveness of hypnotherapy on a variety of medical conditions is extensive. In one study, the use of hypnotherapy did not seem to alter the core symptoms in the treatment of **attention-deficit hyperactivity disorder** (ADHD); however, it did seem useful in managing the associated symptoms including sleep disturbances and tics.

Hypnotherapy is being studied in children who have common, chronic problems and to aid in relieving pain. Children are particularly good candidates for hypnotherapy because their lack of worldly experience enables them to move easily between the rational world and their imagination. Studies with children have shown responses to hypnotherapy ranging from diminished pain and anxiety during a number of medical procedures, a 50% range in reduction of symptoms or a complete resolution of a medical condition, and a reduction in use of anti-nausea medication and **vomiting** during chemotherapy for childhood cancers.

In 2002, a report compiled several study results on hypnosis. One recent study evaluated how self&hypnosis relieved pain and anxiety in patients undergoing angioplasty with local anesthesia. Those patients needed less sedation and less procedure time. Another study found that pregnant adolescents counseled in hypnosis needed less anesthesia during delivery and less pain medication afterward. They also left the hospital sooner.

The use of hypnotherapy with **cancer** patients is another area being investigated. A meta-analysis of 116 studies showed positive results of using hypnotherapy with cancer patients. Ninety-two percent showed a positive effect on **depression**; 93% showed a positive effect on physical well-being; 81% showed a positive effect on vomiting; and 92% showed a positive effect on pain. In 2002, the National Hospice and Palliative Care Association reported that it recognizes hypnosis therapy as one effective tool to help terminally ill patients deal with their fears, feelings, emotions, and promote relaxation.

Training and certification

As of 2000, anyone could be a hypnotherapist. It is very easy to learn how to hypnotize someone, and the fact that hypnotism dates back to ancient times proves the ease with which a trance can be induced. There are no licensing procedures in place that limit the practice of hypnotherapy to medical professionals. Hypnotherapists are not regulated in any way; there are no uniform education or certification requirements to perform hypnotherapy.

The National Board for Hypnotherapy and Hypnotic Anaesthesiology (NBHA) has specific membership requirements, and also offers varying levels of professional recognition. Certification as a Clinical Hypnotherapist (C.Ht.) requires a minimum of 200 hours of classroom instruction, independent study and life learning experience in the medical, dental, psychological, or peer counseling professions. Certification as a Medical Hypnotherapist (C.M.H.) requires meeting the standards for the Clinical Hypnotherapist level plus attending a residential training course or home study training course that requires a clinical practicum/internship approved by the NBHA. Certification as a Hypno-Anesthesia Therapist (Ct.H.A.) requires the successful completion of an NBHA-approved course in Visualization and **Guided Imagery** for Pain Management, and a passing score on the examination. Certification as a Registered Hypnotic Anaesthesiologist (R.H.A.) requires two years of continuous membership in the NBHA at the Ct.H.A. level, and completion of advanced training seminars. The highest level of certification that can be obtained in this organization is Fellow (F.B.H.A.). Requirements for achieving this level of certification include membership at the R.H.A. level and a graduate degree from an accredited university, plus submitting a comprehensive thesis paper.

There is an ongoing debate regarding the issue of clinically trained versus lay hypnotists. The position of the American Society of Clinical Hypnotists (ASCH) is that the training of lay hypnotists is unethical. This organization supports only the training of those persons who are pursuing an advanced degree in the health sciences. ASCH further believes that hypnotherapy is a treatment modality to be used in conjunction with other forms of treatment, not a treatment that stands alone. Medical professionals believe that lay hypnotists keep the view of hypnotherapy in low esteem by the general public. They also believe that their practices are impacted economically by the lay hypnotists.

ASCH and the Society for Clinical and Experimental Hypnosis (SCEH) are two organizations that are trying to set up formal screening, training, and accrediting standards. Both of these organizations offer formal training to medical professionals at their annual meetings.

Resources

BOOKS

Elman, Dave. *Hypnotherapy*. California: Westwood Pub lishing Co., 1964.

Kappas, John G. *Professional Hypnotism Manual: Intro ducing Physical and Emotional Suggestibility and Sexuality*. California: Panorama Publishing Company, 1987.

Murphy, Michael. *The Future of the Body: Explorations Into the Further Evolution of Human Nature*. California: Jeremy P. Tarcher, Inc., 1992.

Shrader, Wesley. *The Amazing Power of Hypnosis: What It Can Do for You*. New York: Doubleday & Company, Inc., 1976.

Targ, Russell and Jane Katra. *Miracles of Mind: Exploring Nonlocal Consciousness and Spiritual Healing*. Califor nia: New World Library, 1998.

PERIODICALS

Baumgaertel, Anna. "Attention Deficit/Hyperactivity Dis order: Alternative and Controversial Treatments for Attention Deficit/Hyperactivity Disorder." *Pediatric Clinics of North America* (October 1999).

Devine, E.C., and S.K. Westlake. "The Effects of Psycho educational Care Provided to Adults with Cancer: Meta analysis of 116 Studies." *Oncology Nursing Forum* (1995).

"Hypnosis: Theory and Application Part II." *Harvard Mental Health Letter* (June 2002).

"Hypnotherapy is no Longer Just a Party Trick: Hospices can use it to Relieve Pain and Grief." *Hospice Man agement Advisor* (April 2002): 42 44.

Margolis, Clorinda G. "Hypnotic Trance: The Old and the New." *Primary Care Clinics in Office Practice*.

Newell, Sallie and Rob W. Sanson Fisher. "Australian Oncologists' Self reported Knowledge and Aattitudes about Non traditional Therapies used by Cancer Patients." *Medical Journal of Australia* (February 7, 2000).

ORGANIZATIONS

American Board of Hypnotherapy. 16842 Von Karman Avenue, Suite 476, Irvine, CA 92714. http://www. hypnosis.com/.

American Psychotherapy & Medical Hypnosis Association. 210 S. Sierra, Reno, NV 89501. http://members. xoom.com/Hypnosis/.

American Society of Clinical Hypnosis. 200 E. Devon Avenue, Des Plaines, IL 60018.

International Council for Medical and Clinical Therapists. 7361 McWhorter Place, Suite 300, Annandale, VA 22003 5469. http://www.ultradepth.com/ICMCT.htm.

International Medical and Dental Hypnotherapy Associa tion. 4110 Edgeland, Suite 800, Royal Oak, MI 48073 2285. http://www.infinityinst.com.

The National Board for Hypnotherapy and Hypnotic Anaesthesiology. 7841 West Ludlow Drive, Suite A, Peoria, AZ 85381. http://www.nbha medicine.com/ index.html.

National Guild of Hypnotists. PO Box 308, Merrimack, NH. http://www.ngh.net

Society for Clinical and Experimental Hypnosis. 6728 Old McLean Village Drive, McLean, VA 22101.

World Hypnosis Organization, Inc. 2521 W. Montrose Avenue, Chicago, IL 60618. http://www.worldhypnosis.org/about.html.

Kim Sharp
Teresa G. Odle

Hypoglycemia

Definition

Hypoglycemia is a condition in which one's blood sugar falls to abnormally low levels.

Description

Carbohydrates are the main dietary source of the glucose that is absorbed into the bloodstream and used to fuel the body's cells and organs. Glucose concentration is controlled by hormones, primarily insulin and glucagon. Glucose concentration is also controlled by epinephrine (adrenalin) and norepinephrine, as well as growth hormone. If these regulators are not working properly, levels of blood sugar can become either excessive (as in hyperglycemia) or inadequate (as in hypoglycemia). If individuals have a blood sugar level of 70 mg/dL or less, they are considered hypoglycemic, although glucose levels vary widely from one person to another.

Hypoglycemia can occur in several ways.

Drug-induced hypoglycemia

Drug-induced hypoglycemia, a complication of diabetes, is the most commonly seen and most dangerous form of hypoglycemia.

Hypoglycemia occurs most often in diabetics who must inject insulin periodically to lower their blood sugar. While other diabetics are also vulnerable to low blood sugar episodes, they have a lower risk of a serious outcome than do insulin-dependent diabetics. Unless recognized and treated immediately, severe hypoglycemia in the insulin-dependent diabetic can lead to generalized convulsions followed by amnesia and unconsciousness. Death, though rare, is a possible outcome.

In insulin-dependent diabetics, hypoglycemia known as an insulin reaction or insulin shock can be caused by several factors. These include overmedicating with manufactured insulin, missing or delaying a meal, eating too little food for the amount of insulin taken, exercising too strenuously, drinking too much alcohol, or any combination of these factors.

Reactive hypoglycemia

Reactive hypoglycemia (also called idiopathic postprandial hypoglycemia) occurs two to four hours after consumption of a high-carbohydrate meal. A number of kinds of reactive hypoglycemia have been identified. They occur as the result of a deficiency of certain essential hormones or enzymes or problems with the digestive system, especially as the result of stomach surgery. In some cases, this form of hypoglycemia appears to be associated with malfunctions or diseases of the liver, pituitary, adrenals, liver, or pancreas. Children intolerant of a natural sugar (fructose) or who have inherited defects that affect digestion may also experience hypoglycemic attacks. Some children with a negative reaction to aspirin also experience reactive hypoglycemia. It sometimes occurs among people with an intolerance to the sugar found in milk (galactose), and it also often begins before the onset of diabetes.

Fasting hypoglycemia

Fasting hypoglycemia sometimes occurs after long periods without food, but it also happens occasionally following strenuous **exercise**, such as running in a marathon.

Other factors sometimes associated with hypoglycemia are:

- pregnancy
- a weakened immune system
- a poor diet high in simple carbohydrates
- prolonged use of drugs, including antibiotics
- chronic physical or mental stress
- heartbeat irregularities (arrhythmias)
- allergies
- breast cancer
- high blood pressure treated with beta-blocker medications (after strenuous exercise)
- upper gastrointestinal tract surgery

Causes and symptoms

When carbohydrates are eaten, they are converted to glucose that goes into the bloodstream and is distributed throughout the body. Simultaneously, a combination of chemicals that regulate how the body's cells absorb that sugar is released from the liver, pancreas, and adrenal glands. These chemical regulators include insulin, glucagon, epinephrine (adrenalin),

and norepinephrine. The mixture of these regulators released following digestion of carbohydrates is never the same, since the amount of carbohydrates that are eaten is never the same.

Interactions among the regulators are complicated. Any abnormalities in the effectiveness of any one of the regulators can reduce or increase the body's absorption of glucose. Gastrointestinal enzymes such as amylase and lactase that break down carbohydrates may not be functioning properly. These abnormalities may produce hyperglycemia or hypoglycemia and can be detected when the level of glucose in the blood is measured.

Cell sensitivity to these regulators can be changed in many ways. Over time, a person's **stress** level, exercise patterns, advancing age, and dietary habits influence cellular sensitivity. For example, a diet consistently overly rich in carbohydrates increases insulin requirements over time. Eventually, cells can become less receptive to the effects of the regulating chemicals, which can lead to glucose intolerance.

Diet is both a major factor in producing hypoglycemia as well as the primary method for controlling it. **Diets** typical of western cultures contain excess refined carbohydrates, especially in the form of simple carbohydrates such as sweeteners, which are more easily converted to sugar. In poorer parts of the world, the typical diet contains even higher levels of carbohydrates. Fewer dairy products and meat are eaten, and grains, vegetables, and fruits are consumed. This dietary trend is balanced, however, since people in these cultures eat more complex carbohydrates, eat smaller meals, and usually use carbohydrates more efficiently through physical labor.

Early symptoms of severe hypoglycemia, particularly in the drug-induced type of hypoglycemia, resemble an extreme shock reaction. Symptoms include:

- cold and pale skin
- numbness around the mouth
- apprehension
- heart palpitations
- emotional outbursts
- hand tremors
- mental cloudiness
- dilated pupils
- sweating
- fainting

Mild attacks, however, are more common in reactive hypoglycemia and are characterized by extreme tiredness. Patients first lose their alertness, then their muscle strength and coordination. Thinking grows fuzzy, and finally patients become so tired that they become "zombie-like," awake but not functioning. Sometimes they actually fall asleep. Unplanned naps are typical of the chronic hypoglycemic patient, particularly following meals.

Additional symptoms of reactive hypoglycemia include headaches, double vision, staggering or an inability to walk, a craving for salt and/or sweets, abdominal distress, premenstrual tension, chronic **colitis**, **allergies**, ringing in the ears, unusual patterns in the frequency of urination, skin eruptions and inflammations, **pain** in the neck and shoulder muscles, memory problems, and sudden and excessive sweating.

Unfortunately, a number of these symptoms mimic those of other conditions. For example, the **depression**, **insomnia**, irritability, lack of concentration, crying spells, **phobias**, forgetfulness, confusion, unsocial behavior, and suicidal tendencies commonly seen in nervous system and psychiatric disorders may also be hypoglycemic symptoms. It is very important that anyone with symptoms that may suggest reactive hypoglycemia see a doctor.

Because all of its possible symptoms are not likely to be seen in any one person at a specific time, diagnosing hypoglycemia can be difficult. One or more of its many symptoms may be due to another illness. Symptoms may persist in a variety of forms for long periods of time. Symptoms can also change over time within the same person. Factors that can influence symptoms include physical or mental activities, physical or mental state, the amount of time passed since the last meal, the amount and quality of sleep, and exercise patterns.

Diagnosis

Drug-induced hypoglycemia

Once diabetes is diagnosed, patients then monitor their blood sugar level with a portable machine called a glucometer. The diabetic places a small blood sample on a test strip that the machine can read. If the test reveals that the blood sugar level is too low, the diabetic can make a correction by eating or drinking additional carbohydrates.

Reactive hypoglycemia

Reactive hypoglycemia can be diagnosed only by a doctor. Symptoms usually improve after the patient has gone on an appropriate diet. Reactive hypoglycemia was diagnosed more frequently in the 1980s and 1990s than it is in the late 2000s. Studies have shown

that most people suffering from its symptoms test normal for blood sugar, leading many doctors to suggest that actual cases of reactive hypoglycemia are quite rare. Some doctors think that people with hypoglycemic symptoms may be particularly sensitive to the body's normal postmeal release of the hormone epinephrine or are actually suffering from some other physical or mental problem. Other doctors believe reactive hypoglycemia is actually the early onset of diabetes that occurs after a number of years. In the late 2000s there continues to be disagreement about the cause or causes of reactive hypoglycemia.

A common test to diagnose hypoglycemia is the extended oral glucose tolerance test. Following an overnight fast, a concentrated solution of glucose is drunk and blood samples are taken hourly for five to six hours. Though this test remains helpful in early identification of diabetes, its use in diagnosing chronic reactive hypoglycemia has lost favor because it can trigger hypoglycemic symptoms in people with otherwise normal glucose readings. As of 2008 some doctors recommend that blood sugar be tested at the actual time a person experiences hypoglycemic symptoms.

Treatment

Treatment of the immediate symptoms of hypoglycemia can include eating sugar. For example, a patient can eat a piece of candy, drink milk, or drink fruit juice. Glucose tablets can be used by patients, especially those who are diabetic. Effective treatment of hypoglycemia over time requires the patient to follow a modified diet. Patients are usually encouraged to eat small, but frequent, meals throughout the day, avoiding excess simple sugars (including alcohol), fats, and fruit drinks.

One of the herbal remedies commonly suggested for hypoglycemia is a decoction (an extract made by boiling) of gentian (*Gentiana lutea*). It should be drunk warm 15–30 minutes before a meal. Gentian is believed to help stimulate the endocrine (hormone-producing) glands.

In addition to the dietary modifications recommended above, people with hypoglycemia may benefit from supplementing their diet with **chromium**, which is believed to help improve blood sugar levels. Chromium is found in whole grain breads and cereals, cheese, molasses, lean meats, and **brewer's yeast**. Eating oats can help stabilize blood sugar levels. Daily supplements of **vitamin E** are also recommended. Hypoglycemics should avoid alcohol, **caffeine**, and cigarette smoke, since these substances can cause significant swings in blood sugar levels.

Allopathic treatment

Those patients with severe hypoglycemia may require fast-acting glucagon injections that can stabilize their blood sugar within approximately 15 minutes.

Prevention

Drug-induced hypoglycemia

Preventing hypoglycemic insulin reactions in diabetics requires taking glucose readings through frequent blood sampling. Insulin can then be regulated based on those readings. Maintaining proper diet is also a factor. Programmable insulin pumps implanted under the skin have proven useful in reducing the incidence of hypoglycemic episodes for insulin-dependent diabetics. Drug manufacturers have also developed a number of insulin analogs, forms of insulin produced by recombinant DNA (genetic engineering) technology that can be used in place of natural insulin. Some examples of these analogs are lispro (Humalog), aspart (NovoLog), insulin glulisine (Apidra), insulin glargine (Lantus), and insulin detemir (Levemir).

Reactive hypoglycemia

The onset of reactive hypoglycemia can be avoided or at least delayed by following the same kind of diet used to control it. While not as restrictive as the diet diabetics must follow to keep tight control over their disease, it is quite similar.

There are a variety of diet recommendations for the reactive hypoglycemic. Patients should:

- Avoid overeating.
- Never skip breakfast.
- Include protein in all meals and snacks, preferably from sources low in fat, such as the white meat of chicken or turkey, most fish, soy products, or skim milk.
- Restrict intake of fats (particularly saturated fats, such as animal fats), and avoid refined sugars and processed foods.
- Keep a "food diary." Until the diet is stabilized, patients should note what and how much they eat and drink at every meal. If symptoms appear following a meal or snack, patients should note them and look for patterns.

KEY TERMS

Adrenal glands—Two organs that sit atop the kidneys, which make and release hormones such as epinephrine.

Epinephrine—Also called adrenalin, a secretion of the adrenal glands (along with norepinephrine) that helps the liver release glucose and limits the release of insulin. Norepinephrine is both a hormone and a neurotransmitter, a substance that transmits nerve signals.

Fructose—A type of natural sugar found in many fruits, vegetables, and in honey.

Glucagon—A hormone produced in the pancreas that raises the level of glucose in the blood. An injectable form of glucagon, which can be bought in a drug store, is sometimes used to treat insulin shock.

Postprandial—After eating or after a meal.

- Eat fresh fruits, but restrict the amount eaten at one time. Patients should remember to eat a source of protein whenever they eat high sources of carbohydrate such as fruit. Apples make particularly good snacks because, of all fruits, the carbohydrate in apples is digested most slowly.
- Follow a diet that is high in fiber. Fruit is a good source of fiber, as is oatmeal and oat bran, which slows the buildup of sugar in the blood during digestion.

A doctor can recommend a proper diet, and there are many cookbooks available for diabetics. Recipes found in such books are equally effective in helping to control hypoglycemia.

Expected results

Like diabetes, there is no cure for reactive hypoglycemia, only ways to control it. While some chronic cases continue through life (rarely is there complete remission of the condition), others develop into type II (age onset) diabetes. Hypoglycemia appears to have a higher-than-average incidence in families in which there has been a history of hypoglycemia or diabetes among their members, but whether hypoglycemia is a controllable warning of oncoming diabetes had not been determined by clinical research as of 2008.

Resources

BOOKS

Chow, James, and Cheryl Chow. *Hypoglycemia for Dummies*. Indianapolis, IN: For Dummies, 2007.

Flagg, Anita. *Hypoglycemia: The Other Sugar Disease*. Ottawa, Canada: Book Coach Press, 2006.

PERIODICALS

Briscoe, Vanessa J., Donna Bowman Tate, and Stephen Neil Davis. "Type 1 Diabetes: Exercise and Hypoglycemia." *Applied Physiology, Nutrition, and Metabolism* (June 2007): 576 582.

Deiss, Dorothee, et al. "Treatment with Insulin Glargine Reduces Asymptomatic Hypoglycemia Detected by Continuous Subcutaneous Glucose Monitoring in Children and Adolescents with Type 1 Diabetes." *Pediatric Diabetes* (June 2007): 157 162.

DiNardo, Monica, et al. "The Medical Emergency Team and Rapid Response System: Finding, Treating, and Preventing Hypoglycemia." *Joint Commission Journal on Quality and Patient Safety* (October 2006): 591 595.

Papanikolaou, Y., et al. "Better Cognitive Performance Following a Low glycaemic Index Compared with a High glycaemic index Carbohydrate Meal in Adults with Type 2 Diabetes." *Diabetologia* (March 2006): 855 862.

ORGANIZATIONS

Hypoglycemia Support Foundation, PO Box 451778, Sun rise, FL, 33345, http://www.hypoglycemia.org/.

National Institute of Diabetes and Digestive and Kidney Diseases, Office of Communications and Public Liai son, Building 31, Room 9A06, 31 Center Dr., MSC 2560, Bethesda, MD, 20892 2560, (301) 496 3583, http://www2.niddk.nih.gov/.

Paula Ford-Martin
Teresa G. Odle
David Edward Newton, Ed.D.

Hypothyroidism

Definition

Hypothyroidism occurs when there are abnormally low amounts of thyroid hormones in the bloodstream. The condition develops when the thyroid gland fails to produce or secrete as much thyroxine (T_4) and/or triiodothyronine (T_3) as the body needs. Because T_3 and T_4 regulate such essential functions as heart rate, digestion, physical growth, and mental development, an insufficiency of these hormones can slow life-sustaining processes, damage organs and tissues in every part of the body, and lead to life-threatening complications.

Symptoms of hypothyroidism

Goiter

Unexplained weight gain

Tingling or numbness in the hands

Heightened sensitivity to cold

Lethargy

Decreased heart rate

Hoarse voice

Pain, stiffness or swelling in your joints

Elevated blood cholesterol level

Muscle ache, weakness, or stiffness

Heavier than normal menstrual periods

(Illustration by Corey Light. Cengage Learning, Gale)

Description

Hypothyroidism is one of the most common chronic diseases in the United States. Symptoms may not appear until years after the thyroid has stopped functioning, and they are often mistaken for signs of other illnesses, **menopause**, or **aging**. Although this condition is believed to affect as many as 11 million adults and children, as many as two of every three people with hypothyroidism may not know they have the disease.

The thyroid gland influences almost every organ, tissue, and cell in the body. It is shaped like a butterfly and located just below the Adam's apple. The thyroid stores **iodine** the body gets from food and uses this mineral to synthesize T_4 and T_3. T_3 is also produced outside the thyroid gland by the deiodination (removal of iodine) from T_4. This process actually accounts for more than half of the T_3 that circulates in the bloodstream. Low thyroid hormone levels can alter weight, appetite, sleep patterns, body temperature, sex drive, and a variety of other physical, mental, and emotional characteristics.

Scientists know of three types of hypothyroidism. The most common is primary hypothyroidism, in which the thyroid does not produce an adequate amount of T_4. Secondary hypothyroidism develops when the pituitary gland does not release enough of the thyroid-stimulating hormone (TSH) that prompts the thyroid to manufacture T_4. Tertiary hypothyroidism results from a malfunction of the hypothalamus, the part of the brain that controls the endocrine system. Drug-induced hypothyroidism, an adverse reaction to medication, occurs in two of every 10,000 people, but rarely causes severe hypothyroidism.

Hypothyroidism is at least twice as common in women as it is in men. Although hypothyroidism is most common in women who are middle-aged or older, the disease can occur at any age. Newborn infants are tested for congenital (acquired in uterus) thyroid deficiency (cretinism) using a test that measures the levels of thyroxine and TSH in the infant's blood. Treatment within the first few months of life can prevent mental retardation and physical abnormalities. Older children who develop hypothyroidism suddenly stop growing.

Factors that increase a person's risk of developing hypothyroidism include age, weight, and medical history. Women are more likely to develop the disease after age 50; men, after age 60. **Obesity** (excessively fat condition) also increases the risk. A family history of thyroid problems or a personal history of high **cholesterol** levels or such autoimmune diseases as lupus, **rheumatoid arthritis**, or diabetes can make an individual more susceptible to hypothyroidism.

Causes and symptoms

Hypothyroidism is most often the result of Hashimoto's disease, also known as chronic thyroiditis (inflammation of the thyroid gland). In this disease, the immune system fails to recognize that the thyroid gland is part of the body's own tissue and attacks it as if it were a foreign body. The attack by the immune system impairs thyroid function and sometimes destroys the gland. Other causes of hypothyroidism include:

- Radiation (the process whereby an element such as radium emits rays). Radioactive (the quality some atoms have of producing energy) iodine used to treat hyperthyroidism (overactive thyroid) or radiation treatments for head or neck cancers can destroy the thyroid gland
- Surgery. Removal of the thyroid gland because of cancer or other thyroid disorders can result in hypothyroidism
- Viruses (very small organisms that cause disease) and bacteria (one-cell organisms that divide and can cause disease). Infections that depress thyroid hormone production usually cause permanent hypothyroidism.

- Human immunodeficiency virus (HIV). Among viruses, HIV, the virus that causes acquired immunodeficiency syndrome (AIDS), may cause overt hypothyroidism.
- Medication. Nitroprusside, lithium, or iodides can induce hypothyroidism. Because patients who use these medications are closely monitored by their doctors, this side effect is very rare.
- Pituitary gland malfunction. In this rare condition the pituitary gland fails to produce enough TSH to activate the thyroid's production of T_4.
- Congenital defect. One of every 4,000 babies is born without a properly functioning thyroid gland.
- Diet. Because the thyroid makes T_4 from iodine contained in food, an iodine-deficient diet can cause hypothyroidism. Adding iodine to table salt and other common foods has all but eliminated iodine deficiency in the United States. Certain foods (cabbage, rutabagas, peanuts, peaches, soybeans, spinach) can interfere with thyroid hormone production.
- Environmental contaminants. Certain industrial chemicals, such as PCBs, found in the local environment at high levels also may cause hypothyroidism.

Hypothyroidism sometimes is referred to as a silent disease because early symptoms may be so mild that no one realizes anything is wrong. Untreated symptoms become more noticeable and severe and can lead to confusion and mental disorders, breathing difficulties, heart problems, fluctuations in body temperature, and death.

Someone who has hypothyroidism will probably have more than one of the following symptoms:

- fatigue
- decreased heart rate
- progressive hearing loss
- weight gain
- problems with memory and concentration
- depression
- goiter (enlarged thyroid gland)
- muscle pain or weakness
- loss of interest in sex; decreased libido
- numb, tingling hands
- dry skin
- swollen eyelids
- dryness, loss, or premature graying of hair
- extreme sensitivity to cold
- constipation
- irregular menstrual periods
- hoarse voice

Hypothyroidism usually develops gradually. When the disease results from surgery or other treatment for **hyperthyroidism**, symptoms may appear suddenly and include severe **muscle cramps** in the arms, legs, neck, shoulders, and back. It is important to see a doctor if any of these symptoms appear unexpectedly. When hypothyroidism remains undiagnosed and untreated, a person may eventually develop myxedema. Symptoms of this rare but potentially deadly complication include enlarged tongue, swollen facial features, hoarseness, and physical and mental sluggishness.

Myxedema coma can cause unresponsiveness, irregular and shallow breathing, and a drop in blood pressure and body temperature. The onset of this medical emergency can be sudden in people who are elderly or have been ill, injured, or exposed to very cold temperatures; who have recently had surgery; or who use sedatives or antidepressants. Without immediate medical attention, myxedema coma can be fatal.

Diagnosis

The diagnosis of hypothyroidism is based on the patient's observations, medical history, physical examination, and thyroid function tests. Doctors who specialize in treating thyroid disorders (endocrinologists) are most apt to recognize subtle symptoms and physical indications of hypothyroidism. A blood test known as a thyroid-stimulating hormone (TSH) assay tests of T_4 and T_3 levels; a thyroid nuclear medicine scan and thyroid ultrasound are used to confirm the diagnosis. A woman being tested for hypothyroidism should let her doctor know if she is pregnant or breastfeeding. All patients should be sure their doctors are aware of any recent procedures involving radioactive materials or contrast media.

The TSH assay is extremely accurate, but some doctors doubt the test's ability to detect mild hypothyroidism. They advise patients to monitor their basal (resting) body temperature for below-normal readings that could indicate the presence of hypothyroidism. These readings should be taken for five consecutive days, starting on the second day of the menstrual cycle for female patients.

Treatment

Alternative treatments are aimed primarily at strengthening the thyroid gland and will not eliminate the need for thyroid hormone medications. They include nutritional therapy, herbal therapy, and **exercise**.

Nutritional therapy

If a person is experiencing symptoms resembling those of hypothyroidism, it is best to talk to a family physician immediately for appropriate diagnosis and treatments. Nutritional therapy should only be complementary and not be used to replace conventional treatment for this disorder. In 2004, a study found that feeding soy formula to infants with congenital hypothyroidism led to prolonged increases in TSH levels. The study authors recommended close follow-up and frequent TSH measures if infants are put on soy-based formulas.

A naturopath or a nutritionist may recommend the following dietary changes to improve mild hypothyroidism:

- Avoiding eating the following raw foods: cabbage, mustard, spinach, cassava roots, peanuts, soybeans, and peaches. They may interfere with thyroid hormone production if not cooked.
- Eating foods with high iodine content such as fish, shellfish, and seaweed.
- Taking multivitamin and mineral supplements daily. Vitamins A, B_2, B_3, B_6, E, and zinc are needed for normal thyroid hormone production.
- Strengthening thyroid function with thyroid preparations sold at local food stores. They are used to treat mild hypothyroidism only. Available products include thyroid extracts, iodine, zinc, or tyrosine. Most Americans may not need iodine supplements as the daily requirement can easily be met by eating iodine-rich foods or using iodized salt. Consuming more than 600 mcg of iodine per day may result in harmful or toxic effects

Herbal therapies

Herbal remedies to improve thyroid function and relieve thyroid symptoms include **Siberian ginseng** (for treatment of **fatigue**), *Panax ginseng,* and **bladderwrack** (*Fucus vesiculosus,*) which can be taken in capsule form or as a tea.

Homeopathic remedies

Homeopathic treatments (tiny doses of diluted, safe remedies to promote healing) may gradually reduce the need for supplemental thyroid hormone in some patients. Homeopathic remedies for hypothyroidism include homeopathic thyroid as well as others based on the patient's individualized symptoms.

Exercise

Exercise improves thyroid function by stimulating more production of thyroid hormone and making body tissues more responsive to the effects of thyroid hormone. It also increases the metabolic (chemical changes in cells providing energy to the body) rate and helps hypothyroid patients lose weight.

KEY TERMS

Cretinism—Severe hypothyroidism that is present at birth.

Endocrine system—The network of glands that produces hormones and releases them into the bloodstream. The thyroid gland is part of the endocrine system.

Hypothalamus—The part of the brain that controls the endocrine system.

Myxedema—A condition that can result from a thyroid gland that produces too little of its hormone. In addition to a decreased metabolic rate, symptoms may include anemia, slow speech, an enlarged tongue, puffiness of the face and hands, hair loss, coarse and thickened skin, and sensitivity to cold.

Pituitary gland—A small oval endocrine gland attached to the hypothalamus. The pituitary gland releases TSH, the hormone that activates the thyroid gland.

Thyroid-stimulating hormone (TSH)—A hormone secreted by the pituitary gland that controls the release of T_4 by the thyroid gland.

Thyroxine (T_4)—A thyroid hormone that regulates many essential body processes.

Triiodothyronine (T_3)—A thyroid hormone similar to thyroxine but more powerful. Preparations of triiodothyronine are used in treating hypothyroidism.

Allopathic treatment

In allopathic treatment—medical practice that combats disease with remedies that produce effects different from those produced by the disease—natural or synthetic thyroid hormones are used to restore normal (euthyroid) thyroid hormone levels. Synthroid, or synthetic T_4, is easy to take and works for about 80% of patients. In addition, some patients need additional T_3. However, physicians typically disagree about adding this therapy. Synthetic hormones are at least as effective as natural substances, but it may take several months to determine the correct dosage. Patients start to feel better within 48 hours, but symptoms return if they stop taking the medication.

Many doctors prescribe levothyroxine **sodium** tablets, and many people with hypothyroidism take the medication for the rest of their lives. Aging, other medications, and changes in weight and general health can affect how much replacement hormone a patient needs, and regular TSH tests are used to monitor hormone levels. Patients should not switch from one brand of thyroid hormone to another without a doctor's permission.

Possible side effects of too much T_4 or T_3 include **osteoporosis** (after long-term use), occasional **anxiety**, heart palpitations (very fast, strong heartbeat), **insomnia**, and occasional episodes of mania (acting crazed).

Regular exercise and a **high-fiber diet** can help maintain thyroid function and prevent **constipation**.

Expected results

Thyroid hormone replacement therapy generally maintains normal thyroid hormone levels unless treatment is interrupted or discontinued.

Prevention

Primary hypothyroidism cannot be prevented, but routine screening of adults can detect the disease in its early stages and prevent complications.

Resources

BOOKS

Barnes, Kathleen. *User's Guide to Thyroid Disorders*. Laguna Beach, CA: Basic Health, 2006.

Rone, James K. *The Thyroid Paradox: How to Get the Best Care for Hypothyroidism*. Laguna Beach, CA: Basic Health, 2007.

Shomon, Mary J. *Living Well with Hypothyroidism: What Your Doctor Doesn't Tell You . . . that You Need to Know*. Doughcloyne, Wilton, Cork, Ireland: Collins Press, 2005.

Starr, Mark. *Hypothyroidism Type 2: The Epidemic*. Irvine, CA: New Voice, 2005.

PERIODICALS

Cortinovis, Francesca, et al. "Thyroid Scintigraphy and Perchlorate Test after Recombinant Human TSH: A New Tool for the Differential Diagnosis of Congenital Hypothyroidism during Infancy." *European Journal of Nuclear Medicine and Molecular Imaging* (September 2007): 1498 1503.

Kordonouri, Olga, et al. "Early Treatment with L thyroxine in Children and Adolescents with Type 1 Diabetes, Positive Thyroid Antibodies, and Thyroid Gland Enlargement." *Pediatric Diabetes* (August 2007): 180 184.

Kyriazopoulou, Venetsana, et al. "Recommendations for Thyroxin Therapy during Pregnancy." *Expert Opinion on Pharmacotherapy* (February 2008): 421 427.

Pearce, Elizabeth N. "Thyroid Dysfunction in Perimeno pausal and Postmenopausal Women." *Menopause International* (March 2007): 8 13.

Weetman, Anthony P. "Radioiodine Treatment for Benign Thyroid Diseases." *Clinical Endocrinology* (June 2007): 757 764.

ORGANIZATIONS

American Thyroid Association, 6066 Leesburg Pike, Suite 550, Falls Church, VA, 22041, (703) 998 8890, http://www.thyroid.org.

Endocrine Society, 8401 Connecticut Ave., Suite 900, Chevy Chase, MD, 20815, (301) 941 0200, http://www.endosociety.org/.

Thyroid Foundation of America, One Longfellow Place, Suite 1518, Boston, MA, 02114, (800) 832 8321, http://www.tsh.org/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Hyssop

Description

Hyssop (*Hyssopus officinalis*) is a member of the Lamiaceae or mint family. This aromatic evergreen, classified by botanists as a sub-shrub, should not be confused with several distinct species of plants also called hyssop, including giant hyssop, hedge hyssop, prairie hyssop, or wild hyssop. Hyssop is native to southern Europe and Asia. The London surgeon and apothecary John Gerard, author of the *Herball or Generall Historie of Plantes* brought hyssop to England in 1597. The attractive herb soon became a component in many ornamental knot gardens. The sun-loving hyssop has naturalized throughout North America, and grows wild in chalky soil and on dry and rocky slopes in the Mediterranean.

Hyssop has a short and fibrous rhizome. The stalk emerges from a woody base and divides into numerous erect, square, and branching stems that may reach a height of 2 ft (61 cm). The small leaves are opposite, without stems, and lance-shaped, with fine hairs and smooth margins. They have a somewhat bitter taste. Flowers have a tubular, two-lipped corolla, and four stamens. They bloom in successive whorls in the leaf axils at the top of the stems, only growing along one side. The blooms may be in shades of rose, purple, mauve, blue, and sometimes white, depending on the variety. Hyssop comes into flower from June through October, and the blossoms are well loved by bees. The

perennial hyssop is a sweet and warming aromatic with a camphor-like scent. This garden favorite is especially useful in companion planting. Hyssop attracts the white butterfly, a pest to cabbage and broccoli, thus sparing the food crops from the infestation. The herb also has been used to increase the yield of grapevines and the flavor of the fruit when it is planted nearby.

The Hebrew people called this herb *azob*, meaning "holy herb." Hyssop was used in ancient times as a cleansing herb for temples and other sacred places. It was also used to repel insects. The Romans used hyssop to bring protection from the plague, and prepared an herbal wine containing hyssop. In ancient Greece, the physicians Galen and Hippocrates valued hyssop for inflammations of the throat and chest, pleurisy, and other bronchial complaints. In the early seventeenth and eighteenth centuries, hyssop tea and tincture were used to treat **jaundice** and dropsy.

General use

The flowers and leaves of hyssop are considered medicinally valuable by some herbalists; however, the German Commission E has not approved hyssop for any medicinal purposes. The herb has some antimicrobial and antiviral properties. It is especially useful in helping the immune system to combat respiratory infections and colds. Hyssop, taken in a warm infusion, acts as an expectorant and will help to expel phlegm and break up congestion in the lungs. It is frequently recommended for the treatment of congested sinuses and catarrh. It is also a beneficial herb for treatment of the **cold sore** virus, *Herpes simplex*. An infusion has also been used to relieve the distress of **asthma**. Hyssop is a diaphoretic, and acts to promote perspiration. It will help to reduce fever and eliminate toxins through the skin. Hyssop also acts as a carminative and digestive aid, relieving flatulence and relaxing the digestive system. This versatile herb is also a nervine, which calms anxiety. It is useful in children's digestive and respiratory herbal formulas, as well.

Used externally as a skin wash, a decoction of the flowering tops can help the healing of **burns** and relieve skin inflammations. The fresh, crushed leaves promote healing of bruises, and relieve the discomfort of insect **bites** and stings. When applied as a hair rinse, hyssop may help eliminate head lice. Hyssop preparations have also been used to relieve muscular pain and rheumatism when taken as a tea or as a bath additive. The hot vapors of a steaming decoction of hyssop may bring relief for **earache** and inflammation.

KEY TERMS

Carminative—Any medication or preparation given to expel gas from the digestive tract.

Catarrh—Inflammation of the mucous membranes in the respiratory tract accompanied by heavy secretions.

Diaphoretic—A medication or herbal preparation given to induce or increase perspiration.

Essential oil—A concentrated oil that has been distilled from a plant, usually by the steam method.

Expectorant—A drug given to help bring up mucus or phlegm from the respiratory tract.

Infusion—A method for releasing the herbal essence of herbal leaves and flowers by pouring boiling water over the plant matter and allowing it to steep.

Nervine—A type of medication or herbal preparation given to calm the nerves.

Rhizome—A horizontal underground stem that sends up shoots from its upper surface.

Tincture—The concentrated solution of an herbal extract, usually made with alcohol.

A research study published in 2002 confirmed the results of studies done in the early 1990s, which found that hyssop leaf extract demonstrates strong anti-HIV activity. The specific compounds responsible for this antiviral action, however, were not identified in these studies. Moreover, none of these studies tested the efficacy of hyssop in human subjects. The volatile oil of hyssop contains camphene, pinenes, terpinene, the glycoside hyssopin, flavonoids (including diosmin and **hesperidin**), tannins, acids, resin, gum, and the bitter substance known as marrubiin. Marrubiin is also found in white horehound (*Marrubium vulgare*).

More recently, researchers have discovered that essential oil of hyssop is an effective muscle relaxant. The component that has been identified as most likely responsible for this effect is isopinocamphone.

Preparations

Harvest hyssop when the herb reaches a height of about 1.5 ft (46 cm). Frequent cuttings from the tops of mature plants will keep the foliage tender for use in salads, soups, or teas. Used sparingly in culinary preparations, hyssop's tender shoots are a digestive aid, especially with greasy meats. When harvesting the

herb for medicinal uses, the flowering tops are used. Gather the herb on a sunny August day after the dew has dried. Hang the branches to dry in a warm, airy room out of direct sunlight. Remove leaves and flowers from the stems and store in clearly labeled, tightly sealed, dark-glass containers.

Infusion: Place 3 Tbsp dried, or twice as much fresh, hyssop leaf and blossom in a warm glass container. Bring 2.5 cups of fresh, nonchlorinated water to the boiling point, and add it to the herbs. Cover and infuse the tea for 10–15 minutes. Strain and drink warm. The prepared tea will store for about two days if kept in a sealed container in the refrigerator. Hyssop tea may be enjoyed by the cupful up to three times a day. Hyssop may be combined with white **horehound** for additional expectorant action to relieve coughs. For sore throats, a warm infusion of hyssop combined with sage (*Salvia officinalis*) is a home remedy recommended by some herbalists.

Tincture: Combine four ounces of finely-cut fresh or powdered dry herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts. Place the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly-capped, dark glass bottle. A standard dose is 1–2 ml of the tincture three times a day.

Essential oil: The commercially available essential oil of hyssop is obtained by steam distillation of the flowering tops. The oil is highly aromatic and is used in perfumes, **aromatherapy**, and to flavor liqueurs, especially Chartreuse and Benedictine. The oil has a warm and pungent aroma with a slight camphor-like smell. It may be used in dilute form as an external nonirritating application on **bruises**, **cuts**, eczema, and **dermatitis**, as a chest rub for bronchitis and the congestion of colds, and as an additive to bath water to relieve nervous exhaustion and melancholy.

Precautions

Only moderate amounts of hyssop essential oil should be used. Do not use the herb continuously in any form for long periods of time. Pregnant women, children, and persons with **epilepsy** should avoid any use of this potent essential oil. High doses (10–30 drops for adults) may cause convulsions due to the ketone known as pinocamphone. Pregnant or lactating women should not use any form of hyssop.

Side effects

Hyssop can cause **nausea**, upset stomach, and **diarrhea** in susceptible persons. Symptoms of overdose include **dizziness**, tightness in the chest, and disturbances of the central nervous system.

Interactions

No interactions between hyssop and standard pharmaceuticals have been reported as of early 2003.

Resources

BOOKS

Lawless, Julia. *The Complete Illustrated Guide to Aroma therapy*. Rockport, MA: Element Books Inc., 1997.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, Inc., 1997.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies. Emmaus, PA: Rodale Press, Inc., 1997.

Tyler, Varro E. *The Honest Herbal*. New York: Pharma ceutical Products Press, 1993.

PERIODICALS

Bedoya, L. M., S. S. Palomino, M. J. Abad, et al. "Screening of Selected Plant Extracts for In Vitro Inhibitory Activity on Human Immunodeficiency Virus." *Phyto therapy Research* 16 (September 2002): 550 554.

Lu, M., L. Battinelli, C. Daniele, et al. "Muscle Relaxing Activity of *Hyssopus officinalis* Essential Oil on Isolated Intestinal Preparations." *Planta Medica* 68 (March 2002): 213 216.

ORGANIZATIONS

American Herbalists Guild. 1931 Gaddis Road, Canton, GA 30115. (770) 751 6021. www.americanherbalists guild.com.

Herb Research Foundation. 1007 Pearl Street, Boulder, CO 80302.(303) 449 2265.

OTHER

Hoffmann, David L. "Hyssop." Herbal Materia Medica. http://www.healthy.net/asp/templates/book.asp? PageType Book&ID 603.

Clare Hanrahan
Rebecca J. Frey, PhD

I

IBD *see* **Inflammatory bowel disease**

IBS *see* **Irritable bowel syndrome**

Iceland moss

Description

Iceland moss (*Cetraria islandica*) is a lichen (a moss-like plant) that grows on the ground in mountains, forests, and arctic areas. In addition to Iceland, the lichen is found in Scandinavia, Great Britain, North America, Russia, and other areas in the Northern Hemisphere. Iceland moss also grows in Antarctica.

The plant's thallus (shoot) curls from 1–4 in (2.5–10 cm) tall. The dried thallus is used as an herbal remedy. Iceland moss is also known as Iceland lichen, cetraria, fucus, muscus, and eryrngo-leaved (spiny-leaf) liverwort.

General use

Iceland moss is rich in **calcium**, **iodine**, **potassium**, phosphorous, and vitamins. The lichen is a bitter-tasting plant that is said to smell like seaweed when it is wet. Despite these unappetizing characteristics, Iceland moss has long been used in Scandinavia and Europe as a food source and a remedy for numerous conditions.

Historic uses of Iceland moss

People in countries including Iceland, Sweden, Norway, Finland, and Russia have used Iceland moss for food and medicine. When used for nourishment, the Iceland moss plant was ground into flour, which was used to bake bread. Boiling the plant was said to remove the bitter taste, so the plant was boiled and made into a jelly. The lichen became part of a gelled dessert with ingredients that could include chocolate, almonds, or lemon.

In addition, Iceland moss was boiled in milk, a beverage served as a remedy for conditions such as malnutrition. The milk-and-lichen beverage was served to sick people, frail children, and the aged. It was also used for serious conditions when the person was vomiting.

Iceland moss also had numerous folk medicine uses. The lichen was a folk remedy for **tuberculosis**, lung disease, chest ailments, and problems with the kidney and bladder. Iceland moss was also used to treat **wounds** that did not heal, **diarrhea**, problems with lactation, fevers, and **gastritis**.

Furthermore, people in Norway ate Iceland moss during a seven-year famine that started in 1807. The Russians found another use for the lichen during World War II, when they prepared a version of molasses with Iceland moss.

Contemporary uses of Iceland moss

The acids in Iceland moss have an antibiotic effect. It is a mild antimicrobial and a demulcent—a remedy that soothes irritated or inflamed mucous membranes. The lichen is used for inflammation of the mouth and pharynx, and for treatment of the **common cold**, fever, dry **cough**, and bronchitis. It is also used for people who have a tendency toward infection. Furthermore, the bitter herb is a remedy for digestive complaints, loss of appetite, and **gastroenteritis**. Iceland moss boiled in milk is still used as a tonic beverage for people recovering from illnesses. In addition, the lichen has been used to treat diabetes.

Preparations

In Europe, Iceland moss cough drops are sold in pharmacies. The lichen is also sold in other forms for a range of conditions. In the United States, Iceland moss is generally found in powdered form and is usually

Iceland moss (Cetraria islandica). *(© Arco Images / Alamy)*

consumed as a tea. It can be used as a gargle to soothe a sore throat .

Iceland moss is made by pouring 1 cup of boiling water over 1–2 tsp of powdered Iceland moss. The mixture is covered and steeped for 10–15 minutes. Sweetener can be added to the tea, or the herb can be mixed with cocoa or chocolate. The average daily dosage of Iceland moss is 1–3 tsp.

An Iceland moss decoction can be made by putting 2 tsp of shredded lichen in 2 cups of cold water. The mixture is simmered for 10 minutes. It is then strained to squeeze out the juice. One cup of the decoction is consumed in the morning and another at night. Iceland moss can also be taken as a tincture.

In addition, Iceland moss can be used topically for skin rashes and fungus.

Precautions

Iceland moss is safe when taken in proper dosages. However, Iceland moss is not regulated by the FDA. Before beginning herbal treatment, people should consult a physician, health practitioner, or herbalist to discuss potential cautions.

Powdered Iceland moss must be soaked in lye for 24 hours or filtered through ash in order to properly extract the lichen acids. One study found that poorly prepared Iceland moss may contain toxic levels of lead. A person should talk to an experienced herbalist or other health practitioner to determine a proper source for Iceland moss, and should not attempt to prepare it oneself.

In rare cases, external use of Iceland moss has caused sensitivity reactions.

KEY TERMS

Decoction—A system for releasing the herbal essence of bark or roots that includes simmering in water.

Infusion—A system for releasing the herbal essence of leaves and flowers in which the herbs are steeped in boiled water.

Tincture—A method of preserving herbs with alcohol or water.

Side effects

Side effects include the rare sensitivity reaction, and the risk of **lead poisoning** in poorly prepared Iceland moss. In excessive doses or with prolonged use, Iceland moss may cause gastric irritation and liver problems.

Interactions

There are no known interactions associated with use of Iceland moss.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, Penn.: Rodale Press, Inc., 1997.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, N.J.: Medical Economics Company, 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, Utah: Woodland Health Books, 1995.

Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX 78720. (512) 331 8868. http://www.herbs.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

Holistic OnLine. http://www.holisticonine.com.

Moore, Michael. Southwest School of Botanical Medicine. http://chili.rt66.com/hrbmoore.

MotherNature.com Health Encyclopedia. http://www.mothernature.com/ency.

OnHealth Network Company. "Iceland Moss." http://www.onhealth.com/alternative/resource/herbs/item,77157.asp (August 8, 2000).

Liz Swain

Ignatia

Description

Ignatia is a homeopathic remedy that is derived from the bean of a small tree that is native to the Philippine Islands and China. The tree belongs to the Loganiaceae family, and has long, twining, smooth branches. On the branches grows a fruit that is the size and shape of a pear. Inside the fruit are almond-shaped seeds, or beans, that have a fine, downy covering and are blackish gray or clear brown in color.

The Latin name is *Ignatius amara*, amara being the Latin word for bitter. The bean was named after St. Ignatius Loyola, a Spanish Jesuit who was responsible for bringing the beans to Europe from the Philippines in the seventeenth century. As a result, the beans are often called St. Ignatius beans. The missionaries were introduced to the beans by the locals, who wore the beans as amulets to prevent disease. The bean was then used as a treatment for **gout**, **epilepsy**, cholera, and **asthma**.

The beans contain a substantial amount of strychnine, a bitter substance that is often used in rat poison. Strychnine is fatal to humans if taken in large doses. Small doses cause headaches, loss of appetite, cramps, muscle twitching, trembling, frightening dreams, cold sweat, nervous laughter, and giddiness.

General use

Ignatia is one of the best remedies for conditions brought about by emotional upset such as grief, shock, jealousy, fear, anger, **depression**, embarrassment, fright, or ridicule. Homeopaths frequently recommend ignatia when the patient is suffering from romantic disappointment or the loss of a spouse, relative, friend, or pet. The remedy helps the patient bear the grief and suffering common to emotional upsets.

Suppression of the emotions is the general cause of ignatia complaints. Men and women of all ages may benefit from ignatia when they are grieving, but ignatia is particularly well suited for sensitive, delicate women and children. It is recommended for children who develop ailments after being punished, teenagers who are suffering from a lost love, women who have had a miscarriage, and elderly folk who grieve silently. Ignatia is a good remedy for children who suffer from extreme trembling after a fright. Ignatia is frequently prescribed in cases of physical or sexual abuse. Women who suffer from nervousness, confusion, or forgetfulness during their menstrual cycles may also benefit from ignatia.

KEY TERMS

Succussion—A process integral to the creation of a homeopathic remedy in which a homeopathic solution is struck against a firm surface. This is performed to thoroughly mix the substance and magnify its healing properties.

Persons who require the interaction of ignatia are idealistic, introspective, moody, quarrelsome, sensitive to **pain**, timid, easily startled, weepy, and depressed. As a result of their grief they become fearful, apprehensive, and antisocial. They dislike consolation and desire to be alone. When in the company of others they are secretive and try to hold in their emotions, although they sigh frequently and loudly. When alone, they are prone to frequent bouts of sobbing alternating with nervous laughter. They are conscientious about performing tasks correctly.

Ignatia is a remedy of contradictions. Symptoms are often paradoxical and erratic. For example, symptoms of **nausea** are relieved by eating, a **sore throat** is better from swallowing solids, and simple foods are harder to digest than heavier foods. Symptoms may be relieved after passing a hard stool. Lying on the painful side may make the symptoms better. Eating causes the patient to have more hunger. She may crave sour or hard to digest foods. She may also want to remain uncovered when cold. The patient dislikes fresh air and is sensitive to coffee and tobacco.

General symptoms are aggravated by cold air, emotional excitement, mental exertion, sweets, and consolation. They are worse in the morning, evening, night, and before and during **menstruation**. Symptoms may appear at regular intervals, such as headaches that occur every seven days. Symptoms are improved by warmth and eating.

Ignatia is also used as a remedy for headaches, sore throat, trembling, nervousness, **insomnia**, heart palpitations, **gas**, **indigestion**, weakness, and weeping. Other conditions include **irritable bowel syndrome**, painful **hemorrhoids**, or a dry, tickling **cough**.

The cough is a dry, irritating cough that is often accompanied by a stitching pain in the chest. Suppression of the cough is helpful. The patient is made worse by coughing or lying in bed, and the cough is worse in the evening. Ignatia is often used in the treatment of **whooping cough** or **croup**.

The **fever** is often accompanied by extreme thirst and **chills**. The patient feels better when uncovered, and is worse in the afternoon.

Headaches typical of ignatia start gradually and stop suddenly. The pain is gathered in the forehead. The patient may complain of a sensation as if a nail were being driven through her head. Headaches are often caused by emotional upset and are worse in a smoky room.

A sore throat accompanied by stitching pains and a sensation as if there were a lump in the throat is often present as a result of suppressed emotions. The throat is worse in the evening and is better from swallowing.

When indigestion is present, the patient may feel as though her stomach were empty. She may suffer from sour-tasting belches that ameliorate her symptoms.

Preparations

Ignatia is prepared by grinding the bean into a powder and steeping the powder in alcohol. The mixture is strained and diluted until it becomes a non-toxic substance. It is then succussed to create the final preparation.

During an emotional crisis, take a single dose of 30X or 30C. If the symptoms are unchanged after eight hours, try another remedy. If the dose helps, repeat the dose only when the symptoms worsen. Do not take more than two times a day for three days.

Precautions

If symptoms do not improve after the recommended time period, consult your homeopath or health-care practitioner.

Do not exceed the recommended dose.

Ignatia may cause insomnia and should be taken in the morning.

Side effects

The only side effects are individual aggravations that may occur.

Interactions

When taking any homeopathic remedy, do not use **peppermint** products, coffee, or alcohol. These products may cause the remedy to be ineffective.

Resources

BOOKS

Cummings, M.D., Stephen and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Imagery *see* **Guided imagery**

Immuno-augmentation therapy

Definition

Immuno-augmentation therapy (IAT), also called immuno-augmentative or immuno-augmentive therapy, is a **cancer** treatment aimed at restoring the immune system with injections of a mixture of blood factors.

Origins

Dr. Lawrence Burton formulated the theory behind IAT in the 1950s. After earning his doctorate in experimental zoology in 1955 from New York University, Burton moved to the California Institute of Technology (Caltech) as a postdoctoral fellow in the laboratory of H. K. Mitchell. There, he and his coworkers discovered a tumor-inducing factor (TIF) in fruit flies. A few years later, Burton and his colleague, Dr. Frank Friedman, joined the cancer research staff of Dr. Antonio Rottino at St. Vincent's Hospital in New York City. Rottino was one of the first scientists to conclude that a connection existed between the body's immune system and cancer.

Burton and the development of IAT

Burton and his colleagues reported finding an inhibitor of fruit-fly TIF in mice and human tissue, but afterward, Mitchell published a retraction of the papers he had coauthored with Burton. Mitchell claimed that Burton's assay for TIF—on which Burton was basing his recent work—could not be repeated independently. Undeterred, Burton continued using fruit flies and mice to develop a mixture of blood proteins to slow or stop the proliferation of cancer cells.

By the mid-1960s, Burton was making sensational presentations. In 1966, at an American Cancer Society (ACS) seminar for science writers, Burton injected mice with his "unblocking factor," and their tumors shrunk in less than an hour. Although newspaper headlines read "15-Minute Cancer Cure," the medical community was unconvinced. Professional journals refused to publish Burton's papers and he eventually lost his research funding. The American Cancer Society (ACS) placed Burton's IAT on its list of unproven methods.

In 1973, Burton and Friedman left St. Vincent's and, with independent funding, founded the Immunology Researching Foundation in Great Neck, New York. They began treating cancer patients with IAT. The following year they submitted an investigational new drug application to the United States Food and Drug Administration (FDA) in order to begin clinical trials of IAT. When FDA officials asked for his experimental evidence, however, Burton withdrew his application.

Burton and Friedman eventually patented four substances that they claimed to have isolated from human blood:

- deblocking protein
- tumor antibody 1
- tumor antibody 2
- tumor complementBurton claimed that when used in the correct combination, these substances restored normal immune function in cancer patients.

During the 1970s and early 1980s, the National Cancer Institute (NCI) tried to evaluate IAT. Burton refused to disclose his methods for isolating his blood substances, and and the NCI and Burton could not reach an agreement regarding evaluation methods.

The Bahamian clinic

Hostility from the medical establishment drove Burton to close his New York clinic in 1977. With private funding, he founded the Immunology Researching Centre (IRC), Ltd. in Freeport on Grand Bahama Island. This not-for-profit organization was licensed to treat people who had been diagnosed with cancer. In 1978, representatives from the Bahamian Ministry of Health and the Pan American Health Organization found violations in admissions, treatment, and evaluation of the clinic's patients. They could not determine the blood components used in IAT, and found no records of patient survival rates. They concluded that there was no evidence that IAT was effective, and recommended that the facility be closed.

Nonetheless, the Bahamian health authority did not shut down the clinic until 1985. At that time, blood supplies across the United States had been found to be contaminated with the human immunodeficiency virus (HIV) and Burton's clinic was no exception. Indeed, the clinic had treated Kaposi's sarcoma in patients with acquired immune deficiency syndrome (**AIDS**). Although no HIV **infections** were ever traced to the clinic, and some scientists questioned the HIV screening used by the authorities, the sera used in IAT were found to carry **hepatitis** virus and infectious bacteria. At least two cases of hepatitis were traced to the sera. The Bahamian government, at the apparent insistence of the FDA and the NCI, closed the Burton's clinic for seven months, until screening and sterilization methods for serum production were improved.

Shortly thereafter, the FDA banned the import of IAT drugs. IAT had been legalized in Florida and Oklahoma in the early 1980s, although Florida rescinded its law when the clinic closed.

The closing of Burton's clinic and the ban on sera import enraged many patients and their families. They formed the Immuno-Augmentative Therapy Patient Association (IATPA), later renamed People Against Cancer, and began lobbying the United States Congress. In 1986, the Office of Technology Assessment (OTA), then a research branch of Congress, was told to investigate alternative cancer therapies. OTA worked with Burton to develop procedures for an IAT clinical trial on colon cancer patients, but the arrangement broke down, and the OTA concluded that no reliable data existed with which to evaluate IAT.

During the 1990s, the Burton's Immunology Researching Centre opened additional clinics in Germany and Mexico. Burton died in 1993 and his longtime associate, Dr. R. John Clement, took over IRC operations. In 2003, Clement founded the ITL Cancer Clinic, a new operating company for the IRC. This new, expanded clinic began offering cancer vaccines, and additional mainstream and alternative treatments combined with IAT.

Benefits

Proponents claim that the therapy can stop the spread of many cancers and may send the cancer into remission. They claim that by treating deficiencies or imbalances in the immune system, the body is able treat itself, resulting in an extended lifespan and enhanced quality of life. They note, however, that sometimes the disease has spread too far within the body to respond to IAT. Furthermore, if chemotherapy or radiation treatment has over-suppressed the immune system, response to IAT may be slow.

IAT has been claimed to have about a 19 percent effectiveness rate, but various cancers respond differently:

- Bladder cancer responds favorably.
- Brain cancer: astrocytomas (non-capsulated brain tumors arising in brain cells called astrocytes), grades I and II, respond favorably; grade III does not respond well; glioblastoma multiforme (the fastest-growing type of brain tumor) is not a candidate for IAT.
- Breast cancer: all types respond, although inflammatory cancers respond poorly.
- Cervical cancer: responds in early stages; mixed results in late stages.
- Colorectal cancer: good response in most stages; metastasis to the liver disqualifies it for IAT.
- Head and neck cancers respond favorably.
- Leukemias: adult chronic types respond to IAT.
- Lung cancers: adeno- and squamous-cell (large-cell) cancers and mesotheliomas respond well to IAT; small-cell, oat-cell, and undifferentiated cancers are not candidates for IAT.
- Lymphoma: responses vary.
- Melanomas: extremely variable responses.
- Myeloma responds well, even at late stages.
- Pancreatic cancer: good response in some cases, although IAT may be inappropriate because of disease complications.
- Prostate cancer responds at all stages.
- Skin metastasis does not respond to IAT.

Description

Both conventional cancer immunotherapy and IAT are based on enhancement of the immune system. Sometimes called immune enhancement or immune modulation, conventional immunotherapy is used at many U. S. clinics. Clinical trials have found conventional immunotherapy useful for treating various cancers, including melanoma, lymphoma, kidney, and bladder cancers.

IAT components and treatment

Three serum factors are used in IAT:

- Tumor antibody factor (TAF), more commonly called tumor necrosis factor (TNF), may induce antibodies that destroy tumors.
- Tumor complement factor (TCF) is said to induce antibody formation.
- De-blocking protein factor (DPF) is claimed to remove an endogenous blocking protein that prevents the immune system from detecting the cancer.TAF and DPF are isolated from the blood of healthy donors. TCF is isolated from the clotted blood of cancer patients.

IAT patients are screened for imbalances in immune system components. During the initial treatment, blood factors are measured once or twice per day, five days per week. In addition to measuring the serum factors used in treatment, the blood is analyzed for blocking protein factor (BPF). High levels of BPF and low levels of DPF and TCF are claimed to cause immunosuppression or immunodeficiency, enabling the cancer to grow and spread. This data determines the amount of each serum to be injected into the patient.

Treatment varies from one to 12 daily injections. Treatment is on an outpatient basis for an average of 10–12 weeks. Following outpatient treatment, patients are given supplies of sera and a computerized prescription for home injections. Home treatment may last weeks, months, or the rest of one's life. Patients typically return to the clinic for about two weeks, every four to six months. They undergo measurements of tumor activity and IAT responses, in conjunction with conventional methods for determining tumor regression, and symptom and disease remission.

Approximate costs

IAT is expensive:

- Four weeks of initial and intensive therapy—$7,500.
- Each week thereafter—$700.
- Home maintenance supplies—$50 per week.

These fees do not include:

- Special medications or nutrients not used in routine IAT.
- Laboratory or other tests performed outside of the clinic.
- Outside physician or hospital services.
- Medical aids or equipment not prescribed or supplied by the clinic.
- Transportation, lodging, and living expenses during outpatient treatment.IAT usually is not covered by insurance.

Preparations

Under Bahamian law, IAT patients must have been previously diagnosed with cancer. Patients are screened to determine if IAT is appropriate for their type of cancer. Typically, patients travel to an IAT clinic, where they receive a physical exam, and blood and urine tests to determine the status of their immune

KEY TERMS

Adenocarcinoma—A cancerous tumor derived from epithelial (surface) cells or a gland-like tumor.

Antibody—A protein that recognizes and destroys a specific foreign antigen, such as a cancer cell.

Best-case series—A preliminary study that relies on assumptions about patient outcomes without a specific treatment, compared with similar patients receiving the best available conventional treatments. There are no control cases.

Blocking protein factor (BPF)—A serum component that may prevent the immune system from recognizing cancer cells.

Complement—A large group of serum proteins that are involved in the immune response.

De-blocking protein factor (DPF)—A serum component used in IAT that is claimed to inactivate or remove BPF.

Immune system—The body system that fights infection and disease.

Mesothelioma—A tumor consisting of spindle cells or fibrous tissue, usually in the lining of the lung.

Metastasis, pl. metastases—A secondary tumor; the process by which cancerous cells form secondary tumors in distant parts of the body.

Serum, pl. sera—The clear liquid that remains after cellular components are removed from blood by clotting; a blood derivative containing an antitoxin for diagnostic or therapeutic use.

Tumor—An overgrowth of body tissue.

Tumor antibody factor (TAF)—A component of IAT sera, possibly tumor necrosis factor (TNF), that may induce antibodies that destroy tumors.

Tumor complement factor (TCF)—A component of IAT sera that stimulates antibody production.

Tumor-inducing factor (TIF)—A blood component that can initiate tumor growth.

system. IAT appears to be more effective among patients who have not had chemotherapy.

IAT patients are asked to abstain from tobacco and to limit alcohol consumption during treatment. **Lung cancer** patients must have stopped **smoking** prior to treatment at the IRC. In addition, patients should:

- Avoid dietary animal fats
- Avoid excess vitamin C
- Take antioxidant supplements that are recommended

Precautions

Proponents of IAT claim that it is nontoxic, safe, and effective. However, there have been no controlled clinical studies of IAT, and scientists have not been able to replicate Burton's original results with mice. In addition:

- IAT sera have not been tested for safety by accepted medical standards.
- Some medical practitioners caution that the unregulated IAT sera may contain infectious agents transmitted in human blood.
- Relying on IAT in place of conventional cancer treatments may have serious health consequences.

Side effects

Anecdotal reports from patients indicate that the side effects of IAT are minor and include:

- Fatigue
- Pain at the injection site
- Flu-like symptoms
- Pain and edema (fluid accumulation) during IAT given to bone cancer patients

Research and general acceptance

There is no scientific evidence that IAT is an effective cancer treatment. In addition, there is no scientific evidence that IAT sera contain specific components. In 1980, MetPath, a biomedical firm, terminated a contract with Burton after they could not identify or measure a substance that Burton claimed was present in IAT serum. Most anecdotal claims and testimonials for IAT's effectiveness against cancer are without supporting evidence.

In 1984, researchers at the University of Pennsylvania Cancer Center collected data from 79 patients who had received IAT at Burton's clinic. They concluded that reliable comparisons with those receiving conventional cancer treatment were not possible; however, their survey did find extended survival times among the IAT patients. They suggested that a well-controlled prospective study be performed.

In April 2003, the United States Agency for Healthcare Research and Quality (AHRQ) issued a report on IAT. Using criteria developed by the NCI, they conducted a "best-case series" to examine nine cancer patients treated with IAT. Their cancers included:

- Hodgkin's lymphoma
- Non-small cell carcinoma of the lung

- Poorly differentiated nodular lymphoma
- Peritoneal mesothelioma (two cases)
- Ovarian adenocarcinoma
- Squamous cell carcinoma of the vocal cords (two cases)
- Adenocarcinoma of the colonThe report concluded that IAT warranted further study. It recommended either a random controlled clinical trial or a prospective case series with treatment protocol and documentation established prior to treatment. Also in 2003, however, a research study from the Samueli Institute for Information Biology in Virginia tested 46 patients who were undergoing IAT treatment. The researchers found no indication of effectiveness, nor any improvement in the patients' quality of life.

Training and certification

IAT practitioners are usually medical doctors.

Resources

BOOKS

Gordon, James, and Sharon Curtin. *Comprehensive Cancer Care: Integrating Alternative, Complementary, and Conventional Therapies*. Perseus, 2001.

Sackman, Ruth. *Rethinking Cancer: Non traditional Approaches to the Theories, Treatments and Prevention of Cancer*. Garden City Park, NY: Square One Pub lishers, 2003.

PERIODICALS

Green, Saul. "Immunoaugmentative Therapy." *Journal of the American Medical Association (JAMA)* 270, no. 14 (October 13, 1993): 1719 24.

Pfeifer, Bernd and Wayne Jonas. " Clinical evaluation of "immunoaugmentative therapy (IAT)": an unconven tional cancer treatment." *Integrative Cancer Therapy* 2, no. 2 (June 2003): 112 119.

ORGANIZATIONS

ITL Cancer Clinic (Bahamas) Ltd. P.O. Box F 42689, Freeport, Grand Bahama, Bahamas. (877) 290 2607. (242)352 7455. http://www.immunemedicine.com/ (accessed February 11, 2008).

People Against Cancer. 604 East Street, P.O. Box 10, Otho, IA 50569. (515) 972 4444. http://www.peopleagainst cancer.net/ (accessed February 11, 2008).

OTHER

"Best Case Series for the Use of Immuno Augmentation Therapy and Naltrexone for the Treatment of Cancer. Summary." *Evidence Report/Technology Assessment: No. 7. AHRQ Publication No. 03 E029*. April 2003 http://www.ahrq.gov/clinic/epcsums/immaugsum.htm (accessed February 11, 2008).

"Immuno Augmentive Therapy." American Cancer Society. Revised July 20, 2007. http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Immuno Augmentive_ Therapy.asp?sitearea ETO (accessed February 11, 2008).

Margaret Alic
Leslie Mertz, Ph.D.

Impetigo

Definition

Impetigo is a contagious bacterial infection of the skin. It primarily afflicts children and the elderly. Ecthyma is a more severe form of impetigo with sores affecting a deeper layer of the skin. It often leaves scarring and discoloration of the skin.

Description

The first sign of impetigo is a clear, fluid-filled bump, called a vesicle, which appears on the skin. The vesicle soon dries out and develops a scab-like, honey-colored crust, which breaks open and leaks fluid. These vesicles usually appear grouped closely together, and they may spread out and cover a large area of the skin. Impetigo often affects the area around the nose and mouth; however, it can spread to anywhere on the skin, but especially the arms and legs, as well as the diaper areas of infants. The condition called ecthyma is a form of impetigo in which the sores that develop are larger, filled with pus, and covered with brownish-black scabs that may lead to scarring. Impetigo **infections** most commonly occur during warmer weather.

Impetigo on a patient's foot. *(ISM/Phototake, Reproduced by permission.)*

Causes and symptoms

Impetigo is most frequently caused by the bacteria *Staphylococcus aureus,* also known as staph, and less frequently, by group A beta-hemolytic streptococci, also known as strep. These bacteria are highly contagious. Impetigo can quickly spread from one part of the body to another through scratching. It can also be spread to other people if they touch the infected sores or if they have contact with the soiled clothing, diapers, bed sheets, or toys of an infected person. Factors such as heat, humidity, crowded conditions, and poor hygiene increase the chance that impetigo will spread rapidly among large groups.

Impetigo tends to develop in areas of the skin which have already been damaged through some other means such as injury, insect bite, **sunburn**, **diaper rash**, chicken pox, or herpes, especially oral herpes. The sores tend to be very itchy, and scratching may lead to the spread of the disease. Keeping the hands washed with antibacterial soap, and fingernails well trimmed are good precautions for limiting further infection.

Diagnosis

Observation of the appearance, location, and pattern of sores is the usual method of diagnosis. Fluid from the vesicles can be cultured and examined to identify the causative bacteria.

Treatment

Echinacea tincture can be applied directly to the skin. The homeopathic remedy *Antimonium tartaricum* can be used when impetigo affects the face.

Bag Balm, an anti-bacterial salve, can be applied to sores to relieve **pain** and heal the skin.

A tincture of the pansy flower, *Viola tricolor,* can be taken internally twice daily for a week to speed healing.

Burdock root oil can be directly applied to the skin to help it heal.

Topical washes with **goldenseal**, **grapefruit seed extract** (which may sting), or **tea tree oil** are also recommended.

Allopathic treatment

Uncomplicated impetigo is usually treated with a topical antibiotic cream such as mupirocin (Bactroban). Oral antibiotics are also commonly prescribed. Patients are advised to wash the affected areas with an antibacterial soap and water several times per day and to otherwise keep the skin dry. Scratching is discouraged, and the suggestion is that nails be cut or that mittens be worn—especially with young children. Ecthyma is treated in the same manner but at times may require surgical debridement, or removal of the affected area.

KEY TERMS

Sequela—Any abnormal condition that follows as the result of a disease or injury.

Systemic—Involving the whole body; the opposite of localized.

Expected results

The vast majority of those with impetigo recover quickly, completely, and uneventfully. However, there is a chance of developing a serious disease, or sequela, especially if the infection is left untreated. Local spread of the infection can cause osteomyelitis, septic arthritis, cellulitis, or lymphangitis. If large quantities of the bacteria begin to circulate in the bloodstream, there is also a danger of a systemic infection developing, such as glomerulonephritis or **pneumonia**.

Prevention

Prevention of impetigo involves good hygiene. In order to avoid spreading the infection from one person to another, those with impetigo should be isolated until all sores are healed, and their used linen, clothing, and toys should be kept out of contact with others.

Resources

BOOKS

Sehgal, Virendra N., and Govind Srivastava. *Diagnosis and Treatment of Common Skin Diseases*. Tunbridge Wells, Kent, UK: Anshan Book Publishers, 2005.

PERIODICALS

Ajose, Frances O. A. "Some Nigerian Plants of Dermato logic Importance." *International Journal of Dermatol ogy* (October 2007): 48 55.

Levy, Moise L., and Jeffrey Weinberg. "Current Issues in Uncomplicated Skin and Skin Structure Infections." *Expert Review of Dermatology* (April 2007): 153 165.

Steer, Andrew C., Margaret H. Danchin, and Jonathan R. Carapetis. "Group A Streptococcal Infections in Chil dren." *Journal of Paediatrics and Child Health* (April 2007): 203 213.

Wyndham, Mike. "Impetigo (Ringworm)." *Community Practitioner* (April 2007): 22.

Patience Paradox
David Edward Newton, Ed.D.

Impotence

Definition

Impotence, also known as erectile dysfunction (ED), is the inability to achieve or maintain an erection long enough to engage in sexual intercourse.

Description

Under normal circumstances, when a man is sexually stimulated, his brain sends a message down the spinal cord and into the nerves of the penis. The nerve endings in the penis release chemical messengers, called neurotransmitters, that signal the arteries that supply blood to the corpora cavernosa (the two spongy rods of tissue that span the length of the penis) to relax and fill with blood. As they expand, the corpora cavernosa close off other veins that would normally drain blood from the penis. As the penis becomes engorged with blood, it enlarges and stiffens, causing an erection. Problems with blood vessels, nerves, or tissues of the penis can interfere with an erection.

Causes and symptoms

Estimates of the rate of impotence vary widely. A 2006 review of 13 studies on ED completed prior to 1998 reported on the Public Library of Science (PLoS) Web site found impotency rates ranging from 1% to more than 70%, depending on age, nationality, health status, and other factors. The figure most commonly quoted for the prevalence of ED among American males appears to be between 15 and 30 million, again depending on a number of personal factors. The PLoS article points out that estimates of the prevalence of ED are not a purely scientific issue. Drug manufacturers who make medications for the treatment of the disorder may wish to inflate the actual number of cases to broaden the appeal of their product.

In any case, medical views on impotence have changed significantly over the past few decades. For example, as of 2008, the disorder was being diagnosed much more commonly than it had been previously. A study conducted as part of the National Ambulatory Medical Care Survey in 1998 found that the rate of impotence cases reported at physician's offices had nearly tripled between 1985 and 1999, from 7.7 per 1,000 visits for 1985 to 22.3 visits per 1,000 in 1999. At one time, doctors thought that most cases of impotence were psychological in origin. They later recognized that, at least in older men, physical causes may play a primary role in 60% or more of all cases. In men over the age of 60, the leading cause is **atherosclerosis**, or narrowing of the arteries, which can restrict the flow of blood to the penis. Injury or disease of the connective tissue, such as Peyronie's disease, may prevent the corpora cavernosa from completely expanding. Damage to the nerves of the penis from certain types of surgery or neurological conditions, such as Parkinson's disease or **multiple sclerosis**, may also cause impotence. Men with diabetes are especially at risk for impotence because of their high risk of both atherosclerosis and a nerve disease called diabetic neuropathy.

Some drugs, including certain types of blood pressure medications, antihistamines, tranquilizers (especially before intercourse), and antidepressants known as selective serotonin reuptake inhibitors (SSRIs, including Prozac and Paxil) can interfere with erections. **Smoking**, excessive alcohol consumption, and illicit drug use may also contribute. In some cases, low levels of the male hormone testosterone may contribute to erectile failure. Finally, psychological factors, such as **stress**, guilt, or **anxiety**, may also play a role, even when the impotence is primarily due to organic causes.

Diagnosis

When diagnosing the underlying cause of impotence, the doctor begins by asking the man a number of questions about when the problem began, whether it happens only with specific sex partners, and whether he ever wakes up with an erection. (Men whose dysfunction occurs only with certain partners or who wake up with erections are more likely to have a psychological cause for their impotence.) Sometimes, the man's sex partner is also interviewed. In some cases, domestic discord may be a factor.

The doctor also obtains a thorough medical history to find out about past pelvic surgery, diabetes, cardiovascular disease, kidney disease, and any medications the man may be taking. The physical examination should include a genital examination, hormone tests, and a glucose test for diabetes. Sometimes a measurement of blood flow through the penis may be taken.

Alternative health practitioners often forgo such extensive testing and rely on information obtained from the patient. Usually the fact that the man cannot get or maintain an erection is reason enough to begin alternative or holistic therapy.

Treatment

A number of herbs have been promoted for treating impotence. The most widely touted is **yohimbe**

(*Corynanthe yohimbe*), derived from the bark of the yohimbe tree native to West Africa. It was used in Europe for for most of the twentieth century to treat erectile dysfunction. In the United States, yohimbe products are available in two formats. One is a prescription drug that contains yohimbine, the active ingredient in yohimbe bark. This drug has been approved by the U.S. Food and Drug Administration (FDA) for use with ED and some other medical problems. It is available under a number of trade names, including Yocon, Aphrodyne, Erex, Yohimex, Testomar, Yohimbe, and Yovital. The second form includes a variety of supplements that contain more or less of the natural product. As a dietary supplement, this form of yohimbe is not regulated by the FDA. In fact, the agency strongly recommends against use of the product because of its very serious side effects, which may include paralysis, **fatigue**, stomach disorders, and even death.

There is no clear medical research that indicates exactly how or why yohimbe works in treating impotence. It is generally believed that yohimbe dilates blood vessels and stimulates blood flow to the penis, causing an erection. It also prevents blood from flowing out of the penis during an erection. It may also act on the central nervous system, specifically the lower spinal cord area where sexual signals are transmitted. Studies show it is effective in 30–40% of men with impotence. It is primarily effective in men with impotence caused by vascular, psychogenic (originating in the mind), or diabetic problems. It usually does not work in men whose impotence is caused by organic nerve damage. In healthy men without impotence, yohimbe in some cases appears to increase sexual stamina and prolong erections.

The usual dosage of yohimbine (yohimbe extract) to treat erectile dysfunction is 5.4 mg three times a day. It may take three to six weeks for it to take effect. Most commercially available supplements do not contain enough yohimbe to be effective and doctors recommend obtaining a prescription for yohimbe to get enough active ingredient to meet with success.

Ginkgo (*Ginkgo biloba*) is also used to treat impotence, although it has not been shown to help the condition in controlled studies and probably has more of a psychological effect. In addition, ginkgo carries some risk of abnormal blood clotting and should be avoided by men taking blood thinners, such as coumadin. Other herbs promoted for treating impotence include true unicorn root (*Aletrius farinosa*), **saw palmetto** (*Serenoa repens*), ginseng (*Panax ginseng*), and **Siberian ginseng** (*Eleuthrococcus senticosus*). Nux vomica (*Strychnos nux-vomica*) has been recommended, especially when impotence is caused by excessive alcohol, cigarettes, or dietary indiscretions. Nux vomica can be very toxic if taken improperly, so it should be used only under the strict supervision of a physician trained in its use.

A number of Chinese herbal remedies are available for treatment of impotence, usually combinations of herbs and sometimes such animal parts as deer antler and sea horse.

Allopathic treatment

Years ago, the standard treatment for impotence was a penile implant or long-term **psychotherapy**. Although physical causes are in the late 2000s more readily diagnosed and treated, individual or marital counseling is still an effective treatment for impotence when emotional factors play a role. Fortunately, other approaches are available to treat the physical causes of impotence.

The first drug developed for the treatment of ED was sildenafil citrate, sold under the brand name Viagra. It quickly became one of the most dramatic commercial successes in drug history. In the two-year period following its approval by the FDA in March 1998, sales reached more than a billion dollars annually. In 2007, worldwide sales were still high, at $1.76 billion. Viagra is a very effective treatment for ED, with a success rate of more than 60%. The drug boosts levels of a substance called cyclic GMP, which is responsible for widening the blood vessels of the penis. In clinical studies, Viagra produced headaches in 16% of men who took it, and other side effects included flushing, **indigestion**, and stuffy nose.

The primary drawback to Viagra, which works about an hour after it is taken, is that the FDA cautions men with **heart disease** or low blood pressure to be thoroughly examined by a physician before obtaining a prescription. At least 130 men have died while taking Viagra. Shortly after use of the drug skyrocketed, concerns were expressed over cardiovascular effects from Viagra. However, studies reported in 2002 that sildenafil had no effect on cardiac symptoms in older men who used it. Instead, cardiac events reported with use of Viagra are more likely the result of the physical demands of sexual activity in patients using the drug who were already at higher risk for cardiovascular disease.

In 2003, the FDA approved two additional drugs for the treatment of ED, vardenafil (Levitra) and tadalafil (Cialis). The three drugs all work in essentially the same way and have about the same success rate. Manufacturers claim that one or the other works

KEY TERMS

Atherosclerosis—A disorder in which plaques of cholesterol, lipids, and other debris build up on the inner walls of arteries, narrowing them.

Cialis—Trade name for tadalafil, an oral medication for the treatment of impotence.

Corpus cavernosum (plural, corpora cavernosa)—One of two rods of spongy tissue in the penis that become engorged with blood in order to produce an erection.

Gene therapy—A method of treating a disorder by replacing damaged or abnormal genes with normal ones. Some researchers think that gene therapy may offer a new way to treat impotence.

Levitra—Trade name for vardenafil, an oral medication for the treatment of impotence.

Neurotransmitters—Chemicals that modify or help transmit impulses across nerve synapses.

Penile implant—An artificial device inserted by surgery in the penis to produce an erection. Implantation of rigid or semi-rigid bars produces a permanent erection; use of an inflatable device allows the man to produce an erection at will.

Peyronie's disease—A disease resulting from scarring of the corpus cavernosa, which causes painful erections.

Topical—A type of medication that is applied to a specific and limited area of skin and affects only the area to which it is applied.

Urethra—The small tube that drains urine from the bladder and in men serves as a conduit for semen during ejaculation.

Viagra—Trade name of an orally administered drug for erectile failure first cleared for marketing in the United States in March 1998. Its generic name is sildenafil citrate.

faster, has fewer side effects, and lasts longer, but such differences are relatively insignificant.

Other medications under investigation as treatments for impotence are topical agents, which means that they are applied externally to the skin rather than being injected or taken by mouth. If approved, these drugs would provide a noninvasive alternative for men who cannot take sildenafil, vardenafil, tadalafil, or other oral medications for impotence. In November 2007, the FDA accepted a new drug application filed by NexMed, Inc., for its topical ointment containing the compound alprostadil for treatment of impotence.

Other traditional therapies for impotence include vacuum pump therapy, injection therapy involving injecting a substance into the penis to enhance blood flow, and a penile implantation device. In rare cases, if narrowed or diseased veins are responsible for impotence, surgeons may reroute the blood flow into the corpus cavernosa or remove leaking vessels.

A later approach to the treatment of erectile dysfunction is gene therapy. As of early 2008, several preclinical studies had shown promise, but none of the gene-based strategies at the time had been tested for safety.

Expected results

With proper diagnosis, impotence can nearly always be treated or coped with successfully. Unfortunately, fewer than 10% of impotent men seek treatment.

Prevention

There is no specific treatment to prevent impotence. Perhaps the most important measure is to maintain general good health and avoid atherosclerosis by exercising regularly, controlling weight, controlling **hypertension** and high **cholesterol** levels, and not smoking. Avoiding excessive alcohol intake may also help.

Resources

BOOKS

Carson, Culley C., and John D. Dean. *Management of Erectile Dysfunction in Clinical Practice*. New York: Springer, 2007.

Eardley, Ian. *Therapy for Erectile Dysfunction*. London: Taylor & Francis, 2007.

Kirby, Roger S. *An Atlas of Erectile Dysfunction,* 2nd ed. London: Taylor & Francis, 2007.

Steidle, Christopher, and Janet Casperson. *Overcoming Erectile Dysfunction: A Man's Guide to Treatment*. Omaha, NE: Addicus Books, 2008.

PERIODICALS

Adeniyi, Ade A., et al. "Yohimbine in the Treatment of Orgasmic Dysfunction." *Asian Journal of Andrology* (May 2007): 403 407.

Bivalacqua, Trinity J., and Travis D. Strong. "The Use of Gene Transfer Technology to Study the Pathophysiol ogy of Erectile Dysfunction." *Journal of Sexual Medi cine* (February 2008): 268 275.

Dean, J., et al. "Integrating Partners into Erectile Dysfunc tion Treatment: Improving the Sexual Experience for the Couple." *International Journal of Clinical Practice* (January 2008): 127 133.

Hatzimouratidis, Konstantinos, and Dimitrios G. Hatzi christou. "Looking to the Future for Erectile Dysfunc tion Therapies." *Drugs* 68, no. 2 (2008): 231 250.

Mittleman, M. A., et al. "Cardiovascular Outcomes among Sildenafil Users: Results of the International Men's Health Study." *International Journal of Clinical Prac tice* (March 2008): 367 373.

Reffelmann, Thorsten, Arne Kieback, and Robert A. Kloner. "The Cardiovascular Safety of Tadalafil." *Expert Opinion on Drug Safety* (January 2008): 43 52.

ORGANIZATIONS

American Urological Association Foundation, 1000 Cor porate Bvld., Linthicum, MD, 21090, (866) 746 4282, http://www.auafoundation.org/.

National Kidney and Urologic Diseases Information Clear inghouse, 3 Information Way, Bethesda, MD, 20892 3580, 800 891 5390, http://kidney.niddk.nih.gov/.

Ken R. Wells
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Indian medicine *see* **Ayurvedic medicine**

Indian paint *see* **Bloodroot; Goldenseal**

Indian plantago *see* **Psyllium**

Indian tobacco *see* **Lobelia**

Indigestion

Definition

Indigestion, which is sometimes called dyspepsia, is a general term covering a group of nonspecific symptoms in the digestive tract. It is often described as a feeling of fullness, bloating, **nausea**, **heartburn**, or gassy discomfort in the chest or abdomen. The symptoms develop during meals or shortly afterward. In approximately 44% of cases, indigestion is a minor problem that often clears up without professional treatment. Researchers believe, however, that chronic heartburn can lead to more serious disorders, such as esophageal **cancer**. It is also important for patients with indigestion to be evaluated for a possible cardiac disease.

Description

Indigestion, or dyspepsia, is a widespread condition, estimated to occur in 25% of the adult population of the United States. Most people with indigestion do not feel sick enough to see a doctor; nonetheless, it is a common reason for office visits. About 3% of visits to primary-care doctors are for indigestion.

Effective therapies for indigestion

Therapy	Description
Acupressure	Massage the soft flesh between the thumb and pointer finger (Large Intestine 4) and press two fingers width away from the navel on both sides of the stomach (Stomach 25)
Aromatherapy	Ingest one drop of tarragon, marjoram, or rosemary accompanied by honey or other edible oils (safflower, almond, etc.)
Herbal medicine	Lavender, chamomile, peppermint, goldenseal, or lemon balm tea
Hydrotherapy	Hot water bottle or hot compresses on abdomen
Massage	Abdominal massage
Traditional Chinese medicine (TCM)	Chinese herbal formulas such as Po Chai and Pill Curing

(Illustration by Corey Light. Cengage Learning, Gale)

Causes and symptoms

Physical causes

The symptoms associated with indigestion have a variety of possible physical causes, ranging from commonplace food items to serious systemic disorders:

- Diet. Milk, milk products, alcoholic beverages, tea, and coffee cause indigestion in some people because they stimulate the stomach's production of acid.
- Medications. Certain prescription drugs as well as over-the-counter medications can irritate the stomach lining. These medications include nonsteroidal anti-inflammatory drugs (NSAIDs, or over-the-counter pain killers such as aspirin), some antibiotics, digoxin, calcium antagonists, nitrates, theophylline, corticosteroids, iron (ferrous sulfate), oral contraceptives, and tricyclic antidepressants.
- Disorders of the pancreas and gallbladder. These include inflammation of the gallbladder or pancreas, cancer of the pancreas, and gallstones.
- Intestinal parasites. Parasitic infections that cause indigestion include amebiasis, fluke and tapeworm infections, giardiasis, and strongyloidiasis.
- Systemic disorders, including diabetes, thyroid disease, and collagen vascular disease.
- Cancers of the digestive tract.
- Conditions associated with women's reproductive organs. These conditions include menstrual cramps, pregnancy, and pelvic inflammatory disease.

Psychological & emotional causes

Indigestion often accompanies an emotional upset because the part of the nervous system involved in the so-called fight-or-flight response also affects the digestive tract. People diagnosed with **anxiety** or somatoform disorders frequently have problems with indigestion. Many people in the general population, however, also experience heartburn, what is commonly called butterflies in the stomach, or stomach cramps when they are in upsetting situations—such as school examinations, arguments with family members, crises in their workplace, and so on. Some people's digestive systems appear to react more intensely to emotional **stress** due to hypersensitive nerve endings in their intestinal tract.

Specific gastrointestinal disorders

In some cases, the patient's description of the symptoms suggests a specific digestive disorder as the cause of the indigestion. Some doctors classify these cases into three groups:

ESOPHAGITIS TYPE. Esophagitis is an inflammation of the tube that carries food from the throat to the stomach (the esophagus). The tissues of the esophagus can become irritated by the flow (reflux) of stomach acid backward into the lower part of the esophagus. If the patient describes the indigestion in terms of frequent or intense heartburn, the doctor considers gastroesophageal reflux disease (GERD) as a possible cause. GERD is a common disorder in the general population, affecting about 30% of adults. In 2001, a study showed that **obesity** impairs the antireflux action. Those who are overweight have more severe reflux than most patients. Nighttime GERD affects 79% of adults with heartburn and is potentially more destructive to the esophagus than daytime indigestion. Another study found that acid reflux leads to **cough** and **wheezing** problems, particularly in people with **asthma**.

GERD also affects some infants and children and is a common cause of babies' spitting up formula. In most cases, the condition resolves itself, but children older than one year with regularly occurring **pain** in the lower chest or upper abdomen should cause concern. If a child is bothered by these symptoms during sleep or activities, a physician should be consulted.

PEPTIC ULCER TYPE. Patients who smoke and are over 45 are more likely to have indigestion of the peptic ulcer type. This group also includes people who find that their indigestion is relieved by taking antacids or eating a small amount of food. Patients in this category are often found to have *Helicobacter pylori* **infections**. *H. pylori* is a rod-shaped bacterium that lives in the tissues of the stomach and causes irritation of the mucous lining of the stomach walls. Most people with *H. pylori* infections do not develop chronic indigestion, but the organism appears to cause peptic ulcer disease (PUD) in a vulnerable segment of the population.

NONULCER TYPE. Most cases of chronic indigestion—as many as 65%—fall into this third category. Nonulcer dyspepsia is sometimes called functional dyspepsia because it appears to be related to abnormalities in the way that the stomach empties its contents into the intestine. In some people, the stomach empties either too slowly or too rapidly. In others, the stomach's muscular contractions are irregular and uncoordinated. These disorders of stomach movement (motility) may be caused by hypersensitive nerve endings in the stomach tissues. Patients in this group are likely to be younger than 45 and have a history of taking medications for anxiety or **depression**.

Diagnosis

Patient history

Because indigestion is a nonspecific set of symptoms, patients who feel sick enough to seek medical

attention are likely to go to their primary-care doctor. The history does not always point to an obvious diagnosis. The doctor can, however, use the process of history-taking to evaluate the patient's mood or emotional state in order to assess the possibility of a psychiatric disturbance. In addition, asking about the location, intensity, timing, and recurrence of the indigestion can help the doctor weigh the different diagnostic possibilities.

An important part of the history-taking is asking about symptoms that may indicate a serious illness. These warning symptoms include:

- weight loss
- persistent vomiting
- difficulty or pain in swallowing
- vomiting blood or passing blood in the stools
- anemia.

Imaging studies

If the indigestion should be investigated further, the doctor orders an endoscopic examination of the stomach. An endoscope is a slender tube-shaped instrument that allows the doctor to look at the lining of the patient's stomach. If the patient has indigestion of the esophagitis type or nonulcer type, the stomach lining will appear normal. If the patient has PUD, the doctor will be able to see breaks or ulcerated areas in the tissue. The physician may also order ultrasound imaging of the abdomen, or a radionuclide scan, to evaluate the motility of the stomach.

Laboratory tests

BLOOD TESTS. If the patient is over 45 years old, the doctor will have the patient's blood analyzed for a complete blood cell count, measurements of liver enzyme levels, electrolyte and serum **calcium** levels, and thyroid function.

TESTS FOR *HELICOBACTER PYLORI*. Doctors can test patients for the presence of *H. pylori* without having to take a tissue sample from the stomach. One of these noninvasive tests is a blood test and the other is a breath test.

Treatment

Nutritional supplements

Nutritionists or naturopaths may recommend the following to improve digestion:

- Avoid foods that may cause an upset stomach. These include spicy, fried, cured, or junk foods, cucumbers, onions, peppers, tomatoes, beans, carbonated beverages, or beverages containing caffeine.
- Eat lighter but more frequent meals.
- Avoid smoking.
- Adopt a high-fiber diet to improve regularity and treat digestive problems such as constipation, hemorrhoids, irritable bowel disease, and colon cancer. A high-fiber diet provides such additional health benefits as boosting the immune system function and preventing heart disease, cancer, and other diseases.
- Increase water intake. Proper hydration helps the digestive system work better.
- Improve poor digestive enzyme function with hydrochloric acid and pancreatic enzyme supplements such as lipase, amylase, and protease.
- Thicken a baby's food to help with reflux (add one tablespoon of dry rice cereal to each ounce of formula or breast milk). Hold babies upright after feedings rather than laying them down right away.

Herbal medicine

Practitioners of Chinese traditional herbal medicine might recommend medicines derived from peony (*Paeonia lactiflora*), **hibiscus** (*Hibiscus sabdariffa*), or hare's ear (*Bupleurum chinense*) to treat indigestion. Western herbalists are likely to prescribe **fennel** (*Foeniculum vulgare*), **lemon balm** (*Melissa officinalis*), or **peppermint** (*Mentha piperita*) to relieve stomach cramps and heartburn.

Homeopathy

Homeopaths tailor their remedies to the patient's overall personality profile as well as the specific symptoms. Depending on the patient's reaction to the indigestion and some of its likely causes, the homeopath might choose *Lycopodium*, *Carbo vegetalis*, ***Nux vomica***, or *Pulsatilla*.

Diet and stress management

Many patients benefit from the doctor's reassurance that they do not have a serious or fatal disorder. Cutting out alcoholic beverages and drinks containing **caffeine** often helps. The patient may also be asked to keep a record of food intake, daily schedule, and symptom severity. Food diaries sometimes reveal psychological or dietary factors that influence indigestion. Eating small frequent meals may also offer relief.

Other treatments

Some alternative treatments are aimed at lowering the patient's stress level or changing attitudes and beliefs that contribute to indigestion. These therapies and practices include **Reiki**, **reflexology**, **hydrotherapy**, therapeutic massage, **yoga**, and **meditation**.

Allopathic treatment

Since most cases of indigestion are not caused by serious disorders, many doctors prefer to try medications and other treatment measures before ordering an endoscopy. However, in cases of individuals over 55 years of age, the physician may perform an endoscopy earlier in the course of treatment.

Many patients with acid reflux treat themselves with over-the-counter remedies. For nighttime GERD, a 2001 study recommended a dose of proton pump inhibitor before breakfast and another dose before dinner. Some medicines are also approved for use in infants and children with indigestion that does not resolve itself.

Medications

Patients with the esophagitis type of indigestion are often treated with H_2 antagonists, drugs that block the secretion of stomach acid. They include ranitidine (Zantac) and famotidine (Pepcid).

Patients with motility disorders may be given prokinetic drugs. Prokinetic medications such as metoclopramide (Reglan) and cisapride (Propulsid) speed up the emptying of the stomach and increase intestinal motility.

Removal of H. pylori

Antibiotic therapy may be given to wipe out *H. pylori* bacteria from the gastrointestinal tract.

Expected results

Most cases of mild indigestion do not need medical treatment. For patients who consult a doctor and are given an endoscopic examination, 5–15% are diagnosed with GERD and 15–25% with PUD. About 1% of patients who are endoscoped have stomach cancer. Most patients with functional dyspepsia do well on either H_2 antagonists or prokinetic drugs, depending on the cause of their indigestion.

Prevention

Indigestion can often be prevented by attention to one's diet, general stress level, and ways of managing stress. Specific preventive measures include:

- Stopping smoking.
- Cutting down on or eliminating alcohol, tea, or coffee.
- Avoiding foods that are highly spiced or loaded with fat.
- Eating slowly and keeping mealtimes relaxed.
- Practicing yoga or meditation.
- Not taking aspirin or other medications on an empty stomach.
- Keeping one's weight within normal limits.

KEY TERMS

Dyspepsia—Another name for indigestion.

Endoscope—A slender tubular instrument used to examine the inside of the stomach.

Gastroesophageal reflux disease (GERD)—A disorder of the lower end of the esophagus, caused by stomach acid flowing backward into the esophagus and irritating the tissues.

H_2 antagonist—A type of drug that relieves indigestion by reducing the production of stomach acid.

Heartburn—A popular term for an uncomfortable burning sensation in the stomach and lower esophagus, sometimes caused by the reflux of small amounts of stomach acid.

Helicobacter pylori—A gram-negative rod-shaped bacterium that lives in the tissues of the stomach and causes inflammation of the stomach lining.

Motility—The movement or capacity for movement of an organism or body organ. Indigestion is sometimes caused by abnormal patterns in the motility of the stomach.

Peptic ulcer disease (PUD)—A stomach disorder marked by corrosion of the stomach lining due to the acid in the digestive juices.

Prokinetic—A drug that works to speed up the emptying of the stomach and the motility of the intestines.

Reflux—The backward flow of a body fluid or secretion. Indigestion is sometimes caused by the reflux of stomach acid into the esophagus.

Resources

BOOKS

Wendland, Barbara E., and Lisa Marie Ruffolo. *Chronic Heartburn: Managing Acid Reflux and GERD Through Understanding, Diet, and Lifestyle*. Toronto, Ontario, Canada: Robert Rose, 2006.

PERIODICALS

Banerjee, S., and J. Van Dam. "GERD: Reflux to Esoph ageal Adenomcarcinoma." *New England Journal of Medicine* 355 (August 24, 2006): 848.

ORGANIZATIONS

American College of Gastroenterology, PO Box 342260, Bethesda, MD, 20827 2260, (301) 263 9000, http://www.acg.gi.org.

Teresa Norris
Rhonda Cloos, RN

Infant massage

Definition

Infant massage refers to massage therapy as specifically applied to infants. In most cases, oil or lotion is used as it would be on an adult subject by a trained and licensed massage therapist. Medical professionals caring for infants might also use massage techniques on infants born prematurely, on those with motor or gastrointestinal problems, or on those who have been exposed to cocaine in utero.

Origins

The practice of massaging infants dates back to ancient times, particularly in Asian and Pacific Island cultures; that is, massage was a component of the baby's regular bath routine among the Maoris and Hawaiians. Touch in these cultures is considered healthful both physically and spiritually. In the West, however, infant massage has received more attention in recent years in conjunction with the popularity of natural **childbirth** and midwife-assisted births. Dr. Frédéric Leboyer, a French physician who was one of the leaders of the natural childbirth movement, helped to popularize infant massage through his photojournalistic book on the Indian art of baby massage.

Infant massage. *(© Photo Researchers, Inc. Reproduced by permission.)*

Infant massage was introduced formally into the United States in 1978 when Vimala Schneider McClure, a **yoga** practitioner who served in an orphanage in Northern India, developed a training program for instructors at the request of childbirth educators. An early research study by R. Rice in 1976 had showed that premature babies who were massaged surged ahead in weight gain and neurological development over those who were not massaged. From McClure's training in India, her knowledge of **Swedish massage** and reflexology, along with her knowledge of yoga postures that she had already adapted for babies, she became the foremost authority on infant massage. In 1986 she founded the International Association of Infant Massage (IAIM), which has 27 chapters worldwide as of 2000.

Benefits

Research from experiments conducted at the Touch Research Institutes at the University of Miami School of Medicine and Nova Southeastern University has been cited for the clinical benefits massage has on infants and children. Tiffany Field, Ph. D., director, noted that the research "... suggests that touch is as important to infants and children as eating and sleeping. Touch therapy triggers many physiological changes that help infants and children grow and develop. For example, massage can stimulate nerves in the brain which facilitate food absorption, resulting in faster weight gain. It also lowers level of **stress** hormones, resulting in improved immune function."

The benefits of infant massage include:

- relaxation
- relief from stress
- interaction with adults
- stimulation of the nervous system

The results of several studies showed that infant massage alleviates the stress that newborns experience as a result of the enormous change that birth brings about in their lives after the 6–9 months they have spent in the womb. Both premature infants and full-term babies need the relaxation that comes from massaging and moving their limbs and muscles. In infants with **colic**, massage provides the relief necessary to disperse **gas**, ease **muscle spasms**, tone the digestive system and help it work efficiently. Some techniques even help bring relief from teething and emotional stress. The stimulation an infant receives from massage can aid circulation, strengthen muscles, help digestion, and relieve **constipation**. The bonding that occurs with massage between a parent and child enhances the entire process of bonding that comes with contact through all of the senses, including touch, voice, and sight. It affords a physical experience of quality time between the parents and the child as well as with any significant others in a baby's life.

Description

Various techniques are used in infant massage, with the different strokes specific to a particular therapy. Special handling is used for treating a baby with gas and colic. Some of the strokes are known as "Indian milking," which is a gentle stroking of the child's legs; and the "twist and squeeze" **stroke**, a gentle squeeze of the muscles in the thigh and calf. The light "feather" strokes often employed in regular Swedish massage are applied at the end of a massage. The procedure is not unlike certain forms of adult massage, but with extra care taken for the fragility of the infant.

There are also specific Chinese techniques of pediatric massage, including massage of children with special needs. In China, these forms of massage can be given by medical professionals, but parents are often taught how to do the simpler forms for home treatment of their children.

Preparations

If lotions or oils are used, care is taken to ensure their safety on a baby's delicate skin. The most important consideration is to use vegetable oils rather than mineral oils, which can clog the pores in the skin. The oil that is used should be warmed in the caregiver's hands before applying it to the baby's skin. The environment in which the massage is given to an infant should be comfortably warm, and as calm and non-threatening as possible.

Precautions

Extreme caution is necessary when performing infant massage. Strokes are made with the greatest delicacy in order not to harm the infant in any way. Proper techniques are taught by licensed massage therapists ensuring that the infant is treated with appropriate physical touch. Anyone who is unfamiliar with handling a baby should receive appropriate instruction before beginning infant massage.

Side effects

No adverse side effects have been reported when infant massage is done properly after careful instruction, or by a licensed massage therapist who specializes in infant care.

Research and general acceptance

In addition to the study already noted regarding touch therapy, a website devoted to infant massage lists research published as early as 1969, and cites hundreds of individual projects that have been conducted throughout the world focusing on infant massage. Many of the studies are related to the benefits of massage and touch for premature infants and others born with such risk factors as drug dependence. Conclusions regarding the benefits are overwhelmingly positive. The proliferation of therapists licensed in infant massage across the United States and worldwide indicates that infant massage is increasingly recognized as a legitimate health care treatment.

Training and certification

The International Association of Infant Massage (IAIM) has developed a basic course for licensing infant massage therapists. The pioneer in the field, Vimala McClure, began to prepare a course of instruction in the 1970s. The course is introduced in four-day sessions around the United States. Licensing is obtained by those who complete the course, pass a take-home examination, and complete a teaching practicum with five families over a three-month period. IAIM listed its course in 2000 as costing $550.00 if paid in full two weeks prior to training, and $595 after that. It includes a $100 nonrefundable deposit due one month before training. The cities where the basic course was offered in 2000 included Augusta, GA; Gaithersburg, MD; Chicago, IL; Boston, MA; Washington, DC; Charlottesville, VA; Minneapolis, MN; and Albuquerque, NM. In 2000, the International Institute of Infant Massage in Albuquerque also offered an Infant Massage Instructor Certification Course specifically geared to men, entitled "Men Teaching Fathers," and scheduled to last four days.

The licensing of massage therapists varies from state to state, as infant massage qualifies for consideration as medical treatment. Infant massage is becoming an increasingly popular discipline within the field. Numerous websites provide listings for infant massage specialists throughout the United States. The IAIM course is recognized as the official course for infant massage.

Resources

BOOKS

Auckett, Amelia. *Baby Massage: Parent Child Bonding through Touching*. Newmarket Press, 1982.

Cline, Kyle. *Chinese Massage for Infants and Children: Traditional Techniques for Alleviating Colic, Teething Pain, Earache, and Other Common Childhood Conditions*. Inner Traditions International, Limited, 1999.

Fan, Ya Li. *Chinese Pediatric Massage Therapy: Traditional Techniques for Alleviating Colic, Colds, Earaches, and Other Common Childhood Conditions*, ed. Bob Flaws. Blue Poppy Enterprises, 1999.

Gordon, Jay, and Brenda Adderly. *Brighter Baby: Boosting Your Child's Intelligence, Health and Happiness through Infant Therapeutic Massage*. New York: Regnery Pub lishing, Inc. 1999.

Heinl, Tina. *The Baby Massage Book: Shared Growth through the Hands*. Sigo Press, 1991.

Leboyer, Frédéric. *Loving Hands: The Traditional Indian Art of Baby Massage*. New York: Knopf, 1976.

McClure, Vimala Schneider. *Infant Massage: A Handbook for Loving Parents*. New York: Bantam Books, 1989.

Walker, Peter. *Baby Massage: A Practical Guide to Massage and Movement for Babies and Infants*. New York: St. Martin's Press, 1996.

ORGANIZATIONS

International Association of Infant Massage. P.O. Box 1045. Oak View, CA 93022.

International Institute of Infant Massage. 605 Bledsoe Rd. NW. Albuquerque, NM 87107. (505) 341 9381. Fax: (505) 341 9386. http://www.infantmassage.com.

OTHER

Gentle Touch Infant Massage Video. Gentle Touch, Inc. 1996.

Jane Spehar

Infections

Definition

An infection is a condition in which viruses, bacteria, fungi, or parasites enter the body and cause a state of disease. These foreign invaders are called pathogens. They damage the body by adhering to or invading cells, altering the body's metabolism, releasing toxic substances, or causing allergic reactions. The body's immune system has a set series of responses to attempt to control infection; however, these reactions are not always successful. Chronic lower respiratory infection, **influenza** and **pneumonia** (combined), and sepsis (overwhelming systemic infection) were among the top ten causes of death in the United States in 2005.

Description

Pathogens are everywhere in the environment. They may enter the body through breathing, ingesting food or water, through sexual contact, open **wounds**, or contact

with contaminated materials. The body has many natural barriers to infection. For example, harmless bacteria normally found on the skin, known as commensal bacteria, inhibit the growth of some pathogens. Sweat and oil gland secretions also protect the skin, and the skin itself offers a significant physical barrier to the entry of many pathogens. Mucus in the mouth and throat help physically trap inhaled pathogens before they can reach the lungs.

In addition to physical barriers, many of the body's secretions contain compounds that help destroy pathogens. The mucous membranes that line the airways and digestive system contain enzymes and chemicals that kill or disable pathogens. Commensal bacteria also live in the intestines and slow multiplication of pathogens just as they do on the skin. The digestive tract contains stomach acid, pancreatic enzymes, and other secretions that can kill certain pathogens. Peristalsis and the shedding of the lining of the intestinal tract also help to remove pathogens. The acid pH of the vagina is protective, as is the long urethra in males. The flushing action of urine as it is excreted also protects against infection. Nevertheless, some pathogens are able to enter the body and survive.

Most pathogens that succeed in entering the body are quickly killed before they have a chance to multiply. If, however, the body is unable to keep the pathogens in check, serious disease or death may occur. Acute infections develop suddenly, and they disappear when a person receives treatment or the body's immune system responds and destroys the pathogen. Chronic infections develop if the body has only limited control over a pathogen. In chronic infections, the body is never completely rid of the pathogen, but symptoms may disappear temporarily. Symptoms will then flare up again in response to physical or emotional **stress** or when the body is weakened by another illness. Sepsis is a serious, often fatal, condition in which a pathogen spreads throughout the body by way of the bloodstream. This type of infection affects the entire body and can cause major organ failure and death.

The body's immune system (mainly the spleen, thymus, lymph nodes, and white blood cells [WBCs]) does not stand by helplessly when pathogens begin to multiply. In response to chemicals released by cells damaged by pathogens, WBCs circulating in the blood migrate to the site of the infection. Several types of WBCs engulf pathogens and render them harmless. At the same time, body temperature often increases (a **fever**) in response to the chemical interferon that is released by damaged body cells. Low to moderate fever is a helpful part of the body's response to an infection because many pathogens do not thrive at higher-than-normal body temperatures. However, if body temperature climbs above 102°F (38.9°C), the individual may need treatment to lower it in order to avoid seizures, dehydration, and tissue damage.

WBCs are involved in another immune system response. This response takes a week or more to become effective. Pathogens are antigens. Antigens are foreign materials that stimulate the immune system to respond by making special proteins called antibodies. When a pathogen successfully establishes itself in the body, specialized WBCs respond by making antibodies. Antibodies interfere with the surface structure of the pathogen so that it cannot attach to or enter cells. Making enough antibodies to control a pathogen takes time, so the individual gets sicker before beginning to recover. Sometimes the pathogen multiplies so fast that the immune system cannot suppress it, and recovery does not occur. Once a person has made antibodies to a specific pathogen, the person is highly unlikely to be made ill by that pathogen again and is said to have immunity against that particular pathogen. Vaccination against diseases such as **measles** and polio is a way to create artificial immunity without the person having symptoms of the disease.

Causes and symptoms

Infections are caused by pathogens invading the body and multiplying. Headaches, muscle aches, fever, **chills**, and **fatigue** are common systemic symptoms of infections. These symptoms most often are due to inflammation and the response of the body to the release of interferon and other chemicals by damaged cells rather than by the pathogen. At the infection site, release of the chemical histamine brings an increased blood supply to that site and causes the blood capillaries become "leaky" so that WBCs can escape the capillaries and attack the pathogen. The infection site then becomes reddened, warm, and swollen. When the WBCs die and decay they form a thick fluid known as pus.

More specific symptoms of infection vary according to the site and type of the infection. Some of these symptoms include the following:

- Gastrointestinal system: diarrhea, vomiting, nausea, stomachaches, cramps, gas pains, and dehydration.
- Respiratory system: coughing, sneezing, sore throat, congestion, fever, bronchitis, and runny nose.
- Urinary system: increased frequency and urgency of urination; pain on urination; blood, pus, or other discharge in the urine; bad-smelling urine or discharge; and vaginal itching.

- Skin: rashes, sores, itching, and blisters; redness, swelling, tenderness, and pain.
- Joints: local pain, stiffness, redness, and swelling.

Factors that increase the risk of acquiring an infection include chronic disease (e.g., **AIDS**), severe emotional stress, broken skin, changes in the pH of various body fluids, malnutrition, surgery, rupture of amniotic membranes in pregnant women, invasive medical or dental procedures, tissue injuries, decreased flow of body fluids (often a contributing factor in bladder infections) changes in peristalsis, decreased output of stomach acid, and suppressed immune function (e.g., in chemotherapy patients, people with AIDS, transplant patients). Many infections are contagious; that is, they can be passed from person to person. Contagion is especially typical in respiratory diseases, which can be transmitted through contact with the sputum and droplets produced by coughing or **sneezing**. Contact with infected waste products, open sores, skin eruptions, infected clothing and bedclothes, and sexual contact are other ways of spreading common pathogens.

In the first decade of the twenty-first century, people around the world are acutely aware of the threat of infection from bioterrorism. For example, Americans faced a scare from the deliberate distribution of anthrax spores through the United States postal system following the September 11, 2001 attacks. The U.S. Army Research Institute of Infections Diseases (USAMRIID) at Fort Detrick in Frederick, Maryland, researches ways to prevent and treat biological threats. As the threat of bioterrorism increased, USAMRIID provided training and diagnostic support to the FBI and state and local law enforcement, as well as researching medical methods for protecting military personnel from biological weapons.

The development of mutated (genetically changed as the result of natural selection) pathogens that are not killed by commonly used antibiotics is of increasing concern to healthcare workers. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a strain of staphylococcal bacteria that is resistant to the antibiotic methicillin and other common antibiotics that normally control **staphylococcal infections**. Although this strain of staph has existed in hospitals for years, in the 1990s, MRSA began appearing in places other than hospitals. By 2007, two forms of MRSA were recognized, hospital-acquired MRSA (HA-MRSA) and community-acquired MRSA (CA-MRSA). Symptoms of a MRSA infection are similar to those of other staph infection symptoms, only MRSA is much more dangerous and has a much higher mortality rate because treatment with common antibiotics does not kill the bacterium. The incidence of drug-resistant **tuberculosis** was also rising as of 2008. Overuse of antibiotics accelerates the development of these drug-resistant pathogens.

Diagnosis

Many infections are minor and self-limiting. Superficial infections can generally be cured by keeping the area clean and antiseptic and applying warm, moist compresses to the affected area for 20 to 30 minutes three or four times a day. Some infections, however, are more serious and can lead to permanent impairment or death. For example, an untreated streptococcal infection (**strep throat**) can develop into **rheumatic fever**. Rheumatic fever damages the valves of the heart, although this damage may not show up for years. If an infection does not clear up within a few days, or if it gets worse, a healthcare provider should be consulted.

Infections usually are initially diagnosed by the patient's symptoms and a history of the illness or injury. A complete blood count (CBC) is a simple clinical test that can be used to diagnose or confirm an infection. Increases in the total WBC count usually indicate infection. Increases in specific types of white blood cells known as neutrophils, lymphocytes, and monocytes also point to an infection. An increase in eosinophils may be due to a parasitic infection. A blood chemistry panel may be done to determine whether significant chemical changes have been brought on by infection.

A serious illness may require further evaluation and diagnostic tests. Additional laboratory tests can be performed using blood, feces, or samples of the infected tissue. Laboratory tests, for example, can determine what type of bacterium is causing an infection and which antibiotics will kill it. Ultrasound, computed tomography (CT) scans, and magnetic resonance imaging (MRI) also may be used. In some cases, a tissue sample (biopsy) is taken from the affected site for microbial culture tests and microscopic examination.

Treatment

Herbal therapy

Herbs that may help the body overcome or withstand infection include the following:

- Garlic (*Allium sativum*). This herb is believed to have antibacterial properties. Herbalists recommend consuming three garlic cloves or three garlic oil capsules a day, starting when symptoms of infection first appear.

- Cleavers (*Galium aparine*). This anti-inflammatory herb is believed to support the lymphatic system. It may be taken internally to help heal staph abscesses and reduce swelling of the lymph nodes. A cleavers compress can also be applied directly to a skin infection.
- Goldenseal (*Hydrastis canadensis*). Another herb believed to fight infection and reduce inflammation, goldenseal may be taken internally when symptoms of infection first appear. Making a paste of water and powdered goldenseal root and applying it directly to the affected area can treat skin infections. The preparation should be covered with a clean bandage and left in place overnight.
- Echinacea (*Echinacea* spp.). Taken internally, this herb is believed to have antibiotic properties and is also thought to strengthen the immune system.
- Thyme (*Thymus vulgaris*), lavender (*Lavandula officinalis*), or bergamot (*Citrus bergamot*) oils. These oils are believed to have antibacterial properties and may help to prevent the scarring that may result from skin infections. A few drops of these oils are added to water and then a compress soaked in the water is applied to the affected area.
- Tea tree oil (*Melaleuca* spp., or ylang ylang). Another infection-fighting herb, this oil can be applied directly to a boil or other skin infection.
- Reishi (*Ganoderma lucidum*), shiitake (*Lentinus edodes*), and maitake (*Grifola frondosa*) mushrooms are known for their ability to strengthen the immune system and their antimicrobial properties.

Dietary modifications

A healthful balanced diet and lifestyle are important supports of the immune function. Regular supplementation with **vitamin C**, **vitamin A** or beta-carotene, **zinc**, and **bioflavonoids** is also thought to boost the immune response.

Sugary foods, including honey, may depress the immune system. Very high levels of fat in the diet may also interfere, as well as causing other negative health effects. Alcohol decreases the functioning of the immune system. All of these substances should be avoided during the course of an infection. People should increase their intake of fluids, including soups, teas, diluted fruit and vegetable juices, and pure water when fighting an infection, especially if they have a fever.

Aromatherapy

Aromatherapy may be a useful supportive measure in infectious conditions. An essential oil of cedarwood (*Cedrus atlantica*) is recommended in **fungal infections**. **Essential oils** of tea tree (*Melaleuca alternifolia*) and patchouli are also useful. Essential oils are very concentrated and toxic to the liver and kidneys; they should be used only in very small doses (drops) under the supervision of an aromatherapist.

Acupuncture and yoga

Acupuncture may be helpful in stimulating the immune system and drawing heat away from the infected area. It reduces the effects of stress, improves circulation, and increases the production of red blood cells (RBCs) and WBCs. **Yoga** stimulates the immune system and promotes **relaxation**.

Hydrotherapy

Constitutional **hydrotherapy** is the use of applications of hot water alternated with cold. It is effective in respiratory infections and may stimulate the immune system. For proper administration of hydrotherapy, a naturopath or other healthcare provider familiar with its techniques should be consulted.

Allopathic treatment

Symptoms arising from minor infections are often relieved by over-the-counter medications. A high fever or joint **pain** may be a sign of infection spreading throughout the body. A physician should be contacted promptly. Infections from **bites** and puncture wounds should also receive medical attention and they may require a **tetanus** shot.

Serious infections are treated with antibiotics. Some antibiotics are effective against certain parasitic and fungal infections as well as bacteria. Antibiotics are ineffective against viral infections, and there is a trend away from giving them unless a bacterial infection has been clinically documented. The elderly or seriously ill may receive antibiotics when infected with a virus to prevent a secondary bacterial infection, which often occurs because of the weakened state brought on by the virus. In the case of viral infections, antiviral drugs may reduce symptoms. These drugs tend to be expensive and their usefulness is somewhat limited by the timing with which they must be administered.

Antifungal drugs are often applied directly to surface fungal infections such as athlete's foot. They also may be taken orally or injected. Fungal infections tend to be stubborn and often require several weeks of treatment and repeated courses of the drug.

Expected results

Most minor infections resolve within a week. Chronic infections may last for years. Serious infections need to be attended by a physician, as tissue and organ damage and death may result from failure to treat. **Anemia** may result from severe infections, since RBCs or their production may be affected.

Prevention

Various vaccines are available to prevent some specific infections. Vaccines are made from deactivated parts of viruses or bacteria that stimulate the body to produce antibodies against the pathogen without producing symptoms of the disease. They produce future immunity to infection from those pathogens that last anywhere from a season (influenza) to a lifetime (smallpox). Vaccinations for **mumps**, measles, chicken pox, tetanus, **hepatitis**, diphtheria, **whooping cough**, pneumonia, and **meningitis** are widely available in the United States. They are routinely given to infants and children to provide immunity from these diseases. Most states require certain vaccinations before children may attend public school (although exceptions can be made on religious and other grounds), and many universities require certain re-vaccinations before matriculation. Individuals in the military are also vaccinated or re-vaccinated against many diseases. Individuals traveling to developing countries often require non-routine vaccination against diseases uncommon on nonexistent in the United States.

Good hygienic practices help slow the spread of infection. These include keeping the body clean, as well as keeping food, utensils, and areas of preparation clean and free from contamination. The mantra for preventing food-borne infection is: "Keep cold food cold. Keep hot food hot." Warm or room-temperature food is a breeding ground for food-borne pathogens. Meat, seafood, and dairy products should be properly refrigerated until used. Meat, seafood, and eggs should be completely cooked to an internal temperature that kills food-borne pathogens. Breaks in the skin should be cleaned, disinfected, and covered. Direct contact with people known or suspected to have infections should be limited, depending on the nature of the disease. Thorough hand washing is one of the simplest and most cost-effective ways to prevent the spread of infection.

A positive mental outlook also is important in maintaining a healthy immune system, as are getting adequate amounts of sleep, relaxation, **exercise**, and stress reduction. A diet high in fresh fruits, fresh vegetables, and whole grains and low in saturated (animal) fats promotes general good health. Good lifestyle habits, such as avoiding **smoking**, recreational drugs, and limiting alcohol intake should be cultivated.

KEY TERMS

Allergen—Any substance, usually a protein, that induces an allergic reaction in a particular individual.

Antibiotic—An agent able to kill or interfere with the development of bacteria and other micro-organisms.

Antibody—A protein produced by the immune system to fight infection or rid the body of foreign material. The foreign material that stimulates the production of antibodies is called an antigen. Specific antibodies are produced in response to each different antigen and can only inactivate that particular antigen.

Commensal bacteria—Bacteria that live in or on the human body and are in an often beneficial relationship with the human host. For example, some bacteria in the digestive tract produce needed B vitamins.

Inflammation—The body's response to tissue damage; includes hotness, swelling, redness, and pain in the affected part.

Lymph nodes—Small, bean-shaped masses of tissue scattered along the lymphatic system that act as filters and immune monitors, removing fluids, bacteria, or cancer cells that travel through the lymph system.

Pathogens—Micro-organisms capable of causing disease.

Peristalsis—The smooth muscle contractions that move food, bile, and urine through their respective passageways.

pH—A comparative measure of the acidity or alkalinity of a solution.

Vaccine—Any preparation introduced into the body to prevent a disease by stimulating antibodies against it.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

Centers for Disease Control and Prevention (CDC), 1600 Clifton Road, Atlanta, GA, 30333, (800) 311 3435, (404) 639 3534, http://www.cdc.gov.

National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http://www.homeopathic.org.

National Institute of Ayurvedic Medicine, 375 Fifth Ave., Fifth Floor, New York, NY, 10016, (212) 685 8600, http://niam.com/corp web/index.htm.

Patience Paradox
Teresa G. Odle
Tish Davidson, A. M.

Infectious mononucleosis *see* **Mononucleosis**

Infertility

Definition

Infertility is the failure of a couple to conceive a **pregnancy** after trying to do so for at least one full year. In primary infertility, pregnancy has never occurred. In secondary infertility, one or both members of the couple have previously conceived but are unable to conceive again after a full year of trying.

Description

Approximately 20% of couples struggle with infertility at any given time. Infertility increased as a problem after 1975. Some studies blamed this increase on social phenomena, including the tendency for marriage and starting a family to occur at a later age. For women, fertility decreases with increasing age:

- Infertility in married women ages 16 to 20: 4.5%.
- Infertility in married women ages 35 to 40: 31.8%.
- Infertility in married women over the age of 40: 70%.

Individuals may have multiple sexual partners before they marry and try to have children. The increase in numbers of sexual partners has led to an increase in sexually transmitted diseases. Scarring from these **infections**, especially from **pelvic inflammatory disease** (PID, an infection of the female reproductive organs) seems to be partially responsible for the increase in infertility. Furthermore, use of some forms of the contraceptive called the intrauterine device (IUD) has contributed to an increased rate of pelvic inflammatory disease, with subsequent scarring. As of 2008 IUDs were not a common form of birth control in the United States, but they were widely used in Europe. In the late twentieth century, **copper** IUDs were linked to increased tubal infertility. Research subsequently strongly suggested that infection from the sexually transmitted disease **chlamydia** was likely the true cause.

To understand issues of infertility, it is first necessary to understand the basics of human reproduction. Fertilization occurs when a sperm from the male merges with an egg (ovum) from the female, creating a zygote that contains genetic material (DNA) from both the father and the mother. If pregnancy is then established, the zygote will develop into an embryo, then a fetus, and ultimately, if all goes well, a baby will be born in about nine months.

Sperm are small cells that carry the father's genetic material. The sperm are mixed into fluid called semen, which is discharged from the penis during sexual intercourse. The whip-like tail of the sperm allows the sperm to swim up the female reproductive tract, in search of an egg.

The ovum is the cell that carries the mother's genetic material. Once a month, a single mature ovum is produced and leaves the ovary in a process called ovulation. This ovum enters a tube leading to the uterus (the fallopian tube) where fertilization occurs.

When fertilization occurs, the resulting cell (which now contains genetic material from both the mother and the father) is called the zygote. This single cell will divide into multiple cells and the resulting cluster of cells (called a blastocyst) moves into the womb (uterus). The uterine lining (endometrium) has been stimulated by female hormones and grows thicker to prepare it to receive a blastocyst. If the blastocyst successfully attaches itself to the wall of the uterus, pregnancy has been achieved.

Causes and symptoms

Unlike most medical problems, infertility is an issue requiring the careful evaluation of two separate

individuals, as well as an evaluation of their interactions with each other. In about 3 to 4% of couples, no cause for infertility is discovered. About 40% of the time, infertility is due to a problem with the male; about 40% of the time, infertility is due to the female; and the remainder of the time, there are fertility problems with both the male and the female.

The main factors involved in causing infertility are:

- male sperm problems: 35%
- ovulation problems: 20%
- tubal problems: 20%
- endometriosis: 10%
- cervical factors: 5%

Male factors

Male infertility can be caused by a number of different characteristics of the sperm. To check for these characteristics, a sample of semen is obtained and examined under the microscope (semen analysis). Four basic characteristics are evaluated:

- Sperm count is the number of sperm present in a semen sample. The normal number of sperm present in just 1 ml of semen is over 20 million. A man with only 5 to 20 million sperm is considered subfertile and a man with less than 5 million sperm is considered infertile.
- Sperm are also examined to see how well they swim (sperm motility) and to be sure that most have normal structure.
- Not all sperm within a specimen of semen are perfectly normal. Some may be immature, and some may have abnormalities of the head or tail. A normal semen sample contains no more than 25% abnormal forms of sperm.
- Volume of the semen sample is important. An abnormal amount of semen could affect the ability of the sperm to successfully fertilize an ovum.

Any number of conditions result in abnormal findings in the semen analysis. Men can be born with testicles that have not descended properly from the abdominal cavity (where testicles develop originally) into the scrotal sac, or they may be born with only one instead of the normal two testicles. Testicle size can be smaller than normal. Past infection (including **mumps**) can affect testicular function, as can a past injury. The presence of abnormally large veins (varicocele) in the testicles can increase testicular temperature, which decreases sperm count. History of having been exposed to various toxins, drug use, excess alcohol use, use of anabolic steroids, certain medications, diabetes, thyroid problems, or other endocrine disturbances can have direct effects on the formation of sperm (spermatogenesis). Certain organic solvents that men encounter in the workplace are also a possible cause of low sperm count. These solvents are most likely encountered by professional printers, painters, and decorators. Problems with the male anatomy also can cause sperm to be ejaculated not out of the penis, but into the bladder, and scarring from past infections can interfere with ejaculation.

Researchers continue to try and determine reasons for male infertility. They have reported that a certain protein lacking in the sperm could prevent formation of the structure on the head of the sperm that contains enzymes that help penetrate the egg, allowing conception. The finding may lead to further study of the molecular/chemical basis of male fertility.

Ovulatory problems

Infertility in women can occur for a variety of reasons. The first step in diagnosing ovulatory problems is to make sure that an ovum is being produced each month. A woman's morning body temperature is slightly higher around the time of ovulation. A woman can measure and record her temperature daily, and a chart can be drawn to show whether ovulation has occurred. Luteinizing hormone (LH) is released just before ovulation. A simple urine test can be done to check if LH has been released around the time that ovulation is expected.

Pelvic adhesions and endometriosis

Pelvic adhesions cause infertility by blocking the fallopian tubes and preventing the sperm from reaching the egg. Pelvic adhesions are fibrous scars. These scars can be the result of past infections, such as PID, or infections following abortions or prior births. Previous abdominal surgeries can also cause scarring.

A hysterosalpingogram (HSG) can show if the fallopian tubes are blocked. This is an x-ray exam that tests whether dye material can travel through the patient's fallopian tubes. Scarring also can be diagnosed by examining the pelvic area through the use of a laparoscope that is inserted into the abdomen through a tiny incision made near the navel.

Endometriosis is the abnormal location of uterine tissue outside the uterus. When uterine tissue is planted elsewhere in the pelvis, it still bleeds on a monthly basis with the start of the normal menstrual period, which leads to irritation within the pelvis around the site of this abnormal tissue and bleeding

and may cause scarring. Endometriosis may lead to pelvic adhesions.

Cervical factors

The cervix is the opening between the vagina and the uterus through which the sperm must pass. Mucus produced by the cervix helps to transport the sperm into the uterus. Injury to the cervix or scarring of the cervix after surgery or infection can result in a smaller than normal cervical opening, making it difficult for the sperm to enter. Injury or infection can also decrease the number of glands in the cervix, leading to a smaller amount of cervical mucus. In other situations, the mucus produced is the wrong consistency (perhaps too thick) to allow sperm to travel through. In addition, some women produce antibodies (immune cells) that are specifically directed to identify sperm as foreign invaders and to kill them.

Cervical mucus can be examined under a microscope to diagnose whether cervical factors are contributing to infertility. The interaction of a live sperm sample from the male partner and a sample of cervical mucus from the female partner can also be examined. This procedure is called a post-coital test.

Treatment

Conventional treatment for infertility usually involves invasive, expensive procedures. There are many alternative treatments available that can increase the chance of conception. Some have been proven effective in clinical studies.

General measures to increase fertility include monitoring ovulation and timing intercourse (optimal chance for conception is in the days prior to and including the day of ovulation), and quitting **smoking**, excessive drinking, and drug taking. To improve sperm quality, men can wear boxer shorts instead of briefs.

Both men and women can increase fertility by eating a well-balanced diet. Good food choices include legumes (especially soy), dark-colored vegetables, fruits, seeds, nuts, and sufficient good quality protein, including meat, fish, and eggs. Some people believe that refined sugar, processed cheeses, foods made with white flour, and chemical preservatives should be avoided. Adequate sleep is also important.

Supplements

Dietary supplements that may enhance fertility include the following:

- Multivitamins can help treat infertility in women.
- Vitamin E has antioxidant activity that prevents reproductive damage in men and women. It can increase sperm count and motility in men and balance hormones in women.
- Vitamin C has antioxidant activity that prevents reproductive damage in men and women. Also, a study found that vitamin C supplementation led to improved sperm count and decreased sperm clumping in infertile men.
- Folic acid (with a multivitamin) improved fertility in a study of infertile women.
- Zinc deficiency is often associated with low sperm count. Studies have found that zinc supplementation can improve male fertility.
- Arginine supplementation led to major increases in sperm count and motility in a study of infertile men.
- Selenium has antioxidant activity. Selenium supplementation led to increased sperm count and motility and decreased number of abnormal sperm in a study of infertile men.
- Beta-carotene supplementation can increase sperm count and motility.
- B vitamins (B_2, B_6, and B_{12}) are important for optimal fertility.

Herbals and Chinese medicine

The following may be taken by women to treat infertility:

- Dong quai (*Angelica sinensis*) has been used to regulate menstrual cycles and for infertility.
- Licorice helps to balance levels of estrogen and testosterone and is used for infertility.
- Red clover (*Trifolium pratense*) has a beneficial effect on the uterus, can calm the nervous system, and can balance hormone levels.
- Nettle (*Urtica dioica*) supports the uterus and hormonal system.
- Raspberry leaf strengthens the mucous lining of the uterus.
- Chasteberry (*Vitex agnus-castus*) balances hormone production.
- Ladies mantle (*Alchemilla vulgaris*) balances hormone production.
- Shatavari (*Asparagus racemosus*) is an Ayurvedic remedy for infertility and works by balancing hormones.
- *Rehmannia* is an Ayurvedic remedy for infertility.
- Myrrh (*Commiphora myrrha*) is an Ayurvedic remedy for infertility.

- False unicorn (*Chamaelirium luteum*) balances hormone levels.
- Pomegranate essence balances the reproductive system.

The following may be taken by men to treat infertility:

- Ginseng may increase the formation of sperm, testosterone levels, and sexual activity.
- Pygeum may help infertile men who have a reduced secretion of semen.
- Pine bark extract improves sperm shape.
- Chasteberry (*Vitex agnus-castus*) balances hormone production.
- Shatavari (*Asparagus racemosus*) is an Ayurvedic remedy for infertility and works by balancing hormones; may increase sperm production.
- Saw palmetto (*Serenoa serrulata*) increases the production of testosterone and strengthens the reproductive system.
- Ashwaganda (*Withania omnifera*) is an Ayurvedic remedy that improves the quality of semen and sperm count.
- Chinese herbals must be specifically designed and used to treat infertility in males.

Other treatments

A variety of other alternative treatments may be used for infertility:

- stress reduction
- cognitive behavior therapy
- visualization
- homeopathy
- reflexology
- essential oils
- acupuncture

Allopathic treatment

The first step in the treatment of infertility is performing thorough physical exams and testing of both partners in the hope of finding the source of infertility. For the woman this involves blood testing and ultrasound examinations at specific days during the menstrual cycle. This may include an endometrial biopsy in which a sample of the lining of the uterus is taken and examined. Hysteroscopy, in which a special camera examines the inside of the uterus, may be performed.

Pelvic adhesions can be treated during laparoscopy. The adhesions are cut using special instruments. Endometriosis can be treated with certain medications but may also require surgery to repair any obstruction caused by adhesions.

Treatment of cervical factors includes antibiotics in the case of an infection, steroids to decrease production of anti-sperm antibodies, and artificial insemination techniques to completely bypass the cervical mucus.

Treatment of ovulatory problems depends on the cause. If a thyroid or pituitary gland problem is responsible, simply treating that problem can restore fertility. Medications that stimulate ovulation are clomiphene citrate (Clomid) that is taken by mouth and follicle stimulating hormone (Pergonal, Fertinex, and Follistim) that is given by injection. These drugs increase the risk of multiple births (e.g., twins, triplets) and may cause side effects.

Treatment of male infertility includes addressing known reversible factors first; for example, discontinuing any medication known to have an effect on spermatogenesis or ejaculation, as well as decreasing alcohol intake, and treating thyroid or other endocrine disease. Varicoceles can be treated surgically. Testosterone in low doses can improve sperm motility.

Other treatments of male infertility include collecting semen samples from multiple ejaculations, pooling them, and depositing them into the female's uterus during ovulation. When the male partner's sperm is proven to be absolutely unable to produce pregnancy, donor sperm may be used. Depositing the male partner's sperm or donor sperm by mechanical means into the female is called artificial insemination.

Assisted reproductive techniques include in vitro fertilization (IVF), gamete intrafallopian transfer (GIFT), and zygote intrafallopian tube transfer (ZIFT). These are usually used after other techniques to treat infertility (surgery, medications, and/or insemination) have failed.

IVF involves the use of drugs to induce the simultaneous production of many eggs from the ovaries, which are retrieved surgically or via ultrasound-guided needle aspiration through the vaginal wall. The ova and sperm are combined in a laboratory, where several of the ova may be fertilized. Cell division is allowed to take place up to the pre-embryo stage. While this takes place, the female may be given progesterone to ensure that her uterus is ready for implantation. Two or more pre-embryos are transferred to the female's uterus.

Success rates of IVF were rather low as of 2008. The national average success rate of IVF is approximately

KEY TERMS

Blastocyst—A cluster of cells representing multiple cell divisions that have occurred in the fallopian tube after successful fertilization of an ovum by a sperm. This is the developmental form that must enter the uterus and implant to achieve pregnancy.

Cervix—The opening from the vagina leading into the uterus.

Embryo—The stage of development of a baby between the second and eighth weeks after conception.

Endometrium—The lining of the uterus.

Fallopian tube—The tube leading from the ovary into the uterus.

Ovary—The female organ in which eggs (ova) are stored and mature.

Ovum—The reproductive cell of the female that contains genetic information and participates in the act of fertilization; also popularly called the egg.

Semen—The fluid that contains sperm, which is ejaculated by the male.

Sperm—The reproductive cell of the male that contains genetic information and participates in the act of fertilization of an ovum.

Spermatogenesis—The process by which sperm develop to become mature sperm, capable of fertilizing an ovum.

Zygote—The result of the sperm successfully fertilizing the ovum. The zygote is a single cell that contains the genetic material of both the mother and the father.

27%, but some centers have higher pregnancy rates. Because most IVF procedures put more than one embryo into the uterus, the chance for a multiple birth (twins or more) is greatly increased.

GIFT involves retrieval of both multiple ova and semen, and the mechanical placement of both within the female's fallopian tubes, where fertilization may occur. ZIFT involves the same retrieval of ova and semen, and fertilization and growth in the laboratory up to the zygote stage, at which point the zygotes are placed in the fallopian tubes. Both GIFT and ZIFT have higher success rates than IVF. These procedures can be expensive. Insurance coverage for all assisted reproductive techniques varies widely.

Expected results

In general, about half of the couples who undergo a complete evaluation of infertility followed by treatment will ultimately have a successful pregnancy. About 5% of those couples who choose to not undergo evaluation or treatment will go on to conceive after a year or more.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Hornstein, Mark D., and Daniel Schust. "Infertility." In *Novak's Gynecology,* edited by Jonathan S. Berek. Philadelphia: Lippincott Williams & Wilkins, 2007.

Lewis, Randine. *The Infertility Cure: The Ancient Chinese Wellness Program for Getting Pregnant and Having Healthy Babies*. New York: Little Brown, 2005.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

American Society for Reproductive Medicine, 1209 Montgomery Highway, Birmingham, AL, 35216 2809, (205) 978 5000, http://www.asrm.com.

International Center for Infertility Information Dissemination, PO Box 6836, Arlington, VA, 22206, (703) 379 9178, http://www.asrm.org.

National Institute of Ayurvedic Medicine, 375 Fifth Ave., Fifth Floor, New York, NY, 10016, (212) 685 8600, http://niam.com/corp web/index.htm.

RESOLVE, 8405 Greensboro Drive, Suite 800, McLean, VA, 22102 5120, (703) 556 7172, http://www.resolve.org.

Belinda Rowland
Teresa Norris
Tish Davidson, A. M.

Inflammatory bowel disease

Definition

Inflammatory bowel disease (IBD) is an inflammation of the intestines, especially the colon and rectum. It occurs primarily in two forms, ulcerative **colitis** and Crohn's disease. The disease is characterized by swelling, ulcerations, and loss of function of the intestines.

Description

The primary problem in IBD is inflammation, as the name suggests. Inflammation is a process that often occurs to fight off foreign invaders in the body, including viruses, bacteria, and fungi. In response to such organisms, the body's immune system begins to produce a variety of cells and chemicals intended to stop the invasion. These immune cells and chemicals, however, also have direct effects on the body's tissues, resulting in heat, redness, swelling, and loss of function. No one knows what starts the cycle of inflammation in IBD, but the result is a swollen, boggy intestine.

In ulcerative colitis, the inflammation affects the lining of the rectum and large intestine. It is thought that the inflammation typically begins in the last segment of large intestine, which empties into the rectum (sigmoid colon). This inflammation may spread through the entire large intestine, but only rarely does it affect the very last section of the small intestine (ileum). The rest of the small intestine remains normal.

Crohn's disease is a form of IBD that affects both the small and large intestines. The inflammation of ulcerative colitis occurs only in the lining of the intestine, unlike Crohn's disease which affects all of the layers of the intestinal wall. As the inflammation continues, the tissue of the intestine begins to slough off, leaving pits (ulcerations) that often become infected.

IBD can occur in all age groups, with the most common age of diagnosis being between 15 and 35 years of age. Men and women are affected equally. Whites are more frequently affected than other racial groups, and people of Jewish origin have three to six times greater likelihood of suffering from IBD. IBD is familial; an IBD patient has a 20% chance of having other relatives who also have the disease.

Causes and symptoms

No specific cause of IBD has been identified. Although no organism (virus, bacteria, or fungi) has been found to set off the cycle of inflammation, some researchers continue to suspect that an organism is responsible. Other researchers have concentrated on identifying some change in the cells of the colon that cause the body's immune system to accidentally begin treating those cells as foreign. Additional evidence for a disorder of the immune system includes the high number of other immune disorders that frequently accompany IBD. The condition has also been linked to physical, mental, and emotional **stress**.

The first symptoms of IBD are abdominal cramping and **pain**, a sensation of urgent need to have a bowel movement (defecate), and blood and pus in the stools. Some patients experience **diarrhea**, **fever**, and weight loss. If the diarrhea continues, signs of severe fluid loss (dehydration) begin to appear, including low blood pressure, fast heart rate, and **dizziness**.

Severe complications of IBD include perforation of the intestine, toxic dilation (enlargement) of the colon, and the development of colon **cancer**. Intestinal perforation occurs when long-standing inflammation and ulceration of the intestine weakens the wall to such an extent that a hole occurs. This complication is life-threatening because the contents of the intestine (which contain a large number of bacteria) spill into the abdomen. The presence of bacteria in the abdomen can result in a massive infection called peritonitis.

Toxic dilation of the colon is thought to occur because the intestinal inflammation interferes with the normal function of the muscles of the intestine. This condition allows the intestine to become lax, and its diameter begins to increase. The enlarged diameter thins the walls further, increasing the risk of perforation and peritonitis. When the diameter of the intestine is quite large, and infection is present, the condition is referred to as toxic megacolon.

Patients with IBD have a significant risk of developing colon cancer. This risk seems to begin around 10 years after diagnosis. The overall risk of developing cancer seems to be greatest for those patients with the largest extent of intestine involved. The risk becomes statistically greater every year:

- At 10 years, the risk of cancer is about 0.5–1%.
- At 15 years, the risk of cancer is about 12%.
- At 20 years, the risk of cancer is about 23%.
- At 24 years, the risk of cancer is about 42%.

Patients with IBD also have a high chance of experiencing other disorders, including inflammation of the joints (arthritis); inflammation of the vertebrae (spondylitis); ulcers in the mouth and on the skin; the development of painful, red bumps on the skin;

inflammation of several areas of the eye; and various disorders of the liver and gallbladder.

Diagnosis

IBD is first suspected based on the symptoms that a patient is experiencing. Examination of the stool usually reveals the presence of blood and pus (white blood cells). Blood tests may show an increase in the number of white blood cells, which is an indication of inflammation occurring somewhere in the body. The blood test may also reveal **anemia**, particularly when a great deal of blood has been lost in the stool.

The most important allopathic method of diagnosis is endoscopy, during which a doctor passes a flexible tube with a tiny, fiber-optic camera device through the rectum and into the colon. The doctor can then examine the lining of the intestine for signs of inflammation and ulceration. A tiny sample (biopsy) of the intestine is removed through the endoscope, which is examined under a microscope for evidence of IBD. X-ray examination is helpful to determine the amount of affected intestine. However, x-ray examinations requiring the use of barium compound should be delayed until treatment has begun. The barium compound used is a chalky solution that the patient drinks or is administered through the rectum and into the intestine (enema). The presence of barium in the intestine makes possible a more distinct picture on x-ray films.

Treatment

Treatment for IBD targets the underlying inflammation, as well as the problems occurring due to continued diarrhea and blood loss. The use of alternative medicines in the treatment of IBD is common. IBD sufferers have used a variety of treatments; however, few controlled studies of their effectiveness have been performed.

Chamomile tea is used to treat IBD. Chamomile is known to have anti-inflammatory, antispasmodic, and antibacterial properties. The patient should steep dried flowers for 10 to 15 minutes and drink three to four cups daily. Chamomile can cause allergic reactions to those who are allergic to other daisies. Other antispasmodics include **valerian**, wild yam, and **cramp bark**.

There is some preliminary evidence that alteration of the kinds of bacteria in the intestine prevents or controls colitis. Intestinal bacteria can be manipulated through use of **probiotics** or prebiotics. Probiotics refers to treatment with beneficial microbes either by ingestion or through a suppository. Prebiotics refers to dietary changes which favor the overgrowth of beneficial microbes. Preliminary animal and human studies have shown that *Lactobacilli* and related bacteria can control colitis and prolong remission. Ingestion of the nondigestable carbohydrates inulin or lactulose as prebiotics stimulates growth of these beneficial bacteria.

In a related treatment, preliminary evidence suggests that ingestion of parasitic worm eggs eases the symptoms of IBD. Within two to three weeks, five out of the six IBD patients who ingested the eggs went into complete remission which lasted one month. The tiny, harmless **worms** cannot reproduce in humans and are excreted within a few months.

Ingestion of enteric coated **fish oil** capsules may reduce the IBD relapse rate. A small study found that patients taking fish oil supplements had a lower relapse rate (59%) than those on placebo (90%).

A number of studies have attempted to assess the efficacy of various complementary and alternative approaches to the treatment of IBD. In many cases, these studies have not been repeated or confirmed, although they may suggest future lines of research. In one study, 72 percent of ulcerative colitis patients taking a Kui Jie Qing enema (alum, Halloysite, Calamine, *Indigo naturalis*) and plum-blossom tongue-pointing pills daily were considered cured as compared to 5% of those who were taking anti-inflammatory drugs. Fifty-three percent of ulcerative colitis patients taking Jian Pi Ling tablet and root of *Sophorae flavescentis* plus the flower of *sophora* enema were considered cured as compared to 28% of those taking sulfasalazine and dexamethasone and 19% of those taking a placebo tablet and the enema. There are many other Chinese herbs that are useful in treating diarrhea and mucus in the bowel. Sometimes these are effective when drugs are not.

Forty-five percent of ulcerative colitis patients on an enzyme potentiated hyposensitization protocol (B-glucuronidase enzyme and 1,3-cyclohexanediol with egg, milk, wheat, potato, and yeast) improved as compared to 6% of those on placebo.

Nutritionists often recommend changes in the diet for patients with inflammatory bowel disease. Food **allergies** and certain kinds of food are linked with the increased incidence of the disease. Eliminating diary and wheat products, common allergens, often alleviates symptoms. The incidence of Crohn's disease has increased in areas in which people consume a diet high in refined sugars and carbohydrates and saturated fats and low in dietary fiber. Elimination **diets** or those restricted in refined foods have sometimes proved successful in the alleviation of inflammatory bowel disease.

Dietary supplements are generally beneficial in the treatment of digestive disorders. Some typical recommendations are:

- vitamin C: 4000 mg daily
- vitamin B_6: 250 mg daily
- Magnesium (aspartate): 400 mg daily
- vitamin E: 800 IU daily
- glutamine: 3000 mg daily, taken between meals
- garlic, deodorized: 2000 mg daily
- deglycyrrhizinated licorice: chew as needed.

Other treatments for IBD include **acupuncture**, macrobiotics, **cat's claw** (*Uncaria tomentosa*), **slippery elm**, **acupressure**, **biofeedback**, **relaxation** techniques, and **hypnotherapy**. A 2006 review of complementary and alternative methods for treating IBD by researchers at University College London Hospitals found suggestive evidence for the efficacy of some methods, but it concluded that further clinical trials were necessary to confirm their value. The reviewers also pointed out a number of safety problems involved in the use of herbal and other treatments and called for enhanced legislation that would further protect consumers from the risks posed by some remedies.

Allopathic treatment

Inflammation is often treated with an immune-suppressive drug called sulfasalazine. Because of poor absorption, sulfasalazine stays primarily within the intestine, where it is broken down into its two components: an antibiotic and an anti-inflammatory. It is believed to be primarily the anti-inflammatory component, salicylic acid, that is active in treating IBD. For patients who do not respond to sulfasalazine, steroid medications (such as prednisone) are the next choice.

Depending on the degree of blood loss, a patient with IBD may require blood transfusions and fluid replacement through a needle in the vein (intravenous or IV). Medications that can slow diarrhea must be used with great care because they may actually cause the development of toxic megacolon.

Patients with toxic megacolon require close monitoring and care in the hospital. They usually are given steroid medications through an IV and may be put on antibiotics. If these measures do not improve the situation, they may have to undergo surgery to remove the colon. This procedure reduces the risk of death after perforation of toxic megacolon, which is greater than 50%.

A patient with proven cancer of the colon, or even a patient who shows certain precancerous signs, may need a colectomy (colon removal). When a colectomy is performed, a piece of the small intestine (ileum) is pulled through an opening in the abdomen and fashioned surgically to allow attachment of a special bag to catch the body's waste (feces). This opening, which remains for the duration of the patient's life, is called an ileostomy.

KEY TERMS

Endoscopy—A medical examination in which an instrument called an endoscope is passed into an area of the body (the bladder or intestine, for example). The endoscope usually has a fiber-optic camera, which allows the operator to see a greatly magnified image on a video screen.

Immune system—The system of the body that is responsible for producing various cells and chemicals that fight off infection by viruses, bacteria, fungi, and other foreign bodies. In autoimmune disease, these cells and chemicals are turned against the body itself.

Inflammation—The result of the body's attempts to fight off and wall off an area that is infected. Inflammation results in redness, heat, swelling, and loss of function.

Expected results

Remission refers to a disease's becoming inactive for a period of time. The rate of remission of IBD (after a first attack) is nearly 90%. Those individuals whose colitis is confined primarily to the left side of the large intestine have the best prognosis. Those individuals with extensive colitis, involving most or all of the large intestine, have a much poorer prognosis. Some studies show that about 10% of these patients have died within 10 years after diagnosis. About 20–25% of all IBD patients require colectomy. Unlike the case for patients with Crohn's disease, however, such radical surgery results in a cure of the disease.

Resources

BOOKS

Bernstein, Charles N. *The Inflammatory Bowel Disease Yearbook*. Limassol, Cyprus: Remedica, 2008.

Lichtenstein, Gary R. *The Role of Biologic Therapy in Inflammatory Bowel Disease Gastroenterology Clinics of North America*. Philadelphia: Saunders, 2006.

Loftus, Edward. *Blackwell Clinical Handbook: Inflammatory Bowel Disease*. Malden, MA, and Oxford, UK: Blackwell Publishing, 2008.

Orchard, Timothy, et al., eds. *Inflammatory Bowel Disease: An Atlas of Investigation and Management*. Oxford, UK: Clinical Publishing Services, 2008.

PERIODICALS

Gang, Alfred. "Review Article: Alternative and Comple mentary Therapies for Inflammatory Bowel Disease." *Nature Clinical Practice Gastroenterology & Hepatology* (April 2006): 180 181.

Hussain, Z., and E. M. Quigley. "Systematic Review: Com plementary and Alternative Medicine in the Irritable Bowel Syndrome." *Alimentary Pharmacology & Thera peutics* (February 2006): 465 471.

Langmead, L., and D. S. Rampton. "Complementary and Alternative Therapies for Inflammatory Bowel Dis ease." *Alimentary Pharmacology & Therapeutics* (Feb ruary 2006): 341 349.

Liu, J. P., et al. "Herbal Medicines for Treatment of Irritable Bowel Syndrome." *Cochrane Database of Systematic Reviews* (January 2006).

Tillisch, Kirsten. "Complementary and Alternative Medi cine for Functional Gastrointestinal Disorders." *Gut* (May 2006): 593 596.

Weinstock, J. V., R. W. Summers, and D. E. Elliott. "Role of Helminths in Regulating Mucosal Inflammation." *Springer Seminars on Immunopathology* (June 2005): 249 271.

ORGANIZATIONS

Crohn's and Colitis Foundation of America, 386 Park Ave. South, 17th Floor, New York, NY, 10016 8804, (800) 932 2423, http://www.ccfa.org/.

Belinda Rowland
David Edward Newton, Ed.D.

Influenza

Definition

Usually referred to as the flu or grippe, influenza is a highly infectious respiratory disease. Its name comes from the Italian word for "influence," because people in eighteenth-century Europe thought that the disease was caused by the influence of bad weather. Later people learned that flu is caused by a virus. When the influenza virus is inhaled, it attacks cells in the upper respiratory tract, causing such typical flu symptoms as **fatigue**, **fever** and **chills**, a hacking **cough**, and body aches. Although the stomach or intestinal flu is commonly blamed for stomach upsets and **diarrhea**, the influenza virus affects humans less often than is commonly believed. According to the Centers for Disease Control, approximately 5% to 20% of the U.S. population contracts the flu each year.

Description

Influenza is considerably more debilitating than the **common cold**. Influenza outbreaks occur suddenly, and infection spreads rapidly. The annual death toll attributable to influenza and its complications averages 20,000 in the United States alone. In the 1918–1919 Spanish flu pandemic, the death toll reached a staggering 20–40 million worldwide. Approximately 500,000 of these fatalities occurred in North America.

Influenza outbreaks occur on a regular basis. The most serious outbreaks are pandemics, which affect millions of people worldwide and last for several months. The 1918–1919 influenza outbreak serves as the primary example of an influenza pandemic. Pandemics also occurred in 1957 and 1968 with the Asian flu and Hong Kong flu, respectively.

Epidemics are widespread regional outbreaks that occur every two to three years and affect 5–10% of the population. A regional epidemic is shorter lived than a pandemic, lasting only several weeks. Finally, there are smaller outbreaks each winter that are confined to specific locales.

There are three types of influenza viruses, identified as A, B, and C. Influenza A can infect a range of animal species, including humans, pigs, horses, and birds, but only humans are infected by types B and C. Influenza A is responsible for most flu cases, while infection with types B and C virus are less common and cause a milder illness.

In the United States, 90% of all deaths from influenza occur among persons older than 65. Flu-related deaths have increased substantially in the United States since the 1970s, largely because of the **aging** of the American population. In addition, elderly persons are vulnerable because they are often reluctant to be vaccinated against flu.

A new concern regarding influenza is the possibility that hostile groups or governments could use the virus as an agent of bioterrorism. A report published in early 2003 noted that Type A influenza virus has a high potential for use as such an agent because of the virulence of the Type A strain that broke out in Hong Kong in 1997 and the development of laboratory methods for generating large quantities of the virus. The report recommended the stockpiling of present antiviral drugs and speeding up the development of new ones.

In 2008, the Centers for Disease Control and Prevention (CDC) issued a health alert stating that the number of children's deaths from influenza in the

2006–2007 flu season was five times greater than in past years. The agency investigated whether bacteria such as staphylococcus can cause illnesses such as influenza. During the 2006–2007 flu season, the CDC learned of 73 children whose deaths were related to influenza, compared to 47 and 46 children's deaths in the two previous years.

Causes and symptoms

Approximately one to four days after infection with the influenza virus, the victim is hit with an array of symptoms. Symptoms are usually sudden, although the sequence can be quite variable. They include the onset of **headache**, **sore throat**, dry cough, and chills, nasal congestion, fatigue, malaise, overall soreness, and a fever that may run as high as 104°F (40°C). Some patients may experience **pain** when they inhale, known as pleuritic chest pain. Flu victims feel extremely tired and weak and may not return to their normal energy levels for several days or weeks.

Influenza complications usually arise from bacterial **infections** of the lower respiratory tract. Signs of a secondary respiratory infection often appear just as the patient seems to be recovering. These signs include high fever, intense chills, chest pains associated with breathing, and a productive cough or sinus discharge with thick yellowish green sputum. If these symptoms appear, medical treatment is often necessary. Other secondary infections, such as sinus or ear infections, may also require medical intervention. Heart and lung problems, and other chronic diseases, can be aggravated by influenza, which is a particular concern with elderly patients.

With children and teenagers, it is advisable to be alert for symptoms of Reye's syndrome, a rare, but serious complication that occurs when children are given aspirin. Symptoms of Reye's syndrome are **nausea** and **vomiting**, and more seriously, neurological problems such as confusion or delirium. The syndrome is primarily associated with the use of aspirin to relieve flu symptoms in children.

Diagnosis

Although there are specific laboratory tests to identify the flu virus strain from respiratory samples, doctors typically rely on a set of symptoms and the presence of influenza in the community for diagnosis. Specific tests are useful to determine the type of flu in the community, but they do little for individual treatment. Doctors may administer such tests as throat or sinus cultures or blood tests to identify secondary infections.

After 1999, however, seven rapid diagnostic tests for flu became commercially available. These tests appear to be especially useful in diagnosing flu in children, allowing doctors to make more accurate treatment decisions in less time.

Treatment

The patient should drink plenty of fluids and eat nutritious foods. Chicken soup with **ginger**, scallions, and rice noodles is nutritious and has healing powers. Rest, to allow the body to fight infection, is very important. Gargling with salt water (half teaspoon salt in one cup of water) helps to soothe a sore throat. A vaporizer with **eucalyptus** or Vicks makes the patient feel more comfortable by easing breathing and aiding sleep. Applying Vicks ointment over chest and back assists and speeds recovery. Returning to normal activities too quickly invites a possible relapse or complications.

Herbals

Herbal teas and other preparations can be taken to stimulate the immune system, for antiviral activity, and to relieve symptoms. The following herbs are used to treat influenza:

- Ginger (*Zingiber officinalis*) reduces fever and pain, has a sedative effect, settles the stomach, and suppresses cough.
- Forsythia (*Forsythia suspensa*) fruit can be taken as a tea for its anti-inflammatory, fever reducing, and antimicrobial properties.
- Honeysuckle (*Lonicera japonica*) flower can be taken as a tea for its anti-inflammatory, fever reducing, and antimicrobial properties.
- Anise seed (*Pimpinella anisum*) can be added to tea to expel phlegm, induce sweating, ease nausea, and ease stomach gas.
- Slippery elm (*Ulmus rubra*) can be taken as a tea or slurry to soothe sore throat and ease cough.
- Echinacea (*Echinacea purpurea* or *angustifolia*), in clinical studies, reduced flu symptoms, including sore throat, chills, sweating, fatigue, weakness, body aches, and headaches. The usual dosage is 500 mg thrice on the first day, then 250 mg four times daily thereafter.
- Goldenseal (*Hydrastis canadensis*) has fever reducing, antibacterial, anti-inflammatory, and antitussive properties. The usual dose is 125 mg three to four times daily. Goldenseal should not be taken for more than one week.

- Astragalus (*Astragalus membranaceus*) boosts the immune system and improves the body's response to stress. The common dose is 250 mg of extract four times daily.
- Cordyceps (*Cordyceps sinensis*) modulates and boosts the immune system and improves respiration. The usual dose is 500 mg two to three times daily.
- Elder (*Sambucus nigra*) has antiviral activity, increases sweating, decreases inflammation, and decreases nasal discharge. In a study, elderberry extract reduced flu symptoms within two days whereas placebo took six days. The usual dose is 500 mg of extract thrice daily. Also use 2 tsp of dried flowers in 1 cup of water as a tea.
- Schisandra (*Schisandra chinensis*) helps the body fight disease and increases endurance.
- Grape (*Vitis vinifera*) seed extract has antihistamine and anti-inflammatory properties. The usual dose is 50 mg three times daily.
- Eucalyptus (*Eucalyptus globulus*) or peppermint (*Mentha piperita*) essential oils added to a steam vaporizer may help clear chest and nasal congestion.
- Boneset infusion (*Eupatorium perfoliatum*) relieves aches and fever.
- Yarrow (*Achillea millefolium*) relieves chills.

Other remedies

Acupuncture and **acupressure** are said to stimulate natural resistance, relieve nasal congestion and headaches, fight fever, and calm coughs, depending on the points used.

A homeopathic remedy called *Oscillococcinum* may be taken at the first sign of flu symptoms and repeated for a day or two. This remedy is said to shorten the duration of flu by one or two days. Although oscillococcinum is a popular flu remedy in Europe; however, a research study published in 2003 found it to be ineffective.

Other homeopathic remedies recommended vary according to the specific flu symptoms present. *Gelsemium* (*Gelsemium sempervirens*) is recommended to combat weakness accompanied by chills, a headache, and nasal congestion. *Bryonia* (*Bryonia alba*) may be used to treat muscle aches, headaches, and a dry cough. For restlessness, chills, hoarseness, and achy joints, poison ivy (*Rhus toxicodendron*) is recommended. Finally, for soreness and a dry cough or chills, *Eupatorium perfoliatum* is suggested.

Hydrotherapy can be used. A bath to induce a fever will speed recovery from the flu. While supervised, patients should take a bath as hot as they can tolerate and remain in the bath for 20–30 minutes. While in the bath, the patients drink a cup of **yarrow** or elderflower tea to induce sweating. During the bath, a cold cloth is held on the forehead or at the nape of the neck to keep the temperature down in the brain. Patients are assisted when getting out of the bath (they may feel weak or dizzy) and then get into bed and cover up with layers of blankets to induce more sweating.

Supplemental vitamins are recommended for treating influenza and include 500–2000 mg **vitamin C**, 400 IU to 500 IU of **vitamin E**, 200 micrograms to 300 micrograms **selenium**, and 25,000 IU beta-carotene. **Zinc** lozenges are helpful, as is supplemental zinc at 25 mg per day for two weeks or more.

Traditional Chinese medicine (TCM) uses mixtures of herbs to prevent flu as well as to relieve symptoms once a person has fallen ill. There are several different recipes for these remedies, but most contain ginger and Japanese **honeysuckle** in addition to other ingredients.

Allopathic treatment

Because influenza is a viral infection, antibiotics are useless in treating it. However, antibiotics are frequently used to treat secondary infections.

Over-the-counter medications are used to treat flu symptoms. Any medication that is designed to relieve such symptoms as pain and coughing will provide some relief. The best medicine for symptoms is an analgesic, such as aspirin, acetaminophen, or naproxen. Without a doctor's approval, aspirin is generally not recommended for people under 18 owing to its association with Reye's syndrome, a rare aspirin-associated complication seen in children recovering from viral infections. Children should receive acetaminophen or ibuprofen to treat their symptoms.

There are several antiviral drugs marketed for treating influenza. To be effective, treatment should begin no later than two days after symptoms appear. Antivirals may be useful in treating patients who have weakened immune systems or who are at risk for developing serious complications. They include oseltamavir phosphate (Tamiflu) and zanamavir (Relenza), which have few side effects but can cause **dizziness**, jitters, and **insomnia**. Other antiviral medications are amantadine (Symmetrel, Symadine) and rimantadine (Flumandine), which work against Type A influenza. Amantadine and rimantadine can cause side effects such as nervousness, **anxiety**, lightheadedness, and nausea. Severe side effects, including seizures, delirium, and hallucination, are rare and are nearly always limited to people who have kidney

problems, seizure disorders, or psychiatric disorders. Zanamavir and oseltamavir phosphate work against both Types A and B influenza.

At the 2006 Interscience Conference on Antimicrobial Agents and Chemotherapy, the first research was presented showing that patients admitted to the hospital with either influenza or **pneumonia** as a complication of the former experienced a reduction in complications and mortality if they were given oseltamavir phosphate. In the study, patients were given the medication longer than 48 hours after symptoms began, a timeframe usually considered outside the drug's limits of maximum effectiveness. In 2007, officials in Japan ordered the manufacturer of oseltamivir phosphate to include a warning that the drug may have the potential to cause severe neuropsychiatric effects in adolescents ages 10 to 19 years.

Expected results

Following proper treatment guidelines, healthy people under the age of 65 usually suffer no long-term consequences associated with flu infection. The elderly and the chronically ill are at greater risk for secondary infection and other complications, but they can also enjoy a complete recovery.

Most people recover fully from an influenza infection, but it should not be viewed complacently. Influenza is a serious disease, and approximately 1 in 1,000 cases proves fatal.

Prevention

The Centers for Disease Control and Prevention recommend that people get an influenza vaccine injection each year before flu season starts. In the United States, flu season typically runs from late December to early March. Vaccines should be received two to six weeks prior to the onset of flu season to allow the body enough time to establish immunity.

Each season's flu vaccine contains three virus **strains** that are the most likely to be encountered in the coming flu season. The virus strains used to make the vaccine are inactivated and will not cause illness. When there is a good match between the anticipated flu strains and the strains used in the vaccine, the vaccine is 70–90% effective in people under 65. Because immune response diminishes somewhat with age, people over 65 may not receive the same level of protection from the vaccine, but even if they do contract the flu, the vaccine diminishes the severity and helps prevent complications.

KEY TERMS

Bioterrorism—The intentional use of disease-causing microbes or other biologic agents to intimidate or terrorize a civilian population for political or military reasons. Type A influenza virus could be used as an agent of bioterrorism.

Common cold—An illness caused by an upper respiratory viruses. Usual symptoms include nasal congestion, coughing, sneezing, throat irritation, and a low-grade fever.

Epidemic—A widespread regional disease outbreak.

Guillain-Barré syndrome—Also called acute idiopathic polyneuritis, a neurologic syndrome that can cause numbness in the limbs and muscle weakness following certain viral infections.

Pandemic—Worldwide outbreak of an infection, afflicting millions of people.

Secondary infection—An infection by a microbe that occurs during an infection by a different kind of microbe.

It should be noted that certain people should not receive an influenza vaccine. Infants younger than six months have immature immune systems and will not benefit from the vaccine. Because the vaccines are prepared using hen eggs, people who have severe **allergies** to eggs or other vaccine components should not receive the influenza vaccine. Some persons may receive a course of amantadine or rimantadine, which are 70–90% effective in preventing influenza.

Certain groups are strongly advised to be vaccinated because they are at greater risk for influenza-related complications:

- All people 50 years and older
- Residents of nursing homes and chronic-care facilities
- Children ages 6 months to 5 years
- Pregnant women
- People of any age with certain chronic medical conditions
- Anyone in contact with the above groups, such as teachers, care givers, health-care personnel, and family members

In addition to an injectable flu vaccine, an intranasal spray vaccine (made from a live virus) may be given to healthy persons ages 2 years 49 years of age who are not pregnant.

The following dietary supplements may be taken to help prevent influenza:

- Elderberry to prevent influenza virus from infecting cells
- Astragalus, 250–500 mg daily
- Multivitamin with zinc
- Vitamin C, 500 mg
- Echinacea, at the first sign of malaise or infection, take 3–5 ml of tincture or 2 tablets three or four times daily for three to 10 days.

Resources

PERIODICALS

Call, Stephanie, et al. "Does This Patient Have Influenza?" *Journal of the American Medical Association*. 293, no. 8 (February 23, 2005): 987 997.

Shortridge, K. F., J. S. Peiris, and Y. Guan. "The Next Influenza Pandemic: Lessons from Hong Kong." *Jour nal of the American Medical Association* 297 (2007): 1646.

OTHER

NIAID Fact Sheet: Flu. Bethesda, MD: NIAID. http://www.niaid.nih.gov/factsheets/flu.htm (February 27, 2008).

Toner, Eric, "CBN Report: New Research on Antiviral Treatment of Influenza." *Clinicians' Biosecurity Net work* (October 13, 2006). http://www.upmc cbn.org/report_archive/2006/10_October_2006/cbnreport_101306.html (February 27, 2008).

ORGANIZATIONS

Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA, 30333, (888) CDC FACTS (888 232 3228), http://www.cdc.gov/.

National Institute of Allergy and Infectious Diseases (NIAID), 6610 Rockledge, Bethesda, MD, 20892 6612, (866) 284 4107, http://www.niaid.nih.gov.

Belinda Rowlands
Rebecca J. Norris
Rhonda Cloos, RN

Ingrown nail

Definition

Ingrown nail refers to the condition in which the edge of a nail cuts into the adjacent skin fold, causing **pain**, redness, and swelling.

Ingrown toenails. *(Custom Medical Stock Photo. Reproduced by permission.)*

Description

Ingrown nail (onychocryptosis) occurs when the nail plate (the horny covering) grows into and cuts the skin alongside the nail (lateral nail fold). Ingrown toenails make up 3–5% of all foot problems. Most cases of ingrown nail occur in men between the ages of 10–30 years. In this age group, males are affected twice as often as females. In older adults, the incidence is equal. There are three major types of ingrown nail: subcutaneous ingrown nail in which the nail grows under the skin; overcurvature of the nail plate; and hypertrophy (overgrowth) of the lateral nail fold.

Ingrown nails occur most often on the big toe. Penetration of the nail into the skin causes inflammation (swelling and redness). Infection by bacteria or fungi may follow. Severe infection may lead to **abscess** formation, characterized by an oozing, pus-filled blister. Small, translucent, red bumps called granulation tissue may develop along the lateral nail fold.

Causes and symptoms

Ingrown nails are most commonly caused by incorrect cutting of the nails and wearing poorly-fitting shoes. Other causes of ingrown nail include:

- abnormally long toes
- overcurvature of the nail
- excessive sweating
- shoes that put pressure on the toes (pointed-toe, high-heeled)
- poor foot hygiene
- high lateral nail folds
- discrepancy between the widths of the nail and nail bed

KEY TERMS

Granulation tissue—Small, red, bumpy, velvety-looking tissue produced during the healing of wounds.

Lateral nail fold—The fold of skin along the side of the nail.

Nail plate—The horny plate covering the tips of the fingers and toes. Commonly called the nail.

Onychocryptosis—The medical term for ingrown nail.

- improper alignment of the large toenail
- repeated trauma to the large toe

Persons who are at increased risk of developing ingrown nails include people with arthritis, immune system deficiencies, neoplasms (tumors), **obesity**, and circulatory disorders.

The symptoms of ingrown nail include swelling, redness, and pain in the lateral nail fold. Increased swelling, pus drainage, and ulceration (tissue destruction) can occur as the condition progresses. Advanced onychocryptosis is characterized by long-term swelling, the formation of granulation tissue, and lateral fold overgrowth.

Diagnosis

Ingrown nail is easily diagnosed in a physical examination done by a family physician, a podiatrist (foot specialist), or a dermatologist (skin specialist).

Treatment

Because of the possibility of serious complications, a physician should be consulted for treatment of severe and/or infected ingrown nails. Alternative treatments for treating ingrown nail include:

- Ayurveda. Ayurvedic principles state that persons whose constitutions are dominated by vata and kapha have stronger nails and are prone to ingrown nails. Ingrown nails are treated with warm water soaks followed by application of a solution of equal parts tea tree and neem oils under the nails.
- Herbal therapy. When an ingrown nail is forming, the toe should be soaked for 15–30 minutes in five drops each of hypericum and calendula tinctures diluted in 1/2 pint of warm water. Afterward, the toe should be wrapped in linen, placing it between the fold and the nail.
- Homeopathy. Preparations of *Hepar sulph* or *Silica* in 6c potency may be taken every 12 hours for two weeks, to reduce the inflammation around the nail.
- Hydrotherapy. To treat ingrown nail, the patient should soak the foot in hot, soapy water for 20 minutes, trim the nail square, wrap the toe in a hot compress, and cover it with a dry cloth overnight. In the morning, the patient should trim the nail into a U shape and place a bit of cotton between the nail and the fold. The cotton should be kept in place until the nail grows out.
- Massage. If an ingrown nail is developing the patient should push the skin away from the nail. Repeated massage of the overgrown lateral nail folds can reduce pain and separate the fold away from the nail.

Allopathic treatment

Nonsurgical

Nonsurgical methods of treating ingrown nails focus on eliminating infection with medications and separating the ingrown nail from the lateral nail fold. Whenever possible, the offending nail is clipped, and the patient is instructed to soak the foot in water containing Epsom salts and povidone-iodine thrice daily. Procedures used to separate the nail from the fold include inserting a piece of fabric (moistened with antiseptics), plastic, or metal between the nail and the fold until the nail grows out. Cryotherapy, in which the affected nail fold is frozen with liquid nitrogen, is also used. Cauterization (destruction of tissue using heat) may be performed to eliminate granulation tissue. A metal brace may be worn on the toe for several months to flatten overcurvature.

Surgical

In cases of severe ingrown nail or ineffective nonsurgical treatment, part or all of the nail is surgically removed. Most commonly, only a portion of the nail is removed. Ingrown nail recurs in 60%–80% of the patients. If nail regrowth is expected to cause a recurrence of ingrown nail, then the nail matrix (where nail growth occurs) is destroyed, which prevents nail regrowth. In most cases, only local anesthesia is needed for surgical treatment.

Expected results

Although natural remedies can be effective in healing minor ingrown nails, prevention is the best solution. Many cases of ingrown nail require surgical treatment.

Complications of ingrown toenail include infection, osteomyelitis (infection of the bone), and **gangrene** (tissue death). The elderly are at increased risk of complications because of decreased sensation resulting from such conditions as diabetes, **heart disease**, or arteriosclerosis (hardening of the arteries).

Prevention

Ingrown nails may be prevented by:

- clipping nails straight across
- leaving the nail edge slightly longer than the end of the toe
- not trimming the sides of nails
- wearing shoes with ample toe space
- not pulling or tearing at the toenails

Resources

BOOKS

Nails: Therapy, Diagnosis, Surgery, edited by Richard K. Scher et al. Philadelphia: W. B. Saunders Company, 1997.

PERIODICALS

Ikard, Robert W. "Onychocryptosis." *Journal of the American College of Surgeons*, 187 (July 1998): 96 102.

Belinda Rowland

Inositol

Description

Inositol is a natural glucose isomer that is normally found in animal cells, with its highest concentration in the brain and heart. It is also referred to as myoinositol, IP6, phytic acid, and vitamin B8 (although it is not officially a vitamin as the body can make it). It aids the liver in processing fats and also plays a role in nerve transmission and muscle functions. Inositol is also available in supplement form.

Inositol is not considered an essential nutrient. Foods such as beans, cantaloupe, citrus fruits, nuts, whole grains, and seeds provide a substance known as phytic acid. When phytic acid comes into contact with the bacteria normally found in the stomach, inositol is released.

General Use

Inositol is used to treat **depression** and panic disorders. It has been found to be at low levels in the spinal fluid of persons suffering from depression. Furthermore, inositol plays a role in the processing of serotonin, a neurotransmitter in the brain. Low levels of serotonin have been associated with clinical depression. Because of these associations, inositol is believed to provide benefits for persons with clinical depression.

The use of inositol in treating the following disorders continues in the 2000s to be investigated:

- Panic disorders
- Polycystic ovary syndrome
- Obsessive-compulsive disorders
- Alzheimer's disease
- Autism
- Post-traumatic stress disorders

More investigation is needed to determine conclusive evidence of benefit for these conditions.

In 2001, data were released from a study comparing inositol with fluvoxamine in the treatment of **obsessive-compulsive disorder**. Inositol showed fewer side effects, an attractive benefit for a drug designed to treat a **panic disorder**. But further investigation was suggested.

In 1999, a study conducted in Israel recommended that manic patients on lithium therapy eat an inositol-free diet because of the role inositol plays in blocking the body's ability to use lithium. A study released in 2004 found that persons with **psoriasis** who were taking lithium benefited from inositol supplementation. Psoriasis patients who were not undergoing lithium treatment did not realize this benefit.

Some researchers believe that inositol hexaphosphate (IP6) is capable of launching **cancer** cells on a path to destruction. The cancer-related studies have used animal subjects. In these tests, IP6 supplementation resulted in prevention of cancerous tumors in the colon, prostate, lung, skin, and other areas. It also showed a possible ability to improve the effectiveness of hormone or chemotherapy treatments. A preliminary study performed on humans indicated that IP6 supplementation may cause shrinkage of a malignant lung tumor. As of 2008, IP6 had not been studied as a treatment for humans with cancer. The anti-cancer properties of IP6 were first studied in the 1980s at the University of Maryland. Pathologist Abulkalam Shamsuddin first began studying the compound's anti-cancer capabilities at that time.

Inositol is sometimes taken in supplement form by bodybuilders and athletes, who desire its potential role in fat distribution and promoting a calm mind.

KEY TERMS

Isomer—Two compounds that have the same molecular formulas but different chemical structures.

Neurotransmitter—A substance involved in the transmission of nerve impulses.

Preparations

There is no recommended dietary intake for inositol. However, the typical diet in the United States provides approximately 1.0 gram of inositol per day. In research settings, doses up to 18 grams per day have been used.

Inositol supplements are available in capsule, tablet, and powder forms.

Precautions

Inositol supplementation may inhibit the body's ability to absorb minerals, including **calcium**, **iron**, and **zinc**, prompting concern particularly in regards to use in infants. As of 2008, long-term safety studies had not been performed. Its safety had not been established for pregnant or breastfeeding women, young children, and persons with liver or kidney ailments. A number of experts advise consumers to obtain inositol through dietary sources before taking the supplemental form.

Side Effects

The most common side effects are **gas** and **diarrhea**. Consumers should stop taking inositol and report to a healthcare provider immediately any sign of an allergic reaction such as **hives**, rash, **itching**, tightness in the throat or chest, or difficulty breathing. Like any supplement, inositol should be taken under the guidance of a healthcare professional.

Interactions

Inositol should not be taken with lithium, except under the guidance of a physician. Inositol is said to block the absorption of the minerals calcium, iron, and zinc.

ORGANIZATIONS

American Cancer Society, 1599 Clifton Rd. NE, Atlanta, GA, 30329, (800) 227 2345, www.cancer.org.

Rhonda Cloos, RN

Insect bites *see* **Bites and stings**

Insomnia

Definition

Insomnia is the inability to obtain an adequate amount or quality of sleep. The difficulty may be in falling asleep, remaining asleep, or waking up too early. A person may experience one or all of these symptoms. People with insomnia do not feel refreshed when they wake up. Insomnia affects more than 70 million people, according to the National Institutes of Health. The sleeplessness is a symptom that may be caused by physical or mental conditions or circumstances. Furthermore, research indicated that insomnia may also be a medical condition, according to the National Sleep Foundation (NSF).

Description

Adults need approximately seven to eight hours of sleep each night. Teenagers should get about nine hours of sleep, and infants need to sleep from 16 to 18 hours of sleep each day. Sleep is essential for mental and physical restoration. It is a cycle with two separate states: rapid eye movement (REM), the stage in which most dreaming occurs; and non-REM (NREM). Four stages of sleep take place during NREM: stage I, when the person passes from relaxed wakefulness; stage II, an early stage of light sleep; stages III and IV, which are increasing degrees of deep sleep. Most stage IV sleep (also called delta sleep) occurs in the first several hours of sleep. A period of REM sleep normally follows a period of NREM sleep.

Disrupted sleep

Sleeplessness or insomnia may be caused by a physical condition such as **obesity**, a mental condition such as **depression**, shift work with irregular hours, or a traumatic event. In the days immediately after the terrorist attacks on September 11, 2001, 47% of Americans rated their sleep as "poor," or "fair," according to NSF's "2002 Sleep in America" poll. In comparison, 27% of poll participants rated sleep as poor or fair for most nights of that year.

The foundation's 2005 poll indicated that women were more likely to experience insomnia than men. NSF explored that demographic in the "2007 Sleep in America" poll of women between the ages of 18 and 64. That study showed that sleep problems such as insomnia were experienced by 72% of working mothers and 68% of single working women. Furthermore, 74% of stay-at-home mothers displayed symptoms of insomnia during a couple nights each week.

That poll paralleled other research that showed that women are 1.3 more likely to report insomnia than men. They may experience sleeplessness before and at the onset of their menstrual cycle, during **pregnancy**, and **menopause**. In addition, the foundation reported that people over the age of 65 are more likely to be bothered by insomnia than younger individuals.

Furthermore, people who are divorced, widowed, or separated are more likely to have the problem than those who are married. In addition, insomnia is more frequently reported by those with lower socioeconomic status.

Insomnia is classified both by its nightly symptoms and its duration. Sleep-onset insomnia refers to difficulty falling asleep. Maintenance insomnia refers to waking frequently during the night or waking early. Insomnia is also classified in relation to the number of sleepless nights. Short-term, or transient, insomnia is a common occurrence and usually lasts only a few days. Long-term, or chronic, insomnia lasts more than three weeks. This condition increases the risk for injuries in the home, at the workplace, and while driving because of the person experiences daytime sleepiness and decreased concentration ability. Chronic insomnia could also lead to mood disorders such as depression.

Causes and symptoms

Transient insomnia is often caused by a temporary situation in a person's life such as an argument with a loved one, a brief medical illness, or **jet lag**. When the situation is resolved or the precipitating factor disappears, the condition goes away, usually without medical treatment.

Prescription drugs such as **asthma** medicine, steroids, and anti-depressants may cause insomnia. Sleeplessness may also be a side effect of over-the-counter products such as nasal decongestants and appetite suppressants.

Chronic insomnia usually has different causes, and there may be more than one factor contributing to sleeplessness. Causes of insomnia include:

- A medical condition or its treatment, including sleep apnea, diabetes, arthritis, a heart condition, and asthma
- Use of substances such as caffeine, alcohol, and nicotine
- Psychiatric conditions such as mood or anxiety disorders
- Stress or depression, such as sadness caused by the loss of a loved one or a job.
- A change in work shift
- A work schedule with nontraditional hours. Shift workers who may experience insomnia include medical professionals, truck drivers, the military, and people working at businesses open 24 hours a day.
- Sleep-disordered breathing, such as snoring
- Periodic jerky leg movements, *nocturnal myoclonus*, which occur just as the individual is falling asleep.
- Restless legs syndrome, which involves the urge to move the legs. The person may also experience feelings such as tingling or cramping.
- Repeated nightmares or panic attacks during sleep

Excessive worrying about whether the person will be able to fall asleep may also cause insomnia. The concern creates so much **anxiety** that the individual's bedtime rituals and behavior actually trigger insomnia, a condition called psychophysiological insomnia.

Symptoms of insomnia

People who have insomnia do not start the day refreshed from a good night's sleep. They may have difficulty falling asleep and commonly lie in bed tossing and turning for hours. Or the individual may go to sleep without a problem but wakes in the early hours of the morning. The person is either unable to go back to sleep or drifts into a restless, unsatisfying sleep. This is a common symptom in the elderly and those suffering from depression. Sometimes sleep patterns are reversed and the individual has difficulty staying awake during the day and takes frequent naps. The sleep at night is fitful and frequently interrupted.

Diagnosis

Insomnia, unlike some medical conditions, is easily recognizable, as people know when they are not getting enough sleep. The key to treating insomnia is determining its causes. Some people can identify sleep-inhibiting factors such as a death in the family or a hectic work schedule with too much caffeine consumption and not enough **exercise**. A doctor will take factors such as these into account when making a diagnosis.

The physician's diagnosis is based on the patient's reported signs and symptoms. The doctor may review a patient's health history or order tests to determine if a medical condition is causing the insomnia. The physician may ask if the patient is depressed, in **pain**, under **stress**, or taking medications, according to the National Sleep Foundation. The doctor may ask about disruptions in a patient's life such as working nontraditional shifts or traveling across different time zones.

It may be useful for the patient to keep a daily record for two weeks of sleep patterns, food intake, use of alcohol, **caffeine**, nicotine, medications, exercise, and any other information recommended by the physician. If the patient has a bed partner, information can be obtained about whether the patient snores or is restless during sleep. This information, together with a medical history and physical examination, can help confirm the doctor's assessment.

A wide variety of healthcare professionals can recognize and treat insomnia. When a patient with chronic insomnia does not respond to treatment, or the condition is not adequately explained by the patient's physical, emotional, or mental circumstances, then more extensive testing by a specialist in sleep disorders may be warranted.

Treatment

In both alternative and conventional medicine, treatment of insomnia includes alleviating or coping with any physical and emotional problems that contribute to the condition. Also effective is exploring changes in lifestyle that will improve the situation.

Changes in behavior

Patients can make changes in their daily routine that are simple and effective in treating insomnia. Eating a healthy diet rich in calcium, **magnesium**, and the B vitamins is also beneficial.

Patients should go to bed only when sleepy and use the bedroom only for sleep or sex. Activities such as reading, watching television, or snacking should take place elsewhere. If people are unable to go to sleep, they should go into another room and do some quiet activity such as reading. People should return to bed only when sleepy. Patients should set the alarm and get up every morning at the same time, no matter how much they have slept, to establish a regular sleep-wake pattern. Naps during the day should be avoided, but if absolutely necessary, then a 30-minute nap early in the afternoon may not interfere with sleep at night.

Another successful technique is called sleep-restriction therapy, restricting the time in bed to the actual time spent sleeping. This approach allows a slight sleep debt to build up, which increases the individual's ability to fall asleep and stay asleep. If a patient sleeps five hours a night, the time in bed is limited to 5–5.5 hours. The time in bed is gradually increased in small segments, with the individual rising at the same time each morning; at least 85% of the time in bed must be spent sleeping.

Mind and body relaxation

Incorporating **relaxation** techniques into bedtime rituals helps a person go to sleep faster and improves the quality of sleep. These, alone or in combination with other relaxation techniques, can safely promote sleepiness. Also effective are massage techniques such as **shiatsu**, the traditional Japanese form of body work. Gentle pressure is applied to points of the body to bring on sleep.

Learning to substitute pleasant thoughts for unpleasant ones (imagery training) helps reduce worrying. Another technique is using recordings that combine the sounds of nature with soft relaxing music. **Meditation**, **prayer**, and breathing exercises could also be effective.

Insomnia may be treated professionally through techniques such as cognitive therapy. The therapist works with the patient to discover attitudes and feelings that disrupt sleep.

Herbal remedies

Many alternative treatments are effective in treating both the symptom of insomnia and its underlying causes. Much treatment is centered on herbal remedies, but the United States Food and Drug Administration does not regulate these treatments, which means that the remedies have not proven to be safe or effective. Furthermore, ingredients are not standardized to comply with regulations. People should consult with their healthcare provider or complementary medicine practitioner before taking herbal remedies. This is especially important because some remedies such as **melatonin** interact with herbals like **valerian** and prescription medicines.

Valerian

Research up to the spring of 2008 indicated that valerian may help with insomnia. People who took valerian fell asleep more quickly and experienced improved slumber. Because of the herb's sedative properties, valerian is used to treat insomnia and anxiety. It is an approved remedy in the German Commission E Monographs, a guide to herbal remedies. Approved uses include sleeping disorders caused by nervousness.

Valerian's sedative properties have been studied in animals and people. As of the spring of 2008, valerian was regarded as probably safe when taken at the recommended dosage. The remedy did not appear to disrupt sleep cycles or REM sleep.

Furthermore, a combination of valerian and **hops** could help with sleeplessness. Other herbs most recommended for treating insomnia include **skullcap** and ginseng. Herbal products are available in capsule, tincture, and powdered form. Some people treat insomnia by sipping a warm cup of tea made with an herb mixture such as valerian, **chamomile**, hops, **lemon balm**, **passionflower**, or **St. John's wort**.

Aromatherapy and hydrotherapy

Aromatherapy involves healing through **essential oils**, the aromatic extracts of plants. Essential oils may be used for a soothing bath; applied to the face, neck, shoulders, and pillow; or diffused in air.

Hydrotherapy consists of a warm bath, scented with an essence such as rose, **lavender**, or marjoram. Valerian may also be added to bath water.

Dream pillows

Another form of aromatherapy involves sleeping on a dream pillow. Also known as a sleep pillow, it can be made by sewing together two 8-inch pieces of fabric. There should be an opening to insert a tablespoon. Herbs such as hops, chamomile, and lavender are spooned into the dream pillow, which is placed under the bed pillow.

Melatonin

Melatonin is a natural hormone that is secreted from the brain's pineal gland. The gland regulates a person's biological clock, particularly day and night cycles. Melatonin is generally used as a jet lag remedy. It may also help establish sleep patterns for shift workers. While melatonin may help people fall asleep more quickly, studies indicated limited success when it was used for treating insomnia. Melatonin is not regulated by the FDA, so the long-term effects of taking it are not known.

Traditional Chinese medicine

Traditional Chinese medicine (TCM) treatments for insomnia include **acupuncture** and herbal remedies. Acupuncture involves the insertion of needles to manipulate energy flows around the body. Acupuncture is also applied to the treatment of conditions, including anxiety.

In TCM, herbs are used as remedies in teas and other preparations. Treatments for insomnia include reishi, a medicinal mushroom available in extract form. However, the side effects of reishi could include **dizziness** and nose bleeds, so it is important to consult with a healthcare professional before taking this remedy.

Light therapy

In **light therapy**, natural or artificial light is used to boost serotonin, a neurotransmitter in the brain related to reducing anxiety. This therapy is used to treat **seasonal affective disorder**, a condition that some people experience when there is less sunlight or fewer daylight hours. Some people with this disorder feel depressed during the winter, and their spirits pick up during the summer. Light therapy is used to combat the depression experienced during the winter. There were no known risks as of the spring of 2008.

A study on the use of bright light therapy to treat insomnia was described in the July 2005 edition of the professional journal *Sleep*. The research involved 24 men diagnosed with early-morning waking insomnia. During the two nights of the study, the men were exposed to light while watching television. Some received bright light (2,500-lux white light) from 8 p.m. to midnight the first night and from 9 p.m. to 1 a.m. the following night. The other subjects were in the dim-light control group. The subjects in the bright light group said they tended to sleep longer than they did before the treatment. They woke up later. When they did waken, they went back to sleep more quickly.

Allopathic treatment

A physician may determine that drug therapy is necessary to treat insomnia. Drugs may be prescribed if the patient is undergoing a crisis or insomnia persists after a patient has made lifestyle changes. However, drug therapy is regarded as a short-term remedy, not a solution.

Conventional medications given for insomnia include sedatives, tranquilizers, and anti-anxiety drugs. All require a doctor's prescription and may be habit-forming. They could lose effectiveness over time and can reduce alertness during the day. The medications should be taken up to four times daily or as directed for approximately three to four weeks. The dose will vary with the physician, patient, and medication. If insomnia is related to depression, then an antidepressant medication may be helpful.

Drugs prescribed for improving sleep are called hypnotics. This category includes benzodiazepines, which are prescribed for anxiety and insomnia. Benzodiazepines commonly prescribed for insomnia include triazolam (Halcion), tempazepam (Restoril), lorazepam (Ativan), alprazolam (Xanax), fluazepam (Dalmane), and oxazepam (Serax). Other medications prescribed for insomnia include zolpidem tartrate (Ambien), eszopiclone (Lunesta), and ramelteon (Rozerem).

Over-the-counter sleep products include Nytol, Sominex, Unisom Nightime Tablets, and Tylenol PM. While these products are usually not addictive, some experts believe they are not very effective in sustaining stage IV sleep and could affect the quality of sleep.

Expected results

Insomnia has numerous causes and treatments, so the amount of time may vary before results are seen. A prescription drug may bring immediate results to someone coping with a spouse's death. An herbal remedy may not work immediately for a person who consumed excessive amounts of caffeine to stay awake at work after a sleepless night. A procedure such as cognitive therapy may take some time as therapist and patient work to resolve issues that hinder sleep.

Research has provided information about when some treatments take effect:

- Valerian is sold commercially in the form of capsules, extracts, and teas. The capsule or extract dosage ranges from 300 to 600 mg. As a sleep aid, it should be taken shortly before bedtime. People who have trouble falling asleep may see results quickly. It could take from two weeks to a month before a person with chronic insomnia experiences improved sleep.
- A combination of hops and valerian at bedtime could provide a good night's sleep.
- Melatonin is taken in a dose of from 0.3 to 3 mg an hour of retiring. When taken as a 3-mg dose one to two hours before bed for a maximum of four to five days per week, the dietary supplement melatonin was said to be effective in shortening the time before a person fell asleep. Side effects could include nightmares and sleepwalking.
- St. John's wort can take two weeks to take effect.
- A combination of alternative therapies should bring a difference in disturbed sleep within two to four days.
- Combinations of treatments could more quickly bring about an uninterrupted night of sleep. The person who reduces caffeine intake, walks for 15 minutes, and enjoys an herbal bath may discover that that combination brings restful sleep.
- Acupuncture is said to bring some people immediate relief. In small studies, people said that after treatment that it was easier to fall asleep and they remained asleep. This treatment is safe when it is done correctly.
- Light therapy proved to be effective in the treatment of men whose insomnia caused them to wake early. In that study, the men said they experienced an immediate benefit. However, no women were studied, and the research did not include people with other types of insomnia.

KEY TERMS

Biofeedback—A training technique that enables an individual to gain some element of control over involuntary body functions.

Mood disorder—A group of mental disorders involving a disturbance of mood, along with either a full or partial excessively happy (manic) or extremely sad (depressive) syndrome not caused by any other physical or mental disorder. Mood refers to a prolonged emotion.

Sleep apnea—A condition in which a person stops breathing while asleep. These periods can last up to a minute or more and can occur many times each hour. In order to start breathing again, the person must become semi-awake. The episodes are not remembered, but the following day the person feels tired and sleepy. If severe, sleep apnea can cause other medical problems.

Sleep disorder—Any condition that interferes with sleep. As of 2008, at least 84 have been identified, according to the American Sleep Disorders Association.

Prevention

Prevention of insomnia centers around the promotion of a healthy lifestyle. A balance of rest, recreation, and exercise in combination with stress management, regular physical examinations, and a healthy diet can do much to reduce the risk. Walking is also recommended. However, exercise should be done no more than three hours before bedtime.

Also to be avoided in the evening are drinks that contain caffeine such as coffee, tea, and colas. Chocolate contains a stimulant and may keep people awake. In addition, alcohol may initially make a person sleepy. However, it could have the opposite effect a few hours later.

Maintaining a comfortable bedroom temperature, reducing noise, and eliminating light are also helpful. The bedroom should be used only for sleeping, not watching television or reading.

Exercise, relaxation, and **nutrition** should be considered ongoing preventive measures. While life brings unexpected stresses and pressures, the person who is familiar with relaxation techniques is more prepared to cope with insomnia.

Resources

BOOKS

Mayo Clinic Book of Alternative Medicine. New York: Time Inc. Home Entertainment, 2007.

PERIODICALS

"Snooze Alarm: Herbal Sleep Aids Come Up Short." *Envi ronmental Nutrition* (October 2006): 3.

OTHER

Sleep Disorders Infocenter. Holistic Online.com. http://holisticonline.com/Remedies/Sleep/sleep_home.htm. (February 1, 2008).

Johnston, Smith L., III "Societal and Workplace Conse quences of Insomnia, Sleepiness, and Fatigue." *Med scape Neurology & Neurosurgery,* September 29, 2005. http://www.medscape.com/viewarticle/513572_1. (February 1, 2008).

Lack, L., H. Wright, K. Kemp, S. Gibbon, S. "The Treat ment of Early Morning Awakening Insomnia with 2 Evenings of Bright Light." *Sleep* (July 2005). http://www.ncbi.nlm.nih.gov/pubmed/16171276. (February 1, 2008).

ORGANIZATIONS

American Medical Association, 515 N. State St., Chicago, IL, 60610, (800) 621 8335, http://www.ama assn.org.

National Sleep Foundation, 1522 K St. NW, Suite 500, Washington, DC, DC, 20005, (202) 347 3471, http://www.sleepfoundation.org/.

Liz Swain

Insulin resistance

Definition

Insulin resistance is a condition in which cells, particularly those of muscle, fat, and liver tissue, display "resistance" to insulin by failing to take up and utilize glucose for energy and metabolism (insulin normally promotes take up and utilization of blood glucose from the blood stream). In its early stages, the condition is asymptomatic, but may develop into Type II Diabetes. Although there are several established risk factors, the underlying cause is unknown.

It has been estimated that 30 to 33 million Americans are insulin resistant, and the number appears to be increasing.

Description

Insulin resistance is initially asymptomatic, and in its early stages can be detected only by laboratory tests. These tests will show an abnormally high blood sugar (glucose) level, but not high enough to be considered pre-diabetic or diabetic. While the condition does not always lead to further problems, the majority of people who reach the pre-diabetic level go on to develop Type II Diabetes (formerly called Maturity Onset Diabetes.

Causes and symptoms

The cause of insulin resistance is unknown, although the condition has been seen to run in families, indicating that there is a genetic association. Being overweight, and lack of **exercise** are also associated with insulin resistance, although the nature of the relationship is not clear. Risk factors for insulin resistance are:

- having a family history of diabetes
- having a low HDL (good) cholesterol—and high serum lipids
- having high blood pressure
- having a history of diabetes during pregnancy, or having given birth to a baby weighing more than 9 pounds
- being a member of one of the racial groups that appear to have a high incidence of insulin resistance (African American, Native American, Hispanic American/Latino, or Asian American/Pacific Islander)
- having syndrome X
- being obese

In its mildest form, insulin resistance causes no symptoms, and is only recognizable on laboratory tests. In more severe cases, there may be dark patches on the back of the neck, or even a dark ring around the neck. The dark patches are called *Acanthosis nigricans* and may also cause darkening of skin color in the elbows, knees, knuckles, and armpits.

There is a constellation of symptoms now called metabolic syndrome or insulin resistance syndrome that is linked to insulin resistance. This syndrome was formerly called syndrome X. Metabolic syndrome is defined by the National **Cholesterol** Education Program as the presence of any three of the following conditions:

- excess weight around the waistline (waist measurement of more than 40 inches for men and more than 35 inches for women)
- high levels of serum triglycerides (150 mg/dL or higher)
- low levels of HDL, or "good," cholesterol (below 40 mg/dL for men and below 50 mg/dL for women)
- high blood pressure (130/85 mm Hg or higher)
- high fasting blood glucose levels (110 mg/dL or higher)

KEY TERMS

Acanthosis nigricans—A localized darkening of the skin that is associated with insulin resistance. This is not seen in all cases, and is considered a rare disorder.

Diabetes—Any of several metabolic diseases affecting the body's use of blood sugars or the intake and excretion of fluids. In Type 2 diabetes, formerly called maturity onset diabetes, there is sufficient insulin, but the insulin is unable to penetrate the cell membrane.

Insulin—A hormone, secreted by the pancreas, which is essential for the body's ability to use glucose to provide energy. Inadequate insulin supplies result in Type 1 diabetes.

Metformin—An anti-diabetic drug of the biguanide class. This drug increases the sensitivity of cells to insulin, but is capable of causing very severe adverse reactions, including lactic acidosis and anemia.

Pioglitazone—An anti-diabetic drug of the thiazolidinedione class. This drug increases the sensitivity of the cells to insulin, but is capable of causing severe adverse reactions, including congestive heart failure.

Note that the numbers are those from an expert panel convened by the National Institutes of Health in 2001. Other panels of similarly qualified experts have given slightly different definitions.

Diagnosis

The only means of diagnosis for insulin resistance is laboratory test. While there are several tests that may be performed, the two most common screening tests are the **Fasting** Blood Sugar Test and Glucose Tolerance Test.

Fasting blood sugar measures the blood glucose level after a 12 hour fast (no food). A normal level, according to the United Sates National Institute of Diabetes and Digestive and Kidney Disease (NIDDK), should be below 100 mg/dL (milligrams of glucose in every deciliter of blood. A value in the n the 100 to 125 mg/dL range is considered evidence of insulin resistance, and is considered pre-diabetic. A value of 126 mg/dL is considered diabetic. (Blood sugar levels after a 12 hr fast are typically lower than this, and are controlled by pancreatic insulin secretion that transports blood glucose out of the blood and into the muscles, brain, organs, and other tissues.)

The glucose tolerance test is performed after the patient has had nothing but water for 10 to 16 hours. The patient has his blood drawn for a a baseline blood glucose level. Next, the patient drinks a special sweetened test drink that contains exactly 75 grams of glucose (pregnant women are normally given 100 grams of glucose.) Blood is drawn again at one half hour and each of the next six hours to compare blood glucose levels and watch their pattern in response to the sweet drink. Normally the blood sugar level is lower before the drink, rises quickly during the first few hours, and slowly drops again. In insulin resistance, the blood sugar rises but stays abnormally high, because it is resistant to being removed from blood into tissues by insulin. High blood sugar from food or the test glucose drink stimulates the pancreas to secrete insulin into the blood. However in insulin resistance, the insulin is secreted but only partially absorbed by the tissues. According to the National Diabetes Information Clearinghouse (NDIC) a normal level would be below 140 mg/dL 2 hours after the drink. If it is in the 140 to 199 mg/dL range 2 hours after drinking the solution, the diagnosis is impaired glucose tolerance (IGT) or prediabetes. A level of 200 or higher, if confirmed, represents a diagnosis of diabetes.

Treatment

Among the most important treatment modalities are diet and exercise, weight loss if obese, endocrine hormone correction- if unbalanced. In 2001, the National Institutes of Health completed the Diabetes Prevention Program (DPP), a clinical trial designed to find the most effective ways of preventing type 2 diabetes in overweight people with prediabetes. The researchers found that lifestyle changes reduced the risk of diabetes by 58 percent. Also, many people with prediabetes showed a return to normal blood glucose levels.

According to the DDP results, a mere half hour of brisk walking or bicycling five days a week can significantly reduce the risk of developing type 2 diabetes. Patients should use diet and exercise to reduce their body mass index (BMI) to 25 or below.

Smoking has been associated with insulin resistance, as well as with some of the more severe problems associated with diabetes. Discontinuing smoking should be a top priority.

A healthful diet, in addition to assisting in weight loss, may reduce serum lipids and reduce some of the risk factors for diabetes. One study recommended the

Mediterranean diet as being the most beneficial for people with insulin resistance. Diet improvements include reducing sweets, desserts and high glycemic meals; eating balanced meals that contain protein, complex carbohydrates, fiber, greens and healthy oils, eating at regular times, and avoiding excess junk food and sugar.

No complimentary or alternative therapies have been proven to cure insulin resistance. Although several herbal remedies have been traditionally used for treatment of diabetes, none have been adequately documented as effective. Among medicinal plants shown to help lower elevated blood sugar are the Asian **bitter melon** and the Navaho Optunia cactus. Such herbal **bitters** as **dandelion** root and **yellow dock** can improve digestive strength and sometimes help; though no herbal remedy alone "cures" insulin resistance or diabetes. Guar gum, glucomannan, and **psyllium** seed all have demonstrated some ability to lower blood sugar in insulin resistance or diabetes, but none have been shown to be reliably effective for use in treatment of humans.

Allopathic treatment

Insulin resistance does not normally require drug therapy; however, some studies have shown that the drugs used to treat type 2 diabetes may delay development of diabetes. Two classes of dugs now used to treat diabetes act by increasing insulin sensitivity, the biguanides and the thiazolidinediones; the other drugs used to treat diabetes act in different ways.

Although drugs from both classes have been effective in treatment of insulin resistance, neither drug has been as effective as a regimen of diet and exercise. Both classes of drugs have the potential for very severe adverse effects.They are also not approved by the FDA for control of insulin resistance, although physicians may prescribe them for this use if the condition appears to be progressing without drug therapy. In one study, oral hypoglycemic drugs of various mechanisms that help reduce elevated blood blood glucose reduced the rate of disease progression from insulin resistance to diabetes by about one-third over a three year period.

Expected results

In mild, asymptomatic insulin resistance, proper treatment may lead to a complete reversal, with normalization of blood sugar.

Even if complete normalization is impossible, treatment will lead to control of the condition, and a significant reduction in its rate of progression to diabetes.

Prevention

In insulin resistance, prevention is even better than treatment. Maintaining a normal weight, a balanced diet, and a regular program of aerobic exercise is the best preventive measure.

Resources

BOOKS

Beers, M. H., R. Berkow, eds. *The Merck Manual of Diag nosis and Therapy, 17th ed.* Whitehouse Stations, New Jersey: Merck and Co., 2004.

Blumental, M., ed. *The Complete German Commission E Monographs*. Austin, TX: American Botanical Council, 1999.

Blumentahl, M., ed. *Herbal Medicine*. Austin, TX: American Botanical Council, 2000.

Hart, C. R., M. K. Grossman. *The Insulin Resistance Diet*. Chicago: Contemporary Books, 2001

PERIODICALS

Brame, L., S. Verma, T. Anderson, A. Lteif, and K. Mather. "Insulin resistance as a therapeutic target for improved endothelial function: metformin." *Curr Drug Targets Cardiovasc Haematol Disord* (March 2004): 53 63.

Camp, H. S. "Thiazolidinediones in diabetes: current status and future outlook." *Curr Opin Investig Drugs* (April 2003): 406 11.

Cargo, D. M. "Association between smoking, insulin resist ance and beta cell function in a North western First Nation." *Diabet Med* (February 2004): 188 93.

Dzien, A., C. Dzien Bischinger, F. Hoppichler, and M. Lechleitner. "The metabolic syndrome as a link between smoking and cardiovascular disease." *Diabetes Obes Metab* (March 2004): 127 32.

Nelson, M. R. "Managing 'metabolic syndrome' and multiple risk factors." *Aust Fam Physician* (April 2004): 201 5.

Osei, K, S. Rhinesmith, T. Gaillard, and D. Schuster. "Beneficial metabolic effects of chronic glipizide in obese African Americans with impaired glucose toler ance: implications for primary prevention of type 2 diabetes." *Metabolism* (April 2004): 414 22.

Scheen, J. "Current management strategies for coexisting diabetes mellitus and obesity." *Drugs* (2003): 1165 84.

Yamamoto, Y., I. Sogawa, A. Nishina, S. Saeki, N. Ichi kawa, and S. Iibata. "Improved hypolipidemic effects of xanthan gum galactomannan mixtures in rats." *Bio sci Biotechnol Biochem* (October 2000): 2165 71.

ORGANIZATIONS

American Association of Clinical Endocrinologists (AACE) 1000 Riverside Avenue Suite 205 Jacksonville, FL 32204.

National Organization for Rare Disorders. 55 Kenosia Avenue PO Box 1968 Danbury, CT 06813 1968.

Samuel Uretsky, Pharm.D.

Interstitial cystitis

Definition

Interstitial Cystitis is a chronic bladder disorder involving symptoms such as pelvic **pain**, urinary frequency and urgency, which occurs in the absence of infection.

Description

Interstitial Cystitis (IC) is a condition affecting the bladder, often presenting with urinary symptoms and pelvic pain. Although many of the symptoms are similar to urinary tract **infections** (UTIs), IC is distinct in that a criterion for diagnosis is that no infectious organisms are present. The cause of IC is not fully known, and it is probable that multiple factors contribute to its development.

IC is characterized by chronic or remitting and recurring urinary symptoms. There is typically chronic urinary frequency and urgency which may significantly interfere with activities of daily living. Frequent nighttime urination causes sleep disruption that can lead to **fatigue** and **depression**.

Demographics

In the late 1990s between 500,000 and 1,000,000 cases of IC were reported in the United States. It is likely that prevalence of IC may be substantially greater than this due to the strict diagnostic criteria and many cases have gone undiagnosed.

Interstitial cystitis affects predominantly women, who comprise about 90% of cases. This may be in part because estrogen appears to play a role in the disorder. Women also have increased incidence of autoimmune conditions in general, and IC may have an autoimmune component.

Causes and Symptoms

The etiology of interstitial cystitis is largely theoretical and not well understood. It is likely a multifactorial condition with multiple causes. Research has confirmed several contributing aspects to the pathology of IC, including neurological, immunological, hormonal and structural origins.

The nervous system is involved in the pathology of interstitial cystitis as the site of neurogenic inflammation. Sensory nerves in the pelvis secrete immunological agents, causing inflammation and pain. One such agent is known as Substance P, a neuropeptide that acts to communicate a pain signal to the central nervous system, resulting in sensation of pain. Elevated levels of Substance P are found in patients with IC, contributing to the sensation of pelvic and bladder pain.

The immune system promotes neurogenic inflammation through chemical mediators such as substance P, inflammatory cytokines, and mast cells. Mast cells release histamine, an immune agent that promotes a local inflammatory response. In 30-65% of cases of IC, elevated mast cell levels were found in the bladder wall, contributing to chronic inflammation. It is suspected that there is autoimmune activity in IC, but studies have been inconclusive.

Estrogen plays a role in the etiology of IC, which may partially explain the higher incidence in women. Studies have shown that estrogen plays a role in determining the intensity of nerve inflammation. Symptoms are typically more severe in premenopausal women, especially at ovulation when estrogen levels peak.

As a result of chronic inflammation of the bladder wall, the mucosal lining of the bladder is compromised in IC. The surface layer of the bladder is comprised of glycosaminoglycans (GAGs) which protect the bladder from microorganisms, toxins and the acidity of the urine. In IC, the GAG layer is broken down, leading to increased permeability, inflammation and stimulation of pain receptors. IC is sometimes referred to as "leaky bladder syndrome," as the urine leaks through the protective membrane and irritates the deeper layers of the bladder.

Diagnosis

In 1987-88, the National Institutes of Health established a task force to define the diagnostic criteria of IC, which were revised in 1999 by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). These criteria have also been critiqued as being too restrictive, resulting in underdiagnosis of interstitial cystitis by as much as 60%. In 2007, a Consensus Group on Interstitial Cystitis/Painful Bladder Syndrome met to discuss and further refine the definition of IC, also referred to as Painful Bladder Syndrome (PBS), to the following: "Pelvic pain, pressure, or discomfort related to the bladder, typically associated with persistent urge to void or urinary frequency, in the absence of infection or other pathology."

IC is a diagnosis of exclusion, meaning that other conditions must first be ruled out before a diagnosis of interstitial cystitis can be made. The conditions that must be ruled out include **pelvic inflammatory**

disease, sexually transmitted disease, **bladder infection**, kidney or bladder stones and **bladder cancer**.

Interstitial cystitis is diagnosed based on history of symptoms for greater than nine months and absence of other diagnoses upon urological evaluation. The "gold standard" of diagnosis is cystoscopy with hydrodistention. This outpatient surgical procedure involves filling the bladder with fluid and viewing the bladder wall with a scope, under local anesthesia. This procedure will reproduce the sensation of intense urgency for urination, as well a diminished filling capacity. Cystoscopy often reveals pinpoint hemorrhages on the bladder wall called glomerulations, and more rarely reveals ulceration of the bladder lining known as Hunner's ulcers.

At this writing in 2008, additional testing had been developed to use potassium-chloride (KCl) to diagnose IC. Due to increased permeability of the bladder wall, **potassium** in the urine can pass through the bladder, provoking the inflammatory and pain reactions. The KCl sensitivity test utilizes an infusion of KCl through a catheter into the bladder to reproduce the symptoms. This test has been found to be about 60-75% accurate and is not yet approved for diagnosis.

Treatment

Conventional treatment includes the oral heparinoid compound pentosan polysulfate (PPS) and heparin injected to the bladder intravesically. PPS and heparin are similar in structure to the GAGs that regulate the permeability of the bladder surface. This form of treatment has found to be successful in clinical studies when used for at least one to two years. One study of long-term use of PPS oral therapy found that 65% of study participants found relief.

PPS and similar drugs may be used in conjunction with other medications that address the immunological and neurological components of IC, such as antihistamines and anti-depressants. Additional pharmacologic agents used for adjunct treatment are gabapentin, an antiepileptic drug, and in extreme cases, opioids for pain management.

Hydrodistention, the procedure for diagnosing IC, has been found to bring short-term relief for 3-6 months and is often used therapeutically. Other agents applied directly to the bladder include dimethyl sulfoxide (DMSO), which has been found to reduce inflammation and mastocytosis of the bladder. One study found 53% of participants reported improvement after treatment with DMSO.

Natural therapies are similarly selected to address the underlying mechanisms of interstitial cystitis. Oral supplementation of glycosaminoglycans such as **glucosamine** sulfate and **chondroitin** sulfate may help repair the GAG layer of the bladder and reduce leakage of potassium-containing urine through the protective surface. Glucosamine sulfate, chondroitin sulfate and other sulfate donors may act as sulfate donors for glycosaminoglycan repair. Sulfate is required for GAG synthesis and glucosamine increases serum sulfate concentrations.

The nutrients L-arginine and quercitin have been studied for their use in treating IC. L-arginine is an amino acid found to increase nitric oxide (NO) and its precursor nitric oxide synthase (NOS), which may be deficient in patients with IC, causing increased bladder irritability. Randomized clinical trials of L-arginine are conflicting, although it may decrease pain intensity, frequency and nighttime urination. Quercitin, a bioflavinoid, stabilizes mast cells and reduces histamine secretion. It has shown some promise in small studies for significantly decreasing pain, although further study is needed.

Botanical medicine can offer much relief to sufferers of interstitial cystitis. Botanicals that may be useful are demulcent herbs such as marshmallow (Althea officinalis) and couch grass (Agropyren repens). **Licorice** root (Glycerrhiza glabra) has both anti-inflammatory and demulcent properties, soothing irritated mucosa. Kava (Piper methysticum) is a well-known nervine botanical that alleviates inflammation and irritation of the urinary system as well as relieving neuralgic pain. Its use should be supervised by a practitioner knowledgeable about botanical medicine because although it is generally safe, long-term use has been associated with adverse liver effects.

Therapeutic **nutrition** is another consideration for IC treatment, particularly the identification and elimination of food sensitivities. Keeping a diet diary can help identify foods that aggravate IC symptoms, usually within 2-4 hours of ingestion. Inflammation may be reduced by following an anti-inflammatory diet, eliminating foods that promote inflammation such as wheat, dairy, soy, peanuts and nightshade vegetables such as peppers and tomatoes. Avoidance of **caffeine**, sugar and artificial sweeteners, alcohol, spicy and acidic foods, and food additives may reduce irritation to the bladder.

Hydrotherapy treatments such as sitz baths may help reduce inflammation and relieve pelvic pain, using alternating hot and cold water. This home treatment is done by using two large basins or tubs, one with hot water and one with cold (approximately 105° and 45°, respectively). The water should be deep enough to submerge the pelvis up to the navel when

KEY TERMS

Cystoscopy—A procedure for examination of the interior of the bladder using an instrument introduced through the urethra into the bladder.

Cytokines—Produced by white blood cells, cytokines are chemical signalers that commune immunologic messages and direct specific immune responses.

Glycosaminoglycans—Any of a group of polysaccharides with high molecular weight that contain amino sugars and often form complexes with proteins.

Histamine— An amine acting as an immunologic agent or neurotransmitter, producing a range of responses including redness, flushing, inflammation and edema.

Hydrodistention—Filling the bladder with fluid for the purpose of examining the internal bladder with a cystoscope.

seated in the tub. Taking care not to get chilled, the bather first sits in the hot tub for 3-5 minutes, then moving to the cold tub for 30-60 seconds. This cycle can be repeated three times, always ending with the cold water bath.

Lastly, homeopathic remedies that are individually selected for the patient may improve the symptoms when used acutely for pain and discomfort. **Homeopathy** may also be used to improve the overall constitutional health, and is best used with the supervision of a skilled homeopath.

Prognosis

Many clinical trials of conventional treatments indicate at least marginal improvement with pharmacologic therapy. Fewer studies exist on the efficacy of nutritional or botanical therapeutics, although empirical evidence and some small clinical trials of various natural remedies brought about symptom relief and improved quality of life.

Prevention

As the etiology of IC is poorly understood, it is difficult to determine means of preventing its onset. One theory is that food **allergies** and sensitivities contribute the generalized inflammation and local irritation to the gut lining and may similarly affect the bladder. For this reason, identifying and removing food sensitivities may prevent the occurrence of IC or its worsening in individuals with mild pelvic and urinary symptoms.

Resources

BOOKS

Yarnell, Eric, ND, RH. *Naturopathic Urology and Men's Health*. WA: Healing Mountain Publishing. 2001.

PERIODICALS

Imamov O, Yakimchuk K, Morani A, Schwend T, Wada Hiraike O, Razumov S, Warner M, Gustafsson J. Estrogen receptor B deficient female mice develop a bladder phenotype resembling human interstitial cysti tis. *Proceedings of the National Academy of Sciences*. 2007;Volume 104, Number 23: 9806 9809.

Marshall K. Interstitial Cystitis: Understanding the Syn drome. *Alternative Medicine Review*. 2003; Volume 8, Number 4.

A Multidisciplinary Consensus Meeting on IC/PBS: Out come of the Consensus Meeting on Interstitial Cystitis/ Painful Bladder Syndrome. *Reviews in Urology*. 2007; 9(2): 81 83.

Nickel JC. Interstitial Cystitis: Characterization and Man agement of an Enigmatic Urologic Syndrome. *Reviews in Urology*. 2001;4(3):112 121.

Parcell S. Sulfur in Human Nutrition and Applications in Medicine. *Alternative Medicine Review*. 2002; 7(1): 22 44.

Parsons CL. Interstitial Cystitis and Lower Urinary Tract Symptoms in Males and Females The Combined Role of Potassium and Epithelial Dysfunction. *Reviews in Urology*. 2002; 4 (Supplement 1): S49 S55.

Whitmore KE. Complementary and Alternative Therapies as Treatment Approaches for Interstitial Cystitis. *Reviews in Urology*. 2002; 4 (supplement 1): S28 S35.

ORGANIZATIONS

Interstitial Cystitis Association, 110 North Washington Street, Suite 340, Rockville, MD 20850, 1 800 HELP ICA, ICAmail@ichelp.org

International Pelvic Pain Society, The, 100 E. Woodfield Rd #520, Schaumburg, IL 60173, Phone: (847) 517 8712, Fax: (847) 517 7229, Website: http://www.pelvicpain.org/

OTHER

NIDDK IC Booklet Website: http://www.niddk.nih.gov/ health/urolog/pubs/cystitis/cystitis.htm

National Kidney & Urologic Diseases Clearinghouse Web site: http://kidney.niddk.nih.gov/kudiseases/pubs/ interstitialcystitis/index.htm

Diana Christoff Quinn, ND

Iodine

Description

Iodine is a trace mineral required for human life. Humans require iodine for proper physical and mental development. It affects cell respiration and metabolism,

Recommended dietary allowance of Iodine

Age	mg/day
Children 0-6 mos.	110
Children 7-12 mos.	130
Children 1-3 yrs.	90
Children 4-8 yrs.	90
Children 9-13 yrs.	120
Adolescents 14-18 yrs.	150
Adults ≥ 19 yrs.	150
Pregnant women ≤ 18 yrs.	220
Pregnant women ≥ 19 yrs.	220
Breast feeding women ≤ 18 yrs.	290
Breast feeding women ≥ 19 yrs.	290

Foods that contain iodine	mcg
Seaweed, dried, 1 oz.	up to 18,000
Kelp, 1/4 cup wet (amount is highly variable)	415
Salt, iodized, 1 tsp.	400
Haddock, 3 oz.	104-145
Cod, 3 oz.	99
Salt, iodized, 1 g	77
Milk, 1 cup	55-60
Turkey breast, cooked, 3 oz.	34
Cottage cheese, 1/2 cup	25-75
Shrimp, 3 oz.	21-37
Egg, 1 large	19-29
Processed fish sticks, 1 piece	17
Tuna, canned, 3 oz.	17
Ground beef, cooked, 3 oz.	8

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

proper functioning of nerves and muscles, differentiation of the fetus, growth and repair of tissues, and the condition of skin, hair, teeth, and nails. Iodine is also needed for the production of thyroid hormones. The thyroid (a small gland in the front of the neck), which contains 80% of the body's iodine pool, converts iodine into the thyroid hormones thyroxine (T_4) and triiodothyronine (T_3). These hormones are released into the bloodstream, controlling the body's metabolic rate.

General use

The recommended dietary allowance (RDA) for iodine was revised in 2001 by the Food and **Nutrition** Board of the Institute of Medicine, and the data is provided in the table in this entry. That standard differs for various ages and each sex and for pregnant and lactating women.

Estimates of the average daily intake of iodine for citizens of the United States and other countries around the world vary widely depending on a number of factors, one of which is geographical location. The most recent estimates for iodine intake in the United States range from about 200 mcg/day to 500 mcg/day, with the upper level reaching nearly 750 mcg/day in some parts of the country. According to the *Merck Manual of Diagnosis and Therapy*, less than 20 mcg per day of iodide results in iodine deficiency; iodide intake 20 times greater than the daily requirement (1.5 mg) results in chronic iodine toxicity.

Iodine is available from a variety of food sources, drugs, and most commercial vitamin preparations. Some seafood and sea vegetables provide good sources of dietary iodine: canned sardines, canned tuna, clams, cod, haddock, halibut, herring, lobster, oyster, perch, salmon, sea bass, and shrimp. Dulse, **kelp**, and seaweed are also sources of dietary iodine. If grown in iodine-rich soil, foods including asparagus, green peppers, lettuce, lima beans, mushrooms, pineapple, raisins, spinach, summer squash, Swiss chard, turnip greens, and whole-grain wheat may provide good sources of dietary iodine. Animal products can also provide a source of iodine, especially if the animals are fed iodine-enriched foods or salt: beef, beef liver, butter, cheddar cheese, cottage cheese, cream, eggs, lamb, milk, and pork. Some foods such as breads may contain iodine additives.

Another source of dietary iodine is iodized salt. Iodized table salt was introduced in the United States in 1924 and significantly reduced the incidence of iodine deficiency. Providing iodized salt licks for livestock adds iodine to animal products. In some parts of the world, iodized oil supplements and water iodination provide other means of iodine supplementation. In 2007, the Network for Sustained Elimination of Iodine Deficiency reported that 70% of the world's population had access to supplemental iodine in one form or another. Many countries, however, still have insufficient iodine supplementation programs.

Iodine has several medical applications. Typically, in conjunction with drug therapy, iodine may be used to treat goiter (an enlargement of the thyroid gland), symptoms of **hypothyroidism** (diminished production of thyroid hormone), and **hyperthyroidism** (increased production of the thyroid gland). It may also be used as an expectorant in **cough** medications. Applications of iodine to conditions such as arteriosclerosis, arthritis, and **angina** pectoris have also been noted. Iodine tinctures (dilute mixtures of alcohol and iodine) or a combination of Bacitracin **zinc** and Polymyxin B sulfate (Betadine) are used as antiseptics to kill bacteria in skin **cuts**. Atomidine, a product

containing iodine trichloride and other unlisted ingredients, is also sold as an antiseptic. Atomidine taken orally in minute, cyclic doses is also recommended as a glandular stimulant and purifier.

Some research has shown that oral iodine supplements have antifibrotic and anti-inflammatory effects. Commonly reported studies have also suggested that iodine deficiency may be a factor in **fibrocystic breast disease** (FBD), a catch-all term that describes general, often normal, lumpiness of the breast. Clinical trials on women diagnosed with FBD found that, even in women showing normal thyroid function, thyroid hormone supplementation resulted in decreased breast **pain** and decreased breast nodules. Some early research also correlated higher incidence of breast, endometrial, and ovarian cancers with hypothyroidism and/or iodine deficiency. However, others have noted that low levels of **selenium**, which is more typically associated with **cancer**, were also present in these studies.

Iodine is used in several compounds for a variety of medical testing procedures. For example, it may be used in x-raying the gallbladder or kidneys or in cardiac imaging. It is used as a diagnostic tool to examine the thyroid gland's output. A common test measures thyroid radioactive iodine uptake (RAIU). Trace amounts of radioactive iodine (^{123}I or ^{131}I) are used to test thyroid function. Together with blood tests, examining how much iodine is taken up by the thyroid gland helps physicians diagnose hypothyroid conditions (when the thyroid takes up too little iodine) and hyperthyroid conditions (when it takes up too much). Radioactive iodine therapy is also used for treating thyroid disease and cancer. But radioactive iodine can cross the placenta, causing severe dysfunction and damage to the fetus's thyroid gland, so experts recommend that nursing mothers should discontinue nursing for a period of time after receiving test or treatment doses of radioactive iodine. Medical professionals may also prescribe low iodine **diets** in combination with radioactive iodine tests or treatments.

Precautions

Too much or too little iodine intake results in a wide spectrum of disorders that are addressed by adjusting iodine intake. Too much iodine can result in toxicity.

Iodine deficiency disorders (IDDs) are preventable, but not curable, by ensuring adequate iodine intake. Only a small amount of iodine is required over the human lifespan. The body, however, does not store iodine for long periods so the intake must be regular. Too little iodine intake can result in cold feet; **fatigue**; **insomnia**; problems with skin, nails, and hair; and weight gain. Goiter can result from iodine deficiency. Certain substances called goitrogens can also induce goiter by interfering with thyroid functioning. Some foods have goitrogenic tendencies, as do certain drugs, for example, thiourea, sulfonamides, and antipyrine. Foods containing substances that can prevent the utilization of iodine when eaten in large quantities include brussels sprouts, cabbage, cauliflower, kale, millet, mustard, peaches, peanuts, pears, pine nuts, soybeans, and turnips. Limiting consumption of these foods may be recommended for persons with an underactive thyroid.

Iodine deficiency can also result in serious, irreversible disorders, widely recognized as a serious global health problem by organizations such as the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). According to the International Council on Control of Iodine Deficiency Disorders (ICCIDD), IDDs are the most common cause of preventable brain damage and mental retardation worldwide. IDD results in cretinism (a form of stunted growth) and problems in movement, speech, and hearing. A pregnant woman with an iodine deficiency risks miscarriage, stillbirth, and mental retardation of her baby. In 2006, WHO estimated that at least 800 million people worldwide live in environments that are deficient in iodine, placing them at serious risk for IDDs. In 2002, the United Nations Children's Fund announced a pledge to eliminate iodine deficiency in the world by 2005, citing the problem as a major cause of mental and learning disabilities. The 2005 goal turned out to be overly optimistic, although the effort to reduce iodine deficiency problems around the world, later called the Iodine Network, continued in operation in the late 2000s.

Side effects

Excess iodine is typically excreted, and output can be measured in the urine. Regular excessive iodine intake is needed for toxicity. Excess iodine, when used as a supplement or in drug therapy, may reduce thyroid function. Although more commonly associated with iodine deficiency, goiter can also result from too much iodine due to thyroid hyperactivity. Additionally, high amounts of iodine from sources such as overuse of iodized salt, vitamins, cough medications, kelp tablets, or from medical testing can cause effects, including rapid pulse, nervousness, headaches, fatigue, a brassy taste in the mouth, excessive salivation, gastric irritation, and hypothyroidism. **Acne** can appear or become worse. Some iodine-sensitive individuals may have an allergic reaction to iodine, often a skin rash. A physician may recommend

that high iodine foods be removed from the diet of those who are iodine-sensitive. Similar side effects have also been observed in some women participating in studies on iodine and diagnosed FBD. Radioactive iodine has been implicated in producing thyroid dysfunction and thyroid cancer.

Resources

BOOKS

Alloway, Brian J., et al., eds. *Essentials of Medical Geology: Impacts of the Natural Environment on Public Health*. Amsterdam: Elsevier Academic Press, 2005.

Brownstein, David. *Iodine: Why You Need It, Why You Can't Live Without It*. West Bloomfield, MI: Medical Alternatives Press, 2007.

Otten, Jennifer J., Jennifer Pitzi Hellwig, and Linda D. Meyers, eds. *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: National Academies Press, 2006.

Shils, Maurice E., et al., eds. *Modern Nutrition in Health and Disease*. Philadelphia: Lippincott Williams & Wilkins, 2006.

PERIODICALS

Rehman, Shakaib U., Florence N. Hutchison, and Jan N. Basile. "Goiter in Older Adults." *Aging Health* (Octo ber 2006): 823 831.

Taras, Howard. "Nutrition and Student Performance at School." *Journal of School Health* (August 2005): 199 213.

ORGANIZATIONS

Iodine Network, 180 Elgin St., Suite 1000, OttawaON, Canada, K2P 2K3, +1 (613) 782 6812, http://www.iodinenetwork.net/.

U.S. Fund for UNICEF, 125 Maiden Lane, New York, NY, 10038, (800) 4UN ICEF, http://www.unicefusa. org/.

World Health Organization (WHO), Avenue Appia 20, 1211, Geneva, 27, Switzerland, +41 22 791 2111, http://www.who.int/en/.

OTHER

International Council for Control of Iodine Deficiency Dis orders (ICCIDD). http://www.iccidd.org/. (February 26, 2008).

Kathy Stolley
Teresa G. Odle
David Edward Newton, Ed.D.

Ipecac

Description

There are two categories of ipecac preparations—a syrup used in standard medical practice and a homeopathic remedy. They are given for different purposes. The medicinal effects of ipecac were recognized centuries ago by the Portuguese who settled in South America. They found a plant that can make people vomit and appropriately named it *Caephalis ipecacuanha*, meaning sick-making plant. Nowadays, ipecac is used to treat a variety of conditions. Its most widely accepted use is to induce **vomiting** in cases of accidental poisoning. When ipecac is swallowed, a substance in it called cephaeline irritates the stomach and causes vomiting. Syrup of ipecac is now considered the safest drug to treat poisoning and is often the most effective. There are different types of ipecac preparations that vary greatly in strength. Syrup of ipecac is best for use at home to treat accidental poisoning. Ipecac fluid extract and ipecac tincture should be avoided as they are much stronger compounds and can be toxic.

Ipecacuanha is a homeopathic remedy made from ipecac by a process of dilution and succussion (shaking). In contrast to syrup of ipecac, it is given to relieve vomiting.

General use

Treatment of poisoning

Standard medical practice uses ipecac to cause vomiting in cases of poisoning in order to remove the toxic substance from the stomach before absorption occurs. It can be used on animals as well as humans. Ipecac is safer and more effective than many other methods for inducing vomiting, such as sticking a finger down a child's throat or using salt water. There are times, however, when ipecac should not be used because it can make certain kinds of poisoning worse. Syrup of ipecac should not be used if the poison is one of the following.

- strychnine
- alkalis (lye)
- strong acids
- kerosene
- fuel oil
- gasoline
- coal oil
- paint thinner
- cleaning fluid

Poisoning is a potentially serious condition. It is best to contact a local poison control center, local hospital emergency room, or the family doctor for instructions before using syrup of ipecac.

Ipecac's reputation for inducing vomiting has encouraged some bulimics to take it on a regular basis

KEY TERMS

Bulimia nervosa—An eating disorder characterized by episodic binge eating followed by self-induced vomiting or laxative abuse.

Cephaeline—A chemical compound found in ipecac that irritates the stomach lining and triggers the vomiting reflex.

Fluid extract—A concentrated preparation of a drug.

Law of similars—A principle of homeopathic treatment according to which substances that cause specific symptoms in healthy people are given to sick people with similar symptoms.

Modality—A factor or circumstance that makes a patient's symptoms better or worse. Modalities include such factors as time of day, room temperature, the patient's level of activity, sleep patterns, etc.

Tincture—An alcoholic solution of a chemical or drug.

in order to purge the contents of the stomach after an eating binge. This misuse of ipecac is extremely dangerous; it can cause heart problems, tears in the esophagus or stomach lining, vomiting blood, seizures, or even death.

Homeopathy

The homeopathic remedy made from ipecac is called *Ipecacuanha*. Homeopathic preparations are given for a reason completely opposite from that of standard allopathic treatment. In **homeopathy**, ipecac is given to stop vomiting rather than to induce it. According to Hahnemann's law of similars, a substance that would cause vomiting in large doses when given to a healthy person will stimulate a sick person's natural defenses when given in extremely diluted and carefully prepared doses. *Ipecacuanha* is a favorite homeopathic remedy for **morning sickness** associated with **pregnancy**. It is also given to stop **nausea** that is not relieved by vomiting; when the vomitus is slimy and white; when there is gagging and heavy salivation; when the tongue is clean despite the patient's feelings of nausea; and when the patient is not thirsty. The nausea may be accompanied by a **headache**, **cough**, or heavy menstrual bleeding. The modalities (circumstances) that suggest *Ipecacuanha* as the appropriate homeopathic remedy is that the patient feels worse lying down; in dry weather; in winter; and when exercising or moving about.

A homeopathic practitioner would not necessarily prescribe ipecac for all cases of nausea. *Arsenicum* would be given when the nausea is caused by **food poisoning** and accompanied by strong thirst, ***Nux vomica*** when the nausea is the result of overindulgence in food or alcohol and accompanied by **gas** or **heartburn**. A sick child might be given *Pulsatilla*, particularly if rich foods have been eaten.

On the other hand, a homeopathic practitioner may prescribe ipecac for any of the following conditions that are not related to nausea and vomiting.

- Nosebleeds producing bright red blood.
- Dental bleeding.
- Diarrhea with cramping abdominal pain. The stools are green with froth or foam.
- Asthma of sudden onset. The patient has to sit up in order to breathe, but cannot bring up any mucus in spite of violent coughing.
- Hoarseness or loss of voice following a cold.
- Physical or mental exhaustion.

Preparations

Syrup of ipecac

Syrup of ipecac is made from the dried roots and rhizomes (underground stems) of *Cephaelis ipecacuanha*. It is available over the counter in 0.5–1 oz bottles. Larger bottles require a doctor's prescription. The dosage for infants under 6 months old should be prescribed by the family doctor or poison control center. For children six months to one year, the usual dose is 5–10 ml or 1–2 tsp. One-half or one full glass (4–8 oz) of water should be taken immediately before or after the dose. The dose may be repeated once after 20–30 minutes if vomiting does not occur. For children one to 12 years of age, the usual dose is 15 ml (1 tbsp) to be taken with one full glass (8 oz) of water. Adults and teenagers should take 15–30 ml of ipecac with at least 1 full glass of water. Syrup of ipecac should not be taken with milk or soda drinks as these foods may prevent it from working properly. If vomiting does not occur within 20–30 minutes after the first dose, a second dose may be needed. If the second dose fails to induce vomiting, the patient should be taken to a hospital emergency room.

If both **activated charcoal** and syrup of ipecac are recommended to treat poison, ipecac must be used first. Activated charcoal should not be taken until 30

minutes after taking syrup of ipecac, or until the vomiting caused by ipecac stops.

Homeopathic preparations

Ipecacuanha is available as an over-the-counter remedy in 30x potency. This is a decimal potency, which means that one part of ipecac has been mixed with nine parts of alcohol or water; 30x means that this decimal dilution has been repeated 30 times. The dilute solution of ipecac is then added to sugar tablets so that the remedy can be taken in tablet form.

Precautions

Syrup of ipecac

For inducing vomiting in cases of accidental poisoning, only the syrup form of ipecac should be used. Syrup of ipecac should not be mixed with milk or carbonated drinks as they may prevent vomiting. If syrup of ipecac is not immediately available in the home, it generally cannot be used. A 2002 report studied parents' attempts to administer the syrup upon calling a poison center when they felt they could obtain it within 15 minutes. However, actual time to administration was generally closer to 30 minutes and the report recommended that parents not be referred to purchase ipecac when their children have ingested a significant amount of a poisonous substance and the syrup is not already available in the home.

Syrup of ipecac should not be used in the following situations (contact poison control center or family doctor for alternative treatments).

- Poisoning caused by strychnine; sustained-release theophylline; such corrosive substances as strong alkalis (lye); strong acids (such as toilet bowl cleaner); and such petroleum products as kerosene, gasoline, coal oil, fuel oil, paint thinner, or cleaning fluids.
- Overdoses of medications given for depression.
- Excessive vomiting.
- A serious heart condition.
- Timing. Do not give ipecac more than 4–6 hours after the poison was ingested.
- Pregnancy.
- Very young children (less than six months old). Infants and very young children may choke on their own vomit or get vomit into their lungs.
- Drowsy or unconscious patients.
- Seizures.

Homeopathic preparations

Ipecacuanha should not be given after *Arsenicum* or *Tabac* because these remedies will counteract it.

Side effects

The following side effects have been associated with the use of syrup of ipecac.

- Loose bowel movements.
- Diarrhea.
- Fast irregular heartbeat.
- Inhaling or choking on vomit.
- Stomach cramps or pains.
- Coughing.
- Weakness.
- Aching.
- Muscle stiffness.
- Severe heart problems often occur in cases of ipecac abuse. Because ipecac stays in the body for a long time, damage to the heart frequently occurs in persons who repeatedly take ipecac to induce vomiting.
- Seizures. These are most likely to occur in patients who accidentally swallow ipecac or in ipecac abusers.
- Death. Deaths have been reported due to ipecac abuse in bulimic persons.

Homeopathic *Ipecacuanha* has been highly diluted and is relatively nontoxic.

Interactions

Ipecac should not be given with other drugs because it can decrease their effectiveness and increase their toxicity. If both syrup of ipecac and activated charcoal are needed to treat suspected poisons, ipecac should be given first. Activated charcoal should not be given until vomiting induced by ipecac has stopped. Soda should also be avoided because it can cause the stomach to swell. The person should lie on the stomach or side in case vomiting occurs.

Homeopathic *Ipecacuanha* is considered complementary to *Arnica* and *Cuprum*. It is counteracted by *Arsenicum* and *Tabac*.

Resources

BOOKS

Cummings, Stephen, MD, and Dana Ullman, MPH. *Everybody's Guide to Homeopathic Medicines.* New York: G. P. Putnam's Sons, 1991.

Ellenhorn's Medical Toxicology, 2nd ed. Baltimore: Williams & Wilkins, 1997.

Hammond, Christopher. *The Complete Family Guide to Homeopathy: An Illustrated Encyclopedia of Safe and Effective Remedies*. New York: Penguin Studio, 1995.
PDR Nurse's Drug Handbook. Montvale, NJ: Delmar Pub lishers, 2000.

PERIODICALS

J. Garrison, et al. "Effectiveness of Home Ipecac Syrup Administration when it is Not Initially Available." *Journal of Toxicology:Clinical Toxicology* (August 2002): 618.

ORGANIZATIONS

American Foundation for Homeopathy. 1508 S. Garfield. Alhambra, CA 91801.
Homeopathic Educational Services. 2124B Kittredge St. Berkeley, CA 94704. (510) 649 0294. Fax: (510) 649 1955.

Mai Tran
Teresa G. Odle

Ipraflavone *see* **Ipriflavone**

KEY TERMS

Calcitonin—A hormone that inhibits bone resorption in response to high blood levels of calcium.

Daidzein—A soy isoflavone used to produce ipriflavone.

Genistein—A plant isoflavone, found as genistin in soy, that is used to produce ipriflavone.

Isoflavones—Compounds, including plant estrogens, with two phenolic rings, that are found in significant quantities in soybeans and soy foods. Isoflavones belong to the larger category of flavonoids, plant compounds that are often a source of the plant fruit or flower color, and possess anticancer, anti-inflammatory, anti-allergy, and antioxidant qualities.

Menopause—The cessation of menstruation.

Osteoporosis—A progressive disease characterized by loss of bone density and increased bone fragility.

Resorption—The dissolution of bone tissue.

Ipriflavone

Description

Ipriflavone (IP), also called ipraflavone, is a mass-produced synthetic derivative of genistein (genistin) or daidzein. Genistein and daidzein are unique plant compounds called isoflavones, which are primarily found in soy products. Isoflavones belong to a larger category known as flavonoids, which are natural plant components that have antioxidant, anti-inflammatory, anti-allergy, and anticancer properties. Although most soy isoflavones are classified as plant estrogens (phytoestrogens), ipriflavone does not have estrogenic activity, and does not activate any estrogen receptors in the body. However, it may prevent or treat bone loss—osteoporosis—associated with **menopause** (the cessation of **menstruation**) and **aging**.

Ipriflavone contains three carbon rings. Its chemical names are:

- 7-isopropoxyisoflavone
- 7-isopropoxy-3-phenyl-4H-1-benzopyran-4-one
- 7-(1-methylethoxy)-3-phenyl-4H-1-benzopyran-4-one
- 7-isopropoxy-3-phenylchromone

One source notes that ipriflavone is found in foods, but only in trace amounts. In addition to soy products (including some soy sauces), trace amounts are found in **alfalfa** and other foods. It also is found in propolis, a resin that bees collect from tree buds for use as a hive cement. Ipriflavone is a solid that dissolves only slightly in water.

The liver metabolizes ipriflavone into 7-hydroxy-ipriflavone and 7-(1-carboxy-ethoxy)-isoflavone. IP and its derivatives are bound to albumin, a blood protein, and distributed to tissues throughout the body.

Ipriflavone may be one of the best-studied compounds in the natural health industry. However, the results of these studies are not clear with regard to efficacy in increasing bone density, its primary claim. Ipriflavone was first isolated at a Hungarian pharmaceutical company in 1969. Since the 1980s, it has been a registered prescription drug for the prevention and treatment of **osteoporosis** in Japan, Argentina, and Europe.

General use

Like other cells in the human body, bone cells are constantly being replaced. Furthermore, bones serve as a **calcium** bank because they are a source of calcium used for other functions, such as buffering the blood. Osteoporosis is a net loss of bone mass, caused either by excessive bone-resorping (dissolving) or low bone-forming activities. These activities are often related to the increased bone turnover rate that accompanies menopause.

Women have a lifetime risk of 40% for developing osteoporosis. One-half of all women over the age of 50 will develop the disease. One in eight men experience bone **fractures** as a result of osteoporosis. Hip fractures caused by osteoporosis are a direct or indirect cause of death in one-quarter of elderly Americans. Bone building and breakdown are influenced by the following:

- hormones, including estrogen and calcitonin (from the parathyroid gland)
- minerals such as magnesium, phosphorus, boron, zinc, silica, and vanadium
- vitamins, including vitamin D.
- other factors such as corticosteroid use, sunlight, dietary acidity, physiologic pH, and overall bodily health

Numerous studies have indicated that ipriflavone maintains or increases bone mineral density in osteoporosis, particularly in conjunction with calcium supplementation. Clinical studies have demonstrated that ipriflavone supplementation may:

- prevent rapid bone loss immediately following menopause
- increase bone density in postmenopausal women by as much as 3%
- increase bone mineral density in women with osteoporosis by up to 6%
- decrease the incidence of bone fractures among postmenopausal women
- reduce bone pain caused by osteoporosis
- increase mobility in women with osteoporosis
- stimulate the synthesis and secretion of calcitonin, a hormone that controls calcium metabolism
- lower the high cholesterol levels associated with menopausal estrogen deficiency
- have some activity against cancer

Ipriflavone also slows bone loss in women whose ovaries have been removed, although it does not appear to prevent acute bone loss immediately following ovariectomy. Further studies in this area have not obtained the same conclusions, except under very specific conditions including younger age and active bone loss. Therefore, the presence of osteoporosis alone does not appear to be sufficient for obtaining good results, even with calcium supplementation.

The mechanisms of ipriflavone activity are not understood. *In vitro* and animal studies have indicated that:

- Genistein inhibits the breakdown of bone.
- Ipriflavone inhibits bone resorption (the breakdown and recycling of bone tissue).
- Ipriflavone may stimulate bone formation.

In contrast, one large study of postmenopausal women with slight osteoporosis found no significant bone density changes between the group taking calcium supplements alone and those taking calcium plus ipriflavone.

Since ipriflavone does not have estrogenic activity, it may be appropriate for treating bone loss in men, particularly in those with **prostate cancer** who are receiving therapies that reduce androgen (masculinizing hormone) levels.

Preparations

Ipriflavone is available over-the-counter (OTC) in many generic and brand name forms (e.g. Ostivone, Natrol, and Bone Support Ipriflavone Blend). It is supplied in capsules, each containg 100, 200, or 300 mg. A typical IP dose for the management of osteoporosis is 200 mg, two to three times daily. Almost all studies consistently used 600 mg daily. A two-month supply costs about $20.

Food items, particularly those containing lipids, increase the small intestine's absorption of ipriflavone. IP supplements are more effective if combined with calcium and other supplements that help to diminish bone loss during menopause and aging. Ipriflavone sometimes is combined with low-dose estrogen preparations.

Natural isoflavone supplements isolated from soy do not appear to have the same benefits or phytoestrogen neutral qualities as ipriflavone.

Precautions

Ipriflavone has not been subjected to long-term safety studies. In one study, a consistent precaution resulting from research that spanned as much as three years, is that ipriflavone appears to decrease lymphocyte (disease-fighting white-blood-cell) levels in a significant number of postmenopausal women with minor osteoporosis. Additionally, since ipriflavone is metabolized by the liver, those with liver disease are advised to avoid it unless directed otherwise by a healthcare professional. Other contraindications include **pregnancy** and breast-feeding, gastric or duodenal ulcers, and kidney disease. Ipriflavone is not recommended for small children.

Side effects

No significant side effects have been observed with ipriflavone, although there are reports of **heartburn**, **nausea**, **diarrhea**, or other mild gastrointestinal disturbances. These side effects may be avoided by

taking the supplement with food. One source noted that the percentage of perceived side effects was actually less among the IP users than in the placebo group. Generally, ipriflavone is considered to be well tolerated, to have no effect on fertility, and to not promote precancerous cellular changes (mutagenicity). Approximately 13% of women studied had a decrease in white blood cell count, usually within the first six months. However, this group did not become more susceptible to disease or illness. Their normal white blood cell counts returned within one to two years of discontinuing the IP. There were occasional reports of hypersensitivity reactions, and increases in liver function test scores.

Interactions

Similar to grapefruit juice, IP has an inhibiting effect on a liver **detoxification** pathway involving an enzyme known as cytochrome P450. This effect increases both the blood levels and the effects of these drugs:

- theophylline: IP and 7-hydroxy-ipriflavone may inhibit the metabolism and elimination of this asthma drug, leading to elevated—and potentially toxic—blood levels
- zafirlukast (Accolate), an asthma medication
- antipsychotic medications
- caffeine
- celecoxib (Celebrex), a pain reliever for arthritis
- cyclobenzaprine (Flexeril), a muscle relaxant
- nifedipine
- nonsteroidal anti-inflammatory medications and pain relievers
- tacrine (Cognex), a medication for Alzheimer's disease
- tamoxifen (Nolvadex), for cancer prevention and treatment
- tolbutamide, levels are increased by both ipriflavone and 7-hydroxy isoflavone
- warfarin (Coumadin), a blood-thinner

The effects of ipriflavone may be additive with the effects of these drugs:

- bisphosphonates, for the treatment of osteoporosis
- calcitonin
- estrogen
- selective estrogen receptor modulators (SERMs)

During the management of osteoporosis, ipriflavone effects may be additive with the effects of the following nutritional supplements:

- boron
- calcium
- fluoride
- vitamin D
- vitamin K

Resources

BOOKS

Girman, A., and C. Poole. *Preventing Osteoporosis with Ipriflavone: Discover the Proven, Safe Alternative to Estrogen Replacement Therapy*. Roseville, CA: Prima Publishing, 2000.

PDR for Nutritional Supplements. Montvale NJ: Thomson PDR, 2001.

PERIODICALS

Alexandersen, Peter, et al. "Ipriflavone in the Treatment of Postmenopausal Osteosporosis: A Randomized Con trolled Study." *Journal of the American Medical Asso ciation* 285, no. 11 (March 21, 2001): 1482 8.

"Can Ipriflavone Help Save Your Bones From Osteoporo sis?" *Environmental Nutrition* 2415 (May 2001): 7.

Fuchs, Nan K. "Ipriflavone Limitations." *Women's Health Letter* 813 (March 2002): 7.

Glazier, M. Gina, and Marjorie A. Bowman. "A Review of the Evidence for the Use of Phytoestrogens as a Replacement for Traditional Estrogen Replacement Therapy." *Archives of Internal Medicine* 161 no. 9 (May 14, 2001): 1161 72.

Schelonka, E. P., et al. "Ipriflavone and Osteoporosis." *Journal of the American Medical Association* 286 no. 15 (October 17, 2001): 1836.

"Total Health Resource Guide: Ipriflavone a Foundation for Healthy Bones." *Total Health* 24, no. 5 (November/ December 2002): S24 5.

Walsh, Nancy. "Dietary Supplement Ipriflavone Stems Bone Loss." *Family Practice News* 31, no. 8 (April 15, 2001): 32.

ORGANIZATIONS

National Osteoporosis Foundation. 1232 22nd Street N.W., Washington, DC 20037 1292. (202) 223 2226. http:// www.nof.org.

OTHER

Brown, Ph.D., CCN, Susan E. *Ipriflavone, Osteoporosis Education Project Analysis*. The Osteoporosis Educa tion Project (OEP), 2000. [cited May 28, 2004]. http:// www.betterbones.com.

Ipriflavone. Healthnotes, Inc. 2004. [cited May 28, 2004]. http://www.healthwell.com/healthnotes.

Ipriflavone. National Nutritional Foods Association, 2001. [cited May 28, 2004]. http://www.nnfa.org/services/ science/bg_ipriflavone.htm.

Mercola, Joseph. *Ipriflavone Has No Effect on Bone Density*. 2004. [cited May 28, 2004]. http://www.mercola.com/ 2000/oct/8/ipriflavone.htm.

Margaret Alic

Iridology

Definition

Iridology, also called iris analysis or iris diagnosis, is the study of the iris (the colored part of the eye). Iris "readings" are made by iridologists to assess a person's health picture (physical, emotional, mental, and spiritual) and guide them to take measures to improve their health.

Origins

The basic concept of iridology has existed for centuries. The medical school of the University of Salerno in Italy offered training in iris diagnosis. A book published by Philippus Meyers in 1670, called *Chiromatica medica*, noted that signs in the iris indicate diseases. Dr. Ignatz von Peczely, however, is generally considered the father of iridology, with the date of his discovery given as 1861. Von Peczely was a Hungarian physician. As a child, he accidentally broke an owl's leg. He observed that a black line formed in the owl's lower iris at the time of the injury. After the owl's leg healed, the young von Peczely noted that the black streak had changed appearance. As a physician, he treated a patient with a broken leg in whose eye he observed a black streak in the same location as on the injured owl's iris. Von Peczely became intrigued by the possibility of a connection between diseases and eye markings. Through observing his patients' eyes, he became convinced of this connection and developed a chart that mapped iris-body correlations. After several decades of comparative study, von Peczely mapped organs across zones identified by hours and minutes on a clock face superimposed over drawings of the eyes. In 1881, he published his theories in a book called *Discoveries in the Field of Natural Science and Medicine: Instruction in the Study of Diagnosis from the Eye*.

A Swedish pastor and homeopath named Nils Liljequist also developed the concept of iris-body correlations at roughly the same time but independently of von Peczely's work. He was the first iridologist to identify the effects of such drugs as **iodine** and quinine on the iris. Liljequist based his initial observations on changes in his own irises after illnesses and injuries, publishing writings and eye drawings during the late nineteenth century. One of his students, Dr. Henry Lahn, brought the practice of iridology to the United States. A variety of practitioners, primarily European, have sought to popularize iridology since these early works. Dr. Bernard Jensen, a chiropractor, is the best-known contemporary American advocate of iridology.

Benefits

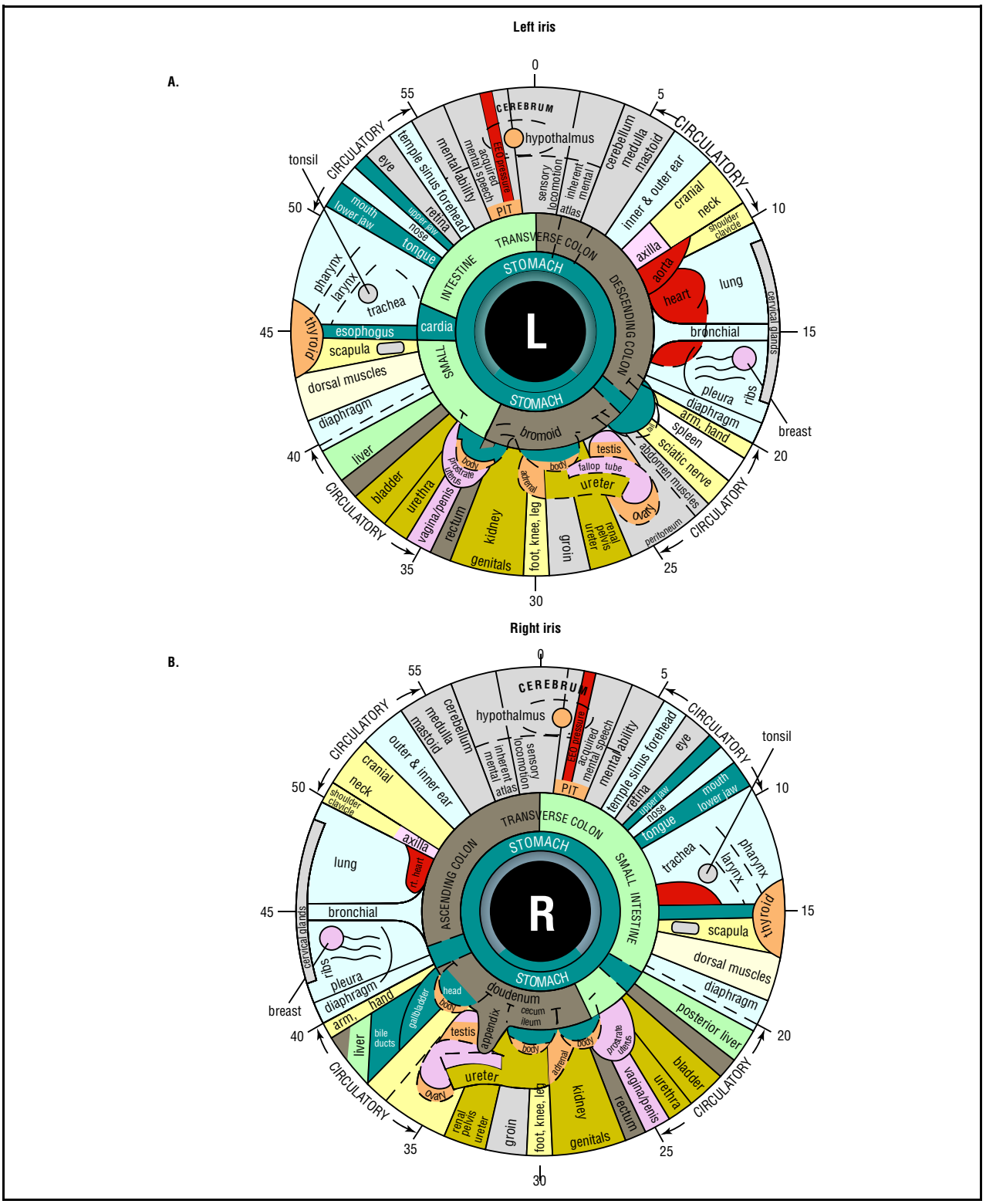
Iridologists claim that by studying the patterns of a person's iris, they can provide helpful and accurate health and wellness information. Iridology is a holistic endeavor in that it addresses the person's whole being in the reading. The range of information gleaned encompasses physical, emotional, mental, and spiritual aspects of the person's health picture. In addition to assessing the person's general level of health, readings can reveal other data, including energy quotients; internal areas of irritation, degeneration, injury, or inflammation; nutritional and chemical imbalances; accumulation of toxins; life transitions; and subconscious tensions. Iridologists maintain that the eyes reveal information about the person's physical and emotional constitution, such as inherited weaknesses and risks to which the person may be prone. Strengths may also be revealed, including inherited emotional tendencies from which the person derives particular talents. Cleansing and healing can be verified by changes in the iris. By looking for certain signs such as healing lines, iridologists obtain information about previous health problems and injuries and discover what may have gone wrong in the person's past.

An iridology reading reflects the causes of problems, not symptoms. It may, iridologists claim, reveal that organs or systems are overstressed or predisposed to disease before clinical symptoms even develop. By predicting future problems, iridology can be used as a preventive tool. People can use the information from iridology readings to improve their health and make better behavioral choices in the future, thereby heading off problems before they occur.

In North America, iridology is generally considered to be an assessment tool to be used in cooperation with other health specialties. Iridology is not a diagnostic tool (although it is more likely to be considered so by European iridologists) and should not be used to diagnose or name specific diseases. Not only would diagnosis represent an improper application of iridology according to many iridologists, as noted by the International Iridology Research Association (IIRA), it could also be construed in many countries as practicing medicine without a license.

Description

Iridology is generally based on the concept of neural pathways between the body and the iris. Although iridologists may differ on the exact mechanism, most maintain that the iris reflects what is happening throughout the body via nerve conduction from all parts of the body to the eye. The client's health



Iridology charts for left and right irises. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

KEY TERMS

Iris—The colored portion of the eye.

Sclera—A dense white fibrous membrane that, together with the cornea, forms the outer covering of the eyeball.

is assessed by the iridologist, who interprets patterns, shapes, rings, colors and pigmentation markings, fibers, structures, and changes in the pupil and iris. Many iridologists also use sclerology (reading the lines in the white part of the eyes) in their health evaluation.

Iridology readings are typically performed by such holistically oriented practitioners as naturopaths, chiropractors, or nutritionists. The reading may be done using a bright light, a magnifying glass, and a notepad. The iridologist may also use various tools to better view the eye, a special camera to take pictures of the iris, and/or a computer.

Iridologists conduct their readings using charts on which each area of the iris is mapped to a specific body system or organ. Iridology charts vary, with at least 20 different ones in existence. Some charts are more widely used than others; however, many iridologists believe that there is more than one correct map and that each practitioner should become familiar with several charts. Some iridologists even develop their own charts. Differences also exist among practitioner techniques; among American, European, and other approaches; and in the interpretation of specific iris signs.

Iridology charts divide the iris into numerous zones corresponding to different parts of the body. Although the specifics may differ on each chart, all share a general pattern. The left eye is mapped to the left side of the body and the right eye to the right side. The top of the eye is mapped to the upper body (e.g., brain, face, neck, chest and heart). The center of the eye is mapped to the stomach and digestive organs, with other organs being represented by concentric circular zones moving outward toward the edge of the iris. The bottom of the eye is mapped to the legs and lower half of body. Paired organs (e.g., the kidneys) are mapped to both irises.

Using a holistic approach that considers each client as an individual with unique health patterns and concerns, behaviors, and experiences, the iridologist will examine the eyes and make a health assessment. Based on the results of that reading, the iridologist generally recommends a wellness program tailored to the individual's physical, emotional, and life situation. This program may incorporate various health improvement, maintenance, and prevention regimes. Recommendations may include vitamins, minerals, herbs, supplements, and/or diet and **nutrition**, among other suggestions.

Preparation

No special preparations are necessary before an iridology reading.

Precautions

An iridology reading is unlikely to cause any physical harm by itself, as it does not involve direct contact with the eye or applying eye drops of any kind. Critics of iridology, however, argue that iridology can be detrimental to health if a sick person delays treatment for a condition not suggested by the iridology reading; or that it can can cause anguish and unnecessary expense if a reading suggests a problem when there actually is none.

Research and general acceptance

Rita M. Holl, RN, PhD, states that "Within Western medicine, iridology is considered a controversial science at best and medical fraud at worst." Proponents of iridology argue that the practice is time-tested with proven results. Although critics acknowledge that certain symptoms of non-ocular disease do appear in the eyes (e.g., brain injury), there is, they argue, a lack of rigorous scientific testing and no evidence that iridology has any merit. Studies published in the *Australian Journal of Optometry*, the *British Medical Journal*, and the *Journal of the American Medical Association (JAMA)* have found iridologists' assessment of patients with diagnosed serious diseases including kidney and gall bladder disease to be inaccurate. Iridologists counter that the research itself was faulty, citing problems including poor-quality photos; the absence of important additional information including the ability to see/interview the client; and inappropriate expectations of diagnosing specific diseases, a task outside the parameters of iridology. A more recent study conducted to reevaluate *JAMA's* findings in regard to renal failure was published in the *Alternative Health Practitioner*. Acknowledging that the "study leaves several questions unanswered," the author reported both similarities and variations in the iridologists' readings and concluded that the iridologist's level of expertise is extremely important as well.

Training and certification

Iridologists receive training from various sources. They may learn their trade through books, tapes,

correspondence courses, online classes, or live classes. According to the IIRA, "Iridology operates in a gray area in North America. In general, there are no laws defining or regulating the practice. In Europe, especially in Germany, Iridology is well recognized and routinely used by natural medicine practitioners." Also according to the IIRA, "Because Iridology has no official standards of practice, anyone can call themselves an Iridologist, often with little training or experience. There are also great differences in the Iridology information being taught, especially in North America."

Resources

BOOKS

Jackson, Adam J. *Iridology: A Guide to Iris Analysis and Preventive Health Care*. Boston: Charles B. Tuttle, 1993.

Jensen, Bernard. *Iridology: Science and Practice in Healing Arts,* Vol. II. Escondido, CA: B. Jensen, 1982.

Jensen, Bernard. *What is Iridology?* Escondido, CA: B. Jen sen, 1984.

Jensen, Bernard and Donald Bodeen. *Visions of Health: Understanding Iridology*. Garden City Park, NY: Avery Publishing, 1992.

Worrall, Russell S. "Iridology: Diagnosis or Delusion?" in *Science Confronts the Paranormal,* ed. Kendrick Fraz ier. Amherst, NY:

ORGANIZATIONS

Canadian Neuro Optic Research Institute. P.O. Box 29053. 4324 Dewdney Ave. Regina, Saskatchewan S4T 7X3. Canada. (306) 359 7694. Fax: (306) 525 2659. cnricon tacts@cnri.edu. http://www.cnri.edu/.

International Iridology Research Association. PO Box 1442. Solano Beach, CA 92075 2208. (888) 682 2208. IIR AOffice@aol.com. http://www.iridologyassn.org/.

OTHER

Quackwatch: Your Guide to Health Fraud, Quackery, and Intelligent Decisions. http://www.quackwatch.com/ 01QuackeryRelatedTopics/iridology.html.

Kathy Stolley

Recommended dietary allowance of iron

Age	mg/day
Children 0-6 mos.	0.27
Children 7-12 mos.	11
Children 1-3 yrs.	7
Children 4-8 yrs.	10
Children 9-13 yrs.	9
Boys 14-18 yrs.	11
Girls 14-18 yrs.	15
Men 19-50 yrs.	8
Women 19-50 yrs.	18
Adults ≥ 51 yrs.	8
Pregnant women	27
Breastfeeding women ≤ 18 yrs.	10
Breastfeeding women ≥ 19 yrs.	9

Foods that contain heme iron	mg
Chicken liver, cooked, 3 oz.	12.8
Oysters, 6 med	5.04
Beef, cooked, 3 oz.	3.2
Turkey, light meat, cooked, 3 oz.	2.3
Shrimp, cooked, 8 large	1.36
Tuna, light, canned, 3 oz.	1.3
Chicken, dark meat, cooked, 3 oz.	1.13
Halibut, cooked, 3 oz.	0.9
Crab, cooked, 3 oz.	0.8
Pork loin cooked, 3 oz.	0.8

Foods that contain nonheme iron	mg
Cereal, 100% iron fortified, 1 cup	18
Soybeans, boiled, 1 cup	8.8
Tofu, firm, 1/2 cup	6.22
Beans, kidney, cooked, 1 cup	5.2
Beans, lima, cooked, 1 cup	4.5
Beans, pinto, cooked, 1 cup	3.6
Blackstrap molasses, 1 tbsp.	3.5
Potato, med. with skin	2.75
Cashew nuts, 1 oz.	1.70
Bread, whole wheat, 1 slice	0.9
Raisins, small box, 1.5 oz.	0.89

mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

Iron

Description

Iron is a mineral that the human body uses to produce the red blood cells (hemoglobin) that carry oxygen throughout the body. It is also stored in myoglobin, an oxygen-carrying protein in the muscles that fuels cell growth.

General use

Iron is abundant in red meats, vegetables, and other foods. A well-balanced diet can usually provide an adequate supply of the mineral, but when there is insufficient iron from dietary sources or as a result of blood loss in the body, the amount of hemoglobin in the bloodstream is reduced and oxygen cannot be efficiently transported to tissues and organs throughout

the body. The resulting condition, iron-deficiency **anemia**, is characterized by **fatigue**, shortness of breath, pale skin, concentration problems, **dizziness**, a weakened immune system, and energy loss.

Iron-deficiency anemia can be caused by a number of factors, including poor diet, heavy menstrual cycles, **pregnancy**, kidney disease, **burns**, and gastrointestinal disorders. Individuals with iron-deficiency anemia should always undergo a thorough evaluation by a physician to determine the cause.

Children two years old and younger also need adequate iron in their **diets** to promote proper mental and physical development. Children under two who are not breastfeeding should eat iron-fortified formulas and cereals. Women who breastfeed their babies need at least 15 mg of dietary or supplementary iron a day in order to pass along adequate amounts of the mineral in their breast milk. Parents should consult a pediatrician or other healthcare professional for guidance on iron supplementation in children.

Some authorities have theorized that excess stored iron can lead to **atherosclerosis** and ischemic **heart disease**. Phlebotomy, or blood removal, has been used with some success to reduce stored iron in patients with iron overload. Iron chelation with drugs such as desferrioxamine (Desferal) that help patients excrete excess stores of iron can be used in treating iron overload caused by multiple blood transfusions.

Iron levels in the body are measured by both hemoglobin and serum ferritin blood tests.

Normal total hemoglobin levels are:

- neonates: 17–22 g/dL
- one week: 15–20 g/dL
- one month: 11–15 g/dL
- children: 11–13 g/dL
- adult males: 14–18 g/dL (12.4–14.9 g/dL after age 50)
- adult females: 12–16 g/dL (11.7–13.8 g/dL after menopause)

Normal serum ferritin levels are:

- neonates: 25–200 ng/mL
- one month: 200–600 ng/mL
- two to five months: 50–200 ng/mL
- six months to 15 years: 7–140 ng/mL
- adult males: 20–300 ng/mL
- adult females: 20–120 ng/mL

Preparations

Iron can be found in a number of dietary sources:

- pumpkin seeds
- dried fruits (apricots)
- lean meats (beef and liver)
- fortified cereals
- turkey (dark meat)
- green vegetables (spinach, kale, and broccoli)
- beans, peas, and lentils
- enriched and whole grain breads
- molasses
- sea vegetables (blue-green algae and kelp)

Eating iron-rich foods in conjunction with foods rich in **vitamin C** (such as citrus fruits) and lactic acid (sauerkraut and yogurt) can increase absorption of dietary iron. Cooking food in cast-iron pots can also add to their iron content.

The recommended dietary allowances (RDA) of iron as outlined by the United States Department of Agriculture (USDA) are as follows:

- children 7–12 months: 11 mg/day
- children 1–3 years: 7 mg/day
- children 4–8 years: 10 mg/day
- adolescent males, 9–13 years: 8 mg/day
- adolescent females, 9–13 years: 8 mg/day
- males, 14–18 years: 11 mg/day
- females, 14–18 years: 15 mg/day
- males, 19–50 years: 8 mg/day
- females, 19–50 years: 18 mg/day
- adults, over 50 years: 8 mg/day
- pregnant females: 27 mg/day
- breastfeeding females: 9–10 mg/day

A number of herbal remedies contain iron and can be useful as a natural supplement. The juice of the herb stinging **nettle** (*Urtica dioica*) is rich in both iron and vitamin C (which is thought to promote the absorption of iron). It can be taken daily as a dietary supplement. **Dandelion** (*Taraxacum officinale*), curled dock (*Rumex crispus*), and **parsley** (*Petroselinum crispum*) also have high iron content and can be prepared in tea or syrup form.

In Chinese medicine, dang gui (**dong quai**), or *Angelica sinensis*, the root of the **angelica** plant, is said to both stimulate the circulatory system and aid the digestive system. It can be administered as a decoction or tincture and should be taken in conjunction with an iron-rich diet. Other Chinese remedies include **foxglove**

root (*Rehmannia glutinosa*), **Korean ginseng** (*Panax ginseng*), and **astragalus** (*Astragalus membranaceus*).

Ferrum phosphoricum (iron phosphate) is used in homeopathic medicine to treat anemia. The remedy is produced by mixing iron sulfate, phosphate, and **sodium** acetate, which is administered in a highly diluted form to the patient. Other homeopathic remedies for anemia include ***natrum muriaticum***, *Chinchona officinalis*, *cyclamen europaeum*, *ferrum metallicum*, and *manganum aceticum*. As with all homeopathic remedies, the type of remedy prescribed for iron deficiency depends on the individual's overall symptom picture, mood, and temperament. Patients should speak with their homeopathic professional or physician, or healthcare professional before taking any of these remedies.

Iron is also available in a number of over-the-counter supplements (i.e., ferrous fumerate, ferrous sulfate, ferrous gluconate, iron dextran). Both heme iron and non-heme iron supplements are available. Heme iron is more efficiently absorbed by the body, but non-heme iron can also be effective if used in conjunction with vitamin C and other dietary sources of heme iron. Some multivitamins also contain supplementary iron. Ingesting excessive iron can be toxic and may have long-term negative effects. For this reason, iron supplements should be taken only under the recommendation and supervision of a doctor.

Precautions

Iron deficiency can be a sign of a more serious problem, such as internal bleeding. Anyone suffering from iron-deficiency anemia should always undergo a thorough evaluation by a healthcare professional to determine the cause of the problem.

Iron overdose in children can be fatal and is a leading cause of poisoning in children. Children should never take supplements intended for adults, and they should receive iron supplementation only under the guidance of a physician.

Individuals with chronic or acute health conditions, including kidney infection, **alcoholism**, liver disease, **rheumatoid arthritis**, **asthma**, heart disease, **colitis**, and stomach ulcer, should consult a physician before taking herbal or pharmaceutical iron supplements.

If individuals taking homeopathic dilutions of *ferum phosphoricum* experience worsening of their symptoms (known as a homeopathic aggravation), they should stop taking the remedy and contact their healthcare professional. A homeopathic aggravation can be an early indication that a remedy is working properly, but it can also be a sign that a different remedy is needed.

Patients diagnosed with hemochromatosis, a genetic condition in which the body absorbs too much iron and stores the excess in organs and tissues, should never take iron supplements.

Side effects

Taking herbal or pharmaceutical iron supplements on an empty stomach may cause **nausea**. Iron supplementation may cause hard, dark stools, and individuals who take iron frequently experience **constipation**. Patients who experience dark bowel movements accompanied by stomach pains should check with their doctor, as this symptom can also indicate bleeding in the digestive tract.

Other reported side effects include stomach cramps and chest **pain**. These symptoms should be evaluated by a physician if they occur.

Some iron supplements, particularly those taken in liquid form, may stain the teeth. Taking these through a straw or with a dropper placed towards the back of the throat may be helpful in preventing staining. Toothpaste containing baking soda and/or hydrogen peroxide can be useful in removing iron stains from teeth.

Signs of iron overdose include severe **vomiting**, racing heart, bloody **diarrhea**, stomach cramps, bluish lips and fingernails, pale skin, and weakness. If overdose is suspected, the patient should contact poison control and/or seek emergency medical attention immediately.

Interactions

Iron supplements may react with certain medications, including antacids, acetohydroxamic (Lithostat), dimercaprol, etidronate, and fluoroquinolones. In addition, they can decrease the effectiveness of certain tetracyclines (antibiotics). Individuals taking these or any other medications should consult their healthcare professional before starting iron supplements.

Certain foods decrease the absorption of iron, including some soy-based foods, foods with large concentrations of **calcium**, and beverages containing **caffeine** and tannin (a substance found in black tea). These should not be taken within two hours of using an iron supplement. Some herbs also contain tannic acid and should be avoided during treatment with iron supplements. These include allspice (*Pimenta dioica*) and **bayberry** (*Myrica cerifera*, also called wax myrtle).

Individuals considering treatment with homeopathic remedies should also consult their healthcare

KEY TERMS

Chelation—The use of a medication or herbal substances to inactivate toxic substances in the body. Chelation is used to treat iron overload in some patients.

Decoction—An herbal extract produced by mixing an herb in cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. The decoction is then strained and consumed hot or cold. Decoctions are usually chosen over infusion when the botanical being used is a root or berry.

Ferritin—An iron storage protein found in the blood. High levels of serum ferritin may indicate iron overload.

Hemochromatosis—Also known as iron overload; a genetic condition in which excess iron is stored in the tissues and organs by the body where it can build up to toxic amounts.

Homeopathic remedy—Used to treat illnesses that manifest symptoms similar to those that the remedy itself causes, but administered in extremely diluted doses to prevent any toxic effects.

Infusion—An herbal preparation made by mixing boiling water with an herb, letting the brew steep for 10 minutes, and then straining the herb out of the mixture. Tea is made through infusion.

Thalassemia—A group of several genetic blood diseases characterized by absent or decreased production of normal hemoglobin. Individuals who have thalassemia have to undergo frequent blood transfusions, and are at risk for iron overload.

Tincture—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture.

professional about possible interactions with certain foods, beverages, prescription medications, aromatic compounds, and other environmental elements—factors known in **homeopathy** as *remedy antidotes*—that could counteract the efficacy of treatment for iron deficiency.

Resources

BOOKS

Otten, Jennifer J., Jennifer Pitzi Hellwig, and Linda D. Meyers, eds. *DRI, Dietary Reference Intakes: The Essential Guide to Nutrient Requirement*. Washington, DC: National Academies Press, 2006.

PERIODICALS

Ekong, Udeme. "The Treatment Conundrum of Neonatal Hemochromatosis." *Pediatric Transplantation* (June 2007): 347 348.

Huma, Nuzhat, et al. "Food Fortification Strategy Pre venting Iron Deficiency Anemia: A Review." *Critical Reviews in Food Science and Nutrition* (March 2007): 259 265.

Skalicky, Anne, et al. "Child Food Insecurity and Iron Deficiency Anemia in Low Income Infants and Tod dlers in the United States." *Maternal and Child Health Journal* (March 2006): 177 185.

Vanderley, Angela M., and Wayne W. Campbell. "Vegeta rian Diets: Nutritional Considerations for Athletes." *Sports Medicine* (April 2006): 293 305.

Paula Ford-Martin
David Edward Newton, Ed.D.

Irritable bowel syndrome

Definition

Irritable bowel syndrome (IBS) is a common intestinal condition characterized by abdominal **pain** and cramps; changes in bowel movements (**diarrhea**, **constipation**, or both); gassiness; bloating; **nausea**; and other symptoms. There is no recognized cure for IBS. Much about the condition remains unknown or poorly understood; however, dietary changes, drugs, and psychological treatment are often able to eliminate or substantially reduce its symptoms.

Description

IBS is a condition that was once called **colitis**, spastic colon, nervous colon, spastic bowel, and functional bowel disorder. Some of these names reflected the now outdated belief that IBS is a purely psychological disorder and a product of the patient's imagination. Although modern medicine recognizes that **stress** can trigger IBS attacks, medical specialists agree that IBS is a genuine physical disorder, or group of disorders, with specific identifiable characteristics.

No one knows for sure how many Americans suffer from IBS. Surveys indicate a range of 10–20%, with perhaps as many as 30% of Americans experiencing IBS at some point in their lives. IBS normally makes its first appearance during young adulthood, and in half of all cases, symptoms begin before age 35. Women with IBS outnumber men by two to one, for

reasons not understood as of 2008. IBS is responsible for more time lost from work and school than any medical problem other than the **common cold**. It accounts for a substantial proportion of the patients seen by gastroenterologists, who are specialists in diseases of the digestive system. Yet only half—possibly as few as 15%—of IBS sufferers ever consult a doctor.

Symptoms and Causes

The symptoms of IBS tend to rise and fall in intensity rather than grow steadily worse over time. They always include intestinal (abdominal) pain, which may be relieved by defecation; diarrhea or constipation; or diarrhea alternating with constipation. Other symptoms, which vary from person to person, include: cramps, gassiness, bloating, nausea, a powerful and uncontrollable urge to defecate (urgency), passage of a sticky fluid (mucus) during bowel movements, or the feeling after finishing a bowel movement that the bowels are still not completely empty. The accepted diagnostic criteria, known as the Rome criteria, require at least three months of continuous or recurrent symptoms before IBS is diagnosed. An estimated 70% of IBS cases can be described as "mild;" 25% as "moderate;" and 5% as "severe." In mild cases the symptoms are slight. As a general rule, they are not present all the time and do not interfere with work and other normal activities. Moderate IBS disrupts normal activities and may cause some psychological problems. People with severe IBS may constantly fear the unpredictable need for a bathroom. They often find living a normal life impossible and experience crippling psychological problems as a result. For some, the physical pain is constant and intense.

Causes

Researchers remain unsure about the cause or causes of IBS. It is called a functional disorder because it is thought to result from changes in the activity of the major part of the large intestine (the colon). After food is digested by the stomach and small intestine, the undigested material passes in liquid form into the colon, which absorbs water and salts. This process may take several days. In a healthy person the colon is quiet during most of that period except after meals, when its muscles contract in a series of wavelike movements called peristalsis. Peristalsis helps absorption by bringing the undigested material into contact with the colon wall. It also pushes undigested material that has been converted into solid or semisolid feces toward the rectum, where it remains until defecation.

In IBS, however, the normal rhythm and intensity of peristalsis is disrupted. Sometimes there is too little peristalsis, which can slow the passage of undigested material through the colon and cause constipation. Sometimes there is too much, which has the opposite effect and causes diarrhea. A Johns Hopkins University study found that healthy volunteers experienced six to eight contractions of the colon each day, compared with up to 25 contractions a day for volunteers suffering from IBS with diarrhea, and an almost complete absence of contractions among constipated IBS volunteers. In addition to differences in the number of contractions, many of the IBS volunteers experienced powerful spasmodic contractions affecting a larger-than-normal area of the colon—"like having a Charlie horse in the gut," according to one of the investigators.

DIET. Some kinds of food and drink appear to play a key role in triggering IBS attacks. Food and drink that healthy people can ingest without any trouble may disrupt peristalsis in IBS patients, which probably explains why IBS attacks often occur shortly after meals. Chocolate, milk products, **caffeine** (in coffee, tea, colas, and other drinks), and large quantities of alcohol are some of the chief culprits. Other kinds of food have also been identified as problems, however, and the pattern of what can and cannot be tolerated is different for each person. Characteristically, IBS symptoms rarely occur at night and disrupt the patient's sleep.

In 2002, a research study reported that some children had trouble absorbing certain sugars from some fruit juices, particularly apple and pear juices. When children with IBS went off these juices for one month, 46% saw improvement in their IBS symptoms. Apple and pear juice contain more fructose than glucose sugar, which may be the cause of the poor absorption in IBS sufferers' intestines. Yet white grape juice, which contains almost equal portions of fructose and glucose, is more easily absorbed.

STRESS. Stress is an important factor in IBS because of the close nervous system connections between the brain and the intestines. Although researchers do not yet understand all of the links between changes in the nervous system and IBS, they point out the similarities between mild digestive upsets and IBS. Just as healthy people can feel nauseated or have an upset stomach when under stress, people with IBS react the same way, but to a greater degree. Finally, IBS symptoms sometimes intensify during **menstruation**, which suggests that female reproductive hormones are another trigger. In fact, a study published in 2002 confirmed that IBS symptoms worsened in women and that rectal sensitivity changed with the menstrual cycle in women with IBS. It also was the first study to contrast these changes with those of healthy women.

Diagnosis

Diagnosing IBS is a fairly complex task because the disorder does not produce changes that can be identified during a physical examination or by laboratory tests. When IBS is suspected, the doctor (a family doctor or a specialist) needs to determine whether the patient's symptoms satisfy the Rome criteria. The doctor rules out other conditions that resemble IBS, such as Crohn's disease and ulcerative colitis. These disorders are ruled out by taking a standard medical history, performing a physical examination, and ordering laboratory tests. The patient may be asked to provide a stool sample that can be tested for blood and intestinal parasites. In some cases x rays, bowel studies, or an internal examination of the colon using a flexible instrument inserted through the anus (a sigmoidoscope or colonoscope) is necessary.

Patients may also be asked to keep a diary of symptoms for two or three weeks, covering daily activities, including meals and emotional responses to events. The doctor can then review the diary with the patient to identify possible problem areas.

Treatment

Dietary adjustments are critical to controlling IBS. For some patients, a **high-fiber diet**, including whole grain breads and cereals, dried and fresh fruits, spinach, and oat bran, can reduce digestive system irritation. For others, a high-fiber diet aggravates the symptoms. Many patients with IBS also find that avoiding alcohol, caffeine, sugar, and fatty, **gas** producing, or spicy foods can prevent symptoms.

To control IBS symptoms that are triggered or made worse by stress, several stress management therapies may be helpful. These include **yoga**, **meditation**, hypnosis, **biofeedback**, **exercise**, muscle **relaxation** training, **aromatherapy**, **hydrotherapy**, and **reflexology**. Reflexology is a foot massage technique that focuses on manipulating different regions of the foot in order to bring harmony to specific organs and body systems. Hydrotherapy is the therapeutic use of water, as in a whirlpool bath.

Biofeedback, which teaches an individual to control muscle tension and any associated pain through thought and visualization techniques, is also a treatment option for IBS. In biofeedback treatments, sensors placed on the forehead of the patient are connected to a special machine that allows the patient and healthcare professional to monitor a visual and/or audible readout of the level of muscle tension and stress in the patient. Through relaxation and visualization exercises, the patient learns to relieve tension and can actually see or hear the results of his or her efforts instantly through a sensor readout on the biofeedback equipment. Once the technique is learned and the patient is able to recognize and differentiate between the feelings of muscle tension and muscle relaxation, the biofeedback equipment itself is no longer needed and the patient has a powerful, portable, and self-administered treatment tool for dealing with pain and tension.

To soothe an irritated or inflamed digestive tract, an herbalist or holistic healthcare practitioner may recommend one or more herbs, including **comfrey** root (*Symphytum officinale*), **hops** (*Humulus lupulus*), **Iceland moss** (*Cetraria islandica*), Irish moss (*Chondrus crispus*), **marsh mallow** root (*Althaea officinalis*), oats (*Avena sativa*), quince seed (*Cydonia oblonga*), and **slippery elm** (*Ulmus rubra*).

Herbs that relieve gas associated with IBS (known as carminatives) include **angelica** (*Angelica archangelica*), aniseed (*Pimpinella anisum*), caraway (*Carum carvi*), **cayenne** (*Capsicum annuum*), German **chamomile** (*Matricaria recutita*), **ginger** (*Zingiber officinale*), **thyme** (*Thymus vulgaris*), and **peppermint** (*Mentha* x *piperata*).

An infusion of meadowsweet (*Filipendula ulmaria*) may be helpful in treating diarrhea related to IBS, and herbs such as **barberry** (*Berberis vulgaris*), **Psyllium** ovata seed, **dandelion** root (*Taraxacum officinale*), **licorice** (*Glycyrrhiza glabra*), and **yellow dock** (*Rumex crispus*) have laxative properties that can help to relieve constipation. More powerful laxative herbs, such as **rhubarb root** (*Rheum palmatum*), **buckthorn** (*Rhamnus catharticus*), and cascara (*Rhamnus purshiana*) should only be taken under the direction of a healthcare professional.

Individuals with cramp-like pains, or **colic**, can benefit from antispasmodic herbs such as German chamomile (*Matricaria recutita*), **Valerian** (*Valeriana officinalis*), **lemon balm** (*Melissa officinalis*), ginger (*Zingiber officinale*), and wild yam (*Dioscorea villosa*).

Homeopathy uses highly diluted remedies that cause similar effects to the symptoms they are intended to treat in an effort to stimulate the body's natural immune response. A homeopathic physician might recommend a remedy of **belladonna**, colocynthis (bitter cucumber), phosphate of magnesia (Magnesia phosphorica), or wild hops (*Bryonia alba*) to relieve abdominal pain and cramping associated with IBS. As with all homeopathic remedies, the prescription depends on the individual's overall symptoms, mood, and temperament.

Acupuncture and **guided imagery** may be useful tools in treating IBS symptoms. Acupuncture involves the placement of thin needles into the skin at targeted locations on the body known as acupoints in order to harmonize the energy flow within the human body. An acupuncturist may also use **moxibustion**, which involves applying a heat source such as warm herbs to the acupoint, to treat IBS symptoms. Guided imagery techniques teach the patient to visualize a peaceful, soothing scene or situation to relax the body and better cope with the discomfort caused by IBS.

Several studies have indicated **probiotics** may be beneficial in treating IBS. Researchers believe this may be due to the antiviral, antibacterial, and anti-inflammatory effects of probiotics, such as *Lactobacillus acidophilus*, commonly referred to simply as **acidophilus**, a friendly inhabitant of the gastrointestinal (GI) tract. It, as well as some related **strains** of bacteria, is known as a probiotic. Probiotic organisms secrete enzymes that support healthy digestion. They keep the flora of the intestines balanced and compete with some pathogenic organisms. One small study of the use of acidophilus to treat IBS showed more improvement in the treated group than in those who took a placebo. This is not conclusive evidence, but in view of the safety of the treatment and the scarcity of effective alternatives, many health practitioners believe acidophilus may be worth trying.

KEY TERMS

Anus—The opening at the lower end of the rectum.

Crohn's disease—A disease characterized by inflammation of the intestines. Its early symptoms may resemble those of IBS.

Defecation—Passage of feces through the anus.

Feces—Undigested food and other waste that is eliminated through the anus. Feces are also called fecal matter or stools.

Homeopathy—A system of medical practice that treats a disease by administering diluted doses of a remedy that would, in a healthy person, cause symptoms like the illness being treated. Homeopaths believe that this treatment stimulates the body's natural healing processes.

Lactose—A sugar found in milk and milk products. Some people are lactose intolerant, meaning they have trouble digesting lactose. Lactose intolerance can produce symptoms resembling those of IBS.

Peristalsis—The periodic waves of muscular contractions that move food through the intestines during the process of digestion.

Ulcerative colitis—A disease that inflames and causes breaks (ulcers) in the colon and rectum, which are parts of the large intestine.

Allopathic treatment

Dietary changes, sometimes supplemented by drugs or **psychotherapy**, are considered the key to successful treatment. A drug called alosetron was approved by the Food and Drug Administration (FDA) in 2002 for limited marketing for treating women with diarrhea-prominent IBS after some controversy in 2000 because of serious side effects from the drug. Its use should be limited to only those patients suffering from severe, chronic diarrhea-predominant IBS who have failed to respond to conventional therapy.

An individualized diet, low in saturated fats and foods that trigger the patient's reaction, can reduce symptoms for many IBS sufferers. Caffeine sources, sugar, and alcohol usually worsen symptoms. Bran or 15–25 grams a day of an over-the-counter psyllium laxative may also help both constipation and diarrhea. The patient can have milk or milk products if lactose intolerance is not a problem. Establishing set times for meals and bathroom visits may help people with irregular bowel habits, especially for constipated patients.

Although a high-fiber diet remains the standard treatment for constipated patients, such laxatives as lactulose or sorbitol may be prescribed. Loperamide and cholestyramine are suggested for diarrhea. Abdominal pain after meals can be reduced by taking antispasmodic drugs such as hyoscyamine or dicyclomine before eating.

Psychological counseling or **behavioral therapy** may be useful for some patients in reducing **anxiety** and learning to cope with the pain and other symptoms of IBS. Relaxation therapy, hypnosis, biofeedback, and cognitive-behavioral therapy are examples of behavioral therapy.

When IBS produces constant pain that interferes with everyday life, antidepressant drugs can help by blocking pain transmission from the nervous system.

Expected results

IBS is not a life-threatening condition. It does not cause intestinal bleeding or inflammation, nor does it cause other bowel diseases or **cancer**. Although IBS

can last a lifetime, in up to 30% of cases the symptoms eventually disappear. Even if the symptoms cannot be eliminated, with appropriate treatment they can usually be decreased so that IBS becomes merely an occasional inconvenience. Treatment requires a long-term commitment, however; six months or more may be needed before the patient notices substantial improvement.

Resources

BOOKS

Lacy, Brian E. *Making Sense of IBS: A Physician Answers Your Questions about Irritable Bowel Syndrome*. Balti more: Johns Hopkins University Press, 2006.

Nicol, Rosemary. *Irritable Bowel Syndrome: A Natural Approach*. Berkeley, CA: Ulysses Press, 2007.

Wangen, Stephen. *The Irritable Bowel Syndrome Solution: How It's Cured at the IBS Treatment Center*. Seattle: Innate Health, 2006.

PERIODICALS

Bell, John R. "Hypnotherapy Beats Standard IBS Care for Kids." *Family Practice News* (October 1, 2007): 35.

Friedman, Lawrence S. "Sensitive Gut." *Harvard Special Health Report* (2005): 23(8).

Gaby, Alan R. "Lab Tests Predict Response to Diet in Patients with Irritable Bowel Syndrome." *Townsend Letter: The Examiner of Alternative Medicine* (January 2008): 51.

"In Brief: Mint Conditions." *Harvard Health Letter* (July 2007): N/A.

Khalsa, Karta Purkh Singh. "SOS for IBS: Is Irritable Bowel Syndrome Ruling Your Life? Discover Three Treat ments that Can Improve Your Symptoms." *Better Nutrition* (September 2007): 40.

Walsh, Nancy. "Probiotics for Irritable Bowel Syndrome." *Family Practice News* (August 1, 2007): 34.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http:// www.homeopathyusa.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

Irritable Bowel Syndrome Association, 1440 Whalley Ave., Suite 145, New Haven, CT, http://www.ibsassociation. org.

National Center for Alternative and Complementary Med icine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Paula Ford-Martin
Ken R. Wells

Ischemia

Definition

Ischemia is an insufficient supply of oxygenated blood to an organ, usually due to a blocked artery.

Description

Myocardial ischemia is an intermediate condition in coronary artery disease during which the heart tissue is slowly or suddenly starved of oxygen and other nutrients. Eventually, the affected heart tissue dies. When blood flow is completely blocked to the heart, ischemia can lead to a **heart attack**. Ischemia can be silent or symptomatic. According to the American Heart Association, up to four million Americans may have silent ischemia and be at high risk of having a heart attack with no warning.

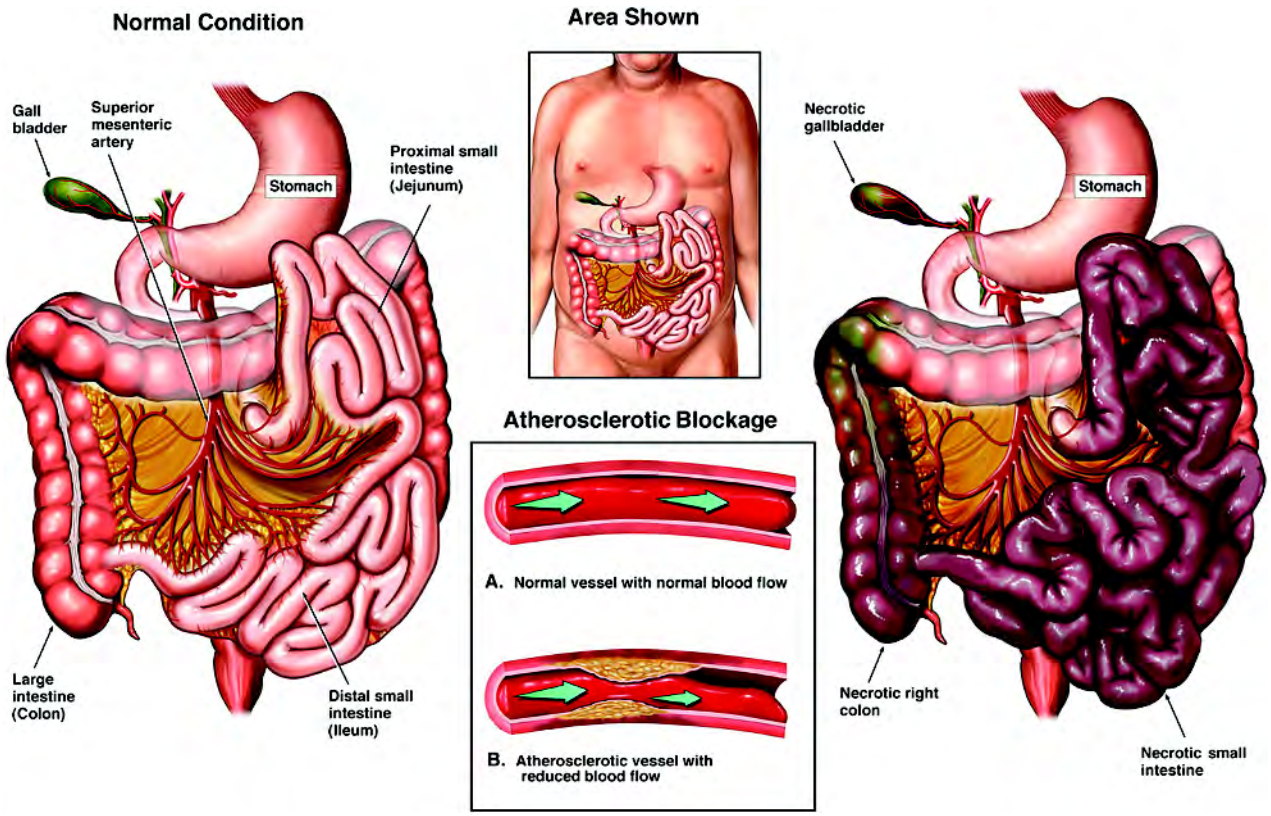
Symptomatic ischemia is characterized by chest **pain** called **angina** pectoris. The American Heart Association estimates that nearly seven million Americans have angina pectoris, usually called angina. Angina occurs more frequently in women than in men and more often in African Americans and Hispanics than in Caucasians. It also occurs more frequently as people age—25% of women over the age of 85 and 27% of men between 80 and 84 years of age have angina.

People with angina are at risk of having a heart attack. Stable angina occurs during exertion, can be quickly relieved by resting or taking nitroglycerine, and lasts from three to 20 minutes. Unstable angina, which increases the risk of a heart attack, occurs more frequently, lasts longer, is more severe, and may cause discomfort during rest or light exertion.

Ischemia also can occur in the arteries of the brain, where blockages can lead to a **stroke**. About 80 to 85% of all strokes are ischemic. Most blockages in the cerebral arteries are due to a blood clot, often in an artery narrowed by plaque. Sometimes, a blood clot in the heart or aorta travels to a cerebral artery. A transient ischemic attack (TIA) is a mini-stroke caused by a temporary deficiency of blood supply to the brain or by a blood clot briefly blocking a cerebral artery. It occurs suddenly, lasts a few minutes to a few hours, and is a strong warning sign of an impending stroke. Ischemia can also affect intestines, legs, feet, and kidneys. Pain, malfunctions, and damage in those areas may result.

Causes and symptoms

Ischemia almost always is caused by blockage of an artery, usually due to atherosclerotic plaque.



Mesenteric Ischemia. *(© Nucleus Medical Art, Inc. / Alamy)*

Myocardial ischemia also is caused by **blood clots** (which tend to form on plaque), artery spasms or contractions, or any of these factors combined. Silent ischemia usually is caused by emotional or mental **stress** or by exertion, but there are no symptoms. Angina usually is caused by increased oxygen demand when the heart is working harder than usual, for example, during **exercise** or during mental or physical stress. Researchers point out that physical stress is harder on the heart than mental stress.

Risk factors

The risk factors for myocardial ischemia are the same as those for coronary artery disease, TIA, and stroke:

- Heredity. People whose parents have coronary artery disease are more likely to develop the condition. African Americans also are at higher risk.
- Sex. Men are more likely to have heart attacks than women and to have them at a younger age. Angina is more likely to occur in women.
- Age. Men who are 45 years of age and older and women who are 55 years of age and older are considered to be at risk. Risk also increases with age.
- Smoking. Smoking increases both the chance of developing coronary artery disease and the chance of dying from it. Second-hand smoke also may increase risk.
- High cholesterol. Risk of developing coronary artery disease increases as blood cholesterol levels increase. When combined with other factors, the risk is even greater.
- High blood pressure. High blood pressure makes the heart work harder, and with time, weakens it. When combined with obesity, smoking, high cholesterol, or diabetes, the risk of heart attack or stroke increases several times.
- High fibrinogen levels. Fibrinogens are proteins involved in blood clotting and plaque formation.
- High homeocysteine levels. Homeocysteine is also involved in plaque formation.
- Oxidant damage, as indicated by high lipid peroxide levels. High lipid peroxide levels represent a high level of free radical damage and antioxidant deficiency.
- Lack of physical activity. Lack of exercise increases the risk of coronary artery disease.

- Diabetes mellitus. The risk of developing coronary artery disease is seriously increased for diabetics.
- Obesity. Excess weight increases the strain on the heart and increases the risk of developing coronary artery disease, even if no other risk factors are present. Obesity increases blood pressure and blood cholesterol, and can lead to diabetes.
- Stress and anger. Some scientists believe that stress and anger can contribute to the development of coronary artery disease. Stress increases the heart rate and blood pressure and can injure the lining of the arteries. Angina attacks often occur after anger, as do many heart attacks and strokes.

Angina symptoms include:

- a tight, squeezing, heavy, burning, or choking pain that is usually beneath the breastbone—the pain may spread to the throat, jaw, or one arm
- a feeling of heaviness or tightness that is not painful
- a feeling similar to gas or indigestion
- attacks brought on by exertion and relieved by rest

If the pain or discomfort continues or intensifies, immediate medical help should be sought, ideally within 30 minutes.

TIA symptoms include:

- sudden weakness, tingling, or numbness, usually in one arm or leg or both the arm and leg on the same side of the body, as well as sometimes in the face
- sudden loss of coordination
- loss of vision or double vision
- difficulty speaking
- vertigo and loss of balance

Diagnosis

Diagnostic tests for myocardial ischemia include: resting, exercise, or ambulatory electrocardiograms; scintigraphic studies (radioactive heart scans); echocardiography; coronary angiography; and, rarely, positron emission tomography (PET) studies. Diagnostic tests for TIA include physician review of symptoms, computed tomography (CT) scans, carotid artery ultrasound (Doppler ultrasonography), and magnetic resonance imaging (MRI). Angiography is the best test for ischemia of any organ.

An electrocardiogram (ECG) shows the heart's activity and may reveal a lack of oxygen. Electrodes covered with conducting jelly are placed on the patient's chest, arms, and legs. Impulses of the heart's activity are recorded on paper. The test takes about 10 minutes and is performed in a physician's office. About 25% of patients with angina have normal electrocardiograms. Another type of electrocardiogram, the exercise stress test, measures response to exertion when the patient is exercising on a treadmill or a stationary bike. It is performed in a physician's office or an exercise laboratory and takes 15–30 minutes. This test is more accurate than a resting ECG in diagnosing ischemia. Sometimes an ambulatory ECG is ordered. For this test, the patient wears a portable ECG machine called a Holter monitor for 12, 24, or 48 hours.

Myocardial perfusion scintigraphy and radionuclide angiography are nuclear studies involving the injection of a radioactive material (e.g., thallium), that is absorbed by healthy tissue. A gamma scintillation camera displays and records a series of images of the radioactive material's movement through the heart. Both tests usually are performed in a hospital's nuclear medicine department and take about 30 minutes to an hour. A perfusion scan sometimes is performed at the end of a stress test.

An echocardiogram uses sound waves to create an image of the heart's chambers and valves. The technologist applies gel to a handheld transducer then presses it against the patient's chest. The heart's sound waves are converted into an image on a monitor. Performed in a cardiology outpatient diagnostic laboratory, the test takes 30 minutes to an hour. It can reveal abnormalities in the heart wall that indicate ischemia, but it does not evaluate the coronary arteries directly.

Coronary angiography is the most accurate diagnostic technique, but it also is the most invasive. It shows the heart's chambers, great vessels, and coronary arteries by using a contrast solution and x-ray technology. A moving picture is recorded of the blood flow through the coronary arteries. The patient is awake but sedated, and connected to ECG electrodes and an intravenous line. A local anesthetic is injected. The cardiologist then inserts a catheter into a blood vessel and guides it into the heart. Coronary angiography is performed in a cardiac catheterization laboratory and takes from 30 minutes to two hours.

Positron emission tomography (PET) is a noninvasive nuclear test used to evaluate the heart tissue. A PET scanner traces high-energy gamma rays released from radioactive particles to provide three-dimensional images of the heart tissue. Performed at a hospital, it usually takes from one hour to one hour and 45 minutes.

CT and MRI are computerized scanning methods. CT scanning uses a thin x-ray beam to show three-dimensional views of soft tissues. It is performed

at a hospital or clinic and takes only minutes. MRI uses a magnetic field to produce clear, cross-sectional images of soft tissues. The patient lies on a table that slides into a tunnel-like scanner for about 30 minutes.

Treatment

Ischemia can be life-threatening. Although there are alternative treatments for angina, traditional medical care may be necessary. Prevention of the cause of ischemia, primarily **atherosclerosis**, is primary. This becomes even more important for people with a family history of **heart disease**.

Nutritional therapy

Dietary modifications are essential in the treatment and prevention of ischemic heart disease. The following dietary changes are recommended:

- Limiting intake of red meat and animal fats that contain high amounts of cholesterol and saturated fats.
- Eating a heart-wise diet with emphasis on fresh fruits and vegetables, grains, beans, and nuts. Increased fiber (found in fresh fruits and vegetables, grains, and beans) can help the body eliminate excessive cholesterol through the stools.
- Avoiding coffee (caffeinated and decaffeinated) and smoking. Not smoking will prevent damage from smoke and the harmful substances (oxidants) it contains.
- Taking high-potency multivitamin/mineral supplement (one tablet daily). Heart patients may require higher amounts of antioxidants, such as vitamins C and E. They should aim for total daily intake of 500–1000 mg of vitamin C and 400–800 IU of (natural) vitamin E. They also should take 1 tbsp of flaxseed oil or fish oil per day. Flaxseed oil is a good source of omega-3 oils. Numerous studies have demonstrated the cardio-protective effects of omega-3 fatty acids.
- Considering supplements for specific health problems. Individuals with diabetes might benefit from chromium, garlic, and pantethine supplements. Niacin, flaxseed oil, and garlic help treat elevated fibrinogen levels. For those with high homocysteine levels, vitamin B_6, B_{12}, and folic acid may be needed. Patients with high lipid peroxide levels require more antioxidants to prevent free radical damage. Antioxidants, such as vitamins C and E, selenium, *Ginkgo biloba*, bilberry (*Vaccinium myrtillus*), and hawthorn, can help prevent initial arterial injury that can lead to the formation of plaque deposits. In 2008, the U.S. Office of Complementary and Alternative Medicine reported that hawthorne was safe and effective for the treatment of mild kinds of heart failure but that there is not enough scientific evidence to support its use for other types of heart problems.

Herbal therapy

Western herbal medicine recommends **hawthorn** (*Crataegus laevigata* or *C. oxyacantha*) to help prevent long-term angina, since they strengthen heart muscles' ability to contract.

Homeopathy

Cactus (*Cactus grandiflorus*) is a homeopathic remedy used for pain relief during an attack.

Ayurvedic medicine

Abana, a mixture of herbs and minerals used in **Ayurvedic medicine**, may reduce the frequency and severity of angina attacks.

Exercises

Exercise, particularly aerobic exercise, is essential for circulation health. It is recommended that the patient exercise for 20 minutes, at least three times a week.

Mind/body medicine

Mind/body **relaxation** techniques such as **yoga**, **meditation**, stress reduction, and **biofeedback** can help ease strong emotions and stress.

Chelation therapy

The use of **chelation therapy**, a long-term injection by a physician of a mix containing synthetic amino acid, ethylenediaminetetracetic acid (EDTA), and anticoagulant drugs and nutrients, remained controversial as of 2008.

Allopathic treatment

Angina is treated with drug therapy and surgery. Drugs such as nitrates, beta-blockers, and **calcium** channel blockers relieve chest pain, but they cannot clear blocked arteries. There is some evidence that administering testosterone to men with myocardial ischemia may help reduce the risk of ischemia. Aspirin helps prevent the formation of blood clots. Many authorities recommend that people at risk for ischemia take one child's aspirin (81 mg) at night before bed. Surgical procedures include percutaneous transluminal coronary angioplasty and coronary artery bypass graft surgery.

Nitroglycerin is the classic treatment for angina. It quickly relieves pain and discomfort by opening the

coronary arteries and allowing more blood to flow to the heart. Beta-blockers reduce the amount of oxygen required by the heart during stress. Calcium channel blockers help keep the arteries open and reduce blood pressure. Statins help reduce **cholesterol** levels, which can lessen the risk of ischemic events.

Percutaneous transluminal coronary angioplasty and coronary artery bypass graft surgery are invasive procedures that improve blood flow in the coronary arteries. Percutaneous transluminal coronary angioplasty is a procedure in which a catheter tipped with a balloon is threaded from a blood vessel in the thigh into the blocked artery. The balloon is inflated, compressing the plaque to enlarge the blood vessel and open the blocked artery. The balloon is deflated and the catheter is removed. Sometimes a metal stent is placed in the artery to prevent closing.

In coronary artery bypass graft, called bypass surgery, a detour is built around the coronary artery blockage with a healthy leg vein or chest wall artery. The healthy vein or artery then supplies oxygen-rich blood to the heart. Bypass surgery is major surgery appropriate for patients with blockages in two or three major coronary arteries or severely narrowed left main coronary arteries, as well as those who have not responded to other treatments.

As of 2008, there were several experimental surgical procedures. Two of these were atherectomy, in which a surgeon shaves off and removes strips of plaque from the blocked artery, and laser angioplasty, in which a catheter with a laser tip is inserted to burn or break down the plaque. A stenting procedure was widely used in the treatment of coronary blockages as of the late 2000s; in this procedure a metal coil, called a stent, is implanted permanently to keep a blocked artery open.

TIAs are treated by drugs that control high blood pressure and reduce the likelihood of blood clots and surgery. Aspirin is commonly used and anticoagulants are sometimes used to prevent blood clots. In some cases, carotid endarterectomy surgery is performed to help prevent further TIAs. The procedure involves removing arterial plaque from inside blood vessels.

Expected results

In many cases, ischemia can be successfully treated, but the underlying disease process of atherosclerosis is usually not cured. Certain diagnostic techniques have been developed to enable doctors to identify ischemia earlier. These technologies and surgical procedures can prevent angina from leading to a heart attack or TIA from resulting in a stroke. The outcome for patients with silent ischemia had not been well established as of 2008.

Prevention

A healthy lifestyle, including eating right, getting regular exercise, maintaining a healthy weight, not **smoking**, drinking in moderation, not using illegal drugs, controlling **hypertension**, and managing stress, can reduce the risk of ischemia progressing to a heart attack or stroke.

A healthy diet includes a variety of foods that are low in fat (especially saturated fat), low in cholesterol, and high in fiber. Plenty of fruits and vegetables should be eaten and **sodium** should be limited. Fat should comprise no more than 30% of total daily calories. Cholesterol should be limited to about 300 mg and sodium to about 2,400 mg per day.

The Centers for Disease Control and Prevention and the American College of Sports Medicine recommend moderate aerobic exercise lasting about 30 minutes four or more times per week for maximum heart health. Three 10-minute exercise periods also are beneficial. If any risk factors are present, a physician's clearance should be obtained before starting exercise.

Maintaining a desirable body weight also is important. People who are 20% or more over their ideal body weight have an increased risk of developing coronary artery disease or stroke.

Smoking has many adverse effects on the heart and arteries and should be avoided. Heart damage caused by smoking can be improved by quitting. Several studies have shown that ex-smokers face the same risk of heart disease as nonsmokers within five to ten years after quitting.

Excessive drinking can increase risk factors for heart disease. Modest consumption of alcohol, however, can actually protect against coronary artery disease. The American Heart Association defines moderate consumption as one ounce of alcohol per day—roughly one cocktail, one 8 oz glass of wine, or two 12 oz glasses of beer.

Commonly used illegal drugs can seriously harm the heart and should never be used. Even stimulants such as **ephedra** and decongestants like pseudoephedrine can be harmful to patients with hypertension or heart disease.

Treatment should be sought for hypertension. High blood pressure can be completely controlled through lifestyle changes and medication. Stress, which can increase the risk of a heart attack or stroke, should also be managed. While it cannot always be avoided, it can be controlled.

KEY TERMS

Atherosclerosis—A process in which the walls of the arteries thicken due to the accumulation of plaque in the blood vessels. Atherosclerosis is the cause of most coronary artery disease.

Coronary artery disease—A narrowing or blockage, due to atherosclerosis, of the arteries that provide oxygen and nutrients to the heart. When blood flow is cut off, the result is a heart attack.

Plaque—A deposit of fatty and other substances that accumulate in the lining of the artery wall.

Stroke—A sudden decrease or loss of consciousness caused by rupture or blockage of a blood vessel by a blood clot or hemorrhage in the brain. Ischemic strokes are caused by blood clots in a cerebral artery.

Resources

BOOKS

Hamalainen, Eetu, ed. *New Trends in Brain Hypoxia Ischemia Research*. Hauppauge, NY: Nova Science, 2008.

Kaste, M., and J. Castillo, eds. *Neuroprotection in Brain Ischemia: An Update*. Basel, Switzerland: Karger, 2006.

PERIODICALS

Arumugam, Thiruma V., et al. "Targeting Ischemic Brain Injury with Intravenous Immunoglobulin." *Expert Opinion on Therapeutic Targets* (January 2008): 19 29.

Singh, Vineeta, et al. "Brief Ischemia Causes Long term Depression in Midbrain Dopamine Neurons." *Euro pean Journal of Neuroscience* (September 2007): 1489 1499.

Weber, J. T., et al. "Antioxidants and Free Radical Scav engers for the Treatment of Stroke, Traumatic Brain Injury, and Aging." *Current Medicinal Chemistry* (February 2008): 404 414.

Woo, Karen, et al. "Laparotomy for Visceral Ischemia and Gangrene." *American Surgeon* (October 2007): 1006 1008.

ORGANIZATIONS

American Heart Association, National Center, 7272 Greenville Ave., Dallas, TX, 75231 4596, (800) 242 8721, http://www.americanheart.org/.

National Heart, Lung, and Blood Institute Information Center, PO Box 30105, Bethesda, MD, 20824 0105, (301) 592 8573, http://www.nhlbi.nih.gov/.

Mai Tran
Teresa G. Odle
David Edward Newton, Ed.D.

Italian diet *see* **Mediterranean diet**

Itching

Definition

Itching is an intense, distracting irritation or tickling sensation that may be felt all over the skin's surface or confined to just one area. The medical term for itching is pruritus.

Description

Itching leads most people instinctively to scratch the affected area. Different people can tolerate different amounts of itching, and anyone's threshold of tolerance can be changed due to **stress**, emotions, and other factors. In general, itching is more severe if the skin is warm, and if there are few distractions. This is why people tend to notice itching more at night.

Causes and symptoms

As of 2002, the recent discovery of itch-specific neurons (nerve cells) has given doctors a better understanding of the causes of the sensation of itching. Another factor that contributes to itching is the release of endogenous opioids in the body. While these chemicals function primarily to relieve **pain**, they also appear to enhance the sensation of itching. Although itching is the most noticeable symptom of many skin diseases, however, it doesn't necessarily mean that a person who feels itchy has a disease.

Stress and emotional upset can make itching worse, no matter what the underlying cause. If emotional problems are the primary reason for feeling itchy, the condition is known as psychogenic itching. Some people become convinced that their itch is caused by a parasite or some medical disorder. This conviction is often linked to burning sensations in the tongue, and may be caused by a major psychiatric disorder.

Generalized itching

Itching that occurs all over the body may indicate a medical condition such as **diabetes mellitus**, liver disease, kidney failure, **jaundice**, thyroid disorders, and rarely, **cancer**. Blood disorders such as **leukemia**, and lymphatic conditions such as **Hodgkin's disease** may sometimes cause itching as well.

Some people may develop an itch without a rash when they take certain drugs (such as aspirin, codeine, cocaine). Others may develop an itchy, red "drug rash" or **hives** because of an allergy to a specific drug.

A team of researchers in Texas has discovered that some people infected by *Helicobacter pylori*, a bacterium that causes **gastritis**, also develop itching that

KEY TERMS

Atopic dermatitis—An intensely itchy inflammation often found on the face of people prone to allergies. In infants and early childhood, it's called infantile eczema.

Creeping eruption—Itchy irregular, wandering red lines on the skin made by burrowing larvae of the hookworm family and some roundworms. Also called cutaneous larva migrans.

Dermatitis herpetiformis—A chronic, very itchy skin disease with groups of red lesions that leave spots behind when they heal. It is sometimes associated with cancer of an internal organ.

Eczema—A superficial type of inflammation of the skin that may be very itchy and weeping in the early stages; later, the affected skin becomes crusted, scaly, and thick. There is no known cause.

Endogenous opioids—Natural pain relievers produced by the body that are also associated with the sensation of itching.

Hodgkin's disease—A type of cancer characterized by slowly enlarging lymph tissue; symptoms include generalized itching.

Lichen planus—A noncancerous, chronic, itchy skin disease that causes small, flat purple plaques on wrists, forearm, and ankles.

Neurodermatitis —An itchy skin disease (also called lichen simplex chronicus) found in nervous, anxious people.

Psoriasis—A common, chronic skin disorder that causes red patches anywhere on the body.

Scabies—A contagious parasitic skin disease characterized by intense itching.

Swimmer's itch—An allergic skin inflammation caused by a sensitivity to flatworms that die under the skin, causing an itchy rash.

does not respond to usual treatments. When the bacterium is eradicated from the patient's digestive tract, the itching is relieved.

Itching also may be caused when hookworm larvae penetrate the skin. This includes swimmer's itch, creeping eruption caused by cat or dog hookworm, and ground itch caused by the "true" hookworm.

Skin conditions that cause an itchy rash include:

- atopic dermatitis
- chickenpox
- contact dermatitis
- dermatitis herpetiformis (occasionally)
- eczema
- fungal infections (such as athlete's foot)
- hives (urticaria)
- insect bites
- lice
- lichen planus
- neurodermatitis (lichen simplex chronicus)
- psoriasis (occasionally)
- Scabies

Itching all over the body can be caused by something as simple as bathing too often, which removes the skin's natural oils and may make the skin too dry and scaly.

Localized itching

Specific itchy areas may occur if a person comes in contact with soaps, detergents, and wool or other rough-textured, scratchy material. Adults who have **hemorrhoids**, anal fissure, or persistent **diarrhea** may notice pruritus ani (itching around the anus). In children, itching in this area is most likely due to **worms**.

Intense itching called pruritus vulvae (itching of the external genitalia in women) may be due to a **yeast infection**, hormonal changes, **contact dermatitis**, or the use of certain spermicides, vaginal suppositories, ointments, or deodorants.

It's also common for older people to suffer from dry, itchy skin (especially on the back) for no obvious reason. Moreover, older people are more likely to develop itching as a side effect of prescription medications. Younger people may notice dry, itchy skin in cold weather. Itching is also a common complaint during **pregnancy**.

Diagnosis

Itching is a symptom that is quite obvious to its victim. Someone who itches all over should seek medical care. Because itching can be caused by such a wide variety of triggers, a complete physical exam and medical history will help diagnose the underlying problem. A variety of blood and stool tests may help determine the underlying cause.

Treatment

In general, itchy skin should be treated very gently. While scratching may temporarily ease the itch, in the long run scratching just makes it worse. In

addition, scratching can lead to an endless cycle of more itching and scratching.

To avoid the urge to scratch, a person can apply a cooling or soothing lotion or cold compress to the area. Itching may be relieved by applying a warm compress of diluted vinegar, preferably herbal vinegars such as **plantain**, violet, lavender, or rose.

The itching associated with mosquito **bites** can be reduced by applying meat tenderizer paste, table salt (to wet skin), or toothpaste. Any alkaline preparation (like a paste of baking soda and water) will help ease the itch.

Probably the most common cause of itching is dry skin. **Flaxseed** oil and **vitamin E** taken orally can help to rehydrate dry skin and can reduce itching. There are a number of simple things a person can do to relieve itching.

- Don't wear tight clothes.
- Avoid synthetic fabrics.
- Don't take long baths.
- Wash the area in lukewarm water with a little baking soda.
- Take a lukewarm shower for generalized itching.
- Try a lukewarm oatmeal (or Aveeno) bath for generalized itching.
- Apply bath oil or lotion (without added colors or scents) right after bathing.

Practitioners of Chinese medicine utilize a wide variety of herbs as well as **acupuncture** and ear acupuncture to treat itching based upon the cause. The medicine Xiao Feng Zhi Yang Chong Ji (Eliminate Wind and Relieve Itching Infusion) can be taken three times daily to relieve itching. For external treatment of itching, the patient may bathe in Zhi Yang Xi Ji (Relieve Itching Washing Preparation) and apply She Chuang Zi Ding (Cnidium Tincture) and Zhi Yang Po Fen (Relieve Itching Powder).

Emotional stress can trigger many different dermatoses including certain itching **rashes**. Hypnosis has been helpful in treating atopic **dermatitis**, itching, **psoriasis**, hives, and other dermatoses.

In several small studies, transcutaneous electrical nerve stimulation (TENS) has been effective in temporarily relieving chronic itch associated with varying dermatoses. TENS is a treatment where mild electrical current is passed through electrodes on the skin to stimulate nerves and block pain signals. Portable TENS units are available for home use.

Cutaneous field stimulation (CFS) was found to safely relieve experimentally induced itching for a longer time period than TENS. CFS electrically stimulates nerves in the skin to harmlessly mimic scratching and inhibit the itch sensation.

Herbal itch remedies

The following herbal remedies for itching are used externally:

- aloe vera
- bracken juice
- bird-of-paradise (*Strelitzia reginae*) flowers
- cabbage leaf poultice
- cattail (*Typha latifolia*) juice
- chickweed (*Stellaria media*) salve
- comfrey (*Symphytum officinale*) juice
- evening primrose (*Oenothera biennis*) oil
- heal-all (*Prunella vulgaris*) juice
- honeysuckle vine flowers and leaves
- marigold (*Caledula officinalis*)
- marsh mallow (*Althaea officinalis*) leaf poultice
- myrrh (*Commiphora* species) oil
- oats (*Avena sativa*) bath or poultice
- onion juice
- papaya fruit
- plantain (*Plantago major*) juice or poultice
- red pepper juice
- Sage (*salvia officinalis*) leaves
- St. John's wort (*Hypericum perforatum*)
- tea tree (*Melaleuca alternifolia*) oil
- yellow dock (*Rumex crispus*) tea bath

Allopathic treatment

Specific treatment of itching depends on the underlying cause. Such antihistamines as diphenhydramine (Benadryl) can help relieve itching caused by hives, but won't affect itching from other causes. Most antihistamines also make people sleepy, which can help patients sleep who would otherwise be awake from the itch. Newer antihistamines that do not make people drowsy as a side effect are also available to treat itching.

Creams or ointments containing cortisone may help control the itch from insect bites, contact dermatitis, or **eczema**. Cortisone cream should not be applied to the face unless a doctor prescribes it, and should not be used over the body for prolonged periods without a doctor's approval.

A newer medication that relieves the itching associated with **burns** as well as speeding the healing

process is called dexpanthenol. Dexpanthenol helps to relieve the itching by preventing the affected skin from drying out.

Expected results

Most cases of itching go away when the underlying cause is treated successfully.

Prevention

Soaps are often irritating and drying to the skin and can make an itch worse. They should be avoided or used only when necessary. People who tend to have itchy skin should:

- Avoid bathing daily.
- Use lukewarm water when bathing.
- Use mild soap.
- Pat (not rub) the skin dry after bathing, leaving some water on the skin.
- Apply a moisturizer immediately after the bath, but avoid lanolin products.
- Use a humidifier, particularly during heating season in colder climates.

Eating **garlic** and onion and taking vitamin B supplements may help to repel mosquitoes. Application of cedar, **sage**, **pennyroyal**, **rosemary**, artemisia, or marigold to the skin may also repel mosquitoes

Resources

BOOKS

Turkington, Carol A., and Jeffrey S. Dover. *Skin Deep: An A to Z of Skin Disorders, Treatments and Health*. New York: Facts on File, 1998.

Ying, Zhou Zhong, and Jin Hui De. "Cutaneous Pruritus." *Clinical Manual of Chinese Herbal Medicine and Acu puncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Black, A. K., and M. W. Greaves. "Antihistamines in Urti caria and Angioedema." *Clinical Allergy and Immunol ogy* 17 (2002): 249 286.

Ebner, F., A. Heller, F. Rippke, and I. Tausch. "Topical Use of Dexpanthenol in Skin Disorders." *American Journal of Clinical Dermatology* 3 (2002): 427 433.

Kandyil, R., N. S. Satya, and R. A. Swerlick. "Chronic pruritus associated with *Helicobacter pylori*." *Journal of Cutaneous Medicine and Surgery* 6 (March April 2002): 103 108.

Nilsson, Hans Jörgen, Anders Levinsson, and Jens Schouenborg. "Cutaneous Field Stimulation (CFS): A New Powerful Method to Combat Itch." *Pain* 71 (1997): 49 55.

Schmelz, M. "Itch Mediators and Mechanisms." *Journal of Dermatologic Science* 28 (February 2002): 91 96.

Shenefelt, Philip D. "Hypnosis in Dermatology." *Archives of Dermatology* 136 (March 2000): 393 399.

Stander, S., and M. Steinhoff. "Pathophysiology of Pruritus in Atopic Dermatitis: An Overview." *Experimental Dermatology* 11 (February 2002): 12 24.

Tang, William Yuk Ming, Loi Yuen Chan, Kuen Kong Lo, and Tze Wai Wong. "Evaluation of the Antipruritic Role of Transcutaneous Electrical Nerve Stimulation in the Treatment of Pruritic Dermatoses." *Dermatology* 199 (1999): 237 241.

Yoon, S., J. Lee, and S. Lee. "The Therapeutic Effect of Evening Primrose Oil in Atopic Dermatitis Patients with Dry Scaly Skin Lesions Is Associated with the Normalization of Serum Gamma Interferon Levels." *Skin Pharmacology and Applied Skin Physiology* 15 (January February 2002): 20 25.

ORGANIZATIONS

American Academy of Dermatology. 930 N. Meacham Rd., PO Box 4014, Schaumburg, IL 60168. (708) 330 0230.

Belinda Rowland
Rebecca J. Frey, PhD

J

Jamaica dogwood

Description

Jamaica dogwood, *Piscidia erythrina* or *Piscidia piscipula,* is an herb that is used to treat **insomnia**, **muscle spasms**, and severe nerve **pain** called **neuralgia**. The plant is native to Central America, the West Indies, and Florida. It is also called *Fish Poison Tree*. As of 2008, it could also be found growing in parts of Texas, Mexico, and the northern region of South America. The plant is covered with a yellowish or grayish brown bark, which emits an offensive odor. Inside, the surface is light colored or white. The herb tastes acrid and bitter and causes a burning sensation in the mouth. The bark is the portion of the plant containing its medicinal properties. Jamaica dogwood is a potent herb, with the potential for toxicity. As of 2008 it had not undergone safety testing or much research.

Jamaica dogwood was discovered by scientists in the mid-1800s, when its pain-relieving properties and ability to promote sweat gained acclaim. In Central America and South America, it has been a widely used fish poison. In the early part of the twentieth century, Jamaica dogwood made its way into the medical literature when a Harvard researcher named Vedux-Tyrode wrote about it. His 1902 article, published in the *Journal of Medical Research,* explained that a solution containing Jamaica dogwood was toxic to frogs, eventually causing death, yet death did not occur in warm-blooded creatures such as rabbits. The researcher concluded that more investigation was needed to determine the pharmacological properties inherent in Jamaica dogwood.

Jamaica dogwood contains a substance known as rotenone, an insect-killing agent used to destroy fleas, lice, and larvae. At recommended doses, rotenone is not known to be harmful to humans or other warm-blooded animals.

General uses

In general, Jamaica dogwood is used to control nerve pain, promote sleep, and reduce spasms. In studies, Jamaica dogwood has been shown to possess a variety of other potential benefits, although further research in these areas is needed:

- Cough reliever
- Fever reducer
- Anti-inflammatory agent

In alternative health treatments, it may be used to treat the following:

- Anxiety
- Coughing
- Menstrual pain
- Headache, particularly migraine
- Nerve Pain
- Toothache
- Insomnia

Preparations

Jamaica dogwood has been available as dried root bark, powder, tincture, or liquid extract. But as of 2008 the liquid extract was no longer available in the marketplace. However, Jamaica dogwood can be found in some medicinal preparations.

Precautions

Jamaica dogwood is a powerful herb that can be toxic at higher dosages. Its safety had not been tested as of 2008. It should be used only under the advice of a healthcare professional. Jamaica dogwood should not be taken by women who are pregnant or breastfeeding, nor should older individuals or children take it.

KEY TERMS

Anti-inflammatory agent—A medication or treatment that reduces inflammation, redness, and swelling.

Trembling—A shaking of a body part.

Side effects

Jamaica dogwood should be stopped immediately and the physician should be promptly notified if signs of an allergy occur, such as **itching**, rash, swelling, tightness in the chest or throat, or difficulty breathing. Side effects include increased drooling and sweating, **fatigue**, **nausea**, gastric disorders, and nerve symptoms such as numbness, twitching, or trembling.

Interactions

Jamaica dogwood may increase the effects of drugs used for **anxiety** or sleeplessness, such as Ambien, Seconal, and Valium. Consumers should check with their physician before taking Jamaica dogwood.

Resources

BOOKS

PDR for Herbal Remedies, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

PERIODICALS

Vedux Tyrode, M. "On the Active Principle of Jamaica Dogwood." *Journal of Medical Research* 7, no. 4 (May 1902): 405 6.

ORGANIZATIONS

University of Maryland Health Center, Health Library, College Park, MD, 20742, (301) 314 8180, http://www.umm.edu.

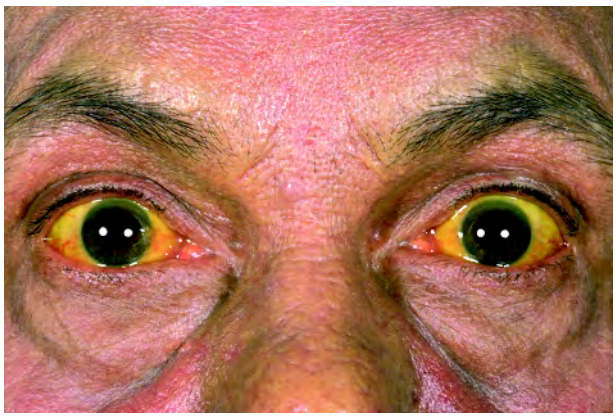
Rhonda Cloos, RN

Japanese traditional medicine *see* **Kampo medicine**

Jaundice

Definition

Jaundice is a condition in which a person's skin and the whites of the eyes are discolored yellow due to an increased level of bile pigments in the blood resulting from liver disease. Jaundice is sometimes called *icterus*, from a Greek word for "the condition."



Jaundice due to primary billary cirrhosis. *(© Medical-on-Line / Alamy)*

Description

In order to understand jaundice, it is useful to know about the role of the liver in producing bile. The most important function of the liver is the metabolic processing of "chemical" waste products like **cholesterol**, and excreting them into the intestines as bile. The liver is the premier "chemical" factory in the body—most incoming and outgoing chemicals pass through it. It is the first stop for all nutrients, toxins, and drugs absorbed by the digestive tract. The liver also collects chemicals from the blood for processing. Many of these outward bound chemicals are excreted into the bile. One particular substance, bilirubin, is yellow. Bilirubin is a product of the breakdown of hemoglobin, which is the protein inside red blood cells. If bilirubin cannot leave the body, it accumulates and discolors other tissues. The normal total level of bilirubin in blood serum is between 0.2 mg/dL and 1.2 mg/dL. When it rises to 3 mg/dL or higher, the person's skin and the whites of the eyes become noticeably yellow.

Bile is formed in the liver. It then passes into the network of hepatic bile ducts, which join to form a single tube. A branch of this tube carries bile to the gallbladder, where it is stored, concentrated, and released on a signal from the stomach. Food entering the stomach is the signal that stimulates the gallbladder to release the bile. The tube, which is called the common bile duct, continues to the intestines. Before the common bile duct reaches the intestines, it is joined by another duct from the pancreas. The bile and the pancreatic juice enter the intestine through a valve

called the Ampulla of Vater. After entering the intestine, the bile and pancreatic secretions together help in the process of digestion.

Causes and symptoms

There are many different causes for jaundice, but they can be divided into three categories based on where they start—before (pre-hepatic), in (hepatic), or after (post-hepatic) the liver. When bilirubin begins its life cycle, it cannot be dissolved in water. Thus, the liver changes it so that it is soluble in water. These two types of bilirubin are called unconjugated (insoluble) and conjugated (soluble). Blood tests can easily distinguish between these two types of bilirubin.

Hemoglobin and bilirubin formation

Bilirubin begins as hemoglobin in the blood-forming organs, primarily the bone marrow. If the production of red blood cells (RBCs) falls below normal, the extra hemoglobin finds its way into the bilirubin cycle and adds to the pool.

Once hemoglobin is in the red cells of the blood, it circulates for the life span of those cells. The hemoglobin that is released when the cells die is turned into bilirubin. If for any reason the RBCs die at a faster rate than usual, then bilirubin can accumulate in the blood and cause jaundice.

Hemolytic disorders

Many disorders speed up the death of red blood cells. The process of red blood cell destruction is called hemolysis, and the diseases that cause it are called hemolytic disorders. If red blood cells are destroyed faster than they can be produced, the patient develops **anemia**. Hemolysis can occur in a number of diseases, disorders, conditions, and medical procedures:

- Malaria. The malaria parasite develops inside red blood cells. When it is mature it breaks the cell apart and swims off in the blood. This process happens to most of the parasites simultaneously, causing the intermittent symptoms of the disease. When enough cells burst at once, jaundice may result from the large amount of bilirubin formed from the hemoglobin in the dead cells. The pigment may reach the urine in sufficient quantities to cause "blackwater fever," an often lethal form of malaria.
- Side effects of certain drugs. Some common drugs can cause hemolysis as a rare, but sudden, side effect. These medications include some antibiotic and antituberculosis medicines; drugs that regulate the heartbeat; and levodopa, a drug used to treat Parkinson's disease.
- Certain drugs in combination with a hereditary enzyme deficiency known as glucose–6–phosphate dehydrogenase (G6PD). G6PD is a deficiency that affects more than 200 million people in the world. Some of the drugs listed above are more likely to cause hemolysis in people with G6PD. Other drugs cause hemolysis only in people with this disorder.

KEY TERMS

Ampulla of Vater—The widened portion of the duct through which the bile and pancreatic juices enter the intestine. *Ampulla* is a Latin word describing a bottle with a narrow neck that opens into a wide body.

Anemia—A condition in which the blood does not contain enough hemoglobin.

Biliary system/bile ducts—The gall bladder and the system of tubes that carry bile from the liver into the intestines.

Bilirubin—A reddish pigment excreted by the liver into the bile as a breakdown product of hemoglobin.

Crigler-Najjar syndrome—A moderate to severe form of hereditary jaundice.

Erythroblastosis fetalis—A disorder of newborn infants marked by a high level of immature red blood cells (erythroblasts) in the infant's blood.

Gilbert's syndrome—A mild hereditary form of jaundice.

Glucose–6–phosphate dehydrogenase (G6PD) deficiency—A hereditary disorder that can lead to episodes of hemolytic anemia in combination with certain medications.

Hemoglobin—The red chemical in blood cells that carries oxygen.

Hemolysis—The destruction or breakdown of red blood cells.

Hepatic—Refers to the liver.

Icterus—Another name for jaundice.

Microangiopathic—Pertaining to disorders of the small blood vessels.

Pancreas—The organ beneath the stomach that produces digestive juices, insulin, and other hormones.

Sickle cell disease—A hereditary defect in hemoglobin synthesis that changes the shape of red cells and makes them more fragile.

Splenectomy—Surgical removal of the spleen.

Most important among these drugs are antimalarial medications, such as quinine, and vitamins C and K.

- Poisons. Snake and spider venom, certain bacterial toxins, copper, and some organic industrial chemicals directly attack the membranes of red blood cells.
- Artificial heart valves. The inflexible moving parts of heart valves damage RBCs as they flutter back and forth. This damage is one reason to recommend pig valves and valves made of other organic materials.
- Hereditary RBC disorders. There are a number of hereditary defects that affect the blood cells. There are many genetic mutations that affect the hemoglobin itself, the best known of which is sickle cell disease. Such hereditary disorders as spherocytosis weaken the outer membrane of the red cell. There are also inherited defects that involve the internal chemistry of RBCs.
- Enlargement of the spleen. The spleen is an organ that is located near the upper end of the stomach and filters the blood. It is supposed to filter out and destroy only worn out RBCs. If it has become enlarged, it filters out normal cells, as well. Malaria, other infections, cancers and leukemias, some of the hereditary anemias mentioned above, obstruction of blood flow from the spleen—all these and many more diseases can enlarge the spleen to the point where it removes too many red blood cells.
- Diseases of the small blood vessels. Hemolysis that occurs in diseased small blood vessels is called microangiopathic hemolysis. It results from damage caused by rough surfaces on the inside of the capillaries. The RBCs squeeze through capillaries one at a time and can easily be damaged by scraping against the vessel walls.
- Immune reactions to RBCs. Several types of cancer and immune system diseases produce antibodies that react with RBCs and destroy them. In 75% of cases, this reaction occurs all by itself, with no underlying disease to account for it.
- Transfusions. If a patient is given an incompatible blood type, hemolysis results.
- Kidney failure and other serious diseases. Several diseases are characterized by defective blood coagulation that can destroy red blood cells.
- Erythroblastosis fetalis. Erythroblastosis fetalis is a disease of newborns marked by the presence of too many immature red blood cells (erythroblasts) in the baby's blood. When a baby's mother has a different blood type, antibodies from the mother may leak into the baby's circulation and destroy blood cells. This reaction can produce severe hemolysis and jaundice in the newborn. Rh factor incompatibility is the most common cause.
- High bilirubin levels in newborns. Even in the absence of blood type incompatibility, the newborn's bilirubin level may reach threatening levels.

Normal jaundice in newborns

Normal newborn jaundice is the result of two conditions occurring at the same time—a pre-hepatic and a hepatic source of excess bilirubin. First of all, the baby at birth immediately begins converting hemoglobin from a fetal type to an adult type. The fetal type of hemoglobin was able to extract oxygen from the lower levels of oxygen in the mother's blood. At birth the infant can extract oxygen directly from his or her own lungs and does not need the fetal hemoglobin any more. So fetal hemoglobin is removed from the system and replaced with adult hemoglobin. The resulting bilirubin loads the system and places demands on the liver to clear it. But the liver is not quite ready for the task, so there is a period of a week or so when the liver has to catch up. During that time the baby is jaundiced.

In 2002, studies found that infants younger than eight weeks old with jaundice often had hidden (asymptomatic) urinary tract **infections**. Previous studies have shown that newborn jaundice may be an early sign of bacterial infections in infants. The study recommended that pediatricians routinely test young infants with jaundice for urinary tract infections.

Hepatic jaundice

Liver diseases of all kinds threaten the organ's ability to keep up with bilirubin processing. Starvation, circulating infections, certain medications, **hepatitis**, and **cirrhosis** can all cause hepatic jaundice, as can certain hereditary defects of liver chemistry, including Gilbert's syndrome and Crigler-Najjar syndrome.

Post-hepatic jaundice

Post-hepatic forms of jaundice include the jaundices caused by failure of soluble bilirubin to reach the intestines after it has left the liver. These disorders are called obstructive jaundices. The most common cause of obstructive jaundice is the presence of **gallstones** in the ducts of the biliary system. Other causes have to do with birth defects and infections that damage the bile ducts; drugs; infections; cancers; and physical injury. Some drugs—and **pregnancy** on rare occasions—simply cause the bile in the ducts to stop flowing.

Symptoms and complications associated with jaundice

Certain chemicals in bile may cause **itching** when too much of them end up in the skin. In newborns, insoluble bilirubin may get into the brain and do permanent damage. Long standing jaundice may upset the balance of chemicals in the bile and cause stones to form. Apart from these potential complications and the discoloration of skin and eyes, jaundice by itself is inoffensive. Other symptoms are determined by the disease producing the jaundice.

Diagnosis

Physical examination

In many cases, the diagnosis of jaundice is suggested by the appearance of the patient's eyes and complexion. The doctor will ask the patient to lie flat on the examining table in order to feel (palpate) the liver and spleen for enlargement and to evaluate any abdominal **pain**. The location and severity of abdominal pain and the presence or absence of **fever** help the doctor to distinguish between hepatic and obstructive jaundice.

Laboratory tests

Disorders of blood formation can be diagnosed by more thorough examination of the blood or the bone marrow, where blood is made. Occasionally a bone marrow biopsy is required, but usually the blood itself will reveal the diagnosis. The spleen can be evaluated by an ultrasound examination or a nuclear scan if the physical examination has not yielded enough information.

Imaging studies

Disease in the biliary system can be identified by imaging techniques, of which there are many. X rays are taken a day after swallowing a contrast agent that is secreted into the bile. This study gives functional, as well as anatomical, information. There are several ways of injecting x-ray dye directly into the bile ducts. It can be done through a thin needle pushed straight into the liver, or through a scope passed through the stomach that can inject dye into the Ampulla of Vater. CT and MRI scans are very useful for imaging certain conditions, such as cancers in and around the liver, or gallstones in the common bile duct.

Liver disease is usually assessed from blood studies alone, but again a biopsy may be necessary to clarify less obvious conditions. A liver biopsy is performed at the bedside. The doctor uses a thin needle to take a tiny core of tissue from the liver. The tissue sample is sent to the laboratory for examination under a microscope.

Assessment of jaundice in newborns

Newborns are more likely to have problems with jaundice if:

- They are premature.
- They are of Asian or Native American descent.
- They have been bruised during the birth process.
- They have lost too much weight during the first few days.
- They are born at a high altitude.
- The mother has diabetes.
- Labor had to be induceds.

Research is continuing to find noninvasive methods to determine bilirubin levels in newborns so that physicians did not have to rely on visual examination alone to determine which infants should receive blood tests. Once these measurements of skin pigment can be shown effective and cost-effective in clinical practice, they may become more available. Another study used this measurement method incorporated into home health visits to monitor babies within 24 hours of discharge from the hospital following birth.

Treatment

Jaundice is often early warning sign of serious liver damage. Alternative medicine treatments should not be used as a substitute for conventional medical treatment. Patients should contact their doctors for diagnosis and treatment immediately if experiencing signs and symptoms of jaundice. Alternative therapies may be helpful as complementary measures for patients who have an underlying disease that already has been diagnosed.

Nutritional therapy

Naturopaths or nutritionists may recommend the following dietary changes:

- Drinking fresh vegetable or fruit juices during the first several weeks after diagnosis and eating a diet consisting mostly of raw fruits and vegetables, seeds, and nuts during the next month. These fruits and vegetables are easy to digest and contain lots of antioxidants, vitamins and minerals. They help the body remove toxins from the blood, and decrease stress/strain on the liver for digestion/metabolism.
- Fasting intermittently.

- Eliminate alcohol from the diet for good, and avoiding foods that are processed and high in fat. These foods are bad for the liver.
- Drinking a cup of lemonade (without sugar) early in the morning to improve liver and bile function.
- Incorporating olive oil or lemon oil into the diet as a liver flush regimen.
- Taking nutritional supplements, such as multivitamins or minerals, vitamin C, vitamin B complex, other antioxidant-containing supplements, supplements containing alpha lipoic acid, protein supplements, essential fatty acids (EFAs), and digestive enzymes with bile (for patients having pale stools).

Traditional Chinese medicine

Depending on a patient's specific condition, an expert Chinese herbalist may prescribe herbal remedies that can help improve liver function. Animal studies have shown the following Chinese herbs may have liver protective effects:

- *Bupleurum chinense*
- *Phellodendron wilsonii*
- *Clementis chinensis*

Herbal therapy

Patients should consult an experienced herbalist for specific herbal treatments that may include **milk thistle** or **artichoke**.

Homeopathy

For homeopathic therapy, patients should consult a homeopathic physician who will prescribe specific remedies based on knowledge of the underlying cause.

Juice therapy

Juice therapy helps the liver detoxify toxins to be eliminated from the body. Patients should mix one part of pure juice with one part of water before drinking. Daily consumption of the following juices may be helpful:

- carrot and beet juice with a touch of radish or dandelion root juice
- grapes, pear, and lemon
- carrot, celery, and parsley
- carrot, beet, and cucumber

Aromatherapy

Essential oils of **rosemary**, lemon, and geranium may help improve liver function and relax the body. They can be given as inhalants, a soothing bath, or soak.

Other therapies

Other alternative treatments that may be help improve liver function include **fasting**, Ayurveda, **hydrotherapy**, and **acupuncture**.

Allopathic treatment

Jaundice in newborns

Newborns are the only major category of patients in whom the jaundice itself requires attention. If there is reason to suspect increased hemolysis in the newborn, the bilirubin level must be measured repeatedly during the first few days of life. If the level of bilirubin shortly after birth threatens to go too high, treatment must begin immediately. Exchanging most of the baby's blood was the only way to reduce the amount of bilirubin until a few decades ago. Jaundiced babies are now fitted with eye protection and placed under bright fluorescent blue lights. The light chemically alters the bilirubin in the blood as it passes through the baby's skin so that it may be more easily eliminated in the urine. In 2003, researchers tested a new drug called Stanate that showed promise in blocking bilirubin production. However, debate concerning the use of the drug for treatment of only those infants with jaundice or as a preventive measure was delaying its FDA approval and widespread use.

Hemolytic disorders

Hemolytic diseases are treated, if at all, with medications and blood transfusions, except in the case of an enlarged spleen. Surgical removal of the spleen (splenectomy) can sometimes cure hemolytic anemia. Drugs that cause hemolysis or arrest the flow of bile must be stopped immediately.

Hepatic jaundice

Most liver diseases have no specific cure, but the liver is so robust that it can heal from severe damage and regenerate itself from a small remnant of its original tissue.

Post-hepatic jaundice

Obstructive jaundice frequently requires a surgical cure. If the original passageways cannot be restored, surgeons have several ways to create alternate routes. To create alternate passageways, a surgeon will sew an open piece of intestine over a bare patch of liver. Tiny bile ducts in that part of the liver will begin to discharge their bile into the intestine, and pressure from the obstructed ducts elsewhere will find release in that direction. As the flow increases, the

ducts grow to accommodate it. Soon, all the bile is redirected through the open pathways.

Prevention

Erythroblastosis fetalis can be prevented by giving an Rh negative mother a gamma globulin solution called RhoGAM whenever there is a possibility that she is developing antibodies to her baby's blood. G6PD hemolysis can be prevented by testing patients before giving them drugs that can cause it. Medication side effects can be minimized by early detection and immediate cessation of the drug. **Malaria** can often be prevented by taking certain precautions when traveling in tropical or subtropical countries. These precautions include staying in after dark; using prophylactic drugs such as mefloquine; and protecting sleeping quarters with mosquito nets treated with insecticides and mosquito repellents. In 2003, new studies showed promise for a possible vaccine against malaria. Early trials showed that vaccination combination might stimulate T-cell activity against malaria, the best type of protection that researchers can hope to find. However, further studies will have to be done.

New research in 2002 linked a popular antidepressant drug paroxetine (Paxil) to several newborn complications, including jaundice. Although research is preliminary, pregnant women might want to discuss use of the drug with their physicians to prevent complications like jaundice in their newborn babies.

Resources

BOOKS

Balistreri, William F. "Manifestations of Liver Disease." In *Nelson Textbook of Pediatrics,* edited by Waldo E. Nelson, et al. Philadelphia: W. B. Saunders, 1996.

"Jaundice." *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

"Jaundice." In *Sleisenger & Fordtran's Gastrointestinal and Liver Disease,* edited by Mark Feldman, et al. Phila delphia: W. B. Saunders, 1998.

Kaplan, Lee M., and Kurt J. Isselbacher. "Jaundice." In *Harrison's Principles of Internal Medicine,* edited by Kurt Isselbacher et al. New York: McGraw Hill, 1998.

"Liver Problems." *The Hamlyn Encyclopedia of Comple mentary Health*. London, Great Britain: Reed Interna tional Books Limited.

McQuaid, Kenneth R. "Alimentary Tract." In *Current Medical Diagnosis and Treatment,* edited by Lawrence M. Tierney, Jr., et al. Stamford, CT: Appleton & Lange, 1996.

Scharschmidt, Bruce F. "Bilirubin Metabolism, Hyperbilir ubinemia, and Approach to the Jaundiced Patient." In *Cecil Textbook of Medicine,* edited by J. Claude Bennett and Fred Plum. Philadelphia: W. B. Saunders, 1996.

PERIODICALS

Chin, Hui Fen, Chun Ching Lin, Chui Ching Yang, and Fay Yang. "The Pharmacological and Pathological Studies on Several Hepatic Protective Crude Drugs from Taiwan." *American Journal of Chinese Medicine* XVI no. 3 4 (1988): 127 137.

Garcia, Francisco J., and Alan L. Nager. "Jaundice as an Early Diagnostic Sign of Urinary Tract Infection in Infancy." *Pediatrics* (May 2002): 846.

Grimm, David. "Baby Pigment Peril." *U.S. News &World Report* (July 28, 2003): 39.

Lawrence, David. "Combination Malaria Vaccine Shows Early Promise in Human Trials." *The Lancet* (May 31, 2003): 1875.

Morantz, Carrie and Brian Torrey. "AHRQ Report on Neonatal Jaundice." *American Family Physician* (June 1, 2003): 2417.

"Paxil Linked to Complications in Newborns." *Psycho pharmacology Update* (June 2002): 6.

Richmond, Glenn, Melissa Brown, and Patricia Wagstaff. "Using a Home Care Model to Monitor Bilirubin Levels in Early Discharged Infants." *Topics in Health Informa tion Management* (January March 2003): 39 43.

ORGANIZATIONS

American Liver Foundation. 1425 Pompton Avenue, Cedar Grove, New Jersey 07009. 800 223 0179. http:// www.liverfoundation.org.

Teresa G. Odle

Jet lag

Definition

Jet lag is a commonplace condition marked by **fatigue**, **insomnia**, and irritability that is caused by air travel through a number of time zones. Some studies have shown that up to 90% of all international business travelers experienced at least a mild form of jet lag.

Description

Living organisms are accustomed to periods of night and day alternating at set intervals. Most of the human body's regulating hormones follow this cycle, known as circadian rhythm. The word circadian comes from the Latin, *circa*, meaning "about," and *dies*, meaning "day." These cycles are not exactly 24 hours long, hence the approximation indicated in "circa." Each chemical has its own cycle of highs and lows, interacting with and influencing the other cycles. Body temperature, sleepiness, thyroid function, growth hormone, metabolic processes, adrenal hormones, and

the sleep hormone **melatonin** all cycle with daylight. There is a direct connection between the retina (where light hits the back of the eye) and the part of the brain that controls all these hormones. Artificial light has some effect, but sunlight has much more. Disruption of circadian rhythms affects the sleep-wake cycles of night shift workers as well as travelers.

When people are without clocks in a compartment that is completely closed to sunlight, most of them fall into a circadian cycle of about 25 hours. Typically, all the regulating chemicals follow one another in order like threads in a weaving pattern. Every morning the sunlight resets the cycle, stimulating the leading chemicals and thus compensating for the difference between the 24-hour day and the 25-hour innate rhythm.

When traveling through a number of time zones, most people reset their rhythms within a few days, demonstrating the adaptability of the human body. Some people, however, have upset rhythms that last indefinitely.

Causes and symptoms

Traveling through a few time zones at a time is not as disruptive to circadian rhythms as traveling much greater distances can be. The foremost symptom of jet lag is altered sleep pattern: sleepiness during the day and insomnia during the night. Jet lag may also include **indigestion** and trouble concentrating. Individuals afflicted by jet lag alternate in and out of a normal day-night cycle.

Treatment

Exposure to bright morning sunlight cures jet lag after a few days in most people. A few will have prolonged sleep phase difficulties. For these individuals, there is a curious treatment that has achieved success. By forcing one's self into a 27 hour day, complete with the appropriate stimulation from bright light, all the errant chemical cycles will be able to catch up during one week.

When selecting an international flight, individuals should try to arrange an early evening arrival in their destination city. When people travel to a destination in the east, they can try going to bed and waking up a few hours earlier several days before their flight. If travel is to the west, going to bed and waking up later than usual can help the body start to adjust to the upcoming time change. More specific recommendations are available, tailored to whether individuals are traveling through 6 time zones, 7–9 zones, or 10 or more.

The following precautions taken during an international flight can help to limit or prevent jet lag:

- Stay hydrated. Drink plenty of water and juices to prevent dehydration. Beverages and foods with caffeine should be avoided because of their stimulant properties. Alcohol should also be avoided.
- Stretch and walk. As much movement as possible during a flight helps circulation, which moves nutrients and waste through the body and aids in elimination.
- Stay on time. Set watches and clocks ahead to the time in the destination city to start adjusting to the change.
- Sleep smart. Draw the shade and sleep during the evening hours in the destination city, even if it is still daylight outside the airplane. Earplugs and sleep masks may be helpful in blocking noise and light. Many airlines provide these items on international flights.
- Dress comfortably. Wear or bring comfortable clothes and slippers that will make sleeping during the flight easier.

Upon arrival in the destination city, individuals should spend as much time outdoors in the sunlight as possible during the day to reset their internal clock and lessen the symptoms of jet lag. Bedtime should be postponed until at least 10 p.m., with no daytime naps. If a daytime nap is absolutely necessary, it should be limited to no more than two hours.

To promote a restful sleeping environment in a hotel setting, travelers should request that the hotel desk hold all phone calls. Because sleeping in too late can also prolong jet lag, an early wake up call should be requested if an alarm clock is not available. If the hotel room is noisy, a portable white noise machine can help to block outside traffic and hallway noises. A room air conditioner or fan can serve the same purpose. The temperature in the room should also be adjusted for sleeping comfort.

New information shows that **exercise** at one's destination can also help. When headed westbound, travelers should exercise one hour in the evening. If going eastbound, they do best by exercising in the morning.

All **antioxidants** help to decrease the effects of jet lag. Extra doses of vitamins A, C, and E, as well as **zinc** and **selenium**, two days before and two days after a flight help to alleviate jet lag. Melatonin, a hormone which helps to regulate circadian rhythms, can also aid in combating jet lag. Melatonin is

available as an over-the-counter supplement in most health food stores and pharmacies. Reports show that the drug is safe for short-term use and recommend 5 mg between 10 p.m. and midnight at the destination to help one fall asleep and sleep better.

If weather prevents an individual from spending time in the sunlight, **light therapy** may be beneficial in decreasing jet lag symptoms. Light therapy, or phototherapy, uses a device called a light box, which contains a set of fluorescent or incandescent lights in front of a reflector. Typically, the patient sits for 30 minutes next to a 10,000-lux box (which is about 50 times as bright as an ordinary indoor light). Light therapy is safe for most people, but those with eye diseases should consult a healthcare professional before undergoing the treatment.

Allopathic treatment

In cases of short-term insomnia triggered by jet lag, a physician may recommend sleeping pills or prescription medication. Such medication should be taken only under the guidance of a healthcare professional.

As of 2008, a melatonin agonist known as LY 156735 was being investigated. An agonist is a drug that stimulates activity at cell receptors that are normally stimulated by such naturally occurring substances as melatonin. LY 156735 was found to speed up the re-adaptation time of volunteer subjects following a simulated 9-hour time shift.

Another area of research in the late 2000s involved the genes that encode the proteins governing circadian rhythms. Evidence suggested that differences among individuals in adaptability to time zone changes are to some extent genetically determined. Targeting the genes that affect this adaptability was hoped to yield new treatments for jet lag and other disorders of circadian rhythm.

Expected results

Jet lag usually lasts 24–48 hours after travel has taken place. In that short time period, the body adjusts to the time change, and with enough rest and daytime exposure to sunlight, it returns to normal circadian rhythm.

Prevention

Eating a high-protein diet that is low in calories before intended travel may help reduce the effects of jet lag.

KEY TERMS

Agonist—A medication that has an affinity for and stimulates the activity of cell receptors that are normally stimulated by naturally occurring substances, such as melatonin.

Circadian—Pertaining to biological rhythms occurring at approximately 24-hour intervals. Jet lag is caused by a disruption of the human body's circadian clock.

Hormone—A chemical made in one part of the body that has an effect on another part.

Melatonin—A hormone that helps to regulate circadian rhythms.

Resources

PERIODICALS

Eriksen, Claire Anne, and Torbjörn Åkerstedt. "Aircrew Fatigue in Trans Atlantic Morning and Evening Flights." *Chronobiology International* (April 2006): 843 858.

Lewy, Alfred, et al. "Circadian Uses of Melatonin in Humans." *Chronobiology International* (January 2006): 403 412.

Pandi Perumal, Seithikurippu R., et al. "Role of the Mela tonin System in the Control of Sleep: Therapeutic Implications." *CNS Drugs* (December 2007): 995 1018.

Reilly, Thomas, et al. "Coping with Jet lag: A Position Statement for the European College of Sport Science." *European Journal of Sport Science* (March 2007): 1 7.

ORGANIZATIONS

American Academy of Sleep Medicine, One Westbrook Corporate Center, Suite 920, Westchester, IL, 60154, (708) 492 0930, http://www.aasmnet.org/.

National Sleep Foundation, 1522 K St. NW, Suite 500, Washington, DC, 20005, (202) 347 3471, http://www.sleepfoundation.org/.

Paula Ford-Martin
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Jew's myrtle *see* **Butcher's broom**

Jock itch

Definition

Also known as *tinea cruris*, jock itch is a growth of fungus in the warm, moist area of the groin.

Jock itch. *(© Custom Medical Stock Photo / Alamy)*

KEY TERMS

Bupleurum—An Asian plant used in traditional Chinese and Japanese medicines to treat infected or inflamed skin.

Saikosaponins—Chemical compounds found in bupleurum that have anti-inflammatory effects.

Tinea—A term that refers to any of several fungal infections of the skin, especially ringworm.

Tinea cruris—The medical term for jock itch.

Description

Fungal infections are named for the affected part of the body. *Cruris* is derived from the Latin word for leg, hence *Tinea cruris*, for the fungal rash affecting the area where the leg joins the pelvis. Fungi seem to thrive in dark, moist places. Jock itch has been found most often in males, especially those who wear athletic equipment and are exposed to public showers and locker rooms. It is also thought that some fungal **infections** may be spread by towels that may be inadequately cleansed between gym/spa users, but this has not been clearly documented.

Fungal infections can invade or spread to various other areas of the body, and are named for the affected body part. For example, *Tinea capitis* is a fungal infection of the head, usually resulting in red, itchy areas that destroy the hair in the affected area. A fungal infection of the skin on the arms, legs or chest is called *Tinea corporis*. **Athlete's foot** or *Tinea pedis* is a fungal infection in the moist skin fold between the toes. Fungal infection affecting the toenails is called *Tinea ungium*, and causes thickened, crumbly toenails.

Causes and symptoms

The mode of transmission of fungal infections is not clear, but it seems that some individuals are more prone to development of the infection than others. An average of one in five people develops fungal infection at some point during their lifetime. Fungal infection can also be carried by household pets, such as cats and dogs, or by farm animals. In animals, fungal infection manifests itself as a missing area of fur. In humans, as the fungus grows, it spreads to surrounding tissues in a circular fashion, with the skin in the middle returning to a normal appearance. The borders of the affected area may look red and scaly, and the individual may complain of intense **itching** and/or burning. Because the borders develop a raised appearance, there may appear to be a worm beneath the skin and be referred to as ringworm. There is, however, no worm affecting the skin or underlying tissue in cases of fungal infections, including jock itch.

Diagnosis

Often a case of jock itch can be identified based on the characteristic description previously described. If assessed by a conventional doctor, the area of affected skin may be scraped onto a glass slide for definitive diagnosis under the microscope. In order to determine the exact type of fungus present, a small piece of affected skin may be sent to a laboratory for further study or cultured via scraping.

Treatment

Topical treatments include poultices of **peppermint**, oregano, or **lavender**. **Tea tree oil**, diluted with a carrier oil of almond oil, can be applied to the rash several times per day. Cedarwood and jasmine oils can relieve itching when applied in the same manner. **Grapefruit seed extract** can be taken as a strong solution of 15 drops in 1 oz of water.

Bupleurum, or **Chinese thoroughwax**, is an Asian plant that has been used in **traditional Chinese medicine** and Japanese Kampo formulations to treat jock itch and other fungal skin infections. Bupleurum contains compounds known as saikosaponins, which have anti-allergic and anti-inflammatory effects.

A good remedy for jock itch is to wash the groin area with the diluted juice of a freshly squeezed lemon, which can help dry up the rash. A hair dryer on the cool setting can also be used on the area after showering to dry it thoroughly. A warm bath relieves itching in many patients. The affected area should kept clean and dry, and patients are advised to wear loose-fitting

pure cotton underwear. Fabrics that contain polyester or nylon hold moisture against the body.

Allopathic treatment

Typical conventional treatment for jock itch involves the use of an antifungal cream, spray, or powder twice a day for about two weeks. Two commonly used over-the-counter antifungal preparations are *clotrimazole* (Lotrimin) and *tolnaftate* (Tinactin). While the tendency to discontinue treatment once itching disappears is common, patients should use the antifungal preparation for a full two-week course in order to prevent recurrence of the infection. Doctors recommend continuing the treatment for a full week following clinical clearance of the infection.

Expected results

Most tinea infections resolve without scarring or spread of infection below the skin's surface. Inflammation, however, may require the use of a combination antifungal/steroid medication.

Prevention

Careful attention to skin hygiene, including the maintenance of clean, dry, and intact skin, is the most important step in preventing the development of fungal infection. Light clothing should be worn during warm weather, to decrease perspiration and allow dissipation of body heat. Clean and dry cotton underwear will wick perspiration away from the skin, and prevent jock itch from developing. Use baby powder to keep the area dry during **exercise**. Do not share towels at the gym. Dietary measures discussed under treatment will also prevent initial fungal infection and/or recurrence.

Resources

BOOKS

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

PERIODICALS

Park, K. H., J. Park, D. Koh, and Y. Lim. "Effect of Sai kosaponin A, a Triterpenoid Glycoside, Isolated from *Bupleurum falcatum* on Experimental Allergic Asthma." *Phytotherapy Research* 16 (June 2002): 359 363.

Weinstein, A., and B. Berman. "Topical Treatment of Common Superficial Tinea Infections." *American Family Physician* 65 (May 15, 2002): 2095 2102.

ORGANIZATIONS

American Academy of Dermatology. 930 East Woodfield Rd., PO Box 4014, Schaumburg, IL 60168. (847) 330 0230. www.aad.org.

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. www.aaom.org.

Kathleen Wright
Rebecca J. Frey, PhD

Jojoba oil

Description

Jojoba (pronounced ho-ho-ba) oil is a vegetable oil obtained from the crushed bean of the jojoba shrub (*Simmondsia chinenis*). The jojoba shrub is native to the Sonoran Desert of northwestern Mexico and neighboring regions in Arizona and southern California. It grows in dense stands throughout that region. The woody evergreen shrub may reach 15 ft (4.5 m) in height. Jojoba has flat gray-green leathery leaves and a deep root system that make it well adapted to desert heat and drought. It has a life span of 100–200 years, depending on environmental conditions. Jojoba grows best in areas with 10–18 in (25–45 cm) of annual rainfall where temperatures seldom fall below 25°F (-4°C) for more than a few hours at night. It can grow on many types of soils, including porous rocks, in slightly acid to alkaline soils, and on mountain slopes or in valleys.

Jojoba shrubs are dioecious, meaning plants are either male (staminate), producing pollen, or female (pistillate), producing flowers. The small flowers have no odor or petals and do not attract pollinating insects. The flowers are pollinated by wind in late March; the flowers develop into fruit by August, with full maturation occurring by October. The green fruit dries in the desert heat, its outer skin shriveling and pulling back to expose a wrinkled brown soft-skinned seed (referred to as a nut or bean) the size of a small olive. These nuts, which resemble coffee beans, contain a vegetable oil that is clear and odorless but less oily to the touch than traditional edible oils. The oil comprises half of the weight of the nut. There are about 1,700 seeds in a pound; 17 lb (6.3 kg) of jojoba seeds are required to produce one gallon of oil.

Native Americans have used jojoba for hundreds of years. In the 1700s, Father Junipero Serra, the founder of 21 California missions, noted in his diary

that the Native Americans were using the oil and the seeds for many different purposes: for treating sores, **cuts**, **bruises**, and **burns**; as a diet supplement and as an appetite suppressant when food was not available; as a skin conditioner, for soothing windburn and **sunburn**; as a cooking oil; as a hair or scalp treatment and hair restorative; and as a coffee-like beverage by roasting the seeds.

The chemical structure of jojoba oil is different from that of other vegetable oils. Rather than being an oil, it is actually is a polyunsaturated liquid wax that is similar to sperm whale oil, though without the fishy odor. It is made of fatty acids as well as esters composed entirely of straight chain alcohols. Both the acid and alcohol portions of jojoba oil have 20 or 22 carbon atoms, and each has one unsaturated bond. Waxes of this type are difficult to synthesize. As a wax, jojoba oil is especially useful for applications that require moisture control, protection, and emolliency. Jojoba oil is liquid at room temperature because of its unsaturated fatty acids. It does not oxidize or become rancid and does not break down under high temperatures and pressures. Jojoba oil can be heated to 370°F (188°C) for 96 hours without exhibiting degradation in general composition and carbon chain length. The stability shown by jojoba oil makes it especially useful for cosmetic applications.

When the United States banned the use of sperm whale oil (spermaceti wax) in 1974, the government began to fund efforts to investigate and cultivate jojoba as a replacement. Jojoba oil was found to be an adequate substitute for applications that had previously used sperm whale oil. The first commercial cultivation of jojoba was in the Negev Desert and Dead Sea areas of Israel, but by 1977, domestic cultivation had begun in the United States. In 2000, the International Jojoba Export Council expected the global jojoba production to increase 15% over a five-year period.

General use

Jojoba oil has many uses in a wide variety of industries. As a cosmetic, it is an effective cleanser, conditioner, moisturizer, and softener for the skin and hair. It is applied directly to the skin to soften the skin, to reduce wrinkles and stretch marks, to lighten and help heal scars, and to promote healthy scalp and hair. Jojoba oil is similar to, and miscible with, sebum, which is secreted by human sebaceous glands to lubricate and protect skin and hair. When sebum production decreases due to age, pollutants, or environmental stresses, jojoba oil can be used to replicate sebum oil. Jojoba oil can accumulate around hair roots, thereby conditioning hair and preventing it from becoming brittle and dull. If there is too much sebum buildup on the scalp, it dissolves and removes the sebum, leaving the hair clean. Jojoba oil as a solubilizing agent can also remove sticky buildup on hair from hair preparations as well as airborne particulates deposited on the hair. It forms a lipid layer on the skin, acting as a moisturizer, as well as penetrating and being absorbed by the outer layer of skin. It is widely used as an ingredient in shampoos, conditioners, facial, hand and body lotions, cuticle and nail care products, baby care lotions, creams, and oils, cleansers, moisturizers, bath oils and soaps, sunscreen lotions, and makeup products. Jojoba oil is also used as a base in the manufacture of perfume.

KEY TERMS

Noncomedogenic—A substance that contains nothing that would cause blackheads or pimples to form on the skin. Jojoba oil is noncomedogenic.

The potential therapeutic uses of jojoba oil include the treatment of **acne**, cold sores, and such skin diseases as **psoriasis**.

Jojoba oil is also a registered (licensed for sale) pesticide for use on crops. It is used to control white flies on all crops and powdery mildew on grapes and ornamentals. It is applied as a spray containing 1% or less final concentration of jojoba oil. It acts as a pesticide by forming a physical barrier between an insect pest and the leaf surface. Because of its low toxicity and its rapid degradation in the environment, jojoba oil does not pose a risk to non-target organisms or the environment; though as an oil, it should not be disposed of in lakes or other bodies of water.

Preparations

Jojoba oil is prepared by pressing the jojoba seeds to extract the oil, followed by filtration. It is then pasteurized to ensure product safety. Four grades of jojoba oil are produced: (1) a pure, natural golden grade, a golden-yellow color oil that is produced by the basic production process; (2) refined and bleached jojoba oil, with color removed by bleaching and filtration; (3) a decolorized/deodorized grade, which is used in cosmetics requiring colorless and odorless oils; and (4) a molecular distilled grade, an expensive formulation produced in minimal quantities, with its use having mostly been replaced with decolorized/deodorized jojoba oil.

Precautions

Jojoba oil is a nontoxic, noncomedogenic (does not clog pores), and hypoallergenic substance. It has been widely used for decades in cosmetics, with no reported adverse effects. If jojoba oil is ingested, most of it is eliminated in the feces, with little getting distributed in the body.

Side effects

No side effects are expected with the use of jojoba oil in recommended amounts, although allergic reactions are a rare possibility.

Interactions

Since jojoba oil does not oxidize or become rancid, it is added to other oils to extend their shelf life.

Resources

BOOKS

Baldwin, A.R. *Seventh International Conference on Jojoba and Its Uses*. American Oil Chemists Society, 1989.

Wisniak, Jaime. *The Chemistry and Technology of Jojoba Oil*. American Oil Chemists Society, 1987.

Judith Sims

Journal therapy

Definition

Journal therapy is the purposeful and intentional use of a written record of one's own thoughts or feelings to further psychological healing and personal growth. It is often used as an adjunct to many **psychotherapy** and recovery programs. Healthcare practitioners maintain that written expression fills a very important role in the therapeutic process by providing a mechanism of emotional expression in circumstances in which interpersonal expression is not possible or viable.

Origins

People have kept journals and diaries to record dreams, memories, and thoughts since ancient times. Emotional expression has also long held a central role in the study and practice of psychology. Throughout history, psychologists have advocated the expression of emotions as essential for good mental and physical health. Since the early 1980s, interest in this topic has resulted in numerous research studies investigating the health benefits of expressive writing.

KEY TERMS

Art therapy—The use of art media to assess and treat an individual's development, abilities, personality, interests, concerns, or conflicts.

Psychodyamic—The scientific study of mental or conditional forces developing especially in early childhood and their effect on behavior and mental states.

Benefits

Journal writing produces a number of benefits in healthy people—among other things, it enhances creativity, helps cope with **stress**, and provides a written record of memorable life experiences. Likewise, some researchers have found that journal writing has a number of psychological and physical health benefits for people who are ill.

Aside from a reduction in physical symptoms of disease, the psychological benefits include reconciling emotional conflicts, fostering self-awareness, managing behavior, solving problems, reducing **anxiety**, aiding reality orientation, and increasing self-esteem. Writing therapy has been used as an effective treatment for the developmentally, medically, educationally, socially, or psychologically impaired and is practiced in mental health, rehabilitation, medical, educational, and forensic institutions. Populations of all ages, races, and ethnic backgrounds are served by writing therapy in individual, couple, family, and group therapy formats.

The therapeutic use of expressive writing allows individuals to confront upsetting topics, thus alleviating the constraints or inhibitions associated with not talking about the event. The psychological drain of the inhibition is believed to cause and/or exacerbate stress-related disease processes. Researchers have found that emotional expression facilitates cognitive processing of the traumatic memory, which leads to emotional and physiological change. Specifically, written emotional expression promotes integration and understanding of the event while reducing negative emotions associated with it.

Description

Journal writing and other forms of writing therapy are based on the premise that the mind and the body are inseparably joined in the healing process. Although there are many methods of conducting

journal writing therapy depending on the therapeutic technique of the psychologist or psychiatrist, the therapist often instructs the participant to write about a distressing or traumatic event or thought in one or more sessions.

Although researchers are uncertain about exactly how writing about traumas produces improvements in psychological well-being, traumatic stress researchers have pointed out that ordinary memories are qualitatively different from traumatic memories. Traumatic memories are more emotional and perceptual in nature. The memory is stored as a sensory perception, obsessional thought, or behavioral reenactment. It is associated with persistent, intrusive, and distressing symptoms, avoidance, and intense anxiety that results in observed psychological and biological dysfunction. Thus, one goal in treating traumatic memories is to find a means of processing them.

A narrative that becomes more focused and coherent over a number of writing sessions is often associated with increased improvement, according to several research studies. The memories become deconditioned and restructured into a personal, integrated narrative. Changes in psychological well-being after writing therapy may result from cognitive shifts about the trauma either during or after the writing process.

Preparations

In a health care setting, the participant often prepares for journal writing by receiving (from the therapist) a set of instructions regarding the length and focus of the writing session or sessions. Other instructions may include writing in a stream-of-consciousness fashion, without censorship or concern about grammar or style.

Precautions

It is advisable that journal therapy be conducted only by a licensed health professional, such as a certified **art therapy** practitioner or trained psychologist or psychiatrist. While journal writing classes available to the general public may perform a variety of useful functions, these classes are not intended to provide medical therapy. In journal therapy, the participant may, for example, uncover potentially traumatic, repressed, or painful memories. Therefore, a trained health professional may be necessary to supervise the process and treat these symptoms as they arise.

Side effects

There are no known side effects of journal or writing therapy.

Research and general acceptance

Therapeutic writing became an increasingly popular topic in the final decades of the twentieth century, not only among trained health care professionals, but also among self-improvement speakers without medical training. Seminars, workshops, and Internet sites purportedly offering therapy though expressive writing sprang up around the nation and gained popular acceptance. Despite the large body of research indicating that writing confers benefits on healthy people, the topic of writing therapy's affects on diseased individuals has not received a great deal of research attention. Although increasingly used by health care professionals as an adjunct to various therapeutic approaches, the practice has been criticized by some members of the health care community. Some researchers are distrustful of the findings that so much measurable improvement in health status can occur in just a few brief writing sessions.

In the United Kingdom, the focus of journal therapy has been on descriptive accounts and psychodynamic explanations for subjective improvements in the health status of participants. In the United States, on the other hand, the focus is on formal scientific research aimed at validating the impact of brief, highly standardized writing exercises on physical measures of illness. The research demonstrates that although physical measures of illness may change, the reasons for the change are not always clear.

In the United States, one study on the effects of writing about stressful experiences on symptom reduction in patients with **asthma** or **rheumatoid arthritis** found that after four months of writing therapy—in conjunction with standard pharmacotherapy—nearly half the patients enrolled in the study experienced clinically relevant improvement. A growing number of studies have documented symptom improvement in patients with psychiatric disorders as well, suggesting that addressing patients' psychological needs produces both psychological and physical health benefits.

Training and certification

Although journal therapy is often provided by certified instructors who receive variable amounts of training in a number of programs around the country, journal therapy is best administered by a licensed psychologist (who may also be an art therapist) or psychiatrist.

Educational, professional, and ethical standards for art therapists who conduct writing therapy are regulated by The American Art Therapy Association, Inc. The American Art Therapy Credentials Board,

Inc., an independent organization, grants postgraduate supervised experience. A registered art therapist who successfully completes the written examination administered by the Art Therapy Credentials Board qualifies as Board Certified (ATR-BC), a credential requiring maintenance through continuing education credits.

Resources

BOOKS

Adams, Kathleen. *Journal to the Self*. New York: Warner Books,1990.

PERIODICALS

Greenhalgh, Tricia. "Writing as Therapy." *British Medical Journal* (July 1999): 270 271.

Nye, Emily F. "Writing as Healing" *Qualitative Inquiry* (December 1997): 439 450.

Smyth, Joshua M. et al. "Effects of Writing About Stressful Experiences on Symptom Reduction in Patients With Asthma or Rheumatoid Arthritis." *Journal of the American Medical Association* (April 1999): 1304 1309.

Smyth, Joshua M. "Written Emotional Expression: Effect Sizes, Outcome Types, and Moderating Variables." *Journal of Consulting and Clinical Psychology* (1998): 174 184.

Spiegel, David. "Healing Words: Emotional Expression and Disease Outcome." *Journal of the American Medical Association* (April 1999): 1328 1329.

Walker, B. Lee, Lillian M. Nail, and Robert T. Croyle. "Does Emotional Expression Make a Difference in Reactions to Breast Cancer?" *Oncology Nursing Journal* (July 1999): 1025 1032.

ORGANIZATIONS

The American Art Therapy Association. 1202 Allanson Road. Mundelein, IL 60060 3808. *http://www.arttherapy.org*.

The Center for Journal Therapy. 12477 W. Cedar Drive, #102. Lakewood, CO 80228. http://www.journaltherapy.com.

Genevieve Slomski

Juice therapies

Definition

Juice therapy involves the consumption of the juice of raw fruit or vegetables. A person may drink juice preventively to stay healthy, to treat a medical condition such as **cancer**, or to produce a certain outcome, such as strengthening the immune system. Three widely practiced juice therapies differ primarily in the amount of time that a person is involved in the therapy and whether other items are included in the person's diet.

Vitamins and minerals found in juices

Type of juice	Vitamins and minerals
Apple	Chromium, selenium, vitamin C
Asparagus	Folic acid, potassium, vitamins A, B_6, C, and K
Bok choy	Calcium
Broccoli	Folic acid, phosphorus, potassium, vitamins A, B_6, C, E, and K
Brussel sprouts	Folic acid, potassium, thiamine, vitamins B_6, C, and K
Cabbage	Calcium, chromium, manganese, vitamins B_6 and C
Cantaloupe	Beta-carotene, potassium, vitamin C
Carrots	Beta-carotene, zinc
Celery	Potassium, vitamins B_1, B_2, B_6, and C
Citrus fruits	Vitamin C
Collard greens	Calcium, vitamin K
Garlic	Manganese, selenium, vitamin B_6
Ginger	Zinc
Green peas	Zinc
Kale	Calcium, folic acid, vitamins B_6 and K
Orange	Folic acid, potassium, vitamin C
Papaya	Beta-carotene, vitamin A, C, and E
Peppers	Vitamin C
Spinach	Vitamins B_6 and E
Sweet peppers	Chromium
Tomatoes	Carotenes (especially lycopene), folic acid, niacin, vitamins C and K
Turnip	Calcium, copper, folic acid, manganese selenium, vitamin C
Turnip greens	Calcium, folic acid, manganese, vitamins B_6, C, and E

*Selenium amounts in plant foods vary greatly depending on the amount in the soil in which the plants are grown.

(Illustration by Corey Light. Cengage Learning, Gale)

For some people, adding fresh juice to their daily meal plan is sufficient. Others will embark on a juice fast for several days to cleanse their systems. Juice is also a major component of the so-called **Gerson therapy** diet that is used to treat cancer. This therapy usually starts with a stay of three to eight weeks in a clinic. Then therapy continues at home and may continue for years.

Origins

Fasting and juice consumption

The two components of most juice therapies, **fasting** and juice consumption, date back thousands of years. Fasting is a long-standing religious tradition described in the Bible and other ancient writings. The medicinal use of juice can be traced back thousands of years to India. Proponents of **Ayurvedic medicine**, a healing system, believed that drinking juice strengthens body tissues.

In the centuries that followed, people continued to recognize that eating fruit and vegetables produced health benefits. Much folklore and many sayings developed around the benefits of fruits and vegetables. Carrots were said to improve eyesight; and according to the adage, "An apple a day keeps the doctor away." During the twentieth century, fruit and vegetables became important components of healing therapy.

Gerson juice diet

During the 1940s, a German doctor, Max B. Gerson, developed a therapy using juice to treat his migraine headaches. He developed the therapy further and recommended it to people diagnosed with migraines, arthritis, **tuberculosis**, and cancer. His diet was based on the theory that excess **sodium** in a person's system disrupts the immune system and the functions of the liver, pancreas, and thyroid gland. Gerson developed a low-salt organic diet that focused on raw vegetable and fruit juices. The diet included nutritional supplements and coffee enemas, which he claimed, detoxified the liver and relieved **pain**. Since the therapy worked for Gerson, he recommended it to patients.

Advocates of juice therapies maintain that refraining from eating solid food boosts the body's ability to heal itself. Since the body is not spending time and energy on digesting complex high-fat food, it can concentrate on healing instead. Advocates also believe that all-juice **diets** can help the body eliminate toxins (poisons). This reasoning is typically the basis put forth in support of juice fasts.

Juicing

Another form of juice therapy known as juicing involves extracting the juice from raw fruit and vegetables. From the 1970s on, people like "Juiceman" Jay Kordich popularized the concept of drinking fresh juice to boost energy, lose weight, and achieve other health benefits. Kordich provided recipes and sold juice extractors that are also known as "juicers."

Kordich toured the country and talked about juice ingredients that seemed exotic to a public used to tomato juice and orange juice. He presented suggestions for new juice combinations, such as juiced potato, apple, carrot, and **parsley**. Kordich even provided various recipes that were aimed at producing specific results, such as weight loss or increased vitality. Through his infomercials and presentations, as well as those of other people who followed in his footsteps, the public became much more conscious of juice and its potential health benefits. One outgrowth of the interest in juices has been the establishment of chain stores such as Jamba Juice that sell primarily juice drinks.

Benefits

Research has shown that a diet rich in fresh fruits and vegetables reduces the risk of such chronic diseases such as **heart disease** and diabetes. This diet is also believed to reduce the risk of developing cancer. Furthermore, raw vegetables and fruit contain vitamins, food enzymes, minerals, **amino acids**, and natural sugars. Some of those nutrients are altered or lost in commercial juices sold in stores because, with few exceptions, these juices must be pasteurized (heat treated) to prevent spoilage. According to juice therapy advocates, however, the benefits of fresh juices extend beyond their nutritional content.

Proponents of juice therapies continue to study its benefits. In 2002, a physician reported to the American College of Cardiology that two cups of orange juice daily significantly lowered the blood pressure of hypertensive patients. A British study in the same year verified the positive effects of **cranberry** juice on urinary tract **infections**.

Juice is used in Ayurvedic treatment for such conditions as arthritis, **anemia**, and **constipation**. Juice is also a component of naturopathy, which is also known as the "whole body cure." A naturopathic doctor may prescribe a juice fast as part of treatment for arthritis, cancer, or **AIDS**. Supporters of juice fasting believe that the process releases a hormone that helps the body fight disease so that a juice fast strengthens the immune system. The fast also allows the naturopathic

physician to identify food sensitivities (allergens) as the patient begins eating food.

Juice fasting is also a part of **detoxification** therapy. It is part of the Gerson diet, a cancer therapy said to eliminate the build-up of toxins in the body by stimulating enzymes, improving the digestive system, and providing the correct balance of vitamins and minerals.

Description

Juice therapy can be as simple as extracting the juice from raw produce or as complicated as the Gerson diet. The therapies vary in the amount of commitment involved and the cost. Whether a therapy is covered by medical insurance will depend on the health plan. The costs of juicing or fasting at home are generally not covered. A juice fast administered as part of another treatment by a doctor or other health care provider might be covered. For Gerson therapy, some companies pay for part or all of the costs, according to the Gerson Institute Web site. Individuals interested in therapeutic juice fasting as part of treatment for a specific disease should check with their insurance company about coverage.

Gerson therapy

The Gerson therapy treatment was originally administered at a Gerson therapy clinic. Today, the institute does not operate facilities; instead since 1999, it has licensed such facilities as the Oasis of Hope Hospital in Tijuana, Mexico. The Gerson therapy treatment is based on drinking freshly pressed vegetable and fruit juice every hour. During a typical day at a Gerson clinic, a person would drink 13 glasses of raw carrot/apple and green-leaf vegetable juices. Vegetarian meals of organically grown food are served. During treatment, the patient receives coffee enemas during the evening to detoxify the blood and tissues. A stay at the Oasis of Hope is quite expensive and may not be covered by medical insurance.

Fasting

A juice fast can be undertaken at home with no professional guidance or under the direction of an alternative medicine practitioner such as a naturopathic doctor. The fast could also be part of the program at a retreat center.

Another juice therapy option is a short-term cleansing diet lasting two to three days. One popular fast involves consumption of fruit and vegetable juice for several days. In some plans, herbal tea and broth are allowed. Another variation is the raw food diet, which involves eating uncooked fruit and vegetables. Advocates claim the diet is useful in treating such conditions as heart disease and arthritis.

Juicing

Juicing involves the extraction of juice from raw fruit or vegetables. An extractor, fresh produce, and a commitment of time to juice the items are required. A blender is not strong enough to juice produce. Juice extractors are priced from about $120–$2,000. Juice should be consumed as soon as possible after extraction. When it is stored, juice loses some of its nutritional value.

BENEFICIAL JUICES. While most people know that orange juice is rich in **vitamin C**, the juices of other produce are believed to provide other health benefits. The wide selection of juices offers benefits that include the following:

- An 8-oz (240 ml) glass of carrot juice contains more than 10 times the recommended daily allowance of vitamin C.
- Fresh fruit and vegetable juices, including wheatgrass juice, are consumed for ulcers. Ulcer remedies include raw potato juice for peptic ulcers. For a duodenal ulcer, raw cabbage juice can be mixed with carrot and celery juice.
- Cranberries help prevent and treat urinary infections.
- Beet juice can be diluted to stimulate the liver.
- Garlic lowers the blood pressure and cholesterol.
- Cantaloupe juice can be consumed for stress.

Preparations

Individuals should consult a doctor or nutritionist before beginning a fast or treatment such as Gerson therapy. The medical professional can determine whether it is safe for the individual to undertake the fast, and recommend duration for the fast. The individual should also discuss with his or her healthcare provider any warning signs that indicate health problems are developing from the therapy. Prolonged fasting can be dangerous and knowing the signs of a possible problem can help prevent serious health consequences.

Precautions

Some precautions should be taken with each form of juice therapy. Juicing removes much of the necessary dietary fiber found in fruits and vegetables. Since an adult diet should contain 20–25 g of fiber per day, a person relying heavily on juice should find other sources of dietary fiber. Another caution is that carrot

greens, rhubarb greens, and apple seeds can be toxic and should not be juiced.

Some health professionals advise against fasting, a process they say can produce weakness, **fatigue**, anemia, and other conditions. Other health professionals believe that fasts are safe, but should not be undertaken by pregnant women, people who are diabetic, and those who have ulcers or a heart condition. In some cases, the doctor or practitioner may advise a supervised fast.

Another potential problem with juicing fresh fruit and some vegetables is that it can lead to the intake of considerable amounts of sugar. In some people, the sugar produces a quick rush of energy followed by a "crash." Although drinking juice can help individuals ensure that they get the recommended amounts of fruit and vegetables each day, consuming large amounts of fruit juice can lead to excessive sugar intake which can cause weight gain and increase the risk of type 2 diabetes.

Critics of the Gerson diet say that it has many dangerous side effects, including dehydration, electrolyte imbalance, constipation, infection, poor resistance to disease, excessive weight loss, inflammation of the colon, and in some cases even death. A person diagnosed with cancer should never undertake Gerson therapy instead of conventional cancer treatments such as chemotherapy. As of 2008, there were only two licensed Gerson centers in the world, 10-bed center in Tijuana, Mexico and a 3-bed center in California.

Side effects

The side effects of fasting can include weight loss, mental confusion, fatigue, electrolyte imbalance, constipation, **diarrhea**, and dehydration.

In Gerson therapy, diarrhea and **nausea** are considered part of the healing process. During the treatment, a person may experience flu-like symptoms, loss of appetite, weakness, and **dizziness**. Other side effects may include **feverblisters**, perspiration and **body odor**, intestinal cramping, and a painful feeling in tumors.

Research and general acceptance

The Gerson diet is highly controversial. Individuals who are proponents of the therapy have come forward with some studies they claim to be proof of its effectiveness. Members of the medical community have criticized these studies, however, for involving too few subjects, not being reproducible, and other methodological problems. According to the American Cancer Society, available scientific evidence does not support the health claims made by Gerson therapy practitioners. The Gerson diet is classified by the National Cancer Institute as not medically proven and potentially unsafe.

Both alternative and traditional medical practitioners accept the benefits of eating a diet that includes a wide variety of many different fruits and vegetables. Juicing, as part of a balanced, healthy diet, can be an excellent way for individuals to include fruits and vegetables in their diet. Juice fasts, however, especially those of long duration, are not widely accepted as beneficial, and many medical professionals warn against their potential dangers.

KEY TERMS

Ayurvedic medicine—A 5,000-year old system of holistic medicine developed on the Indian subcontinent. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Training and certification

Although there is no official training in juice therapy as such, those who administer it may have training and certification in other disciplines. A naturopathic doctor or medical doctors will have medical training. Individuals staffing the Gerson Clinics have been trained in Gerson therapy. A trained nutritionist or dietitian may recommend juicing as a way to include more fruits and staffers at Gerson Clinics have been trained in that therapy.

Resources

BOOKS

Bailey, Steven, and Larry Trivieri, Jr. *Juice Alive: The Ultimate Guide to Juicing Remedies*. Garden City Park, NY: Square One Publishers, 2007.

Brown, Ellen. *The Complete Idiot's Guide to Juicing*. Indianapolis: Alpha Books, 2007.

Cabot, Sandra. *Juice Fasting Bible: Discover the Power of an All Juice Diet to Restore Good Health, Lose Weight, and Increase Vitality*. Berkeley, CA: Ulysses Press, 2007.

Petersen Schepern, Elsa. *Juices*. New York: Ryland Peters and Small, 2004.

PERIODICALS

Gaby, Alan R. "Is the 'Gallbladder Flush' beneficial?" *Townsend Letter: The Examiner of Alternative Medicine* 293 (December 2007): 54.

Hideyuki, Emilio, et al. "New Beverage for Cardiovascular Health, Proposal Based on Oriental and Occidental Food Culture From a World Wide Epidemiological Study." *Geriatrics & Gerontology International* 18 (March 2008): S3 S7.

Kiani, Jawad, and Sadar Z. Imam. "Medical Importance of Grapefruit Juice and its Interaction with Various Drugs." *Nutrition Journal* 6.33 (October 30, 2007): 33.

ORGANIZATIONS

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

American Cancer Society, 1599 Clifton Road NE, Atlanta, GA, 30329 4251, (800) ACS 2345, http://www.cancer.org.

Gerson Institute, 1572 Second Avenue, San Diego, CA, 92101, (800) 838 2256, http://www.gerson.org.

Liz Swain
Teresa G. Odle
Tish Davidson, A. M.

KEY TERMS

Diuretic—A substance that promotes urination.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Sitz bath—A bath in which only the hips and buttocks are soaked.

Stomachic—A substance that increases the appetite.

Juniper

Description

Juniper (*Juniperus communis*) is an evergreen shrub found on mountains and heaths throughout Europe, Southwest Asia, and North America. The tree grows to a height of 6-25 ft (2-8 m) and has stiff, pointed needles that grow to 0.4 in (1 cm) long. The female bears cones that produce small, round, bluish black berries, which take three years to fully mature.

Juniper belongs to the pine family (Cupressaceae). Juniper has diuretic, antiseptic, stomachic, antimicrobial, anti-inflammatory, and antirheumatic properties. The tree's therapeutic properties stem from a volatile oil found in the berries. This oil contains terpenes, flavonoid glycosides, tannins, sugar, tar, and resin. Terpinen-4-ol (a diuretic compound of the oil) stimulates the kidneys, increasing their filtration rate. The flavonoid amentoflavone exhibits antiviral properties. Test tube studies show that another constituent of juniper, desoxypodophyllotoxins, may act to inhibit the herpes simplex virus. The resins and tars contained in the oil benefit skin conditions such as **psoriasis**.

For more than 300 years, juniper berries have been a popular flavoring agent for gin. The word gin comes from the Dutch word for juniper, "geniver." In addition to being an ingredient in alcohol, juniper also has medicinal properties. Ancient Egyptian doctors used the oil as a laxative as far back as 1550 B.C. The Zuni Native American people used the berries to assist them in **childbirth**. Other Native Americans gathered juniper berries and leaves to treat **infections**, arthritis, and **wounds**. British herbalists used juniper to promote **menstruation**. Nineteenth-century American herbalists used juniper as a remedy for congestive heart failure, **gonorrhea**, and urinary tract infections.

Juniper has also been used as a traditional remedy for **cancer**, arthritis, **gas**, **indigestion**, **warts**, **bronchitis**, **tuberculosis**, **gallstones**, **colic**, heart failure, intestinal disease, **gout**, and back **pain**. The berries were often eaten to relieve rheumatism or to freshen bad breath. When treating patients, doctors often chewed juniper berries to prevent infection.

General use

Modern herbalists prescribe juniper to treat bladder infections, kidney disease, chronic arthritis, gout, rheumatic conditions, fluid retention, cystitis, skin conditions, inflammation, digestive problems, menstrual irregularities, and high blood pressure. The German Commission E has approved juniper berries for use in treating **heartburn** and dyspepsia (indigestion), belching, and other digestive disturbances.

Juniper is a powerful diuretic. The volatile oil contained in juniper is composed of compounds that stimulate the kidneys to remove fluid and bacterial waste products from the body. This is useful in conditions such as congestive heart failure, urinary infections, and kidney disease.

The oil also has antiseptic properties, which makes it a useful disinfectant treatment for urinary and bladder infections. The German Commission E reported that juniper caused an increase in urine flow

and smooth muscle contractions. Juniper may be combined with other herbs such as **uva ursi**, **parsley**, cleavers, or **buchu** to treat bladder infections. In fact, juniper may help treat bladder infections more effectively when combined with other herbs.

Juniper's anti-inflammatory properties help to relieve the inflammation, stiffness, and pain that are present in conditions like arthritis, rheumatism, and gout. The berries can be made into an ointment and rubbed on the affected joints and muscles. The tree needles may be crushed and added to a bath to ease aching muscles. Some people may find relief from the nerve, muscle, joint, and tendon pains of gout and **rheumatoid arthritis** by applying a compress made from an infusion of juniper berries.

Juniper is also warming to the digestive system and increases the production of stomach acid, stimulates the appetite, settles the stomach, and relieves gas.

A steam distillation process is used to extract the essential oil of juniper from the ripe, dried berries. This aromatic oil has a light, fruity fragrance that is psychologically uplifting during periods of low energy, **anxiety**, and general weakness. Applied topically, essential oil of juniper has a warming effect on the skin and helps to promote the removal of fluid and waste products from tissues. External applications also help relieve sore muscles, joint and lower back pain, and can be used to clear up **acne**, **eczema**, and **varicose veins**. To stimulate menstruation, juniper oil can be added to a carrier oil and used in a sitz bath or massage. Steam inhalation of the essential oil may also help relieve coughs and lung conditions such as bronchitis.

Consumers should use juniper oil sparingly and should not use more than the recommended dose. Six or more drops of juniper oil can have a toxic effect. Any **aromatherapy** essential oil should be diluted in a carrier oil such as almond or grapeseed oil before external use.

Preparations

The ripe, mature berries and needles from the tree are used in herbal medicine. Juniper is available in bulk form as whole berries, or as a supplement in the form of capsules or tinctures.

The recommended tincture dosage is 10-20 drops four times daily.

Teas are often taken to relieve digestive problems. To make a tea, 1 cup of boiling water is poured over 1 tablespoon of juniper berries. The mixture is covered and steeped for 10-20 minutes. One cup can be drunk two times daily. The tea should not be used for longer than two weeks at a time. A clean cloth may be soaked in the cooled mixture to create a compress.

Precautions

Juniper should be used only for short periods of time. High doses or prolonged use of juniper may irritate the kidneys and urinary tract, causing damage. People with kidney problems should not use this herb.

Juniper stimulates contractions of the womb. Pregnant women should not use juniper. Breastfeeding women also should not use juniper.

Juniper may increase blood sugar levels in diabetics. Therefore, diabetics should consult with their doctor before using juniper.

When taking juniper for a **bladder infection**, consumers should see their doctor if the infection is still present after several days of use, or if lower back pain, **fever**, or **chills** develop.

Side effects

External application of juniper oil may cause a skin rash.

People with **allergies** may experience allergy symptoms such as nasal congestion.

Side effects of juniper overdose include **diarrhea**, purplish urine, blood in the urine, kidney pain, intestinal pain, elevated blood pressure, and a quickened heartbeat. If these effects occur, consumers should stop taking juniper and call their doctor immediately.

Interactions

Consumers should use juniper cautiously with other diuretic drugs or substances because excessive fluid loss may occur.

Resources

BOOKS

Lininger, Skye, D.C. *The Natural Pharmacy*. Virtual Health, LLC, 1998.

Time Life Books. *The Alternative Advisor*. Time Life Inc., 1997.

Jennifer Wurges

Juvenile rheumatoid arthritis

Definition

Juvenile **rheumatoid arthritis** (JRA) includes a number of different conditions, all of which affect children and all of which have immune-mediated joint inflammation as their major manifestation. JRA is also known as juvenile idiopathic arthritis or JIA. The European League Against Rheumatism (EULAR) refers to the disorder as juvenile chronic arthritis (JCA).

Description

The skeletal system of the body is made up of different types of strong, fibrous material known as connective tissue. Bone, cartilage, ligaments, and tendons are all forms of connective tissue that have different compositions and different characteristics.

The joints are structures that hold two or more bones together. Some joints (synovial joints) allow for movement between the bones being joined (articulating bones). The simplest model of a synovial joint involves two bones, separated by a slight gap called the joint cavity. The ends of each articular bone are covered by a layer of cartilage. Both the articular bones and the joint cavity are surrounded by a tough tissue called the articular capsule. The articular capsule has two components: the fibrous membrane on the outside, and the synovial membrane (or synovium) on the inside. The fibrous membrane may include tough bands of fibrous tissue called ligaments, which are responsible for providing support to the joints. The synovial membrane has special cells and many capillaries (tiny blood vessels). This membrane produces a supply of synovial fluid that fills the joint cavity, lubricates it, and helps the articular bones move smoothly about the joint.

In JRA, the synovial membrane becomes intensely inflamed. Usually thin and delicate, the synovium becomes thick and stiff, with numerous infoldings on its surface. The membrane becomes invaded by white blood cells, which produce a variety of destructive chemicals. The cartilage along the articular surfaces of the bones may be attacked and destroyed, and the bone, articular capsule, and ligaments may begin to be worn away (eroded). These processes severely interfere with movement in the joint.

JRA specifically refers to chronic arthritic conditions that affect a child under the age of 16 years and that last for a minimum of three to six months. JRA is often characterized by a waxing and waning course, with flares separated by periods of without noted symptoms (remission). Some literature refers to JRA as juvenile rheumatoid arthritis, although most types of JRA differ significantly from the adult disease called rheumatoid arthritis, in terms of symptoms, progression, and prognosis.

Demographics

JRA is the most common chronic inflammatory disease in children, affecting about 50,000 children in the United States.

Causes and symptoms

A number of different causes have been sought to explain the onset of JRA. There appears to be a genetic link; the tendency to develop JRA sometimes runs in particular families, and certain genetic markers are more frequently found in patients with JRA and other related diseases. Research has shown that several autoimmune diseases, including JRA, share a common genetic link. In other words, patients with JRA might share common genes with family members who have other autoimmune diseases such as rheumatoid arthritis, systemic lupus, **multiple sclerosis**, and others.

Many researchers have looked for some infectious cause for JRA, but no clear connection to a particular organism has ever been made. JRA is considered by some to be an autoimmune disorder. Autoimmune disorders occur when the body's immune system mistakenly identifies the body's own tissue as foreign and attacks those tissues, as if trying to rid the body of an invader (such as a bacteria, virus, or fungi). While an autoimmune mechanism is strongly suspected, certain markers of such a mechanism (such as rheumatoid factor, often present in adults with such disorders) are rarely present in children with JRA.

Joint symptoms of arthritis may include stiffness, **pain**, redness, warmth of the joint, and swelling. Bone in the area of an affected joint may grow too quickly or too slowly resulting in limbs that are of different lengths. When the child tries to avoid moving a painful joint, the muscle may begin to shorten from disuse, which is called a contracture.

Symptoms of JRA depend on the particular subtype. According to criteria published by the American College of Rheumatology (ACR) in 1973 and modified in 1977, JRA is classified by the symptoms that appear within the first six months of the disorder:

- Pauciarticular JRA: The most common and the least severe type of JRA, affecting about 40–60% of all JRA patients, pauciarticular JRA affects fewer than four joints, usually the knee, ankle, wrist, and/or elbow. Other more general (systemic) symptoms are usually absent, and the child's growth usually remains normal. Very few children (less than 15%) with pauciarticular JRA end up with deformed joints. Some children with this form of JRA experience painless swelling of the joint. Others have a serious inflammation of structures within the eye, which if left undiagnosed and untreated could lead to blindness. This condition, known as uveitis, affects about 20% of children diagnosed with JRA. While many children have cycles of flares and remissions, in some children the disease completely and permanently resolves within a few years of diagnosis.
- Polyarticular JRA: About 50% of all cases of JRA are of this type. Polyarticular JRA is most common in children up to age three or after the age of 10 and affects girls more often than boys. Polyarticular JRA affects five or more joints simultaneously. This type of JRA usually affects the small joints of both hands and both feet, although other large joints may be affected as well. Some patients with arthritis in their knees experience a different rate of growth in each leg. Ultimately, one leg grows longer than the other. About half of all patients with polyarticular JRA have arthritis of the spine and/or hip. Others with polyarticular JRA have other symptoms of a systemic illness, including anemia (low red blood cell count), decreased growth rate, low appetite, low-grade fever, and a slight rash. The disease is most severe in those children who are diagnosed in early adolescence. Some of these children test positive for rheumatoid factor (RF), a marker present in other autoimmune disorders. RF is found in adults who have rheumatoid arthritis. Children who are positive for RF tend to have a more severe course, with a disabling form of arthritis that destroys and deforms the joints. This type of arthritis is thought to be the adult form of rheumatoid arthritis occurring at a very early age.
- Systemic onset JRA: Sometimes called Still's disease (after a physician who originally described it), this type of JRA occurs in about 10% of children with arthritis. Boys and girls are equally affected, and diagnosis is usually made between the ages of five and 10. The initial symptoms are not usually related to the joints. Instead, these children have high fevers; a rash; decreased appetite and weight loss; severe joint and muscle pain; swollen lymph nodes, spleen, and liver; and serious anemia. Some children experience other complications, including inflammation of the sac containing the heart (pericarditis), inflammation of the tissue lining the chest cavity and lungs (pleuritis), and inflammation of the heart muscle (myocarditis). The eye inflammation often seen in pauciarticular JRA is uncommon in systemic onset JRA. Symptoms of actual arthritis begin later in the course of systemic onset JRA, and they often involve the wrists and ankles. Many of these children continue to have periodic flares of fever and systemic symptoms throughout childhood. Some children go on to develop a polyarticular type of JRA.
- Spondyloarthropathy: This type of JRA most commonly affects boys aged eight years and older. The arthritis occurs in the knees and ankles, moving over time to include the hips and lower spine. Inflammation of the eye may occur occasionally but usually resolves without permanent damage.
- Psoriatic JRA: This type of arthritis usually shows up in fewer than four joints but goes on to include multiple joints (appearing similar to polyarticular JRA). Hips, back, fingers, and toes are frequently affected. A skin condition called psoriasis accompanies this type of arthritis. Children with this type of JRA often have pits or ridges in their fingernails. The arthritis usually progresses to become a serious, disabling problem.

Diagnosis

Diagnosis of JRA is often made on the basis of the child's collection of symptoms. Laboratory tests often show normal results. Some nonspecific indicators of inflammation may be elevated, including white blood cell count, erythrocyte sedimentation rate, and a marker called C-reactive protein. As with any chronic disease, **anemia** may be noted. Children with an extraordinarily early onset of the adult type of rheumatoid arthritis have a positive test for rheumatoid factor.

Treatment

Range-of-motion and muscle-strengthening exercises are among the best natural therapies for JRA. Research has shown that **exercise** can decrease inflammatory agents while increasing anti-inflammatory compounds in the body, thereby improving immune function. However, physical activity can be challenging when patients are experiencing symptoms of pain. Physical or occupational therapists can provide supervised exercises to teach proper technique, and these exercises should be practiced as recommended at home.

To reduce morning stiffness, the child can take a hot bath or shower or apply a heating pad.

Diet is also believed to play a role in treating JRA. A number of autoimmune disorders, including JRA, seem to have a relationship to food **allergies**. Patients may experience symptom relief after identifying and eliminating food allergens from the diet, which can trigger inflammation. Following a diet low in saturated fats may also help reduce the inflammatory response, which can be increased by a diet high in saturated fats. A strict vegetarian diet low in fats and free of glutens may also be helpful. Including foods rich in **calcium** and **vitamin D** is also important to build bone mass and reduce the risk of **fractures**.

Massage has been shown to benefit children with JRA by reducing **anxiety** and **stress**, reducing pain, and reducing morning stiffness.

Alternative treatments that have been suggested for arthritis include juice therapy, which can work to detoxify the body, helping to reduce JRA symptoms. Some recommended fruits and vegetables are carrots, celery, cabbage, potatoes, cherries, lemons, beets, cucumbers, radishes, and **garlic**. Tomatoes and other vegetables in the nightshade family (potatoes, eggplant, and red and green peppers) are discouraged. As an adjunct therapy, **aromatherapy** preparations include cypress, **fennel**, and lemon. Massage oils include **rosemary**, benzoin, **chamomile**, camphor, **juniper**, **eucalyptus**, and **lavender**. Other types of therapy that have been used are **acupuncture**, **acupressure**, and body work.

Also shown to be effective in some cases are the **essential fatty acids**: **omega-3 fatty acids** in **fish oil**, and the omega-6 fatty acid gamma liolenic acid (GLA) found in **borage oil**, current seed oil, and **evening primrose oil**. Several alternative medicine doctors suggest there may be some benefit in taking **cartilage supplements**, although no definitive studies had been done as of 2008 on this treatment. Anti-inflammatory spices such as **turmeric**, **ginger**, and **cayenne** may be helpful. Natural remedies such as **yucca**, **burdock root**, **horsetail**, **devil's claw**, sarsaparilla, and **white willow** bark also can be helpful since they have anti-inflammatory and analgesic properties.

Nutritional supplements that may be beneficial include large amounts of **antioxidants** (vitamins C, A, E, **zinc**, **selenium**, and flavonoids), as well as B vitamins and a full complement of minerals (including **boron**, **copper**, **manganese**). One study showed 1,800 International Units (IU) of **vitamin E** a day could be helpful in relieving symptoms. Other nutrients that assist in detoxifying the body, including **methionine**, cysteine, and other **amino acids**, may also be helpful. Constitutional **homeopathy** can also work to quiet the symptoms of JRA and bring about balance to the whole person.

Allopathic treatment

Treating JRA involves efforts to decrease the amount of inflammation, in order to preserve movement. Nonsteroidal anti-inflammatory agents (such as ibuprofen, naproxen, diclofenac, and celecoxib) are usually the first line of treatment for JRA to reduce inflammation. Analgesics, including acetaminophen and tramadol, may provide pain relief but do not reduce inflammation. Patients should ask their doctor about using analgesics in combination with their other arthritis medications. Steroid medications are effective but have many serious side effects with long-term use. Injections of steroids into an affected joint can be helpful. Steroid eye drops are used to treat eye inflammation. Drugs that act on the immune system may be added when NSAID monotherapy is not effective in treating symptoms. These include: methotrexate (Rheumatrex), azathioprine (Imuran), leflunomide (Arava), cyclosporine (Sandimmune), sulfasalazine (Azulfidine), and hydroxychloroquine (Plaquenil). Glucocorticoids are stronger medications that may be used in select cases of JRA in low doses for short-term treatment.

Tumor necrosis factor (TNF) antagonists represent a newer class of biologic drugs used to treat JRA. These drugs include etanercept (Enbrel); infliximab (Remicade), which is usually given with methotrexate; and adalimumab (Humira), a drug in this class approved by the U.S. Food and Drug Administration in February 2008. These drugs ease joint pain, reduce swelling, and improve mobility and may be associated with less severe side effects than other medications.

Physical therapy and exercises are often recommended in order to improve joint mobility and strengthen supporting muscles. Occasionally, splints are used to rest painful joints and to prevent or improve deformities.

Research has confirmed that the blood serum of patients with JRA contained elevated levels of interleukin-6, a cytokine (nonantibody protein) that is critical to regulation of the immune system and blood cell formation. Because interleukin-6 is also associated with inflammation, researchers have suggested that compounds inhibiting the formation of interleukin-6 may provide new treatment options for JRA.

Expected results

Treatment and continued physical activity can prevent loss of function, provide pain relief, and maintain joint mobility. Most children with JRA can attend

KEY TERMS

Autoimmune disorder—A condition marked by an overactive immune system; the body's immune system mistakenly identifies the body's own tissue as foreign and attacks those tissues, as if trying to rid the body of an invader.

Rheumatoid factor—An antibody found in approximately 80% of patients with adult onset rheumatoid arthritis. When RF is identified in children with juvenile rheumatoid arthritis, there is an increased risk of joint damage, and the child may require more aggressive treatments.

Synovial membrane—A layer of connective tissue that lines the insides of joints, tendon sheaths, and bursae. The synovial membrane produces synovial fluid, which has a lubricating function.

Tumor necrosis factor (TNF) antagonist—A substance that blocks the action of TNF, a naturally occurring protein in the body that helps cause inflammation.

a regular school and benefit from being with children of the same age. Special school accommodations may be available for children with JRA under Federal Act 504 of the Rehabilitation Act of 1973, which bans discrimination against disabled persons in programs that receive federal funds.

The prognosis for pauciarticular JRA is quite good, as is the prognosis for spondyloarthropathy. Polyarticular JRA carries a slightly worse prognosis. RF-positive polyarticular JRA carries a difficult prognosis, often with progressive, destructive arthritis and joint deformities. Systemic onset JRA has a variable prognosis, depending on the organ systems affected, and the progression to polyarticular JRA. About 1 to 5% of all JRA patients die of such complications as infection, inflammation of the heart, or kidney disease.

Prevention

Little is known about the causes of JRA; therefore, there are no recommendations available for how to avoid developing it.

Resources

BOOKS

Hay, W. W., et al, eds. *Current Pediatric Diagnosis and Treatment,* 18th ed. Columbus, OH: McGraw Hill, 2007.

Imboden, John B., David B. Hellmann, and John H. Stone, eds. *Current Rheumatology Diagnosis & Treatment,* 2nd ed. Columbus, OH: McGraw Hill, 2007.

PERIODICALS

Riddle, R., et al. "The Impact on Health Related Quality of Life from Non Steroidal Anti Inflammatory Drugs, Methotrexate, or Steroids in Treatment for Juvenile Idiopathic Arthritis." *Journal of Pediatric Psychology* 31, no. 3 (April 1, 2006): 262 271.

ORGANIZATIONS

American College of Rheumatology, 1800 Century Place, Suite 250, Atlanta, GA, 30345, (404) 633 3777, http://www.rheumatology.org.

Arthritis Foundation, PO Box 7669, Atlanta, GA, 30357 0669, (800) 283 7800, http://www.arthritis.org.

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), National Institutes of Health, 1 AMS Circle, Bethesda, MD, 20892 3675, (877) 226 4267, (301) 495 4484, http://www.niams.nih.gov.

Ken R. Wells
Teresa Norris
Rebecca J. Frey, PhD
Angela M. Costello

K

Kali bichromium

Description

Kali bichromium is a bright orange, caustic, corrosive compound used in the manufacture of dye, photography, and batteries. It is also used as a homeopathic remedy. In **homeopathy**, **potassium** bichromate is diluted to the point where it no longer retains any poisonous or caustic qualities. Homeopaths usually abbreviate kali bichromium as kali bich. or as kali bi.

General use

Homeopathic medicine operates on the principle that "like heals like." This means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow another homeopathic law, the Law of Infinitesimals. In opposition to traditional medicine, the Law of Infinitesimals states that the lower a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount, if any, remains in a huge amount of the diluting liquid.

In homeopathic medicine, kali bichromium is said to have an affinity for the mucous membranes and the skin. It is used primarily to treat stringy yellowish or greenish mucous discharges from any part of the body, including the nose, throat, larynx, vagina, urethra, and stomach. Its most common use is to treat colds that are accompanied by sinus congestion or evolve into sinusitis.

In these situations the patient feels pressure and fullness in the sinuses and experiences extreme **pain** at the root of the nose that improves when pressure is applied to the painful spot. Kali bichromium is also used to treat feelings of fullness and pressure in the middle ear and to treat sinus or migraine headaches that start at night.

In addition, kali bichromium is used to treat a sore throat with swollen tonsils, swollen neck, and a discharge of pus. In the mouth, ulcers or a dry, burning feeling are treated by kali bichromium when accompanied by intense pain at the root of the tongue or a dry, yellow-coated tongue.

Certain types of coughs are also treated with kali bichromium when the voice is rough and hoarse, and the **cough** is dry. If the cough worsens when breathing damp, cold air, worsens in the early hours of the morning, and is better in warm air, these are also indications to the homeopath that kali bichromium is an appropriate remedy.

Kali bichromium is used to treat joint pains that appear and disappear suddenly or wander to different spots in the body causing severe pain. These pains, like the cough, are improved by warmth.

Kali bichromium is sometimes used for relief of distress in the digestive system such as **nausea** and vomiting of yellow mucus and bile. In homeopathic terminology, the effectiveness of remedies is proved by experimentation and reporting done by famous homeopathic practitioners. Kali bichromium was proved as a **vomiting** remedy by Dr. John H. Clark (1853–1931).

In homeopathic medicine the fact that certain symptoms get better or worse under different conditions is used as a diagnostic tool to indicate what remedy will be most effective. Symptoms that benefit from treatment with kali bichromium get worse in the very early hours of the morning (2 a.m. to 5 a.m.), worsen in wet weather, are worse in the summer, are worse upon awaking, upon getting cold from undressing, and upon consuming alcohol (which often induces vomiting and **diarrhea** in patients that need this remedy). Symptoms improve with warmth, movement, pressure, and from eating. Patients needing kali bichromium tend to get cold easily.

Homeopathy also ascribes certain personality types to certain remedies. The kali bichromium personality is

KEY TERMS

Sinusitis—An inflammation of the sinuses with or without a mucus discharge.

Urethera—The tube that drains the bladder.

said to be listless with aversion to physical or mental **exercise**. People with kali bichromium personalities also tend to be rigid and inflexible, doing most activities such as eating, sleeping, and working on a rigid timetable. They are very detail oriented. Morally, they tend to be very proper, rigid, and conservative, which results in a narrow-minded, self-centered personality.

Preparations

Kail bichromium is prepared by extensive dilutions of what is called a mother tincture of potassium dichromate dissolved in an alcohol/water mixture. There are two homeopathic dilution scales, the decimal (x) scale with a dilution of 1:10 and the centesimal (c) scale where the dilution factor is 1:100. Once the mixture is diluted, shaken, strained, then re-diluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Kali bichromium is available commercially in tablets or pellets in strengths of 6x, 12x, 30x, 200x, 6c, 12c, 30c, and 200c.

Homeopathic and orthodox medical practitioners agree that by the time the mother tincture is diluted to strengths used in homeopathic healing, it is likely that very few if any molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called potentization that has not yet been explained by mainstream scientists.

Precautions

No particular precautions have been reported when using kali bichromium.

Side effects

When taken in the recommended dilute form, no side effects have been reported. However, concentrated quantities of this compound are corrosive.

Interactions

Studies on interactions between kali bichromium given in homeopathic doses and conventional pharmaceuticals are nonexistent.

Resources

BOOKS

Cummings, Stephen and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. 3rd edition. New York: Putnam, 1997.

Hammond, Christopher. *The Complete Family Guide to Homeopathy*. London: Penguin Studio, 1995.

Lockie, Andrew and Nicola Geddes. *The Complete Guide to Homeopathy*. London: Dorling Kindersley, 1995.

ORGANIZATIONS

Foundation for Homeopathic Education and Research. 21 Kittredge Street, Berkeley, CA 94704. (510) 649 8930.

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206) 776 4147.

National Center for Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314. (703) 548 7790.

ORGANIZATIONS

The British Institute of Homeopathy Canada. 1445 St. Joseph Blvd., Gloucester, ON K1C 7K9 Canada. (613) 830 4759. http://www.homeopathy.com.

OTHER

Holistic Medicine Online. http://www.holisticmed.com.

Tish Davidson

Kampo medicine

Definition

Kampo (sometimes spelled kanpo) is a Japanese variant of Chinese traditional medicine that involves the extensive use of herbs. The name is derived from the Japanese symbols *kan*, which means China and *po*, which means medicine. Kampo treatment has become very much integrated in the Japanese health care system. It is widely available from hospitals and physicians there, and is the most popular form of complementary health care in contemporary Japan. Kampo herbal preparations are sold by many pharmacies in Japan, which, according to the World Health Organization (WHO), has the highest per capita consumption of herbal medicine in the world. In addition to herbal treatments, Kampo practitioners may also administer **acupuncture**, **moxibustion** (therapy using moxa, or **mugwort** herb), and manipulative therapy.

Origins

Oriental traditional medicine has employed herbs for almost 4,000 years. Much of the earliest literature about the subject comes from ancient China, where wealthy families hired herbalists and paid them only

when everyone in the family enjoyed good health. Kampo medicine is a form of **traditional Chinese herbalism**, which came to Japan about 16 centuries ago and was refined over the years by Japanese practitioners. At Shoso-in, a famous historical site in western Japan, a 1,200-year-old cache of medicinal herbs was discovered—stored in air-tight wooden boxes. Researchers found that many of those samples still retained full medicinal potency.

Western medicine started to enter Japan with Jesuit missionaries and Dutch traders during the 16th and 17th centuries, but never succeeded in fully displacing traditional practices. In recent years, a considerable resurgence of Kampo's popularity has occurred.

Benefits

Kampo preparations are used to treat a wide variety of conditions, including **eczema**, atopic **dermatitis**, and gynecological problems. Other applications include **allergies**, **rheumatoid arthritis**, chronic **hepatitis**, diabetic **retinopathy**, bronchial **asthma**, endometrial **cancer**, collagen disease, colds, **nausea**, high **cholesterol**, and even **bedwetting**.

Description

Like other forms of Oriental traditional medicine, Kampo is based on concepts quite foreign to Western medical thinking. These concepts include *In-You* (negative and positive); *Gogyou* (five lines); *Ki* (air); *Sui* (water); and *Ketu* (blood). Unlike Western medicine, which thinks largely in terms of diseases affecting specific organs, Kampo emphasizes identifying patterns of "whole body" symptoms.

Kampo herbal treatments are divided into three basic groups related to urination, to sweating, and to defecation. Most prescriptions consist of a combination of crude drugs, used to treat whatever disharmony is detected. Kampo remedies usually take longer to work than standard pharmaceuticals. A typical trial period for a new prescription is three months. Patients may continue taking some prescriptions for years. Examples of crude drugs used in Kampo preparations include glycyrrhiza (**licorice**), rhubarb, and ginseng.

Japan's medical regulators have recognized Kampo since the 1970s, and Kampo herbs are included in the list of reimbursable drugs under the country's national health insurance plan. During the 1990s and continuing into the new millennium, Japanese officials required recertification of a number of Kampo drugs, insisting that their safety and effectiveness be re-evaluated.

Japanese pharmacists are allowed to manufacture a limited number of drugs themselves. Of these licensed products, 50 percent are Kampo products, according to the Japan Pharmaceutical Association.

Precautions

As with all Oriental herbal remedies, persons should use only Kampo preparations obtained from a reliable source. Serious problems have arisen when Oriental herbal prescriptions were misidentified or contained adulterants. The Register of Chinese Herbal Medicine in the United Kingdom recommends that patent medicines mixing Western and Oriental herbs be avoided, together with any patent preparation containing heavy metals. Some patients have developed hepatitis after taking patent-medicine tablets based on traditional Oriental formulas. One investigation revealed that the tablets did not contain the complete herb, but rather a chemical isolated from a single herb. This practice contradicts the most basic principles of Oriental traditional medicine, which uses combinations of whole herbs.

Because of Kampo's complexity, self-treatment is usually not advised, and consultation with a knowledgeable practitioner is essential. Some patients have experienced serious, even fatal, kidney or liver problems after treatment with Oriental herbs. Anyone with a history of disease in those organs should not be treated without accompanying blood tests to monitor their function. It has also been suggested that patients who consume considerable amounts of alcohol should receive liver function tests. It is important that patients be monitored after starting Oriental herb treatments to check for signs of liver or kidney problems.

Side effects

Because Kampo and other forms of Oriental traditional medicine are so old, practitioners say that most side effects were identified long ago and so are easily avoided by an experienced practitioner. Some Oriental herbal preparations, however, are known toxins that continue to be prescribed because of their beneficial effects. These must be used with extreme care, employing only low doses under the direction of a highly competent and certified practitioner. In most cases, these preparations should be used only in a hospital setting. In addition, some people may have an allergic hypersensitivity to certain herbs.

Research and general acceptance

In Japan, Kampo treatment is studied and frequently prescribed by medical doctors. As many as 70

percent of Japanese gynecologists are said to employ Kampo, particularly in menopausal patients.

Training and certification

In Japan, Kampo drugs are widely available from medical doctors and pharmacists. In the rest of the world, Kampo preparations and practitioners are largely unregulated.

Resources

BOOKS

Bensky, Dan, Steven Clavey, and Erich Stoger. *Chinese Herbal Medicine: Materia Medica*. Third edition. Seattle, WA: Eastland Press, 2004.

PERIODICALS

Kampo Today. http://www.tsumura.co.jp/English/kampo/today/index.htm (accessed February 11, 2008).

ORGANIZATIONS

Japan Society for Oriental Medicine. Kokusai Hamamatsucho Bldg. 6F, 1 9 18 Kaigan, Minato ku, Tokyo 105 0022, Japan. office@jsom.or.jp. http://www.jsom.or.jp/html/en/index.htm (accessed February 11, 2008).

OTHER

Dharmananda, Subhuti. "Kampo Medicine: The Practice of Chinese Herbal Medicine in Japan." http://www.itmonline.org/arts/kampo.htm (accessed February 11, 2008).

David Helwig
Leslie Mertz, Ph.D.

Kaposi's sarcoma

Definition

Kaposi's sarcoma (KS), also called multiple idiopathic hemorrhagic sarcoma, is a neoplastic disease associated especially with **AIDS**, usually affecting the skin and mucous membranes.

Description

Typically, raised lesions appear on the skin and in the mouth. These are quite disfiguring nodules or blotches and can be red or purple. The gastrointentinal track and the respiratory track can be involved with symptoms of coughing, **fever**, and inflammation and swelling.

Causes and symptoms

Kaposi's sarcoma (KS) is caused by human herpesvirus 8 (HHV8). Malignant cells are found in the tissues under the skin or mucous membranes that line the mouth, nose, and anus. KS causes red or purple patches on the skin and/or mucous membranes and spread to other organs, such as the lungs, liver, or intestinal tract. KS is seen in three forms:

- indolent
- lymphadenopathic
- AIDS related

The primary distinction between the three forms of KS is the rate of growth and the location of the lesions. In the past, the indolent form of Kaposi's sarcoma was the most common and was most often seen in men, over the age of 60 years, of Jewish or Italian ancestry, in African men, and in patients who had organ transplants or have had their immune systems impaired for other reasons. KS was frequently left untreated. Because of its slow growth, the **cancer** was not a threat to the patient. Since the 1980s, more cases with rapid growth have been observed, usually accompanied by AIDS (HIV disease).

The aggressive form of KS is seen in about one-third of patients with AIDS, and has become endemic in equatorial African. In African nations, aggressive KS is seen most often among young men and children.

Lymphadenophic KS affects the lymph nodes, as well as the skin structures.

Diagnosis

KS is traditionally diagnosed based on the red or purple patches on the skin or mucous membranes. A biopsy is usually performed in order to verify the diagnosis. Since other cancers may have a similar appearance to KS, it is often useful to test for the presence of human herpesvirus 8 in order to confirm the diagnosis.

Treatment

In indolent KS, localized treatment is often adequate. Superficial lesions may be removed surgically. Alternatives are radiation therapy, electrical curettage, in which the lesion is burned with an electrical current, or cryotherapy, in which a source of extreme cold, such as liquid nitrogen, is applied to the cancer in order to kill the cells.

Among patients who develop KS after an organ transplant, reduction in the dose of drugs used to control the immune response may be enough to control or

eliminate the cancer, although this procedure increases the risk of transplant rejection. One report from the University of Barcelona in Spain stated that a change of medication may resolve the problem of KS after transplantation.

In KS associated with AIDS, systemic chemotherapy is usually required.

The Gay Men's Health Crises (GMHC) has reviewed a number of alternative therapies that have been tried in KS, but none has shown consistently favorable results. Among the treatments mentioned were shark cartilage, herbal and purifying massage therapies to enhance immune function, and transcendental **meditation**. **Homeopathy** has been tried, but here too the results have not been reliable.

Allopathic treatment

KS cannot be cured in the usual sense of the term. However, treatments are available to deal with weakened immune systems that make possible the disease. Among individuals with HIV and AIDS diseases, drug "cocktails" to combat the human immunodeficiency virus (HIV) have produced improvement in KS symptoms in nearly half of all cases. Cryosurgery and radiation are sometimes used to remove the lesions associated with KS, but traditional surgery is generally not recommended because of dangerous side-effects.

Expected results

Expected results depend primarily on the underlying condition of the patient. Those patients who have classic, slow-growing KS may live many years, even in the absence of treatment. For patients with HIV/AIDS, a proposed staging system has divided patients into low and high risk groups, depending both on the extent of the sarcoma and their underlying immune function. Patients with well functioning immune systems, no AIDS associated opportunistic **infections**, and KS confined to the skin, have an estimated survival of about three years. Those with impaired immune systems, other infections, and more widespread KS, have an estimated survival of about one year. Overall survival depends on the patient's response to treatment.

A variety of other drugs is available for treating various aspects of KS. The antiviral drug vinblastine and **sodium** tetradecyl sulfate are sometimes injected directly into the lesions associated with KS. Systemic treatment for the disease is possible using the anti-cancer drugs doxorubicin and daunorubicin. Encouraging results with use of the anti-cancer drug paclitaxel (Taxol) and the anti-leukemia drug imatinib have also been reported.

KEY TERMS

Acquired immune deficiency syndrome (AIDS)—a disease in which the immune response is impaired. The disease is caused by the human immunodeficiency virus (HIV), which is spread by direct contact with body fluids such as blood and semen.

Lesion—A diseased patch of skin.

Sarcoma—A cancer arising from connective tissue such as skin.

Prevention

The United States Public Health Service (USPHS) guidelines for prevention of KS call for prophylactic administration of drugs that are effective against human herpesvirus-8. The primary drugs for this purpose are foscarnet and ganciclovir. In each case, the dose must be adjusted based on the patient's condition. While the USPHS recognizes that KS may affect children as well as adults, no formal recommendations for prevention had been published as of 2008.

Resources

BOOKS

Boshoff, C., and R. A. Weiss, eds. *Kaposi Sarcoma Herpesvirus: New Perspectives*. New York: Springer, 2006.

PERIODICALS

Caccialanza, M., et al. "Radiotherapy of Classic and Human Immunodeficiency Virus related Kaposi'S Sarcoma: Results in 1482 Lesions." *Journal of the European Academy of Dermatology & Venereology* (March 2008): 297 302.

Casper, Corey. "Defining a Role for Antiviral Drugs in the Treatment of Persons with HHV 8 Infection." *Herpes* (February 2006): 42 47.

Osawa, Rinko, et al. "Clearance of Recurrent, Classical Kaposi's Sarcoma Using Multiple Paclitaxel Treat ments." *Acta Dermato Venereologica* (September 2007): 435 436.

OTHER

"What Is Kaposi's Sarcoma?" American Cancer Society, March 14, 2006. http://www.cancer.org/docroot/CRI/content/CRI_2_4_1X_What_is_Kaposis_Sarcoma_21.asp. (February 12, 2008).

Samuel Uretsky, Pharm.D.
David Edward Newton, Ed.D.

Kava kava

Description

Kava kava (*Piper methysticum*) is a tropical shrub that grows throughout the Pacific Islands. Kava kava belongs to the pepper family (Piperaceae) and is also known as kava, asava pepper, or intoxicating pepper. It grows to an average height of 6 ft (1.83 m) and has large heart-shaped leaves that can grow to 10 in (25.4 cm) wide. A related species is *Piper sanctum*, a native plant of Mexico that is used as a stimulant.

Kava kava has been used as a medicinal herb for hundreds of years and used by Pacific Islanders to treat rheumatism, **asthma**, **worms**, **obesity**, headaches, **fungal infections**, leprosy, gonorrhea, vaginal **infections**, urinary infections, menstrual problems, migraine headaches, and **insomnia**. It was also used as a diuretic, an aphrodisiac, to promote energy, and to bring about sweating during colds and fevers. Pacific Islanders consume a kava kava drink at social, ritual, and ceremonial functions. It is drunk at ceremonies to commemorate marriages, births, and deaths; in meetings of village elders; as an offering to the gods; to cure illness; and to welcome honored guests. Pope John Paul II, Queen Elizabeth II, and Hillary Rodham Clinton have all drunk kava kava during their island visits.

The drink is prepared by grinding, grating, or pounding the roots of the plant, then soaking the pulp in cold water or coconut milk. Traditionally the root was chewed, spit into a bowl, and mixed with coconut milk or water. That practice is no longer the standard.

Captain James Cook has been accredited with the western discovery of kava kava during his journey to the South Pacific in the late 1700s. The first herbal products made from kava kava appeared in Europe in the 1860s. Pharmaceutical preparations became available in Germany in the 1920s. Currently, kava kava has received widespread attention because of its reputation to promote **relaxation** and reduce stress.

General use

Kava kava has been prescribed by healthcare providers to treat a wide range of ailments including

The root of the kava kava plant can be pressed into a muddy and bitter drink with relaxing benefits. The beverage is making a comeback in Hawaii amid a broader cultural renaissance in Hawaiian language, music and arts. *(Lucy Pemoni / AP Photo)*

Kava, leaves with inflorescences. *(© inga spence / Alamy)*

insomnia, nervousness, and stress-related **anxiety** and anxiety disorders. It is also reported to relieve urinary infections, **vaginitis**, fatigue, asthma, rheumatism, and **pain**.

The active ingredients in kava kava are called kavalactones and are found in the root of the plant. Kavalactones cause reactions in the brain similar to pharmaceutical drugs prescribed for depression and anxiety. Research has shown that kavalactones have a calming, sedative effect that relaxes muscles, relieves spasms, and prevents convulsions. Kavalactones also have analgesic (pain-relieving) properties that may bring relief to sore throats, sore gums, canker sores, and toothaches.

Kava kava is a strong diuretic that is reportedly beneficial in the treatment of **gout**, rheumatism, and arthritis. The effect of the herb relieves pain and helps remove waste products from the afflicted joints. Antispasmodic properties have shown to help ease menstrual cramps by relaxing the muscles of the uterus. Kava kava's antiseptic and anti-inflammatory agents may help relieve an irritable bladder, urinary tract infections, and inflammation of the prostate gland.

Preparations

Kava kava is available in dry bulk (powdered or crushed), capsule, tablet, tea, and tincture forms. Many of the products are made from the dried powder of the root. Western consumers have generally been advised to look for standardized extracts of kava kava that contain a 70% kavalactone content. On the other hand, a report submitted to the Committee of Safety of Medicines (CSM) of the United Kingdom in April 2002 indicates that many of the side effects reported in connection with kava kava are due to the high concentration of the herb in commercial standardized extracts. The report suggested that kava preparations made according to traditional methods are relatively safe. It is likely that controversy over kava kava will continue.

Precautions

Before 2002, the usual precautions regarding kava kava stated that it should not be used by pregnant or lactating women, or when driving or operating heavy machinery. The American Herbal Products Association (AHPA) advised consumers in 1997 not to take kava kava for more than three months at a time, and not to exceed the recommended dosages. In light of more recent findings, however, it would be prudent for many adults to completely avoid preparations of or products containing kava kava.

As of March 25, 2002, the United States Food and Drug Administration (FDA) recommended that people who have a history of liver disease or are taking medications that affect the liver should consult a physician before taking any preparations containing kava kava.

Side effects

Prior to 2002, most reports of side effects from kava kava concerned relatively minor problems, such as numbness in the mouth, headaches, mild **dizziness**, or skin **rashes**. Nineteenth-century missionaries to the Pacific islands noted that people who drank large quantities of kava kava developed yellowish scaly skin. A more recent study found the same side effect in test subjects who took 100 times the recommended dose of the plant.

As of 2002, however, kava kava has been associated with serious side effects involving damage to the liver, including **hepatitis**, **cirrhosis**, and liver failure. Most of the research on kava kava has been done in Europe, where the herb is even more popular than it is in the United States. By the late fall of 2001, there had been at least 25 reports from different European countries concerning liver damage caused by the plant. French health agencies reported one death and four patients requiring liver transplants in connection with kava kava consumption. On December 19, 2001, the MedWatch advisory of the U. S. Food and Drug Administration posted health warnings about the side effects of kava kava; and on January 16, 2002, Health Canada advised Canadians to avoid all products containing the herb. France banned the sale of preparations containing kava kava in February 2002. The U. S. National Center for Complementary and

Kava kava plant. *(Gilbert S. Grant / Photo Researchers, Inc.)*

Alternative Medicine (NCCAM) put two research studies of kava kava on hold while awaiting further action by the FDA. NCCAM advised consumers in the United States on January 7, 2002 to avoid products containing kava. On March 25, 2002, the FDA issued a consumer advisory and a letter to health care professionals concerning the risk of severe liver damage from the use of products containing kava kava. While the most recent actions on the part of the FDA stop short of banning kava products from the U. S. market, the agency asks consumers as well as medical practitioners to notify its MedWatch hotline of any liver damage or other injuries associated with using kava kava. The MedWatch toll-free number is (800) 332-1088.

In addition to causing liver damage, kava kava appears to produce psychological side effects in some patients. Beverages containing kava kava have been reported to cause anxiety, **depression**, and insomnia. In addition, kava kava has caused tremors severe enough to be mistaken for symptoms of **Parkinson's disease** in susceptible patients.

Interactions

Kava kava has been shown to interact with beverage alcohol and with several categories of prescription medications. It increases the effect of barbiturates and other psychoactive medications; in one case study, a patient who took kava kava together with alprazolam went into a coma. It may produce dizziness and other unpleasant side effects if taken together with phenothiazines (medications used to treat **schizophrenia**). Kava kava has also been reported to reduce the effectiveness of levodopa, a drug used in the treatment of Parkinson's disease.

Some interactions between kava kava and prescription medications, as well as some of the herb's side effects, have been attributed to synergy (combined effects) among the various chemicals contained in kava kava rather than to any one component by itself.

KEY TERMS

Analgesic—A medication or preparation given for pain relief.

Barbiturate—A group of drugs that have sedative properties. Barbiturates depress the body's respiratory rate, blood pressure, temperature, and central nervous system.

Diuretic—A substance that increases the flow of urine. Diuretics are given to lower the volume of liquid in the body.

Kavalactones—Medically active compounds in kava root that act as local anesthetics in the mouth and as minor tranquilizers

Sedative—A drug that has a calming and relaxing effect. Sedatives are used to aid sleep and ease pain, and are often given as mild tranquilizers.

Standardized extract—A product that contains a specific amount of the active ingredients of the herb.

Synergy—Combined action or effects. Some researchers think that the side effects and interactions reported for kava kava are related to synergy among the various compounds in the herb.

Resources

BOOKS

Cass, M.D., Hyla, and Terrence McNally. *Kava: Nature's Answer to Stress, Anxiety, and Insomnia*. Schoolcraft, MI: Prima Communications, Inc.,1998.

Connor, Kathryn M. and Donald S. Vaughan. *Kava: Nature's Stress Relief*. New York: Avon Books, 1999.

Lebot, Vincent, Mark Merlin, and Lamont Lindstrom. *Kava: The Pacific Elixir: The Definitive Guide to Its Ethnobotany, History, and Chemistry*. Inner Traditions International, Limited, 1997.

Robinson, Ph.D, Maggie Greenwood. *Kava: The Ultimate Guide to Nature's Anti Stress Herb*. New York: Dell Publishing Company, Inc., 1999.

PERIODICALS

Almeida, J. C., and E. W. Grimsley. "Coma from the Health Food Store: Interaction Between Kava and Alprazolam." *Annals of Internal Medicine* 125 (1996): 940 941.

Ballesteros, S., S. Adan, et al. " Severe Adverse Effect Associated with Kava Kava." *Journal of Toxicology: Clinical Toxicology* 39 (April 2001): 312.

Beltman, W., A. J. H. P van Riel, et al. "An Overview of Contemporary Herbal Drugs Used in the Netherlands. " *Journal of Toxicology: Clinical Toxicology* 38 (March 2000): 174.

Bilia, A. R., S. Gallon, and F. F. Vincieri. "Kava Kava and Anxiety: Growing Knowledge About the Efficacy and Safety." *Life Sciences* 70 (April 19, 2002): 2581 2597.

Denham, A., M. McIntyre, and J. Whitehouse. "Kava The Unfolding Story: Report on a Work in Progress." *Journal of Alternative and Complementary Medicine* 8 (June 2002): 237 263.

Ernst, E. "The Risk Benefit Profile of Commonly Used Herbal Therapies: Ginkgo, St. John's Wort, Ginseng, Echinacea, Saw Palmetto, and Kava." *Archives of Internal Medicine* 136 (January 1, 2002): 42 53.

" France is Latest to Pull Kava Kava Prods." *Nutraceuticals International* (February 2002): np.

Humbertson, C. L., J. Akhtar, and E. P. Krenzelok. "Acute Hepatitis Induced by Kava Kava, an Herbal Product Derived from *Piper methysticum*." *Journal of Toxicology: Clinical Toxicology* 39 (August 2001): 549.

Meseguer, E., R. Taboada, V. Sanchez, et al. "Life Threat ening Parkinsonism Induced by Kava Kava." *Movement Disorders* 17 (January 2002): 195 196.

Spinella, M. "The Importance of Pharmacological Synergy in Psychoactive Herbal Medicines." *Alternative Medicine Review* 7 (April 2002): 130 137.

ORGANIZATIONS

American Botanical Council (ABC). P.O. Box 144345, Austin, TX 78714 4345. (512) 926 4900. Fax: (512) 926 2345. www.herbalgram.org.

FDA Center for Food Safety and Applied Nutrition (FDA/CFSAN). www.fda.gov/medwatch/safety/2002/kava.htm.

NIH National Center for Complementary and Alterna tive Medicine (NCCAM) Clearinghouse. P. O. Box 8218, Silver Spring, MD 20907 8218. TTY/TDY: (888) 644 6226. Fax: (301) 495 4957. www.nccam.nih.gov.

NIH Office of Dietary Supplements. Building 31, Room 1B25. 31 Center Drive, MSC 2086. Bethesda, MD 20892 2086. (301) 435 2920. Fax: (301) 480 1845. www.odp.od.nih.gov/ods.

OTHER

FDA/CFSAN. *Consumer Advisory*, March 25, 2002. "Kava Containing Dietary Supplements May be Associated with Severe Liver Injury." www.cfsan.fda.gov/~dms/addskava.html.

FDA/CFSAN. *Letter to Health Care Professionals*, March 25, 2002. "FDA Issues Consumer Advisory That Kava Products May be Associated with Severe Liver Injury." www.cfsan.fda.gov/~dms/ds ltr29.html.

Jennifer Wurges
Rebecca J. Frey, PhD

Kegel exercises

Definition

Kegel exercises (Kegels) are exercises designed to strengthen the muscles of the lower pelvic girdle, or pelvic floor—the pubococcygeal (PC) muscles. The PC muscles support the bladder, urethra, and urethral sphincter—the muscle group at the neck of the bladder that acts as a spigot for controlling urine flow into the urethra— and the vagina, uterus, and rectum. Anything that puts pressure on the abdomen can weaken or damage these pelvic muscles. Such conditions include **pregnancy**, **childbirth**, excess weight, hormonal changes, and **aging**. Kegel exercises enable the PC muscles to better withstand increases in intra-abdominal pressure (pressure inside the abdomen). They make the bladder, urethra, and vagina more resilient, and improve bladder control and sexual relations.

Thirteen to 20 million American women suffer from **urinary incontinence**, primarily stress urinary incontinence (SUI)—urine leakage while laughing, coughing, **sneezing**, standing up suddenly, or exercising. SUI occurs when intra-abdominal pressure increases and the urethral sphincter opens inappropriately. During pregnancy, the fetus puts pressure on the bladder and the sphincter may relax and leak. Postpartum incontinence may result from muscle and nerve damage during childbirth due to delivery of a large baby, prolonged labor, excessive pushing, a forceps delivery, or an episiotomy (an incision made during delivery to prevent tearing of maternal tissue). About 40% of American women suffer from incontinence after childbirth, and the incidence increases by about 12% following each birth. Childbirth also increases the risk for incontinence later in life. During **menopause**, as a result of lower levels of estrogen, women with SUI may have thinning of the lining of the outer urethra, a sensation of having to urinate often, and recurrent urinary tract **infections** (UTIs). Beginning Kegels in midlife can help prevent urinary incontinence later.

Origins

In the 1930s, Dr. Joshua W. Davies hypothesized that strengthening the PC muscles could improve bladder control by assisting the closure of the urethral sphincter. By 1948, Dr. Arnold M. Kegel, a Los Angeles-area obstetrician and gynecologist, was having his patients practice vaginal contractions in preparation for childbirth. That same year he invented the Kegel perineometer, or pelvic-muscle sensor, to help prevent urinary incontinence (leakage) following childbirth.

Kegel's perineometer was the first **biofeedback** machine designed for clinical use. Employing a vaginal

sensor, an air-pressure balloon, and a tire gauge, it enabled patients to verify that they were performing Kegel's correctly and to monitor their progress. The patients continued their practice at home. Kegel published numerous papers on his work and claimed to have cured incontinence in 93% of 3,000 patients. He produced a documentary movie to teach the procedure to other physicians. However, his perineometer was never marketed effectively and there was a widespread misconception that Kegels could not be performed without it. In the 1970s, more sensitive electromyography (EMG) perineometers became available for those with severely debilitated pelvic muscles.

Benefits

Kegel exercises strengthen the PC muscles and increase blood flow and nerve supply to the pelvic region, promoting or resulting in:

- increased pelvic support
- restoration of vaginal muscle tone and improved vaginal health
- protection from the physical stresses of childbirth
- restoration of sexual function and improved sexual response and pleasure
- increased vaginal-wall thickness and lubrication after menopause (cessation of menstruation)
- prevention or reversal of urinary leakage and rectal incontinence
- relief from pelvic pain or pain of vulvar vestibulitis (inflammation of the vaginal opening)

KEY TERMS

Biofeedback—An electronic monitoring technique for learning to control a body movement or function.

Electromyography (EMG)—The recording of electrical currents generated by muscle activity.

Incontinence—Inability to control the passage of urine or feces.

Perineometer—A device for measuring PC-muscle contraction.

Pubococcygeal (PC) muscles—The muscles of the lower pelvic girdle, or pelvic floor, which support the bladder, urethra, and urethral sphincter; the muscle group at the neck of the bladder that acts as a spigot for controlling urine flow into the urethra, vagina, uterus, and rectum.

Stress urinary incontinence (SUI).—Urine leakage upon straining, coughing, laughing, or sneezing.

Urethra—The tube that delivers urine from the bladder to the exterior.

Urethral sphincter—Circular muscle that controls the movement of urine from the bladder to the urethra.

Vaginal cone—A weighted cone held in the vagina for Kegel excercising.

Vulvar vestibulitis—Inflammation of the vestibule of the vulva or vagina.

Description

Locating the PC muscles

The PC muscles can be felt by:

- stopping and starting urine flow to identify the forward PCs
- squeezing the vagina to identify the back of the PCs
- squeezing around two fingers placed in the vagina
- imagining sucking a marble up the vagina
- preventing a bowel movement or the passing of gas by tightening the muscles around the anus

There is a pulling sensation when the correct muscles are contracted. Weaker and stronger contractions are practiced until the PC muscles can be squeezed at will.

Practicing Kegels

There are numerous suggestions for practicing Kegels, which include:

- Contracting the PC muscles three to 10 seconds and relaxing them three to 10 seconds for five to 15 repetitions, three to 12 times per day.
- Contracting the PC muscles strongly for one second then releasing for one second, 20 times, three times per day, speeding up the contractions until there is a fluttery sensation.
- While emptying the bladder, stopping the urine flow at least three seconds, 10 times during each urination, which provides 60–80 contractions per day. The complete **exercise** requires muscle contraction from back to front. It may take three to eight weeks for noticeable improvement. Once good muscle tone is achieved, Kegels may be performed just once a day.

The PC muscles can be exercised at almost any time—while lying down, sitting (in the car at a stop light, at work, etc.), squatting, standing, or walking—and varying the exercise position is said to be most effective. Sitting or standing adds weight to the exercise. It may be helpful to perform a Kegel squeeze before

coughing, standing up, or lifting a heavy object. It may also be helpful to incorporate Kegels into a daily routine and keep a log. It is recommended that pregnant women practice Kegels regularly before, as well as after, childbirth.

Squeezing with two fingers in the vagina will confirm that only the vaginal muscles are contracting. Placing a hand on the lower abdomen is a reminder to keep the belly soft and relaxed, to refrain from tightening other muscles such as the stomach, buttocks, or leg muscles, or to hold the breath, all of which increase intra-abdominal pressure, working against the Kegels.

Vaginal cones

Kegels can be performed by the ancient Chinese technique of placing a weighted cone in the vagina and holding it in place up to 15 minutes twice a day. The practice is initiated using the heaviest cone that can be held easily for one minute. The cones weigh from 15–100 gm (0.04–0.3 lb). Brands include FemTone Weights, Kegel Weights, Kegel Kones, and Perineal Exerciser. Sequentially heavier cones are used until a maintenance program is established. This method automatically uses the correct muscles. Some of these products require a doctor's prescription.

Biofeedback devices and electrical stimulation

Nerve damage may prevent some people from performing Kegels properly. Vaginal or anal sensors and EMG perineometers with computerized visual or auditory feedback displays can measure the PC contraction. A handheld over-the-counter product (called the Myself pelvic muscle trainer) costs about $90. Another device can send mild electrical impulses to help locate the PC muscles.

With a vaginal sensor and biofeedback monitor, two 20-minute sessions per day for seven to nine months—with a specific goal such as holding 45-microvolts for 60 seconds—can relieve vulvar vestibular **pain** in the majority of women.

Insurance may not pay for EMG biofeedback therapy; however Medicare will reimburse for it if conventional Kegel exercises have failed.

Preparations

Training may be provided before initiating a Kegels routine.

Precautions

A temporary loss of muscle and nerve function following childbirth may make Kegels more difficult.

Kegel exercises do not work if abdominal, thigh, or buttock muscles are contracted. Furthermore, such contractions can increase pressure on the bladder, aggravating incontinence. Vaginal cones are not recommended in the presence of infection, neurological damage, diuretic medicines, or **caffeine**.

Side effects

There are no side effects to Kegel exercises.

Research and general acceptance

When performed properly and consistently, Kegels are usually helpful. The United States Agency for Health Care Policy and Research recommends that behavioral methods, including Kegels and biofeedback, be utilized to treat urinary incontinence before initiating drugs or surgery. Randomized controlled studies have shown that as many as 50–90% of women can reduce or overcome SUI with Kegels alone. However, reports of effectiveness vary since many people do not receive proper Kegel instruction. Consistent use of vaginal cones can improve or cure incontinence within four to six weeks in 70% of women.

The use of Kegels to improve urinary incontinence in men has not been extensively studied, although many clinicians report improvement. One study found that after the removal of a cancerous prostate, men who performed Kegels twice a day regained bladder control faster than those who did not do the exercises.

Training and certification

Patient training in Kegel exercises can be performed by a knowledgeable healthcare provider.

Resources

BOOKS

Bladder Research Progress Review Group. *Overcoming Bladder Disease: A Strategic Plan for Research*. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases, August 2002.

Hulme, Janet A. *Beyond Kegels: Fabulous Four Exercises and More To Prevent and Treat Incontinence*. Missoula, MT: Phoenix, 2002.

Icon Health Publications. *Kegel Exercises: A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References*. Icon Health Publications, 2004.

National Kidney and Urologic Diseases Information Clearinghouse. *Exercising Your Pelvic Muscles*. NIH Publication No. 02 4188. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases, April 2002.

National Kidney and Urologic Diseases Information Clearinghouse. *Treatments for Urinary Incontinence in Woman*. NIH Publication No. 03 5104. Bethesda, MD:

National Institute of Diabetes and Digestive and Kidney Diseases, June 2003.
Northrup, Christiane. *The Wisdom of Menopause*. New York: Bantam, 2001.

PERIODICALS

Chiarelli, Pauline, and Jill Cockburn. "Promoting Urinary Continence in Women After Delivery: Randomized Controlled Trial." *British Medical Journal* 324, no. 7348 (May 25, 2002): 1241 4.
Perry, John D., and Leslie B. Talcott. "The Kegel Perineometer: Biofeedback Twenty Years Before Its Time." *Proceedings of the 20th Annual Meeting of the Association for Applied Psychophysiology and Biofeedback* (March17 22, 1989): 169 72.
Resnick, Neil M., and Derek J. Griffiths. "Expanding Treatment Options for Stress Urinary Incontinence in Women." *Journal of the American Medical Association (JAMA)* 290, no. 3 (July 16, 2003): 395 7.
Singla, A. "An Update on the Management of SUI." *Contemporary Ob/Gyn* 45, no. 1 (2000): 68 85.

ORGANIZATIONS

American Foundation for Urologic Disease, Inc. 1000 Corporate Boulevard, Suite 410, Linthicum, MD 21090. (800) 828 7866. (410) 689 3990. memberservices @nafc.org. *http://www.afud.org*.
Continence Restored, Inc. 407 Strawberry Hill Avenue, Stanford, CT 06902. (914) 493 1470.
National Association for Continence. P.O. Box 1019, Charleston, SC 292402 1019. 800 BLADDER. (843) 377 0900.

OTHER

Nerve Disease and Bladder Control. National Kidney and Urologic Diseases Information Clearinghouse. NIH Pub lication No. 03 4560. May 2003 [cited May 2, 2004]. http://kidney.niddk.nih.gov/kudiseases/pubs/nervedisease/index.htm.
Urinary Incontinence and Pelvic Muscle Rehabilitation Index. InContiNet. February 15, 2000 [cited May 2, 2004] http:incontinent.com/articles/art_urin/index.htm.
Urinary Incontinence in Men. National Kidney and Urologic Diseases Information Clearinghouse. NIH Publication No. 04 5280. March 2004 [cited May 2, 2004]. http://niddk.nih.gov/kudiseases/pubs/uimen/index.htm.

Margaret Alic

Kelley-Gonzalez diet

Definition

The Kelley-Gonzalez diet consists of large amounts of raw fruits, juices, raw and steamed vegetables, cereals, and nuts. When combined with massive quantities of dietary supplements and freeze-dried pancreatic enzymes, together with a "detoxification" process involving coffee enemas, it is said to slow the growth of **cancer** tumors.

Origins

The Kelley-Gonzalez regimen is based on a belief that enzymes from the pancreas are capable, like chemotherapy, of killing cancer cells. The use of pancreatic enzymes to treat cancer was first proposed in 1906 by John Beard, a Scottish embryologist. This idea received some attention at the time but was largely abandoned after Beard died in 1923. During the 1960s, the concept was resurrected by William Donald Kelley, a controversial dentist from Grapevine, Texas. Kelley wrote a book titled *One Answer to Cancer* that outlined his five-pronged approach:

- Nutritional therapy: Beef pancreatic enzymes combined with numerous other dietary supplements.
- Diet: A carefully individualized diet, ranging all the way from vegetarian to all-meat.
- Detoxification: As few as three or as many as 52 weeks of enemas and laxative purging.
- Neurological stimulation: Various manipulations including chiropractic, osteopathic, mandibular, and physiotherapeutic.
- Spiritual therapy: Prayer and Bible reading.

In 1981, Nicholas Gonzalez, then a second-year medical student at Cornell University, began a five-year investigation of Kelley's work. Reviewing 10,000 patient records and interviewing 500 cancer patients, Gonzalez became convinced that many of Kelley's patients had survived significantly longer than would otherwise have been expected. "Despite the careful documentation and the five-year investment of time, my attempts at publication were met with scorn and ridicule," Gonzalez recalls. "It seemed no one in academic medicine could, at the time, accept that a nutritional therapy might produce positive results with advanced cancer patients."

In 1987, Gonzalez started practicing medicine in New York City and developing his own cancer regimen similar to Kelley's, except that he rejected the neurological and spiritual aspects of Kelley's treatment. In 1999, the journal *Nutrition and Cancer* published results from a pilot study of the Gonzalez regimen in 11 patients with inoperable, advanced pancreatic cancer. the results were promising enough to prompt the U.S. National Institutes of Health's (NIH) National Center for Complementary and Alternative Medicine (NCCAM) to sponsor a $1.4 million, seven-year, large-scale clinical study of the regimen. In the study, one group of patients received the standard chemotherapy,

KEY TERMS

Amebiasis—An infection or disease caused by amoebas.

Campylobacter—A bacterium that can invade the lining of the intestine.

Hyponatremia—Abnormally low levels of sodium in the blood, often related to dehydration.

Sepsis—The presence of pus-forming micro-organisms or their toxins in the blood.

and the other group followed the Kelley-Gonzalez regimen. The study accepted participants until 2005. The results have not yet been released.

Benefits

In his New York medical practice, Gonzalez uses his enzyme-based treatment on patients with pancreatic cancer, as well as a wide variety of other cancers. In addition, he uses variations of the Gonzalez regimen to treat a range of other illnesses, including **chronic fatigue syndrome**, arthritis, and **multiple sclerosis**.

Description

As currently practiced by Gonzalez, the regimen includes pancreatic enzymes taken orally every four hours and at meals for 16 days. Patients also take as many as 150 dietary supplements a day, including vitamins, minerals, **magnesium** citrate, papaya, trace elements, and glandular products from animals. Patients also receive frequent coffee enemas. They are placed on a strict diet including large quantities of fresh fruits, vegetable juices, cereals, and as many as 20 almonds a day. Red meat, white sugar, chicken, refined grain products, and soy are all forbidden. Fish is allowed only in limited quantities.

Precautions

The Kelley-Gonzalez diet is considered a highly experimental treatment for cancer, with only limited evidence of its effectiveness. It should therefore be undertaken only with competent medical advice and monitoring. Prospective patients should be aware that the diet requires considerable commitment and can almost be considered a full-time job. Initially, it can involve as many as eight enemas a day as well as preparing four servings of fresh carrot juice and taking dietary supplements 10 times a day.

Side effects

At least two deaths have been linked to coffee enemas, attributed to hyponatremia (**sodium** deficiency in the blood) and dehydration. With unqualified practitioners, a risk of contamination may result from unsanitary equipment used to administer enemas. For example, one outbreak of *Campylobacter* sepsis occurred among clients of a border clinic in Mexico that offered coffee enemas. In Colorado, an amebiasis outbreak was linked to fecal contamination of an enema-delivery system. Other side effects of the Kelley-Gonzalez treatment may include low-grade **fever**, muscle aches and pains, or **rashes**.

Research and general acceptance

For many years, the Kelley-Gonzalez Diet was rejected by orthodox medical practitioners. However, as described earlier, a 1999 pilot study by Gonzales has led to a clinical trial sponsored by the NIH. The results of that large-scale trial are not yet available.

Training and certification

Gonzalez offers his regimen from his medical practice in New York City. In a 1995 interview with *The Moneychanger,* he said that there are other practitioners "who say they do the Kelley therapy or the Gonzalez therapy, and I've never even met them."

Resources

PERIODICALS

Gonzalez, Nicholas James, and Linda Lee Isaacs. "Evaluation of Pancreatic Proteolytic Enzyme Treatment of Adeno carcinoma of the Pancreas, with Nutrition and Detoxifi cation Support." *Nutrition and Cancer*. 33, no.2, 1999: 117 124.

OTHER

Nicholas J. Gonzalez, M.D., P.C. 36A East 36th St., Suite 204. New York, NY 10016. (212) 213 3337. www.drgonzalez.com (accessed February 11, 2008).

"Questions & Answers: The Phase III Gonzalez Protocol Trial," National Center for Complementary and Alternative Medicine, National Institutes of Health. http://nccam.nih.gov/news/19972000/121599.htm (accessed February 12, 2008).

"Questions and Answers About the Gonzalez Regimen," National Cancer Institute, National Institutes of Health. http://www.cancer.gov/cancertopics/pdq/cam/gonzalez/Patient/page2 (accessed February 12, 2008).

David Helwig
Leslie Mertz, Ph.D.

Kelp

Description

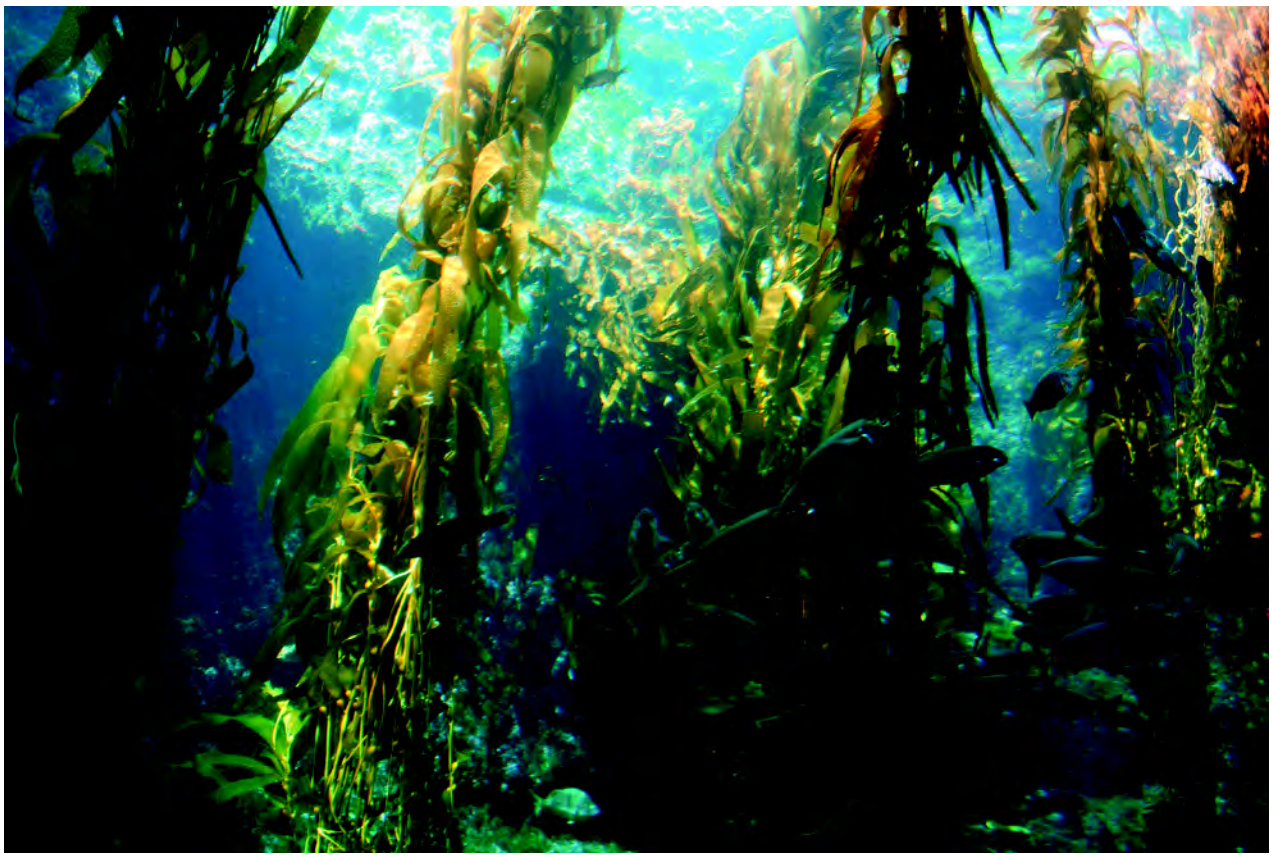
Kelp (*Fucus vesiculosus*) is a type of brown seaweed, moderate in size, that grows in regions with cold coastlines including those of the northwestern United States and northern Europe. There are several varieties of kelp: true kelp, which thrives in cool seas; giant kelp and bladder kelp, which grow in the North Pacific. Giant kelp is so named because it grows to 213 ft (65 m). Kelp anchors itself to rocky surfaces via tentacle-like roots. From these roots grows a slender stalk with long, leaf-like blades.

Kelp belongs to the Laminaria family. Other names for *Fucus vesiculosus* are kelpware, black-tang, bladderfucus, cutweed, and **bladderwrack**. The main constituents of kelp include phenolic compounds, mucopolysaccharides, algin, polar lipids, and glycosyl ester diglycerides. Kelp also contains protein, carbohydrates, and **essential fatty acids**.

Kelp contains approximately 30 minerals. It is a rich source of **iodine**, **calcium**, **sulfur**, and silicon. Other minerals include **phosphorus**, **iron**, **sodium**, **potassium**, **magnesium**, chloride, **copper**, **zinc**, **manganese**, barium, **boron**, **chromium**, lithium, nickel, silver, titanium, **vanadium**, aluminum, strontium, bismuth, chlorine, cobalt, gallium, tin, and zirconium. Kelp also contains vitamins C, E, D, K, and B complex. The highest concentrations of these vitamins and minerals are found in the tissues of kelp. Since kelp is such a valuable source of nutrients, it is often recommended as a dietary supplement, particularly for people with mineral deficiencies.

Origins

Different kinds of kelp have been eaten for nutritional value for over a thousand years. The Chinese used kelp and other types of seaweed as medicine as far back as 3,000 B.C. The Greeks used kelp to feed their cattle around the first century B.C. Kelp has been a staple food of Icelanders for centuries, and ancient Hawaiian nobles grew gardens of edible seaweed.



Kelp forest. West Coast, USA. *(© Papilio / Alamy)*

KEY TERMS

Diuretic—A substance that promotes urination.

Goiter—An enlargement of the thyroid gland.

Hypothyroidism—A condition resulting from an underactive thyroid gland.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Kelp was also used in Europe and Great Britain as fertilizer to nourish soil and assist plant growth.

The largest consumer of kelp, however, has been Japan. The Japanese have incorporated kelp and seaweed into their **diets** for 1,500 years. During the seventh to ninth centuries, only the Japanese nobility consumed seaweed. In the seventeenth century, Japan began farming seaweed. The Japanese and other Asian cultures used kelp to treat uterine problems, genital tract disorders, and kidney, bladder, and prostate ailments.

Kelp is still an integral part of the Japanese diet. The Japanese include kelp in almost every meal, using it in salads or as a garnish, or cooking it in soups, sauces, and cakes. Noodles made from kelp are a staple of the Japanese diet. Until recently, kelp was eaten almost exclusively by the Japanese. Now the Western population is beginning to take note of this nutrient-rich seaweed. However, *Fucus vesiculosus* is not the kind of kelp that is eaten.

Eating dietary kelp may be responsible for the low rate of **breast cancer** among Japanese women, and also for the low rate of **heart disease**, respiratory disease, rheumatism, arthritis, high blood pressure, and gastrointestinal ailments. The occurrence of thyroid disease is also low in Japan.

General use

Many herbalist and naturopathic physicians recommend *Fucus vesiculosus* to treat thyroid disorders, arthritis, rheumatism, **constipation**, colds, high blood pressure, **colitis**, **eczema**, goiter, **obesity**, low vitality, poor digestion, nervous disorders, menstrual irregularities, glandular disorders, and water retention.

Fucus vesiculosus has a therapeutic effect on many systems of the body. It strengthens immune system function and increases resistance to infection and **fever**. Kelp is also beneficial to the nervous and endocrine systems. It enhances the function of the adrenal, thyroid, and pituitary glands, and supports brain health and function.

One of the main therapeutic uses of *Fucus vesiculosus* is for thyroid conditions such as **hypothyroidism** and goiter. Partly due to its high iodine content, this kind of kelp assists in the production of thyroid hormones, which help regulate the thyroid gland. People who don't eat dairy products, seafood, and salt may develop an iodine deficiency. This may result in low thyroid function. Kelp is a good source of iodine for those who may be deficient.

Thyroid hormones are also necessary to maintain a normal metabolism. *Fucus vesiculosus* helps boost metabolism, which helps to sustain normal weight (especially in people who are overweight because of a thyroid condition).

This type of kelp is also used to rid the body of and keep it from absorbing harmful chemicals, toxins, carcinogens, and such heavy metal pollutants as barium and cadmium. Algin, a fiber-like extract of kelp, helps prevent the body from assimilating these elements. Algin is used industrially in the production of tires and as an agent that prevents ice cream from crystallizing. Kelp also helps to prevent the body from absorbing radioactive elements such as strontium 90, a dangerous radioactive substance created by nuclear power plants. However, since *Fucus vesiculosus* absorbs toxic chemicals, it must be harvested from clean waters or it may contain toxins.

Kelp also reduces **cholesterol** levels by inhibiting bile acid absorption. The diuretic effect of kelp is beneficial to an irritated or infected bladder since it helps to flush out harmful bacteria. Kelp helps reduce inflammation in injured tissues and ease painful joints in rheumatism and **rheumatoid arthritis**. Kelp may also reduce an enlarged prostate in men, and is also used to strengthen fingernails, prevent **hair loss**, and regenerate hair if the follicle is still alive.

In addition to its medicinal uses, kelp contains natural **antioxidants** that make it useful to the food industry in retarding spoilage. The cosmetics industry is also studying the effects of a gel derived from kelp in improving the elasticity of human skin.

Preparations

The kelp used medicinally in modern times is generally harvested in kelp farms. These farms help preserve the natural balance of the sea, which is disrupted when large amounts of naturally growing seaweed are removed. Farming kelp also helps to ensure that the kelp retains its nutritional value. Kelp loses valuable nutrients when it is washed ashore. When

kelp is harvested, it is cut, dried, then ground into powder. It is this powder that is encapsulated or pressed into tablets.

Kelp is available in bulk form either dried or as a ground powder. It is also sold as granules, capsules, tablets, or tinctures. Granulated or powdered kelp can be added to food as a salt substitute.

The recommended daily dose for adults is 10–15 mg. Kelp can also be made into a tea. To create an infusion, 1 cup of boiling water is poured over 2-3 tsp of dried or powdered kelp. The tea is steeped for 10 minutes, and can be drunk three times daily.

Precautions

People should not gather wild kelp because it may contain contaminants absorbed from the sea.

People with high blood pressure or a history of thyroid problems should consult their healthcare practitioner before using kelp. The high sodium content of *Fucus vesiculosus* may make high blood pressure worse. Kelp isn't recommended for people on a low-sodium diet.

Excessive consumption of kelp can provide the body with too much iodine and interfere with thyroid function. Consumers should use it only as directed.

Side effects

There are no known side effects, but some people may be sensitive or allergic to kelp. Common allergic symptoms include mild stomachache.

Interactions

Fucus vesiculosus shouldn't be taken with thyroid medications.

Resources

BOOKS

Lininger, D.C., Skye. *The Natural Pharmacy*. Virtual Health, LLC, 1998.

Time Life Books. *The Alternative Advisor*. Time Life, Inc., 1997.

PERIODICALS

Fujimura, T., K. Tsukahara, S. Moriwaki, et al. "Treatment of Human Skin with an Extract of *Fucus vesiculosus* Changes Its Thickness and Mechanical Properties." *Journal of Cosmetic Science* 53 (January February 2002): 1 9.

Ruperez, P., O. Ahrazem, and J. A. Leal. "Potential Antiox idant Capacity of Sulfated Polysaccharides from the Edible Marine Brown Seaweed *Fucus vesiculosus*." *Journal of Agricultural and Food Chemistry* 50 (February 13, 2002): 840 845.

Jennifer Wurges
Rebecca J. Frey, PhD

Khella

Definition

Khella *(Ammi visnaga)* is a member of the *Apiaceae* family, whose familiar members include carrot and **parsley**. Khella is an herbaceous annual native to North Africa, and naturalized to Australia, North and South America, and throughout the Middle East. It is grown in the United States, Mexico, Argentina, and Chile, and cultivated commercially in the former Soviet Union, Egypt, Morocco, and Tunisia. Khella has been known since ancient times and is mentioned in the *Ebers papyrus*, one of the oldest known medical works dating from 1500 B.C. Khella, so named by the Moors of North Africa, has many other common names reflecting both its folk use and appearance, including false queen Anne's lace, toothpick plant, green mist lace, and honey plant. The herb is sometimes called bishop's weed, though this is also the common name for a related plant, *Ammi majus L.* The Greek physician Dioscorides, author of *De Materia Medica* called the herb "ammi," meaning "sand," perhaps reflecting the common habitat of the herb.

Khella thrives in sunny fields and among cultivated crops in well-drained, sandy soil. It reaches heights from 2 to 3 feet and may spread as wide as 4 feet. It is self-fertile and pollinated by insects. The fern-like, finely cut, toothed leaves grow from erect, round, and furrowed stems that branch toward the top. The stems bear small greenish-white flowers in a rounded and clustered compound umbel that gives the appearance of fine lacework. The flowers are androgynous, containing both male and female reproductive parts. In damp conditions, the compound umbels open up, and when dry they close with a nest-like appearance. The pedicels of the flowers are stiff when dry and pleasant tasting. They have been traditionally used as tooth cleansers. The seeds are tiny, smooth, ovate to oblong, and bitter.

Active Constituents

The medically active constituents in khella are present in the fruit and seeds. A primary active constituent, the furanocoumarin khellin, is found in the fatty oil of the seed and was first isolated in crystalline form in 1879. Other furanocoumarins are visnagin and khellol. Other compounds include the flavonoids **quercetin**, kaemperot, and isorhamnetin, and the **essential oils** camphor, terpineol, terpinen, and linalool oxides, as well as fixed oils, psoralens (methoxypsoralen), and protein.

General use

Khella acts therapeutically as a urinary tract antispasmodic, diuretic, hypoglycemic, lithontripic, selective coronary vasodialator, and bronchodilator. Khella has been used for decades as an effective remedy for various respiratory problems, including **asthma**, **bronchitis**, **emphysema**, and **whooping cough** and to treat arteriosclerosis and relieve the sharp **pain** of **angina** and pre-menstrual distress. An extract of the phytochemical khellin used as a topical gel has been shown to be helpful in treatment of vitiligo, a skin disease. Khella increases the sun sensitivity of melanocytes in the skin, thus stimulating repigmentation.

Khella's active constituents have been included in many commercial drug formulas used for dilating blood vessels. This use was based on research dating from the 1950s. However in 1994, the German Commission E, a committee of experts evaluating the safety and efficacy of herbs and herbal combinations, withdrew approval of khella for therapeutic use "due to the insufficiently proven efficacy of the drug and its pharmaceutical preparations, as well as the associated risks."

Khella was cultivated in the medicinal gardens of ancient Egypt where it was valued for relieving the pain and easing the passage of **kidney stones**. Its antispasmodic properties help relax bile duct constrictions and relax the muscle of the urethra, and khella has been shown to relax the coronary arteries thus improving the blood supply to the heart muscle.

Research

In 2001, scientists at Umm Al-Qura University in Saudi Arabia investigated the effect of *Ammi visnaga* seeds on experimentally induced kidney stones in albino rats. Daily oral treatment with 500 mg of the extract, according to researchers "highly reduced the incidence of nephrolithiasis (**calcium** oxalate deposition in the kidneys)." The seed extract also showed highly potent diuretic activity. The researchers offered a daily dosage of 60 ml of khella extract to human volunteers who complained of kidney stones. Researchers reported that "the patients confirmed the efficacy of *Ammi visnaga* treatment."

Preparations

Khella is commercially available in capsule form, as an essential oil, in liquid extract, tincture, and dried for use as a tea. For an infusion, individuals can use one teaspoon of crushed seeds per cup of water and steep for 25 minutes. Khella extract, standardized to contain a minimum of 12% of the phytochemical constituent khellin, is commercially prepared from the seeds with a dry seed/menstruum ratio of 1:3 using grain alcohol (60–65%) and distilled water. The recommended daily dosage is 120 to 160 mg.

KEY TERMS

Antispasmodic—Phytochemical agent that acts to relax muscular spasms, suppressing smooth muscle contractions and preventing or reducing incident of seizure.

Lithontripic—Phytochemical effect that acts to prevent the formation of kidney or gall stones and facilitates dissolution and removal when formed.

Melanocyte—The pigment-producing cell in the epidermis that produces malanin and determines skin color.

Vitiligo—A skin pigmentation disorder in which the melanocytes are destroyed leaving irregular patches of unpigmented skin, appearing most commonly on hands, feet, face and lips.

Precautions

Khella has been shown to have cumulative toxicity. Prolonged use may bring about **nausea** and **vomiting**, **headache**, **insomnia**, **constipation**, and vertigo. Externally, the sap of the plant may cause irritation and a painful skin rash. When used topically, particularly for prolonged periods, the phototoxic activity of khella may cause blistering in normal skin when exposed to the sun. Individuals should use this herb under the supervision of a healthcare professional as appropriate dosages will vary depending upon the condition being treated.

Contraindications

Khella should not be taken by patients using antiarrhythmics, anticoagulants, calcium channel blockers, and other antihypertensives. Khella may enhance the effects of these pharmaceuticals. Individuals should avoid using khella if they are pregnant or breast-feeding as effects are unknown. Khella may cause elevated liver function test results.

Resources

BOOKS

Gruenwald, Joerg, Thomas Brendler, and Christof Jaenicke, eds. *PDR for Herbal Medicines,* 4th ed. London: Thomson Healthcare, 2007.

Karalliedde, Lakshman, Rita Fitzpatrick, and Debbie Shaw. *Traditional Herbal Medicines: A Guide to Their Safer Use*. London: Hammersmith Press, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agriculture. 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov.

Clare Hanrahan

Kidney infections

Definition

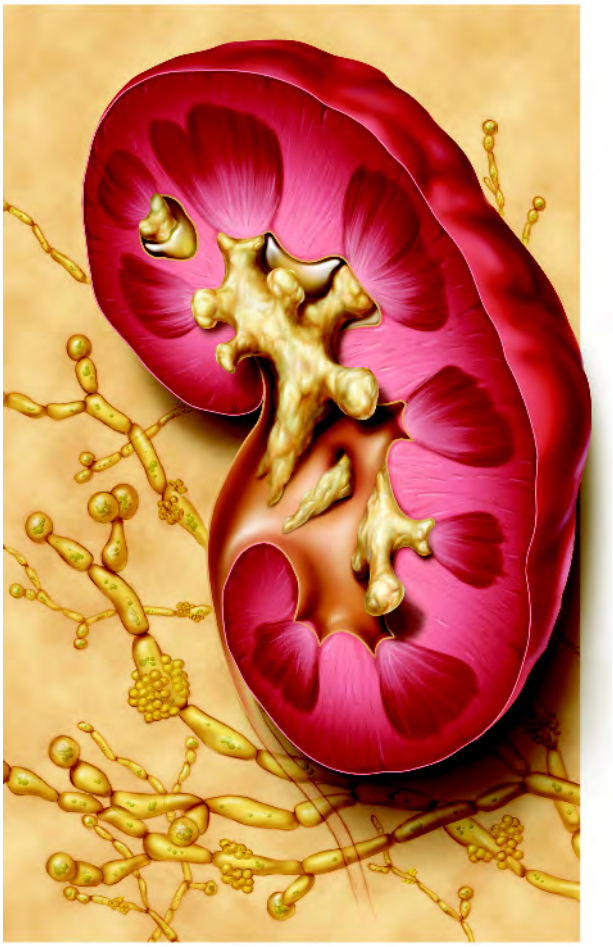
Kidney infection is a general term used to describe infection of the kidney by bacteria, viruses, or fungi. The infecting microbe may have invaded the kidney from the urinary bladder or from the bloodstream. The disease is characterized by **fever**, **chills**, back **pain**, and, often symptoms associated with **bladder infection**.

Description

The kidneys are bean-shaped organs located in the abdominal cavity on the right and left side of the lower back. As the principle part of the urinary system, the kidneys process the fluid component of blood (plasma) to maintain appropriate water volume and concentrations of chemicals (electrolytes). Urine is the waste product formed from this process. Urine flows from each kidney through a tube called a ureter to the urinary bladder, and is removed from the body through a tube called the urethra. The kidneys and ureters comprise the upper urinary tract, and the bladder and urethra comprise the lower urinary tract.

Kidney infection, also called pyelonephritis and upper urinary tract infection, occurs when microbes, usually bacteria, invade the tissues of the kidney and multiply. One or both kidneys may be infected. Infection originating directly from the bladder is called an ascending infection.

Inflammation occurs in response to the infection. As a result of the infection and inflammation, scarring and other tissue damage may occur. Most cases of acute kidney infection resolve without any permanent kidney damage. In severe cases, kidney damage is so extensive that the kidneys can no longer function, a state called renal failure.



Kidney infected with candida cast, yeast-like fungi. *(Brian Evans / Photo Researchers, Inc.)*

There are several types of kidney **infections**.

- Acute pyelonephritis: uncomplicated kidney infection which has a short and relatively severe course.
- Chronic pyelonephritis: long-standing disease associated with either active or inactive kidney infection.
- Emphysematous pyelonephritis: acute infection associated with gas in and around the kidney. This type almost always occurs in persons with diabetes.
- Pyonephrosis: acute or chronic pyelonephritis associated with blockage of the ureter.
- Renal and perinephric abscesses: abscesses (pockets of pus) in and around the kidney.

Kidney infections occur most often in adult women who are otherwise healthy. Urinary tract infections are uncommon in men until old age when bladder

catheterization and other urinary procedures are more commonly performed.

Causes and symptoms

Kidney infection is usually caused by bacteria, although infection by fungi (yeasts and molds) or viruses does occur. The bacteria *Escherichia coli (E. coli)* is responsible for about 85% of the cases of acute pyelonephritis. However, *E. coli* causes only 60% of the acute pyelonephritis cases in the elderly.

Other common causes include *Klebsiella*, *Enterobacter*, *Proteus*, *Enterococcus*, and *Pseudomonas* species. Infection by *Proteus* species can lead to the formation of **kidney stones**.

Kidney infection may also be caused by *Mycobacteria tuberculosis* or other Mycobacteria species or by the yeast *Candida*. Kidney infection also can be caused by Group B Streptococci in newborns.

Certain women are inherently more susceptible to urinary tract infections. Researchers have found that women who have recurrent infections possess certain markers on their blood cells. Also, the bacteria that commonly cause urinary tract infections stick more readily to the vaginal cells of women who have recurrent infections.

Other risk factors for developing kidney infections include:

- bladder catheterization, a common cause of bladder and kidney infections in hospitals.
- diabetes
- pregnancy
- urinary calculi (stone)
- urinary tract abnormalities
- urinary tract obstruction

The symptoms of kidney infection include fever, shaking chills, **nausea**, **vomiting**, and middle to lower back pain that may travel to the abdomen and groin. This pain may be severe. These symptoms may be preceded or accompanied by those associated with bladder infection—frequent, painful urination.

Infants and young children may have fever, irritability, straining on urination, and unusual urine odor. Fewer than half of newborns have fever associated with kidney infection, which makes diagnosis difficult.

In more than 20% of elderly patients with kidney infection, the presenting symptoms are gastrointestinal or pulmonary (lung). Also, one third of elderly patients do not develop fever.

Diagnosis

Kidney infections can be diagnosed by family physicians, obstetrics and gynecology (OB/GYN) doctors, and urologists (doctors who specialize in the urinary system). The diagnosis of kidney infection is based primarily on symptoms, urinalysis, and urine cultures. Blood tests may also be performed. Approximately 20% of patients have bacteria in the bloodstream, a condition called bacteremia. Urine dipsticks that detect signs of infection are often used right in the doctor's office. Urine also is examined with a microscope for the presence of bacteria and leukocytes (white blood cells). Urine culture can identify which microbe is causing the infection and may also be used to determine which antibiotic would be most effective.

Other diagnostic procedures may be used to look for signs of infection in the kidney. An x ray of the abdomen may be taken. Ultrasound, which uses sound waves to visualize internal organs, may be used to examine the bladder and kidney. Less routinely performed are intravenous urograms, computerized tomography (CT scan), and scintillation scans.

Treatment

Delays in the diagnosis and treatment of kidney infection can lead to permanent kidney damage. The person who suspects kidney infection should seek professional care immediately, as antibiotics are essential to control the infection. Alternative medicine may be used as an adjunct to the appropriate antibiotic treatment.

Dietary changes that may help to control and prevent kidney infection.

- Drinking 8–12 glasses of water daily helps to wash out bacteria, although this also may dilute antibacterial factors in the urine.
- Acidifying the urine by eating few alkaline foods such as dairy.
- Following a diet rich in whole grains, vegetables, and acidifying juices, such as citrus and cranberry.
- Eliminating high sugar foods.
- Drinking unsweetened cranberry juice to acidify the urine and provide the antimicrobial agent hippuric acid. In controlled studies, cranberry extract capsules did not provide the same benefit as cranberry juice. Studies have shown that cranberry juice helps suppress the growth of certain bacteria and reduces urinary tract infection by making it more difficult for bacteria to stick to the lining of the ureter and bladder.

- Ingesting at least one clove of garlic or up to 1,200 mg garlic as a tablet daily for its alleged anti-infective properties.

Magnesium supplementation may help prevent the formation of kidney stones and thus indirectly prevent kidney infection by preventing urinary tract blockage. **Zinc** may boost the immune system. A study in rats with ascending pyelonephritis found that the addition of vitamins A and E to standard antibiotic therapy significantly reduced kidney inflammation as compared to antibiotic treatment alone. This effect has not been tested in humans.

Traditional Chinese medicine treats pyelonephritis with **acupuncture**, herbals, and patent medicines. The Chinese patent medicine Zhi Bai Di Huang Wan (**Anemarrhena**, Phellodendron, and Rehmannia Pill) is often used to treat kidney infections and disease and bladder infections. The patient can take eight pills three times daily. Herbs such as *Semen Abutili seu Malvae, Semen plantaginis,* and *Herba lygodii japonici* are used to treat or prevent the formation of kidney stones.

In traditional Chinese medicine, treatment of urinary tract infection often uses one or more of the following herbs in doses of 30 g to 60 g taken once or twice daily. Patients should consult a traditional Chinese medical practitioner for the treatment best suited for them:

- Herba commelinae
- H. plantaginis
- H. patriniae
- H. salviae plebeiae
- H. hedyotis seu oldenlandiae
- H. taraxaci
- H. andrographis

Allopathic treatment

Initiating antibiotic therapy as soon as possible is critical to prevent or reduce damage to the kidneys. Historically, all pyelonephritis patients were treated in the hospital. This is no longer considered necessary. Responsible patients with mild kidney infection can be treated at home with antibiotics taken by mouth. Patients with high fever, vomiting, evidence of bacteria in the bloodstream, and/or dehydration should be hospitalized in order to receive intravenous (IV) antibiotics and fluids. Severe illness, either with or without complications, requires hospitalization for treatment.

The recommended treatment for acute pyelonephritis is two weeks of therapy with the antibiotic combination trimethoprim/sulfamethoxazole. Fluoroquinolones (Cipro, Noroxin, NegGram), ceftriaxone (Rocephin), or gentamicin are other choices. Fluoroquinolones should not be used by pregnant women or children. With treatment, symptoms normally resolve within two to three days. Patients must, however, take the full two-week course of antibiotics so that the infection does not recur.

Abscesses may be treated with percutaneous (by a needle through the skin) or surgical drainage. Emphysematous pyelonephritis may be treated with antibiotics, however, surgical removal of the kidney (nephrectomy) may be necessary (individuals can, however, live normally with only one kidney). Because of the 75% death rate, nephrectomy is the treatment of choice in people with diabetes who have emphysematous pyelonephritis. Kidney stones are most often treated with extracorporeal shock wave lithotripsy (ESWL). Shock (sound) waves are aimed at the stone. The energy in the shock waves causes the stone to vibrate and fragment into small pieces that can be more easily passed.

Expected results

Antibacterial therapy of kidney infection has a 90% cure rate. Severe or chronic infection can lead to kidney damage and renal failure. Renal failure requires hemodialysis, a process that uses a dialysis machine (an artificial kidney) to process the patient's blood and remove waste products several times a week. Patients with severe kidney damage require kidney transplantation.

Prevention

Researchers are trying to develop a vaccine for urinary tract infections (UTIs), but as of 2008, none were available in the United States. The key to preventing kidney infection is to promptly treat bladder infection. Measures taken to prevent bladder infection may prevent subsequent kidney infection. These include:

- drinking large amounts of fluid
- reducing intake of sugar
- voiding frequently and as soon as the need arises
- proper cleansing of the area around the urethra (females), especially after sexual intercourse
- acupuncture (effective in preventing recurrent lower UTIs in women)
- avoiding use of vaginal diaphragms and spermicidal jelly (females)

The primary preventive measure specifically for men is prompt treatment of prostate infections. Chronic prostatitis may go unnoticed but can trigger recurrent UTIs. In addition, men who require temporary catheterization following surgery can be given antibiotics to lower the risk of UTIs.

KEY TERMS

Ascending infection—Infection which begins in the urinary bladder and travels through the ureters up to the kidneys.

Electrolyte—ions in the body that participate in metabolic reactions. The major human electrolytes are sodium (Na+), potassium (K+), calcium (Ca 2+), magnesium (Mg2+), chloride (Cl-), phosphate (HPO4 2-), bicarbonate (HCO3-), and sulfate (SO4 2-).

Hemodialysis—The blood processing procedure used when kidney function is lost. Blood is removed from a vein, processed through a dialysis machine (artificial kidney), and put back into a vein.

Nephrectomy—Surgical removal of a kidney.

Percutaneous—Medical procedure that is performed through the skin using a needle. Abscess drainage and urinary stones may be treated percutaneously.

Pyelonephritis—Infection and inflammation of the kidney.

Renal failure—A state when the kidneys are so extensively damaged that they can no longer function.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

ICON Health. *Kidney Infections: A Medical Dictionary, Bibliography, And Annotated Research Guide To Internet References*. San Diego: CA ICON Health Pub., 2004.

Mayo Clinic. *Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine*. New York: Time Inc. Home Entertainment, 2007.

Weil, Andrew, *Natural Health, Natural Medicine,* rev. ed. New York: Houghton Mifflin, 2004.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Potomac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

American Association of Oriental Medicine. PO Box 162340, Sacramento, CA 95816. (866) 455 7999 or (914) 443 4770 http://www.aaaomonline.org.

American Holistic Medical Association. PO Box 2016 Edmonds, WA 98020. 425 967 0737. *http://www.holisticmedicin.org*.

National Kidney Foundation, Inc. 30 East 33rd Street, New York, NY 10016. (800)622 9010. www.kidney.org.

OTHER

"Kidney Infection." *Mayo Clinic*. August 9, 2007 [cited April 5, 2008]. http://www.mayoclinic.com/health/kidney infection/DS00593.

"Kidney Infection." *MedlinePlus*. July 25, 2007 [cited April 5, 2008]. http://www.nlm.nih.gov/medlineplus/ency/article/000522.htm.

"Urinary tract Infection Homeopathic remedies." *Peace Health.org* September 1, 2007 [cited April 5, 2008]. http://www.peacehealth.org/kbase/cam/hn 2262002.htm.

Belinda Rowland
Tish Davidson, A. M.

Kidney stones

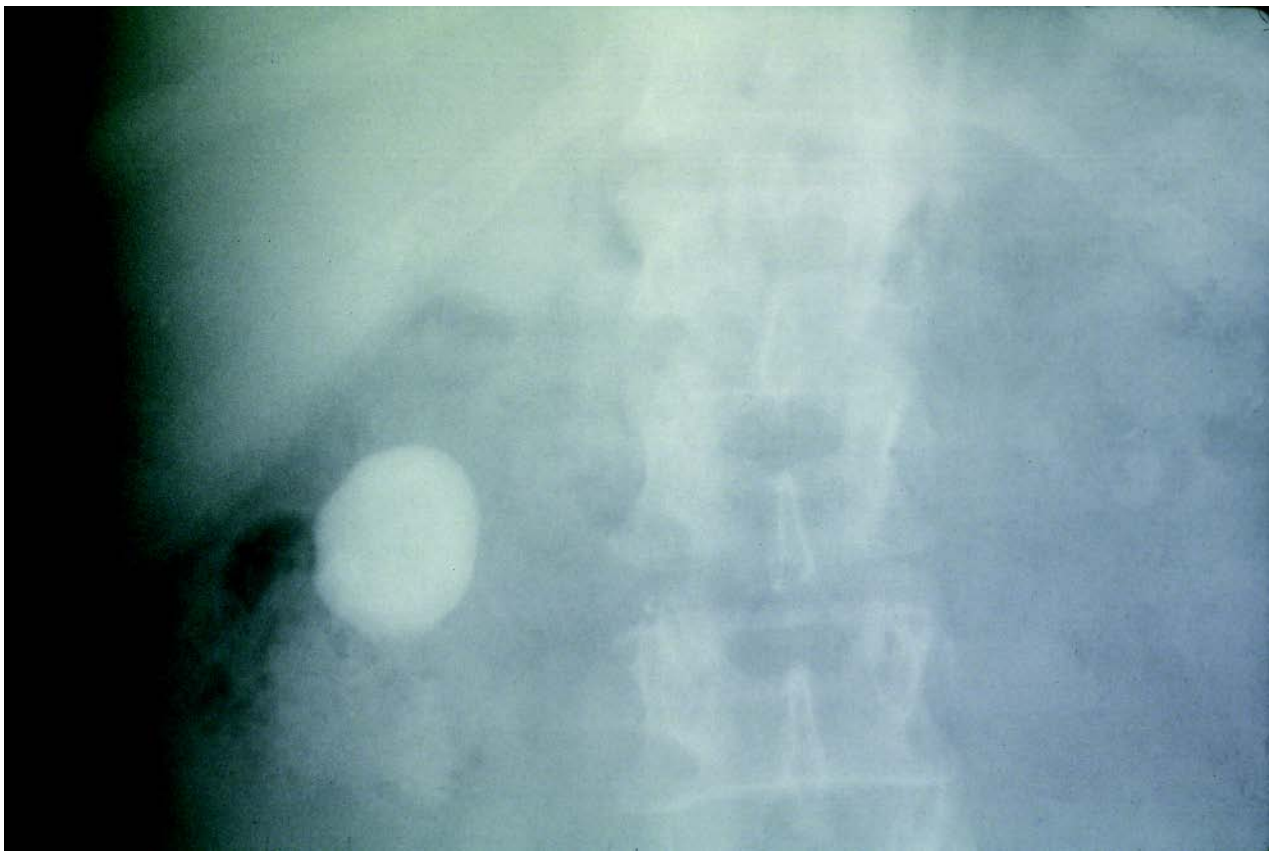
Definition

Kidney stones are solid accumulations of material that form in the tubal system of the kidney. Kidney stones cause problems when they block the flow of urine within the kidney or urinary tract. When the stones move through the ureter, they can cause severe **pain**.

Description

Urine is formed by the kidneys. Blood flows into the kidneys, and nephrons (specialized tubes) within the kidneys allow a certain amount of fluid from the blood, along with certain substances dissolved in that fluid, to flow out of the body as urine. Sometimes, a problem causes the dissolved substances to become solid again. Tiny crystals then form in the urine, meet, and cling together to create a larger solid mass called a kidney stone.

Many kidney stones are small enough that the kidney continues to function normally, and the stones never cause any pain. These are called "silent stones." Kidney stones cause problems when they interfere with the normal flow of urine. They can obstruct (block) the flow through the ureter. The kidney is not accustomed to experiencing any pressure. When pressure builds from backed-up urine, the kidney may swell (hydronephrosis). If the kidney is subjected to this pressure for some time, there may be damage to delicate kidney structures. When the kidney stone is



X ray showing a kidney stone. *(Custom Medical Stock Photo. Reproduced by permission.)*

lodged further down the ureter, the backed-up urine may also cause the ureter to swell (hydroureter). Because the ureter is a muscular tube, the presence of a stone makes the tube spasm, causing severe pain.

About 10% of all people have a significant kidney stone during their lifetime. Kidney stones are most common among white men over age 30, people who have previously had kidney stones, and people whose family members are prone to developing kidney stones. Eating a lot of animal protein and drinking too few fluids are also thought to contribute to the development of kidney stones.

Causes and symptoms

Kidney stones can be composed of a variety of substances. The most common types of kidney stones are described here.

Calcium stones

About 80% of all kidney stones are **calcium** stones. These stones are composed of either calcium and phosphate, or calcium and oxalate. People with calcium stones may have other diseases that cause them to have increased blood levels of calcium. These diseases include primary parathyroidism, sarcoidosis, **hyperthyroidism**, renal tubular acidosis, multiple myeloma, hyperoxaluria, and some types of **cancer**.

Struvite stones

Struvite stones account for 10% of all kidney stones. Struvite stones are composed of **magnesium** ammonium phosphate. These stones occur most often in patients who have had repeated urinary tract **infections** caused by certain types of bacteria. These bacteria produce a substance called urease that increases the urine pH and makes the urine more alkaline. This chemical environment allows struvite to settle out of the urine, forming stones.

Uric acid stones

About 5% of all kidney stones are uric acid stones. These occur when increased amounts of uric acid circulate in the bloodstream. When the uric acid content becomes very high, it can no longer remain

Kidney stone on a human finger tip. *(Stephen J. Krasemann / Photo Researchers, Inc.)*

dissolved and solid particles of uric acid settle out of the urine. A kidney stone is formed when these particles cling to each other within the kidney, slowly forming a solid mass. About half of all patients with this type of stone also have deposits of uric acid elsewhere in their bodies, commonly in the joint of the big toe. This painful disorder is called **gout**. Other causes of uric acid stones include chemotherapy for cancer, bone marrow disorders in which certain types of blood cells are over-produced, and an inherited disorder called Lesch-Nyhan syndrome.

Cystine stones

Cystine stones account for 2% of all kidney stones. Cystine is a type of amino acid, and people with this type of kidney stone have an abnormality in the way their bodies process **amino acids** in the diet.

Patients who have kidney stones usually do not have symptoms until the stone passes into the ureter. Before this, some people may notice blood in their urine. Once the stone is in the ureter, however, most people experience bouts of very severe pain. The pain is crampy, spasmodic, and intense. It usually begins in the flank region, the area between the lower ribs and the hip bone. As the stone moves closer to the bladder, a patient will often feel the pain radiating along the inner thigh. Women may feel the pain in the vulva, while men often feel pain in the testicles. **Nausea**, **vomiting**, frequent and painful urination, and blood in the urine are common. **Fever** and **chills** usually mean that the ureter has become obstructed, allowing bacteria to become trapped in the kidney and cause a kidney infection (pyelonephritis).

Diagnosis

Most often in a healthy adult, diagnosis of kidney stones is based on the patient's pattern of severe, distinctive pain. Diagnosis may include laboratory examination of a urine sample and an x-ray examination. During the passage of a stone, examination of the urine usually reveals blood. A number of imaging tests can, if necessary, be used to diagnose kidney stones. A plain x ray of the kidneys, ureters, and bladder may or may not reveal the stone. A series of x rays taken after injecting **iodine** dye into a vein is usually a more reliable way of seeing a stone. This procedure is called an intravenous pyelogram (IVP). The dye "lights up" the urinary system as it travels. In the case of an obstruction, the dye will be stopped by the stone or will only be able to get past the stone at a slow trickle. This test is not often used in the twenty-first century since less invasive imaging tests are available. An ultrasound can also be used to detect renal blockage. The use of computed tomography (CT) scans has been added to diagnose of some kidney stones.

When a patient is passing a kidney stone, the urine is strained through a special sieve to catch the stone. If the stone can be located (often it cannot), it can then be sent to a laboratory for analysis to determine the chemical composition of the stone. After the kidney stone has been passed, other tests may be done to understand the underlying condition that may have caused the stone to form. Collecting urine for 24 hours, followed by careful analysis of its chemical makeup, can often determine the reason for stone formation.

Treatment

It is believed that stones will pass more quickly if the patient is encouraged to drink large amounts of water (2–3 quarts per day). **Cranberry** (*Vaccinium macrocarpon*) juice has been a traditional remedy for the treatment and prevention of kidney stones. Although good-quality clinical trials have found that cranberry juice has some effect on urinary tract infections, its effectiveness in treating kidney stones is unproven.

Herbal remedies that have anti-lithic (stone-dissolving) action can assist in dissolving small kidney stones. These include gravel root (*Eupatorium purpureum*), hydrangea (*Hydrangea aborescens*), and wild carrot (*Daucus carota*). Starfruit (*Averrhoa carambola*) is recommended to increase the amount of urine a patient passes and to relieve pain.

A Chinese herbal practitioner may use herbs such as *Semen Abutili seu Malvae, Semen plantaginis,* and *Herba lygodii japonici* for urinary stones. Dietary

Human male calcium oxalate kidney stone. *(© Steve Sant / Alamy)*

KEY TERMS

Diuretic—A substance that removes water from the body by increasing urine production.

pH—A measure of the acidity of a fluid. On a scale of 1 to 14, a pH of 7 is neutral. Higher pH readings are alkaline and lower pH readings are acidic.

Ureter—A tube that carries urine from the kidney to the bladder.

changes can be made to reduce the risk of future stone formation and to facilitate the resorption of existing stones. Supplementation with magnesium, a smooth muscle relaxant, can help reduce pain and facilitate stone passing. **Guided imagery** may also be used to help relieve pain. Large stones may require conventional medical intervention.

Allopathic treatment

The pain associated with a kidney stone sends most patients to the emergency room, and a patient with a kidney stone will say that the most important aspect of treatment is adequate pain relief. Because the pain of passing a kidney stone is so severe, narcotic pain medications are usually required. If the patient is vomiting or unable to drink fluids because of the pain, it may be necessary to provide intravenous fluids and anti-emetics (drugs that stop vomiting). If symptoms and urine tests indicate the presence of infection, antibiotics are required.

Although most kidney stones pass on their own, some do not. The preferred method of treatment is extracorporeal shock wave lithotripsy (ESWL). Shock waves are aimed at the stone. The energy of the shock waves causes the stone to vibrate and fragment into small pieces that can be more easily passed. This procedure is generally done under light anesthesia because the shock waves cause pain. If the stone is lodged in the ureter, the urologist may insert a device into the ureter that can direct laser or ultrasound energy at the stone and pulverize it. If the stone is large and ESWL does not work, the stone may be removed by minimally invasive surgery.

Expected results

A patient's prognosis depends on the underlying disorder causing the development of kidney stones. In most cases, patients with uncomplicated calcium stones recover very well. About 60% of these patients, however, will have other kidney stones. Struvite stones are particularly dangerous because they may grow extremely large, filling the tubes within the kidney. These are called staghorn stones and will not pass out in the urine. They require surgical removal. Uric acid stones may also become staghorn stones.

Prevention

Prevention of kidney stones depends on the type of stone and the presence or absence of an underlying disease. In almost all cases, increasing fluid intake so that a person consistently drinks 2 to 3 quarts (liters) of water a day is an important preventative measure. Drinking a glass of lemonade made with real lemons or real lemon concentrate also helps increase the amount of citrate in the urine. Citrate makes it more difficult for kidney stones to form.

People with calcium oxalate stones do not need to reduce the amount of calcium in their diet but may reduce the amount of foods containing oxalate. These foods include rhubarb, star fruit, beets, beet greens, collards, okra, refried beans, spinach, Swiss chard, sweet potatoes, sesame seeds, almonds, and soy products. A vegan diet or one very low in animal products also is effective in preventing kidney stones, especially when combined with a very low salt diet.

People prone to form kidney stones may also be given medication to help prevent their formation. A thiazide diuretic can help prevent the formation of calcium stones. Allopurinol (Zyloprim, Aloprim) reduces the amount of uric acid blood and urine and helps prevent the formation of uric acid stones. Sturvite stones often form when the kidney becomes infected, so preventing infection also helps to prevent stone formation. Cystine stones are difficult to prevent.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

Rodman, John S. *No More Kidney Stones,* rev. ed. Hoboken, NJ: Wiley, 2006.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

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American Holistic Medical Association., PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

National Kidney Foundation, 30 East Thirty third Street, New York, NY, 10016, (800) 622 9010, http://www.kidney.org.

OTHER

"Kidney Stones." *eMedicine Health* September 7, 2007. http://www.emedicinehealth.com/kidney_stones/page6_em.htm#Medical%20Treatment. (April 12, 2008).

"Kidney Stones." *Mayo Clinic* January 31, 2008. http://www.mayoclinic.com/health/kidney stones/DS00282/DSECTION 7. (April 12, 2008).

Paula Ford-Martin
Teresa G. Odle
Tish Davidson, A. M.

Kinesiology *see* **Applied kinesiology**

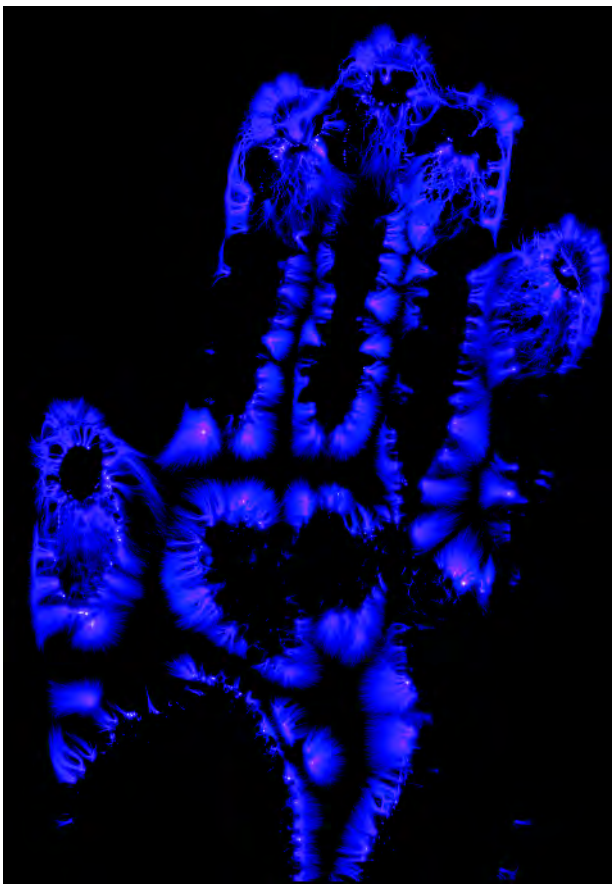
Kirlian photography

Definition

Kirlian photography creates a photographic image by placing the object or body part to be photographed on film or photographic paper and exposing it to an electromagnetic field.

Origins

Although experiments with photographing objects exposed to an electrical field are known to have been carried out as early as the 1890s, Kirlian photography is generally said to have originated with the work of a pair of Soviet scientists, Semyon and Valentina Kirlian, beginning around 1939. Over the next several decades at Kazakh State University, the Kirlians developed electrophotographic techniques which used neither a lens nor a camera. By the 1960s, their work had attracted public attention in the Soviet Union. Interest in Kirlian photography spread to the West during the 1970s, where attempts were made to replicate effects achieved in photographs of Alexei Krivorotov, a well-known psychic healer in the U.S.S.R. In the United States, studies were carried out with psychic healers at the Jerrey Society for Parapsychology and the UCLA Neuropsychiatric Institute.



Kirlian photograph of a hand. *(© Andrew Wakeford / Alamy)*

Benefits

The most common therapeutic use of Kirlian photography is as a diagnostic tool. Variations in the shapes, colors, and intensity of the images produced are said to provide clues to the patient's overall health and energy level and to indicate the presence or absence of disease, specific emotional states, and other physiological or psychological conditions.

Kirlian photograph of the palms of a woman's hands. *(© Photo Researchers, Inc. Reproduced by permission.)*

Description

Practitioners most often photograph the patient's hand (or, less frequently, the foot), which rests on a photographic medium placed over an electrically charged metal plate. During the approximately one-minute exposure, the patient may feel tingling in the exposed surface. After developing the image, the practitioner interprets its significance and, if necessary, refers the patient to a health-care provider for treatment. Kirlian photography is also sometimes used to assess the effectiveness of treatments (such as **acupuncture**) by comparing before and after photographs of the patient.

Research and general acceptance

Although some have speculated that Kirlian photography actually records the aura long said by some mystics and psychic healers to exist around human beings, this is not a generally accepted viewpoint. A scientific explanation of these dramatic images is that they result from interactions between charged particles created by the electromagnetic field used to form the images. A 1976 *Science* article concluded that moisture is a principal determinant of the form and color of human Kirlian photographs.

It has also been noted that variations in a variety of factors, including the amount of pressure on the plate, the voltage and frequency, and the exposure time, moisture, and temperature, can all influence the images produced.

For these reasons, as well as claims of unreliability and a lack of research data supporting its use, Kirlian photography is not recognized as a legitimate diagnostic tool by the mainstream medical community.

Nevertheless, individual practitioners and researchers continue to experiment with Kirlian photography for diagnosis, especially in Russia and Eastern Europe. It

has also been used for nonmedical purposes, such as detecting flaws in metal and determining the viability of seeds.

Resources

BOOKS

Woodham, Anne, and Dr. David Peters. *DK Encyclopedia of Healing Therapies*. New York: DK Publishing, 1997.

PERIODICALS

Stanwick, M. "Aura Photography: Mundane Physics or Diagnostic Tool?" *Nursing Times* (June 1996): 19 25.

Peter Gregutt

Knee pain

Definition

Knee **pain** refers to any aching or burning pain of the knee joint. Knee pain can be a symptom of numerous conditions and diseases including knee **stress**, **osteoarthritis**, injury, **gout**, infection, and **bursitis**.

Description

Knee pain is very common. Each year, millions of Americans visit the doctor for knee pain. It is the most frequent reason for visits to an orthopedist (bone and joint surgeon).

To understand the various causes of knee pain, it is important to know how the knee functions. The knee refers to the joint where the femur (thigh bone) meets the tibia (largest lower leg bone). In front of this joint lies the patella (knee cap). The joint is lined by a membrane called a synovial sac. The synovial sac produces synovial fluid which acts as a lubricant much in the way that oil lubricates the moving parts of machinery. Other tissues that make up the knee joint include cartilages, muscles, tendons, and ligaments. The upper end of the tibia has cartilaginous shock absorbers called "menisci" (meniscus). Other protective structures are the bursae, which cushion areas of friction in the joint. Most of the muscles involved with joint mobility originate in the thigh, cross the knee joint, and attach to the tibia.

The knee supports two to three times a person's body weight. It is a complex joint that allows for a considerable range in mobility. In addition to simple flexion (bending) and extension (straightening) movements, the knee joint is designed to allow for rotation, gliding, and rolling movements. To allow for complex mobility and joint stability, joint strength is sacrificed, making the knee very prone to injury.

X ray of an arthritic knee showing narrowing of the joint space with sclerotic changes in an 84 year old woman. *(© PHOTOTAKE Inc./ Alamy)*

Causes and symptoms

Knee pain is a symptom of many different diseases and conditions. Short-term knee pain may be the result of excess stress on the knee. Possible causes of knee pain include:

- Arthritis. Osteoarthritis (joint degeneration), rheumatoid arthritis (joint inflammation), and septic arthritis (joint infection) can cause knee pain.
- Bursitis. Inflammation of the bursae of the knee can cause knee pain. Bursitis can be caused by infection, gout, rheumatoid arthritis, injury, illness, or chronic irritation (crawling or kneeling)

KEY TERMS

Bursae—Sacs of fluid that serve to cushion areas of friction in joints.

Decoction—Concentration of an herb obtained by boiling it down.

Ligament—A fibrous band of tissue connecting cartilage or bones that serves to strengthen and support joints.

Meniscus—Crescent-shaped disks of cartilage located on the head of the tibia that serve as shock absorbers.

Tincture—A medicinal solution consisting of an herb and alcohol mixture.

- Cysts. A cyst is a fluid-filled sac. Cysts associated with the knee can cause swelling and knee pain or discomfort.
- Fracture. Breakage or crack in any of the bones associated with the knee joint can cause knee pain.
- Gout. A faulty chemical process leads to high levels of uric acid in the blood which causes inflammatory arthritis, crystal deposits in joints, joint destruction, and joint pain.
- Ligament injury or instability. The ligaments supporting the knee may be injured or strained by persons who participate in sports, particularly football, rugby, lacrosse, basketball, skiing, soccer, and volleyball. Other accidents can also cause ligament damage.
- Loose bodies. This condition refers to any loose objects that float around the knee and cause problems. They also are called "joint mice" because of their elusive nature.
- Meniscus conditions. Damage, usually in the form of a tear, to the menisci can be caused by degenerative changes associated with advancing age or sports-related injury. Sports that commonly cause menisci damage include football, basketball, soccer, tennis, lacrosse, and skiing.
- Osteonecrosis. Degeneration of the bones associated with the knee cause pain and deformity.
- Patellofemoral pain. Also known as anterior knee pain syndrome, this condition is characterized by pain around the knee cap. The exact cause of patellofemoral pain is unknown but is probably related to muscle inadequacy, lack of flexibility, rapid growth, or bone positioning.

Diagnosis

Knee pain can be diagnosed and treated by an orthopedic surgeon. Diagnosis is based primarily on medical history and physical exam. The diagnosis begins with a detailed medical history to fully characterize the knee pain. The knee will be bent to determine the range of motion and palpated (felt with the hands) to detect the presence of any abnormalities. The physical exam may include any of a number of different tests designed to detect injuries by manipulating the knee and leg. X rays may be taken. In some cases more advanced testing may be carried out using magnetic resonance imaging (MRI), computed tomography (CT), or contrast arthrography (x ray following injection of a contrast solution).

Treatment

Most alternative treatments for knee pain aim at reducing pain, inflammation, and stiffness. Persons experiencing long-term or severe knee pain should consult a physician to determine the underlying cause.

Herbals

Several herbal remedies are recommended to relieve knee pain. Some remedies are used externally, while others involve internal use of herbs.

The following herbs may relieve knee pain and/or associated symptoms when used externally:

- basil and sage oil rub: knee pain
- comfrey (*Symphytum officinale*) oil rub: joint stiffness and aching joints
- eucalyptus (*Eucalyptus globulus*) essential oil rub: swelling
- ginger (*Zingiber officinale*) root hot compress or bath: joint stiffness, arthritis, and degenerative joint disease
- lavender (*Lavandula officinalis*) essential oil rub: joint stiffness and aching joints
- mustard (*Sinapsis alba*) powder bath or paste (with alcohol): knee pain
- red pepper (*Capsicum*) lotion: arthritic pain and swelling
- St. John's wort (*Hypericum perforatum*) oil rub: joint stiffness and aching joints
- wintergreen (*Gaultheria procumbens*) oil rub: chronic pain

The following herbs may relieve knee pain and/or associated symptoms when used internally:

- celery (*Apium graveolens*) decoction or tincture: swollen joints and gout

- chamomile (*Matricaria recutita*): spasms and swelling
- deadly nightshade (*Atropa belladonna*) plaster: swollen joints
- devil's claw (*Harpagophytum procumbens*) tablets: swollen joints
- flaxseed (*Linus usitatissimum*) oil: lubricates joints
- feranium (*Pelargonium odoratissimum*): chronic pain
- jamaican dogwood (*Piscidia erythrina*): pain and swelling
- lemon (*Citrus limon*) juice: swollen joints
- prickly ash (*Zanthoxylum americanum*) tea: joint pain
- white willow (*Salix alba*) tablets or decoction: swollen joints and joint pain
- wild lettuce (*Lactuca virosa*): pain and swelling

Other remedies

Various other alternative treatments that can be helpful in relieving knee pain include:

- Acupressure. Pressing the Stomach 36 point located below the knee caps tones muscles and relieves joint pain anywhere in the body. Pressing the Spleen 9 points located below the kneecap on the inside of each leg relieves knee pain.
- Acupuncture. Inflammation and pain may be relieved by acupuncture. The large intestine meridian is the most effective channel for pain relief. A National Institutes of Health consensus panel found that acupuncture may be an effective treatment for osteoarthritis pain.
- Aromatherapy. Aromatherapy with essential oils is sometimes recommended. The essential oil of peppermint relieves pain and decreases inflammation. The essential oil of rosemary relieves pain and relaxes muscles.
- Chinese medicine. Knee sprain and contusion (bruise) are treated by application of *Shang Ke Xiao Yan Gao* (Relieve Inflammation Paste of Traumatology) and ingestion of *Die Da Wan* (Contusion Pill). Once the initial pain and swelling have been reduced, the patient can apply *Shang Shi Zhi Tong Gao* (Relieve Damp-Inducing Pain Medicinal Plaster).
- Exercise. Regular moderate exercise can reduce pain by improving the strength, tone, and flexibility of muscles. The endorphins released while exercising may also be helpful.
- Food therapy. Following a detoxification diet may restore nutritional balance to the body and relieve joint pain. Animal proteins may induce joint pain caused by inflammatory conditions, such as arthritis, so following a vegetarian diet may be helpful.
- Homeopathy. Rhus toxicodendron is recommended for joint and arthritis pain that is worse in the morning and relieved by warmth. Kali bichromicum is indicated for persistent, severe pain. Other homeopathic remedies can be designed for specific cases by a homeopathic practitioner.
- Hydrotherapy. A warm compress can relieve joint stiffness and dull pain. A cold compress or ice pack can relieve sharp, intense pain.
- Magnetic therapy. Magnetic fields may increase blood flow and block pain signals.
- Massage. Joint pain may be relieved by massaging the area above and below the painful joint. Massaging with ice packs may interfere with pain signals and replace them with temperature signals.
- Reflexology. Knee pain may be relieved by working the knee reflex points.
- Rolfing. This deep, sometimes painful, massage therapy may speed healing and reduce pain.
- Supplements. Knee pain may be relieved by taking vitamin C to promote healing, the B vitamins to balance the nervous system, which reduces pain, and calcium to increase bone strength.

Allopathic treatment

Knee pain may be relieved by taking nonsteroidal anti-inflammatory drugs such as acetaminophen (Tylenol), ibuprofen (Advil, Motrin), or naproxen (Aleve). More severe pain may be treated with prescription pain relievers such as tramadol or a narcotic. Additional treatment for knee pain depends upon the underlying cause and may include injection of drugs into the knee, surgery, wearing a brace, and/or physical therapy. Surgical treatment depends on the cause, but in the case of osteoarthritis, some patients face actual replacement of the joint. However, in 2002, a new device was introduced that postponed the need to replace an arthritic knee. The device is made of chrome and fits between the natural structures of the knee.

Expected results

Most causes of knee pain respond well to conservative treatments and resolve within 4–6 weeks. Knee pain caused by injury or disease may require surgery and lengthy rehabilitation.

Prevention

Strengthening the leg muscles may help prevent knee pain caused by overworking the joint. In addition, a stronger knee may prevent injury to the joint. Squats are an easy **exercise** that will strengthen the quadriceps (front thigh muscles) and hamstrings (back thigh muscles). The **yoga** warrior posture strengthens the muscles around the knee and increases range of motion.

Resources

BOOKS

Dandy, David J. and Dennis J. Edwards. "Disorders of the Hip and Knee." In *Essential Orthopaedics and Trauma*. Third edition, New York: Churchill Liv ingstone, 1998.

"Joint Pain." In *New Choices in Natural Healing: Over 1,800 of the Best Self Help Remedies from the World of Alternative Medicine*. edited by Bill Gottlieb, et al. Rodale Press, Inc., 1995.

"Pain, Chronic." In *The Alternative Advisor: The Complete Guide to Natural Therapies and Alternative Treatments*. Virginia: Time Life Books, 1997.

PERIODICALS

Brody, Lori Thein and Jill M. Thein. "Nonoperative Treat ment for Patellofemoral Pain." *Journal of Orthopaedics & Sports Physical Therapy* 28 (November 1998): 336 344.

Crowther, Christy L. "Approach to Knee Problems in Primary Care." *Lippincott's Primary Care Practice* 3 (1999): 355 375.

Jensen, Roar, Gothesen, Oystein, Liseth, Knut, and Anders Baerheim. "Acupuncture Treatment of Patellofemoral Pain Syndrome." *The Journal of Alternative and Com plementary Medicine* 5 (1999): 521 527.

"Minimally Invasive Surgical Procedure for Arthritis May Delay Knee Replacement Surgery."*Medical Devices & Surgical Technology Week* (May 19, 2002):4.

Sullivan, Dana. "Sports Medicine's New Alternatives." *Women's Sports & Fitness* 2 (July/August 1999): 106.

Belinda Rowland
Teresa G. Odle

Kneipp wellness

Definition

Kneipp wellness is a holistic system for overall health developed by Sebastian Kneipp, a nineteenth-century Bavarian priest. His approach includes aspects of **hydrotherapy**, herbalism, and aerobic **exercise**.

A couple at the Kneipp Wellness bathing village of Bad Mergentheim in Baden Württemberg, Germany. *(© mediacolor's/ Alamy)*

Origins

Sebastian Kneipp was born to a poor family in Stephansreid, Bavaria, on May 17, 1821. He initially took up his father's trade of weaving, but longed to become a priest. With help from a sympathetic clergyman, he was admitted to high school as a mature student, but after five years of intensive studies, Kneipp became seriously ill with pulmonary **tuberculosis**. At that time, the disease was usually fatal, but Kneipp came across an eighteenth-century book about hydrotherapy that inspired him during the winter of 1849 to immerse himself several times a week in the icy Danube River. These brief exposures to cold water seemed to bolster his immune system, because Kneipp's tuberculosis went into remission and he was able to continue his theological studies in Munich. There, he convinced some of his fellow students to join his experiments with hydrotherapy.

Kneipp was ordained as a priest in 1852. In that capacity, he began using hydrotherapy to help some of his poorer parishioners. He broadened his approach to include herbalism, exercise, and other elements, and toned down his initial enthusiasm for shocking the body with cold water. "I warn all against too-frequent application of cold water," he later wrote. "Three times I concluded to remodel my system and relax the treatment from severity to mildness and thence to greater mildness still." Kneipp's reputation grew after a number of dying patients recovered when he was called to administer last rites

KEY TERMS

Hydrotherapy—A family of therapies that treat illness by using water either externally or internally.

Phytotherapy—A form of treatment that uses plants or plant extracts either externally or internally.

and managed instead to restore them to health. In 1855 he was assigned to Worishofen, a village in the foothills of the Bavarian Alps that soon developed an international reputation as a place of healing. Kneipp summarized his teachings in two popular books, *My Water Cure* in 1886 and *So Sollt Ihr Leben (Thus Thou Shalt Live)* in 1889. Supporters of his techniques formed Kneipp Societies in Germany and the United States.

Father Kneipp was later named a monsignor by Pope Leo XIII. After his death in Worishofen on June 17, 1897, his wellness techniques became less popular, but interest in hydrotherapy increased again during the latter part of the twentieth century.

Benefits

Proponents of Kneipp therapy believe that it bolsters the immune system and results in improved overall wellness. In Germany, it is especially popular for treating **varicose veins**.

Description

Today, Kneipp physiotherapy is essentially a form of classical naturopathy. It is founded on five "pillars":

- Hydrotherapy. Hydrotherapy involves the use of hot and cold water to stimulate the nerves, blood vessels and internal organs. It uses baths, compresses, packs, and water jets.
- Phytotherapy. Plant therapy takes the form of medicinal herbs added to bath water and also administered as juices, lozenges, teas, or ointments, etc.
- Exercise therapy. This aspect of treatment involves long hikes, gymnastics, tennis, cycling, and other vigorous activities to amplify the effects of the water and herb therapies.
- Nutrition therapy, which employs a low-protein, high-fiber diet. Special Kneipp diets are also available for weight loss or such ailments as gout, diabetes, or metabolic problems.
- Health maintenance therapy. Patients in the Kneipp program are trained to adhere to their natural biorhythms.

Precautions

All forms of hydrotherapy may pose some risk of water-borne **infections**, and patients should make sure that baths and similar facilities are properly maintained and disinfected. In addition, persons with serious health problems should consult their physician before undertaking an exercise program.

Side effects

Side effects may vary, depending on the numerous herbs used in Kneipp therapy. When in doubt, it is best to consult a knowledgeable herbalist.

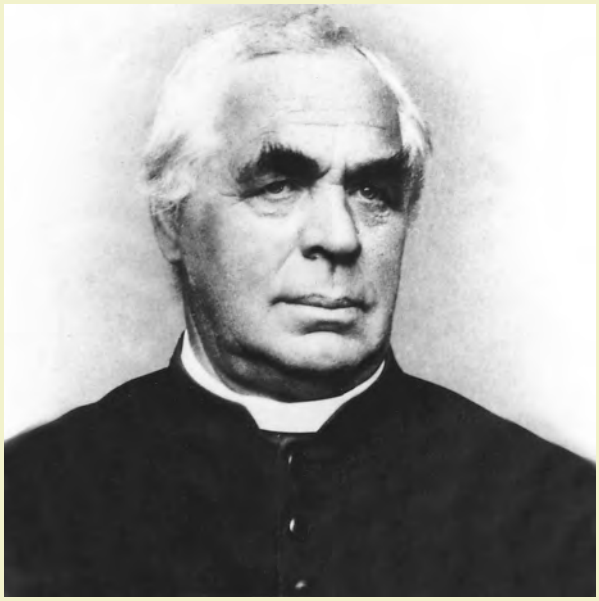
Research and general acceptance

Initially, Kneipp was rejected as a charlatan by the medical establishment. At one point, he was taken to court for quackery, although the judge acquitted him after learning from Kneipp about the shortage of physicians in Alpine villages. Kneipp is now recognized by naturopaths as a founding father of their discipline. The benefits of water are well-known to physiotherapists, but there is so far little conclusive evidence that Kneipp or other methods of hydrotherapy can increase the body's immunity. One German study published in 1977 found that immunological reactions to protein and bacterial antigens were significantly more intense in patients who had undergone Kneipp hydrotherapy, compared to a group of healthy volunteers. There is little doubt among medical doctors that patients should benefit from the vigorous exercise and **high-fiber diet** included in the Kneipp prescription for wellness.

Training and certification

The world center of Kneipp wellness is the village of Bad Worishofen in the foothills of the Bavarian Alps. There, the Kneipp *Kur* is offered by spas, physicians, and guest houses. Healer training is provided by the Sebastian Kneipp School of Physiotherapy. Elsewhere in the world, many adherents of Kneipp's writings treat themselves by using his techniques.

FATHER SEBASTIAN KNEIPP (1821–1897)



(Betmann/CORBIS. Reproduced by permission.)

Born in Stephansreid, Bavaria, Germany, of poor parents, Sebastian Kneipp's childhood was filled with labor, much of it learning weaving from his father. Even as a child, Kneipp wanted to become a priest. With the help of a priest who befriended him, Kneipp entered high school where he studied theology for five years. During this time, he contracted consumption (pulmonary tuberculosis), usually a fatal disease at that time. While ill, he read an eighteenth century book on hydrotherapy by Dr. Hahn. This caused him to bathe two or three times a week in the icy Danube River to stimulate his immune system. His tuberculosis went into remission, his health improved, and in 1850, he entered a seminary in Munich. He continued his hydrotherapy and convinced other theological students to practice it. Kneipp was ordained a priest in 1852. During the next few years, he was called to the bedsides of many patients to perform the last rites. Instead he successfully treated a number of the patients with hydrotherapy.

He perfected his own system of hydrotherapy and his successful treatment of the poor attracted much attention. People came from throughout Germany to be healed by Kneipp's hydrotherapy. His success fostered resentment from physicians and at one point, he was charged in German courts with quackery, where he was subsequently acquitted. In 1886, he published *My Water Cure*, which was translated into several languages and became popular throughout Europe. He continued to refine his treatment from one of severity to milder versions. It consisted of bathing in and drinking cold water, going to bed and rising early, long barefoot walks in wet grass, and simple meals consisting of little meat and lots of whole grain cereals. He continued his hydrotherapy practice at Wörishofen Monastery in the foothills of the Alps until his death. Kneipp's hydrotherapy is still practiced throughout the world, especially in Germany and the United States.

Resources

ORGANIZATIONS

Kneipp Corporation of America. 105 107 Stonehurst Court. Northvale, NJ 07647. (201) 750 0600 or (800) 937 4372. *http://www.kniepp.com*.

David Helwig

Kola nut

Description

The kola nut, or bitter cola, (*Cola vera, Cola acuminata, Cola nitida*) is a seed part from a tree from the Sterculiaceae family. The trees are native to Central and Western Africa, but are now found in the West Indies and Brazil, where they were introduced by African slaves. All three species are used as a stimulant and are prepared in the same manner. The kola tree grows to approximately 40 ft (12 m) in height, and has white to yellow flowers with spots that range from red to purple. The kola tree's leaves are 6–8 in long (15–20 cm) and the tree bears fruit that is shaped like a star. Inside the fruit, about a dozen round or square seeds can be found in a white seed shell.

General use

Kola nut, which contains high amounts of **caffeine**, helps combat **fatigue** and is most commonly used as a central nervous system stimulant that focuses on the cerebrospinal centers. It also contains theobromine, a stimulant found in chocolate as well as in **green tea**. Kola nut also contains tannins, phenolics, phlobaphens, kola red, betaine, protein, starch, fat, **thiamine**, **riboflavin**, and **niacin**. The *Journal of the American Medical Association* advocates the use of kola over other stimulants, because it is not addictive

Kola nut plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

and does not lead to **depression**. Because kola nut is also a diuretic, its use has been suggested for those with renal diseases, cardiac or renal **edema** and rheumatic and rheumatoid conditions. Most people around the world are familiar with kola; many have tasted it and do not even know it. In the 1800s, a pharmacist in Georgia took extracts of kola, sugar and coca and mixed them with carbonated water. His accountant tasted it and called it "Coca Cola." Today, Coca-Cola still uses kola in its original recipe.

Respiratory conditions

Kola is widely used as a treatment for **whooping cough** and **asthma**, as the caffeine acts as a bronchodilator, expanding the bronchial air passages. A *Journal of American Medicine* cites a study of kola nut's effects on asthma that showed "the attack being cut short and the child's condition rapidly improved."

Gastrointestinal disorders

In Africa, the fresh nuts are chewed as a ceremonial greeting, as a stimulant, and to help aid digestion, as kola nut stimulates gastric acid production. Kola nuts are also known to improve the taste of food and act as an appetite suppressant.

Other conditions

The kola nut is also used to treat migraine headaches, because the caffeine and theobromine act as cerebral vasodilators (increase blood flow in the head) and, when used in a poultice, can be applied to external **cuts** and scrapes.

More recently, an ephedra/caffeine preparation made from kola nut extract and a Chinese medication known as Ma Huang was tested for safety and efficacy as part of a weight reduction program. The study indicated that the preparation improved the subjects' rate of weight loss and reduction in body fat without undesirable side effects.

The flavor of kola nut in cola beverages appears to be more effective than other flavors in disguising the taste of **activated charcoal** when the charcoal must be given as an antidote for accidental poisoning.

KEY TERMS

Bronchodilator—A medicine that relaxes the bronchial muscles and opens up the air passages to the lungs.

Cardiac arrythmia—The irregular beating of the heart.

Cotyledon—A seed leaf, from the embryo of a seed plant.

Theobromine—A stimulant that occurs naturally in chocolate as well as in kola nut. Foods and drinks containing theobromine are poisonous to domestic pets.

Vasodilator—A drug or nerve that causes blood vessels to widen.

Preparations

The part of the seed known as the kola nut is the cotyledon, which is also called the seed leaf. The cotyledons are white and bitter when they are fresh, but they turn reddish with almost no taste when they are dried. Fresh nuts are difficult to find outside of the tropical areas where they are grown. Sometimes, the nuts are sold at African markets in international cities, like Washington D.C. The dried cotyledons are 1–2 in (2.5–5 cm) long.

Dosage of kola nut should be 2–6 g per day, as 2.5–7.5 g of liquid extract or 10–30 g per day of tincture. Powdered cotyledons should be taken at 1-3 g per day, as a decoction, liquid extract, or tincture. For the decoction, boil 1-2 teaspoons in a cup of water and take three times a day. The liquid extract should be taken in a 1:1 solution of 60% alcohol at .6-1.2 ml three times a day. Tinctures in a 1:5 solution of 60% alcohol, with 1-4 ml of the cotyledons three times a day.

Precautions

Because of its use as a stimulant, kola nut should be used with caution. Patients should consult with their doctors, especially if they are taking other medications. Due to its caffeine content, kola nut should not be used by women who are pregnant or nursing a child. Also because of its caffeine content, it is not advisable for those suffering from **insomnia** or **anxiety** problems. In some cases, extreme restlessness and sleepnessness can occur. It should not be used by patients with a history of high blood pressure, heart trouble, palpitations, seizures, insomnia, **heart disease**, high **cholesterol**, or **stroke**. Research in Niger showed that the habitual chewing of kola nut can actually cause cardiac arrythmias, based on clinical trials using cats. Kola nut should not be used by those with stomach or duodenal ulcers because it increases gastric juice production and may add to gastrointestinal discomfort and disorders. Kola nut is also one of the top ten common food allergens, among cow's milk and chocolate. Kola nut is naturally very high in tannin, a white-to-yellow astringent powder that gets its name from its use as a textile and leather tanning agent. However, a University of Miami study shows that "tannins are increasingly recognized as dietary carcinogens and as antinutrients interfering with the system's full use of protein" and called for more studies correlating early death and regular kola nut use in third world countries. Kola nut should not be used long-term.

Kola nut and cola beverages should be kept away from dogs, cats, and other domestic animals. The theobromine in kola nut (and in chocolate as well) can be fatal to these pets because they metabolize it much more slowly than humans.

Side effects

Kola nut may cause insomnia, anxiety, nervousness, gastrointestinal problems, and tremors. If there is any indication of an overdose, **diarrhea**, **nausea**, and/or cramps may follow. Oral **blisters** have also been known to form.

Heavy use of kola nut or drinking large quantities of cola beverages has been associated with bone loss in adults and inhibition of bone formation in adolescents. Some practitioners are recommending that teenagers should restrict intake of soft drinks containing cola in order to lower their risk of **osteoporosis** in later life.

Interactions

Kola nut should not be used with muscle relaxants, heart medications, high blood pressure medication, nitrates and calcium-channel blockers.

Clinical experiments indicate that beverages containing cola increase the rate and extent of absorption of carbamazepine (Tegretol), a drug used to treat **epilepsy** and some forms of **bipolar disorder**. Kola nut has been reported to interact with tricyclic antidepressant medications and with MAO inhibitors. In general, patients taking any medication for anxiety or depression should consult their physician before taking preparations containing kola nut.

Resources

BOOKS

Castleman, Michael. *The Healing Herbs*. New York: Bantam Books, 1995.

PERIODICALS

Boozer, C. N., P. A. Daly, P. Homel, et al. "Herbal Ephedra/Caffeine for Weight Loss: A 6 Month Randomized Safety and Efficacy Trial." *International Journal of Obesity and Related Metabolic Disorders* 26 (May 2002): 593 604.

Dagnone, D., D. Matsui, and M. J. Rieder. "Assessment of the Palatability of Vehicles for Activated Charcoal in Pediatric Volunteers." *Pediatric Emergency Care* 18 (February 2002): 19 21.

Malhotra, S., R. K. Dixit, and S. K. Garg. "Effect of an Acidic Beverage (Coca Cola) on the Pharmacokinetics of Carbamazepine in Healthy Volunteers." *Methods and Findings in Experimental and Clinical Pharmacology* 24 (January February 2002): 31 33.

Morton, J.F. "Widespread Tannin Intake Via Stimulants and Masticatories, Especially Guarana, Kola Nut, Betel Vine, and Accessories." *Basic Life Sciences* (1992): 739 65.

Reiling, Jennifer. "Therapeutics of Kola." *Journal of the American Medical Association,* (24 November 1999).

Root, A. W. "Bone Strength and the Adolescent." *Adolescent Medicine* 13 (February 2002): 53 72.

Speer, F. "Food Allergy: The 10 Common Offenders." *American Family Physician* (February 1976):106 12.

ORGANIZATIONS

Centre for International Ethnomedicinal Education and Research (CIEER). www.cieer.org.

OTHER

American Veterinary Medical Association (AVMA). "A Pet Owner's Guide to Common Small Animal Poisons." www.avma.org/pubhlth/poisgde.asp.

Katherine Kim
Rebecca J. Frey, PhD

Kombucha

Description

Kombucha is a fermented beverage prepared from a mushroom (*Fungus japonicus*). Known as kombucha tea, the drink is touted for its health-promoting properties. It is also called Manchurian mushroom tea, Manchurian fungus tea, Kwassan, combucha tea, and champagne of life. During fermentation and preparation, the kombucha membrane becomes a tough, gelatinous cover composed of several different yeasts (one-celled fungi) and certain nontoxic bacteria derived from the air, similar to a sourdough bread starter. When the fungus is fermented in a mixture containing water, black or **green tea**, sugar, and vinegar (or other fermentation source), the microorganisms combine into a complex fermenting culture. This culture produces several compounds that have been considered health tonics over the centuries. Kombucha also contains several B vitamins and **vitamin C**. The tea is said to have a unique, pleasant taste. The membrane surface of the kombucha is also edible.

Kombucha tea. *(© Bon Appetit / Alamy)*

In China, kombucha tea has been utilized as a health beverage for thousands of years, dating back to before 200 B.C. It has been consumed for centuries in Japan, Korea, and Russia. In the early 1900s, use of the tea spread from Russia into other European countries including Germany, where it was touted as a health elixir for many years. In the 1950s and 1960s, German and Italian researchers claimed that kombucha tea exhibited strong anticancer properties, and it was promoted as a miracle cure for **cancer**. Alexander Solzhenitzyn, the Nobel Prize winning Russian author, reported that kombucha tea, which he began to drink during a prison term, cured his stomach cancer. Proponents of kombucha tea continue to tout its possible anticancer and immunity-enhancing properties. However, controlled studies have failed to display conclusive evidence as to its efficacy in treating various medical conditions.

General use

Kombucha tea is taken as a general health tonic. Claims are made for its use as a remedy for specific health conditions and diseases. It is used to introduce

KEY TERMS

Anthrax—A highly toxic strain of bacteria.

Intestinal flora—The beneficial bacteria that live in the digestive tract and aid digestion of food.

and improve healthy intestinal flora and bacteria, as an energy-enhancing tonic, and as a detoxifier in helping to remove pollutants. It is taken to strengthen the immune system after an illness, stimulate hair growth, improve arthritis and skin conditions, and as a health tonic for cancer and autoimmune deficiency syndrom (**AIDS**) patients.

Kombucha tea contains significant amounts of the B complex vitamins, as well as vitamin C and minerals. It contains a small amount of alcohol (higher than 1%), which is produced during fermentation, and small amounts of methylxanthine stimulants. Teas do not contain **caffeine**, but they do contain methylxanthine alkaloids, a similar stimulant.

There is no large body of scientific evidence that supports the strong claims made by advocates of kombucha tea. Some European studies have pointed to positive results in cancer cases, but further research is needed to confirm these results. Its proposed anticancer and **detoxification** effects have been attributed to certain chemicals in the tea. However, more recent tests have failed to validate the presence of these chemicals in the beverage. One study did confirm improvements in liver function after a three-week treatment. Research in Russia demonstrated antibiotic effects caused by kombucha tea. There are many testimonial claims that the tea increases vitality and overall well-being. In general, properly fermented foods have been shown to aid in the growth of beneficial intestinal flora, reduce the growth of harmful yeasts and bacteria in the digestive tract, and improve digestion and absorption. Some testimonial claims have also been made by cancer and AIDS patients.

Preparations

Kombucha tea is available in several forms. Kits include the fungi and all ingredients, as well as directions to make the brew at home. The fungi may also be purchased separately. Dried kombucha is available in capsule form.

Making the tea from scratch is a process similar to preparing yogurt, sauerkraut, and other fermented foods. Instructions should be followed carefully. Particular care should be taken to maintain the cleanliness of the tea-making process, to avoid contamination by mold or unhealthy bacteria (a cause of health problems in those drinking poor quality kombucha). **Smoking** in the same room as the mixture may contaminate it. Mold typically appears as green, pink, or black blotches in the culture, and should be thoroughly removed and discarded. The fermentation process is generally successful if the kombucha skin remains firm and rubbery. Care should be taken if the membrane becomes crumbly or discolored. On average, the fermentation of kombucha tea takes 12–14 days. After fermentation, new batches can be easily made from the existing culture.

When using the supplement in pill form, consumers can follow the manufacturer's recommended dosages. Users of the tea can drink up to three cups of the beverage per day, with food or between meals.

Historically, kombucha was consumed as a tea. The health benefits of other forms of the supplement have not been compared with the original therapeutic beverage. There are reports of consumer illness from home prepared kombucha. This may have been due to tea that was too old, infected with molds or other contaminants, or had other problems. Consumers must be alert to the risks of home prepared fermentation methods.

Precautions

Several precautions concerning kombucha tea have been issued. Because the beverage is fermented at home, there is the risk that the liquid can become contaminated by dangerous bacteria such as anthrax. People with compromised immune systems must be extremely careful not to consume contaminated fermentations. Due to the high acidity of the drink, the tea should not be placed in metal containers or in pottery that has a lead glaze finish. There have been reported cases of **lead poisoning** and anthrax due to drinking kombucha tea that has been improperly prepared. The United States Food and Drug Administration (FDA) issued a warning concerning the danger of lead poisoning from improperly made kombucha tea. Kombucha tea is not recommended for pregnant or nursing mothers.

Side Effects

Consumption of kombucha tea has been observed to cause stomach upset, yeast **infections**, allergic reactions, **nausea**, and **headache**. Persons with stomach ulcers may find that kombucha increases their symptoms. Due to harmful bacteria that can survive in the culture, ingesting contaminated tea can be dangerous or fatal.

Interactions

Kombucha tea is high in acidity, and should not be consumed by those taking medications that make them susceptible to increased gastrointestinal acidity. The tea contains a small amount of alcohol, and should not be consumed with any medications that interact unfavorably with alcohol. The tea should not be taken by people with stabilized **alcoholism**, to avoid aggravating the condition.

Some people report general and specific improved health from moderate use of kombucha tea. These reports await final validation by current research. There are risks associated with the use of poor quality or contaminated kombucha. Its use may be contraindicated in those who have medical conditions or require certain medications.

Resources

BOOKS

Chang, Shu Ting. *Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact*. Boca Raton, FL: CRC Press, 2004.

Hobbs, Christopher. *Medicinal Mushrooms: An Exploration of Tradition, Healing, and Culture*. Loveland, CO: Interweave Press, 1995.

Pascal, Alana and Lynne Van Der Kar. *Kombucha: How To and What It's All About*. Van Der Kar Press, 1995.

Pryor, Betsy and Sanford Holst. *Kombucha Phenomenon: The Miracle Health Tea*. Thriving Press, 1996.

OTHER

Kombucha Tea. http://www.kombucha.org.

Douglas Dupler

Kudzu

Description

Kudzu, whose botanical name is *Pueraria lobata*, is a member of the Fabaceae legume family. It is also known as Ge-gen, kudzu vine, mile-a-minute vine, foot-a-night vine, and the vine-that-ate-the-South. The latter names refer to this vine's property of rapid growth. This perennial trails, climbs, and winds its rough vines around tree poles and anything else it touches. It grows in shady areas, mountain areas, fields, roadsides and forests in China, Japan, and the southern United States, more so in the latter because when imported, its native insects did not tag along. Kudzu was first seen in the United States as an ornamental plant at the 1876 Philadelphia Centennial Exposition. During the Depression, the United States Department of Agriculture (USDA) imported kudzu for erosion control. In 1972, the USDA classified kudzu as a weed because the plant can reach 60 ft (18.29 m) in a single growing season. In June and July, the vines sport purple flowers and in autumn, the leaves shed.

The kudzu root, which can grow to the size of a human being, has a history of use in Chinese medicine. Kudzu contains daidzein, an isoflavone, and daidzin and puerarin, isoflavone glycosides. The isoflavone amount can range from 1.77–12.08%, based on kudzu's growing conditions. The highest isoflavone is puerarin with daidzin and daidzein next in isoflavone amounts. A study at the University of Michigan compared legumes for their sources of the isoflavones of genistein and daidzein. The results showed the kudzu root as a good nutritional source of those two components.

The root also supports bacteria that grab nitrogen from the atmosphere and put it in the soil. This factor may explain kudzu's rapid growth and its success in feeding Angora goats raised by Tuskegee University researcher Dr. Errol G. Rhoden.

General use

Traditional uses

Traditional Chinese medicine has used kudzu, whose Chinese name is *ge gan*, for centuries. Kudzu's medicinal uses were first recorded in Shen Nong's herbal text, published around A.D. 100. Chinese medicine recommends kudzu for what it calls *wei*, or superficial syndrome, referring to a mild disease that appears just below the body's surface and is accompanied by a **fever**. Chinese medicine also indicates using kudzu for thirst, headaches (migraine and other types of headaches), **neck pain** from **hypertension**, **angina**, **allergies**, **diarrhea**, and speeding the progression of **measles** in children. In general, kudzu is used as a demulcent, or medication given to soothe irritated mucous membranes.

Cardiovascular disease

One alternative practitioner has stated that because kudzu improves the body's flow of blood and levels of oxygen and opens heart vessels, it might help the cardiovascular system. Another researcher, James Duke, refers to a Chinese clinical study that showed that kudzu can benefit angina sufferers. For a period of 1–6 months, 71 participants took 10–15 gm of kudzu root extract. The results indicated that 29 people had significant improvement, 20 had an

KEY TERMS

Demulcent—A substance or medication given to soothe irritated or inflamed mucous membranes. Kudzu is used as a demulcent in traditional Chinese medicine.

Daidzein—An isoflavone contained in kudzu that appears to be useful in treating alcoholism.

Ethanol—Another name for the alcohol found in alcoholic drinks.

Extract—A concentrated form of the herb made by pressing the herb with a hydraulic press, soaking it in water or alcohol, then allowing the excess water or alcohol to evaporate.

Tincture—A liquid herbal preparation, made by soaking the herb in alcohol or a mixture of alcohol and water.

intermediary amount of improvement, and the remaining 22 showed no improvement or only a slight improvement.

Duke cites another Chinese study showing that kudzu can lower blood pressure. For a period of 2–8 weeks, 52 people drank about 8 tsp of kudzu root in a tea. Seventeen people had their blood pressure decrease substantially, while the other 30 had some relief from hypertension.

Alcoholism

It is the Chinese medicinal use of kudzu in treating **alcoholism**, however, that is the focus of many studies on kudzu. In 1989, two associate research professors in the psychiatry department at the University of North Carolina tested rats for their alcohol cravings. In 1991 an organic chemist tested a tea containing seven herbs including kudzu on drunken rats. The rats had been injected with alcohol; when they ingested the herbal tea, their motor movements became more coordinated.

In further studies conducted in 1992, the rats were allowed to drink alcohol for an hour each day. The rats gulped down an enormous amount of alcohol; however, after a week, when the herbal mixture containing kudzu was given to them 15 minutes before their happy hour, they drank much less alcohol. In another study, the rats were allowed to drink alcohol for the first 24 hours, then deprived for the next 24 hours. On day three, the rats' alcohol intake increased from 20% to 30%. Once injected with the herbal mixture, however, the rats either drank a normal or less than normal amount.

A 1995 study was also conducted at Harvard University using hamsters, because hamsters naturally choose alcohol over water. Thirty hamsters were given either daidzein, an active ingredient in kudzu; or disulfiram (Antabuse), a compound that stops ethanol craving in humans. Nine more hamsters were allowed to drink as much alcohol as they wanted without anything added. Hamsters receiving daidzein dropped their alcohol intake by 70% and those receiving disulfiram had 80% less alcohol intake. The researchers concluded that daidzein takes a less toxic metabolic route than disulfiram.

A double-blind random clinical study using human subjects was conducted at the Veterans' Affairs Medical Center in Prescott, Arizona. Thirty-eight middle-aged men suffering from chronic alcoholism were given either 1.2 g of kudzu root extract (21 men) or 1.2 g of a placebo (17 men) twice daily for a month. The results of this test showed no significant difference in sobriety or alcohol cravings in either group.

Preparations

The problems of manufacturing kudzu root as a drug to treat alcoholism and other disorders were outlined in an article on traditional Chinese medicine by Dr. James Zhou. Zhou says that herbs lose their natural balance when manufacturers purify, refine, and treat them with chemicals. The daidzein in kudzu could treat alcoholism, but the purification process destroys the isoflavone balance. Because it is the isoflavone puerarin in kudzu that stops cardiovascular damage impairment and may prevent an alcoholic side effect, liver damage, Zhou believes that the herb should be given in its natural state.

For angina pectoris, practitioners of traditional Chinese medicine recommend 30–120 mg of standardized tablets of kudzu root two to three times daily. Ten mg of a standardized tablet equals 1.5 g of the pure root. Tinctures of 1–2 ml three to five times daily are recommended in place of tablets. To help lower cravings for alcohol, the recommended dosage is 3–5 g of kudzu root three times daily or 3–4 ml of tincture three times daily. The *All-In-One-Guide to Natural Remedies and Supplements* recommends drinking kudzu tea to combat alcoholism. An alternative form of treatment involves taking 1500-mg supplements or cubes before or after the alcohol. The 1500 mg can be divided equally into three daily doses.

Kudzu also comes in supplements combined with **St. John's wort** to treat the symptoms of alcoholism. One capsule is taken with each meal on a daily basis.

Kudzu leaves can also be used in cooking, for example in quiches and as a deep-fried dish.

Precautions

Kudzu should not be taken by pregnant and lactating women. In traditional Chinese practice, people who sweat too much or have cold in their stomach should avoid kudzu because it is given for "wind-heat" illnesses.

Side effects

No toxic side effects or damage to the liver have been reported from kudzu.

Interactions

Kudzu should not be taken in conjunction with prescription drugs. As with all medicinal supplements, it is best to check with a health care provider before taking kudzu.

Resources

BOOKS

Ali, Elvis, Dr., et al. *The All In One Guide to Natural Remedies and Supplements*. AGES Publications, 2000.

Balch, James F., MD and Phyllis A. Balch, CNC. *Prescription for Nutritional Healing*, 2nd ed. New York: Avery Publishing Group, 1997.

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Sharon Crawford

L-Arginine *see* **Arginine**

L-Carnitine *see* **Carnitine**

L-Glutamine *see* **Glutamine**

L

Labyrinth walking

Definition

A labyrinth is a patterned path, often circular in form, used as a walking **meditation** or spiritual practice. A labyrinth's walkway is arranged in such a way that the participant moves back and forth across the circular form through a series of curves, ending at the labyrinths's heart or center. It is unicursal, which means that it has only one entrance and leads in only one direction. Although the word "maze" is often used as a synonym for labyrinthmazes are multicursal in design; the user has to make choices at many points along the path. Mazes often have more than one entrance, and usually contain many wrong turns and dead ends.

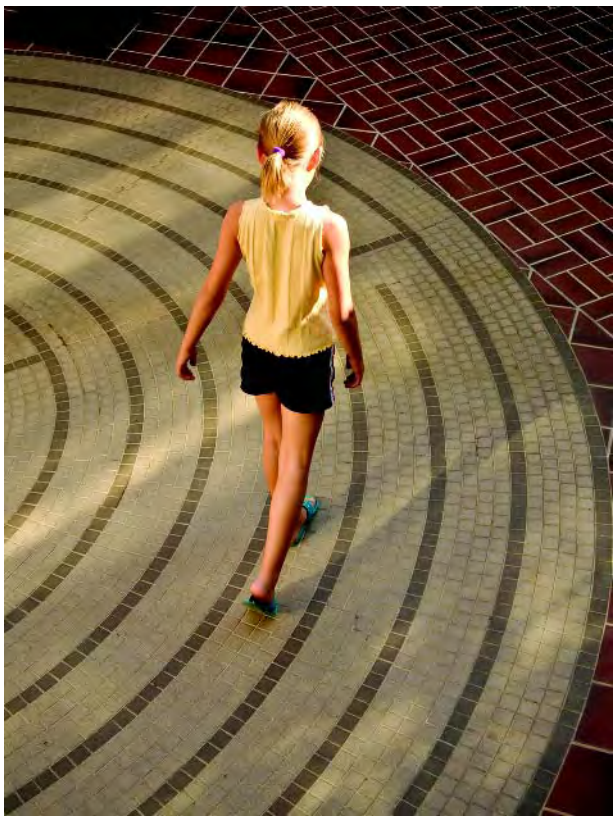
The English word labyrinth is derived from the Greek word *labyrinthos*, which in turn may come from *labrys*, the word for the double-headed axe associated with the Minoan culture on the island of Crete that was at its height around 1650 B.C.. According to the Greek historian Herodotus (c. 450 B.C.), King Minos of Crete asked an Athenian architect and inventor named Daedalus to build a house with winding passages for the Minotaur, a monster that his queen had borne after having intercourse with a bull. This mythical Cretan labyrinth was actually a maze rather than a true labyrinth, as it was intended to prevent those who entered it as human sacrifices to the Minotaur from escaping.

Origins

The unicursal designs associated with labyrinths are thought to predate constructed labyrinths. Pottery estimated to be 15,000 years old painted with labyrinthine patterns has been discovered in the Ukraine. The oldest known constructed labyrinths were built in ancient Egypt and Etruria (central Italy) around 4500 B.C., perhaps to prevent evil spirits from entering tombs. It was thought that the evil spirits were repelled by the planned order of the labyrinth's design. Other labyrinths were made by the Romans as mosaic patterns on the floors of large houses or public buildings. These mosaic labyrinths were usually square or rectangular in shape. The Romans also constructed turf labyrinths in fields or other open areas as a test of skill for horseback riders. Traces of Roman turf labyrinths have been found all over Europe.

Labyrinths have been found in many cultures around the world, including ancient India, Spain, Peru, and China. Members of the Tohono O'odham and Pima tribes in southern Arizona have made baskets for centuries decorated with the so-called "man in the maze" design. The labyrinth pattern woven into the basket represents the path to the top of a local sacred mountain known as Baboquivari. More than five hundred ancient stone labyrinths have been identified in Scandinavia. Most are located near the coast, and are thought to have been used for rituals intended to guarantee good fishing or protection from storms.

The best-known labyrinths in the West, however, are those dating from the Middle Ages. They were built as substitutes for going on a pilgrimage to Jerusalem, a journey that was physically or economically impossible for most Christians in Western Europe during this period. Cathedrals were designated as pilgrimage shrines, and labyrinths were embedded in the stone floors of the cathedrals as part of the shrine's design. The labyrinth on the floor of Chartres Cathedral in France was installed around A.D. 1200, and a similar labyrinth in Amiens Cathedral was made around the same time. Tracing the path through the labyrinth, often on the knees, was for many pilgrims the final act of devotion on the pilgrimage. The circuitous journey to the center of the labyrinth represented the many turnings in the journey of life, a journey that required the Church's guidance and support. Medieval labyrinths were circular in shape, the circle being a universal symbol of wholeness, completion, and unity.



This girl walks on a labyrinth, or a patterned path used for walking meditation or spiritual practice. *(Ginna Fleming / Alamy)*

KEY TERMS

Left brain—The left cerebral hemisphere, which controls activity on the right side of the body in humans. The left brain is thought to be specialized for language use and mathematical calculation; it is also associated with logical analysis, fact-based decisions, and planning or organization. A maze is considered a left-brain puzzle.

Mantra—A sacred word or formula that is repeated as an incantation to focus the mind and spirit, or to induce a mystical state.

Maze—A network of paths or passages intended to confuse, with numerous choices at different points. Unlike a labyrinth, a maze often has high walls intended to block the visitor's line of sight.

Right brain—The right cerebral hemisphere, which controls activity on the left side of the body in humans. It is associated with spatial and nonverbal concepts, intuition, emotions, and creativity. Labyrinth walking is thought to stimulate the right brain.

Unicursal—A curve or series of curves that forms one path, without branching or splitting. A true labyrinth is unicursal in design.

By the seventeenth century, however, many cathedral labyrinths were removed or destroyed. There is some disagreement among scholars regarding the reasons for their removal. Some experts think that the labyrinths were removed because the cathedral clergy had forgotten their history and original purpose, while others speculate that they were destroyed to prevent children from playing on them during Mass and disturbing worship. Another factor was the growth of rationalism in the seventeenth century and the hostility toward religion that emerged during the French Revolution at the end of the eighteenth century. The labyrinths were regarded as remnants of "superstition" and therefore offensive to "enlightened" people.

The contemporary revival of interest in labyrinth walking began in the early 1990s, when Dr. Lauren Artress, a psychotherapist who was on the Special Ministries staff of Grace Cathedral (Episcopal) in San Francisco, attended a Mystery Seminar led by Jean Houston, who describes herself as "a scholar and researcher in human capacities," and directs the Foundation for Mind Research in Pomona, New York. Dr. Houston presented the labyrinth as a tool for spiritual growth that would lead the seminar participants to their spiritual center. She had taped the forty-foot-wide pattern of the Chartres Cathedral labyrinth on the floor of the meeting room. Dr. Artress felt drawn to return to the labyrinth later that night and found walking through it a powerful experience. She then made a pilgrimage to Chartres itself in 1991, followed by further research into the history and significance of labyrinths. After returning to the United States, Dr. Artress made a canvas version of the Chartres labyrinth for use in the San Francisco cathedral. It was introduced to the public on December 30, 1991, and was used twice a month until 1995, when a permanent outdoor labyrinth made of terrazzo stone was laid down in the cathedral's outdoor garden.

Benefits

In general, labyrinth walking is said to benefit participants by allowing a temporary suspension of so-called left-brain activity—logical thought, analysis, and fact-based planning—and encourage the emergence of the intuition and imaginative creativity associated with the right brain. Lauren Artress has said,

"The labyrinth does not engage our thinking minds. It invites our intuitive, pattern-seeking, symbolic mind to come forth. It presents us with only one, but profound, choice. To enter a labyrinth is to choose to walk a spiritual path."

In addition to helping people open themselves to the nonrational parts of the psyche, labyrinth walking puts them in touch with simple body rhythms. Because labyrinth walking involves physical movement, participants may find themselves becoming more mindful of their breathing patterns, the repetition of their footfalls, and the reorientation of the entire body that occurs as they move through the circular turns within the labyrinth. More particularly, the overall pattern of movement in labyrinth walking—first inward toward the center of the labyrinth and then outward on the return path—holds deep symbolic meaning for many people.

Specific benefits that some people have experienced as a result of labyrinth walking include:

- answers to, or insights, personal problems or circumstances
- a general sense of inner peace or calm
- emotional healing from past abuse or other traumas
- a sense of connection to, or unity with, past generations of pilgrims or family ancestors
- reawakened interest in their specific religious tradition
- greater awareness of their own feminine nature or the feminine principle in nature, often associated with circular shapes and patterns
- stimulation of their imagination and creative powers
- improved ability to manage chronic pain
- faster healing following an injury or surgical procedure

Description

Labyrinth construction and design

Contemporary labyrinths are constructed from a wide variety of materials in outdoor as well as indoor settings. In addition to being made from canvas, mosaic flooring, or paving stones, labyrinths have been woven into patterned carpets, outlined with stones, bricks, or hedgerows, or carved into firmly packed earth. Most modern labyrinths range between 40 and 80 feet in diameter, although larger ones have also been made.

One classification scheme categorizes labyrinths as either left- or right-handed, according to the direction of the first turn to be made after entering the labyrinth. The entrance to the labyrinth is known as the mouth, and the walkway itself is called the path. Classical labyrinths are defined as having a simple path with an equal number of turns and counterturns. Labyrinths are also classified by the number of circuits in their design, a circuit being one of the circles or rings surrounding the center of the labyrinth. The labyrinth in Chartres Cathedral, for example, is a classical eleven-circuit labyrinth. Three- and seven-circuit classical labyrinths have been constructed in many parts of the United States, while one labyrinth in Denmark has 15 circuits.

Walking the labyrinth

The actual procedure of labyrinth walking is divided into three phases or stages: the journey inward, a pause for **prayer** or meditation at the center, and the return journey. There are no rules or guidelines for the pace or speed of labyrinth walking, although participants are asked to be respectful of others who may prefer a slower pace, and to move around them as gently as possible. Some people choose to dance, run, crawl on their hands and knees, or walk backwards in the labyrinth. With regard to pausing in the center of the labyrinth, people's behavior varies depending on the size of the labyrinth. Labyrinths based on the Chartres model have six "petals" or semicircular spaces surrounding the center, which allows several people to remain for a few minutes to pray, contemplate, or meditate. Smaller labyrinths may have room for only one person at a time in the center, and it is considered courteous to remain there only briefly.

Labyrinth walking can be incorporated into such ritual events as weddings, funerals, and anniversary celebrations, or such personal events as completing one's schooling, taking a new job, or moving to a new area. Some published guides to labyrinth walking include meditations to be used for labyrinth walking during **pregnancy**, or for blessing ceremonies at different seasons of the year.

Preparations

Although one need not be a member of any specific faith or religious tradition to participate in labyrinth walking, spiritual preparation is considered an important part of the activity. Although the walk itself is informal and relatively unstructured, most participants find that a period of quietness to focus their attention on their journey is essential. Some also recommend clarifying one's intention for the walk beforehand; that is, participants should ask themselves whether they are seeking spiritual guidance, healing, closer fellowship with God, discernment, blessing, or the fulfillment of some other purpose. The use of prayers or mantras is suggested as a way to calm and "center" one's spirit at the beginning of and during the walk.

Participants are advised to wear comfortable shoes and clothing for labyrinth walking so that they will not be distracted by physical discomfort or concerns about their appearance. They will be asked to remove their shoes, however, if the labyrinth is made of canvas or woven into a rug; thus it is a good idea to bring along a pair of clean cotton socks or soft-soled slippers.

Precautions

There are no special precautions needed for labyrinth walking other than allowing sufficient time for the experience. Most people find that the walk takes about 45 minutes or an hour, but some take two to three hours to complete their journey. It is best to plan a labyrinth walk for a day or evening without a tight time schedule.

Side effects

No physical or psychological side effects have been reported from labyrinth walking.

Research and general acceptance

Little research has been done within the mainstream or alternative medical communities on labyrinth walking in comparison to other forms of treatment. As of 2004, however, it appeared to be generally accepted as a form of mind-body therapy or spiritual practice that has few if any associated risks and offers spiritual benefits to many people.

Since the mid-1990s, growing numbers of churches and retreat centers in the United States and Canada have built or installed labyrinths. Some communities have also built outdoor labyrinths for the general public. In the early 2000s, health spas and tourist resorts have added labyrinths to their facilities in order to attract visitors interested in wellness programs. A labyrinth locator is available on the web site of The Labyrinth Society.

Training and certification

The Labyrinth Society (TLS), which was founded in 1999, hosts an annual meeting that includes workshops and speakers on labyrinth construction as well as the spiritual aspects of labyrinth walking. TLS does not, however, offer licensing or training programs as of 2004; its membership code of ethics states, "Membership or leadership in this Society does not serve as qualifying evidence of any level of proficiency or ability relating to labyrinths and their uses and shall not be so represented." Membership in TLS is open to anyone interested in "inspir[ing] possibilities and creat[ing]connections through the labyrinth."

Resources

BOOKS

Artress, Lauren. *Walking A Sacred Path: Rediscovering the Labyrinth as a Spiritual Tool*. New York: Riverhead Books, 1995.

Curry, Helen. *The Way of the Labyrinth: A Powerful Medi tation for Everyday Life*. New York: Penguin Compass Books, 2000.

Schaper, Donna, and Carole Ann Camp. *Labyrinths from the Outside: Walking to Spiritual Insight A Beginner's Guide*.

PERIODICALS

Oakley, Doug. "Tourism Officials Push Wellness as Niche Market." *Travel Weekly*, 20 May 2002.

Stone, Victoria. "Discovering the Labyrinth as a Tool for Health and Healing." *Journal of Healthcare Design* 10 (1998): 73 76.

Unsworth, Tim. "The Ancient Labyrinth Makes a Come back: Walk Through Maze Recalls Our Wandering Journey Through Life." *National Catholic Reporter* 3 October 2003, 10.

ORGANIZATIONS

Labyrinth Enterprises. 128 Slocum Avenue, St. Louis, MO 63119. (800) 873 9873 or (314) 968 5557. Fax: (314) 968 5539. http://www.labyrinth enterprises.com.

StoneCircle Services. E mail: info@stonecircledesign.com. http://www.stonecircledesign.com.

The Labyrinth Society (TLS). P. O. Box 144, New Canaan, CT 06840. (877) 446 4520. http://www.labyrinthsociety.org.

Rebecca Frey

Lachesis

Description

Not all products used in alternative healing come from plants. Lachesis is the venom of the bushmaster snake, *Lachesis mutus*. It is used in homeopathic medicine.

L. mutus is a tropical snake that lives in the jungles of Central and South America, growing to a length of 12 feet (3.6 m). It is the largest poisonous pit viper in the Western hemisphere, and second in size in the world only to the king cobra. *L. mutus* is related to the familiar North American rattlesnake.

A large bushmaster can have fangs more than 1 in (2.5 cm) long. Its venom is deadly and kills rapidly by inhibiting nervous impulses or slowly by interfering

Lachesis is the venom of the bushmaster snake, Lachesis mutus. *(© blickwinkel / Alamy)*

with blood clotting and accelerating the destruction of red blood cells. The bushmaster is also called the surucucu (sometimes spelled surukuku).

General use

Homeopathic medicine operates on the principle that "like heals like." This means that a disease can be cured by treating it with substances that produce the same symptoms as the disease, while also working in conjunction with the homeopathic law of infinitesimals. In opposition to traditional medicine, the law of infinitesimals states that the *lower* a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

In homeopathic terms, fresh *L. mutus* venom was "proved" as a remedy by Constantine Hering around 1830. Although born in what is now Germany, Hering is considered to be the founder of American **homeopathy**. In 1827 he went to Surinam, South America, to conduct biological research for his government. In experimenting with lachesis venom in an attempt to find a homeopathic inoculation for smallpox, he accidentallypoisoned himself with a small amount of venom. This led him to his "proof" that lachesis was a homeopathic remedy. Ever the curious scientist, Hering later accidentally paralyzed his right side by continuing to test higher and higher doses of lachesis on himself.

Lachesis is used in homeopathy to treat a wide range of symptoms. These fall into the following general categories of:

- menstrual and menopausal complaints
- throat and mouth complaints
- fear, paranoia, and associated mental complaints
- nervous system complaints
- circulatory complaints

All these complaints exhibit certain patterns or modalities that indicate they should be treated with lachesis. These symptoms may:

- worsen after sleep and upon awakening
- worsen in the spring
- worsen after drinking hot beverages, taking hot baths, or direct exposure to the sun
- worsen if touched or if the body is constricted by tight clothes
- worsen with alcohol consumption
- produce surging waves of pain
- move from the left side to the right side of the body
- result in a mottled, engorged, congested face
- result in a very sensitive neck
- improve from eating
- improve from the onset of bodily discharge
- improve from exposure to cold and fresh air

In homeopathy, certain remedies are thought to be especially effective in people with specific personality and physical traits. The "lachesis personality" tends to be egocentric, self-important, unstable, and jealous.They may be possessive. This personality type often talks about doing great things, but rarely follows through. Physically, lachesis types tend to be overweight and bloated. They often have red hair and freckles.

Lachesis is a major homeopathic remedy for **hot flashes** associated with **menopause**. It is also used to treat premenstrual and menstrual symptoms such as **premenstrual syndrome** (PMS), menstrual **pain**, and short menses.

Throat and mouth complaints are also treated with lachesis. A **sore throat** that worsens when hot liquids are swallowed is a good example of the type of throat complaint for which lachesis is considered appropriate. Similarly, so is a sore throat with left-sided pain or pain in the left ear, and a purplish, engorged throat, swollen gums, tongue, and foul-tasting saliva. The throat, neck, and larynx are extremely sensitive to touch.

Lachesis is used to alleviate certain mental or emotional symptoms. These include suspicion and distrust that can border on paranoia, extreme talkativeness that reflects nervousness and restless, **depression**, petty jealousy, and unsociability.

Circulatory complaints treated with lachesis include:

- swollen and engorged veins that give the skin a bluish cast
- varicose veins
- nose bleeds
- slow-to-heal, bluish wounds
- a throbbing sensation in various parts of the body
- weak, irregular rapid pulse
- palpitations
- fainting

The main nervous system complaint treated by lachesis is cluster headaches. These are headaches that produce pulsating waves of pain, often on the left side, or beginning on the left side then moving to the right. They often precede **menstruation** and improve once menses begins. Petit mal seizures and **angina** are also treated with lachesis.

Other complaints that lachesis is said to alleviate include stomach pains, appendicitis, **vomiting**, and gastrointestinal complaints, anal spasms, bleeding **hemorrhoids**, and cravings for alcohol, coffee, and shellfish.

Preparations

Fresh venom is commercially prepared in a very highly diluted form. It is available in tablets or liquid and is known as lachesis 12X. It can be taken with other complementary homeopathic remedies.

Precautions

No particular precautions have been reported when using lachesis, however, caution must be taken when using this—and any homeopathic treatment. Individuals should consult a licensed homeopath or physician.

KEY TERMS

Angina—Any painful spasm that leaves one feeling choked or suffocated. In common usage, angina usually refers to chest pain associated with a heart spasm.

Petit mal seizures—A less severe form of epileptic seizure.

Side effects

When taken in the recommended dilute form, no side effects have been reported. However, concentrated quantities of the venom cause paralysis and hemorrhaging, and can be fatal.

Interactions

Studies on interactions between lachesis given in homeopathic doses and conventional pharmaceuticals are nonexistent.

Resources

BOOKS

Hammond, Christopher. *The Complete Family Guide to Homeopathy*. London: Penguin Studio, 1995.

Lockie, Andrew. *The Family Guide to Homeopathy: Symptoms and Natural Solutions*. New York: Prentice Hall, 1989.

Lockie, Andrew and Nicola Geddes. *The Complete Guide to Homeopathy*. London: Dorling Kindersley, 1995.

OTHER

Homeopathic Internet Resources. http://www.holisticmed.com./www/homeopathy.html.

ORGANIZATIONS

National Center for Homeopathy, 801 N. Fairfax Street, Suite 306, Alexandria, VA, 22314, (703)548 7790, (703)548 7792 , http://nationalcenterforhomeopathy.org.

Tish Davidson

Lacto-ovo vegetarianism

Definition

Lacto-ovo vegetarians do not eat meat but do include dairy products (lacto) and eggs (ovo) in their **diets**.

Origins

The term "vegetarian" was coined in 1847 by the founders of the Vegetarian Society of Great Britain, although **vegetarianism** as a way of life had existed for thousands of years. The founders of the Vegetarian Society were lacto-ovo vegetarians.

One of the central values that motivated vegetarians is that food choices should not require the death or suffering of animals. Thus, many vegetarians avoid meat but eat dairy products and eggs (on the grounds that store-bought eggs are unfertilized). Some people argue, however, that eating eggs may prevent the life of an animal, so some vegetarians are lacto-vegetarians. **Veganism**, another type of vegetarianism, follows a diet that uses no animal products at all.

Some of the world's oldest religious traditions have advocated vegetarianism as a means to both physical and spiritual health. In the Christian tradition, Trappist monks of the Roman Catholic Church are vegetarian, as are Seventh Day Adventists, who form a group large enough that many studies have been performed on them to determine the health benefits of lacto-ovo vegetarianism. Some vegetarians maintain that there is evidence that Jesus and the early Christians were vegetarians as well. In ancient India, the idea of *ahimsa* developed, which means "not doing harm." Followers of this creed believe that living in a manner that reduces the suffering of other living beings, including animals, is necessary to reach higher levels of spiritual wellness. According to Hinduismm, there is an endless cycle of rebirth and lives until souls reach nirvana. The presence of souls on all levels of animal life precludes meat eating.

The **yoga** system of living and health recommends vegetarianism because its dietary practices are based on the belief that healthy food contains prana. Prana is the universal life energy, which yoga experts believe is abundant in fresh fruits, grains, nuts, and vegetables, but absent in meat because it comes from an animal that has been killed. Some Buddhists are vegetarian because of their spiritual belief in the oneness of all life. Other traditional cultures, such as those in the Middle East and the Mediterranean regions, have evolved diets that consist mainly of lacto-ovo vegetarian foods. The **Mediterranean diet**, which a Harvard study declared to be one of the world's healthiest, is primarily although not strictly lacto-ovo vegetarian.

The list of famous vegetarians forms an illustrious group. The ancient Greek philosophers, including Socrates, Plato, and Pythagoras, advocated vegetarianism. Other famous vegetarians include Leonardo da Vinci, Sir Isaac Newton, the physician Albert Schweitzer, writer George Bernard Shaw, musician Paul McCartney, and champion triathlete Dave Scott. Albert Einstein, although not a strict vegetarian himself, stated that a vegetarian diet would be an evolutionary step forward for the human race.

Vegetarianism in the United States has generally consisted of a small but vocal number of adherents. It has its roots in the mid-1800s, when some people began to question accepted health and dietary practices. In 1839, Sylvester Graham, who invented the graham cracker from whole wheat flour, wrote *Lectures on the Science of Human Life*. A few decades later, Ralph Waldo Emerson and Henry David Thoreau both advocated vegetarianism. In 1883, Howard Williams published *The Ethics of Diet*, which promoted vegetarianism. Williams's book influenced many people around the world, including Russian author Leo Tolstoy and Indian political leader the Hindu Mahatma Gandhi. But vegetarianism remained largely unpopular in the United States during the nineteenth century.

In the twentieth century, vegetarianism steadily gained followers in the United States, although it met considerable resistance from the meat industry and general public. By the 1960s, the consumption of meat in the United States had increased significantly from consumption levels at the turn of the century. Meat and dairy foods made up two of the four recommended food groups designed by the United States government. Some researchers claimed that meat was fundamental to health, while a growing minority of nutritionists began to correlate the meat-heavy U.S. diet with rising rates of **heart disease**, **cancer**, and diabetes.

In 1971, Frances Moore Lappe published her landmark book, *Diet for a Small Planet,* which proposed that vegetarians could obtain a complete source of dietary protein by combining particular foods such as rice and beans. Until that time it was believed by U.S. nutritionists that only meat could supply adequate protein. The book sold millions of copies. Lappe's book argued that meat-centered diets are unhealthy for both people and the environment, and it stressed that meat-eating perpetuated hunger worldwide because animals raised for food consume so much grain. Millions were converted to vegetarianism by this book.

Vegetarianism steadily gained acceptance as an alternative to the meat-and-potatoes regimen of the traditional American diet. Several factors contributed to the U.S. trend toward vegetarianism. Outbreaks of **food poisoning** from meat products, as well as increased concern over such additives in meat as hormones and antibiotics, led many people and professionals to

question the safety of meat products. People also became aware of unethical treatment of animals in the meat industry. Then too the environmental impact of an agricultural system based on meat production was examined more closely. Some argued that raising of livestock causes soil erosion, water contamination and shortages, pollution, deforestation, and an inefficient use of natural resources.

The growing health consciousness of Americans is probably the most important reason for the surge of interest in vegetarianism. **Nutrition** experts argue that the high rates of heart disease, cancer, and diabetes are directly related to poor dietary habits, particularly a diet high in **cholesterol** and saturated fat and low in fiber. Nutritionists have repeatedly shown in studies that a healthy diet consists of plenty of fresh vegetables and fruits, complex carbohydrates such as whole grains, and foods that are high in fiber and low in cholesterol and saturated fat. The vegetarian diet fulfills all these criteria.

In alternative medicine, vegetarianism is a cornerstone dietary therapy, used in Ayurvedic treatment, **detoxification** therapies, the Ornish and Wigmore diets, and in treatments for many chronic conditions, including heart disease, diabetes, and cancer.

Benefits

Lacto-ovo vegetarianism is sometimes recommended as a dietary therapy for a variety of conditions, including heart disease, cancer, diabetes, **stroke**, high cholesterol, **obesity**, **osteoporosis**, **hypertension**, **gout**, **gallstones**, **kidney stones**, ulcers, **colitis**, **hemorrhoids**, **premenstrual syndrome**, **anxiety**, and **depression**. Lacto-ovo vegetarianism is an economical and easily implemented preventive practice. It does, however, require self-education regarding how to fashion an adequate diet for those who adopt it.

Preparations

It is generally recommended that a vegetarian diet be adopted gradually, to allow people's bodies and lifestyles time to adjust to new eating habits and food intake. Some nutritionists have designed transition diets to help people become vegetarian in stages. Many Americans eat meat products at nearly every meal, and the first stage of a transition diet is to replace meat in just a few meals a week with wholly vegetarian dishes. Then, particular meat products can be slowly reduced and eliminated from the diet and replaced with vegetarian foods. Red meat can be reduced and then eliminated, followed by pork, poultry, and fish. Individuals should be willing to experiment with transition diets and need patience when learning how to combine vegetarianism with such social activities as dining out. Many vegetarian cookbooks are available to help vegetarians prepare meals at home.

The transition to vegetarianism can be smoother for those who make informed choices regarding dietary practices. Nutritional guidelines include decreasing fat intake, increasing fiber, and emphasizing fresh fruits, vegetables, legumes, and whole grains while avoiding processed foods and sugar. Other helpful health practices include reading food labels and understanding such basic nutritional concepts as daily requirements for protein, fats, and nutrients. Would-be vegetarians can experiment with meat substitutes, foods that are high in protein and essential nutrients. Many meat substitutes are readily available, such as tofu and tempeh, which are soybean products that are high in protein, **calcium**, and other nutrients. Veggieburgers can be grilled like hamburgers, and vegetarian substitutes for turkey and sausage have surprisingly realistic textures and tastes.

Precautions

Adopting a lacto-ovo vegetarian diet does not automatically mean an improvement in health. One of the advantages of lacto-ovo vegetarianism is that eggs and dairy products are good sources of the protein, vitamins, and minerals for which vegetarians may have special requirements. Both eggs and dairy products, however, are generally high in calories and contain cholesterol and saturated fat. Studies have shown that some vegetarians consume higher than recommended quantities of fat, and some vegetarians have high cholesterol levels. The lacto-ovo vegetarian diet is most healthful when it uses eggs and low-fat dairy products sparingly to supplement a diet rich in whole grains, fruits, vegetables, and legumes. Another option for lacto-vegetarians is to use only egg whites (which contain no fat) and nonfat dairy products when high cholesterol and fat consumption are problems. Vegetable sources of saturated fat include avocados, nuts, and some cooking oils.

In general, a well-planned lacto-ovo vegetarian diet is healthful and safe and contains all the nutrients needed by the body. Vegetarians who eat few animal products, however, should be aware of particular nutrients that may be lacking in non-animal diets. These are protein, **vitamin A**, **vitamin B_{12}**, **vitamin D**, calcium, **iron**, **zinc**, and **essential fatty acids**. Furthermore, pregnant women, growing children, and people with certain health conditions have higher requirements for these nutrients.

Vegetarians should be aware of getting complete proteins in their diets. A complete protein contains all of the essential **amino acids**, which are proteins that are essential to the diet because the body cannot make them. Meat and dairy products generally contain complete proteins, but many vegetarian foods such as grains and legumes contain incomplete proteins, lacking one or more of the essential amino acids. Vegetarians can overcome this difficulty by combining particular foods in order to create complete proteins. In general, combining legumes such as soy, lentils, beans, and peas with grains such as rice, wheat, or oats forms complete proteins. Eating dairy products or nuts with grains also makes complete proteins. Oatmeal with milk combines to make a complete protein, as does peanut butter on whole wheat bread. Proteins do not necessarily need to be combined in the same meal, but generally they should be combined over a period of a few days.

Getting enough vitamin B_{12} may be an issue for some vegetarians, although this vitamin is present in both eggs and dairy products. Vitamin supplements that contain vitamin B_{12} are recommended, as are fortified soy products and nutritional yeast. Research has indicated that vitamin B_{12} deficiency is a risk for vegetarians, especially vegans. Those choosing a vegetarian diet should watch carefully to ensure they get enough active vitamin B_{12} from diet and supplements. Deficiency of this vitamin poses particular risk to pregnant women and nursing mothers.

Vitamin D can be obtained in dairy products, egg yolks, fortified foods, and sunshine. Calcium can be obtained in dairy products, enriched tofu, seeds, nuts, legumes, dairy products, and dark green vegetables, including broccoli, kale, spinach, and collard greens. Iron is found in raisins, figs, legumes, tofu, whole grains (particularly whole wheat), potatoes, and dark green leafy vegetables. Iron is absorbed more efficiently by the body when iron-containing foods are eaten with foods that contain **vitamin C**, such as fruits, tomatoes, and green vegetables. Zinc is abundant in eggs, nuts, pumpkin seeds, legumes, whole grains, and tofu. For vegetarians who eat no fish, getting enough omega-3 essential fatty acids may be an issue, and such supplements as **flaxseed** oil should be considered as well as eating walnuts and canola oil. Vegetarians may also consider buying organic foods, which are grown without the use of synthetic chemicals, as another health precaution.

Research and general acceptance

Walter Willett, chair of the Department of Nutrition at Harvard University and professor of epidemiology and nutrition, has extensively studied the effects of diet on health. His research has shown that about 82 percent of heart attacks, about 70 percent of strokes, more than 90 percent of type 2 diabetes, and more than 70 percent of colon cancer can be prevented with proper nutrition as part of a healthy lifestyle. In addition, he and his colleagues have found that greater meat consumption is associated with a higher prevalence of degenerative arthritis and soft tissue disorders. In addition, a healthy lifestyle that includes low meat intake has been shown to increase longevity.

One major epidemiological study of vegetarianism was done at Loma Linda University in California. Epidemiology is the study of how diseases affect populations as a whole. Researchers analyzed data from over 25,000 people in the Seventh Day Adventist Church, who are lacto-ovo vegetarians. These vegetarians had 14% of the chance of dying from heart disease that meat-eating Americans faced. The Adventists also had significantly longer life expectancy. From this study, researchers estimated that eating meat just once a day triples the risk of dying from heart disease by age 64. It should be noted, however, that Seventh Day Adventists typically do not smoke or drink alcohol, and may have healthier lifestyles in general, affecting rates of heart disease. A study in England analyzed more than 10,000 vegetarians and meat eaters, and researchers concluded there was a direct relationship between the amount of meat consumed and the chances of getting heart disease. Other studies have been performed on population data from World War II. In Norway during the war, the death rate from heart disease and strokes dropped significantly concurrent with the drop in consumption of meat.

Many studies have concentrated on the benefits of eating fruits and vegetables and have shown that eating more fruits and vegetables helps decrease the risk of cancer. Other studies have shown that diets high in fiber, which vegetarian diets tend to be, reduce the risk for heart disease, cancer, and other conditions, including digestive disorders, appendicitis, and osteoporosis (bone loss).

A lacto-ovo vegetarian diet, as prescribed by Dean Ornish, has been shown to improve heart disease and reverse the effects of **atherosclerosis**, or hardening of the arteries. Ornish's diet was used in conjunction with **exercise**, **stress** reduction, and other holistic methods. Ornish allowed only the use of egg whites and nonfat dairy products in his low-fat vegetarian diet. Ornish's groundbreaking clinical research demonstrated that coronary heart disease can be reversed with comprehensive lifestyle changes.

KEY TERMS

Ayurvedic treatment—A holistic system of medicine from India that focuses on using physical, psychological, and spiritual therapies to achieve a mind-body balance and optimal health.

Cholesterol—A steroid fat found in animal foods that is also produced in the body from saturated fat for several important functions. Excess cholesterol intake is linked to many diseases.

Complex carbohydrates—Nutrients that are broken down by the body into simple sugars for energy, found in grains, fruits, and vegetables.

Detoxification—The process of eliminating or neutralizing toxins in the body, thereby enabling the body to heal itself and restore health.

Legumes—A group of plant foods that includes beans, peas, and lentils, which are high in protein, fiber, and other nutrients.

Organic food—Food grown without the use of synthetic pesticides and fertilizers.

Saturated fat—Fat that is usually solid at room temperature, found mainly in meat and dairy products but also in vegetable sources such as some nuts and seeds, and avocados.

Unsaturated fat—A type of fat found in plant foods that is typically liquid (oil) at room temperature. Unsaturated fats are the most commonly recommended dietary fats.

Resources

BOOKS

Bender, D. A. *A Dictionary of Food and Nutrition*. New York: Oxford University Press, 2005.

Berdanier, C., and J. T. Dywer, eds. *Handbook of Nutrition and Food,* 2nd ed. Boca Raton, FL: CRC Press, 2006.

Willett, Walter C., and P. J. Skerrett. *Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating*. New York: Free Press, 2005.

PERIODICALS

Leitzmann C. "Vegetarian Diets: What Are the Advan tages?" *Forum of Nutrition* 57 (2005): 147 156.

ORGANIZATIONS

Food and Agricultural Organization of the United Nations, http://www.fao.org.

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agriculture. 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov.

International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, 20036, (202) 296 6540, http://www.ific.org.

North American Vegetarian Society, PO Box 72, Dolgeville, NY, 13329, (518) 568 7970, http://www.navs online. org/.

Vegetarian Nutrition Dietetic Practice Group, American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http:// www.vegetariannutrition.net/.

Douglas Dupler
Teresa Norris
Angela M. Costello

Lactobacillus species

Definition

Lactobacillus is a genus of Gram–positive anaerobic bacteria that get their name from the fact that they convert lactose to lactic acid by the process of fermentation. Lactose is a disaccharide sugar, similar

Scanning electron microscope image of lactobacillus acidophilus bacteria. *(Dennis Kunkel / Phototake, Reproduced by permission.)*

to sucrose (ordinary table sugar), that consists of one molecule of glucose and one molecule of galactose bonded to each other. The genus consists of more than 100 species, many of which consist of two or more **strains**. Probably the best known member of the genus is "L. acidophilus"

Description

Lactobacillus is a member of a larger group of bacteria known as lactic acid bacteria (LAB), so named because they convert carbohydrates to lactic acid. Lactobacillus differs from other members of the LAB group in that they are homofermentive, that is, they produce lactic acid only as their primary (>85%) metabolic product. Other LAB produce other fermentative products, such as ethanol (ethyl alcohol), acetic acid, and carbon dioxide in addition to lactic acid. Lactobacillus bacteria are an important component of the gut flora in humans; they are also found in the female genital system. The term gut flora refers to all the bacteria and other microorganisms that live in the human intestinal system and that, for the most part, are benign and play useful roles in the digestive process. Their beneficial function is to some extent a result of their production of lactic acid, which provides an acidic environment in which disease–causing microorganisms are less able to survive. Lactobacillus also occur in many environments other than the human digestive and genital systems, specifically, in any condition in which dead or decaying plant material is available as a food source.

The lactobacilli are of special interest to researchers, at least partly because of their relatively simple genetic and biochemical structure. As of 2008, the genomes of three species, "L. plantarum ", "L. johnsonii", and "L. acidophilus" had been completely sequenced, while the genomes of at least four other members of the genus were at least partially determined.

Uses

Historically, lactobacillus bacteria have played a very important role in many kinds of food production. They are used in the manufacture of cheese and yogurt; sauerkraut, pickles, and kimchi; beer, wine, and cider; and silage, fermented plant matter used as feed for domestic animals. Two common species used in food production are "L. casei" and "L. brevis".

The basic principle behind the use of lactobacilli as dietary supplements is that the human digestive system consists of a finely balanced mixture of beneficial ("good") and harmful ("bad") bacteria. Beneficial bacteria contribute to and support many biochemical reactions that promote growth and development, while harmful bacteria attack systems, leading to disease. In healthy individuals, the body maintains a proper balance between "good" and "bad" bacteria. Any number of conditions may cause a disruption in this balance that can result in disease. For example, the use of antibiotics to treat an infectious disease may result in the destruction of beneficial as well as harmful bacteria. Without the benefit of "good" bacteria to keep "bad" bacteria under control, other diseases may develop. For this reason, health care workers routinely recommend that patients on antibiotics supplement the bacteria in their digestive system by eating yogurt containing a lactobacillus to maintain a proper bacterial balance in their digestive systems.

The most common use of lactobacilli in medicine is as **probiotics**. A probiotic is a dietary supplement consisting of microorganisms thought to have potentially beneficial effects in the digestive system of humans and other animals, with the potential for preventing the growth of pathogenic (disease–causing) organisms. The lactobacillus most widely used for this purpose is "L. acidophilus". A number of diseases and disorders for which "L. acidophilus" has been recommended, with greater or lesser scientific support, include:

- acne
- cancer
- cardiovascular disease
- constipation
- Crohn's disease
- diverticulitis
- heartburn
- indigestion
- stomach ulcers
- ulcerative colitis
- urinary tract infections
- vaginal yeast infections
- weakened immune system

The scientific validity of claims such as these is the subject of considerable research. In November 2005, the National Center for Complementary and Alternative Medicine (NCCAM) held a conference of researchers to determine the current state of knowledge about the use of probiotics in general. The conference reported that there is "encouraging evidence" for claims

that support the use of probiotics in the treatment of a number of conditions, including treatment for:

- diarrhea, for which the evidence is strongest of any condition
- urinary tract and genital tract infections
- irritable bowel syndrome
- bladder cancer (reduction in the risk of recurrence)
- pouchitis (a condition that develops after surgery for removal of the colon)
- atopic dermatitis (eczema) in children

The conference report also concluded that "in studies of probiotics as cures, any beneficial effect was usually low; a strong **placebo effect** often occurs; and more research . . . is needed in order to draw firmer conclusions."

Side effects

Probiotics have been used extensively for many years, with few or no generally recognized side effects. However, well–controlled scientific studies on the subject are largely absent and need to be undertaken to gain a better understanding for the potential of such effects. Some moderate side effects of using probiotics like lactobacilli are already well known and include bloating, **gas**, and **indigestion**. Theoretically, the introduction of bacteria into the digestive system could result in infectious disease, but virtually nothing is known as to the practical likelihood of such an event.

Interactions

Scientists have hypothesized a number of possible interactions between lactobacillus and various herbs and drugs. Alcohol and antibiotics, for example, may be toxic to lactobacillus and should, therefore, not be taken at or near the same time that a probiotic is ingested. Another hypothesis suggests that lactobacillus thrives in a digestive environment that is only moderately acidic, so that taking a antacid prior to using a probiotic will increase the efficacy of the lactobacillus. Some evidence suggests also that lactobacillus may extend the period over which some drugs remain in the body. As an example, a probiotic may magnify the effects of a drug such as lorazepam, one of whose side effects is drowsiness. Herbal practitioners sometimes recommend that certain foods be taken in conjunction with lactobacillus because they are especially efficient at promoting the growth of the bacteria. These foods include asparagus, bananas, **garlic**, Jerusalem artichokes, and onions. At this point, scientific evidence to support any of the side effects is almost completely lacking.

KEY TERMS

Disaccharide—A type of sugar that consists of two simpler (monosaccharide) sugars.

Gram–positive bacteria—Bacteria that turn purple in the Gram staining process. They lack a secondary outer membrane that allows dye to enter and stain the bacterial cell.

Gut flora—A term used to describe all of the microorganisms living in the digestive system.

Lactic acid bacteria (LAB)—Bacteria that convert carbohydrates to lactic acid as a major metabolic product.

Probiotic—A dietary supplement consisting of microorganisms with potential beneficial effects in the digestive system of humans and other animals and potential blocking effects on pathogenic organisms.

Resources

BOOKS

Dash, S. K.. *The Consumer's Guide To Probiotics: The Complete Source Book*. Topanga, Calif.: Freedom Press, 2005.

Elmer, Gary W., Lynne V. McFarland, and Marc McFar land. *The Power of Probiotics: Improving Your Health With Beneficial Microbes*. Binghamton, NY: Haworth Press, 2007.

Huffnagle, Gary B., and Sarah Wernick. *The Probiotics Revolution: The Definitive Guide to Safe, Natural Health Solutions Using Probiotic and Prebiotic Foods and Sup plements*. New York: Bantam Books, 2007.

Lactobacillus acidophilus A Medical Dictionary, Bibliogra phy, and Annotated Research Guide to Internet Referen ces. San Diego: ICON Health Publications, 2004.

Tannock, Gerald W., ed. *Probiotics and Prebiotics: Scientific Aspects*. Wymondham, Norfolk, U.K.: Caister Aca demic Press, 2005.

PERIODICALS

Alvarez Olmost, M. I., and R. A. Oberhelman. "Probiotic Agents and Infectious Diseases: A Modern Perspective on a Traditional Therapy." *Clinical Infectious Diseases* (June 2001): 1567 1576.

Cabana, M. D., et al. "Probiotics in Primary Care Pedia trics." *Clinical Pediatrics* (June 2006): 405 410.

Doron, S., and S. L. Gorbach. "Probiotics: Their Role in the Treatment and Prevention of Disease." *Expert Review of Anti Infective Therapy* (April 2006): 261 275.

Huebner, E. S., and C. M. Surawicz. "Probiotics in the Pre vention and Treatment of Gastrointestinal Infections." *Gastroenterology Clinics of North America* (June 2006): 355 365.

Reid, G., and J. A. Hammond. "Probiotics: Some Evidence of Their Effectiveness." *Canadian Family Physician* (November 2005): 1487 1493.
Vanderhoof, J. A., and R. J. Young. "Current and Potential Uses of Probiotics." *Annals of Allergy, Asthma, & Immunology* (November 2004): S33 S37.

OTHER

Aetna InteliHealth. "Lactobacillus acidophilus." http://www.intelihealth.com/IH/ihtIH/WSIHW000/8513/31402/347266.html?d dmtContent#uses (February 17, 2008).
MedicineNet.com. "Probiotics." http://www.medicinenet.com/probiotics/article.htm (February 17, 2008).
Sahelian, Ray. "Lactobacillus." http://www.raysahelian.com/lactobacillus.html (February 17, 2008).

David Edward Newton, Ed.D.

Laetrile *see* **Apricot seed**
Lapacho *see* **Pau d'arco**

Laryngitis

Definition

Laryngitis is caused by inflammation of the larynx, often resulting in a temporary loss of voice.

Description

When air is breathed in, it passes through the nose and the nasopharynx or through the mouth and the oropharynx. These are both connected to the larynx, a tube made of cartilage. The vocal cords, responsible for setting up the vibrations necessary for speech, are located within the larynx.

The air continues down the larynx to the trachea. The trachea then splits into two branches, the left and right bronchi (bronchial tubes). These bronchi branch into smaller air tubes that run within the lungs, leading to the small air sacs of the lungs (alveoli).

Either food, liquid, or air may be taken in through the mouth. While air goes into the larynx and the respiratory system, food and liquid are directed into the tube leading to the stomach, the esophagus. Because food or liquid in the bronchial tubes or lungs could cause a blockage or lead to an infection, the airway must be protected. The epiglottis is a leaf-like piece of cartilage extending upwards from the larynx. The epiglottis can close down over the larynx when someone is eating or drinking, preventing these substances from entering the airway.

KEY TERMS

Decoction—An herbal tea created by boiling herbs in water. Roots, bark, and seeds are used in decoctions; boiling the herbs brings out their medicinal properties.

Infusion—System for releasing the herbal essence of herbal leaves and flowers. It is similar to brewing tea.

Tincture—A method of preserving herbs in alcohol.

In laryngitis, the tissues below the level of the epiglottis are swollen and inflamed. This causes swelling around the area of the vocal cords and they can't vibrate normally. Hoarse sounds or loss of voice are characteristic of laryngitis. Laryngitis is a very common problem, and often occurs during an upper respiratory tract infection (cold).

Causes and symptoms

Laryngitis is primarily caused by overuse of the voice, a condition faced by people ranging from teachers to performers. Other causes of laryngitis include:

- strain on the larynx from talking or singing for long periods
- shouting or cheering for an extended time
- allergies
- colds or cough
- smoking
- alcohol consumption
- atmospheric conditions like dust in the air
- anxiety
- underactive thyroid
- growths on the larynx

However, the primary medical cause of laryngitis is a viral infection. The same viruses that cause the majority of simple colds are responsible for laryngitis. In extremely rare cases, more harmful bacteria or the bacteria that causes **tuberculosis** (TB) may cause laryngitis. In people with faulty immune systems (like AIDS patients), **infections** with fungi may be responsible for laryngitis.

Symptoms usually begin with a cold. The person may have a sore, scratchy throat, as well as a **fever**, runny nose, aches, and **fatigue**. Difficulty swallowing sometimes occurs, and the patient may have a ticklish **cough** or wheeze. Most characteristically, the patient suffers voice loss or the voice will sound strained, hoarse, and raspy.

In extremely rare cases, the swelling of the larynx may cause symptoms of airway obstruction. This is more common in infants because the diameter of their airways is so small. In that case, the baby may have a greatly increased respiratory rate and exhibit loud, high-pitched sounds with breathing (called stridor).

Diagnosis

Laryngitis is easily recognizable. People realize they can't speak or that their voices are hoarse. In most cases, they know the cause. Laryngitis could be the next phase of the flu or the result of cheering too energetically during a football game. In addition to being an easily recognizable condition, laryngitis is a self-limiting condition that goes away on its own. In most cases, laryngitis can be treated at home.

However, a doctor should be consulted if the laryngitis occurs for no apparent reason or if hoarseness lasts for more than two weeks. A doctor may diagnose another condition such as an underactive thyroid. Symptoms of underactive thyroid include tiredness, **constipation**, aches, and dry skin.

Diagnosis is usually made by learning the history of a cold that is followed by hoarseness. The throat usually appears red and somewhat swollen. Listening to the chest, neck, and back with a stethoscope (an instrument used to hear heart and lungs sounds) may reveal some harsh wheezing sounds when the person breathes.

With chronic laryngitis, TB may be suspected. Using an instrument called a laryngoscope, a doctor can examine the airway for redness, swelling, small bumps of tissue called nodules, and irritated pits in the tissue called ulcerations. Special skin testing (TB testing) will reveal if the person has been exposed to TB.

Treatment

Alternative treatments for laryngitis include various herbal therapies, as well as **reflexology**, homeopathy, **relaxation**, and exercise . Resting the voice is especially important, as is consulting a doctor or practitioner if symptoms last for more than two weeks.

Practitioners who treat laryngitis include naturopathic doctors and ayurvedic doctors. **Naturopathic medicine** focuses on whole body health care; the ayurvedic practitioner concentrates on maintaining balance between the body and the world.

Acupuncture or accupressure, elements of **traditional Chinese medicine** (TCM), may provide some relief. A TCM practitioner may prescribe Throat Inflammation Pills, which are also known as Laryngitis Pills. The pill is an over-the-counter Chinese formula. The usual dosage for adults is 10 pills taken three times daily. This is a short-term treatment and should be stopped after three days.

An ayurvedic practitioner could prescribe an infusion of mint, **ginger**, or cloves, as well as a milk decoction or **licorice** root powder.

Herbal remedies

Numerous herbals can be used to treat laryngitis. Herbal lozenges and throat sprays can provide immediate relief to a raw throat. Herbs that are effective for laryngitis include **thyme**, **horehound**, cardamom, plantain, cinnamon, and **eucalyptus**. Commercial cough medicines that are effective include herbs such as **anise**, **fennel**, and **peppermint**. A person can gargle with warm salt water and slippery elm bark, wild cherry, and mallow.

Echinacea tincture taken in water is recommended to boost the immune system. The tincture consists of 10 drops (1/8 teaspoon or 5/8 ml) of the herb in a glass of water. This mixture is taken frequently, or 5 ml three to four times a day. Antiviral herbs such as usnea, **lomatium**, and ligusticum may help speed recovery.

Poke should be taken as a last resort. It's a strong herb that should be taken only in small amounts and under the direction of a healthcare professional. However, there are many other herbs that can be purchased as packaged cold and throat remedies or used to prepare home treatments.

HYDROTHERAPY. A person can use a vaporizer for relief by inhaling steam. A natural version of the vaporizer is a boiling pot of water with herbs or **essential oils** added. The amount of these ingredients varies. A small handful of **sage** or eucalyptus leaves may be added to the water. When using essential oils, 1-2 teaspoons (4.5-10 g) of an oil such as sage, eucalyptus, **lavender**, benzoin, frankincense, thyme, or sandalwood are added. The pot is removed from the stove and the ingredients are allowed to steep. The person places a towel over the head for a tent-like effect, leans over the pot, and breathes in steam through the mouth.

HERBAL TEAS. Commercial products like horehound tea will provide relief. For brewing tea at home, 1 cup (250 ml) of boiling water is poured over 1-2 teaspoons (4.5-10 g) of an herb. The tea is steeped for about 10 minutes and then strained. Generally, up to 3 cups of tea may be drunk daily.

Helpful herbs for teas include capsicum (cayenne), which is used to treat conditions caused by a cold or flu. Capsicum tea might be a painful treatment if

inflammation is severe. Ginger root helps with chest congestion. Other useful herbs include cardamom, eucalyptus, spearmint, **rosemary**, sweet Annie, **nutmeg**, lavender, bee balm, peppermint, tansy, mallows, and **mullein**.

GARGLES. A home gargle is prepared like herbal tea. One cup (250 ml) of boiling water is poured over 1-2 teaspoons (4.5-10 g) of an herb. This mixture is steeped for about 10 minutes and then strained. The solution is gargled for about 10 seconds, and repeated every three to four hours. Herbs recommended for gargling include **coltsfoot**, garden **raspberry**, golden seal, mullein, **plantain**, red sage, **yarrow**, licorice, and **slippery elm**.

Other home remedies

A range of other home remedies will bring relief to laryngitis and its symptoms. These include:

- Drinking more liquids and eating raw fruit and vegetables.
- Eating certain foods. Candied ginger, honey, lemon, and pineapple juice are soothing. Spicy foods with ingredients like garlic, cayenne pepper, horseradish, mustard, or ginger are helpful.
- Using vitamins. They can also help the immune system. The recommended dosages are 1,000-3,000 mg of vitamin C and 10,000-20,000 I.U. of vitamin A (beta carotene).
- Using a compress. A compress is a form of hydrotherapy that starts by placing a warm washcloth on the neck. Next, a long cotton cloth is soaked in cold water. After the cloth is wrung out, it is wrapped around the neck. Then a long piece of wool flannel such as a scarf is wrapped around the wet cloth. The flannel is secured with a safety pin and remains in place for at least 30 minutes. The compress can be worn overnight.
- Relaxing and exercising. Since anxiety can cause laryngitis, both relaxation techniques and physical exercise can reduce stress.
- Breathing deeply. Deep breaths and breathing exercises can make the respiratory system stronger.

Reflexology

Reflexology is a healing method that involves the manipulation of certain parts of the body to bring about balance. For laryngitis, the reflexology focus is on the throat, lung, chest, lymphatic system, and diaphragm points on both feet. Also recommended is manipulation of all points on the sides and bottoms of the toes.

Homeopathy

Homeopathy is a healing method that is based on the theory that "like cures like." The potency of a homeopathic remedy is indicated by an "x." This indicates the number of times that one part of a remedy was diluted in nine parts of a dilutant. Distilled water is the preferred dilutant. The potency of a remedy can also be expressed as "c," the number of times one part of the remedy was diluted in 99 parts of a dilutant.

Homeopathic remedies for laryngitis include:

- Aconite (6x or 12x). It's taken every two hours at the very start of a cold or when the voice is lost and the person has a dry cough. If there is no improvement after four or five hours, another remedy such as spongia tosta is taken.
- Spongia tosta (12x). It's taken four times daily for laryngitis combined with a dry throat.
- Arnica (6x or 12x). It's taken hourly when loss of voice is caused by overuse or trauma.

Allopathic treatment

Treatment of a simple, viral laryngitis relieves the symptoms. Gargling with warm salt water, using **pain** relievers such as acetaminophen, using a vaporizer to create moist air, and resting will help the illness resolve within a week. Over-the-counter remedies such as throat sprays and lozenges may provide relief.

For an infant who is clearly struggling for air, a doctor may put in an artificial airway for a short period of time. This is very rarely needed.

When a doctor is consulted, antibiotics may be prescribed. The person with an underactive thyroid could be prescribed a thyroid hormone supplement. An individual with tubercular laryngitis is treated with a combination of medications used to treat classic TB. For people with fungal laryngitis, a variety of antifungal medications are available.

Expected results

The prognosis for people with laryngitis is excellent because it is a self-limiting condition. Recovery is complete, usually within a week. In the meantime, alternative remedies can provide relief.

Prevention

Prevention of laryngitis is the same as for any upper respiratory infection. People should wash their hands frequently and thoroughly, and should avoid contact with people who might be sick. However, even with relatively good hygiene practices, most people

will get about five to six colds per year. It is unpredictable which of these may lead to laryngitis.

Resting the voice is important, particularly for people like teachers, politicians, or actors who talk for long periods. Not speaking for a time is one way to rest the voice. Before giving a lengthy speech or attending an exciting championship game, herbal remedies can be used preventively to soothe the larynx. If **anxiety** provokes laryngitis, a person should practice a relaxation technique or **exercise** to reduce **stress**.

In all cases, **smoking** should be avoided. Since alcohol can irritate the throat, consumption may need to be limited.

Resources

BOOKS

Albright, Peter. *The Complete Book of Complementary Therapies*. Allentown, PA: People's Medical Society, 1997.

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc.,1997.

Fauci, Anthony S., et al., eds. *Harrison's Principles of Inter nal Medicine*. New York: McGraw Hill, 1998.

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, N.J: 1998.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases*. New York: John Wiley and Sons, Inc., 1995.

Time Life Books Editors. *The Alternative Advisor*. Alexan dria, VA: Time Life Books, 1997.

Tyler, Varro, and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX, 78720. (512) 331 8868. http://www.herbalgram.org

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

Holistic OnLine. http://www.holisticonline.com.

MotherNature.com Health Encyclopedia. http://www. mothernature.com/ency.

Liz Swain

Laughter therapy *see* **Humor therapy**

Lavender

Description

Lavender is a hardy perennial in the Lamiaciae, or mint, family. The herb is a Mediterranean native. There are many species of lavendula which vary somewhat in appearance and aromatic quality. English lavender, *L. augustifolia*, also known as true lavender, is commercially valuable in the perfume industry and is a mainstay of English country gardens. French lavender, *L.stoechas*, is the species most probably used in Roman times as a scenting agent in washing water. The species *L. officinalis* is the official species used in medicinal preparations, though all lavenders have medicinal properties in varying degrees.

This fragrant, bushy shrub has been widely cultivated for its essential oil. The tiny, tubular, mauve-blue blossoms grow in whorls of six to ten flowers along square, angular stems and form a terminal spike. These flower spikes stretch upward beyond the

French lavender. *(© blickwinkel / Alamy)*

12-18 inch (3.6-5.4 m) height of the shrub, blooming from June to August. The blossoms are well liked by bees and a good source of honey. The needle-like, evergreen, downy leaves are a light, silver-gray. They are lanceolate, opposite, and sessile, and grow from a branched stem. The bark is gray and flaky. The herb thrives in full sun and poor soil. Ancient Greeks and Romans used lavender blossoms to scent bath water, a common use that gave the herb its name, derived from the Latin *lavare*, meaning to wash.

General use

Lavender is best known and loved for its fragrance. The herb has been used since ancient times in perfumery. As an aromatic plant, lavender lifts the spirits and chases melancholy. Taking just a few whiffs of this sweet-smelling herb is said to dispel **dizziness**. Traditionally, women in labor clutched sprigs of lavender to bring added courage and strength to the task of childbearing. A decoction of the flower may be used as a feminine douche for leucorrhoea. The dried blossoms, sewn into sachets, may be used to repel moths and to scent clothing, or may be lit like incense to scent a room. Because of its fumigant properties, the herb was hung in the home to repel flies and mosquitoes, and strewn about to sanitize the floors. Lavender essential oil was a component of smelling salts in Victorian times.

The essential oil of certain lavender species has a sedative, antispasmodic, and tranquilizing effect. Lavender has been long valued as a **headache** remedy. It can be taken in a mild infusion, or can be rubbed on the temples, or sniffed like smelling salts to provide relief from headaches caused by **stress**. Lavender oil is antiseptic, and has been used as a topical disinfectant for **wounds**. In high doses, it can kill many common bacteria such as typhoid, diphtheria, streptococcus, and pneumococcus, according to some research. The essential oil has also been used as a folk treatment for the bite of some venomous snakes. When used in **hydrotherapy** as part of an aromatic, Epsom salt bath, the **essential oils** of some species will soothe tired nerves and relieve the **pain** of **neuralgia**. They are also used topically on **burns** and have been shown to speed healing. It is also a fine addition to a foot bath for sore feet. Lavender essence makes a pleasant massage oil for kneading sore muscles and joints. Acting internally, lavender's chemical properties increase the flow of bile into the intestines, relieving **indigestion**. Its carminative properties help expel intestinal **gas**. Lavender is an adjuvant and may be used in combination with other herbs to make a tonic cordial to strengthen the nervous system.

KEY TERMS

Adjuvant—A characteristic of an herb that enhances the benefits of other ingredients when added to a mixture.

Carminative—A property of an herb that assists in relieving intestinal gas.

Coumarins—These blood-thinning plant chemicals break down red blood cells. Coumarins are responsible for the fresh- mown lawn aroma that some herbs exude.

Flavonoids—There are numerous phytochemicals known as flavones. Most exert a pharmacological effect, depending on their type. Flavonoids are one type of flavone.

Sessile— A botanical term to describe a leaf that emerges from the plant stem without a stalk.

Tannins—These astringent plant chemicals are the medicinal constituent of an herb that enables it to facilitate healing of wounds.

Volatile or essential oils—Simple molecules that give the plant its scent. When applied to the skin, volatile oil extracts are absorbed into the bloodstream through the fatty layer of the skin.

A 2002 report from Korea showed that **aromatherapy** massage with lavender oil and **tea tree oil** on patients undergoing hemodialysis for kidney failure received relief from the **itching** the treatment often causes.

Preparations

The medicinal properties of lavender are extracted primarily from the oil glands in the leaf and blossom. The plant contains volatile oil, tannins, coumarins, flavonoids, and triterpenoids as active chemical components. These phytochemicals are the plant constituents responsible for the medicinal properties. Lavender's volatile oil is best when extracted from flowers picked before they reach maximum bloom and following a long period of hot and dry temperatures. The flower spikes dry quickly when spread on a mat in an airy place away from direct sun.

Distilled oil: The essential oil of lavender is extracted by steam distillation. Just a few drops of this essential oil are effective for topical applications. Commercial distillations of this essential oil are readily available.

Lavender tea: An infusion of the fresh or dried flowers and leaf can be made by pouring a pint of

boiling water over one ounce of the dry leaf and flower, or two ounces fresh herb, in a non-metallic pot. It can be steeped (covered) for about ten minutes, strained and sweetened to taste. It should be drunk while still warm. Lavender tea may be taken throughout the day, a mouthful at a time, or warm, by the cup, up to three cups per day. Lavender works well in combination with other medicinal herbs in infusion.

Lavender oil extract: In a glass container, one ounce of freshly harvested lavender flowers can be combined with 1-1/2 pints of olive oil, sufficient to cover the herb. It should be placed in a sunny windowsill for about three days and shaken daily. After three days, the mixture should be strained through muslin or cheesecloth. More fresh flowers should be added and the process repeated until the oil has the desired aromatic strength. Lavender extract can be safely used internally to treat migraines, and nervous indigestion. A few drops on a sugar cube can speed headache relief. Externally, a small amount of lavender oil, rubbed on sore joints, can relieve rheumatism. The essential oil has also been used to minimize scar tissue when applied to burned skin.

Lavender sachet: Dried lavender blossoms and leaves can be sewn into a small cloth bag to scent linens and deter insects. The bag may be placed beneath the pillow as an aromatherapy.

Lavender vinegar: Fresh leaves and blossoms may be steeped in white vinegar for seven days, then strained and stored in a tightly capped bottle.

Precautions

Lavender has a long history of use as an essential oil and as a mildly sedative tea. When taken in moderation the tea is safe. It is important to note that, as with all essential oils, high or chronic doses of lavender essential oil are toxic to the kidney and liver. Infants are even more easily overdosed than adults.

Interestingly, lavender's relaxant effects were put to the test in a 2002 study on aromatherapy's effects on improved mental or physical performance. It seems that study subjects who smelled lavender actually did worse on mental tests than those who smelled nothing at all. So those choosing to use lavender's soothing effects should perhaps choose the timing carefully.

Side effects

No known side effects.

Interactions

As an adjuvant, lavender can enhance the helpful properties of other herbs when used in combination. **Lemon balm** (*Melissa officinalis*) leaves can be combined with lavender as a headache infusion. For cramping, an infusion of lavender and **valerian** (*Valeriana officinalis*) makes a soothing tea. Lavender's pleasant scent works well to cover disagreeable odors of other herbs in medicinal combinations. A tonic cordial can be made by combining fresh **rosemary** (*Rosmarinus officinalis*) leaves, cinnamon, **nutmeg**, and sandlewood with the lavender blossoms and steeping the mixture in brandy for about a week.

Resources

BOOKS

Blumenthal, Mark. *The Complete German Commission E Monographs, Therapeutic Guide to Herbal Medicines* Mas sachusetts: Integrative Medicine Communications, 1998.

Bown, Deni. *The Herb Society of America, Encyclopedia of Herbs & Their Uses*. New York: D.K. Publications, Inc., 1995

Kowalchik, Claire and Hylton, William H., Editors. *Rodale's Illustrated Encyclopedia of Herbs*. Pennsylva nia: Rodale Press, 1987

Lust, John B. *The Herb Book*. New York: Bantam Books, 1974.

Mabey, Richard. *The New Age Herbalist*. New York: Simon & Schuster, Inc.,1998.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

McVicar, Jekka. *Herbs For The Home*. New York: Penguin Books, 1994.

Peterson, Nocola. *Culpeper Guides, Herbs And Health*. New York: Seafarer Books, Penguin Books, 1994.

Forsell, Mary. *Heirloom Herbs*. New York: Villard Books, 1990.

Phillips, Roger and Foy, Nicky. *The Random House Book of Herbs*. New York: Random House, 1990.

PERIODICALS

Carlson, Mike, et al. "Rosemary on my Mind (Memory Booster)." *Men's Fitness* (August 2002): 28.

Ro, You Ja, et al. "The Effects of Aromatherapy on Pruritis in Patients Undergoing Hemodialysis." *Dermatology Nursing* (August 2002):231 238.

Clare Hanrahan
Teresa G. Odle

Lazy eye

Definition

Lazy eye, or amblyopia, is an eye condition in which disuse causes reduced vision in an otherwise healthy eye. The affected eye is called the *lazy* eye.

Man with a lazy eye. *(Custom Medical Stock Photo. Reproduced by permission.)*

This vision defect occurs in 2–3% of American children. If not corrected before age eight, amblyopia will cause significant loss of stereoscopic vision, the ability to perceive three-dimensional depth.

Description

In some children, one eye functions better than the other. When a child begins to depend on the stronger eye, the weaker eye can become progressively weaker. Eventually, the weaker eye grows "lazy" from disuse. If left untreated beyond the early child-development years (from birth to seven years old), vision in the affected eye will be underdeveloped due to lack of use.

The impairment of vision in the lazy eye occurs in three phases. In the first (suspension) phase, the brain turns the weaker eye on and off. In the second (suppression) phase, the brain turns off the lazy eye indefinitely. At this point, the eye still has usable vision and can function well if the other eye is covered. In the last (amblyopia) phase, which occurs after age seven, the eye loses all the sensitivity that is essential for good vision because it has not been used for so long.

Lazy eye is a visual problem with potentially serious consequences. If left untreated, the affected child may have permanent loss of vision in the lazy eye. Because of loss of vision in one eye, these children cannot see three-dimensional images very well—all images appear flat. They also have problems with depth perception. This has serious consequences in their future ability to work in professions that require good vision in both eyes. Affected children also have increased risk of blindness should something happen to the good eye.

Causes and symptoms

The following are probable causes of lazy eye:

- Strabismus, or misalignment of a child's eyes (crossed eyes). This is the most frequent cause of lazy eye. Approximately half of all children with crossed eyes will develop a lazy eye. In children with crossed eyes, the images do not coordinate, thus confusing the brain. Therefore, the brain will suppress the image that comes from one eye and predominantly use the image from the stronger eye.

KEY TERMS

Anisometropia—An eye condition in which the eyes have unequal refractive power.

Nystagmus—An involuntary, rapid movement of the eyeball, usually from side to side.

Refraction—The deviation of light when passing obliquely through the media of the normal eye and resulting in the focusing of images on the retina.

Refractive power—The degree of refraction of an eye.

Strabismus—Failure of the two eyes to direct their gaze at the same object simultaneously due to muscle imbalance.

- Anisometropia (unequal refractive power). In this case, there is difference in image quality between the two eyes because one eye is severely nearsighted or farsighted. In other words, one eye focuses better than the other. The brain will mostly use the clearer image from the good eye. The other eye will become underdeveloped due to neglect.
- Congenital cataract. The lazy eye can not see well because its lens is already cloudy at birth.
- Ptosis (drooping eyelid). Vision in the lazy eye is blocked or impaired by the drooping eyelid.
- Corneal scarring. The image quality of the affected eye is poor due to scarring in the cornea.

The following are risk factors for amblyopia:

- Rubella (German measles) or other infections in the mother during pregnancy
- premature birth
- other family members with vision problems in childhood

Lazy eye may not present obvious symptoms. For this reason, it is important for small children to have regular eye examinations.

Diagnosis

Diagnosis of amblyopia is often made during visual screening during routine infant check-ups and in the preschool years (aged three to five). Premature babies need to have more frequent eye exams during early childhood to prevent this and other vision problems. A new photoscreening instrument that has been recently introduced appears to significantly increase the accuracy of diagnosis of these eye problems.

Treatment

The following alternative methods may complement conventional treatment of lazy eye. However, they are not replacements for conventional treatments. Because their effectiveness is not proven, parents should consult their child's ophthalmologist about the appropriate use of these methods (if any) in their child's overall eye treatment program.

Orthoptics (eye exercises)

Eye exercises can be helpful. Orthoptic exercises are designed to help the eyes move together and assist the fusing of the two images seen by the eyes. It can help correct faulty vision habit due to misalignment of the eyes and can teach the child to use both eyes effectively and comfortably. This form of therapy can be used before or after eye-realignment surgery to improve results.

Vision therapy

Vision training is a form of physical therapy for the brain and the eyes. It is a more extensive form of eye exercise and requires more frequent visits.

Acupuncture

One study shows that **acupuncture** treatment may be effective in treating anisometropia, a condition in which one eye focuses much better than the other. Acupuncture can reduce the differences in refractive powers between the eyes so that both eyes can have similar image quality. This helps reduce the amblyopia problem. However, its long-term effectiveness remains unknown.

Allopathic treatment

In order to treat lazy eye, the doctor has to identify and treat underlying causes. Depending on these underlying causes, the doctor may recommend surgical or nonsurgical treatments, as discussed below.

Refractive error correction

If both eyes need vision correction, children are given prescription glasses for better focus and to prevent misalignment of the eyes.

Forcing the use of the lazy eye

In many children with amblyopia, only one eye has a focusing problem or weak muscles. In order to force the affected eye to work, the doctor will cover the strong eye with a patch for most of the day for at least several weeks. Sometimes, this treatment requires as

long as a year. The eye patch forces the lazy eye to work and thus, strengthens its vision and its muscles. This is the most common method used to treat lazy eye. To prevent the strong eye from becoming weaken due to disuse, the child is allowed to remove the patch so that he can see with the good eye for at least a few hours each day.

Another way to force the lazy eye to work harder is to use eye drops or ointment to blur the vision in the strong eye so that the child has to use the lazy eye to see. This method is not often used because it is associated with more adverse effects.

Surgical treatments

If the problem is caused by imbalances of the eye muscles and is not treatable with nonsurgical methods, the eye muscles can be realigned surgically to help the eyes coordinate better. Sometimes more than one surgery is required for the correction. Eye patch, glasses, or orthoptic exercises may be necessary following surgery to help the child use both eyes effectively. Long-term follow-up of surgical treatment indicates that it is highly effective in correcting the problem.

In patients whose amblyopia is caused by a congenital cataract in one eye, the cloudy lens is surgically removed and replaced by an intraocular lens. However, after surgery—even with eye glasses or contact lenses—this eye will still have poorer image quality than the good eye. Thus, the risk for amblyopia remains high. Therefore, nonsurgical treatment for lazy eye is often started after cataract surgery.

For a child whose vision is affected by a drooping eyelid, ptosis surgery is needed.

Expected results

With early diagnosis and treatment, children with amblyopia are expected to restore the sight in the lazy eye. However, if left untreated, the weak eye never develops adequate vision and the person may become functionally blind in that eye.

Prevention

Most cases of lazy eye are congenital, occurring since birth. However, if diagnosed early, vision loss in the affected eye can be prevented.

Resources

BOOKS

"Crossed Eyes." In *Reader's Digest Guide to Medical Cures and Treatments*. New York: Reader's Digest Association, 1996.

PERIODICALS

Broderick, Peter. "Pediatric Vision Screening for the Family Physician." *American Family Physician* 58, no. 3 (September 1, 1998): 691 700+. http://www.aafp.org/afp/980901ap/broderic.html.

Mills, Monte D. "The Eye in Childhood." *American Family Physician* 60, no. 3 (September 1, 1999): 907 18. http://www.aafp.org/afp/990901ap/907.html.

Paysse, Evelyn A., et al. "Detection of Red Reflex Asymmetry by Pediatric Residents Using the Bruckner Reflex Versus the MTI Photoscreener." *Pediatrics* 108 (October 2001): 997.

ORGANIZATIONS

American Academy of Ophthalmology. P.O. Box 7424, San Francisco, CA 94120 7424. (415) 561 8500. http://www. eyenet.org.

American Association For Pediatric Ophthalmology and Strabismus. c/o Denise De Losada Wilson. P.O. Box 193832, San Francisco, CA 94119 3832. (415) 561 8505. aapos@aao.org. http://med aapos.bu.edu.

National Association for Parents of the Visually Impaired, Inc. P.O. Box 317, Watertown, MA 02471. (800) 562 6265. Fax: (617) 972 7444. http://www.spedex.com/napvi.

OTHER

"Congenital Eye Defects." *The Merck Manual Online*. http://www.merck.com/pubs/mmanual/section19/chapter261/261i.htm.

Mai Tran
Rebecca J. Frey, PhD

Lead poisoning

Definition

Lead poisoning occurs when a person swallows, absorbs, or inhales lead in any form. The result can be damaging to the brain, nerves, and many other parts of the body. Acute lead poisoning, which is somewhat rare, occurs when a person ingests a relatively large amount of lead over a short period of time. Chronic lead poisoning—a common problem in children—occurs when small amounts of lead are taken in over a longer period. The Centers for Disease Control and Prevention (CDC) defines childhood lead poisoning as a whole-blood lead concentration equal to or greater than 10 mcg/dL.

Description

Lead can damage almost every system in the human body, and it can also cause high blood pressure (**hypertension**). It is particularly harmful to the

Sources of lead poisoning

Source	Description
Paint	Lead-based paint can be a hazard in older homes. Children eat peeling paint, or come in contact with it during remodeling projects.
Dust and soil	Contamination of soil is usually caused by paint, leaded gasoline, pollution from industrial sites, and smelters.
Foods	Lead can be found in imported canned foods, leaded crystal, and some ceramic dishware.
Activities	Activities such as pottery, stained glassmaking, and furniture refinishing can heighten exposure to lead.
Drinking water	Homes built before 1930 may contain lead water pipes. Newer homes may also contain copper pipes with lead solder.
Traditional remedies & cosmetics	Certain ayurvedic medications, traditionally from India and other Southern Asian countries, may contain lead. Also litargirio (a peach -colored powder used mainly in the Dominican Republic) contains high levels of lead, and the FDA warns against its usage. Kohl is another traditional cosmetic frequently containing high levels of lead.

(Illustration by Corey Light. Cengage Learning, Gale)

developing brain of fetuses and young children. The higher the level of lead in a child's blood, and the longer this elevated level lasts, the greater the chance of ill effects. Over the long term, lead poisoning in a child can lead to learning disabilities, behavioral problems, and mental retardation. At very high levels, lead poisoning can cause seizures, coma, and even death. In one of the rare studies of its kind, the National Center for Environmental Health reported in 2003 that there were about 200 deaths from lead poisoning in the United States between 1979 and 1998. Most of the deaths were among males (74%), African Americans (67%), adults over the age of 45 (76%), and southerners (70%).

Of much greater concern than mortality due to lead poisoning is the number of children who have elevated levels of lead in their blood. Many children are exposed to lead through peeling paint in older homes. Others are exposed through dust or soil that has been contaminated by old paint or past emissions of leaded gasoline. Since children between the ages of 12 and 36 months are apt to put objects in their mouths, they are more likely than older children to take in lead. Pregnant women who come into contact with lead can pass it along to their fetuses.

More than 80% of American homes built before 1978 have lead-based paint in them, according to the Centers for Disease Control and Prevention (CDC). The older the home, the more likely it is to contain lead paint, and the higher the concentration of lead in the paint is apt to be. Some homes also have lead in the water pipes or plumbing. People may have lead in the paint, dust, or soil around their homes or in their drinking water without knowing it, since lead cannot be seen, smelled, or tasted. Because lead does not break down naturally, it can continue to cause problems until it is removed.

Efforts to promote public awareness of lead poisoning problems have had marked success in the United States. The percentage of children under the age of six with unacceptably high concentrations of lead in their blood dropped from 7.6% in 1997 to 1.2% in 2006. In 2008, the CDC expressed confidence that it was approaching the federal government's goal of eliminating childhood lead poisoning by the year 2010.

Causes and symptoms

Before scientists knew how harmful it could be, lead was widely used in paint, gasoline, water pipes, and many other products. In the 2000s, house paint is almost lead-free, gasoline is unleaded, and household plumbing is no longer made with lead materials. Still, remnants of the old hazards remain. Following are some sources of lead exposure:

- Lead-based paint. The most common source of exposure to large amounts of lead among preschoolers, paint chips from older homes that have fallen into disrepair are eaten by children. They may also chew on painted surfaces, such as windowsills. In addition, paint may be disturbed during remodeling.
- Dust and soil. These can be contaminated with lead from old paint or past emissions of leaded gasoline. In addition, pollution from operating or abandoned industrial sites and smelters can find its way into the soil, resulting in soil contamination.
- Drinking water. Exposure may come from lead water pipes, found in many homes built before 1930. Even newer copper pipes may have lead solder. Also, some new homes have brass faucets and fittings that can leach lead.
- Jobs and hobbies. A number of activities can expose participants to lead. These include making pottery or stained glass, refinishing furniture, doing home repairs, and using indoor firing ranges. When adults take part in such activities, they may inadvertently expose children to lead residue that is on their clothing or on scrap materials.
- Food. Imported food cans often have lead solder. Lead may also be found in leaded crystal glassware and some imported ceramic or old ceramic dishes (e.g., ceramic dishes from Mexico). A 2003 study of cases of lead poisoning in pregnant women found that 70% of the patients were Hispanics, most of whom had absorbed the lead from their pottery. In addition, food may be contaminated by lead in the water or soil.
- Folk medicines. Certain folk medicines (for example, alarcon, alkohl, azarcon, bali goli, coral, ghasard, greta, liga, pay-loo-ah, and rueda) and traditional cosmetics (kohl, for example) contain large amounts of lead. Also, certain Chinese and Tibetan herbal remedies and techniques are contaminated with lead and other heavy metals, such as mercury.
- Moonshine whiskey. Lead poisoning from drinking illegally distilled liquor is still a cause of death among adults in the southern United States.
- Gunshot wounds. Toxic amounts of lead can be absorbed from bullets or bullet fragments that remain in the body after emergency surgery. The use of lead in some kinds of ammunition has been banned in the United States, and substitutes for lead in other types of ammunition were being developed as of 2008.
- Imported toys. In 2006, the U.S. Consumer Products Safety Commission announced that a number of toy products imported from China were contaminated with lead paint. One of the worst such episodes occurred in 2007 when more than 1.5 million "Thomas & Friends" wooden railway toys painted with lead were recalled. As of 2008, the scope of this problem had not yet been fully determined, nor had adequate methods for controlling the importation of contaminated toys been established.

Chronic lead poisoning

Some evidence suggests that lead may be harmful to children even at low levels that were once thought to be safe, and the risk of damage rises as blood levels of lead increase. The symptoms of chronic lead poisoning take time to develop, however. Children can appear healthy despite having high levels of lead in their blood. Over time, though, problems such as the following may arise:

- learning disabilities
- hyperactivity
- mental retardation
- slowed growth
- hearing loss
- headaches

Scientists also know that certain genetic factors increase the harmful effects of lead poisoning in susceptible children; however, these factors were not completely understood as of 2008.

Lead poisoning is also harmful to adults, who may develop high blood pressure, digestive problems, nerve disorders, **memory loss**, and muscle and joint **pain**. In addition, it can lead to difficulties during **pregnancy**, as well as cause reproductive problems in both men and women.

In the 2000s, chronic exposure to lead in the environment was found to speed up the progression of kidney disorders in patients without diabetes.

Acute lead poisoning

Acute lead poisoning, while less common, shows up more quickly and can be fatal. In such cases, children are almost always affected. Symptoms such as the following may occur:

- severe abdominal pain
- diarrhea
- nausea and vomiting
- weakness of the limbs
- seizures
- coma

Diagnosis

A high level of lead in the blood can be detected with a simple blood test. In fact, testing is the only way to know for sure if children without symptoms have been exposed to lead, since they can appear healthy even as long-term damage occurs. The CDC recommends testing all children at 12 months of age and, if possible, again at 24 months. Testing should start at six months for children at risk for lead poisoning. Based on these test results and a child's risk factors, the doctor decides whether further testing is needed and how often. In some states, more frequent testing is required by law.

Evidence is emerging to indicate that even lower doses of lead than previously thought can cause neurological damage in children. It may be that virtually no level of lead is safe and that measures need to be taken to remove lead from the environment. As of 2008 in the United States, the CDC recommended that lead blood levels in children not exceed 10 mcg/dL.

Children at risk

Children with an increased risk of lead poisoning include those who have the following features:

- live in or regularly visit a house built before 1978 in which chipped or peeling paint is present, particularly poor children in sub-standard housing
- live in or regularly visit a house that was built before 1978 where remodeling is planned or underway
- have a brother or sister, housemate, or playmate who has been diagnosed with lead poisoning
- have the habit of eating dirt or have been diagnosed with pica
- live with an adult whose job or hobby involves exposure to lead
- live near an active lead smelter, battery-recycling plant, or other industry that can create lead pollution

Adults at risk

Testing is also important for adults whose job or hobby puts them at risk for lead poisoning, including the following:

- glazed pottery or stained glass making
- furniture refinishing
- home renovation
- target shooting at indoor firing ranges
- battery reclamation
- precious metal refining
- radiator repair
- art restoration

Treatment

In the event of emergency poisoning, patients or parents should call 911 or the poison hotline at (800) 222-1222. The first step in treating lead poisoning is to avoid further contact with lead. For adults, this usually means making changes at work or in hobbies. For children, it means finding and removing sources of lead in the home. In most states, the public health department can help assess the home and identify lead sources.

If the problem is lead paint, a professional with special training should remove it. Removal of lead-based paint is not a do-it-yourself project. Scraping or sanding lead paint creates large amounts of dust that can poison people in the home. This dust can stay around long after the work is completed. In addition, heating lead paint can release lead into the air. For these reasons, lead paint should be removed only by a professional who knows how to do the job safely and has the equipment to clean up thoroughly. Occupants, especially children and pregnant women, should leave the home until the cleanup is finished.

Medical professionals should take all necessary steps to remove bullets or bullet fragments from patients with gunshot injuries.

Nutritional therapy

While changes in diet are no substitute for medical treatment, they can complement the **detoxification** process. The following nutritional changes are recommended:

- Increased consumption of fresh vegetables, fruits, beans, nuts, whole grains, and seeds.
- Increased consumption of soluble fibers, such as pears, apples, oatmeal, oat bran, rye flour, dried beans, guar gum, pectin, and psyllium.
- Increased consumption of sulfur-containing foods, such as eggs, garlic, and onions. Garlic has been used successfully to reduce lead poisoning in animals.
- Taking high-potency multivitamin/mineral supplements (1 tablet a day).
- Taking additional supplements of vitamin C, B-complex vitamins, iron, calcium, zinc, L-lysine, L-cysteine, and

L-cysteine supplements. These vitamins, minerals, and amino acids help reduce the amount of lead that the body absorbs. Iron is especially important, since people who are deficient in this nutrient absorb more lead. Thiamine, a B-complex vitamin, has been used to treat lead poisoning in animals.

- A 2002 report stated that eating tofu may lower lead levels in the blood since it is rich in calcium.
- Using a filter to prevent lead contamination in the water. Drinking lots of water (at least eight glasses per day) to help the body excrete the toxin.
- Committing to a three-day fast at the end of every season. Fasting is the oldest method of detoxification. During fasting, patients should take supplements and drink four glasses of juice a day to assist the cleansing process and to prevent exhaustion.

Herbal therapy

Milk thistle (*Silybum mariannum*) protects the liver and assists in the detoxification process by increasing **glutathione** supply in the liver. Glutathione is the enzyme involved primarily in the detoxification of toxic heavy metals including lead.

Homeopathy

Homeopathic medicines can be administered once the source is removed, to help correct any imbalances brought on by lead toxicity.

Allopathic treatment

The American Association of Poison Control Centers maintains a nationwide toll-free hotline for prevention and treatment of poisonings. The number is (800) 222-1222. In the case of any suspected poisoning emergency, they can be contacted 24 hours a day.

Chelation therapy

If blood levels of lead are high enough, the doctor may also prescribe **chelation therapy**. This process involves the use of chemicals that bind to lead and help the body pass it in urine at a faster rate. The four most popular chemical agents used for this purpose, either alone or in combination, are edetate **calcium** disodium (EDTA calcium), dimercaprol (BAL), succimer (Chemet; DMSA), and penicillamine (Cuprimine, Depen). EDTA calcium and BAL are given through an intravenous line or in shots, whereas succimer and penicillamine are given orally. (Although many doctors prescribe penicillamine for lead poisoning, this use of the drug has not been approved by the Food and Drug Administration.)

Expected results

If acute lead poisoning reaches the stage of seizures and coma, there is a high risk of death. Even if the person survives, there is a good chance of permanent brain damage. The long-term effects of lower levels of lead can also be permanent and severe. However, if chronic lead poisoning is detected early, these negative effects can be limited by reducing future exposure to lead and getting proper medical treatment.

Prevention

Many cases of lead poisoning can be prevented. These steps can help:

- Keep the areas where children play as clean and dust-free as possible.
- Wash pacifiers and bottles when they fall to the floor, and wash stuffed animals and toys often.
- Make sure children wash their hands before meals and at bedtime.
- Mop floors and wipe windowsills and other chewable surfaces, such as cribs, twice a week with a solution of powdered dishwasher detergent in warm water.
- Plant bushes next to an older home with painted exterior walls to keep children at a distance.
- Plant grass or another ground cover in soil that is likely to be contaminated, such as soil around a home built before 1960 or located near a major highway.
- Have household tap water tested to find out if it contains lead.
- Use only water from the cold-water tap for drinking, cooking, and making baby formula, since hot water is likely to contain higher levels of lead.
- If the cold water has not been used for six hours or more, run it for several seconds, until it becomes as cold as it will get, before using it for drinking or cooking. The more time water has been sitting in the pipes, the more lead it may contain.
- Individuals who work with lead in their jobs or hobbies ought to change their clothes before they go home.
- Do not store food in open cans, especially imported cans.
- Do not store or serve food in pottery meant only for decorative use.
- Arrange for the house to be inspected for lead. Many state health departments will do this.
- Be aware of the status of imported toys that may have unacceptably high levels of lead.

KEY TERMS

Chelation therapy—Treatment with chemicals that bind to a poisonous metal and help the body pass it in urine at a faster rate.

Dimercaprol (BAL)—A chemical agent used to remove excess lead from the body.

Edetate calcium disodium (EDTA calcium)—A chemical agent used to remove excess lead from the body.

Penicillamine (Cuprimine, Depen)—A drug used to treat medical problems (such as excess copper in the body and rheumatoid arthritis) and to prevent kidney stones. It is also sometimes prescribed to remove excess lead from the body.

Pica—An abnormal appetite or craving for non-food items, often such substances as chalk, clay, dirt, laundry starch, or charcoal.

Succimer (Chemet) or DMSA—A drug used to remove excess lead from the body.

Resources

BOOKS

Greim, Helmut, and Robert Snyder, eds.. *Toxicology and Risk Assessment: A Comprehensive Introduction*. New York: Wiley Interscience, 2008.

IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. *Inorganic and Organic Lead Compounds*. Lyon, France: International Agency for Research on Cancer, 2006.

Toxicological Profile for Lead. Atlanta, GA: Agency for Toxic Substances and Disease Registry, 2007.

PERIODICALS

Erickson, Lori, and Teri Thompson. "A Review of a Preventable Poison: Pediatric Lead Poisoning." *Journal for Specialists in Pediatric Nursing* (October 2005): 171 182.

"Herbal Medicines: Lead Poisoning Associated with Ayurvedic Medicines: 8 Case Reports Title." *Reactions* (July 1, 2006): 11 12.

Nevin, Rick. "Understanding International Crime Trends: The Legacy of Preschool Lead Exposure." *Environmental Research* (July 2007): 315 336.

Rajaram, Shireen S. "An Action research Project: Community Lead Poisoning Prevention." *Teaching Sociology* (April 2007): 138 150.

Ronchetti, Roberto, et al. "Lead Neurotoxicity in Children: Is Prenatal Exposure More Important than Postnatal Exposure?" *Acta Paediatrica* (October 2006): 45 49.

OTHER

"Lead Poisoning." MayoClinic.com, March 15, 2007. http://www.mayoclinic.com/health/lead poisoning/FL00068. (February 14, 2008).

Marcus, Steven. "Toxicity, Lead." emedicine.com, December 12, 2007. http://www.emedicine.com/EMERG/topic293.htm. (February 14, 2008).

ORGANIZATIONS

National Center for Environmental Health, Centers for Disease Control and Prevention, 1600 Clifton Rd, Atlanta, GA, 30333, (800) 311 3435, http://www.cdc.gov/nceh/.

National Lead Information Center, National Safety Council, 1121 Spring Lake Dr, Itasca, IL, 60143 3201, (630) 285 1121, http://www.nsc.org/issues/lead/.

Mai Tran
Teresa G. Odle
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Learning disorders

Definition

Learning disorders are academic difficulties experienced by children and adults of average to above-average intelligence. People with learning disorders have difficulty with reading, writing, mathematics, or a combination of the three. These difficulties significantly interfere with academic achievement or daily living.

Description

Learning disorders, or disabilities, affect approximately 2 million children between the ages of six and 17 (5% of public school children), although some experts think the figure may be as high as 15%. These children have specific impairments in acquiring, retaining, and processing information. Standardized tests place them well below their IQ range in their area of difficulty. The three main types of learning disorders are reading disorders, mathematics disorders, and disorders of written expression. The male: female ratio for learning disorders is about 5: 1.

Reading disorders

Reading disorders are the most common type of learning disorder. Children with reading disorders have difficulty recognizing and interpreting letters and words (**dyslexia**). They are not able to recognize and decode the sounds and syllables (phonetic structure) behind

KEY TERMS

Dyslexia—An inability to read, write, or spell words in spite of the ability to see and recognize letters. Dyslexia is an autosomal dominant disorder thst occurs more frequently in males.

IQ—Intelligence quotient; a measure of intellectual functioning determined by performance on standardized intelligence tests.

Phonics—A system to teach reading by teaching the speech sounds associated with single letters, letter combinations, and syllables.

written words and language in general. This condition lowers accuracy and comprehension in reading.

Mathematic disorders

Children with mathematics disorders (dyscalculia) have problems recognizing and counting numbers correctly. They have difficulty using numbers in everyday settings. Mathematics disorders are typically diagnosed in the first few years of elementary school when formal teaching of numbers and basic math concepts begins. Children with mathematics disorders usually have a co-existing reading disorder, a disorder of written expression, or both.

Disorders of written expression

Disorders of written expression typically occur in combination with reading disorders or mathematics disorders or both. The condition is characterized by difficulty with written compositions (dysgraphia). Children with this type of learning disorder have problems with spelling, punctuation, grammar, and organizing their thoughts in writing.

Causes and symptoms

Learning disorders are thought to be caused by neurological abnormalities that trigger impairments in the regions of the brain that control visual and language processing and attention and planning. These traits may be genetically linked. Children from families with a history of learning disorders are more likely to develop disorders themselves. In 2003 a team of Finnish researchers reported finding a candidate gene for developmental dyslexia on human chromosome 15q21.

Learning difficulties may also be caused by such medical conditions as a traumatic brain injury or brain **infections** such as encephalitis or **meningitis**.

The defining symptom of a learning disorder is academic performance that is markedly below a child's age, grade capabilities, and measured IQ. Children with a reading disorder may confuse or transpose words or letters and omit or add syllables to words. The written homework of children with disorders of written expression is filled with grammatical, spelling, punctuation, and organizational errors. The child's handwriting is often extremely poor. Children with mathematical disorders are often unable to count in the correct sequence, to name numbers, and to understand numerical concepts.

Diagnosis

Problems with vision or hearing, mental disorders (**depression**, attention-deficit/hyperactivity disorder), mental retardation, cultural and language differences, and inadequate teaching may be mistaken for learning disorders or complicate a diagnosis. A comprehensive medical, psychological, and educational assessment is critical to making a clear and correct diagnosis.

A child thought to have a learning disorder should undergo a complete medical examination to rule out an organic cause. If one is not found, a psychoeducational assessment should be performed by a psychologist, psychiatrist, neurologist, neuropsychologist, or learning specialist. A complete medical, family, social, and educational history is compiled from existing medical and school records and from interviews with the child and the child's parents and teachers. A series of written and verbal tests are then given to the child to evaluate his or her cognitive and intellectual functioning. Commonly used tests include the Wechsler Intelligence Scale for Children (WISC-III), the Woodcock-Johnson Psychoeducational Battery, the Peabody Individual Achievement Test-Revised (PIAT-R), and the California Verbal Learning Test (CVLT). Federal legislation mandates that this testing is free of charge within the public school system.

Treatment

Once a learning disorder has been diagnosed, an individual education plan (IEP) is developed for the child in question. IEPs are based on psychoeducational test findings. They provide for annual testing to measure a child's progress. Students with learning disorders may receive special instruction within a regular general education class or they may be taught in a special education or learning center for a portion of the day.

Common strategies for the treatment of reading disorders focus first on improving a child's recognition of the sounds of letters and language through phonics training. Later strategies focus on comprehension, retention, and study skills. Students with disorders of written expression are often encouraged to keep journals and to write with a computer keyboard instead of a pencil. Instruction for students with mathematical disorders emphasizes real-world uses of math, such as balancing a checkbook or comparing prices.

Ensuring that the child has proper **nutrition** can help in the treatment of learning disorders. Those who do not receive the proper doses that they need may require changes in their **diets**, or supplements are taken. Supplements that may help with learning disorders are **fish oil**, flax oil, primrose oil, and **omega-3 fatty acids**. Eliminating food additives, like colors and preservatives, as well decreasing the child's consumption of refined sugars, can also be helpful.

Meditation is also beneficial. It helps to slow the mind down and take in the surroundings while focusing on the task at hand.

Herbal remedies may also help to focus the mind. **St. John's wort** and *Ginkgo biloba* are used to treat **attention-deficit hyperactivity disorder** (ADHD). Ginkgo is a blood thinner and those considering taking it should consult a doctor beforehand.

Expected results

The high school dropout rate for children with learning disabilities is almost 40%. Children with learning disabilities that go undiagnosed or are improperly treated may never achieve functional literacy. They often develop serious behavior problems as a result of their frustration with school; in addition, their learning problems are often stressful for other family members and may strain family relationships. The key to helping these students reach their fullest potential is early detection and the implementation of an appropriate individualized education plan. The prognosis is good for a large percentage of children with reading disorders that are identified and treated early. Learning disorders continue into adulthood, but with proper educational and vocational training, an individual can complete college and pursue a challenging career. Studies of the occupational choices of adults with dyslexia indicate that they do particularly well in people-oriented professions and occupations, such as nursing or sales.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition, text revision. Washington, DC: American Psychiatric Association, 2000.

Church, Robin P., M.E.B. Lewis, and Mark L. Batshaw. "Learning Disabilities." *Children with Disabilities*. edited by Mark L. Batshaw. 4th ed. Baltimore: Paul H. Brookes, 1997.

"Learning Disorders. " Section 19, Chapter 262 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laborato ries, 2002.

Mars, Laura. *The Complete Learning Disabilities Directory, 1999/2000*. Grey House Publishing, 1999.

Osman, Betty B. *Learning Disabilities and ADHD: A Family Guide to Living and Learning Together*. New York: John Wiley & Sons, 1997.

PERIODICALS

Baringa, Marcia. "Learning Defect Identified in Brain." *Science*. 273 (August 1996): 867 868.

Galaburda, D. M., and B. C. Duchaine. "Developmental Disorders of Vision." *Neurologic Clinics* 21 (August 2003): 687 707.

Gillberg, C., and H. Soderstrom. "Learning Disability." *Lancet* 362 (September 6, 2003): 811 821.

Stage, Frances K. and Nancy V. Milne. "Invisible Scholars: Students With Learning Disabilities." *Journal of Higher Education*. 67 (July August 1996): 426 45.

Taipale, M., N. Kaminen, J. Nopola Hemmi, et al. "A Can didate Gene for Developmental Dyslexia Encodes a Nuclear Tetratricopeptide Repeat Domain Protein Dynamically Regulated in Brain." *Proceedings of the National Academy of Sciences in the USA* 100 (September 30, 2003): 11553 11558.

Taylor, K. E., and J. Walter. "Occupation Choices of Adults With and Without Symptoms of Dyslexia." *Dyslexia* 9 (August 2003): 177 185.

Witt, W. P., A. W. Riley, and M. J. Coiro. "Childhood Functional Status, Family Stressors, and Psychosocial Adjustment Among School Aged Children with Dis abilities in the United States." *Archives of Pediatric and Adolescent Medicine* 157 (July 2003): 687 695.

ORGANIZATIONS

The Interactive Guide to Learning Disabilities for Parents, Teachers, and Children. http://www.ldonline.org.

The Learning Disabilities Association of America (LDA). 4156 Library Road, Pittsburgh, PA 15234 1349. (412) 341 1515. http://www.ldanatl.org.

National Center for Learning Disabilities (NCLD). 381 Park Avenue South, Suite 1401, New York, NY 10016. (410) 296 0232. http://www.ncld.org.

Paula Ford-Martin
Rebecca J. Frey, PhD

Lecithin

Definition

Lecithin was discovered in 1850 by Maurice Gobley, who isolated it in egg yolks and identified it as the substance that allows oil and water to mix. The name is derived from the Greek word *lekithos*, which means "yolk of egg." Lecithin is a naturally occurring fatty substance found in several foods, including soybeans, whole grains, and egg yolks. It is often used as an emulsification agent in processed foods. It can be taken in various forms as a nutritional supplement, often derived from soybeans. The body breaks lecithin down into its component parts: **choline**, phosphate, glycerol, and fatty acids. The body's highest concentration of lecithin is found in the vital organs, where it makes up about 30% of the dry weight of the brain and nearly two-thirds of the fat in the liver.

General use

Lecithin acts as an emulsifier and helps the body in the absorption of fats. Some studies suggest that soy lecithin improves the metabolism of **cholesterol** in the digestive system. Therefore, lecithin has been touted as a treatment for high cholesterol. It has also been said to be a treatment for neurologic and liver disorders. Promoters claim that supplemental lecithin can be used to help lower cholesterol and deter **memory loss**. Some proponents of lecithin warn that the low fat and low cholesterol **diets** that many Americans follow may lower the amount of lecithin that they consume, creating a deficit and necessitating supplemental lecithin. As Americans eat fewer eggs, meats, and dairy products, the amount of choline that they consume may be less than required. Choline is the key element in lecithin that researchers believe may have a beneficial effect on cholesterol and memory.

Lecithin has been identified as a possible resource for lowering blood cholesterol because of its reputation as a source of polyunsaturated fats. In addition, choline helps the liver metabolize fat and form lipoproteins. However, as of 2008, there was scant evidence to support the use of lecithin in lowering cholesterol. Researchers in some studies have found a drop in cholesterol levels, while others have found no drop in cholesterol levels at all. A group of researchers from the Netherlands who summarized findings in the *American Journal of Clinical Nutrition* concluded that many studies of the effects of lecithin had faulty methods, and the few good studies proved that lecithin was not effective in lowering cholesterol. Subsequently, a group of American researchers solved part of the mystery concerning the fact that eggs, which are packed with cholesterol, do not impact people's cholesterol much if eaten in moderation. The reason seemed to be the lecithin found in eggs that reduces cholesterol's absorption in the bloodstream. Generally speaking, the role of lecithin in reducing blood cholesterol appears to be minimal.

Lecithin is also considered to be of possible benefit to brain function, and supporters claim that it may help prevent **Alzheimer's disease**. Promoters indicate that the choline in lecithin may have the ability to penetrate the blood-brain barrier and impact the production of acetylcholine, a neurotransmitter that facilitates brain function. They claim that long-term use of lecithin as a dietary supplement could help minimize memory loss. However, studies on the use of lecithin for the treatment of Alzheimer's disease have found that it has no marked benefit.

Preparations

Lecithin is derived from soy and is available in capsule, liquid, and granule form. Consumers should not use a synthetic form of the supplement (choline chloride) but should seek one that contains natural phosphatidyl choline. Lecithin from soybeans generally contains about 76% phosphatidycholine. Studies of supplements sold in health food stores show that most contain minimal levels of pure lecithin. In fact, a person might get the same benefit from eating a handful of peanuts. The American Heart Association and the College of Physicians and Surgeons of Columbia University have described lecithin supplements as an expensive and probably unnecessary way of increasing unsaturated fatty acids in one's diet.

Precautions

Consumers should be aware that most nutritional supplements are not regulated by the Food and Drug Administration (FDA) for product safety or effectiveness. Because lecithin is not considered an essential nutrient, as of 2008, no Recommended Daily Allowance (RDA) has been established for this nutrient.

Side effects

There are no major side effects for lecithin as a supplement. In high doses (more than 25 g per day), lecithin can cause sweating, upset stomach, **diarrhea**, **nausea**, and **vomiting**. Pregnant or nursing women and children should avoid the supplement because it has not been adequately tested for safety.

KEY TERMS

Emulsification—The process by which two immiscible liquids are dispersed into each other.

Fatty acid—A long-chain carboxylic acid found in fats, oils, and other lipids.

Neurotransmitter—A chemical that carries a message from the end of one neuron (nerve cell) to the beginning of a second neuron.

Resources

BOOKS

Daniel, Kaayla T. *The Whole Soy Story: The Dark Side of America's Favorite Health Food*. Washington, DC: New Trends Publishing, 2005.

OTHER

"Lecithin." Drugs.com, 2006. http://www.drugs.com/npc/lecithin.html. (February 14, 2008).

Amy Cooper
Teresa G. Odle
David Edward Newton, Ed.D.

Ledum

Description

Ledum is an evergreen shrub, *Ledum palustre*. This plant grows wild in Canada, northern Europe, and the cooler regions of North America as far south as Wisconsin and Pennsylvania, reaching a height of 1–6 ft (0.3–2 m). It has narrow, dark, aromatic leaves with hairy or wooly undersides. The leaves, either dried or fresh, are used primarily in homeopathic healing, but have also been used in Native American and Russian folk medicine.

During the American Revolution when the British imposed a tax on imported tea, the American colonists used ledum as a tea substitute. Other names for ledum include marsh tea, Labrador tea, wild **rosemary**, James's tea, and *ledum latifolium*.

General use

Homeopathic medicine operates on the principle that "like heals like." This saying means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow another homeopathic law, the Law of Infinitesimals. In opposition to traditional medicine, the Law of Infinitesimals states that the lower a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount, if any, remains in a huge amount of the diluting liquid.

Ledum groenlandicum. *(Erin Paul Donovan / Alamy)*

In homeopathic terminology, the effectiveness of remedies is proved by experimentation and reporting done by famous homeopathic practitioners. Ledum was proved as a remedy by the German founder of **homeopathy**, Dr. Samuel Hahnemann (1775–1843).

In homeopathic medicine, ledum is used first and foremost as a first-aid remedy to prevent infection. It is taken internally for:

- bruises, especially bruises that are improved by the application of cold
- insect stings and animal bites
- puncture wounds, cuts, grazes, and scrapes
- black eyes and other eye injuries

Other homeopathic uses for ledum include the treatment of stiff and painful joints, especially when the **pain** begins in the feet and ankles and moves upward. Ledum is also used for sprained ankles. According to some homeopathic practitioners, ledum is said to take away the craving for alcohol.

Since 1995, ledum has been touted as a homeopathic remedy for **Lyme disease**. Originally prescribed by a holistic veterinarian in Connecticut to treat the symptoms of Lyme disease in horses, dogs, and cats, ledum in the 1M potency is now recommended by some alternative practitioners as a treatment for Lyme disease in humans. There are several anecdotal reports of its success in treating this painful disease.

KEY TERMS

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects on living tissue. Ledum appears to be a rich source of antioxidants.

Decoction—Decoctions are made by simmering an herb, then straining the solid material out.

Lyme disease—A chronic, recurrent inflammatory disease carried by deer ticks and caused by a spirochete.

In homeopathic medicine the fact that certain symptoms get better or worse under different conditions is used as a diagnostic tool to indicate what remedy will be most effective. Symptoms that benefit from treatment with ledum get worse with warmth and are also worse at night. Symptoms improve with the application of cold.

Homeopathy also ascribes certain personality types to certain remedies. The ledum personality is said to be discontented and self-pitying. People with the ledum personality may be irritable, angry, impatient, worried, and want to be left alone. People in need of ledum often have restless, disturbed sleep marked by bad dreams.

Ledum is also used in Native American and Russian folk healing. In Russian, ledum is called *bogulnik*. Both these cultures use decoctions or infusions of ledum to treat coughs, **bronchitis**, and bronchial **asthma**. According to historical records, the famous Swedish botanist Karl Linneaus (1707–1778) was the first to record using ledum for sore throats and coughs.

In addition, Russian folk medicine uses ledum mixed with butter to make an ointment that is applied externally to treat scabby **dandruff**, skin **infections**, **bruises**, **wounds**, and bleeding. Used externally, it is believed to act as an antibiotic and an anti-fungal to reduce infection.

Mainstream medical researchers have studied ledum within the field of environmental medicine. Some Russian animal studies from the mid-1990s indicated that ledum offers some protection against radiation damage to the digestive system and the formation of red blood cells. A Canadian study completed in the summer of 2002 reported that ledum is a highly accurate indicator of high environmental concentrations of lead.

Ledum is also being studied for its beneficial effects when eaten as a vegetable. A 2002 report from the School of Pharmacy at the University of London states that ledum has a high level of antioxidant activity, and shows promise as a treatment for **gout**, diseases related to **aging**, and central nervous system disorders.

Preparations

Ledum is prepared by picking the leaves, small twigs, and flowers in the late summer. These can be used fresh or dried to make an infusion (tea) or a decoction. For homeopathic remedies, the dried plant material is ground finely then prepared by extensive dilutions. There are two homeopathic dilution scales, the decimal (x) scale with a dilution of 1:10 and the centesimal (c) scale where the dilution factor is 1:100. Once the mixture is diluted, shaken, strained, then re-diluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Ledum is available commercially in tablets in many different strengths. Dosage depends on the symptoms being treated.

Homeopathic and orthodox medical practitioners agree that by the time the initial remedy solution is diluted to strengths used in homeopathic healing, it is likely that very few if any molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called potentization that has not yet been explained by mainstream scientists.

As an infusion for treating respiratory distress and coughs, 1 oz (30 g) of dried leaves is added to 1 qt (1 L) of boiling water.

Precautions

Puncture wounds from rusty nails, needles, animal **bites**, and similar implements can be serious and may result in **tetanus**. When treating puncture wounds with ledum, patients should make sure their tetanus immunizations are current, monitor their healing, and seek traditional medical help at the first sign of infection.

People who bruise very easily should consult a physician, as this condition is sometimes caused by blood disorders and other serious conditions.

Side effects

Ledum taken in the standard homeopathic dilutions has not been reported to cause side effects. A tea made from ledum has been safely taken for centuries.

Interactions

Studies of interactions between ledum and conventional pharmaceuticals are nonexistent.

Resources

BOOKS

Cummings, Stephen, MD, and Dana Ullman, MPH. *Everybody's Guide to Homeopathic Medicines*, revised and expanded. New York: G. P. Putnam's Sons, 1991.

Hammond, Christopher. *The Complete Family Guide to Homeopathy*. London, UK: Penguin Studio, 1995.

Lockie, Andrew and Nicola Geddes. *The Complete Guide to Homeopathy*. London, UK: Dorling Kindersley, 1995.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Homeopathy. New York: Simon & Schuster, 2002.

PERIODICALS

Narimanov, A. A. "The Antiradiation Effectiveness of a Mixture of *Archangelica officinalis* and *Ledum palustre* Extracts in the Fractionated Gamma Irradiation of Mice." [in Russian] *Radiobiologiia* 33 (March April 1993): 280 284.

Pieroni, A., V. Janiak, C. M. Durr, et al. "In Vitro Antiox idant Activity of Non Cultivated Vegetables of Ethnic Albanians in Southern Italy." *Phytotherapy Research* 16 (August 2002): 467 473.

Pugh, R. E., D. G. Dick, and A. L. Fredeen. "Heavy Metal (Pb, Zn, Cd, Fe, and Cu) Contents of Plant Foliage Near the Anvil Range Lead/Zinc Mine, Faro, Yukon Territory." *Ecotoxicology and Environmental Safety* 52 (July 2002): 273 279.

ORGANIZATIONS

Foundation for Homeopathic Education and Research. 21 Kittredge Street, Berkeley, CA 94704. (510) 649 8930.

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206)776 4147.

Lyme Disease Foundation, Inc. 1 Financial Plaza, Hartford, CT 06103. (800) 886 LYME. www.lyme.org.

National Center for Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314. (703) 548 7790.

Tish Davidson
Rebecca J. Frey, PhD

Lemon balm

Description

Lemon balm is a citrus-scented, aromatic herb. It is a perennial member of the Lamiaceae (formerly Labiatae), or mint, family and has proven benefit to the nervous system. This lovely Mediterranean native, dedicated to the goddess Diana, is bushy and bright. Greeks used lemon balm medicinally over 2,000 years ago. Honey bees swarm to the plant. This attraction inspired the generic name, melissa, the Greek word for honeybee. Romans introduced lemon balm (*Melissa officinalis*) to Great Britain where it became a favorite cottage garden herb. The plant has been naturalized in North America.

Lemon balm. *(© foodfolio / Alamy)*

Lemon balm grows in bushy clumps to 2 ft (0.6 m) tall and branches to 18 in (45.7 cm). It thrives in full sun or partial shade in moist, fertile soil from the mountains to the sea. The heart-shaped, deeply-veined leaves exude a pleasant lemon scent when brushed against or crushed. They have scalloped edges and square stems. The tiny white or golden blossoms grow in the leaf axils, and bloom from June through October. The plant is hardy, self-seeding, and spreads easily in the right soil conditions. The plant has a short rhizome, producing the erect, downy stems. The essential oil content appears to be highest in the uppermost third of the plant.

General use

Lemon balm is a soothing, sedative herb that can relieve tension and lift **depression**. An infusion of this citrus-scented herb will improve digestion, reduce **fever**, ease spasms, and enhance **relaxation**. The plant has antihistaminic properties and helps with **allergies**. Lemon balm infusions, taken hot, will induce sweating. Lemon balm has been used for centuries to calm the mind, improve memory, and sharpen the wit. A daily infusion of lemon balm is said to promote longevity. It is a helpful herb in cases of hyperthyroid activity, palpitations of the heart, and tension **headache**. It can relieve pre-menstrual tension and menstrual

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue. The flavonoids in lemon balm appear to have some antioxidative efficacy.

Essential oil—Another term for volatile oil; the aromatic oil that can be obtained by steam distillation from plant parts. Most essential oils are composed of terpenes and their oxygenated derivatives.

Flavonoids—A class of water-soluble plant pigments that have antiviral and other healing qualities. The flavonoids in lemon balm are the source of its antihistaminic effectiveness.

Sedative—A medication or preparation given to calm or soothe nervousness or irritability. Lemon balm has sedative properties.

Volatile oil—The fragrant oil that can be obtained from a plant by distillation. The word "volatile" means that the oil evaporates in the open air.

cramping. It helps promote good digestion, relieve flatulence, and **colic**, and can ease one into a restful sleep. Lemon balm has antiviral and antibacterial properties. Used externally as a skin wash, this gentle herb can ease the sting of insect **bites**, soothe **cold sore** eruptions (herpes simplex), and treat sores and **wounds**. Lemon balm's highly aromatic qualities make it a good insect repellent. It is also valued in **aromatherapy** to relax and soothe a troubled mind. Fresh leaves are often added to salads, or used with fish, mushroom, and cheese dishes. In France, the herb is used in making cordials, and is called *Tea de France*.

Apart from its traditional medicinal uses, lemon balm is used to flavor vermouth and other alcoholic beverages as well as some soft drinks.

Lemon balm contains volatile oils, including citral, citronella, eugenol, and other components as well as flavonoids, triterpenoids, rosmarinic acid, polyphenols, and tannin. Several new flavonoids were discovered in lemon balm in 2002. Flavonoids are a group of water-soluble plant pigments that have antiviral and antioxidative qualities.

Preparations

Lemon balm leaves and flowers are used in medicinal remedies. The herb is at its best when used fresh from the harvest. The leaves may be picked throughout the summer, but the flavor is at its prime just before flowering. When the plant is dried for storage, the volatile oils diminish, reducing the medicinal potency of the herb. Freezing the fresh harvest is a good way to preserve the leaves for later use.

To create a tea, place two ounces of fresh lemon balm leaves in a warmed glass container; bring 2.5 cups of fresh, nonchlorinated water to the boiling point; add it to the herbs; cover; and infuse the tea for about 10 minutes. Once strained, the tea can be consumed warm. The prepared tea will store for about two days in the refrigerator. Lemon balm infusion is a gentle and relaxing tea. It may be enjoyed by the cupful three times a day.

Lemon balm combines well with the leaves of **peppermint** (*Mentha piperita*), and **nettle** (*Urtica dioica*), and the flowers of **chamomile** (*Matricaria chamomilla*).

Precautions

Lemon balm has been used safely for thousands of years. However, pregnant women and individuals with **hypothyroidism** should avoid use unless under consultation with a physician. Use caution when harvesting because of the likely presence of bees.

Side effects

The sedative effect of lemon balm means that it can depress the central nervous system when given in high doses. In addition, it has been reported that persons with **glaucoma** should avoid using essential oil of lemon balm, as it can raise the pressure inside the eye.

Interactions

Lemon balm should be used in lower dosages when combined with other herbs, particularly such other sedative herbs as **valerian**. In addition, lemon balm should not be taken together with prescription sedatives or alcohol, as it can intensify their effects.

Lemon balm has been reported to interfere with the action of thyroid hormones. Persons taking any medication containing thyroid hormones should not take lemon balm.

A physician should be consulted before taking lemon balm in conjunction with any other prescribed pharmaceuticals.

Resources

BOOKS

Blumenthal, Mark. *The Complete German Commission E Mongraphs, Therapeutic Guide to Herbal Medicines*. Mas sachusetts: Integrative Medicine Communications, 1998.

Bown, Deni. *The Herb Society of America, Encyclopedia of Herbs & Their Uses*. New York: D.K. Publishing, Inc., 1995.
Gladstar, Rosemary. *Herbal Healing for Women*. New York, Simon & Schuster, 1993.
Lust, John. *The Herb Book*. New York: Bantam Books, 1994.
McVicar, Jekka. *Herbs for the Home*. New York: Viking Studio Books, 1995.

PERIODICALS

Mrlianova, M., D. Tekel'ova, M. Felklova, et al. "The Influence of the Harvest Cut Height on the Quality of the Herbal Drugs *Melissae folium* and *Melissae herba*." *Planta Medica* 68 (February 2002): 178 180.
Patora, J., and B. Klimek. "Flavonoids from Lemon Balm (*Melissa officinalis L.*, Lamiaceae)." *Acta Poloniae Pharmaceutica* 59 (March April 2002): 139 143.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.
Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. www.swsbm.com.

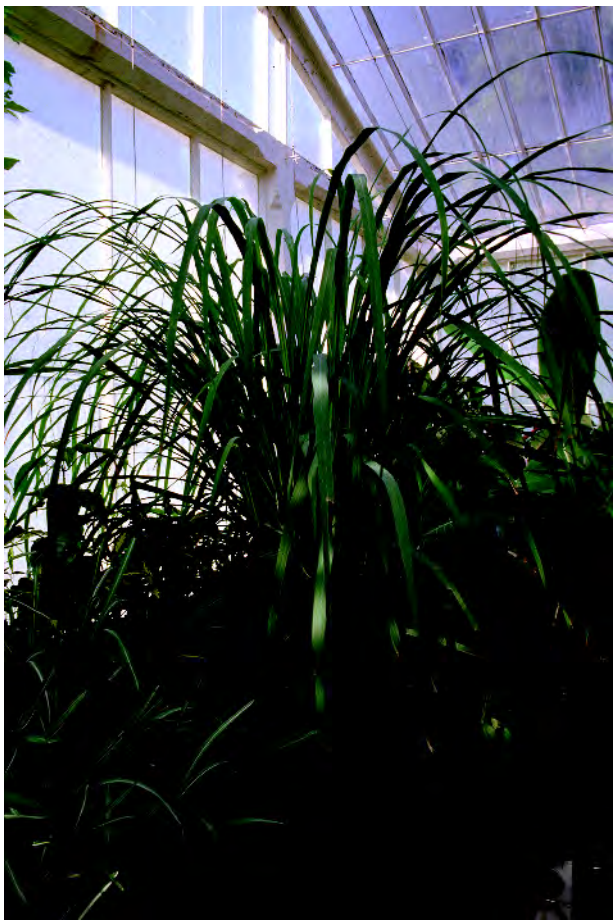
Clare Hanrahan
Rebecca J. Frey, PhD

Lemongrass

Description

Resembling a gigantic weed, lemongrass is an aromatic tropical plant with long, slender blades that can grow to a height of 5 ft (1.5 m). Believed to have a wide range of therapeutic effects, the herb has been used for centuries in South America and India and has also become popular in the United States. Aside from folk medicine, lemongrass is a favorite ingredient in Thai cuisine and dishes that boast a tangy, Asian flavor. While there are several species of lemongrass, *Cymbopogon citratus* is the variety most often recommended for medicinal purposes. Native to Southeast Asia, lemongrass can also be found growing in India, South America, Africa, Australia, and the United States. Only the fresh or dried leaves of lemongrass, and the essential oil derived from them, are used as a drug. *Cymbopogon citratus*, which belongs to the Poaceae family of plants, is also referred to as West Indian lemongrass.

Not to be confused with **lemon balm**, which is an entirely different herb, lemongrass is considered by herbalists to have several useful properties, including antibacterial, antifungal, and fever-reducing effects.



Large lemongrass plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

Some of these claims have been supported by animal and laboratory studies. In one test-tube investigation, published in the medical journal *Microbios* in 1996, researchers demonstrated that lemongrass was effective against 22 strains of bacteria and 12 types of fungi. Scientific research has also bolstered the herb's reputation as an analgesic and sedative. A study conducted in rodents suggests that myrcene, a chemical found in the essential oil of *Cymbopogon citratus*, may act as a site-specific **pain** reliever. Unlike aspirin and similar analgesics, which tend to alleviate pain throughout the body, myrcene seems to work only on particular areas. A study involving people indicates that lemongrass may also affect the way the body processes cholesterol.

More recently, lemongrass has been shown to have antimutagenic properties; that is, researchers have found that it is able to reverse chemically induced mutations in certain strains of bacteria.

While they may not be aware of it, most Americans have already tried lemongrass in one form or

KEY TERMS

Analgesic—Any substance that functions as a pain reliever.

Aromatherapy—The use of fragrances, often derived from essential oils, to improve emotional and physical well-being.

Astringent—An agent that helps to contract tissue and prevent the secretion of internal body fluids such as blood or mucus. Astringents are typically used to treat external wounds or to prevent bleeding from the nose or throat.

Citral—A pale yellow liquid drived from lemongrass used in making perfumes and to flavor food.

Essential oil—A general term describing a wide variety of plant-derived oils. They are often used to make soaps and perfumes; candies, soft drinks, processed foods, and other foods and beverages; and certain drugs and dental products.

Lemon balm—A herb with antiviral properties that is also used to alleviate anxiety or insomnia. The botanical name for lemon balm is *Melissa officinalis.*

Myrcene—A compound found in the essential oil of lemongrass that has pain-relieving properties.

Neuralgia—Nerve pain.

Placebo—A sugar pill or inactive agent often used in the control group of a medical study.

another. Citral, a key chemical found in *Cymbopogon citratus*, is an ingredient in a variety of foods and beverages (including alcohol). It can be found in candies, puddings, baked goods, meat products, and even in certain fats and oils. Citral is a pale yellow liquid that evaporates rapidly at room temperature. Like other **essential oils**, lemongrass is also used as a fragrance enhancer in many perfumes, soaps, and detergents.

General use

While not approved by the Food and Drug Administration (FDA), lemongrass reportedly has a wide variety of therapeutic effects. Because the herb has not been studied extensively in people, its effectiveness is based mainly on the results of animal and laboratory studies as well as its centuries-old reputation as a folk remedy. Lemongrass is one of the most popular plant medicines in Brazil, where it is used to treat nervous disorders and stomach problems. In the Amazon, lemongrass is highly regarded as a sedative tea.

When taken internally, lemongrass has been recommended for **stomachaches**, **diarrhea**, **gas**, bowel spasms, **vomiting**, **fever**, the flu, and headaches and other types of pain. The herb (or its essential oil) may be applied externally to help treat **acne**, **athlete's foot**, lower back pain, **sciatica**, **sprains**, tendinitis, **neuralgia**, and rheumatism. To treat circulatory disorders, some authorities recommend rubbing a few drops of lemongrass oil on the skin of affected areas; it is believed to work by improving blood flow. Like many essential oils, lemongrass is also used in aromatherapy.

The link between lemongrass and **cholesterol** was investigated by researchers from the Department of Nutritional Sciences, University of Wisconsin, who published their findings in the medical journal *Lipids* in 1989. They conducted a clinical trial involving 22 people with high cholesterol who took 140-mg capsules of lemongrass oil daily. While cholesterol levels were only slightly affected in some of the participants—cholesterol was lowered from 310 to 294 on average—other people in the study experienced a significant decrease in blood fats. The latter group, characterized as responders, experienced a 25-point drop in cholesterol after one month, and this positive trend continued over the course of the short study. After three months, cholesterol levels among the responders had decreased by a significant 38 points. Once the responders stopped taking lemongrass, their cholesterol returned to previous levels. It should be noted that this study did not involve a placebo group, which is usually used to help measure the effects of the agent being studied (in this case, lemongrass oil).

Considered an antiseptic and astringent, essential oil of lemongrass is also used by some people to cleanse oily skin and help close pores. Some herbalists recommend mixing a few drops of lemongrass with a normal portion of mild shampoo to combat greasy hair. Lemongrass essential oil can also be used as a deodorant to curb perspiration.

Last but not least, the herb has a strong reputation as an insect repellent. It is an important ingredient in several products designed to keep bugs at bay. Some authorities recommend rubbing the crushed herb directly on exposed areas of skin to avoid insect **bites** when enjoying the great outdoors.

The relative safety and stability of lemongrass oil has recommended it to pharmaceutical researchers who are testing new methods of quantitative analysis. Lemongrass oil has been used to demonstrate the

superiority of near-infrared spectroscopy to older methods of determining the chemical content of plant oils.

Preparations

The optimum daily dosage of lemongrass, which is available as fresh or dried herb or as lemongrass oil, has not been established with any certainty. Because lemongrass has been recommended for so many different purposes, and can be used internally and externally, consumers are advised to consult a doctor experienced in the use of alternative remedies to determine proper dosage. There is a significant difference between the external use of a few drops of essential oil, and the use of larger amounts of the herb in a tincture or tea.

Lemongrass tea can be prepared by steeping 1–2 tsp of the herb (fresh or dried) in a cup of boiling water. The mixture should be strained after 10–15 minutes. The tea is generally taken several times a day. In *Heinerman's Encyclopedia of Healing Herbs & Spices*, John Heinerman recommends using one cup of lemongrass tea every four hours to reduce fever. In the *Green Pharmacy*, prominent herbalist James Duke recommends drinking one to four cups of lemongrass tea a day to benefit from its anti-fungal properties. The used tea bags can also be applied externally as fungi-fighting compresses, according to the author.

To alleviate gas or persistent vomiting, Heinerman recommends a dose of 3–6 drops of lemongrass oil (the *Cymbopogon citratus* variety). It may be placed on a sugar cube or mixed with 1 tsp of real vanilla flavor before swallowing. For sciatica, lower back pain, sprains, tendinitis, and rheumatism, the author suggests rubbing 10 drops of the essential oil onto the skin of the affected areas.

Precautions

Lemongrass is not known to be harmful when taken in recommended dosages, though it is important to remember that the long-term effects of taking the herb (in any amount) have not been investigated. The essential oil should not be used internally by children, women who are pregnant or breast-feeding, or people with liver or kidney disease.

In rare cases, lemongrass essential oil has caused allergic reactions when applied to the skin. To minimize skin irritation, dilute the oil in a carrier oil such as safflower or sunflower seed oil before application. As with all essential oils, small amounts should be used, and only for a limited time.

Avoid getting lemongrass (herb or oil) in the eyes. Citral has been reported to irritate the respiratory tract in sensitive people as well as the eyes and skin.

Side effects

When taken internally in recommended dosages, lemongrass is not associated with any bothersome or significant side effects. Cases have been reported, however, in which people have developed skin **rashes** after drinking lemongrass tea.

Interactions

Lemongrass is not known to interact adversely with any drug or dietary supplement.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics, 1998.

Price, Shirley. *Practical Aromatherapy*. London, UK: Thorsons/HarperCollins, 1994.

PERIODICALS

Bleasel, N., B. Tate, and M. Rademaker. "Allergic Contact Dermatitis Following Exposure to Essential Oils." *Australasian Journal of Dermatology* 43 (August 2002): 211 213.

Melo, S. F., S. F. Soares, R. F. da Costa, et al. "Effect of the *Cymbopogon citratus*, *Maytenus ilicifolia*, and *Baccharis genistelloides* Extracts Against the Stannous Chloride Oxidative Damage in *Escherichia coli*." *Mutation Research* 496 (September 20, 2001): 33 38.

Wilson, N. D., M. S. Ivanova, R. A. Watt, and A. C. Moffat. "The Quantification of Citral in Lemongrass and Lemon Oils by Near Infrared Spectroscopy." *Journal of Pharmacy and Pharmacology* 54 (September 2002): 1257 1263.

ORGANIZATIONS

American Botanical Council. PO Box 144345. Austin, TX 78714 4345. www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.

International Aromatherapy and Herb Association. 3541 West Acapulco Lane. Phoenix, AZ 85053 4625. (602) 938 4439. www.aztec.asu.edu./iaha/

OTHER

Medline. igm.nlm.nih.gov.

Greg Annussek
Rebecca J. Frey, PhD

Leopard's bane *see* **Arnica**

Leukemia

Definition

Leukemia is a **cancer** that starts in the organs that make blood, namely the bone marrow and the lymph system. Depending on specific characteristics, leukemia can be divided into two broad types: acute and chronic. Acute leukemias are the rapidly progressing leukemias, while the chronic leukemias progress more slowly. The vast majority of childhood leukemias are of the acute form.

Description

The cells that make up blood are produced in the bone marrow and the lymph system. The bone marrow is the spongy tissue found in the large bones of the body. The lymph system includes the spleen (an organ in the upper abdomen), the thymus (a small organ beneath the breastbone), and the tonsils (an organ in the throat). In addition, the lymph vessels (tiny tubes that branch like blood vessels into all parts of the body) and lymph nodes (pea-shaped organs that are found along the network of lymph vessels) are also parts of the lymph system. The lymph is a milky fluid that contains cells. Clusters of lymph nodes are found in the neck, underarm, pelvis, abdomen, and chest.

The cells found in the blood are the red blood cells (RBCs), which carry oxygen and other materials to all tissues of the body; white blood cells (WBCs) that fight infection; and platelets, which play a part in the clotting of the blood. The white blood cells can be further subdivided into three main types: granulocytes, monocytes, and lymphocytes.

The granulocytes, as their name suggests, have particles (granules) inside them. These granules contain special proteins (enzymes) and several other substances that can break down chemicals and destroy microorganisms, such as bacteria. Monocytes are the second type of white blood cell. They are also important in defending the body against pathogens.

The lymphocytes form the third type of white blood cell. There are two main types of lymphocytes: T lymphocytes and B lymphocytes. They have different functions within the immune system. The B cells protect the body by making "antibodies." Antibodies are proteins that can attach to the surfaces of bacteria and viruses. This "attachment" sends signals to many other cell types to come and destroy the antibody-coated organism. The T cells protect the body against viruses. When a virus enters a cell, it produces certain proteins that are projected onto the surface of the infected cell. The T cells recognize these proteins and make certain chemicals that are capable of destroying the virus-infected cells. In addition, the T cells can destroy some types of cancer cells.

The bone marrow makes stem cells, which are the precursors of the different blood cells. These stem cells mature through stages into either RBCs, WBCs, or platelets.

KEY TERMS

Antibodies—Proteins made by the B lymphocytes in response to the presence of infectious agents, such as bacteria or viruses, in the body.

Biopsy—The surgical removal and microscopic examination of living tissue for diagnostic purposes.

Chemotherapy—Treatment with drugs that act against cancer.

Computerized tomography (CT) scan—A series of x rays that resemble slices or cross-sections of anatomy, forming detailed images of specific areas.

Cytokines—Chemicals made by the cells that act on other cells to stimulate or inhibit their function. Cytokines that stimulate growth are called growth factors.

Immunotherapy—Treatment of cancer by stimulating the body's immune defense system.

Lumbar puncture—A procedure in which the doctor inserts a small needle into the spinal cavity in the lower back to withdraw some spinal fluid for testing. Also known as a "spinal tap."

Magnetic resonance imaging (MRI)—A medical procedure using a magnet linked to a computer to image areas inside the body.

Maturation—The process by which stem cells transform from immature cells without a specific function into a particular type of blood cell with defined functions.

Radiation therapy—Treatment using high-energy radiation from x-ray machines, cobalt, radium, or other sources.

Remission—Disappearance of a disease as a result of treatment. Complete remission means that all disease is gone. Partial remission means that the disease is significantly improved by treatment, but residual traces of the disease are still present.

Chronic leukemias

In chronic leukemias, the cancer starts in the blood cells made in the bone marrow. The cells mature and only a few remain as immature cells. However, even though the cells mature and appear normal, they do not function as normal cells. Depending on the type of white blood cell that is involved, chronic leukemia can be classified as chronic lymphocytic leukemia or chronic myelogenous leukemia.

Chronic leukemias develop very gradually. The abnormal lymphocytes multiply slowly, but in a poorly regulated manner. They live much longer and thus their numbers build up in the body. The two types of chronic leukemias can be easily distinguished under the microscope. Chronic lymphocytic leukemia (CLL) involves the T or B lymphocytes. B cell abnormalities are more common than T cell abnormalities. T cells are affected in only 5% of the patients. The T and B lymphocytes can be differentiated from the other types of white blood cells based on their size and by the absence of granules inside them. In chronic myelogenous leukemia (CML), the cells that are affected are the granulocytes.

Chronic lymphocytic leukemia (CLL) often shows no early symptoms and may remain undetected for a long time. Chronic myelogenous leukemia (CML), on the other hand, may progress to a more acute form.

Acute leukemias

In acute leukemia, the maturation process of the white blood cells is interrupted. The immature cells (or "blasts") proliferate rapidly and begin to accumulate in various organs and tissues, thereby affecting their normal function. This uncontrolled proliferation of the immature cells in the bone marrow affects the production of the normal red blood cells and platelets as well.

Acute leukemias are of two types: acute lymphocytic leukemia and acute myelogenous leukemia. Different types of white blood cells are involved in the two leukemias. In acute lymphocytic leukemia (ALL), the T or B lymphocytes become cancerous. The B cell leukemias are more common than T cell leukemias. Acute myelogenous leukemia, also known as acute nonlymphocytic leukemia (ANLL), is a cancer of the monocytes and/or granulocytes.

Leukemias account for 2% of all cancers. Because leukemia is the most common form of childhood cancer, it is often regarded as a disease of childhood. However, leukemias affect nine times as many adults as children. Half of the cases occur in people who are 60 years of age or older. The incidence of acute and chronic leukemias is about the same. According to the estimates of the American Cancer Society (ACS), approximately 29,000 new cases of leukemia were diagnosed in 1998. Internationally, leukemia is the fourth most common cancer among people age 15 to 19 years old.

Causes and symptoms

Leukemia strikes both sexes and all ages and its cause is mostly unknown. However, chronic leukemia has been linked to genetic abnormalities and environmental factors. For example, exposure to ionizing radiation and to certain organic chemicals, such as benzene, is believed to increase the risk for getting leukemia. A 2003 study from the Electric Power Research Institute showed possible links between metallic drainpipes and childhood baths. Chronic leukemia occurs in some people who are infected with two human retroviruses (HTLV-I and HTLV-II). An abnormal chromosome known as the Philadelphia chromosome is seen in 90% of those with CML. The incidence of chronic leukemia is slightly higher among men than women.

Acute lymphoid leukemia (ALL) is more common among Caucasians than among African-Americans, while acute myeloid leukemia (AML) affects both races equally. The incidence of acute leukemia is slightly higher among men than women. People of Jewish ancestry have a higher likelihood of getting leukemia. A higher incidence of leukemia has also been observed among persons with Down syndrome and some other genetic abnormalities.

A history of diseases that damage the bone marrow, such as aplastic **anemia**, or a history of cancers of the lymphatic system puts people at a high risk for developing acute leukemias. Similarly, the use of anticancer medications, immunosuppressants, and the antibiotic chloramphenicol also are considered risk factors for developing acute leukemias.

The symptoms of leukemia are generally vague and non-specific. A patient may experience all or some of the following symptoms:

- weakness or chronic fatigue
- fever of unknown origin
- weight loss that is not due to dieting or exercise
- frequent bacterial or viral infections
- headaches
- skin rash
- non-specific bone pain
- easy bruising
- bleeding from gums or nose

- blood in urine or stools
- enlarged lymph nodes and/or spleen
- abdominal fullness

Diagnosis

Like all cancers, leukemias are best treated when found early. There are no screening tests available. If the doctor has reason to suspect leukemia, he or she will conduct a thorough physical examination to look for enlarged lymph nodes in the neck, underarm, and pelvic region. Swollen gums, enlarged liver or spleen, **bruises**, or pinpoint red **rashes** all over the body are some of the signs of leukemia. Urine and blood tests may be ordered to check for microscopic amounts of blood in the urine and to obtain a complete differential blood count. This count will give the numbers and percentages of the different cells found in the blood. An abnormal blood test might suggest leukemia, however, the diagnosis has to be confirmed by more specific tests.

A doctor may perform a bone marrow biopsy to confirm the diagnosis of leukemia. During the biopsy, a cylindrical piece of bone and marrow is removed, generally from the hip bone. These samples are sent to the laboratory for examination. In addition to diagnosis, the biopsy is also repeated during the treatment phase of the disease to see if the leukemia is responding to therapy.

A spinal tap (lumbar puncture) is another procedure that the doctor may order to diagnose leukemia. In this procedure, a small needle is inserted into the spinal cavity in the lower back to withdraw some cerebrospinal fluid and to look for leukemic cells.

Standard imaging tests, such as x rays, computed tomography scans (CT scans), and magnetic resonance imaging (MRI) may be used to check whether the leukemic cells have invaded other areas of the body, such as the bones, chest, kidneys, abdomen, or brain. A gallium scan or bone scan is a test in which a radioactive chemical is injected into the body. This chemical accumulates in the areas of cancer or infection, allowing them to be viewed with a special camera.

Treatment

Alternative therapies should be used only as complementary to conventional treatment, not to replace it. Before participating in any alternative treatment programs, patients should consult their doctors concerning the appropriateness and the role of such programs in the overall cancer treatment plan. Appropriate alternative treatments can help prolong a patient's life or at least improve quality of life, prevent recurrence of tumors or prolong the remission period, and reduce adverse reactions to chemotherapy and radiation.

The effectiveness of most anti-cancer drugs used to treat leukemia can be reduced when patients take mega doses of antioxidants. These **antioxidants**, in patients not undergoing chemotherapy, can be very helpful in protecting the body against cancer. However, taken during chemotherapy, these antioxidants protect the cancer cells from being killed by treatment. Because high-dose supplementation of antioxidants can interfere with conventional chemotherapy treatment, patients should only take them at dosages much above the recommended daily allowance (RDA).

Dietary guidelines

The following dietary changes may be helpful:

- Avoiding fatty and spicy foods, which may be harder to digest.
- Eating new and exciting foods. Tasty foods stimulate appetite so that patients can eat more and have the energy to fight cancer.
- Increasing consumption of fresh fruits and vegetables. They are nature's best sources of antioxidants, as well as vitamins and minerals.
- Eating multiple (five or six) meals per day. Small meals are easier to digest.
- Establishing regular eating times and not eating around bedtime.
- Avoiding foods that contain preservatives or artificial coloring.
- Monitoring weight and eating adequate calories and protein.

Nutritional supplements

A naturopath or nutritional physician may recommend some of the following nutritional supplements to boost a patient's immune function and help fight cancer:

- Vitamins and minerals. Vitamins that are of particular benefit to cancer patients include beta-carotene, B-complex vitamins, (especially vitamin B_6, vitamins A, C, D, E and K. The most important minerals are calcium, chromium, copper, iodine, molybdenum, germanium, selenium, tellurium, and zinc. Many of these vitamins and minerals are strong antioxidants. However, patients should not take mega doses of these supplements without first consulting their doctor. Significant adverse or toxic effects may occur at high dosage, which is especially true for minerals. It is prudent to avoid use of antioxidants when

undergoing chemotherapy or radiation therapy since these treatments kill the cancer by producing oxidants. Antioxidants can undermine the effectiveness of treatment.

- Other nutritional supplements that may help fight cancer and support the body include essential fatty acids (fish or flaxseed oil), flavonoids, pancreatic enzymes (to help digest foods), hormones such as DHEA, melatonin or phytoestrogens, rice bran, and mushroom extracts. It is best to check with a nutritional physician or other licensed provider when adding these supplements.

Traditional Chinese medicine

Conventional treatment for leukemia is associated with significant side effects. These adverse effects can be reduced with Chinese herbal preparations. Patients should consult an experienced herbalist who will prescribe remedies to treat specific symptoms that are caused by conventional cancer treatments.

Juice therapy

Juice therapy may be helpful in patients with cancer. Patients should mix one part of pure juice with one part of water before drinking. Daily consumption of the following juice may be helpful by reducing toxic burden to the liver:

- carrot and beet juice with a touch of radish or dandelion root
- grapes, pear, and lemon
- carrot, celery, and parsley
- carrot, beet, and cucumber juices

Homeopathy

There is conflicting evidence regarding the effectiveness of **homeopathy** in cancer treatment. Because cancer chemotherapy may suppress the body's response to homeopathic treatment, homeopathy may not be effective during chemotherapy. Therefore, patients should wait until after chemotherapy to try this relatively safe alternative treatment.

Acupuncture

Acupuncture is the use of needles on the body to stimulate or direct the meridians (channels) of energy flow in the body. Acupuncture has not been shown to have any anticancer effects. However, it is an effective treatment for **nausea**, a common side effect of chemotherapy and radiation.

Other treatments

Other therapies that may help the leukemia patient include **meditation**, **qigong**, **yoga**, and **t'ai chi**, all of which can aid in **stress** reduction. Guided imagery can increase immune function and decrease **pain** and nausea.

Allopathic treatment

There are two phases of treatment for leukemia. The first phase is called induction therapy. The main aim of the treatment is to reduce the number of leukemic cells as far as possible and induce a remission in the patient. Once the patient shows no obvious signs of leukemia (no leukemic cells are detected in blood tests and bone marrow biopsies), the patient is said to be in remission. The second phase of treatment is then initiated. This is called continuation or maintenance therapy; the aim in this case is to kill any remaining cells and to maintain remission for as long as possible.

Chemotherapy is the use of drugs to kill cancer cells. It is usually the treatment of choice and is used to relieve symptoms and achieve long-term remission of the disease. Generally, combination chemotherapy, in which multiple drugs are used, is more efficient than using a single drug for treatment.

In 2002, scientists announced the discovery of a gene that triggers the death of leukemia cells. Identification of this gene can lead to better targeting of chemotherapy drugs (that involve a **vitamin A** derivative) for acute promyelocytic leukemia (APL). Another advancement in leukemia treatment occurred in the same year. A new drug was found to cancel the effects of mutations of a gene known as the main culprit in AML, an aggressive, treatment-resistant form of leukemia. Further study was needed on both new discoveries, but they were thought important to improving treatment of two forms of leukemia. Later in 2002, Gleevec, a new antileukemia drug that even proved successful at treating chronic myeloid leukemia, was heralded in clinical trials.

Because leukemia cells can spread to all the organs via the blood stream and lymph vessels, surgery is not considered an option for treating leukemias.

Radiation therapy, which involves the use of x rays or other high-energy rays to kill cancer cells and shrink tumors, may be used in some cases. For acute leukemias, the source of radiation is usually outside the body (external radiation therapy). If the leukemic cells have spread to the brain, radiation therapy can be given to the brain.

Bone marrow transplantation (BMT) is a process in which the patient's diseased bone marrow is replaced with healthy marrow. There are two methods of bone marrow transplant. In an allogeneic bone marrow transplant, healthy marrow is taken from a donor whose tissue is either the same as or very closely resembles the patient's tissue. First, the patient's bone marrow is destroyed with very high doses of chemotherapy and radiation therapy. Healthy marrow from the donor is then given to the patient through a needle in a vein to replace the destroyed marrow.

In the second type of bone marrow transplant, called an autologous bone marrow transplant, some of the patient's own marrow is taken out and treated with a combination of anticancer drugs to kill all abnormal cells. This marrow is then frozen and saved. The marrow remaining in the patient's body is destroyed with high-dose chemotherapy and radiation therapy. The marrow that was frozen is then thawed and given back to the patient through a needle in a vein. This mode of bone marrow transplant is currently being investigated in clinical trials.

Biological therapy or immunotherapy is a mode of treatment in which the body's own immune system is harnessed to fight the cancer. Substances that are routinely made by the immune system (such as growth factors, hormones, and disease-fighting proteins) are either synthetically made in a laboratory or their effectiveness is boosted and they are then put back into the patient's body. This treatment mode is also being investigated in clinical trials all over the country at major cancer centers.

Expected results

Like all cancers, the prognosis for leukemia depends on the patient's age and general health. According to statistics, more than 60% of leukemia patients survive for at least one year after diagnosis.

Acute myelocytic leukemia (AML) has a poorer prognosis rate than acute lymphocytic leukemias (ALL) and the chronic leukemias. In the last 15 to 20 years, the five-year survival rate for patients with ALL has increased from 38% to 57%.

Interestingly enough, since most childhood leukemias are of the ALL type, chemotherapy has been highly successful in their treatment. This is because chemotherapeutic drugs are most effective against actively growing cells. Due to the new combinations of anticancer drugs being used, the survival rates among children with ALL have improved dramatically. Eighty percent of the children diagnosed with ALL now survive five years or more, as compared to 50% in the late 1970s.

According to statistics, in chronic lymphoid leukemia, the overall survival for all stages of the disease is nine years. Most of the deaths in people with CLL are due to **infections** or other illnesses that occur as a result of the leukemia.

In CML, if bone marrow transplantation is performed within one to three years of diagnosis, 50-60% of the patients survive three years or more. If the disease progresses to the acute phase, the prognosis is poor. Less than 20% of these patients go into remission.

Prevention

Most cancers can be prevented by changes in lifestyle or diet, which will reduce risk factors. However, in leukemias, there are no such known risk factors. Therefore, at the present time, there are no real prevention recommendations for leukemia. People who are at an increased risk for developing leukemia because of proven exposure to ionizing radiation or exposure to the toxic liquid benzene, and people with Down syndrome, should undergo periodic medical checkups. Some experts recommend limiting toxic exposures, eating a whole foods diet, refraining from **smoking**, exercise, and fluids, and even intermittent **fasting** as possible prevention measures. In 2003, new research found that adult women who took aspirin two or more times a week had a 50% lower risk of developing adult leukemia. Scientists continue to work on a possible vaccine for leukemia. They made some progress in 2002, discovering a gene transfer model that might trigger immunity against leukemia cells.

Resources

BOOKS

Berkow, Robert, et al., eds. *Merck Manual of Diagnosis and Therapy*, 16th ed. Merck Research Laboratories, 1992.

Dollinger, Malin. *Everyone's Guide to Cancer Therapy*. Somerville House Books Limited, 1994.

Labriola, Dan. *Complementary Cancer Therapies: Combining Traditional and Alternative Approaches for the Best Possible Outcome*. Roseville, CA: Prima Health, 2000.

Morra, Marion E. *Choices*. Avon Books, 1994.

Murphy, Gerald P. *Informed Decisions: The Complete Book of Cancer Diagnosis, Treatment and Recovery*. American Cancer Society, 1997.

PERIODICALS

"Cancer Killing Gene Found by Dartmouth Researchers." *Cancer Weekly* (April 9, 2002):17.

"Contact Voltage and Magnetic Fields as Possible Factors in Leukemia Pilot Study." *Journal of Environmental Health* (December 2002):47 51.

"Cytokine and CD154 Gene Transfer Generate Immunity Against Leukemia." *Immunotherapy Weekly* (October 23, 2002):16.
"Drug Blocks Gene Mutation Effect in Lethal Leukemia." *Genomics & Genetics Weekly* (June 21, 2002):13.
"Leukemia Incidence Lowest in Patients 15 30 Years of Age (Incidence Drops at Age 20)." *Internal Medicine News* (May 1, 2002):37.
"New Drug Significantly Improves Survival Even for Patients with Late Stage Disease." *Cancer Weekly* (December 31, 2002):6.
"Study: Regular Use of Aspirin May Lower Risk of Adult Leukemia." *Women's Health Weekly* (July 10, 2003):36.

ORGANIZATIONS

American Cancer Society. 1599 Clifton Road, N.E., Atlanta, Georgia 30329. (800) 227 2345. http://www.cancer.org.
Cancer Research Institute. 681 Fifth Avenue, New York, N.Y. 10022. (800) 992 2623. http://www.cancerresearch.org.
The Leukemia and Lymphoma Society. 600 Third Avenue, New York, NY 10016. (800) 955 4572. http://www.leukemia.org.
National Cancer Institute. 9000 Rockville Pike, Building 31, Room 10A16, Bethesda, Maryland, 20892. (800) 422 6237. http://wwwicic.nci.nih.gov.
Oncolink. University of Pennsylvania Cancer Center. http://cancer.med.upenn.edu.

OTHER

Rosenberg, Z'ev. "Treating the Undesirable Effect of Radi ation and Chemotherapy with Chinese Medicine." *Ori ental Chinese Journal*. http://www.healthypeople.com.

Mai Tran
Teresa G. Odle

KEY TERMS

Crabs—An informal term for pubic lice.

Endemic—A condition that is always present in a given population, such as human lice infestation.

Insecticide—A pesticide that kills insects.

Lindane—An organic chloride, neurotoxic insecticide that kills lice.

Malathion—An organic phosphate, neurotoxic insecticide that kills lice.

Neurotoxin—A chemical compound that is toxic to the central nervous system.

Nit—The egg sac laid by adult female lice.

Pediculicide—Any substance that kills lice.

Pediculosis (plural, pediculoses)—A lice infestation.

Permethrin—A synthetic pyrethroid for killing lice.

Petroleum jelly or ointment—Petrolatum, a gelatinous substance obtained from oil that is used as a protective dressing.

Piperonyl butoxide—A liquid organic compound that enhances the activity of insecticides.

Pyrethrin, pyrethroid—Naturally-occurring insecticide extracted from chrysanthemum flowers. It paralyzes lice so that they cannot feed.

Lice infestation

Definition

A lice infestation, or pediculosis, is caused by parasites living on human skin. Lice are tiny, wingless insects with sucking mouthparts that feed on human blood and lay eggs on body hair or in clothing. Lice **bites** can cause intense **itching**.

Description

There are three related species of human lice that live on different parts of the body:

- Head lice, *Pediculus humanus capitis*
- Body lice, *Pediculosis humanus corpus*
- Pubic lice, *Phthirus pubis,* commonly called "crab") lice

Pediculosis capitis is an infestation of head lice. A body lice infestation is called pediculosis corporis. Pediculosis palpebrarum or Phthiriasis palpebrarum, caused by crab lice, is an infestation of the eyebrows and eyelashes.

Lice infestations are not usually dangerous. However, head lice infestations present a serious public health problem because they spread easily among schoolchildren. In general, lice infestations occur in crowded, unsanitary facilities, including prison, military, and refugee camps. Lice infestations also occur frequently among the homeless.

Lice are transmitted through personal contact or infected clothing, bedding, or towels. Pubic lice are sexually transmitted. Lice do not jump, hop, or fly and they do not live on pets.

Head lice infestations are extremely common among children in schools, childcare facilities, camps, and playgrounds. They are the second most common communicable health problem in children, after the **common cold**, and appear to be on the increase. Six to 12 million American children get head lice every

year. In developing countries, more than 50% of the general population may be infested. Head lice can affect anyone, regardless of race, sex, socio-economic class, or personal hygiene. However children aged three to ten and their families are most affected. Girls and women are more susceptible than boys and men. Although African American children are much less likely to have head lice than white or Hispanic children, the incidence is increasing, particularly in black children with thick, kinky hair or hair extensions or wraps. In Africa, head lice have adapted their claws to the curly, elliptical hair shafts of blacks. In developing countries, head lice infestations are a significant cause of contagious bacterial **infections**. Neither frequent brushing nor shampooing nor hair length affects the likelihood of head lice infestation.

Head lice live and crawl on the scalp, sucking blood every three to six hours. Their claws are adapted for clinging to hair or clothing. Adult head lice can be silvery-white to reddish-brown. They are about the size of a sesame seed, about 0.6 inches (1–4 mm.) long. Female lice lay their eggs in sacs called nits that are about 0.04 inches (1 mm.) long and are glued to shafts of hair close to the scalp. During her one-month lifespan, a female louse may lay more than 100 eggs. The nymphs hatch in three to 14 days and must feed on blood within one day. Nymphs are smaller and lighter in color than adults and become sexually mature after 9 to 12 days. Head lice cannot survive without a human host for more than a few days at most.

Body lice lay their nits in clothing or bedding. Occasionally the nits are attached to body hair. Body lice nits are oval and yellow to white in color. They may not hatch for up to 30 days. Nymphs mature in about 7 days. Body lice can live without human contact for up to 10 days.

Body lice infestations are usually associated with poor personal hygiene, as may occur during war or natural disasters or in cold climates. Body lice can carry and transmit disease-causing organisms, including those for epidemic typhus, relapsing **fever**, and trench fever. Trench fever is self-limiting. However, typhus and relapsing fever have mortality rates of five to 10 percent. The elderly are most vulnerable to these diseases.

Pubic lice can survive for one to two weeks without human contact and occasionally are transmitted through infected bedding, towels, or clothing. Pubic lice have large front legs and look like tiny crabs. Females are larger than males. Nits hatch in about one week and the nymphs mature in about seven days. Although pubic lice do not carry diseases, they often are found in association with other sexually transmitted diseases.

Causes and symptoms

Lice are endemic in human populations, spreading by personal contact or contact with infested clothing or other personal items. Lice also can be transmitted when unaffected clothing is stored with infested items. Among children, head lice are commonly transmitted by the sharing of hats, combs, brushes, hair accessories, headphones, pillows, and stuffed toys.

Lice infestations are characterized by intense itching caused by an allergic reaction to a toxin in the lice saliva. The itching can interfere with sleep and concentration. Repeated bites can lead to generalized skin eruptions or inflammation. Scratching or scraping at the bites can cause **hives** or abrasions that may lead to bacterial skin infections. Swelling or inflammation of the neck glands are common complications of head lice.

Body lice bites first appear as small red pimples or puncture marks and may cause a generalized skin rash. Intense itching can result in deep **scratches** around the shoulders, flanks, or neck. If the infestation is not treated, complications may develop, including **headache**, fever, and skin infection with scarring. Crab lice in children may be an indication of sexual activity or abuse.

Diagnosis

Lice usually are diagnosed by the itching. However, itching may not occur until several weeks after infestation, if at all. The tickling caused by moving lice may be noticeable. Definite diagnosis requires identification of lice or their nits.

Head lice may cause irritability in children. Scalp irritations or sores may be present. Although head lice in children are usually limited to the scalp, in adults, head lice can spread to eyebrows, eyelashes, mustaches, and beards. An adult louse may be visible as movement on the scalp, especially around the ears, nape of the neck, and center line of the crown—the warmest parts of the head. Since less than 20 mature lice may be present at a given time during infestation, the nits often are easier to spot. Nits vary in color from grayish-white to yellow, brown, or black. They are visible at the base or on the shaft of individual hairs. Applying about 10 ounces (280 grams) of isopropyl (rubbing) alcohol to the hair and rubbing with a white towel for about 30 seconds releases lice onto the towel for identification.

Body lice appear similar to head lice, however they burrow into the skin and are rarely seen except on clothing, where they lay their nits in seams. Over time, body lice infestations can lead to a thickening and discoloring of the skin around the waist, groin, and upper thighs. Scratching may cause sores that become infected with bacteria or fungi.

Pubic lice usually appear first on genital hair, although they may spread to other body hair. In young children, pubic lice are usually seen on the eyebrows or eyelashes. Pubic lice appear as brown or gray moving dots on the skin. There are usually only a few live lice present and they move very quickly away from light. Their white nits can be seen on hair shafts close to the skin. Although pubic lice sometimes produce small, bluish spots called maculae ceruleae on the trunk or thighs, usually it is easier to spot scratching marks. Small, dark-brown specks of lice excretion may be visible on underwear.

Since pediculicides (medications for treating lice) are usually strong insecticides with potential side effects, it is important to rule out other causes of scratching and skin inflammation. The oval-shaped head lice nits can be distinguished from **dandruff** because they are glued at an angle to the hair shaft. In contrast, flat, irregularly shaped flakes of dandruff shake off easily. A healthcare professional needs to distinguish between body lice and scabies—a disease caused by skin mites—and between pubic lice and **eczema**, a skin condition.

Treatment

Most treatments apply to all types of lice infestation and, particularly with head lice, treatments are an area of great controversy. The questionable safety and effectiveness of allopathic (fighting disease with remedies that produce effects different from those produced by the disease) treatments has spurred the search for alternative therapies. With any type of treatment, itching may not subside for several days.

Head lice

Most authorities believe that head lice should be treated immediately upon discovery.Before beginning any treatment:

- Test a small scalp section for allergic reactions to the medication
- A vinegar rinse helps loosen nits
- Wash hair with regular shampoo

Treatments for applying to the scalp and hair include:

- Olive oil or petroleum ointment to smother the lice. Cover the head with a shower cap, four to six hours per day for three to four days
- Olive oil (three parts) and essential oil of lavender (one part)
- Herbal shampoos or pomades
- A mixture of paw paw, thymol, and tea tree oil
- A combination of coconut oil, anise, and ylang ylang
- Other mixtures of essential oils
- RID Pure Alternative, a nontoxic, hypoallergenic, dye and fragrance-free product
- A spray containing phenethyl propionate, cedar oil, peppermint oil, and sodium lauryl sulfate (LiceFreee)
- Cocamide DEA (a lathering agent), triethanolamine (a local irritant), and disodium EDTA (a chelator), (SafeTek)is both a nontoxic pediculicide and a conditioner for combing out lice and nits

Cutting the hair or shaving the head may be effective. Aromatherapies also are available. Infested eyelashes and eyebrows should be treated with petroleum jelly for several days and the nits should be plucked off with tweezers or fingernails.

Body lice

Treatment for body lice is a thorough washing of the entire body and replacing infected clothing. Clothing and bedding should be washed at 140°F (60°C) and dried at high temperature, or dry-cleaned.

Pubic lice

A common herbal treatment for pubic lice consists of:

- Oil of pennyroyal (*Mentha pulegium*, 25%
- Oil of garlic (*Allium sativum*, 25%
- Distilled water, 50%

The mixture is applied to the pubic hair once a day for three days. Anyone with pubic lice should be tested for other sexually transmitted diseases.

Nit Removal

Neither alternative nor allopathic treatments will kill all lice nits. Hair and pubic lice nits must be removed manually to prevent re-infestation as the eggs hatch. Manual removal alone may effectively treat a lice infestation.

Before removing nits, one of the following procedures may be used:

- 50% vinegar rinse to loosen the nits
- wiping individual locks of hair from base to tip with a cloth soaked in vinegar
- 8% formic acid solution applied to the hair for 10 minutes, rinsed out, and towel-dried
- catching live lice with a comb, tweezers, fingernails, or by sticking them with double-sided tape
- enzymatic lice-egg remover

Furthermore:

- Hair should be clean, damp, and untangled
- Hair conditioner should not be used on hair treated allopathically
- Remove clothing and place a towel between the hair and shoulders
- Divide hair into square-inch (six sq.-cm.) sections. Clips or elastics can be used to divide long hair

Nits are manually removed with:

- Any fine-toothed comb, including pet flea combs
- A specialized nit comb (LiceMeister, LiceOut)
- A battery-powered vibrating or anti-static comb
- Tweezers
- Baby safety scissors
- Fingernails

To comb out nits:

- Comb along each hair section from scalp to tip
- Between each passing, dip the comb in water and wipe with a paper towel to remove lice and nits
- Hold the comb to the light to be sure it is clean
- If necessary, clean comb with a tooth or fingernail brush or dental floss
- Work under a good light, with a magnifying glass if necessary
- Do not rush. Long, thick hair may take an hour to comb out thoroughly
- Wash towels and clothing after combing
- Repeat at least twice a week for at least two weeks

Re-infestation

Re-infestation occurs often with all types of lice due to:

- Ineffective or incomplete treatment
- Chemical-resistant lice
- Failure to remove live nits
- Failure to treat all infected household members, playmates, or partners
- Failure to remove nits from clothing, bedding, towels, or other items
- Re-infestation from another source

Re-infestation with body or pubic lice can be prevented by washing underclothes, sleepwear, bedding, and towels in hot, soapy water and drying with high heat for at least 20 minutes. Clothing infected with body lice should be ironed under high heat. Sexual partners should be treated for public lice simultaneously and should re-examine themselves for several days.

To prevent head lice re-infestation:

- Repeat lice checks and nit removal daily until none are found
- Notify school, camp, or daycare, and parents of playmates
- Check and if necessary treat household members, playmates, schoolmates, school or daycare staff, and others in close contact with an infestation
- Treat combs and brushes with rubbing alcohol, Lysol, or soapy water above 130°F (54°C)
- Wash all bedding, clothing, headgear, scarves, and coats with soapy water at 130°F (54°C) and dry with high heat for at least 20 minutes
- Wash or vacuum stuffed animals and other toys
- Vacuum all helmets, carpets, rugs, mattresses, pillows, upholstery, and car seats
- Remove the vacuum cleaner bag after use, seal in a plastic bag, and place in the outside garbage
- Non-washable items should be dry cleaned or sealed in a plastic bag for up to four weeks
- Lice pesticide sprays for inanimate objects are toxic and are not recommended
- Repeat treatment if necessary

Allopathic treatment

All types of lice are treated allopathically with insecticidal lotions, shampoos, or cream rinses. However, experts disagree about the effectiveness and/or safety of pediculicides. Pediculicides do not kill nits, so nit removal and a second application in seven to 10 days may be necessary. Pediculicides can be poisonous if used improperly or too frequently and overuse can lead to the proliferation of chemically resistant lice. The residue may remain on the hair for several weeks and can cause skin or eye irritations.

Pediculicides should not be used:

- Near broken skin, eyes, or mucous membranes
- In the bathtub or shower

- By pregnant or nursing women or children under two
- By those with allergies, asthma, epilepsy, or some other medical conditions

Pyrethroids

All U.S. Food and Drug Administration (FDA)-approved non-prescription pediculicides contain relatively safe and effective pyrethroids. Insecticidal pyrethrins (0.33%) (RID, A-200) are extracts from chrysanthemum flowers. Permethrin (1%)(Nix) is a more stable synthetic pyrethrin. Pyrethroid pediculicides usually also contain 4% piperonyl butoxide.

To treat with pyrethroids:

- Apply for specified time, usually 10 minutes.
- Thoroughly rinse out.
- Do not wash hair for one or two days after treatment.
- Do not use cream rinse, hair spray, mousse, gels, mayonnaise, or vinegar before or within one week after treatment. These products may reduce pediculicide effectiveness

During the 1990s, as schools began requiring children to be lice and nit-free, the use of pyrethroids rose significantly and the FDA began receiving reports of ineffectiveness. The FDA ordered new labeling of pyrethroid pediculicides on the outside of the carton, in simpler language, and with more information, to take effect in 2005–2006. Permethrin sprays for treating mattresses, furniture, and other items are not recommended.

Other insecticides

Prescription insecticides are used when other lice treatments fail or cannot be used.These pesticides include:

- Malathion (0.5% in Ovide), a neurotoxic organophosphate, was withdrawn from the U.S. market due to an increase in malathion-resistant lice and re-introduced in 1999. It is foul-smelling and flammable. Sometimes infested clothing is treated with a 1% malathion powder
- Lindane (1% or higher) (Kwell), an organochloride neurotoxin, can induce seizures and death in susceptible people, even when used according to the directions. In 2003 the FDA required new labeling and a reduction in bottle size
- Ivermectin (Stromectol), an oral treatment for intestinal parasites, is effective against head lice but has not been approved for that use by the FDA

Infested eyelashes are treated with a thick coating of prescription petroleum ointment, applied twice daily for ten days.

Prognosis

Despite the presence of chemically resistant lice and the thoroughness required to prevent re-infestation, essentially all lice infestations can be eradicated eventually.

Prevention

Prevention of lice infestation depends on adequate personal hygiene and the following public health measures:

- Avoid sharing combs, brushes, hair accessories, hats, towels, or bedding
- Check hair and scalp weekly for lice and nits
- Limit sexual partners

Regular lice checks in schools and "no nit" reentry policies have not been shown to be effective. The American Academy of Pediatrics, the Harvard School of Public Health, and the National Association of School Nurses recommend their elimination, although many healthcare professionals disagree.

Scientists have identified both the gene that enables head and body lice to digest blood and the gene that helps lice combat deadly infections, with the potential for new treatments and preventions for lice infestation.

Resources

BOOKS

Goldberg, Burton, et al. "Children's Health." *Alternative Medicine: The Definitive Guide*. 2nd ed. Berkeley, CA: Ten Speed Press, 2002.

Grossman, Leigh B. *Infection Control in the Child Care Center and Preschool*. Philadelphia: Lippincott Wil liams & Wilson, 2003.

PERIODICALS

Blenkinsopp, Alison. "Head Lice." *Primary Health Care* 13 (October 2003): 33 34.

Burgess, I. F. "Human Lice and Their Control." *Annual Review of Entomology* 49 (2004): 457.

Elston, D. M. "Drug Resistant Lice." *Archives of Dermatology*. 139 (2003): 1061 1064.

Evans, Jeff "Pediatric Dermatology: Simple Methods Often Best: Lice, Mosquitoes, Warts." *Family Practice News*. 34 (January 15, 2004): 56.

Flinders, David C., and Peter De Schweinitz. "Pediculosis and Scabies." *American Family Physician* 69 (January 15, 2004): 341 352.

Heukelbach, Jorg, and Hermann Feldmeier. "Ectoparasites The Underestimated Realm." *Lancet* 363 (March 13, 2004): 889 891.
Hunter, J. A., and S. C. Barker. "Susceptibility of Head Lice (*Pediculus humanus capitis*) to Pediculicides in Australia." *Parasitology Research* 90 (August 2003): 476 478.
Kittler, R., et al. "Molecular Evolution of *Pediculus humanus* and the Origin of Clothing." *Current Biology* 13 (August 19, 2003): 1414 1417.
"Recommendations Provided for Back to School Head Lice Problem." *Health & Medicine Week* October 6, 2003: 329.
Yoon, K. S., et al. "Permethrin Resistant Human Head Lice, *Pediculus capitis*, and Their Treatment." *Archives of Dermatology* 139 (August 2003): 1061 1064.
Zepf, Bill. "Treatment of Head Lice: Therapeutic Options." *American Family Physician* 69 (February 1, 2004): 655.

OTHER

Lice. MayoClinic.com. August 5, 2002 [cited April 18, 2004]. http://www.mayoclinic.com/invoke.cfm?id DS00368.
Lindane Shampoo and Lindane Lotion Questions and Answers. Center for Drug Evaluation and Research, U.S. Food and Drug Administration. April 15, 2003 [cited April 18, 2004]. http://www.fda.gov/cder/drug/infopage/lindane/lindaneQA.htm.

ORGANIZATIONS

American Academy of Dermatology (AAD). P.O. Box 4014, Schaumburg, IL 60168 4014. 847 330 0230. http://www.aad.org.
American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007 1098. 847 434 4000. kidsdocs@aap.org http://www.aap.org.
Centers for Disease Control and Prevention, National Center for Infectious Diseases, Division of Parasitic Diseases. 1600 Clifton Road, Atlanta, GA 30333. 404 639 3534. 800 311 3435. http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm.
National Pediculosis Association (NPA), Inc. 50 Kearney Road, Needham, MA 02494. 781 449 NITS. npa@headlice.org. http://www.headlice.org.

Rebecca J. Frey, PhD
Margaret Alic, PhD

Lichen *see* **Usnea**

Licorice

Description

Licorice, *Glycyrrhiza glabra*, is a purple and white flowering perennial, native of the Mediterranean region and central and southwest Asia. It is cultivated

Common licorice. *(© blickwinkel / Alamy)*

widely for the sweet taproot that grows to a depth of four ft (1.2 m). Licorice is a hardy plant that thrives in full sun or partial shade and prefers rich, moist soil. It may grow to a height of 3-7 ft (1-2 m). The wrinkled, brown root has yellow interior flesh and is covered with a tangle of rootlets branching from the stolons. The aerial parts of the plant are erect and branching with round stems that become somewhat angular near the top. The leaves are alternate, odd, and pinnate, dividing into as many as eight pairs of oblong leaflets. Licorice blossoms in late summer. The sweet-pea like flowers grow in clusters forming in the angle where the stem joins the branch. The maroon colored seed pods are about 1-2 in (3-5 cm) long and contain one to six kidney-shaped seeds.

Licorice is a sweet and soothing herb that has been appreciated for its medicinal qualities for thousands of years. Hippocrates named the herb *glukos riza*, or sweet root. Several species of this member of the Leguminosae, or pea, family, are used medicinally. *Glycyrrhiza glabra*, also known as sweet wood or sweet licorice, is cited first in most herbals. Chinese licorice, *G. uralenis* or *G. viscida*, known as the peacemaker,

was included in the Chinese classic herbal *Pen Tsao Ching* over 2,000 years ago, and is believed to promote longevity. An American variety, *G. lepidota* or wild licorice, was a common Native American remedy and was also used by early settlers. Dominican friars brought the herb to England in the sixteenth century. The abbess Hildegard of Bingen added licorice to her materia medica, and this well-loved herb was a favorite of German and English herbalists.

General use

The medicinal benefits of licorice root have been studied extensively, and its use in traditional medicine is well documented. Licorice is an expectorant, helpful in the treatment of upper respiratory tract catarrh. The root extract is demulcent, and commonly used as a component of many medicinal syrups and drops providing relief to a **sore throat** and for coughs. The glycoside glycyrrhizin, found in the root, is more than 50 times as sweet as sucrose. Glycyrrhizin, which becomes glycyrrhizic acid when ingested, has been credited with much of the pharmacological action of licorice. The herb is also effective as a mild laxative, cleansing the colon. Licorice is a liver tonic and is used as an anti-inflammatory medicine, useful in the treatment of arthritis. Along with other herbs, licorice is used to treat **muscle spasms**. It also acts to reduce stomach acid and relieves **heartburn**. Other active chemical constituents in licorice root include asparagine, flavonoids and isoflavonoids, chalcones, coumarins, sterols, and triterpenoid saponins. Studies have shown that licorice also stimulates the production of interferon.

Licorice preparations have been used in the healing of peptic ulcers. The demulcent action of the root extract coats and soothes the ulcerated tissue. Licorice also has a beneficial effect on the endocrine system and is helpful in treatment of problems with the adrenal gland, such as Addison's disease. Phytochemicals in the root act similarly to and stimulate the secretion of the body's natural adrenal cortex hormone, aldosterone. This sweet herb also has antibacterial action and is beneficial in treatment of **hypoglycemia**. Licorice increases bile flow and acts to lower blood **cholesterol** levels. Licorice root, when boiled to extract its sweetness, has been used traditionally in candy making. Commercially it is a flavoring in beer, soft drinks, and tobacco. Singers chew the root to ease throat irritation and to strengthen their voice. Many women's herbal formulas include licorice for its estrogenic properties as an aid to normalize and regulate hormone production during **menopause**; however, some recent studies indicate that licorice does not have the estrogenic qualities that have been attributed to it. Licorice is frequently used in medicinal compounds with other herbs. In Chinese medicine, this herb is always used in compound, as it can minimize the bitter taste of some herbal components, and help to blend and harmonize the entire mixture.

KEY TERMS

Apoptosis—Cell suicide or self-destruction. Licorice contains a compound that induces apoptosis in some types of human cancer cells.

Decoction—A herbal extract prepared by boiling the plant material for some time.

Demulcent—A type of medication given to soothe the stomach lining or other irritated mucous membrane. Licorice extract can be used as a demulcent.

Expectorant—A substance or medication given to bring up phlegm or mucus from the respiratory tract.

Glycyrrhizin—A sweet-tasting compound in licorice root that has a number of beneficial effects on the cardiovascular and digestive systems.

Tincture—A herbal preparation made by soaking the roots, leaves, or other parts of the plant in alcohol or a mixture of alcohol and water.

More recently, licorice has been found to offer some protection against cardiovascular disease. A team of Israeli researchers found that licorice root extract added to the diet lowers blood cholesterol levels as well as the rate of oxidation in cardiovascular tissue.

Licorice also shows promise as a possible chemopreventive against **cancer**. Glycyrrhizin, the glycoside credited with many of the beneficial effects of licorice, appears to inhibit the growth of cancer cells as well. In addition, a new polyphenol compound isolated from licorice root has been found to induce apoptosis, or self-destruction, in human prostate and breast tumor cells.

Preparations

The dried root is used in medicinal preparations. Harvest the taproot of three- to four-year-old plants in late autumn. Washed and dried, the root may be stored intact until needed for a preparation.

Decoction: Combine one teaspoonful of dried root, powdered or diced, for each cup of non-chlorinated water. Bring to boil, lower heat and simmer for 10-15

minutes. Dosage is three cups per day. Prepare fresh decoction daily.

Tincture: Combine one part dried root, powdered or diced, with five parts of brandy or vodka in a glass container. A 50/50 alcohol to water ratio is optimal. Seal the container with an airtight lid. Leave to macerate in a darkened place for two weeks. Shake daily. Strain the mixture through a cheesecloth or muslin bag and pour into a dark bottle for storage up to two years. Dosage is one to three milliliters of the tincture three times a day.

Precautions

People should avoid using licorice in large doses for long periods of time. This herbal remedy should be used for no longer than four to six weeks without medical advice. Pregnant women should not use the herb. Persons with high blood pressure or kidney disease should not use licorice, nor should those with cholestatic liver disorders or **cirrhosis**.

Side effects

Excessive use of the herbal extract may raise blood pressure, cause water retention, **headache**, and **potassium** loss; however, for persons on high potassium, low-sodium **diets**, this may not be a problem. Licorice taken in its natural form, such as chewing the root, may mitigate the side effect of water retention because of the high presence of the plant constituent asparagine. **Deglycyrrhizinated licorice** extract is commercially available for treatment of peptic ulcer and eliminates side effects possible with other licorice preparations.

Interactions

When licorice is used while taking thiazide diuretic medications, this may exacerbate potassium loss. Sensitivity to **digitalis** glycosides may increase with loss of potassium.

Resources

BOOKS

Blumenthal, Mark. *The Complete German Commission E Mongraphs, Therapeutic Guide to Herbal Medicines*. Massachusetts: Integrative Medicine Communications, 1998.

Bown, Deni. *The Herb Society of America, Encyclopedia of Herbs And Their Uses*. New York: D.K. Publishing, Inc., 1995.

Gladstar, Rosemary. *Herbal Healing for Women*. New York, Simon & Schuster, 1993.

Kowalchik, Claire, and William H. Hylton. *Rodale's Illustrated Encyclopedia of Herbs*. Pennsylvania: Rodale Press, 1987.

Mabey, Richard. *The New Age Herbalist*. New York: Simon & Schuster, Inc., 1998.

PERIODICALS

Amato, P., S. Christophe, and P. L. Mellon. "Estrogenic Activity of Herbs Commonly Used as Remedies for Menopausal Symptoms." *Menopause* 9 (March April 2002): 145 150.

Fuhrman, B., N. Volkova, M. Kaplan, et al. "Antiathero sclerotic Effects of Licorice Extract Supplementation on Hypercholesterolemic Patients: Increased Resist ance of LDL to Atherogenic Modifications, Reduced Plasma Lipid Levels, and Decreased Systolic Blood Pressure." *Nutrition* 18 (March 2002): 268 273.

Hsiang, C. Y., I. L. Lai, D. C. Chao, and T. Y. Ho. "Dif ferential Regulation of Activator Protein 1 Activity by Glycyrrhizin." *Life Sciences* 70 (February 22, 2002): 1643 1656.

Rafi, M. M., B. C. Vastano, N. Zhu, et al. "Novel Polyphe nol Molecule Isolated from Licorice Root (*Glycyrrhiza glabra*) Induces Apoptosis, G2/M Cell Cycle Arrest, and Bcl 2 Phosphorylation in Tumor Cell Lines." *Journal of Agricultural and Food Chemistry* 50 (Febru ary 13, 2002): 677 684.

Clare Hanrahan
Rebecca J. Frey, PhD

Licorice mint *see* **Agastache**

Light therapy

Definition

Light therapy, or phototherapy, is the administration of doses of bright light in order to treat a variety of sleep and mood disorders. It is most commonly used to re-regulate the body's internal clock and/or relieve **depression**.

Origins

Light, both natural and artificial, has been prescribed throughout the ages for healing purposes. Sunlight has been used medicinally since the time of the ancient Greeks; Hippocrates, the father of modern medicine, prescribed exposure to sunlight for a number of illnesses. In the late nineteenth and early twentieth centuries, bright light and fresh air were frequently prescribed for a number of mood and **stress** related disorders. In fact, prior to World War II, hospitals were regularly built with

Types of light therapy

Type	Description	Condition/disease
Back of knee	The area behind the knee, known as the popliteal region, contains photoreceptors that can adjust the body's circadian rhythms.	Seasonal affective disorder (SAD), jet lag
Colored	Different colored light has therapeutic effects on the body. Depending on the condition, the colored light can be projected as a beam on a specific area or as a floodlight that covers the whole body.	Used in conjunction with accupuncture (but they are not lasers), or on its own
Cold laser	Very low-intensity laser beams are directed at the body.	Used in laser acupunture to treat pain, stress tendinitis, etc.
Full spectrum, non - UV	Full spectrum light that does not emit UV rays.	Skin diseases, rashes, jaundice, and seasonal affective disorder (SAD)

(Illustration by Corey Light. Cengage Learning, Gale)

solariums, or sun rooms, in which patients could spend time recuperating in the sunlight.

In the 1980s, light therapy began to make an appearance in the medical literature as a treatment for **seasonal affective disorder**, or SAD. Today, it is widely recognized as a front-line treatment for the disorder.

Benefits

Light therapy is most often prescribed to treat seasonal affective disorder, a form of depression most often associated with shortened daylight hours in northern latitudes from the late fall to the early spring. It is also occasionally employed to treat such sleep-related disorders as **insomnia** and **jet lag**. Recently, light therapy has also been found effective in the treatment of such nonseasonal forms of depression as **bipolar disorder**. One 2001 study found that bright light reduced depressive symptoms 12–35% more than a placebo treatment in nine out of 10 randomized controlled trials.

When used to treat SAD or other forms of depression, light therapy has several advantages over prescription antidepressants. Light therapy tends to work faster than medications, alleviating depressive symptoms within two to 14 days after beginning light therapy as opposed to an average of four to six weeks with medication. And unlike antidepressants, which can cause a variety of side effects from **nausea** to concentration problems, light therapy is extremely well tolerated. Some side effects are possible with light but are generally not serious enough to cause discontinuation of the therapy.

There are several other different applications for light therapy, including:

- Full-spectrum/UV light therapy for disorders of the skin. A subtype of light therapy that is often prescribed to treat skin diseases, rashes, and jaundice.
- Cold laser therapy. The treatment involves focusing very low-intensity beams of laser light on the skin, and is used in laser acupuncture to treat a myriad of symptoms and illnesses, including pain, stress, and tendinitis.
- Colored light therapy. In colored light therapy, different colored filters are applied over a light source to achieve specific therapeutic effects. The colored light is then focused on the patient, either with a floodlight which covers the patient with the colored light, or

KEY TERMS

Dawn simulation—A form of light therapy in which the patient is exposed while asleep to gradually brightening white light over a period of an hour and a half.

Lux—The International System unit for measuring illumination, equal to one lumen per square meter.

Neurotransmitter—A chemical in the brain that transmits messages between neurons, or nerve cells.

Seasonal affective disorder (SAD)—A mood disorder characterized by depression, weight gain, and sleepiness during the winter months. An estimated 4 6% of the population of Canada and the northern United States suffers from SAD.

Serotonin—A neurotransmitter that is involved in mood disorders as well as transmitting nerve impulses.

with a beam of light that is focused on the area of the illness.

- Back of knee light therapy. A 1998 report published in the journal *Science* reported that the area behind the human knee known as the popliteal region contains photoreceptors that can help to adjust the body's circadian rhythms. The authors of the study found that they could manipulate circadian rhythms by focusing a bright light on the popliteal region. Further studies are needed to determine the efficacy of this treatment on disorders such as SAD and jet lag.

Description

Light therapy is generally administered at home. The most commonly used light therapy equipment is a portable lighting device known as a light box. The light box may be a full-spectrum box, in which the lighting element contains all wavelengths of light found in natural light (including UV rays), or it may be a bright light box, in which the lighting element emits non-UV white light. The box may be mounted upright to a wall, or slanted downwards towards a table.

The patient sits in front of the box for a prescribed period of time (anywhere from 15 minutes to several hours). For patients just starting on the therapy, initial sessions are usually only 10–15 minutes in length. Some patients with SAD undergo light therapy session two or three times a day, others only once. The time of day and number of times treatment is administered depends on the physical needs and lifestyle of the individual patient. If light therapy has been prescribed for the treatment of SAD, it typically begins in the fall months as the days begin to shorten, and continues throughout the winter and possibly the early spring. Patients with a long-standing history of SAD are usually able to establish a time-table or pattern to their depressive symptoms, and can initiate treatment accordingly before symptoms begin.

The light from a slanted light box is designed to focus on the table it sits upon, so patients may look down to read or do other sedentary activities during therapy. Patients using an upright light box must face the light source, and should glance toward the light source occasionally without staring directly into the light. The light sources in these light boxes typically range from 2,500–10,000 lux (in contrast, average indoor lighting is 300–500 lux; a sunny summer day is about 100,000 lux).

Light boxes can be purchased for between $200 and $500. Some healthcare providers and healthcare supply companies also rent the fixtures. This gives a patient the opportunity to have a trial run of the therapy before making the investment in a light box. Recently, several new light box products have become available. Dawn simulators are lighting devices or fixtures that are programmed to turn on gradually, from dim to bright light, to simulate the sunrise. They are sometimes prescribed for individuals who have difficulty getting up in the morning due to SAD symptoms. Another device known as a light visor is designed to give an individual more mobility during treatment. The visor is a lighting apparatus that is worn like a sun visor around the crown of the head. Patients with any history of eye problems should consult their healthcare professional before attempting to use a light visor.

Preparations

Full-spectrum light boxes do emit UV rays, so patients with sun-sensitive skin should apply a sun screen before sitting in front of the box for an extended period of time.

Precautions

Patients with eye problems should see an ophthalmologist regularly both before and during light therapy. Because UV rays are emitted by the light box, patients taking photosensitizing medications should consult with their healthcare provider before beginning treatment. In addition, patients with medical conditions that make them sensitive to UV rays should

also be seen by a healthcare professional before starting phototherapy.

Patients beginning light therapy for SAD may need to adjust the length, frequency, and timing of their phototherapy sessions in order to achieve the maximum benefits. Patients should keep their healthcare provider informed of their progress and the status of their depressive symptoms. Occasionally, additional treatment measures for depression (i.e., antidepressants, herbal remedies, **psychotherapy**) may be recommended as an adjunct, or companion treatment, to light therapy.

Side effects

Some patients undergoing light therapy treatments report side effects of eyestrain, headaches, insomnia, **fatigue**, **sunburn**, and dry eyes and nose. Most of these effects can be managed by adjusting the timing and duration of the light therapy sessions. A strong sun block and eye and nose drops can alleviate the others. Long-term studies have shown no negative effects to eye function of individuals undergoing light therapy treatment.

A small percentage of light therapy patients may experience hypomania, a feeling of exaggerated, hyperelevated mood. Again, adjusting the length and frequency of treatment sessions can usually manage this side effect.

Research and general acceptance

Light therapy is widely accepted by both traditional and complementary medicine as an effective treatment for SAD. The exact mechanisms by which the treatment works are not known, but the bright light employed in light therapy may act to readjust the body's circadian rhythms, or internal clock. Other popular theories are that light triggers the production of serotonin, a neurotransmitter believed to be related to depressive disorders, or that it influences the body's production of **melatonin**, a hormone that may be related to circadian rhythms. A recent British study suggests that dawn simulation, a form of light therapy in which the patient is exposed to white light of gradually increasing brightness (peaking at 250 lux after 90 min) may be even more effective in treating depression than exposure to bright light. Dawn simulation is started around 4:30 or 5 A.M., while the patient is still asleep.

Wide-spectrum UV light treatment for skin disorders such as **psoriasis** is also considered a standard treatment option in clinical practice. However, such other light-related treatments as cold laser therapy and colored light therapy are not generally accepted, since few or no scientific studies exist on the techniques.

Training and certification

Psychiatrists, psychologists, and other mental healthcare professional prescribe light therapy treatment for SAD. Holistic healthcare professionals and light therapists who specialize in this treatment are also available; in some states, these professionals require a license, so individuals should check with their state board of health to ensure their practitioner has the proper credentials. Light therapy for skin disorders should be prescribed by a dermatologist or other healthcare professional with expertise in skin diseases and light therapy treatment.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Press, Inc., 1994.

Lam, Raymond, ed. *Seasonal Affective Disorder and Beyond: Light Treatment for SAD and Non SAD Conditions*. Washington, DC: American Psychiatric Press, 1998.

Rosenthal, Norman. *Winter Blues: Seasonal Affective Dis order What It Is and How to Overcome It*. New York: Guilford Press, 1998.

PERIODICALS

Eagles, John M. "SAD Help Arrives with the Dawn" *Lancet* 358 (December 22, 2001): 2100.

Jepson, Tracy, et al. "Current Perspectives on the Manage ment of Seasonal Affective Disorder." *Journal of the American Pharmaceutical Association*. 39 no. 6 (1999): 822 829.

Sherman, Carl. "Underrated Light Therapy Effective for Depression." *Clinical Psychiatry News* 29 (October 2001): 32.

ORGANIZATIONS

National Depressive and Manic Depressive Association. 730 Franklin Street, Suite 501, Chicago, IL 60610. (800) 826 3632. http://www.ndmda.org

Society for Light Treatment and Biological Rhythms. 824 Howard Ave., New Haven, CT 06519. Fax (203) 764 4324. http://www.sltbr.org. sltbr@yale.edu.

Paula Ford-Martin
Rebecca J. Frey, PhD

Ling zhi *see* **Reishi mushroom**

Linoleic acid

Description

Linoleic acid is a colorless to straw-colored liquid polyunsaturated fatty acid with the chemical formula ($C_{18}H_{32}O_2$) of the omega-6 series. Linoleic and another fatty acid, gamma-linolenic, or gamolenic, produce compounds called prostaglandins. Prostaglandins are substances found in every cell, are needed for the body's overall health maintenance, and must be replenished constantly. Linoleic acid is an essential fatty acid, which means that the body cannot produce it, so it must be obtained in the diet.

Linoleic acid is an important fatty acid, especially for the growth and development of infants. Fatty acids help to maintain the health of cell membranes, improve nutrient use, and establish and control cellular metabolism. They also provide the raw materials that help in the control of blood pressure, blood clotting, inflammation, body temperature, and other body functions. Fatty acids are consumed in the greatest quantities in the synthesis of fat. Although many people are encouraged to consume less fat in their **diets**, fat is still an important component of a healthy body. Fat stores the body's extra calories, helps insulate the body, and protects body tissues. Fats are also an important energy source during **exercise**, when the body depends on its calories after using up available carbohydrates. Fat helps in the absorption and transport through the bloodstream of the fat-soluble vitamins A, D, E, and K.

Conjugated linoleic acid (CLA) is a naturally occurring mixture of various isomers of linoleic acid with conjugated double bonds. The isomers of CLA have different shapes, functions, and benefits. CLA supplements, or fats containing CLA, generally contain a mixture of these isomers. Although CLA is present in many foods and can be synthesized from linoleic acid, it is made naturally in the stomach, especially in ruminant animals. (Ruminants are animals that regurgitate food and chew it, known as "chewing the cud." Cows and sheep are ruminants.) For this reason, CLA is found primarily in dairy and beef products, as well as other foods derived from ruminant animals. Many people have likely decreased their intake of CLA for two reasons. First, people in the 2000s are typically eating less beef and dairy fat in their diets. Second, many cattle are fed grain diets, which are lower in linoleic acid than the grass on which they would naturally feed, so there is less CLA in beef raised in the meat industry and in dairy foods. It is possible to increase the CLA in milk by adding a linoleic acid supplement to livestock feed. The supplement also increases lean tissue and decreases fat in the animals and induces dairy cattle to produce more milk.

Borage is a source of linoleic acid. *(© David Noton Photography / Alamy)*

Linoleic acid is found in **fish oil**, meat, milk, and other dairy products. It is also a constituent of many vegetable oils, including **evening primrose oil**, sunflower oil, and safflower oil. Commercially produced linoleic acid is used in margarine, animal feeds, emulsifying agents, soaps, and drugs.

General use

As mentioned, CLA supplements, or fats containing CLA, generally contain a mixture of CLA isomers. Plant oils, though they contain little CLA, are a rich source of linoleic acid. While linoleic acid may be taken as a supplement to help with certain conditions, the supplement will not necessarily increase CLA levels in the body.

Anticarcinogenic

One particular isomer in CLA, known as cis-9, trans-11, is linked to anticancer benefits. Studies with animals have shown CLA to reduce breast, prostate, stomach, colorectal, lung, and skin cancers. The CLA may slow the growth of cells that give rise to **cancer**. A human study has shown an association between linoleic acids and a decreased risk for **prostate cancer**. In addition, a study done in 2001 on human **breast cancer** cells grown in a laboratory medium showed that linoleic acid works to reduce tumor size through its effects on a gene that controls the rate of apoptosis, or cell self-destruction.

Cystic fibrosis

Infants with cystic fibrosis (CF) often have poor weight gain and growth and an inability to absorb fats. Some research suggests that infants with CF can benefit from formula with a high linoleic acid content because it optimizes **nutrition**, growth, and feeding efficiency.

Multiple sclerosis

Multiple sclerosis (MS) is a disease in which demyelination (loss of myelin sheath material) occurs. (The myelin sheath is a fatty substance that surrounds and insulates the axon of some nerve cells.) This condition leads to disruptions in nerve impulse transmission. Linoleic acid is believed to be helpful because myelin is composed of **lecithin**, which is made of linoleic and other fatty acids. Many diets recommended for MS patients include supplements. Patients supplementing with linoleic acid show a smaller increase in disability and reduced severity and duration of attacks than those with no linoleic acid supplement. Evening primrose oil is beneficial because of its specialized fatty-acid content, including linoleic acid. Doses of sunflower seed oil or evening primrose oil to provide 17 grams linoleic acid per day may be beneficial.

Pregnancy

One study indicated that low doses of linoleic acid and **calcium** can reduce the incidence of preeclampsia in high-risk women. (Preeclampsia is the development of **hypertension** with increased protein in the urine or accumulation of watery fluid in cells or tissues or both, due to pregnancy.) Another study showed, however, that linoleic acid consumption can have a negative effect on fetal growth. Pregnant women should talk to their doctors before taking linoleic acid or any other supplement.

Diet and nutrition

CLA helps regulate how the body accumulates and retains fat. It has been shown to reduce body fat, improve muscle tone, improve nutrient usage, and reduce the appetite by improving the way the body extracts energy from less food. These properties are useful for individuals trying to lose weight or tone muscles and also for people with nutrient absorption disorders and other digestive problems. The CLA isomer linked with reducing body fat and increasing lean muscle mass is trans-10, cis-12.

Skin care

Linoleic acid helps relieve flaky, itchy, or rough skin and maintain smooth, moist skin. A tablespoon of linoleic acid-rich foods or oils may be added on a daily basis to help improve and moisturize skin. Linoleic acid may also help with skin disorders such as atopic **eczema**. Evening primrose oil is taken to help with skin, hair, and nail repair.

Other uses

Animal research suggests that CLA supplementation may limit food allergy reactions and improve glucose tolerance. It is also used as a nutritional supplement for allergic respiratory disease, circulation, arthritis, and inflammatory problems. CLA is a potent antioxidant and may help reduce plaque formation in arteries and thus help prevent **heart disease**. Evening primrose oil helps to reduce arthritis **pain** and **depression**. It also helps to control diabetes, liver and kidney damage due to alcohol, and several symptoms of **premenstrual syndrome** (PMS).

Linoleic acid appears to have at least one negative effect on the human body, however. It appears to increase a person's risk of developing age-related **macular degeneration** (ARMD), a disease of the eye that leads to a progressive loss of vision and eventual blindness.

Preparations

Evening primrose oil is a fixed oil obtained from the seeds of *Oenothera biennis* or other spp. (Onagraceae). It contains about 72% linoleic acid and 9% gamolenic acid. Typical doses expressed as gamolenic acid are 320 or 480 mg daily, taken in two or three doses. Safflower oil is the refined fixed oil obtained from the seeds of the safflower, or false (bastard) **saffron**, *Carthamus tinctorius* (Compositae). It contains about 75% linoleic acid as well as various saturated fatty acids.

KEY TERMS

Age-related macular degeneration (ARMD)—An eye disease that appears to be related to high levels of linoleic acid in the body. ARMD is characterized by progressive and permanent loss of vision.

Apoptosis—The programmed self-destruction of a cell, which takes place when the cell detects some damage to its DNA. Apoptosis is sometimes called "cell suicide." The antitumor activity of linoleic acid is related to its effects on a gene that controls the rate of apoptosis.

Atopic eczema—Inflammation of the skin caused by allergic reaction.

Cystic fibrosis (CF)—A disorder of the exocrine glands that affects many organs of the body, especially the sweat glands and glands in the lungs and pancreas.

Isomers—Molecules that have the same molecular formula, but different configurations.

Multiple sclerosis (MS)—A disease caused by demyelination, or loss of myelin sheath material, which is essential in nerve impulse transmission.

Omega-6 fatty acid—A fatty acid with its first double bond at the sixth carbon in its carbon chain.

Phenothiazines—A parent compound for the synthesis of some antipsychotic compounds.

CLA is available in beef and dairy products, but to avoid eating too many fatty animal foods, supplements may be taken. CLA comes in capsules and softgels that range in potency from 600 to 1,000 mg. A specialist should be consulted to determine what is most appropriate.

Precautions

CLA appears to be safe and nontoxic at supplemental levels. However, using evening primrose oil as a supplement for linoleic acid can cause symptoms of undiagnosed temporal lobe **epilepsy** and should be used with caution in patients with a history of epilepsy.

Side effects

CLA may cause gastrointestinal upset in isolated cases, and evening primrose oil can cause minor gastrointestinal upset and **headache**.

Interactions

People who take epileptogenic drugs (drugs which cause epilepsy), in particular phenothiazines, may have interactions with evening primrose oil and should talk to their doctor before using a supplement.

Resources

BOOKS

Sebedio, J. L., W. W. Christie, and R. Adlof, eds. *Advances in Conjugated Linoleic Acid Research,* vol. 2. Champaign, IL: AOCS Press, 2006.

Williams, Lane. *Conjugated Linoleic Acid for Weight Loss.* Chapmanville, WV: Woodland Press, 2007.

Yurawecz, M. P., et al., eds. *Advances in Conjugated Linoleic Acid Research,* vol. 1. Champaign, IL: AOCS Press, 2006.

PERIODICALS

"Conjugated Linoleic Acid [Clarinol] Reduces Fat Mass in Specific Areas on the Body." *Inpharma* (April 21, 2007): 11.

Das, Undurti N. "Beneficial Actions of Polyunsaturated Fatty Acids in Cardiovascular Diseases: But How and Why?" *Current Nutrition & Food Science* (February 2008): 2 31.

Leaf, Alexander, Jing X. Kang, and Yong Fu Xiao. "Fish Oil Fatty Acids as Cardiovascular Drugs." *Current Vascular Pharmacology* (January 2008): 1 12.

Logan, A. C. "Linoleic and Linolenic Acids and Acne Vulgaris." *British Journal of Dermatology* (January 2008): 201 202.

Rao, A. V., K. Andrews, and A. Logan. "A Double Blind, Randomized Controlled Trial of a Nutritional Supplement (abs+) Containing Conjugated Linoleic Acid (CLA) and Epigallocatechin gallate (EGCG) in Human Weight Loss." *Journal of Herbs, Spices, & Medicinal Plants* (February 2007): 69 78.

Melissa C. McDade
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Linseed *see* **Flaxseed**

Lipase

Definition

Lipase is an enzyme that is used by the body to break down dietary fats (lipids), especially triglycerides, into a form that can be absorbed in the intestines.

Description

Lipase is not found in foods; rather it is naturally manufactured in the pancreas. Small amounts are produced in the stomach and secreted in the saliva. The pancreas also makes two other groups of **digestive enzymes**: protease and amylase. The pancreas is a glandular organ near the stomach that secretes digestive juices into the small intestine and releases the hormones insulin, glucagon, and somatostatin into the bloodstream. Lipase appears in the blood together with another enzyme called amylase following damage to or diseases affecting the pancreas. It was once thought that abnormally high lipase levels were associated only with diseases of the pancreas. Other conditions are in the 2000s known to be associated with high lipase levels, especially kidney failure and intestinal obstruction. Diseases involving the pancreas, however, produce much higher lipase levels than diseases of other organs. Lipase levels in pancreatic disorders are often 5–10 times higher than normal.

Lipase levels are determined by a blood test. The lipase blood test is most often used in evaluating inflammation of the pancreas (**pancreatitis**), but it is also useful in diagnosing kidney failure, intestinal obstruction, **mumps**, and peptic ulcers. Doctors often order amylase and lipase tests at the same time to help distinguish pancreatitis from ulcers and other disorders in the abdomen. If the patient has acute (sudden onset) pancreatitis, the lipase level usually rises somewhat later than the amylase level—about 24–48 hours after onset of symptoms—and remains abnormally high for 5–7 days. Because the lipase level peaks later and remains elevated longer, its determination is more useful in late diagnosis of acute pancreatitis. However, lipase levels are not as useful in diagnosing chronic pancreatic disease.

Although fat digestion is not concentrated in the stomach, gastric lipase will digest egg yolk and cream in the stomach, since they are already emulsified fats. For fat to be digested properly, the liver needs to first emulsify the large fat molecules, and bile breaks it down to small droplets, allowing the lipase to start its work. Fat digestion in the small intestine is reliant on a pancreatic secretion called pancreatin containing lipase as well as protease and amylase. In some vegetarian **diets**, very little bile is produced since the liver is not stimulated to produce bile, with the result that the large fat molecules are not properly emulsified, making it difficult for the lipase to bind. This pattern leads to incomplete or reduced fat absorption. A shortage of lipase in the body may lead to high **cholesterol**, difficulty in losing weight, a tendency towards diabetes, high urine sugar levels—which some believe can lead to arthritis, bladder problems, gall stones, **hay fever**, prostate problems, and heart problems. With too little lipase, the cell membranes' permeability is inefficient, and nutrients cannot enter the cell, while wastes cannot leave it. There is also a tendency among people suffering from lipase deficiency to have a problem with electrolyte balance. **Muscle spasms** and a spastic colon are also reported as symptoms of lipase deficiency. People suffering with a spastic colon may be lipase deficient as well as people with vertigo (Meniere's disease), which is **dizziness** made worse by movement.

General use

Lipase supplements, which usually contain protease enzymes and amylase, are used to treat people with pancreatic insufficiency, meaning the pancreas does not make enough of these enzymes to aid in food digestion. It is also used to treat **celiac disease** and gluten intolerance. It is used infrequently to treat **indigestion** caused by a deficiency of pancreatic enzymes. Several scientific studies have shown its effectiveness in treating pancreatic insufficiency, celiac disease, **irritable bowel syndrome**, and indigestion. There is a lack of scientific evidence that lipase is effective in treating other conditions. However, it is used by some healthcare professionals to help treat cystic fibrosis, Crohn's disease (chronic inflammation, usually of the lower intestinal tract), lactose intolerance, **rheumatoid arthritis**, and lupus.

Celiac disease and gluten intolerance

Celiac disease and gluten intolerance are basically the same condition. Gluten intolerance is the body's inability to break down or digest gluten and can range from mild to moderate. Celiac disease is a condition of the digestive system in which the body produces antibodies that attack the gluten. These antibodies damage the lining of the small intestine and interfere with the absorption of nutrients from food. It is in the severe range of gluten intolerance. As of 2007, the only treatment for celiac disease was a **gluten-free diet**. Gluten is primarily found in products that contains wheat, rye, barley, or oats. It helps to make bread rise and gives many foods a smooth, pleasing texture. In addition to the many obvious places gluten can be found in a normal diet, such as breads, cereals, and pasta, there are many hidden sources of gluten. These include ingredients added to foods to improve texture or enhance flavor and products used in food packaging. Gluten may even be present on surfaces used for food preparation or cooking. An estimated three million Americans have celiac disease but only about

3% of them have been diagnosed, according to the American Academy of Allergy, **Asthma**, and Immunology. Lipase, in combination with other pancreatic enzymes, enhances the benefits of a gluten-free diet for people with celiac disease and gluten intolerance.

Lipase is also used to treat pancreatic insufficiency, a condition in which food cannot be normally processed by the body, and insulin secretion may be inadequate. Studies have shown that taking 1.5 grams of 9X pancreatin with each meal can help people with pancreatic insufficiency to better digest food.

Preparations

Lipase supplements usually contain other enzymes that help digest carbohydrates and protein. In the United States, the supplement pancreatin contains lipase, amylase, and protease. A government standard is used to rate lipase supplements and is denoted as USP units. The standard government measurement for pancreatin is 25 USP units of amylase, 2 USP units of lipase, and 25 USP units of protolytic (protease) enzymes. So a lipase supplement that has a label indicating that it is "9X pancreatin" is nine times stronger than the government standard. Lipase supplements are usually made from enzymes found in animals, although there are a few supplements that use lipase and other pancreatic enzymes derived from plants.

Recommended dosage

Pancreatin supplements usually contain 6,000 LU (lipase activity units) of lipase. The recommended dosage for adults is one to two capsules or tablets three times a day. Dosages for children should be determined by a pediatrician.

Precautions

Lipase supplements should be taken under the supervision of a qualified health care professional. It should not be taken by pregnant women or women who are nursing without approval from their physician.

Side effects

There are no known adverse side effects associated with lipase supplements.

Interactions

Lipase can interact with the anti-obesity drug orlistat (Xenical). Studies have shown orlistat interferes with the activity of lipase supplements. Orlistate is prescribed to treat **obesity** and works by blocking the ability of lipase to break down fats. Also, the dietary supplement betaine should not be taken with lipase supplements, since it can destroy lipase and other enzymes.

KEY TERMS

Celiac disease—A disorder caused by sensitivity to gluten that makes the digestive system unable to deal with fat.

Enzyme—Any complex chemical produced by living cells that is a catalyst for biochemical reactions.

Lupus—Either of two inflammatory diseases affecting connective tissue, one largely confined to the skin, the other affecting the joints and internal organs.

Pancreas—A large elongated glandular organ that is near the stomach and secretes juices into the small intestine and the hormones insulin, glucagon, and somatostatin into the bloodstream.

Pancreatitis—Inflammation of the pancreas.

Triglycerides—Natural fat found in human tissue that in high levels can increase the risk of heart disease and stroke.

Vertigo—Dizziness made worse by movement.

Resources

BOOKS

Parker, Philip M. *Familial Lipoprotein Lipase Deficiency A Bibliography and Dictionary for Physicians, Patients, and Genome Researchers*. San Diego: Icon Group International, 2007.

Salleh, Abu Baker, et al., eds. *New Lipases and Proteases*. Hauppauge, NY: Nova Science, 2006.

PERIODICALS

Baer, Daniel M. "Clinical Utility of Amylase and Lipase." *Medical Laboratory Observer* (October 2005): 38(2).

Corbet, Kelly. "The Gluten Question: What You Need to Know." *Delicious Living* (October 2007): 49(3).

"Lipase, Serum." *CareNotes* (May 2007): N/A.

Luft, Friedrich C. "Lipoprotein Lipase and Heart Size." *Journal of Molecular Medicine* (February 2006): 109(3).

Rao, Bhaskar. "Elevated Serum Amylase and Lipase in Inflammatory Bowel Disease." *Internet Journal of Gastroenterology* (January 2005): N/A.

Serrano, Nicolas. "Increased Lipase Plasma Levels in ICU Patients: When Are They Critical?" *Chest* (January 2005): 7(4).

ORGANIZATIONS

American Academy of Allergy, Asthma, and Immunology, 555 E. Wells St., Suite 1100, Milwaukee, WI, 53202 3823, (414) 272 6071, www.aaaai.org.

National Institute of Diabetes and Digestive and Kidney Diseases, Bldg. 31, Room 9A06, 31 Center Dr., MSC 2580, Bethesda, MD, 20892, (800) 891 5390, http://www.niddk.nih.gov.

National Pancreas Foundation, 363 Boylston St., 4th Floor, Boston, MA, 02116, (866) 726 2737, http://www.pancreasfoundation.org.

Ken R. Wells

Live cell therapy *see* **Cell therapy**

KEY TERMS

Anaphylaxis—An abnormal reaction to a substance that the body considers as dangerous or foreign.

Autogenous vaccine—A vaccine made of dead bacteria from a patient's own body.

Sepsis—Bacterial poisoning causing destruction of body tissues.

Livingston-Wheeler therapy

Definition

Developed by Virginia Livingston-Wheeler, a U.S. medical doctor, this complex vaccine and nutrition-based **cancer** therapy assumed that cancer was caused by *Progenitor cryptocides*, a bacterium said to become active only when the body's immune system is weakened or stressed.

Origins

Livingston-Wheeler discovered *Progenitor cryptocides* during the 1940s. In the following decade, she formed her hypothesis that cancer is caused by this bacterium, and developed a vaccine against it. In 1969, she founded what became the Livingston Foundation Medical Center in San Diego. In the years since then, this center claimed to have treated thousands of patients.

Livingston-Wheeler died in 1990, but her clinic continued to offer the Livingston protocol to about 500 patients a year until the clinic closed in 2004.

Benefits

An analysis by Livingston-Wheeler showed an 82 percent survival rate among 62 of her patients with confirmed diagnoses of various cancers. Of those 62 patients, 37 survived three years or longer. A later, independent study, however, found no significant difference between survival rates among her patients and those at a university cancer center offering conventional therapy. This study, which included 78 pairs of patients, was published in a 1991 issue of the prestigious *New England Journal of Medicine*. The American Cancer Society concluded that no scientific evidence existed to support the claims that the Livingston-Wheeler therapy was an effective treatment for cancer. Although versions of the Livingston protocol were also offered to patients with lupus, arthritis, scleroderma, **allergies**, and stress-induced syndromes, the American Cancer Society also noted that no scientific evidence supported the therapy's use for those or any other diseases.

Description

The treatment was commenced during a 10-day period at the Livingston Foundation Medical Center in San Diego, and continued by the patient afterward at home. In addition to vaccines, the Livingston treatment also often employed vitamins, **digestive enzymes**, sheep spleen extract, liver extract, antibiotics, a vegetarian diet, and **detoxification**. Traditional drug therapy was also used, so long as it continued to enhance the body's immune system. A staff psychologist taught patients strategies for managing emotional trauma. In addition, visualization techniques were used to improve the immune response. The Livingston Center also offered a two-day annual "immunological diagnostic program" focused on preventative health.

Preparations

At the beginning of the 10-day program, patients underwent a physical examination and diagnostic tests including blood counts, electrolytes, chemistry, urinalysis, thyroid and liver function, tumor markers, and hormone levels.

Precautions

In a fact sheet on Livingston-Wheeler therapy, the U.S. National Cancer Institute strongly urged cancer patients "to remain in the care of qualified physicians who use accepted methods of treatment or who are participating in carefully conducted clinical trials (treatment studies). The use of unconventional methods may result in the loss of valuable time and the opportunity to receive potentially effective therapy

and consequently reduce a patient's chance for cure or control of cancer." The U.S. Congressional Office of Technology Assessment (OTA) also warned, "As with any injection into the body of a foreign substance, the injection of the autogenous vaccine carries the associated risk of sepsis or anaphylaxis. Some risk of contamination in the preparation of the material is also possible, depending on the processes and procedures used to make and assure the sterility of the vaccines manufactured at the clinic." In addition, the OTA cautioned that "whole blood transfusion, even with directed donors' blood, carries a small risk of transmitting various infectious agents." and warned that injecting extracts of sheep liver and spleen, "carries certain risks associated with all types of cellular treatment."

Side effects

One University of Pennsylvania study found that self-reported quality of life among patients at the Livingston-Wheeler clinic was actually lower than among patients receiving conventional cancer care at the university's cancer center. Reported side-effects include malaise, slight **fever**, aching, tenderness at the site of vaccine injections, and appetite problems.

Research and general acceptance

In 1990, the Livingston clinic was ordered by California officials to stop using its vaccines on cancer patients, after a state panel of cancer experts and consumers concluded there was no conclusive scientific evidence proving they were safe and effective. The American Cancer Society also advised against the Livingston protocol. In addition, an article in CA: A Cancer Journal for Clinicians asserted that the premise for the Livingston-Wheeler treatment was faulty: the bacterium *Progenitor cryptocides* does not exist. It stated, "Careful research using modern techniques . . . has shown that there is no such organism and that Livingston-Wheeler has apparently mistaken several different types of bacteria, both rare and common, for a unique microbe."

Training and certification

The Livingston protocol and products were offered exclusively through the Livingston Foundation Medical Center in San Diego through its closure in 2004. During its operation, the center stated that it "is not affiliated with any other clinic, physician, research organization, or business entity anywhere in the world."

Resources

PERIODICALS

CA. "Unproven methods of cancer management: Livingston Wheeler therapy." *CA: A Cancer Journal for Clinicians* 40 no. 2 (Mar/Apr 1990): 103 108.

Cassileth, B., E. Lusk, D. Guerry, A. Blake, W. Walsh, L. Kascius, and D. Schultz. "Survival and quality of life among patients receiving unproven as compared with conventional cancer therapy." *New England Journal of Medicine* 325 no. 15 (Oct. 10, 1991): 1103 1105.

ORGANIZATIONS

American Cancer Society. 1599 Clifton Rd. NE, Atlanta, GA 30329 4251, (800)227 2345. http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Livingston Wheeler_Therapy.asp?sitearea ETO (accessed Feb ruary 15, 2008).

David Helwig
Leslie Mertz, Ph.D.

Lobelia

Description

Lobelia inflata, also known as Indian tobacco, wild tobacco, pukeweed, emetic weed, **asthma** weed and gagroot, is native to North America and can commonly be found growing wild over much of the United States. Lobelia derives its name from Matthias de Lobel, a sixteenth-century Flemish botanist. The erect stem reaches a height of between 6 in (15 cm) and several feet. The many small blue flowers appear in midsummer and are visible through late fall. The stem is hairy, and the plant contains a milk-like sap.

Worldwide, there are more than 200 species of lobelia, growing predominantly in the temperate and tropical zones. Some species found at high elevations in mountainous areas of Asia and Africa may achieve a height of up to 15 ft (5.5 m). At the other end of the size spectrum, the dwarf lobelia (*Lobelia erina*) is sometimes cultivated as a small ornamental or hanging plant.

General use

This powerful plant has the distinction of being simultaneously a stimulant (for the respiratory system) and a general relaxant. This unusual combination may help account for the remarkably diverse assortment of ailments for which lobelia is used.

To begin with, lobelia is commonly associated with the treatment of lung-related ailments such as

Edging Lobelia. *(© Arco Images / Alamy)*

asthma, **bronchitis**, coughs, **pneumonia**, colds and flu, and other upper-respiratory problems.

Perhaps not surprisingly, then, this well-established medicinal plant has a special relationship with the (also long-established) practice of **smoking**. In some Native American cultures, lobelia was smoked as a treatment for lung diseases, which presumably led early European naturalists to dub the plant Indian tobacco. Considering the plant's value as an overall tonic for the lungs, this practice stands in marked contrast to contemporary use of tobacco (which many Native American cultures also used) as a plant to be smoked. Even more intriguingly, lobelia is commonly used as an aid to stopping smoking, sometimes in combination with **cramp bark**. One of the alkaloids in lobelia, lobeline, has effects on humans similar to those of nicotine and can be helpful in treating the symptoms of nicotine withdrawal. These same properties may perhaps also explain the use of the plant to treat hangovers and **alcoholism**. Recent research, however, has questioned the usefulness of lobeline in smoking cessation programs; a German study published in 2000 concluded that lobeline "cannot be recommended" as a treatment for nicotine dependence.

KEY TERMS

Amphetamines—A group of drugs that stimulate the central nervous system. They are used medically to counteract depression, but are often used illegally as stimulants.

Beta-amyrin palmitate—A compound found in lobelia that has antidepressant properties.

Diuretic—A medication given to increase the body's output of urine.

Dopamine—A chemical in the brain that governs movement and emotions. Amphetamines trigger the release of dopamine, while lobeline opposes its effects.

Emetic—A medication given to induce vomiting.

Expectorant—A drug given to help bring up mucus or phlegm from the respiratory tract.

Hypokalemia—An abnormally low level of potassium in the bloodstream.

Lobeline—An alkaloid compound found in lobelia that resembles nicotine in its pharmacological effects. It has been studied by researchers in the field of tobacco addiction and drug abuse.

Methamphetamine—A form of amphetamine that is a potent stimulant of the central nervous system and is highly addictive. Slang terms for methamphetamine include "meth," "ice," "speed," and "chalk."

Nonsteroidal anti-inflammatory drugs (NSAIDs)—A term used for a group of pain-relieving medications that also reduce inflammation when used over a period of time. NSAIDs are often given to relieve the pain of osteoarthritis.

More recently, lobeline has attracted the attention of researchers as a possible treatment for methamphetamine addiction. Lobeline appears to oppose the action of dopamine, a brain chemical that regulates movement and emotion, and that is released by the effects of methamphetamine on the brain. Although reports published in 2001 and 2002 are promising, this use of lobeline has not yet reached the stage of clinical trials in humans.

Some Native Americans also used red lobelia to treat both intestinal **worms** and **syphilis**. Among the Shoshone of the American West, lobelia tea was brewed and used for its emetic and cathartic properties.

Lobelia is also commonly used as an emetic (i.e., to induce **vomiting**). This latter fact makes an interesting connection with the ancient "doctrine of signatures," which holds that a plant's appearance offers clues to its use: Lobelia inflata has been said to have "stomach-shaped" flowers.

Although it can be effective alone, lobelia is also commonly used in conjunction with other herbs. Among these are **coltsfoot**, **ephedra**, grindelia, lungwort, and **skullcap**.

In **homeopathy**, lobelia is used in ways similar to its herbal applications: more specifically, in cases of severe **nausea**, vomiting, asthma, **emphysema**, and dry **cough**, and in the treatment of **heart disease** (**angina** pectoris and cardialgia).

Externally, lobelia is used in connection with a variety of problems, including insect **bites** and poison ivy; **bruises**, **sprains** and arthritis; and ringworm.

Preparations

Lobelia is used both internally and externally, in various forms. The entire above-ground portion of the plant, including the seed pods, is harvested in late summer and fall, after it flowers. The leaves and seeds of the plant can be used to make a tincture. The dried herb can also be smoked or used as a tea. Prepared as a salve, it is appropriate for external use. All portions of the plant that are above ground are medicinally useful, including the stem.

Lobelia's chemical composition has been studied to a significant extent. It consists of various alkaloids (notably lobeline, as mentioned above), chelidonic acid, isolobeline, lobelic acid, lobeline, **selenium** and **sulfur**, among other substances.

Perhaps because of the plant's widespread and long-standing use for a diverse range of conditions, some of lobelia's pharmacological qualities have been investigated in the laboratory, including its action on the lungs and the antidepressant effect of a component isolated from the leaves known as beta-amyrin palmitate. A 1996 Russian study of 196 species of medicinal plants identified lobelia as being exceptionally high in **chromium** content, making it potentially useful for treating a chromium deficiency in humans.

Precautions

The effects of lobelia are unusually dose-specific; in other words, this plant can have widely varying effects—both in kind and intensity—depending on the amount taken. Herbal authorities differ markedly in their assessment of the plant's overall safety; some consider it relatively harmless. On the other hand, the Food and Drug Administration (FDA) has issued warnings to consumers in 1993 and 1998 about the potentially dangerous side effects of lobelia, and the Australian government has declared it unsafe for human consumption.

As with any medicinal herb, users are advised to consult with qualified health-care professionals before attempting any form of self-treatment. People using any form of medication should make sure that all their caregivers are aware of any herbs they may also be taking.

More specifically, women who are either pregnant or nursing should not take lobelia. The herb is contraindicated in cases of heart disease, pneumonia, shock, stomach ulcers, ulcerative **colitis**, esophageal reflux, **diverticulitis**, and high blood pressure.

Reports of toxic effects of lobelia in children have led American pediatricians to warn people against giving the herb to children as a treatment for asthma. This warning is particularly urgent in areas of the Southwest where folk medicines containing lobelia are frequently used.

Some writers also report that lobelia sap is highly toxic to livestock.

Side effects

In small doses, lobelia can have a soothing, sedative effect. In larger doses, it induces vomiting. The plant's well-established use in connection with lung disorders is due, in part, to its expectorant effects.

In potentially toxic doses, lobelia produces nausea, pronounced weakness, sweating, speeding heartbeat (tachycardia), sensory disturbances and **diarrhea**. In some people, even very small doses can cause nausea and vomiting. Signs of an overdose of lobelia include profuse sweating, low blood pressure, convulsions, respiratory **depression**, paralysis, coma, and death.

Interactions

Lobelia has been reported to have adverse interactions with several groups of drugs. It may potentiate (intensify) the effects of medications given to control blood pressure. It interferes with the action of drugs given to control diabetes. Lobelia increases the risk of loss of **potassium** from the body (hypokalemia) if it is taken together with diuretics or corticosteroids. Aspirin and NSAIDs appear to increase the risk of toxic reactions to lobelia.

Resources

BOOKS

Balch, James F., MD. *Prescription for Nutritional Healing*. Garden City, N.Y.: Avery Publishing Group, 1997.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, 1995.

PERIODICALS

Dwoskin, L. P., and P. A. Crooks. "A Novel Mechanism of Action and Potential Use for Lobeline as a Treatment for Psychostimulant Abuse." *Biochemical Pharmacol ogy* 63 (January 15, 2002): 89 98.

Haustein, K. O. "Pharmacotherapy of Nicotine Depend ence." *International Journal of Clinical Pharmacology and Therapeutics* 38 (June 2000): 273 290.

Mazur, L. J., L. De Ybarrondo, J. Miller, and G. Colasurdo. "Use of Alternative and Complementary Therapies for Pediatric Asthma." *Texas Medicine* 97 (June 2001): 64 68.

Miller, D. K., P. A. Crooks, L. Teng, et al. "Lobeline Inhibits the Neurochemical and Behavioral Effects of Amphetamine." *Journal of Pharmacology and Experi mental Therapeutics* 296 (March 2001): 1023 1034.

Subarnas, A., Y. Oshima, and Y. Ohizumi. "An antidepressant principle of *Lobelia inflata L.* (Campanulaceae)." *Journal of Pharmaceutical Sciences* 81 (July 1992): 620 621.

ORGANIZATIONS

Office of Dietary Supplements (ODS), National Institutes of Health. 6100 Executive Boulevard, Room 3B01, MSC 7517, Bethesda, MD 20892. (301) 435 2920. www.ods. od.nih.gov.

United States Food and Drug Administration (FDA), Cen ter for Food Safety and Applied Nutrition. 5100 Paint Branch Parkway, College Park, MD 20740. (888) SAFEFOOD. www.cfsan.fda.gov.

OTHER

U. S. Food and Drug Administration, Center for Food Safety and Applied Nutrition. *Illnesses and Injuries Associated with the Use of Selected Dietary Supplements*. Washington, DC: FDA/CFSAN, 1993. www.cfsan.fda.gov.

U. S. Food and Drug Administration, FDA Consumer, Sep tember October 1998. *Supplements Associated with Ill nesses and Injuries*. www.cfsan.fda.gov/~dms/fdsuppch.

Peter Gregutt
Rebecca J. Frey, PhD

Lockjaw *see* **Tetanus**

Lomatium

Description

The name lomatium generally refers to *Lomatium dissectum*, one of the numerous species and varieties of the *Lomatium* genus that is native to western North America. Lomatium is a member of the Apiaceae (carrot) family and grows in the northwestern United States and southwestern Canada. Like many wild plants that have attracted the attention of commercial interests, lomatium is presently threatened with extinction over parts of its range.

In the wild, lomatium grows in rocky soil and reaches a height of 3 ft (0.9 m). The entire lomatium plant is edible, and numerous Native American groups regarded the lomatium plant as a food source and medicinal remedy. For cultivation as an herbal remedy, lomatium roots are unearthed during the months between early spring and fall. Roots are washed and dried for several days. The roots are then sliced and allowed to dry again. When dried correctly, lomatium is said to keep its medicinal properties for 2–3 years. Lomatium's antimicrobial activity is due to the tetronic acids and glucoside of luteolin that it contains. Other ingredients include the resin, which causes rash in some people, and coumarins, which could possibly cause rash as well. The coumarins, however, are being investigated for their possible usefulness in treating HIV infection.

Lomatium is also known as Indian biscuit root, biscuit root, desert **parsley**, desert parsnip, fern-leafed lomatium, ferula dissoluta, Indian desert parsnip, Indian parsnip, leptaotaenia dissecta, tohza, toza, and wild carrot.

General use

Many Native American groups recognized the value of lomatium as a source of nourishment and medicinal remedy. Lomatium root was peeled, dried, and ground into flour to make sweet-tasting biscuits. Lomatium seeds were eaten raw or roasted, or ground into flour for baking.

Native Americans chewed on the root to treat a range of respiratory **infections**. Lomatium was used for conditions including cold, flu, **bronchitis**, tuberculosis, hay fever, **asthma**, and **pneumonia**. Lomatium was also used in a tobacco mixture. The herb was smoked during rituals, and healers used the smoke to treat respiratory infections. Lomatium was used when the Native Americans were exposed to tuberculosis and other diseases that Europeans brought to North America.

When the world faced the **influenza** pandemic of 1917–18, Americans tried remedies such as castor oil, tobacco, aspirin, and morphine. American herbalists recommended use of lomatium, and the remedy was used with reported success, especially in the Southwest.

KEY TERMS

Coumarins—A group of crystalline compounds found in lomatium that may be useful in treating HIV infection.

Infusion—A liquid extract of an herb prepared by steeping or soaking plant parts in water or another liquid.

Potentiate—To intensify the effects of another herb or prescription medication.

Tincture—A method of preserving herbs with alcohol or water.

Wildcrafting—The art of gathering or harvesting herbs or other plants from their native wild environment for human use.

Contemporary uses of lomatium

Lomatium is currently used as an antiviral remedy to treat colds, coughs, and infections. The herb is also known for boosting the immune system and reducing inflammation.

Lomatium can relieve chest **pain** and stomach upset that frequently accompany the flu. It has also been used for conditions such as asthma, **hay fever**, mononucleosis, infective bronchitis, **tuberculosis**, and the early stages of **tonsillitis**. Other uses of lomatium include treatment of skin infections, **cuts**, and sores. A health practitioner might recommend the use of lomatium for a person diagnosed with fibromyalgia, a muscular inflammatory condition. Causes of **fibromyalgia** are not known, but are thought by some to be connected to viruses. Symptoms include an impaired immune system, chronic pain, and **fatigue**.

The future of lomatium

Lomatium was among the plants placed on Montana's plant protection list in April 1999. The state enacted a law that placed a three-year moratorium on the wildcrafting of lomatium, wild echinacea, butterroot, and sundew that grow on state land. Wildcrafting is the harvesting of herbal plants in the wild. Plants like lomatium face the risk of becoming endangered because of increased popularity and usage of herbal remedies, and reduction of habitat due to development.

A moratorium on wildcrafting is one way to protect plants in the short term. Long-term solutions include habitat protection and cultivation of herbs in home gardens and on commercial farms. Several organizations, such as United Plant Savers (www.plantsavers.org), are intent on protecting medicinal plants in the wild and increasing their availability.

Preparations

Lomatium is available as an extract, as a tincture, and in capsule form. Fresh root extract in an alcohol solution is believed to be the most effective remedy.

Lomatium tea, an infusion, is made by pouring one cup of boiling water over 1–2 tsp. of the dried herb. The mixture is steeped for 25 minutes and then strained. Lomatium tea can be taken three times a day.

Lomatium contains a resin that can cause a painful rash in some people. To avoid this rash, people can use "lomatium isolates," which are extracts with the resins removed. The extract can be taken at a dosage of 1–3 ml each day. In tincture form, the daily dosage is generally 10–30 drops taken one to four times per day. Children who are ill with colds or flu can be given lomatium capsules.

Precautions

Before beginning herbal treatment, people should consult a physician or health practitioner. A knowledgeable herbalist can give advice about dosages. Consultation is important because high doses of lomatium can cause nausea and an itchy rash that covers the entire body. Lower doses can also cause rash in people who are sensitive to lomatium resin. A person should first take a small amount of tincture to test for a rash reaction. The rash will go away in one to six days after discontinuing use of lomatium.

Lomatium and other herbal remedies are not regulated by the United States Food and Drug Administration (FDA) in the same way that prescription drugs are regulated. This difference means that the effectiveness of lomatium has not been scientifically tested. In addition, supplements are not standard in their ingredients or dosages. Women who are pregnant or nursing should not use lomatium, because its safety for these conditions has not been determined.

Side effects

Although lomatium is generally believed to be safe, the herb has been reported to cause a skin rash. A high dosage of the herb may result in **nausea**.

Interactions

Lomatium has been reported to potentiate (intensify the effects of) two groups of drugs, anticoagulants (blood thinners) and immunostimulants (drugs given to boost the immune system).

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

PERIODICALS

Lee, T. T., Y. Kashiwada, L. Huang, et al. "Suksdorfin: An Anti HIV Principle from *Lomatium suksdorfii*, Its Structure Activity Correlation with Related Coumarins, and Synergistic Effects with Anti AIDS Nucleosides." *Bioorganic and Medicinal Chemistry* 2 (October 1994): 1051 1056.

McCutcheon, A. R., T. E. Roberts, E. Gibbons, et al. "Antiviral Screening of British Columbian Medicinal Plants." *Journal of Ethnopharmacology* 49 (December 1, 1995): 101 110.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX 78720.(512) 331 8868. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. www.swsbm.com.

United Plant Savers. P.O. Box 98, East Barre, VT 05649. (802) 496 7053. Fax: (802) 496 9988. http://www.plantsavers.org.

OTHER

Cabrera, Chancel. "Uncommon Antibiotics: Usnea and Lomatium." Healthwell.com. http://www.healthwell.com.

Liz Swain
Rebecca J. Frey, PhD

Lomilomi

Definition

The term Lomilomi literally means "to break up into small pieces with the fingers." It is a type of healing massage that is traditionally practiced in the Hawaiian Islands. Lomilomi is also called "loving hands" massage.

Origins

This form of massage incorporates both physical and spiritual ritual components. Lomilomi originated in the South Pacific and is practiced mainly in the Hawaiian islands, although in the 2000s, lomilomi had grown in popularity and practitioners could also be found in most other states, as well as Australia, Canada, Japan, and the United Kingdom.

When Captain Cook and other European explorers disembarked on the islands of Polynesia, the indigenous people healed their aches and pains with therapeutic massage. Experts in lomilomi also knew how to use it in **childbirth** and to treat congestion, inflammation, rheumatism and other musculoskeletal disorders, **asthma**, and **bronchitis**. They also applied lomilomi to babies and children to strengthen them and mold their features for physical beauty.

In times past, lomilomi was practiced mainly among family members. There were various orders of medical priests, known as kahunas. The one who specialized in massage was the kahuna lomilomi. One member of the family would be trained by a village kahuna. This person would then pass the training on to the next generation. Kahunas trained practitioners in the physical aspects of massage, and they taught that an important aspect of the healing process is the transfer of positive thoughts from the lomilomi practitioner to the client in a way that channels energy, called mana or life force and releases a sense of well being. One goal of lomilomi is to unblock energy flow and allow it to move in a new direction. Unlike traditional lomilomi practitioners, some modern practitioners tend to concentrate more on the physical rather than the spiritual aspects of this therapy.

The best-known school for training lomilomi practitioners was run by Margaret Machado, known to her students as Aunty Margaret, on the island of Hawaii. Machado was born in the early 1900s and learned traditional lomilomi techniques from her grandfather. Her daughter, Nerita Machado, continued the family lomilomi teaching tradition.

Benefits

Lomilomi cleanses and relaxes the body, both physically and spiritually in order to achieve internal harmony. It increases circulation, relaxes tension spots, and relieves **pain**.

Description

A lomilomi massage generally begins with clients relaxing on a table and opening themselves to a

healing state of mind. Some practitioners begin by using heated lomi stones to increase blood flow to certain areas of the body.

The traditional stroke of the lomilomi practitioner is out and away from the body. This touch is both deep and gentle, resembling in some ways **Swedish massage**. Unlike Swedish massage, however, lomilomi practitioners use their elbows and forearms and incorporate some vigorous deep tissue techniques. The forearm movement is typically applied across the grain of the long muscles of the back. There is no set pattern to the massage.

Sometimes lomi sticks are used to relieve facial tension or when deeper massage is needed in a specific part of the body. Lomilomi practitioners traditionally used indigenous oils prepared from coconut and leuki trees. The oil is worked into the skin in a rhythmic 1-2-3, 1-2-3, 1-2-3 movement. At its best, lomilomi releases healing energy that flows from the practitioner to the client.

Modern lomilomi massage varies in the length of time spent with the client time and may dispense with many of the traditional ritual preparations. Costs of this therapy are not typically covered by insurance. Many of the luxury resorts and spas in Hawaii have a practitioner trained in lomilomi on their staff.

Preparations

In traditional lomilomi, the client may drink herbal teas to cleanse the body internally before the massage. The body is also cleansed externally with red clay or salt. In some cases time is alternated between a steam hut and plunges in cold water to increase circulation before beginning the massage. Much of this preparation is dispensed with by modern practitioners.

Precautions

There are no particular precautions to be observed when receiving this therapy. Like many therapies, lomilomi is most effective when the client is in a receptive frame of mind to accept healing.

Side effects

No undesirable side effects had been reported as of 2008. Most clients report feel a reduction in **stress** and a general sense of well being. Others report specific relief of pains such as headaches and backaches.

Research and general acceptance

There are relatively few practitioners of lomilomi, so little controlled research had been done on its effectiveness as of the late 2000s. However, lomilomi has been an accepted part of native Hawaiian culture for hundreds of years.

KEY TERMS

Kahuna—A traditional Hawaiian village leader responsible for physical and spiritual healing; some specialize in herbs, others in massage.

Training and certification

The Hawaiian Lomilomi Association offers certification to practitioners who have received training from any of their approved lomilomi instructors. There are three levels of certification, each of which requires an increased amount of instruction and supervised experience. These certification levels are certified lomilomi therapist, licensed lomilomi therapist, and lomilomi clinical practitioner. This last category requires a 10-year apprenticeship under an approved advanced master lomilomi practitioner and 20 years of experience. Hawaii also has licensing requirements that massage therapists are required to meet.

Resources

BOOKS

Chai, R. M. R. *Hawaiian Massage Lomilomi: Sacred Touch of Aloha*. Kailua, HI: Hawaiian Insights, 2007.

Chai, R. M. R. *Na Mo'olelo Lomilomi: The Traditions of Hawaiian Massage and Healing*. Honolulu, HI: Bishop Museum Press, 2005.

Kahalewai, Nancy S. *Hawaiian Lomilomi: Big Island Massage,* 2nd ed. Mountain View, HI: Island Massage, 2005.

Jim, Harry Uhane, and Garnette Arledge. *Wise Secrets of Aloha: Learn and Live the Sacred Art of Lomilomi*. San Francisco, CA: Weiser Books, 2007.

ORGANIZATIONS

Hawaiian Lomilomi Association, PO Box 2356, Kealakekua, HI, 96750 2356, http://www.hawaiilomilomi.com.

Tish Davidson, A. M.

Lou Gehrig's disease

Definition

Lou Gehrig's disease, or amyotrophic lateral sclerosis (ALS), is a neurodegenerative disease of unknown cause that breaks down tissues in the nervous system and affects the nerves responsible

for movement. Its common name comes from the professional baseball player whose career was ended because of it.

Description

Lou Gehrig's disease is a disease of the motor neurons, those nerve cells reaching from the brain to the spinal cord (upper motor neurons) and the spinal cord to the peripheral nerves (lower motor neurons) that control muscle movement. In Lou Gehrig's disease, for unknown reasons, these neurons die, leading to a progressive loss of the ability to move virtually any of the muscles in the body. The disease affects "voluntary" muscles, those controlled by conscious thought, such as the arm, leg, and trunk muscles. Lou Gehrig's disease, in and of itself, does not affect sensation, thought processes, the heart muscle, or the "smooth" muscle of the digestive system, bladder, and other internal organs. Most sufferers retain function of their eye muscles, as well.

"Amyotrophic" refers to the loss of muscle bulk, a cardinal sign of ALS. "Lateral" indicates one of the regions of the spinal cord affected, and "sclerosis" describes the hardened tissue that develops in place of healthy nerves. Lou Gehrig's disease affects approximately 50,000 people in the United States, with about 5,000 new cases each year. The onset usually begins between the ages of 40 and 70, although younger onset is possible. Men have a slightly higher chance of developing the disease than women.

Causes and symptoms

Causes

The symptoms of Lou Gehrig's disease are caused by the death of motor neurons in the spinal cord and brain. Normally, these neurons convey electrical messages from the brain to the muscles to stimulate movement in the arms, legs, trunk, neck, and head. As motor neurons die, the muscles cannot be moved as effectively, and weakness results. In addition, lack of stimulation leads to muscle wasting, or loss of bulk. Involvement of the upper motor neurons causes spasms and increased tone in the limbs, and abnormal reflexes. Involvement of the lower motor neurons causes muscle wasting and twitching (fasciculations).

Although many causes of motor neuron degeneration have been suggested for Lou Gehrig's disease, none has yet been proven responsible. Results of recent research have implicated toxic molecular fragments known as free radicals. Some evidence suggests that a cascade of events leads to excess free radical production inside motor neurons, leading to their death. Why free radicals should be produced in excess amounts is unclear, as is whether this excess is the cause or the effect of other degenerative processes. Additional agents within this toxic cascade may include excessive levels of a neurotransmitter known as glutamate, which may overstimulate motor neurons, thereby increasing free-radical production, and a faulty **detoxification** enzyme known as SOD–1, for superoxide dismutase type 1. The actual pathway of destruction is not known, however, nor is the trigger for the rapid degeneration that marks Lou Gehrig's disease. Further research may show that other pathways are involved, perhaps ones even more important than this one. Autoimmune factors or premature **aging** may play some role, as could viral agents or environmental toxins.

Two major forms of ALS are known: familial and sporadic. Familial Lou Gehrig's disease accounts for about 10% of all Lou Gehrig's disease cases. As the name suggests, familial Lou Gehrig's disease is believed to be caused by the inheritance of one or more faulty genes. About 15% of families with this type of Lou Gehrig's disease have mutations in the gene for SOD–1. SOD–1 gene defects are dominant, meaning only one gene copy is needed to develop the disease. Therefore, a parent with the faulty gene has a 50% chance of passing the gene along to a child. Sporadic Lou Gehrig's disease has no known cause. While many environmental toxins have been suggested as causes, to date no research has confirmed any of the candidates investigated, including aluminum and metal dental fillings. As research progresses, it is likely that many cases of sporadic Lou Gehrig's disease will be shown to have a genetic basis, as well. A third type, called Western Pacific Lou Gehrig's disease occurs in Guam and other Pacific islands. This form of the disease combines symptoms of both ALS and Parkinson's disease.

KEY TERMS

Aspiration—Inhalation of food or saliva.

Bulbar muscles—Muscles of the mouth and throat responsible for speech and swallowing.

Fasciculations—Involuntary twitching of muscles.

Motor neuron—A nerve cell that controls a muscle.

Voluntary muscle—A muscle under conscious control; contrasted with smooth muscle and heart muscle.

Symptoms

The earliest sign of Lou Gehrig's disease is most often weakness in the arms or legs, at first usually more pronounced on one side than the other. Loss of function is usually more rapid in the legs among people with familial Lou Gehrig's disease, and in the arms among those with sporadic Lou Gehrig's disease. Leg weakness may first become apparent by an increased frequency of stumbling on uneven pavement, or an unexplained difficulty climbing stairs. Arm weakness may lead to difficulty grasping and holding a cup, for instance, or loss of dexterity in the fingers.

Less often, the earliest sign of Lou Gehrig's disease is weakness in the *bulbar* muscles, those muscles in the mouth and throat that control chewing, swallowing, and speaking. A person with bulbar weakness may become hoarse or tired after speaking at length, or speech may become slurred.

In addition to muscle weakness, the other cardinal signs of Lou Gehrig's disease are muscle wasting and persistent twitching, which is known as fasciculation. These are usually noticed after weakness in muscles becomes obvious. Fasciculation is also common in people without the disease, and is virtually never the first sign of Lou Gehrig's disease.

While initial weakness may be limited to one region, Lou Gehrig's disease almost always progresses rapidly to involve virtually all the voluntary muscle groups in the body. Later symptoms include loss of the ability to walk, to use the arms and hands, to speak clearly or at all, to swallow, and to hold the head up. Weakness of the respiratory muscles makes breathing and coughing difficult, and poor swallowing control increases the likelihood of inhalation of food or saliva (aspiration). Aspiration increases the likelihood of lung infection, which is often the cause of death. With a ventilator and scrupulous bronchial hygiene, a person with Lou Gehrig's disease may live much longer than the average, although weakness and wasting will continue to erode any remaining functional abilities. Most people with Lou Gehrig's disease continue to retain function of the extraocular muscles that control movement of the eyes, allowing some communication to take place with simple blinks or through use of a computer–assisted device.

Diagnosis

The diagnosis of Lou Gehrig's disease begins with a complete medical history and physical exam, plus a neurological exam to determine the distribution and extent of weakness. An electrical test of muscle function, called an electromyogram, or EMG, is an important part of the diagnostic process. Various other tests, including blood and urine tests, x rays, and CT scans, may be done to rule out other possible causes of the symptoms, such as tumors of the skull base or high cervical spinal cord, thyroid disease, spinal arthritis, **lead poisoning**, or severe vitamin deficiency. Lou Gehrig's disease is rarely misdiagnosed following a careful review of all these factors.

Treatment

There is no cure for Lou Gehrig's disease, and no treatment that can significantly alter its course. There are many things that can be done, however, to help maintain quality of life and to retain functional ability even in the face of progressive weakness.

Two studies published in 1988 suggested that amino–acid therapies may provide some improvement for some people with Lou Gehrig's disease. While individual patient reports claim benefits for megavitamin therapy, herbal medicine, and removal of dental fillings, for instance, no evidence suggests that these offer any more than a brief psychological boost, often followed by a more severe letdown when it becomes apparent the disease has continued unabated. However, once the causes of Lou Gehrig's disease are better understood, alternative therapies may be researched more intensively. For example, if damage by free radicals turns out to be the root of most of the symptoms, antioxidant vitamins and supplements may be used more routinely to slow the progression of Lou Gehrig's disease. Or, if environmental toxins are implicated, alternative therapies with the goal of detoxifying the body may be of some use. In 2002, the Food and Drug Administration (FDA) granted approval for one company to begin trials on use of **creatine**, an amino acid dietary supplement, to treat ALS. Preliminary data from trials show that creatine might slow progression of Lou Gehrig's disease, but research remains to be completed before approval of the supplement for treatment of ALS.

A physical therapist works with the patient and family to implement **exercise** and stretching programs to maintain strength and range of motion, and to promote general health. Swimming may be a good choice for people with Lou Gehrig's disease, as it provides a low–impact workout to most muscle groups. One result of chronic inactivity is contracture, or muscle shortening. Contractures limit a person's range of motion, and are often painful. Regular stretching can prevent contracture.

An occupational therapist can help design solutions for movement and coordination problems, and

provide advice on adaptive devices and home modifications. Speech and swallowing difficulties can be minimized or delayed through training provided by a speech-language pathologist. This specialist can also provide advice on communication aids, including computer-assisted devices and simpler word boards. Nutritional advice can be provided by a nutritionist. A person with Lou Gehrig's disease often needs softer foods to prevent jaw exhaustion or choking. Later in the disease, **nutrition** may be provided by a gastrostomy tube inserted into the stomach.

Allopathic treatment

As of early 2002, only one drug had been approved for treatment of Lou Gehrig's disease. Riluzole (Rilutek) appears to provide on average a three-month increase in life expectancy when taken regularly early in the disease, and shows a significant slowing of the loss of muscle strength. Riluzole acts by decreasing glutamate release from nerve terminals. Experimental trials of nerve growth factor have not demonstrated any benefit. No other drug or vitamin currently available has been shown to have any effect on the course of Lou Gehrig's disease. However, in 2002, researchers had identified how a common drug prescribed for **acne** could slow the progression of cell death in the brain that causes ALS. The drug, called minocycline, can safely be taken orally. Scientists are now working on a combination of minocycline with other drugs to better target a more powerful therapy for Lou Gehrig's disease patients.

Mechanical ventilation may be used when breathing becomes too difficult. Modern mechanical ventilators are small and portable, allowing a person with Lou Gehrig's disease to maintain the maximum level of function and mobility. Ventilation may be administered through a mouth or nose piece, or through a tracheostomy tube. This tube is inserted through a small hole made in the windpipe. In addition to providing direct access to the airway, the tube also decreases aspiration. While many people with rapidly progressing Lou Gehrig's disease choose not to use ventilators for lengthy periods, they are increasingly used to prolong life for a short time.

The progressive nature of Lou Gehrig's disease means that most patients will eventually require full-time nursing care. This care is often provided by a spouse or other family member. While the skills involved are not difficult to learn, the physical and emotional burden of care can be overwhelming. Caregivers need to recognize and provide for their own needs, as well as those of the patient, to prevent **depression** and burnout. Throughout the disease, a support group can provide important psychological aid to the patient, and also act as a caregiver as they come to terms with the losses that Lou Gehrig's disease inflicts. Support groups are sponsored by both the Lou Gehrig's Disease Society and the Muscular Dystrophy Association.

Expected results

Lou Gehrig's disease usually progresses rapidly, and leads to death from respiratory infection within three to five years in most cases. The slowest disease progression is seen in those who are young and have their first symptoms in the limbs. About 10% of people with Lou Gehrig's disease live longer than eight years.

Prevention

There is no known way to prevent Lou Gehrig's disease or to alter its course.

Resources

BOOKS

Mitsumoto, Hiroshi and Forbes H. Norris Jr., eds. *Amyotrophic Lateral Sclerosis: A Comprehensive Guide to Management*. Demos Publications, 1996.

The Muscular Dystrophy Association. *When a Loved One Has ALS: A Caregiver's Guide*. Tucson, AZ: The Muscular Dystrophy Association, 1997.

PERIODICALS

"Creatine Granted Orphan Drug Designation." *Drug Topics* (April 15, 2002):HSE6.

The ALS Digest. http://http1.brunel.ac.uk:8080/~hssrsdn/alsig/alsig.htm.

"Research: Common Acne Antibiotic Minocycline Delays Progression of ALS." *Immunotherapy Weekly* (June 5, 2002):7.

The ALS Newsletter. Available from the Muscular Dystrophy Association.

ORGANIZATIONS

The ALS Association.21021 Ventura Blvd., Suite #321, Woodland Hills, CA 91364. (818) 340 7500.

The Muscular Dystrophy Association. 3300 East Sunrise Drive, Tucson, AZ 85718. (520) 529 2000 or (800) 572 1717. http://www.mdausa.org.

OTHER

With Strength and Courage: Understanding and Living with ALS. Videotape available from the Muscular Dystrophy Association.

Kathleen Wright
Teresa G. Odle

Low back pain

Definition

Low back **pain** (LBP) is a common complaint, second only to cold and flu as a reason why patients seek care from their family doctor. It may be a limited musculoskeletal symptom or caused by a variety of diseases and disorders that affect or extend from the lumbar (lower) spine. Low back pain is sometimes accompanied by **sciatica**, which is pain that involves the sciatic nerve and is felt in the lower back, the buttocks, the backs and sides of the thighs, and possibly the calves. More serious causes of LBP may be accompanied by **fever**, night pain that awakens a person from sleep, loss of bladder or bowel control, numbness, burning urination, swelling, or intense sharp pain.

Description

Low back pain is a symptom that affects 80% of Americans at some point in their life with sufficient severity to cause absence from work. It is a common reason for visits to primary care doctors, and is estimated to cost the U.S. economy more than $100 billion every year in lost wages, lost productivity, and direct healthcare costs. About one-third of the nation's disability-related costs are associated with LBP, a condition primarily affecting individuals between the ages of 30 and 50.

The most common cause of low back pain is lumbar strain. The structures of the normal lumbar region of the spine include the lumbar vertebrae, discs between each vertebrae, ligaments, muscles and muscle tendons, the spinal cord within the vertebrae and nerves extending outward from the spine through vertebral foramina (openings in the bone). The lumbar vertebrae are distinct from the cervical (neck area) and thoracic (upper back) vertebrae, being generally thicker for greater weight bearing support, and resting atop the sacrum (tailbone), the triangular shaped bone between the buttocks.

The discs between each vertebrae of the spine cushion and absorb the shock that might otherwise be transmitted through the spine. Occasionally, the discs may rupture or herniate outward through their fibrous sheath, or covering, putting pressure on the nerves. Nerve pressure on the sciatic nerve (sciatica) may be the cause of or add to LBP. Nerve pain from other local organs may also cause LBP, in which case diagnosis and treatment is more involved, usually much more serious, and may indicate a life-threatening condition.

Risks for low back pain are increased with fracture and **osteoporosis**, narrowing of the spinal canal within the vertebrae (stenosis), spinal curvatures, **fibromyalgia**, osteo- and **rheumatoid arthritis**, **pregnancy**, **smoking**, **stress**, age greater than 30, or disease or illness of the organs of the lower abdomen.

In addition to dividing low back pain into three categories based on duration of symptoms—acute, sub-acute or chronic—low back pain may be described in the following terms:

- Localized. In localized pain the patient feels soreness or discomfort when the doctor palpates, or presses on, a specific surface area of the lower back.
- Diffuse. Diffuse pain is spread over a larger area and comes from deep tissue layers.
- Radicular. The pain is caused by irritation of a nerve root and radiates from the area. Sciatica is an example of radicular pain.
- Referred. The pain is perceived in the lower back, but actually is caused by inflammation or disease elsewhere, such as the kidneys or other structures of or near the lower abdomen, including the intestines, appendix, bladder, uterus, ovaries or the testes.

Causes and symptoms

Acute and sub-acute pain

Lumbar strain or sprain is the most common cause of acute low back pain. The pain usually does not extend into the leg and usually occurs within 24 hours of heavy lifting or overuse of the back muscles. The pain is often localized and may be accompanied by **muscle spasms** or soreness to touch. The patient usually feels better when resting. Symptoms of acute LBP may be accompanied by stiffness (guarding), **constipation**, poor sleep and trouble finding a comfortable position, difficulties walking and other limits on normal range of motion.

Acute strain may follow a sudden movement, especially a lifting and simultaneous twisting motion; however, injury is usually preceded by overuse or lack of **exercise** and tone, especially of the opposing muscles (the abdominals, for example), improper use, long periods of sitting or standing in one position, poor vertebral alignments or conditions compromising **nutrition** of the supportive structures. Acute low back pain due to lumbar strain (approximately 60% of sufferers) usually resolves with a week with conservative therapies, including reducing but not eliminating all activity.

Sub-acute pain is associated with a duration of six to twelve weeks, by which time 90% of individuals

experiencing low back pain and injury return to work. This category accounts for one-third of all disability-related costs. LBP persisting beyond three months is considered chronic.

Chronic pain

Chronic low back pain has several possible causes.

MECHANICAL. Chronic strain on the muscles of the lower back may be caused by **obesity**, pregnancy, or job-related stooping, bending, or other stressful postures. Construction, truck driving accompanied by vibration, jack hammering, sand blasting and other sources of chronic trauma strain to the back or nerve pressure may also contribute.

MALIGNANCY OR OTHER SERIOUS ILLNESS. Low back pain at night that is not relieved by lying down may be caused by a tumor in the cauda equina (the roots of the spinal nerves controlling sensation in and movement of the legs) or metastasized **cancer** that has spread to the spine from the prostate, breasts, or lungs. The risk factors for the spread of cancer to the lower back include a history of smoking, sudden weight loss, and age over 50. Kidney problems, such as **kidney stones**; ovarian and uterine problems, including fibroids; **endometriosis**; premenstrual water retention; and **ovarian cysts**; chronic constipation; sluggish or enlarged colon; benign tumors; bone **fractures**; aneurysm of the aorta; herpes zoster **shingles**; intra-abdominal infection or bleeding secondary to Coumadin therapy; osteomyelitis; **tuberculosis** of the spine (Pott's disease); and sepsis of the vertebral discs, all may be associated with pain to the lower back. Additional symptoms may include night sweats, being awakened at night by pain, weakness, numbness, muscle fatigue or poor coordination which progressively worsens, burning on urination, redness or swelling over the area of pain, changes in bowel or urinary patterns, and malaise.

ANKYLOSING SPONDYLITIS. **Ankylosing spondylitis** is a form of arthritis that causes chronic pain in the back. The pain is made worse by sitting or lying down and improves when the patient stands up. It is most commonly seen in males between the ages of sixteen and thirty-five. Ankylosing spondylitis is often confused with mechanical back pain in its early stages. Other symptoms include morning stiffness, a positive family history, and positive lab results for HLA-B27 antigen (an autoimmune marker), and an increased sedimentation (Sed) rate of the blood. This condition may have food allergy-related components, such as an allergy to wheat, worsened by drinking beer.

HERNIATED SPINAL DISC. Disc herniation is a disorder in which a spinal disc begins to bulge outward between the vertebrae. Herniated or ruptured discs are a common cause of chronic low back pain in adults. Pressure imposed on adjacent nerves results in pain that may worsen with movement, coughing, **sneezing**, or intra-abdominal strain, and may be accompanied by numbness of the skin in the area served by the nerve (dermatome). Deep tendon reflexes (DTRs) may be reduced, and the straight leg raising test may be positive. The crossed straight leg raising test, which is more specific to herniated disc, may also be positive.

PSYCHOGENIC. Back pain that is out of proportion to a minor injury or that is unusually prolonged may be associated with a somatoform disorder or other emotional disturbance. Psychosocial factors such as loss of work, job dissatisfaction, legal problems, and financial compensation issues are some of the non-organic factors that may be associated or causative. Psychogenic symptoms of LBP are usually diffuse, non-localized, and may include other stress related symptoms. A set of five tests called the Waddell tests may be used to help diagnose LBP of psychogenic origin.

Low back pain with leg involvement

Low back pain that radiates down the leg usually indicates involvement of the sciatic nerve. The nerve can be pinched or irritated by herniated discs, tumors of the cauda equina (the nerve roots of the spine), abscesses in the space between the spinal cord and its covering, spinal stenosis, and compression fractures. Some patients experience numbness or weakness of the legs, as well as pain. There may be spasming of muscles stimulated by the involved nerve and a positive leg raising test.

Diagnosis

The diagnosis of low back pain can be complicated. Most cases are initially evaluated by primary care physicians or other health practitioners, rather than by specialists.

Initial workup

PATIENT HISTORY. The doctor will ask the patient specific questions about the location of the pain, its characteristics, its onset, and the body positions or activities that make it better or worse. If the pain seems to be referred from other organs, the doctor may ask about a history of diabetes, peptic ulcers, kidney stones, urinary tract **infections**, heart murmurs, or other health issues. Age, family history, and

previous medical history are also important. LBP in persons younger than 20 and older than 50 is apt to be associated with a more severe underlying condition or cause.

PHYSICAL EXAMINATION. The doctor will examine the patient's back and hips to check for conditions that require surgery or emergency treatment. The examination includes several tests that involve moving the patient's legs in specific positions to test for nerve root irritation or disc herniation. The flexibility of the lumbar vertebrae may be measured to rule out ankylosing spondylitis. Other physical tests include assessments of gait and posture, range of motion, and the ability to perform certain physical positions and coordinated movements. Reflex, sensory, and motor tests may help the clinician screen for referral to a specialist, as needed. Diagnostic tests may be used, especially with persisting, chronic pain. These tests may include x ray, CT scan, MRI, and electromyelographs (EMGs).

RED FLAGS. The presence of certain symptoms warrants a more rapid progress to deeper diagnostic examination as to cause. These serious symptoms include, but are not limited to the following:

- pain following violent injury, accident, or trauma
- constant pain that worsens
- upper spinal pain
- history of cancer
- being HIV positive
- history of steroid drug use or drug abuse
- development of an obvious structural deformity
- history of rapid weight loss
- unexplained fever or night sweats with back pain
- being under age 20 or over age 50

Treatment

A thorough differential diagnosis is important before any treatment is considered. There are times when alternative therapies may be most beneficial, and other times when more invasive treatments are needed.

Chiropractic

Chiropractic treats patients by manipulating or adjusting sections of the spine. It is one of the most popular forms of alternative treatment in the United States for relief of back pain caused by straining or lifting injuries and has been demonstrated through several rigorous randomized trials to be beneficial. Some osteopathic physicians, physical therapists, and naturopathic physicians also use spinal manipulation to treat patients with low back pain, along with work on soft tissue around the bones. Additional recommendations of shoe orthotics, exercise, cold packs to reduce and inhibit swelling immediately after injury, followed one to two days later by hot packs and cold packs to stimulate healing, **hydrotherapy**, and lifestyle adjustments may be recommended. Nutritional supplements known to be beneficial to joint repair and integrity, collagen support, and wound repair may also be recommended, including **glucosamine** sulfate, with or without **chondroitin**, methylsulfonylmethane(**MSM**), and a variety of mineral and vitamin cofactors.

Traditional Chinese medicine

Practitioners of **traditional Chinese medicine** treat low back pain with **acupuncture**, **acupressure**, massage, and the application of herbal poultices. They may also use a technique called **moxibustion**, which involves the use of glass cups, and heated air from a burning braid or stick of herb with a distinctive aroma.

Herbal medicine and anti-inflammatory enzymatic therapy

Herbal medicine uses a variety of antispasmodic and sedative herbs to help relieve low back pain due to spasm. For this purpose and easily available at a local health food store are herbs such as **chamomile** (*Matricaria recutita*), **hops** (*Humulus lupus*), passion flower (*Passiflora incarnata*), valerian (*Valeriana officinale*), and cramp bark (*Viburnum opulus*). **Bromelain** from pineapples has anti-inflammatory activity. Drinking fresh grape juice, preferably made from dark grapes, on a daily basis at a time other than mealtime, has also been found to be helpful. Minor backaches may be relieved with the application of a heating paste of **ginger** (*Zingiber officinale*) powder and water, allowed to sink in for 10 minutes and followed by an **eucalyptus** rub.

Aromatherapy with soothing **essential oils** of blue chamomile, birch, **rosemary**, and/or **lavender** can be effective when rubbed into the affected area after a hot bath.

Homeopathy

Homeopathic treatment for acute back pain consists of various applications of **Arnica** (*Arnica montana*); as an oil or gel applied topically to the sore area or oral doses alone or in prepackaged combination products, including other homeopathic remedies such as St. John's wort (*Hypericum perforatum*), Rhus tox (*Rhus toxicodendron*) and **Ruta** (*Ruta graveolens*). *Bellis perennis* may be recommended for deep muscle injuries.

Other remedies may be recommended based on the symptoms presented by the patient.

Body work and yoga

Massage and numerous other body work techniques can be very effective in treating low back pain. **Yoga**, practiced regularly and done properly, can be combined with **meditation** or imagery to both treat present and prevent future episodes of low back pain.

Allopathic treatment

All forms of treatment of low back pain are aimed either at symptom relief or to prevent interference with the processes of healing. None of these methods appears to speed up healing.

Acute pain

Acute back pain is treated with muscle relaxants or nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or aspirin. Applications of compresses using heat or cold also can be helpful to some patients. Acute LBP often resolves within a short time. Some patients may be prescribed opioid analgesics (pain relievers with codeine or codeine similars); however, statistics demonstrate no shortening of the healing period, as noted above. The use of muscle relaxants may increase risk of further damage, but they have been shown to be more effective than placebo (though no better than NSAIDS alone) in relieving acute pain. If the patient has not experienced some improvement after several weeks of treatment, the doctor will reinvestigate the cause of the pain.

Chronic pain

Patients with chronic back pain are treated with a combination of medications, physical therapy, and occupational or lifestyle modification. The medications given are usually NSAIDs, although patients with **hypertension**, kidney problems, or stomach ulcers are advised not take these drugs. Patients who take NSAIDs for longer than six weeks are advised to be monitored periodically for complications. Chronic pain, by definition longer than three months in duration, may also prompt a more thorough diagnostic analysis.

Physical therapy for chronic low back pain usually includes regular exercise for fitness and flexibility and massage or application of heat if necessary. Lifestyle modifications include quitting smoking, losing weight (if necessary), and evaluation of the patient's occupation or other customary activities. Good lift and bend mechanics may also be reviewed and counseled.

Patients with herniated discs may be treated surgically if the pain does not respond to medication. Vertebral fusion surgery may stiffen the spine; however, engineers of skyscrapers recognize the need of flexibility with height to preserve wind resistance: a fused spine may reduce capacity. Another surgical procedure known as kyphoplasty, involving guided penetration of the back and cemented repair, may be indicated in pain due to vertebral fracture. Patients with chronic low back pain sometimes benefit from pain management techniques, including **biofeedback**, acupuncture, and chiropractic manipulation of the spine. **Psychotherapy** is recommended for patients whose back pain is associated with a somatoform, **anxiety**, or depressive disorder.

Low back pain with leg involvement

Treatment of sciatica and other disorders that involve the legs may include NSAIDs. Patients with long-standing sciatica or spinal stenosis that do not respond to NSAIDs may be treated surgically. Although some doctors use cortisone injections in trigger points and vertebral facet joints to relieve the pain, this form of treatment is controversial. Also debated are benefits due to spinal traction and transcutaneous (through the skin) electrical nerve stimulation.

Expected results

The prognosis for most patients with acute low back pain is excellent. About 80% of patients recover completely in four to six weeks. The prognosis for recovery from chronic pain depends on the underlying cause.

Prevention

Low back pain due to muscle strain can be prevented by lifestyle choices, including regular physical exercise, weight control, avoiding smoking, and learning the proper techniques for lifting and moving heavy objects. Exercises designed to strengthen the muscles of the lower back and the opposing abdominals are also recommended. Simple actions can also help prevent low back pain, such as putting a small, firm cushion behind the lower back when sitting for long intervals; using a soft pillow for sleep that supports the lower neck without creating an unnatural angle for the head and shoulders; using a swiveling desk chair with a postural support or stool that maintains the knees at a higher level than the hips; standing on flexible rubber mats to avoid the impact of concrete floors at places of employment; and wearing supportive, soft-soled shoes and avoiding the use of high heels.

KEY TERMS

Ankylosing spondylitis—A type of arthritis that causes gradual loss of flexibility in the spinal column. It occurs most commonly in males between the ages of 16 and 35 and may be initiated by a food allergy component, such as an allergy to wheat.

Cauda equina—The nerve roots in the final portion of the spine, controlling movement and sensation in the legs. These nerve roots resemble a horse's tail.

Chiropractic—A method of treatment based on the interactions of the spine and the nervous system. Chiropractors adjust or manipulate segments of the patient's spinal column in order to relieve pain and increase the healthy flow of nerve energy.

Lumbar spine—The segment of the human spine above the pelvis that is involved in low back pain. There are five vertebrae, or bones, in the lumbar spine.

Osteoporosis—A condition found in older individuals in which bones decrease in density and become fragile and more likely to break. It can be caused by lack of vitamin D and/or calcium in the diet.

Placebo—A pill or liquid given during the study of a drug or dietary supplement that contains no medication or active ingredient. Usually study participants do not know if they are receiving a pill containing the drug or an identical-appearing placebo.

Radicular—Pain that is caused by compression or impingement at the root of a nerve.

Referred pain—Pain that is experienced in one part of the body but originates in another organ or area. The pain is referred because the nerves that supply the damaged organ enter the spine in the same segment as the nerves that supply the area where the pain is felt.

Sciatica—Pain caused by irritation of the sciatic nerve. Sciatica is felt in the lower back, the buttocks, the backs and sides of the upper legs, and sometimes the calves.

Spinal stenosis—Usually the result of arthritis of the spine, causing narrowing of the spinal canal in the lumbar vertebrae. The narrowing puts pressure on the roots of the sciatic nerve. It may cause sciatica, but not necessarily.

Resources

BOOKS

Hochschuler, Stephen. *Treat Your Back Without Surgery: The Best Nonsurgical Alternatives for Eliminating Back and Neck Pain,* 2nd ed. Alameda, CA: Hunter House, 2002.

OTHER

"Back Pain." *Medline Plus* April 15, 2008 [cited April 18, 2008]. http://www.nlm.nih.gov/medlineplus/backpain.html.

"Low Back Pain." *American Academy of Orthopaedic Surgeons* September 2007 [cited April 18, 2008]. http://orthoinfo.aaos.org/.

"Low Back Pain Fact Sheet." *National Institute of Neurological Disorders and Stroke* April 11, 2008 [cited April 18, 2008]. http://www.ninds.nih.gov/disorders/backpain/detail_backpain.htm.

"Lower Back Pain (Lumbar Back Pain)." *MedicineNet.com* January 22, 2008 [cited April 18, 2008]. http://www.medicinenet.com/.

ORGANIZATIONS

American Academy of Orthopaedic Surgeons, 6300 North River Road, Rosemont, IL, 60018 4262, (847) 823 7186, http://www.aaos.org.

American Association of Naturopathic Physicians, 435 Wisconsin Ave. NW, Suite 403, Washington, DC, 20016, (202) 237 8150, (866) 538 2267, http://www.naturopathic.org.

American Chiropractic Association, 1701 Clarendon Blvd, Arlington, VA, 22209, (703) 276 8800, http://www.amerchiro.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicine.org.

American Physical Therapy Association, 1111 North Fairfax Street, Alexandria, VA, 22314 1488, (800) 999 APTA (2782), (703) 684 APTA (2782), http://www.apta.org.

Kathleen Wright
Katherine Nelson, N.D.
Tish Davidson, A. M.

Low blood sugar *see* **Hypoglycemia**
Lowfat diet *see* **Ornish diet**
Lumbar pain *see* **Low back pain**

Lung cancer

Definition

Lung **cancer** is a disease in which abnormal cells in the lung grow uncontrollably and form tumors. Cells from these tumors can enter the circulatory system and travel through the body to form tumors in new sites. Lung cancer is often fatal; only four in ten people with lung cancer live one year beyond the time of their diagnosis.

Cross section of a human lung with cancer. *(Science Source / Photo Researchers, Inc.)*

Description

There are two types of lung cancer, primary and secondary. Primary lung cancer originates in the lung. Primary lung cancer can further be divided into small cell lung cancer and non-small cell lung cancer, depending on how the cells look under the microscope. Secondary lung cancer is cancer that starts somewhere else in the body (for example, the breast or colon) and spreads (metastasizes) to the lungs.

Small cell lung cancer was formerly called oat cell cancer because the cells resemble oats in their shape. About one-fourth of all lung cancers are small cell cancers. This type of cancer is aggressive and spreads to other organs within a short time. It is found most often in people who are heavy smokers. Its treatment is different from the treatment of non-small cell lung cancers.

Non-small cell lung cancers account for 75% of lung cancers. There are three types of non-small cell lung cancers. Although the cells of the non-small cell cancers look different, treatment of all three types is the same.

Incidence of lung cancer

Since 1987, lung cancer has been the leading cause of cancer death in both men and women in the United States. The American Cancer Society (ACS) estimated that in 2008 about 215,000 new cases of lung cancer would be diagnosed in the United States and approximately 162,000 Americans would die of the disease that year. Worldwide, more than one million new cases of lung cancer are diagnosed each year, 58% of which are in the developing world.

Lung cancer is usually diagnosed in people age 50 and older, with an average age at diagnosis being 60. Most lung cancer is not diagnosed until it is in an advanced stage. While in the United States the incidence of lung cancer has decreased among white men, it has steadily risen among African American men, and among both white and African American women. This change appears to be directly related to changes in the number of smokers in these groups.

Causes and symptoms

Lung cancer is most often caused by pollutants inhaled into the lungs over a long period. There are indications that genetic inheritance also plays a role in how susceptible different people are to these pollutants.

Smoking

Tobacco **smoking** (cigarettes, pipes, cigars) is the leading cause of lung cancer. Ninety percent of lung cancers can be prevented by completely avoiding tobacco use. Smoking **marijuana** cigarettes also is thought to be a risk factor for lung cancer, although it is difficult to obtain accurate information on marijuana use. Marijuana cigarettes have higher tar content than tobacco cigarettes. In addition, they are inhaled very deeply and the smoke is held in the lungs for a longer period than tobacco smoke.

Breathing in smoke from the environment (secondhand smoke) also increases the risk of lung cancer. In the twenty-first century many states have passed laws mandating smoke-free workplaces and public environments in order to protect non-smokers from secondhand smoke.

Exposure to asbestos and toxic chemicals

Repeated exposure to asbestos fibers, either at home or in the workplace, also is considered a risk factor for developing a specific type of rare lung cancer

called mesothelioma. Studies show that compared to the general population, asbestos workers are seven times more likely to die from lung cancer. Asbestos workers who smoke increase their risk of developing lung cancer by 50 to 100 times. Besides asbestos, miners who are exposed to coal products or radioactive ores, such as uranium, and workers exposed to chemicals, such as arsenic, vinyl chloride, mustard gas, and other carcinogens, have a higher than average risk of contracting lung cancer.

Environmental contamination

Exposure to high levels of radon gas increases the risk of developing lung cancer. Radon is a naturally occurring radioactive gas that cannot be seen or smelled. It is produced by the breakdown of uranium. Outdoors, the tiny amounts of radon produced mix with the air and do not present a cancer risk. However, in the basements of some houses that are built over soil containing natural uranium deposits, radon may accumulate and reach dangerous levels. An inexpensive test can detect the presence of indoor radon. Having one's house tested for the presence of radon gas when buying or renting is a good idea and is required by law in some states to be done when a house is sold.

Manmade environmental pollution (e.g., auto exhaust fumes, industrial air pollution) also increases the risk of developing lung cancer. Studies have conclusively linked long-term exposure to fine-particle air pollution with lung cancer deaths. The risk of death from lung cancer is increased substantially for people living in heavily polluted metropolitan areas, particularly in the developing world where the rate of cigarette smoking also is high.

Other causes

Inflammation and scar tissue sometimes are produced in the lung by diseases such as silicosis and berylliosis. These diseases result from inhaling certain minerals, **tuberculosis**, and certain types of **pneumonia**. This scarring may increase the risk of developing lung cancer. Radiation therapy to the chest also increases the risk of lung cancer, especially in people who smoke.

Symptoms

Lung cancers tend to spread very early, but only about 15% are detected in early stages when they are most treatable. Many symptoms of lung cancer are similar to those caused by other diseases. The chance of early detection is improved by promptly seeking medical care if any of the following symptoms appear:

- a cough that does not go away
- chest pain
- shortness of breath
- persistent hoarseness
- swelling of the neck and face
- unintentional significant weight loss
- fatigue and loss of appetite
- bloody or brown-colored spit or phlegm (sputum)
- unexplained fever
- recurrent lung infections, such as bronchitis or pneumonia

If the lung cancer has spread to other organs, the patient may have other symptoms, such as headaches, bone **fractures**, **pain**, bleeding, or **blood clots**.

Diagnosis

Diagnosis begins with a detailed medical and lifestyle history to determine symptoms and assess risk factors. This assessment is followed by a complete physical examination. Among other checks, the doctor will examine the patient's throat to look for other possible causes of hoarseness or coughing and listen to the patient's breathing and the sounds made when the patient's chest and upper back are thumped (percussed). The physical examination usually is inconclusive.

Imaging tests

Based on symptoms and risk factors that give the doctor reason to suspect lung cancer, imaging tests are performed. These usually begin with a chest x ray that can show the presence of any masses in the lungs. Special imaging techniques, such as computed tomography (CT) scans or magnetic resonance imaging (MRI) scans, can provide more precise information about the size, shape, and location of any masses. A special type of computed tomography called spiral CT can detect lung cancer when tumors are smaller than a dime. Routine screening using spiral CT remains controversial because it produces a high number of false positives (detection of an abnormality that turns out not to be cancer). This results in additional unneeded tests and procedures. The National Lung Screening Trial, a large-scale trial of spiral CT technology to detect lung cancer in 50,000 smokers, was conducted between 2002 and 2008. Results, which were expected to be available by 2009, were anticipated to help to clarify whether using this CT spiral technology to routinely screen high-risk individuals produces accurate and cost effective results.

Positron emission tomography (PET) is a diagnostic tool that uses small amounts of radioactive glucose (sugar) to detect where cells are rapidly growing. Cancer cells grow faster than healthy cells and thus use more glucose. Radioactive glucose becomes concentrated in cancer cells and can be detected by special imaging techniques. This procedure is especially helpful in locating very early lung cancers and in determining where more advanced cancers have spread. Some facilities have equipment that performs a simultaneous PET and CT scan.

Sputum analysis

Sputum analysis involves microscopic examination of the cells that are either coughed up from the lungs or are collected through a special instrument called a bronchoscope. Sputum analyses can diagnose at least 30% of lung cancers, some of which are in the very earliest stages and do not show up on chest x rays. The sputum test does not, however, provide any information about the location of the tumor and must be followed by additional tests.

Lung biopsy

Lung biopsy is the definitive diagnostic tool for cancer. It can be performed in several different ways. The doctor can perform a bronchoscopy, which involves the insertion of a slender, lighted tube, called a bronchoscope, down the patient's throat and into the lungs. In addition to viewing the passageways of the lungs, the doctor can use the bronchoscope to obtain samples of the lung tissue. In another procedure known as a needle biopsy, the location of the tumor first is identified using a CT scan or MRI. The doctor then inserts a needle through the chest wall and collects a sample of tissue from the tumor. In a third procedure, known as surgical biopsy, the chest wall is opened and a part of or the entire tumor is removed. A doctor who specializes in the study of diseased tissue (a pathologist) examines the tumor samples to identify the cancer's type and stage.

Treatment

Alternative therapies do not replace conventional treatment but may complement it and improve the patient's quality of life. Before beginning any alternative therapy, lung cancer patients should consult their doctors concerning the appropriateness if treatment and its role in an overall cancer treatment plan. Appropriate alternative treatments may help prolong a patient's life, improve the quality of life, reduce the recurrence of tumors, prolong time in remission, or reduce adverse reactions to chemotherapy and radiation.

Dietary guidelines

The following dietary changes may help improve a patient's quality of life, as well as boost the immune function to better fight the disease. In general, these dietary guidelines are accepted by both alternative and conventional medical practitioners.

- Avoid fatty and spicy foods. A high-fat diet may be associated with increased risk of lung and other cancers. Also, lung cancer patients may have a hard time digesting greasy foods.
- Eat new and interesting foods. Tasty foods stimulate appetite so that patients can eat more and have the energy to fight cancer.
- Increase consumption of fresh fruits and vegetables. They are the best sources of antioxidants, vitamins, and minerals. Especially helpful are the yellow and orange fruits (orange, cantaloupes) and dark green vegetables.
- Eat more broccoli sprouts. These young sprouts are a good source of sulforaphane, a substance thought to help fight lung cancer.
- Eat many (5–6) small meals per day. Small meals are easier to digest.
- Establish a regular eating time and avoid eating around bedtime.
- Avoid foods containing preservatives or artificial coloring.
- Monitor weight and intake of adequate calories and protein.

Nutritional supplements

Many cancer-fighting claims are made for nutritional supplements. However, the effectiveness of some conventional anticancer drugs used to treat lung cancer can be reduced when patients take megadoses of **antioxidants** or other supplements. Free radicals damage DNA, and sometimes this damage leads to the development of cancer. In laboratory cell cultures and animal studies, antioxidants appear to slow the development of cancer. The results have been mixed in studies in which humans took antioxidant dietary supplements. In a large study of 29,000 men, when a beta-carotene dietary supplement, which the body converts into **vitamin A**, was taken by men who smoked, they developed lung cancer at a rate 18% higher and died at a rate 8% higher than men who were taking a placebo.

Another study that gave men dietary supplements of beta-carotene and vitamin A was stopped when researchers found the men receiving the beta-carotene had a 46% greater chance of dying from lung cancer

than those who were given a placebo. Other large studies have shown either no or only slight protective effects against cancer. The position of the American Cancer Society, the National Cancer Institute, and several international health organizations is that antioxidants should come from a healthy diet high in fruits and vegetables and low in fat and not from dietary supplements. Cancer patients should check with their physicians before beginning any herbal or megadose vitamin or mineral therapy.

Most dietary supplements claim to help fight cancer by boosting the function of the immune system. A naturopath may recommend some of the following nutritional supplements to boost immune function and help fight tumor progression:

- Vitamins and minerals. Vitamins that are considered particularly beneficial to cancer patients include B-complex vitamins, especially vitamins B_6, along with vitamins C, D, E, and K. The most important minerals are calcium, chromium, copper, iodine, molybdenum, germanium, selenium, tellurium, and zinc. Many of these vitamins and minerals are strong antioxidants or cofactors for antioxidant enzymes. However, patients should not take megadoses of these supplements without first consulting their doctors. Significant adverse or toxic effects may occur at high dosages, which is especially true for the minerals.
- Other nutritional supplements may help fight cancer and support the body. They include essential fatty acids (fish or flaxseed oil), flavonoids, pancreatic enzymes (to help digest foods), hormones such as DHEA, melatonin, or phytoestrogens. Again, some of these supplements may interfere with specific conventional cancer treatments and should not be taken without consulting a physician knowledgeable about both conventional and alternative therapies.

Traditional Chinese medicine

Conventional treatment for lung cancer is associated with significant side effects. These adverse effects (such as **nausea**, **vomiting**, and **fatigue**) can be reduced with Chinese herbal preparations. Patients should consult an experienced herbalist who will prescribe remedies to treat specific symptoms that are caused by conventional cancer treatments.

Daily consumption of a soup used in **traditional Chinese medicine** is reported to have helped slow the progression of non-small cell lung cancer for patients with advanced stages of the disease. The soup consisted of herbs and vegetables containing natural ingredients that boost immunity and help fight tumors. Patients should check with their doctors and with a licensed traditional Chine medicine specialist for more information. The soup does not prevent or reverse the disease, but may prolong survival.

Juice therapy

Juice therapy involves the consumption of the juice of raw fruit or vegetables. A person may drink juice preventively to stay healthy or to treat a medical condition such as cancer. Juice therapy may be helpful for patients with cancer. Advocates of **juice therapies** maintain that refraining from eating solid food boosts the body's ability to heal itself. Since the body is not spending time and energy on digesting complex high-fat food, it can concentrate on healing instead. Advocates also believe that all-juice **diets** can help the body eliminate toxins (poisons).

The most extreme form of juice therapy for cancer is the Gerson juice therapy diet. The **Gerson therapy** treatment is based on drinking freshly pressed vegetable and fruit juice every hour. During a typical day at a Gerson clinic, a person would drink 13 glasses of raw carrot/apple and green-leaf vegetable juices. Vegetarian meals of organically grown food are served. During treatment, the patient receives coffee enemas during the evening to detoxify the blood and tissues. This treatment is administered in only two clinics, one in California and the other in Mexico. Critics of the Gerson diet say that it has many dangerous side effects, including dehydration, electrolyte imbalance, **constipation**, infection, poor resistance to disease, excessive weight loss, inflammation of the colon, and in some cases even death and that it does not cure cancer.

Homeopathy

There is conflicting evidence regarding the effectiveness of **homeopathy** in cancer treatment. Because cancer chemotherapy may suppress the body's response to homeopathic treatment, homeopathy may not be effective during chemotherapy. Therefore, patients should wait until after chemotherapy to try this relatively safe alternative treatment.

Acupuncture

Acupuncture uses needles inserted into the body to stimulate or direct the meridians (channels) of energy flow. Acupuncture has not been shown to have any anticancer effects. However, for some individuals it is an effective treatment for nausea and other unpleasant side effects of chemotherapy and radiation.

Other treatments

Other alternative treatments include **stress** reduction, **meditation**, **yoga**, t'ai chi, and the use of **guided imagery**. These techniques help the individual cope with cancer and improve quality of life, but do not have any curative effects.

Allopathic treatment

Treatment for lung cancer depends on the type of cancer, its location, and its stage. Treating the cancer early is key. The most commonly used modes of treatment are surgery, radiation therapy, and chemotherapy. Often these treatments are used in combination.

Surgery

Surgery is not usually an option for small cell lung cancers because most have spread beyond the lung by the time they are diagnosed. Because non-small cell lung cancers are less aggressive, however; surgery sometimes can be used to treat them. The surgeon decides on the type of surgery depending on how much of the lung is affected. Surgery may be the primary method of treatment, or radiation therapy and/or chemotherapy may be used to shrink the tumor before surgery is attempted.

There are three different types of surgical operations:

- Wedge resection. This procedure involves removing a small part of the lung.
- Lobectomy. A lobectomy is the removal of one lobe of the lung. If the cancer is limited to one part of the lung, the surgeon will perform a lobectomy.
- Pneumonectomy. A pneumonectomy is the removal of an entire lung. If the surgeon feels that removal of the entire lung is the best option for curing the cancer, a pneumonectomy is performed.

The pain that follows surgery can be relieved by medications. A more serious side effect of surgery is the patient's increased vulnerability to bacterial and viral **infections**. Preventative antibiotics and sometimes antiviral medications are given after surgery.

Radiation therapy

Radiation therapy involves the use of high-energy rays to kill cancer cells. It is used either by itself or in combination with surgery or chemotherapy. There are two types of radiation treatments: external beam radiation therapy and internal (or interstitial) radiotherapy. In external radiation therapy, the radiation is delivered from a machine positioned outside the body. Internal radiation therapy uses a small pellet of radioactive materials placed inside the body in the area of the cancer.

Radiation therapy may produce such side effects as tiredness, skin **rashes**, upset stomach, and **diarrhea**. Dry or sore throats, difficulty in swallowing, and loss of hair in the treated area are all minor side effects of radiation. These may disappear either during the course of the treatment or after the treatment is over. The side effects and ways to minimize them should be discussed with the doctor.

Chemotherapy

Chemotherapy uses anticancer medications that are either given intravenously or taken by mouth (orally). These drugs enter the bloodstream and travel to all parts of the body, killing cancer cells that have spread to different organs. Chemotherapy is used as the primary treatment for cancers that have spread beyond the lung and cannot be removed by surgery. It also can be used in addition to surgery or radiation therapy to kill any remaining cancer cells.

Chemotherapy is tailored to each patient's needs. Most patients are given a combination of several different drugs. Besides killing the cancer cells, these drugs also harm normal cells. Hence, the dose has to be carefully adjusted to minimize damage to normal cells. Chemotherapy often has severe side effects, including nausea, vomiting, **hair loss**, **anemia**, weakening of the immune system, and sometimes **infertility**. Most of these side effects end when the treatment is over. Other medications can be given to lessen the unpleasant side effects of chemotherapy.

Expected results

If the non-small lung cancer is detected and appropriately treated before it has had a chance to spread to other organs, about 47% of patients survive five years or longer after the initial diagnosis. Less than 15% of lung cancers, however, are found at this early stage. The one-year survival rate for all lung cancers in 2008 is about 40%.

Prevention

Overwhelmingly, the most effective way to prevent lung cancer is to not smoke or to quit smoking if one has already started. Secondhand smoke should be avoided as much as possible. Appropriate precautions should be taken when working with cancer-causing substances (carcinogens). Monitoring the diet and eating well-balanced meals that consist of whole foods, vegetables, and fruits; eliminating toxins, exercising routinely, and weight reduction; testing houses for the presence of radon gas; and removing asbestos from buildings also are useful preventive strategies.

KEY TERMS

Antioxidant—A molecule that prevents oxidation. In the body antioxidants attach to other molecules called free radicals and prevent the free radicals from causing damage to cell walls, DNA, and other parts of the cell.

Biopsy—The surgical removal and microscopic examination of living tissue for diagnostic purposes.

Bronchoscope—A thin, flexible, lighted tube that is used to view the air passages in the lungs.

Carcinogen—Any substance capable of causing cancer.

Chemotherapy—Treatment of cancer with synthetic drugs that destroy the tumor either by inhibiting the growth of cancerous cells or by killing them.

Electrolyte—Ions in the body that participate in metabolic reactions. The major human electrolytes are sodium (Na+), potassium (K+), calcium (Ca 2+), magnesium (Mg2+), chloride (Cl-), phosphate (HPO4 2-), bicarbonate (HCO3-), and sulfate (SO4 2-).

Free radical—A molecule with an unpaired electron that has a strong tendency to react with other molecules in DNA (genetic material), proteins, and lipids (fats), resulting in damage to cells. Free radicals are neutralized by antioxidants.

Lobectomy—Surgical removal of an entire lobe of the lung.

Pathologist—A doctor who specializes in the diagnosis of disease by studying cells and tissues under a microscope.

Placebo—A pill or liquid given during the study of a drug or dietary supplement that contains no medication or active ingredient. Usually study participants do not know if they are receiving a pill containing the drug or an identical-appearing placebo.

Pneumonectomy—Surgical removal of an entire lung.

Radiation therapy—Treatment using high energy radiation from x-ray machines, cobalt, radium, or other sources.

Sputum—Mucus or phlegm that is coughed up from the passageways of the lungs.

Stage—A term used to describe the size and extent of cancer.

Traditional Chinese medicine (TCM)—An ancient system of medicine based on maintaining a balance in vital energy or qi that controls emotions, spiritual, and physical wellbeing. Diseases and disorders result from imbalances in qi (the life force), and treatments such as massage, exercise, acupuncture, and nutritional and herbal therapy are designed to restore balance and harmony to the body

Wedge resection—Removal of only a small portion of a cancerous lung.

Resources

BOOKS

Henschke, Claudia I., and Peggy McCarthy. *Lung Cancer: Myths, Facts, Choices and Hope*. New York: Norton, 2003.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

Parles, Karen. *100 Questions & Answers About Lung Cancer*, rev. ed Boston: Jones and Bartlett, 2005.

"Pulmonary Disorders: Tumors of the Lung." In *The Merck Manual of Diagnosis and Therapy*, 18th ed. Edited by Mark H. Beers, Robert S. Porter, and Thomas V. Jones. Whitehouse Station, NJ: Merck, 2007.

OTHER

"Lung Cancer." *MedicineNet.com*. September 11, 2007 [cited April 18, 2008]. http://www.medicinenet.com/lung_cancer/article.htm.

"Lung Cancer." *MedlinePlus*. March 14, 2008 [cited April 18, 2008]. http://www.nlm.nih.gov/medlineplus/lungcancer.html.

"What You Need to Know About Lung Cancer." *National Cancer Institute*. undated [cited April 18, 2008]. http://www.cancer.gov/cancertopics/wyntk/lung.

ORGANIZATIONS

American Cancer Society, 1599 Clifton Road NE, Atlanta, GA, 30329 4251, (800) ACS 2345, http://www.cancer.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

American Lung Association, 61 Broadway, 6th Floor, New York, NY, 10006, (800) LUNG USA, http://www.lungusa.org/.

LungCancer.org: A Program of Cancer Care, 275 Sev enth Avenue, New York, NY, 10001, (212) 712 8400, (800) 813 4673, http://www.lungcancer.org.

National Cancer Institute Public Inquiries Office, 6116 Executive Blvd., Room 3036A, Bethesda, MD, 20892 8322, (800) 4 CANCER, http://www.cancer.gov.

Mai Tran
Teresa G. Odle
Tish Davidson, A.M.

Lupus *see* **Systemic lupus erythematoses**

Lutein

Definition

Lutein is one of only two **carotenoids** (the other is zeaxanthin) that are found in the human eye. Lutein is thought to protect against certain eye diseases and possibly against some cancers.

Description

Found in spinach, kale, turnip, collard, and mustard greens, summer squash, peas, broccoli, brussels sprouts, and yellow corn, as well as egg yolks, lutein is a nutrient with a number of potentially beneficial effects. It is a member of the carotenoid family, a group of chemicals related to **vitamin A**. While beta-carotene, the precursor of vitamin A, may be the most familiar carotenoid, there are almost 600 others whose effects had as of 2008 not been extensively studied. Aside from lutein, these include alpha-carotene, **lycopene**, zeaxanthin, and beta-cryptoxanthin.

In plants, carotenoids such as lutein help to give color to sweet potatoes, carrots, and other fruits and vegetables. In humans, lutein and zeaxanthin make up much of the pigment in the center of the retina (the macula), where vision sensitivity is greatest. While lutein is not considered an essential nutrient, studies suggest that it plays an important role in maintaining healthy vision and preventing or slowing eye diseases such as age-related **macular degeneration** (ARMD), **cataracts**, and retinitis pigmentosa. Getting adequate amounts of lutein may also decrease the risk of developing certain types of **cancer**.

Carotenoids such as lutein are **antioxidants** that react with free radicals. Molecules called free radicals form during normal cell metabolism and with exposure to ultraviolet light or toxins such as cigarette smoke. Free radicals cause damage by reacting with fats and proteins in cell membranes and genetic material. This process is called oxidation. Antioxidants are compounds that attach themselves to free radicals so that it is impossible for the free radical to react with, or oxidize, other molecules. In this way, antioxidants may protect cells from damage. Although lutein and other carotenoids have antioxidant activity in the laboratory, it is not clear how much they function as antioxidants in the body. Concentrated mainly in the lens and retina of the eye, lutein is thought to protect vision by neutralizing free radicals and by increasing the density of eye pigment. Lutein may also shield the eyes from the destructive effects of ultraviolet rays in sunlight by absorbing light in the blue wavelength range.

General use

Several well-controlled clinical trials have produced strong indications that lutein plays an important role in maintaining vision and preventing ARMD and cataracts, the two leading causes of vision loss in adults. It also appears to slow the progress of retinitis pigmentosa. Research is ongoing, and a list of clinical trials currently enrolling volunteers in studies using lutein to treat various eye diseases can be found at http://www.clinicaltrials.gov. There is no charge to the patient to participate in these studies.

Research also indicates that getting adequate amounts of lutein may decrease the risk of endometrial cancer in women. As of 2008, research was underway that continues to investigate the relationship between lutein cancer prevention.

Preparations

Typically the United States Institute of Medicine (IOM) of the National Academy of Sciences develops values called Dietary Reference Intakes (DRIs) for vitamins and minerals. The DRIs define the amount of a nutrient a person needs to consume daily and the largest daily amount from food or dietary supplements that can be taken without harm. The IOM has not as of 2008 developed any DRIs for lutein or other carotenoids because not enough scientific information was available and because no diseases had been identified as being caused by inadequate intake of any carotenoid. The IOM, the American Cancer Society, and the American Heart Association all recommend that people meet their need for antioxidants, including lutein, from a diet high in fruits, vegetables, and whole grains rather than from dietary supplements.

Egg yolks are the richest source and also contain a large amount of zeaxanthin, another carotenoid found in the eye. Other sources of lutein include corn, red seedless grapes, kiwi fruit, squash, and green vegetables

KEY TERMS

Age-related macular degeneration (ARMD)—A chronic, painless eye disease occurring in people over age 50 that damages the macula, or central part of the retina, causing irreversible loss of central vision.

Antioxidant—An organic substance that is able to counteract the damaging effects of oxidation in human and animal tissue. Lutein is an antioxidant.

Carotenoid—Any of a group of red and yellow pigments that are chemically similar to carotene. They are contained in animal fat and some plants.

Cataracts—The clouding of the eye lens, which under normal circumstances is clear.

Free radical—A molecule with an unpaired electron that has a strong tendency to react with other molecules in DNA (genetic material), proteins, and lipids (fats), resulting in damage to cells. Free radicals are neutralized by antioxidants.

Retina—The layer of light-sensitive cells located at the back of the eye.

Retinitis pigmentosa—A group of inherited disorders that affect the rod cells of the retina. Retinitis pigmentosa begins with loss of night vision, followed by gradual loss of peripheral vision, the development of tunnel vision, and finally blindness.

such as zucchini, spinach, collard greens, kale, leaf lettuce, celery, peas, broccoli, and leeks. Oranges and orange juice, tomatoes, and carrots also prove good sources of lutein. Getting too much lutein through food and drink is not considered a significant risk because the nutrient is only present in relatively small amounts in plant and animal foods.

Despite the fact that the optimum daily dosage of lutein has not been established with certainty, indications suggest that therapeutic dosages range from 5 to 30 mg per day, although 6 mg daily is generally considered adequate for cancer prevention and 10 mg daily for ARMD treatment or prevention. As a dietary supplement, lutein is available in capsule form.

Precautions

Lutein is not known to be harmful when taken in recommended dosages, although the long-term effects of taking lutein supplements were unknown as of 2008. Due to lack of sufficient medical study, lutein should be used with caution in children, women who are pregnant or breast feeding, and people with liver or kidney disease.

Side effects

When taken in recommended dosages, lutein is not known to be associated with any significant side effects.

Interactions

Lutein is not known to interact adversely with any drugs or dietary supplements; however, as of 2008, few studies of interactions had been conducted.

Resources

BOOKS

Challem, Jack, and Marie Moneysmith. *Basic Health Pub lications User&s Guide to Carotenoids & Flavonoids: Learn How to Harness the Health Benefits of Natural Plant Antioxidants*. North Bergen, NJ: Basic Health, 2005.

Krinsky, Norman, Susan T. Mayne, Helmut Sies, eds. *Car otenoids in Health and Disease*. New York: Marcel Dekker, 2004.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

Weil, Andrew, *Natural Health, Natural Medicine,* rev. ed. New York: Houghton Mifflin, 2004.

OTHER

Higdon, Jane. "Carotenoids." *Linus Pauling Institute Ore gon State University* December 21, 2005 [cited April 19, 2008]. http://lpi.oregonstate.edu/infocenter/phyto chemicals/carotenoids.

"Lutein and Its Role in Eye Disease." *National Eye Institute* [cited April 19, 2008]. http://www.nei.nih.gov/news/ statements/lutein.asp.

Lutein Information Bureau [cited April 19, 2008]. http:// www.luteininfo.com.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation. org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http:// www.holisticmedicin.org.

National Eye Institute, 2020 Vision Place, Bethesda, MD, 20892 3655, (301) 496 5248, http://www.nei.nih.gov.

Greg Annussek
Teresa Norris
Tish Davidson, A. M.

Lycium fruit

Description

Lycium fruit, sometimes called lycium berry, is used extensively in Chinese herbalism. The fruit are the berries of *Lycium chinense* and more commonly *Lycium barbarum*. The roots also have healing properties. Lycium is a shrub that grows to about 12 ft (4 m) in height. It grows wild on hillsides in the cooler regions of northern China and Tibet. However, it is also cultivated in almost all parts of China and in some other regions of Asia.

Lycium fruit is rich in carotene, vitamins B_1 and B_{12}, and **vitamin C**. The fruit also contains **amino acids** (the building blocks of proteins), **iron**, and trace elements essential to the body, including **zinc**, **copper**, **selenium**, **calcium**, and **phosphorus**. The bright red berries are usually harvested in late summer or early autumn. The roots are usually harvested in the spring, although they can be dug any time of the year. Berries and roots can be used either fresh or dried. Lycium is also called Chinese wolfberry. Its Chinese name is *Gou Qi Zi*.

General use

The first recorded use of lycium fruit as a medicinal herb is from the first century A.D. For thousands of years it has been used in China to promote a long, vigorous, and happy life. It is used as both a *jing* (yin) tonic for liver and kidney, and as a blood tonic. In the Chinese system of health, *jing* is an essential life substance. To remain healthy, yin aspects must be kept in balance with yang aspects. Ill health occurs when the energies and elements of the body are out of balance or in disharmony. Health is restored by taking herbs and treatments that restore this balance.

Lycium fruit is traditionally believed to have many different effects upon the body. In addition to being a general longevity herb, it is said to raise the spirits, fight **depression**, and increase cheerfulness. Berries are made into a blood tonic that is given for general weakness, to improve circulation, and increase the cells' ability to absorb nutrients. When blended with more yang herbs, lycium is used as a sexual tonic.

In Chinese medicine, the liver is associated with the function of the eyes. Lycium berries are used as a liver tonic to brighten the eyes, improve poor eyesight, treat blurred vision, sensitivity to light, and other general eye weaknesses.

One of the qualities ascribed to lycium root is that it said to cool the blood. It is used to reduce **fever** and to treat other conditions of what is referred to as excess heat. These include traditional uses to relieve excess sweating, stop **nosebleeds**, reduce **vomiting**, and treat **dizziness**. Some herbalists use a tea made of lycium root and *Scutellaria* (**skullcap** or *Huang Qin*) to treat **morning sickness** in pregnant women. Lycium is also used to treat certain types of coughs and **asthma**.

Modern herbalists use lycium roots to treat high blood pressure. There is some scientific basis for this treatment, since extracts from the root have been shown in laboratory experiments to relax the involuntary muscles, including artery muscles. This **relaxation** lowers blood pressure.

Other modern scientific studies have shown that extracts of lycium root can reduce fever, including fever associated with **malaria**. One Korean study looked at the effect extracts from the berries and roots had on the blood of mice that were exposed to whole body x rays. They concluded that the mice that received doses of root extract replaced leukocytes, erythrocytes, and thrombocytes faster than those that did not receive the extract. This effect may account for lycium's reputation for creating good health, vigor, and long life.

Since the mid 1990s, claims have been made by some researchers, mainly in China, that lycium extracts can inhibit the growth of **cancer** cells. As of 2007, according to Memorial Sloan-Kettering Cancer Center, "Despite claims by several marketers, the efficacy and safety of lycium products for cancer treatment in humans have not been established." Nevertheless, research continued on this herb.

Preparations

High-quality, fresh lycium fruit has thick flesh, few seeds, and a delicious sweet taste. It can be eaten raw on a daily basis to promote general health and happiness. Dried berries can be used just as raisins are in cooking. Herbalists also make a decoction from dried, chopped lycium berries. To treat eye problems, about 0.5 cup (100 ml) of decoction is consumed daily.

Roots are used either fresh or dried. About 0.5 cup (100 ml) of root decoction daily is given to reduce fevers. A tincture can also be made of the root. About 0.5 teaspoon (3 ml) diluted with water three times a day is taken for coughs.

Combinations

Lycium is regularly used in tonics and herbal formulas that treat blood deficiencies, poor kidney function, and liver depletion. Among these are lycium formula, a blood tonic that is intended to strengthen

KEY TERMS

Decoction—The liquid made from boiling an herb, then straining out the solid material.

Erythrocytes—Known as red blood cells, the ones that carry oxygen to every part of the body.

Leukocytes—Also called white blood cells, the ones that fight infection and boost the immune system.

Thrombocytes—Also called platelets, these help the blood to clot so that wounds can heal.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Yang aspects—Qualities such as warmth, activity, and light, the opposite of yin aspects.

Yin aspects—Qualities such as cold, stillness, darkness, and passiveness, the opposite of yang aspects.

the entire body and brain. Lycium is an ingredient in rehmannia eight combination, a common *jing* tonic for older men and women that is said to regulate blood sugar and control diabetes, and a vision formula with the Chinese name of *Qi Ju Di Huang Wan* is made of lycium, chrysanthemum, and rehmannia.

Precautions

Chinese herbalists do not recommend lycium for people who have a fever due to infection or who have **diarrhea** or bloating. The safety of lycium during **pregnancy** has not been established.

Side effects

There are no reported side effects from taking lycium. Lycium has been used for centuries, both as a healing herb and as a food.

Interactions

Lycium is often used in conjunction with other herbs with no reported interactions. Lycium has also been found to enhance the action of the blood-thinning drug warfarin (Coumadin).

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven, and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

OTHER

"Lycium." Memorial Sloan Kettering Cancer Center, updated April 14, 2007. http://www.mskcc.org/mskcc/html/69287.cfm (February 11, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

Tish Davidson, A. M.

Lycopene

Description

Lycopene is a red, fat-soluble pigment found in vegetables, and most commonly found in tomatoes. It is one of a family of pigments called **carotenoids**. Carotenoids are naturally occurring pigments responsible for the brightly colored fall leaves and the vivid colors of flowers, fruits, and vegetables. In fruits and vegetables, these pigments range in hue from bright yellow in squash, to orange in carrots, to bright red in tomatoes and peppers.

Although the human body does not produce lycopene, it is readily available through the diet. Minor sources include guava, rosehip, watermelon, and pink grapefruit. However, about 85% of lycopene in the U.S. diet comes from tomatoes and tomato products such as juice, soup, sauce, paste, and ketchup. A diet rich in carotenoid-containing foods is associated with a variety of health benefits.

Once lycopene is absorbed in the body, it is deposited widely in the liver, lungs, prostate gland, colon, and skin. Its concentration in body tissues tends to be higher than most other carotenoids. Working as a powerful antioxidant, lycopene fights free radicals—highly reactive molecules that damage cell membranes, attack DNA, and cause disease. Studies have found that patients with HIV infection, inflammatory diseases, and high cholesterol levels (with and without lipid-lowering treatment) may have depleted lycopene serum (blood) levels. In contrast to other carotenoids, serum levels of lycopene are not usually reduced by

Tomatoes are a good source of lycopene. *(© Sorin Alexandru / Alamy)*

smoking or alcohol consumption but rather by increasing age.

General use

A number of studies have indicated that a lycopene-rich diet lowers the risk of certain chronic diseases such as cardiovascular disease, **cancer**, and age-related macular degeneration .

Cardiovascular disease

In its role as an antioxidant, lycopene prevents the oxidation of low-density liproprotein (LDH), the "bad" **cholesterol** that leads to **atherosclerosis** (hardening of the arteries) and coronary artery disease.

As serum lycopene levels rise, the levels of oxidized lipoprotein, protein, and DNA compounds go down, thus lowering the risk of heart disease. Individuals with high levels of lycopene are half as likely to have a **heart attack** than those with low levels, according to one study.

Cancer

Researchers have found a strong relationship between lycopene intake and reduced risk of cancers of the prostate and pancreas. In several studies of these cancers, lycopene was the only carotenoid associated with risk reduction. In late 2001, the first clinical intervention trial of **prostate cancer** patients showed that supplementation with lycopene helped slow growth of prostate cancer. In fact, the spread of prostate cancer was reduced by 73%.

Consuming tomato products twice a week, as opposed to not at all, was associated with a reduced risk of prostate cancer of up to 34%, according to a study conducted by the Dana-Farber Cancer Institute. Of the 46 fruits and vegetables investigated, only tomato products showed a measurable association with reduced risk of prostate cancer. There is also medical evidence to suggest that a high intake of lycopene-rich tomato products is associated with a reduced risk of developing cancers of the lung, breast, cervix, and gastrointestinal tract.

Macular degeneration

Lycopene (as well as other carotenoids such as lutein and beta-carotene) may also help prevent macular degenerative disease, the leading cause of blindness in people over the age of 65. Lycopene is the only micronutrient whose serum level was shown to be inversely related to the risk of age-related **macular degeneration**.

In late 2001, a study showed that lycopene may also help relieve exercise-induced **asthma** symptoms.

Preparations

Although the major sources of lycopene for humans are tomatoes and tomato products, bioavailability from

KEY TERMS

Antioxidant—Agent that prevents or inhibits oxidation, which is the process of creating unstable molecules.

Bioavailability—The rate and extent to which a drug or other substance enters the general circulation.

Carotenoid—A pigment that gives color to plants.

Macular degeneration—Deterioration of the macula of the eye (a part of the retina).

different food items varies considerably. Cooking fresh tomatoes with a source of fat, such as olive oil in spaghetti sauce, enhances the body's absorption of lycopene, since lycopene is fat-soluble. By heating the tomatoes, the bound chemical form of lycopene is converted into a form that is more easily digested. In fact, one study showed that lycopene is absorbed 2.5 times better from tomato paste than from fresh tomatoes.

Although no dietary guidelines have been established, research shows that drinking two cups (about 540 ml) of tomato juice per day provides about 40 mg of lycopene. This is the amount recommended to significantly reduce the oxidation of LDL cholesterol, according to one human dietary intervention study.

The approximate lycopene content of tomatoes and tomato products, based on an analysis by a number of laboratories (mg/100 g wet weight) are listed below.

- tomatoes, fresh (0.9–4.2)
- tomatoes, cooked (3.7)
- tomato sauce (6.2)
- tomato paste (5.4–150)
- tomato soup, condensed (8.0)
- tomato juice (5.0–11.6)
- sun-dried tomato in oil (46.5)
- pizza sauce, canned (12.7)
- ketchup (9.9–13.4)

Although lycopene is available in concentrated capsule form and in combination with other vitamins, such as **vitamin E** or multivitamin preparations, there is inadequate evidence to conclude that supplements are more beneficial than the lycopene consumed in foods. Since most of the health benefits of lycopene have been ascertained from studies of estimated dietary intake or blood concentrations, as of the year 2000, researchers recommend that individuals consume a diet rich in carotenoids and an array of fruits and vegetables rather than turning to lycopene supplements. The United States Department of Agriculture reported in 2001 that people intake an average of 10.9mg per day.

Precautions

There are no known precautions regarding lycopene itself. However, there are a number of indirect problems that may result from consuming excessive amounts of tomatoes or commercially prepared tomato products.

Although processed tomato products are the richest source of lycopene in the diet, ingesting tomatoes may aggravate certain health conditions. As a member of the nightshade variety of plants—which includes eggplants, potatoes, peppers, paprika, and tobacco—tomatoes have been strongly and consistently linked with certain forms of arthritis, particularly rheumatoid and **osteoarthritis**.

One theory maintains that the alkaloids (alkaline chemicals) in the nightshades are deposited in the connective tissue, stimulate inflammation, and then inhibit the formation of normal cartilage. As a result, joint cartilage continues to break down and is not replaced by new, healthy cartilage cells.

Another indirect precaution is that processed tomato products usually contain large amounts of **sodium**, unless the product is labeled low-sodium or salt-free. An excess amount of sodium in the diet can exacerbate high blood pressure.

Side effects

Although extensive research has not been conducted, there have been no reported side effects or toxicity associated with lycopene intake.

Interactions

Research into the interactions of lycopene with food, drugs, or diseases has not been conducted as of the year 2000.

Resources

PERIODICALS

Arab, Lenore and Susan Steck. "Lycopene and Cardiovas cular Disease." *American Journal of Clinical Nutrition* (2000 suppl.): 1961S 1695S.

Bauer, Jeff. "A Tomato Antioxidant May Relieve Asthma." *RN* (October 2001):21.

Broiher, Kitty. "A Tomato a Day May Keep Cancer Away." *Food Processing* (April 1999): 58.

"Clinical Intervention Trial Finds Benefit of Lycopene." *Cancer Weekly* (November 27, 2001) :38.

Clinton, Steven K. "Lycopene: Chemistry, Biology, and Implications for Human Disease." *Nutrition Reviews* (February 1998): 35 51.

Edens, Neile K. "Representative Components of Functional Food Science." *Nutrition Today* (July 1999): 152.

McCord, Holly. "You say 'tomato' and I Say 'Terrific.'" *Prevention* (April 1995): 52.

Zoler, Mitchel L. "Lycopene May Reduce Prostate Cancer Tumor Grade." *Family Practice News* (May 1999): 28.

ORGANIZATIONS

American Heart Association, National Center. 7272 Greenville Avenue, Dallas, TX 75231. http://www.americanheart.org.

National Cancer Institute. Public Inquiries Office. Building 31, Room 10A03, 31 Center Drive, MSC 2580, Bethesda, MD 20892. http://www.nci.nih.gov.

OTHER

Heinz Institute of Nutritional Sciences. http://www.lycopene.org.

Genevieve Slomski
Teresa Norris

Lycopodium

Description

Lycopodium (*Lycopodium clavatum*) is a perennial evergreen plant that grows in pastures, woodlands, heaths, and moors of Great Britain, Northern Europe, and North America. It has a slender stem that trails along the ground and vertical branches that grow to 3 to 4 in (7.5–10 cm). The plant belongs to the (*Lycopodiaceae* family and is related to mosses and ferns. It is often called **club moss**. Other names include wolf's claw, stag horn, witch meal, and vegetable sulfur.

The pale yellow pollen collected from the spores is used to make the homeopathic remedy called lycopodium. The pollen is odorless, water resistant, and highly flammable. For this reason, it used to be a component of fireworks. It was also formerly used to create a coating for pills and as a powder for medical gloves.

Early physicians used the plant to stimulate the appetite and to promote urination and the excretion of other body fluids. Lycopodium was also used in the treatment of flatulence, rheumatism, **gout**, lung ailments, and diseases of children and young girls. In the seventeenth century the pollen was used as an internal remedy for **diarrhea**, dysentery, and rheumatism. Externally, the pollen was a treatment for **wounds** and diseases of the skin such as **eczema**. The whole plant was used to heal kidney ailments.

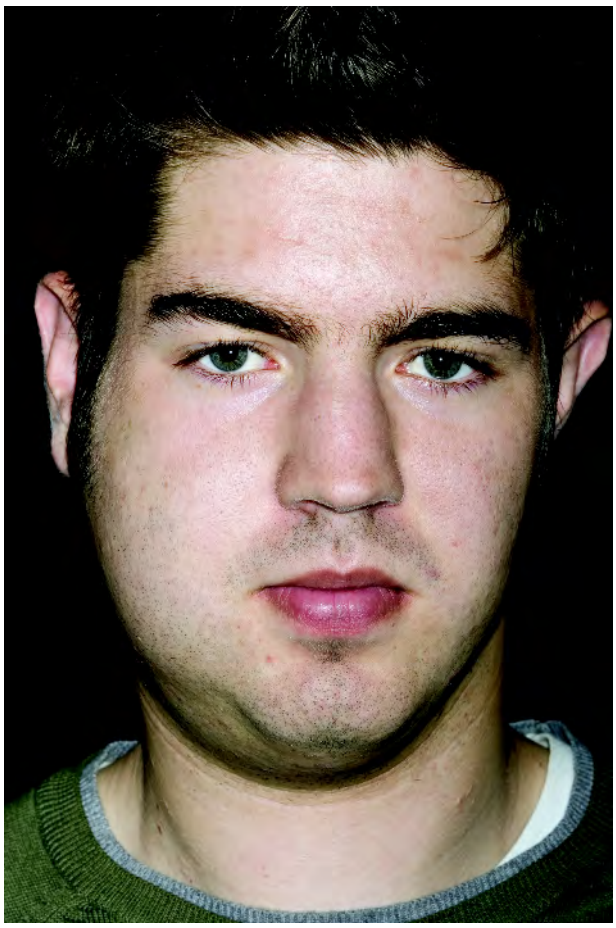
General use

Lycopodium is prescribed by homeopaths for both acute and chronic ailments such as earaches, sore throats, digestive disorders, urinary tract difficulties, prostatitis, and eye conditions. The remedy acts on soft tissues, blood vessels, bones, joints, the liver, and the heart. This polychrest is also recommended in the treatment of back **pain**, **bedwetting**, fevers, **food poisoning**, mouth ulcers, **mumps**, colds, **muscle cramps**, **constipation**, coughs, cystitis, **gas**, **sciatica**, gout, skin conditions, and joint pain. It is often indicated in the early stages of **pneumonia**. The levo-tetrahydropalmatine in lycopodium serratum preparations (also known as *Jin bu haun*) has sedative and analgesic properties.

***Lycopodium clavatum* is a perennial evergreen plant that grows in pastures, woodlands, heaths, and moors of Great Britain, Northern Europe, and North America.** *(Gregory K. Scott / Photo Researchers, Inc.)*

According to homeopaths, lycopodium ailments are frequently the result of anger, horror, chagrin, disappointment, grief, fright, mental exertion, sexual excesses, overeating, or alcohol consumption. Typical lycopodium patients are alcoholic, timid, and fearful adults, irritable and domineering children, or intellectuals who are strong in mind but weak in body. The latter generally look older than they are and their hair becomes gray prematurely. Children who require lycopodium are prone to **tonsillitis**, gas, and bronchial **infections**. They have tantrums if they do not get their way and dislike naps, often kicking and screaming beforehand or upon waking.

Homeopaths may believe that patients likely to use lycopodium are predisposed to lung ailments, gas, and



Lycopodium can aid in the treatment of mumps, pictured above. *(Dr. P. Marazzi / Photo Researchers, Inc.)*

gallstones. They have weak digestive systems and often suffer from dyspepsia, **colitis**, or gastro-enteritis. They become full soon after beginning a meal or have no appetite until eating, whereupon they become ravenous. They may crave sweets and dislike oysters, onions, cabbage, and milk. Their stomachs are often bloated, gassy, acidic, and sour, and are worse from cold drinks, beer, coffee, or fruit. They may become sleepy after eating.

Mentally these persons are irritable, restless, quarrelsome, sensitive, weepy, melancholy, and depressed. Other mental symptoms include dullness, confusion, poor memory, amnesia, anger, hypersensitivity to noise, sadness, and **anxiety** upon waking. They frequently suffer from performance anxiety and are nervous in social situations. They do not prefer the company of others and although they dread the presence of new persons, friends, or visitors, they are afraid to be alone.

Ailments are generally worse on the right side of the body, often traveling from right to left or from above downward. Symptoms are worse between 4:00 and 8:00 p.m. and worsen with cold food and drinks. Exhaustion and illness may set in after much physical exertion. Symptoms are generally worse from cold conditions with the exception of head and spine symptoms, which are worse from warmth. Symptoms are better from open air, warm drinks, and motion.

Specific indications

Physical indications are hunger with sudden fullness, urine with a red sandy color, gas, **fatigue**, numbness of fingers or toes, and a trembling of the limbs. Liver ailments such as **cirrhosis**, **hepatitis**, fatty degeneration of the liver, and liver **cancer** warrant the use of this remedy.

Periodic headaches result from digestive disturbances. If lycopodium patients miss a meal, they may get a **headache**, which is relieved upon eating.

The **sore throat** that typically warrants using this remedy is sore on the right side, with swollen tonsils. The throat feels dusty and is better after swallowing warm drinks.

The cold indicative of lycopodium is accompanied by a headache, yellow mucous, and a stuffed, dry nose. The patient often has to breathe out of his mouth. The lycopodium **cough** is constant, deep and hollow. The chest is tight and the mucus that is expelled is salty, thick, and gray. The cough is worse in the evening.

Eye conditions may develop in which the eyes are inflamed and red and the eyelids are grainy.

When abdominal pains are present they are of a cutting, griping, clutching, or squeezing nature. Gas is accompanied by a bloated abdomen that relieved after passing gas and by wearing loose clothing. The gas is worse after eating.

Joint pains are typically tearing pains that start on the right side and move to the left side. The knee and finger joints are especially stiff. Pains are better from continued movement or warmth and worsened during **fever**, sitting still, and initial movement.

The typical lycopodium patient has a pale, sickly face that is often covered with skin eruptions. Eczema, **psoriasis**, **rashes**, herpetic eruptions, and brown and yellow spots on the skin are common.

Men may be impotent. Women often suffer from inflammation and pain of the ovaries and uterus. The pain generally affects the right ovary more than the left.

Preparations

The spores of the plant are gathered at the end of the summer. The pollen is extracted from the spores and diluted with milk sugar.

KEY TERMS

Polychrest—A homeopathic remedy that is used in the treatment of many ailments.

Lycopodium is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or healthcare practitioner should be consulted. The recommended dose of lycopodium should not be exceeded.

In the United States, herbal remedies are considered dietary supplements, which are not standardized. Although it was regulated under the 1994 Dietary Supplement Health and Education Act (DSHEA), there are no safety reviews or FDA approved therapeutic uses for lycopodium. In addition, herbal remedies are not standardized and preparations of lycopodium can vary greatly. Therefore, it is important to read labels carefully and consult a physician before taking this or any other herbal supplement.

Side effects

Liver toxicity and hepatitis have been reported in several studies, with associated symptoms, including liver enlargement, **jaundice**, fever, fatigue, **nausea**, abdominal pain, and **itching**. Therefore, patients should consult their doctor before using this supplement, particularly if they have known or suspected liver disease.

Interactions

When taking any homeopathic remedy, it is advised to avoid **peppermint** products, coffee, or alcohol. These products may cause the remedy to be ineffective.

Lycopodium is incompatible with the remedy coffea. These remedies should not be taken simultaneously.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines,* 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

PERIODICALS

Gola, Edyta M., Judith A. Jernstedt, and Beata Zagorska Marek. "Vascular Architecture in Shoots of Early Divergent Vascular Plants, *Lycopodium clavatum* and *Lycopodium annotinum*." *New Phytologist* 174, no. 4 (June 2007): 774 786.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

National Center for Complementary and Alternative Medicine, National Institutes of Health, 9000 Rockville Pike,, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Office of Dietary Supplements, National Institutes of Health, 6100 Executive Blvd., Room 3B01, MSC 7517, Bethesda, MD, 20892 7517, (301) 435 2920, http://ods.od.nih.gov.

Jennifer Wurges
Angela M. Costello

Lycopus

Defintion

Lycopus is a genus within the family *Lamiaceae* consisting of about a dozen species. The plant is also known by a number of common names, primarily bugleweed and gypsywort.

Description

Lycopus is somewhat similar in appearance to mint, although lacking in mint's characteristic taste and odor. It is a perennial herb that may grow to about two feet in height. It produces small white or pale purple flowers at the base of leaves. Leaves are bright green, lobed, and pointed. Its prefer habitat is moist soil or wetlands. The primary chemical components of lycopus include tannins, lithospermic acid, lycopine, flavone–glycosides, phenolic derivatives, essential oil, **magnesium** and resin. These components are responsible for the plant's somewhat bitter and astringent taste.

Humans have used lycopus since ancient times for a variety of purposes. Its common name of gypsywort is said to have come from an ancient practice by members of the Roma culture in Eastern Europe in which extracts of the plant were used to dye the skin in order to produce a shade similar to that of the Egyptians. Interest in the use of lycopus for medical purposes in the United States was apparently sparked by an article written in 1822 by J. Smyth Rogers and James M. Pendleton, "Observations on the Lycopus Virginicus, or *Bugleweed*."

Herbalists and other practitioners use the leaves, stems, and flowers for their medicinal preparations.

Uses

The medicinal uses of lycopus have changed substantially over time. Traditionally it was used for a variety of purposes, including:

- treatment for coughs and sore throat
- as an astringent
- as a sedative or mild narcotic
- treatment of tuberculosis (consumption)
- treatment for heavy menstrual bleeding
- treatment for nosebleeds
- relief from anxiety

Modern medicinal applications of lycopus differ significantly from these traditional uses. Today, the plant is probably recommended most commonly for treatment of thyroid problems and palpitations. The herb is thought to be effective for these purposes because some of its components may reduce the activity of thyroid–stimulating hormone (TSH) and thyroxine, one of the primary hormones produced by the thyroid. Reduction of these hormones, in turn, is thought to relieve conditions of **hyperthyroidism**, which may be manifested in shaking and palpitations. The herb is also recommended, for this reason, for the treatment of Grave's disease, which is characterized by palpitations, shaking, and shortness of breath. The effectiveness of lycopus in the treatment of thyroid problems is less than that of synthetic drugs, but may be adequate to treat mild forms of the disorders.

Herbalists also suggest the use of lycopus for the treatment of a number of other diseases and disorders, including:

- cardiac problems
- dandruff
- as a sedative or mild narcotic
- excessive menstrual flow
- diuretic
- treatment for liver disorders
- breast and chest pain

As of 2008, the Natural Standard has found that "there is a lack of high–quality clinical trials investigating the safety and efficacy of bugleweed." The Natural Standard is an international research collaborative that collects and analyzes data on the safety and efficacy of complementary and alternative therapies.

KEY TERMS

Astringent—A substance that dries tissue, producing a "puckered" appearance and feeling.

Diuretic—A substance that tends to increase urine flow.

Grave's disease—A condition produced by excessive production of thyroid hormones, characterized by and enlarged thyroid gland and protruding eyeballs.

Hyperthyroidism—A condition resulting from overproduction of thyroid hormones.

Hypothyroidism—A condition resulting from underproduction of thyroid hormones.

Side effects

Although lycopus may be safely used by people with hyperthyroidism, it should not be ingested by individuals with normal thyroid function or **hypothyroidism**. In such cases, reduction in thyroid function could result in serious health problems and, possibly, death. The herb should also not be used by pregnant women or women who are breast feeding. Since there are no long–term studies on the overall safety of lycopus preparations, the product should be taken only under the advice and care of a health care professional.

Interactions

Preparations of lycopus may interact with drugs used for the treatment of thyroid problems since they may magnify or diminish the effects of the allopathic treatment. In general, there has been relatively little research on the interaction among herbal products or between herbs and allopathic drugs. For this reason, care should be taken in combining the use of lycopus products with other herbal and allopathic remedies.

Resources

BOOKS

Gruenwald, Joerg, Thomas Brendler, and Christof Jaenicke, eds.. *PDR for Herbal Medicines,* 4th edition. London: Thomson Healthcare, 2007.

Juta, C. Rupert. *Modern Diseases and Disorders, and Homeopathy*. Charleston, S.C.: BookSurge Publishers, 2007.

Karalliedde, Lakshman, Rita Fitzpatrick, and Debbie Shaw. *Traditional Herbal Medicines: A Guide to Their Safer Use*. London: Hammersmith Press, 2007.

Mars, Brigitte. *The Desktop Guide to Herbal Medicine: The Ultimate Multidisciplinary Reference to the Amazing*

Realm of Healing Plants, in a Quick study, One stop Guide. Laguna Beach, Calif.: Basic Health Publications, 2007.

PERIODICALS

Beer, A. M., K. R. Wiebelitz, and H. Schmidt Gayk. "Lycopus Europaeus (Gypsywort): Effects on the Thy roidal Parameters and Symptoms Associated with Thyroid Function." *Phytomedicine* (January 2008): 16 22.

Gibbons, S., et al. "Bacterial Resistance Modifying Agents from Lycopus Europaeus." *Phytochemistry* (January 2003): 83 87.

Vonhoff, C., et al. "Extract of Lycopus Europaeus L. Reduces Cardiac Signs of Hyperthyroidism in Rats." *Life Sciences* (February 2006): 1063 1070.

OTHER

Henriette's Herbal Homepage. "Lycopus. Bugleweed." http://www.henriettesherbal.com/eclectic/kings/lycopus.html (February 17, 2008).

iHerb.com. "Bugleweed." http://healthlibrary.epnet.com/GetContent.aspx (February 17, 2008).

Plants for a Future. "Lycopus virginicus L." http://www.pfaf.org/database/plants.php?Lycopus+virginicus (February 17, 2008).

David Edward Newton, Ed.D

Lyme disease

Definition

Lyme disease, which is also known as Lyme borreliosis, is an infection transmitted by the bite of ticks carrying the spiral-shaped bacterium (spirochete) *Borrelia burgdorferi* (Bb). The disease was named for Old Lyme, Connecticut, the town where it was first diagnosed in 1975, after a puzzling outbreak of arthritis. The spiral-shaped bacterium was named for its discoverer, Willy Burgdorfer. The effects of this disease can be long-term and disabling, unless it is recognized and treated properly with antibiotics.

Description

Lyme disease is a vector-borne disease, which means it is delivered from one host to another. It is also classified as a zoonosis, which means that it is a disease of animals that can be transmitted to humans under natural conditions. In this case, a tick bearing the Bb organism literally inserts it into a host's bloodstream when it bites the host to feed on its blood. It is important, however, to note that neither Bb nor Lyme disease can be transmitted directly from one person to another.

This Erythema migrans rash is one of the symptoms of Lyme disease, a common chronic disease in the United States and Europe. *(Adam Hart-Davis / Photo Researchers, Inc.)*

In the United States, Lyme disease accounts for more than 90% of all reported vector-borne illnesses. It is a significant public health problem and continues in the late 2000s to be diagnosed in increasing numbers. The Centers for Disease Control and Prevention (CDC) attributes this increase to the growing size of the deer herd and the geographical spread of infected ticks rather than to improved diagnosis. In addition, some epidemiologists believe that the actual incidence of Lyme disease in the United States may be 5–10 times greater than that reported by the CDC. The reasons for this difference include the narrowness of the CDC's case definition as well as frequent misdiagnoses of the disease.

Controversy clouds the true incidence of Lyme disease because no test is definitively diagnostic for the disease, and many of its symptoms mimic those of so many other diseases. Cases of Lyme disease have been reported in 49 of the 50 states; however, 92% of the 17,730 cases reported to the CDC in 2000 were from only nine states (Connecticut, Rhode Island, New York, Pennsylvania, Delaware, New Jersey, Maryland, Massachusetts, and Wisconsin). The disease is also found in Scandinavia, continental Europe, the countries of the former Soviet Union, Japan, and China; in addition, it is possible that it has spread to Australia.

The risk for acquiring Lyme disease varies, depending on what stage in its life cycle a tick has reached. A tick passes through three stages of development—larva, nymph, and adult—each of which is dependent on a live host for food. In the United States, Bb is borne by ticks

of several species in the genus *Ixodes*, which usually feed on the white-footed mouse and deer (and are often called deer ticks). In the summer, the larval ticks hatch from eggs laid in the ground and feed by attaching themselves to small animals and birds. At this stage they are not a problem for humans. It is the next stage—the nymph—that causes most cases of Lyme disease. Nymphs are very active from spring through early summer, at the height of outdoor activity for most people. Because they are still quite small (less than 2 mm in length), they are difficult to spot, giving them ample opportunity to transmit Bb while feeding. Although far more adult ticks than nymphs carry Bb, the adult ticks are much larger, more easily noticed, and more likely to be removed before the 24 hours or more of continuous feeding needed to transmit Bb.

Causes and symptoms

Lyme disease is a collection of effects caused by Bb. Once Bb gains entry to the body through a tick bite, it can move through the bloodstream quickly. Only 12 hours after entering the bloodstream, Bb can be found in cerebrospinal fluid (which means it can affect the nervous system). Treating Lyme disease early and thoroughly is important because Bb can hide for long periods within the body in a clinically latent state. That ability explains why symptoms can recur in cycles and can flare up after months or years, even over decades. It is important to note, however, that not everyone exposed to Bb develops the disease.

Lyme disease is usually described in terms of length of infection (time since the person was bitten by a tick infected with Bb) and whether Bb is localized or disseminated (spread through the body by fluids and cells carrying Bb). Furthermore, when and how symptoms of Lyme disease appear can vary widely from patient to patient. People who experience recurrent bouts of symptoms over time are said to have chronic Lyme disease.

Early localized Lyme disease

The most recognizable indicator of Lyme disease is a rash around the site of the tick bite. Often, the tick exposure has not been recognized. The area of rash eruption might be warm or itch. The rash—erythema migrans (EM)—generally develops within 3–30 days and usually begins as a round, red patch that expands. Clearing may take place from the center out, leaving a bull's-eye effect; in some cases, the center gets redder instead of clearing. The rash may look like a bruise on individuals with dark skin. Of those who develop Lyme disease, about 50% notice the rash; about 50% notice flu-like symptoms, including **fatigue**, **headache**, **chills** and **fever**, muscle and joint **pain**, and lymph node swelling. However, a rash at the site can also be an allergic reaction to the tick saliva rather than an indicator of Lyme disease, particularly if the rash appears in *less* than three days and disappears only days later.

Late disseminated disease and chronic Lyme disease

Weeks, months, or even years after an untreated tick bite, symptoms can appear in several forms:

- fatigue, forgetfulness, confusion, mood swings, irritability, numbness
- neurologic problems, such as pain (unexplained and not triggered by an injury), Bell's palsy (facial paralysis, usually one-sided but may be on both sides), and a mimicking of the inflammation of brain membranes known as meningitis (fever, severe headache, stiff neck)
- arthritis (short episodes of pain and swelling in joints) and other musculoskeletal complaints

In the past, Lyme arthritis occurred in 60% of patients with Lyme disease, but as of 2006, this number dropped to 10%.

Less common effects of Lyme disease are heart abnormalities (such as irregular rhythm or cardiac block) and eye abnormalities (such as swelling of the cornea, tissue, or eye muscles and nerves).

Diagnosis

A clear diagnosis of Lyme disease can be difficult and relies on information the patient provides and the doctor's clinical judgment, particularly through elimination of other possible causes of the symptoms. Lyme disease may mimic other conditions, including **chronic fatigue syndrome** (CFS), **multiple sclerosis** (MS), and other diseases with many symptoms involving multiple body systems. Differential diagnosis (distinguishing Lyme disease from other diseases) is based on clinical evaluation with laboratory tests used for clarification, when necessary. A two-test approach is common to confirm the results. Because of the potential for misleading results (false-positive and false-negative), laboratory tests alone cannot establish the diagnosis.

Doctors generally know which disease-causing organisms are common in their geographic area. The most helpful piece of information is whether a tick bite or rash was noticed and whether it happened locally or while traveling. Doctors may not consider Lyme disease if it is rare locally, but will take it into account if a

patient mentions vacationing in an area where the disease is commonly found.

Treatment

While antibiotics are essential in treating Lyme disease, many alternative therapies may minimize symptoms, improve the immune response, and help treat late disseminated or chronic disease. General nutritional guidelines include drinking plenty of fluids and eating cooked whole grains and fresh vegetables. The intake of sugar, fat, refined carbohydrates, and dairy products should be reduced. Alternative therapies used in treating Lyme disease include:

- Chinese medicine. Formulae used to treat systemic bacterial infections include Wu Wei Xiao Du Yin (Five-Ingredient Decoction to Eliminate Toxin), Yin Hua Jie Du Tang (Honeysuckle Decoction to Relieve Toxicity), and Huang Lian Jie Du Tang (Coptis Decoction to Relieve Toxicity). Inflammation at the site of infection may be treated externally with Yu Lu San (Jade Dew Extract) or Jin Huang San (Golden Yellow Powder). Specific Chinese herbs and treatments can be used for specific symptoms. For examples, for systemic bacterial infection, one may use honeysuckle flower, forsythia, isatidis, scutellaria, and phellodendron. Acupuncture and ear acupuncture treatments are also used.
- Herbals. Botanical remedies include Echinacea (*Echinacea* species) to clear infection and boost the immune system, goldenseal (*Hydrastis canadensis*) to clear infection and boost the immune system, garlic to clear bacterial infection, and spilanthes (*Spilanthes* species) for spirochete infections.
- Hydrotherapy. The joint pain associated with Lyme disease can be treated with hydrotherapy. Dull, penetrating pain may be relieved by applying a warm compress to the affected area. Sharp, intense pain may be relieved by applying an ice pack to the affected area.
- Imagery. The patient may treat Lyme disease by visualizing Bb as looking like ticks swimming in the bloodstream being killed by the flame of a candle.
- Probiotics. Probiotics is treatment with beneficial microbes either by ingestion or through a suppository. Probiotics can restore a healthy balance of bacteria to the body in cases in which long-term antibiotic use has caused diarrhea or yeast infection. Yogurt or *Lactobacillus acidophilus* preparations may be ingested.
- Supplements. Calcium and magnesium can be used for aches, chlorophyll to aide healing, vitamin C for bacterial infection and inflammation, bioflavonoids for joint inflammation and to boost the immune system, digestive enzyme for digestive problems, vitamin B complex to boost overall health, bromelain for inflammation, and zinc to boost the immune system and promote healing.

Allopathic treatment

For most patients, oral antibiotics (doxycycline or amoxicillin) are prescribed for 21 days. The doctor may have to adjust the treatment regimen or change medications based on the patient's response. Antibiotics can kill Bb while it is active, but not when it is dormant. When symptoms indicate nervous system involvement or a severe episode of Lyme disease, intravenous antibiotic (ceftriaxone) may be given for 14–30 days. Adults with late neurologic Lyme disease are often treated with intravenous ceftriaxone for a period of two to four weeks. Alternative treatments are intravenous cefotaxime or penicillin G.

Treatment for Lyme disease is a source of controversy. Some scientists believe that it is cured after a four-antibiotic regime and that further antibiotic treatment could result in drug allergy. Other researchers, however, believe that the B. burgdorferi may remain in a dormant state within human cells, necessitating another course of treatment.

Expected results

If aggressive antibiotic therapy is given early and the patient cooperates fully and sticks to the medication schedule, recovery should be complete. Only a small percentage of Lyme disease patients fail to respond or relapse (have recurring episodes). Most long-term effects of the disease result when diagnosis and treatment is delayed or missed. Co-infection with other infectious organisms spread by ticks in the same areas as Bb (babesiosis and ehrlichiosis, for instance) may be responsible for treatment failures or more severe symptoms. In certain cases, Lyme disease has been responsible for deaths, but that is rare. Most fatalities reported with Lyme disease involved patients co-infected with babesiosis.

Prevention

Vaccination withdrawn

A vaccine for Lyme disease known as LYMErix was available from 1998 to 2002, when it was removed from the U.S. market. The decision was influenced by reports that LYMErix may be responsible for neurologic complications in vaccinated patients. Researchers from Cornell-New York Hospital presented a

paper at the annual meeting of the American Neurological Association in October 2002 that identified nine patients with neuropathies linked to vaccination with LYMErix. In April 2003, the National Institute of Allergy and Infectious Diseases (NIAID) awarded a federal grant to researchers at Yale University School of Medicine to develop a new vaccine against Lyme disease. As of 2008, the best prevention strategy was through minimizing risk of exposure to ticks and using personal protection precautions.

Minimizing risk of exposure

Precautions to avoid contact with ticks include moving leaves and brush away from living quarters. In highly tick-populated areas, each individual should be inspected at the end of the day to look for ticks. Most important are personal protection techniques when outdoors:

- Avoid walking through woods, shrubbery, or tall grasses.
- Use repellents containing DEET.
- Wear light-colored clothing to maximize ability to see ticks.
- Tuck pant legs into socks or boot top.
- Check children and pets frequently for ticks.

Minimizing risk of disease transmission

The two most important factors are removing the tick quickly and carefully, and seeking a doctor's evaluation at the first sign of Lyme disease. When in an area that may be tick-populated, follow these precautions:

- Although ticks are quite small, check for them, particularly in the area of the groin, underarm, behind ears, and on the scalp.
- Stay calm and grasp the tick as near to the skin as possible, using tweezers.
- To minimize the risk of squeezing more bacteria into the site of the bite, pull straight back steadily and slowly.
- Do not use petroleum jelly, alcohol, or a lit match to remove the tick.
- Place the tick in a closed container (for species identification later, should symptoms develop) or dispose of it by flushing it in a toilet.
- See a physician for any sort of rash or patchy discoloration that appears 3–30 days after a tick bite.

KEY TERMS

Babesiosis—A disease caused by protozoa of the genus *Babesia* characterized by a malaria-like fever, anemia, vomiting, muscle pain, and enlargement of the spleen. Babesiosis, like Lyme disease, is carried by a tick.

Bell's palsy—Facial paralysis or weakness with a sudden onset, caused by swelling or inflammation of the seventh cranial nerve, which controls the facial muscles. Disseminated Lyme disease sometimes causes Bell's palsy.

Blood-brain barrier—A blockade of cells separating the circulating blood from elements of the central nervous system (CNS); it acts as a filter, preventing many substances from entering the central nervous system.

Cerebrospinal fluid—Clear fluid found around the brain and spinal cord and in the ventricles of the brain.

Disseminated—Scattered or distributed throughout the body. Lyme disease that has progressed beyond the stage of localized EM is said to be disseminated.

Erythema migrans (EM)—A red skin rash that is one of the first signs of Lyme disease in about 75% of patients.

Lyme borreliosis—Another name for Lyme disease.

Probiotics—Treatment with beneficial microbes, either by ingestion or through a rectal or vaginal suppository, to restore a healthy balance of bacteria to the body.

Spirochete—A spiral-shaped bacterium. The bacteria that cause Lyme disease and syphilis, for example, are spirochetes.

Vector—An animal carrier that transfers an infectious organism from one host to another. The vector that transmits Lyme disease from wildlife to humans is the deer tick or black-legged tick.

Zoonosis (plural, zoonoses)—Any disease of animals that can be transmitted to humans under natural conditions. Lyme disease and babesiosis are examples of zoonoses.

Resources

PERIODICALS

Craig, David J., and Amy Sarah Clark. "Rash Judgment?" *Columbia Magazine* (Summer 2007). http://www.columbia.edu/cu/alumni/Magazine/Summer2007/contents.html (February 28, 2008).

Wormser, Gary P. "Early Lyme Disease." *New England Journal of Medicine* (2006): 2794 2801. http://www.uchc.edu/md/obgyn/Articles/2006/Sept/Early_Lyme_Disease_6_06.pdf (February 28, 2008).

OTHER

"Bell's Palsy." *National Institute of Neurological Disorders and Stroke* February 4, 2008. http://www.ninds.nih.gov/disorders/bells/bells.htm (February 28, 2008).

"Learn about Lyme Disease." *Centers for Disease Control and Prevention, Division of Vector Borne Infectious Diseases*. http://www.cdc.gov/ncidod/dvbid/lyme/ (February 28, 2008).

ORGANIZATIONS

Centers for Disease Control and Prevention, 1600 Clifton Rd. NE, Atlanta, GA, 30333, (800) 311 3435, (404) 639 3311, http://www.cdc.gov.

Lyme Disease Foundation, One Financial Plaza, Hartford, CT, 06103, (800) 886 LYME , http://www. lyme.org.

Lyme Disease Network of NJ, 43 Winton R., East Bruns wick, NJ, 08816, http://www.lymenet.org.

National Institute of Allergy and Infectious Diseases (NIAID), 31 Center Dr., Room 7A50 MSC 2520, Bethesda, MD, 20892, (301) 496 5717, http://www.niaid.nih.gov.

Belinda Rowland
Rebecca J. Frey, PhD
Rhonda Cloos, RN

Lymphatic drainage

Definition

Lymphatic drainage is a therapeutic method that uses massage-like manipulations to stimulate lymph movement. Lymph is the plasma-like fluid that maintains the body's fluid balance and removes bacteria. Combined with other techniques of complete decongestive physiotherapy, it is used to treat lymphedema, swelling in the limbs caused by lymph accumulation.

Origins

The use of massage and compression techniques to treat swollen arms and legs was pioneered by Alexander Von Winiwarter, a nineteenth-century surgeon from Belgium. These techniques were refined during the 1930s by Danish massage practitioner Emil Vodder into what is now known as manual lymph drainage. During the 1980s, German physician Michael Foldi combined lymph drainage with other techniques to develop complete decongestive physiotherapy, widely used in the treatment of lymphedema.

Benefits

Lymphatic drainage is said to beneficially effect the nervous, immune and muscular systems. Its primary purpose is the treatment of lymphedema, a condition that causes unattractive swelling of arms and legs and creates an environment ripe for infection.

Description

Lymphatic drainage is accomplished by gentle, rhythmic massage following the direction of lymph flow. Mild stretching movements are used on the walls of lymph collectors to redirect the flow away from blocked areas into other vessels that drain into the veins. This massage action is often combined with other elements of complex decongestive therapy, which include:

- bandages
- dietary changes
- skin and nail care to prevent infection
- therapeutic exercise
- special compression sleeves, stockings, and other garments
- patient-applied lymphatic drainage and bandaging techniques
- light-beam generators to stimulate lymphatic drainage

Precautions

Any patient who has undergone **cancer** surgery and experiences sudden swelling after lymphatic drainage should stop treatment and be examined by a medical doctor. Treatment should also be stopped if infection of the lymphatic vessels occurs. The U.S. National Lymphedema Network recommends that patients taking anticoagulants for vascular disease be first checked for **blood clots** using ultrasound or other technology, and followed closely during the treatment. Congestive heart failure patients who may not be able to tolerate excessive movement of lymph need close monitoring also. If any **pain** is associated with lymphatic drainage, the treatment should stop until either the source is discovered or the pain goes away.

Side effects

There are concerns that lymphatic drainage and associated techniques could cause cancer to spread in patients with recurrent or metastatic disease.

A therapist performs lymphatic drainage on a woman. *(© Arco Images / Alamy)*

Research and general acceptance

Lymphatic drainage has enjoyed widespread acceptance in Europe for several decades, and is gaining acceptance within the North American medical establishment.

Training and certification

Lymphatic drainage therapy procedures are most commonly done by osteopaths, chiropractors, physical therapists, occupational therapists, massage therapists, and nurses. Training is available from a number of institutions, and typically involves about 30–130 hours. The Florida-based Academy of Lymphatic Studies offers certification in manual lymph drainage and complete decongestive therapy.

Resources

National Lymphedema Network.Latham Square, 1611 Telegraph Avenue, Suite 1111, Oakland, CA 94612 2138. (800) 541 3259. www.lymphnet.org.

David Helwig

Lymphomas *see* **Hodgkin's disease**

Lysimachia

Description

Several different species of the plant known as lysimachia (genus *Lythrum*) exist. Lysimachia is in the Primulae family. The various species are known by a variety of common names, such as willow herb, purple willow herb, long purples, moneywort, rainbows, soldiers, creeping Jenny, and purple and yellow loosestrife. Other common names include flowering Sally and soldanella, trientalis, and alvet. It is also known through out the world as salicaire, braune, and rother. Lysimachia has no smell but a slightly bitter taste, with astringent properties.

Lysimachia is a perennial found throughout Europe, Russia, central Asia, Australia, and North America. It is an attractive, mainly low-growing plant, with a creeping habit, and deep taproots. Some species can grow to about 4 ft (1.2 m) high. It primarily grows in a damp habitat, preferring riversides and swamps. It flowers from June to August.

Lysimachia punctata. *(© Arco Images / Alamy)*

The flowers, which can be either yellow or purple, are quite eye-catching, and are generally about 1 in (2.54 cm) across, arranged in cone shaped clusters. The leaves of the loosestrife species are downy, yellowish, and about 1 in (2.54 cm) long, although in some species they can be 3-6 in (7.62-15.24 cm). The stems are square and hairy.

All species of lysimachia are commonly used as ornamental plants. They prefer shade, but all grow and multiply readily. Purple loosestrife is successful to such an extent that in parts of the United States, it has been declared a danger to wetlands, as it tends to quickly dominate and force out other species of local flora.

General use

Loosestrife was once widely employed as a medicinal herb, but it has become less popular in modern times. The different species have various medicinal uses, many of which are related to the plants' flavonoids, saponins and phenolic acids.

Yellow loosestrife

Lysimachia vulgaris is the largest of the lysimachia varieties, and is also known as willow herb, willow wort, and wood pimpernel. Its yellow flowers have red stems. Yellow loosestrife is generally larger than purple loosestrife. Yellow loosestrife has been recommended as an antidote to hemorrhage and excess **menstruation**. The smoke created by burning the plant can be used as an insect repellent. In other parts of the world, its smoke is also used to keep snakes away. In addition, it is credited with having a sedative effect, which may explain why some folk customs recommend its use for banishing discord. Loosestrife means "to tame strife." Yellow loosestrife is also used to make a yellow hair dye.

Purple loosestrife

Like other species of lysimachia, the whole herb of purple loosestrife is said to have astringent and demulcent properties. Herbalists say that it is unusual to find both these properties in any one herb.

Purple loosestrife has been used as a lymphatic cleanser. Many of its other properties are similar to those attributed to other species. It may be particularly valuable as a remedy for many of today's gastrointestinal (GI) tract diseases, such as Crohn's disease, **irritable bowel syndrome**, leaky gut syndrome, and others, as it is an effective cure for **diarrhea** and is also an effective anti-inflammatory, with healing properties.

It also has properties that enable it to lower blood-glucose levels, so herbalists consider it valuable as an adjunct to diabetes treatment.

Creeping jenny

Creeping jenny (*Lysimachia numularia*) is one of the smaller species of lysimachia, reaching only about 4 in (10.16 cm) in height. It is also known as moneywort, herb tuppence, string of sovereigns, wandering jenny, wandering sally, creeping charlie, and creeping john. Its leaves are smooth, and it is a leafy trailing plant. The stems may grow to about 4 ft (1.2 m) long. It has small bright yellow flowers that will last all summer if conditions are right.

Like yellow and purple loosestrife, it is known as a deterrent to vermin and insects when burned. In common folklore, it symbolizes peace.

It may be used as a decoction, ointment, or as a poultice for infected **wounds**.

Irish folklore

The various species of lysimachia are common to the British Isles, and are well known to folk medicine. In Irish folklore, lysimachia was known as *lus na s'iochana, earball cait'in,* and *cr'eachtach*. It was believed that its use would discourage bad feeling and discord between the inhabitants of a house. It was also used as a dye and as a medicinal tonic.

Herbalists consider lysimachia to be an effective antidote to diarrhea and have used it effectively to counter outbreaks of dysentery in Switzerland. It is said to be particularly suitable for treating diarrhea in infants. Other medicinal uses include leucorrhea, **tuberculosis**, fevers, liver disease, and even cholera and typhoid. It can also be used as an antiseptic, healing wash for wounds and sores. Made up into an ointment, it is said to be useful for fading scars.

Lysimachia has a reputation for healing eye ailments, and is said to be able to restore sight in certain conditions. Some practitioners say it is superior to **eyebright** for these purposes. It is recommended as a treatment for **macular degeneration**.

It can also be used as an antiseptic gargle to cure throat **infections** and is said to be good for quinsy, which is an infected and very painful throat condition. Loosestrife has astringent properties, and has been used in the leather-tanning process.

It is said to be useful for the treatment of **whooping cough** when boiled with wine or honey.

Preparations

The dried herb may be used as an infusion or decoction. Generally, the whole herb is used. It was once commonly made up into an ointment for the treatment of **cuts** and **bruises**.

To make a useful gargle or eyewash, herbalists recommend mixing half a teaspoon of salt into two cups of boiling water, adding 1-2 tsp of the dried herb or 1-2 tbsp if fresh. Once the mixture has steeped for 10–15 minutes, it is allowed to cool before use. The mixture should be kept covered if used as an eyewash, to avoid contamination.

Precautions

Purple loosestrife may be taken up to three times daily for short periods.

Side effects

Lysimachia tends to have a high tannin content, and because of this, it should not be used as a remedy over long periods of time, as it may lead to deficiencies in valuable minerals.

KEY TERMS

Decoction—An infusion allowed to boil to obtain a more concentrated liquid.

Demulcent—Soothing to the skin.

Infusion—Made up in the form of a tea.

Leukorrhea—Also known as yeast infection, a fungal infection of the vagina producing a thick white discharge.

Macular degeneration—Degeneration of the area of the eye that is responsible for vision, often comes with aging.

Poultice—A mixture of herbs or other substances applied to wounds and inflammations to draw out impurities and inflammation.

Quinsy—Acute inflammation of the tonsils and throat area that often results in abscesses.

Interactions

Lysimachia is not known for its toxicity, and no records of any interaction have been found.

Resources

BOOKS

Chevallier, Andrew *Encyclopedia of Herbal Medicine: The Definitive Home Reference Guide to 550 Key Herbs with All Their Uses as Remedies for Common Ailments Complete Herbal*. New York: DK, 2006.

Hoffmann, David. *Medical Herbalism: The Science Princi ples and Practices Of Herbal Medicine*.Rochester, VT: Healing Arts Press, 2003.

Patricia Skinner
Leslie Mertz, Ph.D.

Lysine

Description

Lysine is an amino acid not produced by the body, but essential to the synthesis of protein molecules in the body. It is necessary for tissue repair and growth, and for producing antibodies, enzymes, and hormones.

Lysine is found in other protein sources, such as red meats, chicken, and turkey. Most individuals have an adequate intake of lysine from their normal diet. However, lysine levels may be low in vegetarians and low-fat dieters. Without enough lysine or any other of the eight essential **amino acids**, the body cannot build protein to sustain muscle tissue and carry out other essential body functions.

General use

The body uses L-lysine to synthesize protein. Since amino acid molecules are asymmetrical, each amino acid exists as both a right- and left-handed form, distinguished as D (for dextro, or right) and L (for levo, or left). As a supplement, L-lysine is used to treat the herpes simplex virus, help prevent **osteoporosis** and **cataracts**, and boost the immune system.

Herpes simplex virus remedy

In the 1950s, scientists discovered that foods containing certain amino acids could encourage or discourage the growth of the herpes virus. When added to the herpes virus, the amino acid **arginine** increases the growth of the virus. Lysine, by contrast, suppresses growth. Since the virus can cause cold sores, **canker sores**, and genital sores, L-lysine supplements increase the ratio of lysine to arginine in the body, preventing outbreak of the virus. Avoiding foods with arginine and eating foods with a higher lysine content helps alleviate the symptoms of the virus.

Foods containing arginine:

- legumes, especially soy
- fish and shellfish
- poultry
- spinach and seaweed
- nut and seed products

Foods containing lysine:

- fish and shellfish
- poultry
- red meats, especially game products
- eggs

Other uses

Lysine also promotes the body's absorption of **calcium**, helping to prevent osteoporosis. It slows the damage to the eyes caused by diabetes, and it may help prevent **atherosclerosis**. Since it is used to slow the growth of the herpes simplex virus, its antiviral properties may help treat **chronic fatigue syndrome**, **hepatitis**, and HIV.

KEY TERMS

Amino acid—An organic compound that contains both an amino ($-NH_2$) and carboxyl (-COOH) group. They are the constituents from which proteins are made.

Osteoporosis—A medical condition characterized by loss of bone mass, often leading to a greater risk for broken bones, especially in older women.

Preparations

L-lysine is best taken as a single supplement and not in combination with other amino acids. Such combinations are touted as nutritional supplements that build more muscle and are often used by athletes and bodybuilders. However, too much protein **strains** the functions of the liver and kidneys and can cause other health problems. The single supplement should be taken on an empty stomach because larger amounts of the amino acid can build up in the blood and brain, enhancing its health benefits. Supplements are best used by individuals suffering from a herpes outbreak or by vegetarians and low-fat dieters. Postmenopausal women can take lysine to encourage absorption of calcium by the body.

Precautions

Supplemental combinations of amino acids are not recommended to build muscle. Excessive build-up of protein in the body can cause kidney and liver problems.

Some consumers are sensitive or allergic to soybeans, a popular food used by vegetarians to replace the natural supply of lysine found in many meats. However, researchers have made progress in creating soybeans that are tolerated by consumers with those sensitivities by shutting off a gene in soybean seeds believed responsible for causing the **allergies**.

Side effects and interactions

As of 2008, no side effects or interactions had been identified.

Resources

BOOKS

Braverman, Eric R. *The Healing Nutrients Within: Facts, Findings, and New Research on Amino Acids*. Laguna Beach, CA: Basic Health, 2006.

Marshall, Keri. *User's Guide to Protein and Amino Acids*. Laguna Beach, CA: Basic Health, 2006.

Sahyun, Melville. *Proteins and Amino Acids in Nutrition*. Toronto: Richardson Press, 2007.

PERIODICALS

Benevenga, Norline J., and Kenneth P. Bleming. "Unique Aspects of Lysine Nutrition and Metabo lism." *Journal of Nutrition* (June 2007): 1610S 1615S.

Singh, Betsy B., et al. "Safety and Effectiveness of an L lysine, Zinc, and Herbal Based Product on the Treatment of Facial and Circumoral Herpes." *Alternative Medicine Review* (June 2005): 123 127.

OTHER

"Lysine." University of Maryland Medical Center. http:// www.umm.edu/altmed/articles/lysine 000312.htm. (February 15, 2008).

Jacqueline L. Longe
Teresa G. Odle
David Edward Newton, Ed.D.

M

Ma huang *see* **Ephedra**

Mace *see* **Nutmeg**

Macrobiotic diet

Definition

A macrobiotic diet is part of a philosophy of life that incorporates the ancient Oriental concept of yin and yang. The diet itself consists mainly of brown rice, other whole grains, and vegetables. It requires foods to be cooked over a flame, rather than by electricity or microwave.

Origins

The term macrobiotics comes from two Greek words; *macro* (great) and *bios* (life). The macrobiotic diet is believed to have originated in nineteenth century Japan, with the teachings of Sagen Ishizuka, a natural healer. George Ohsawa (1893–1966), a Japanese teacher and writer, introduced macrobiotics to Europeans in the 1920s. Ohsawa claims to have cured himself of **tuberculosis** by eating Ishizuka's diet of brown rice, soup, and vegetables. The diet did not attract much attention in the United States until the mid-1960s, when Ohsawa's book *Zen Macrobiotics* was published and became a best seller, especially among the 1960s counterculture. The diet's popularity heightened when the macrobiotic philosophy was embraced by former Beatle John Lennon (1940–1980) and his wife, Yoko Ono (1933–). The macrobiotic diet has changed somewhat over the past forty years. Originally it recommended moving through stages of food elimination to achieve a diet that consisted almost solely of brown rice and water. These nutritionally unsafe dietary guidelines have mostly been replaced with a more moderate and balanced approach to eating.

Benefits

In the macrobiotic diet, foods are selected for their metaphysical qualities rather than their nutritional value. The regime, which is high in whole grains, vegetables, beans, and **soy protein**, has many of the same benefits as a vegetarian or vegan diet. Numerous scientific studies have shown that a diet of this type can significantly reduce the risk of diabetes, **heart disease**, **stroke**, and various cancers. The macrobiotic diet is rich in vitamins, high in dietary fiber, and low in fatty foods.

Description

In addition to its holistic approach to **nutrition**, macrobiotics applies these beliefs to life in general. Its philosophy recommends the following behaviors:

- eating two or three meals a day
- chewing each mouthful of food approximately 50 times to aid digestion and absorption of nutrients
- avoiding food for at least three hours before bedtime
- taking short baths or showers as needed, with warm or cool water
- consuming only organic foods
- using cast iron, clay pots, or stainless steel cookware
- cooking frequently with methods that use liquids (e.g. pressure cooking, boiling, steaming, soups, stews) instead of dry cooking methods (baking, broiling)
- eating nothing that is commercially processed and contains food additives
- taking no dietary supplements
- using grooming, cosmetic, and household products made from natural, non-toxic ingredients

Macrobiotic food. *(© isifa Image Service s .r.o.)*

- wearing only cotton clothing and avoiding metallic jewelry
- spending as much time as possible in natural outdoor settings and walking at least 30 minutes daily
- doing such aerobic or stretching exercises as yoga, dance, or martial arts on a regular basis
- placing large green plants throughout the house to enrich the oxygen content of the air, and keeping windows open as much as possible to allow fresh air circulation
- avoiding food preparation with electricity or microwaves; using gas or wood stoves; and using only cast iron, stainless steel, or clay cookware
- avoiding television viewing and computer use as much as possible

The macrobiotic diet assigns yin and yang energies to foods. Yin represents female or cool, dark, inwardly focused energy. Yang represents male or warm, light, outwardly focused energy. In this ancient Asian philosophy, everything in the universe is assigned a yin or yang quality. For good mental and physical health and a harmonious life, yin and yang forces must be balanced. This balance must be reflected in the food the individual eats. Because environmental yin and yang forces change with the seasons, with climate, and time of day, the diet must also change with them.

Meat, fish, poultry, eggs, and hard cheeses are considered yang, while milk, cream, fruit juice, alcohol, and sugar are yin. The macrobiotic diet consists mainly of foods in the middle, such as brown rice and other whole grains, beans, vegetables, fruit, and nuts. The diet is flexible, and allows fish on occasion. Its flexibility enhances its appeal. The macrobiotic diet allows people to design their own food regimens based on their personal requirements, environment, and medical conditions.

One of the principles of the macrobiotic diet is that people should primarily eat organically grown foods native to their climate and area. The theory is that human health depends on the ability to adapt to changes in the environment. When people eat foods

from a climate that differs from where they live, they lose that adaptability. Proponents of the macrobiotic diet claim that as society has moved away from its traditional ecologically based diet, there has been a corresponding rise in chronic illness. Therefore, for optimal health, the belief is that people need to return to a way of eating based on foods produced in their local environment, or at least grown in a climate that is similar to where they live.

Foods considered yang (contracted energy) last longer and can originate from a wide geographic area. Sea salt and sea vegetables are examples of yang foods. They can come from anywhere within the same hemisphere. Whole grains and legumes are also yang, and can originate anywhere within the same continent since they keep for a long time. Fresh fruits and vegetables are considered yin (expansive energy). Since they have a relatively short shelf life, they should be chosen only from those types that grow naturally within one's immediate area. According to macrobiotic beliefs, balance between yin and yang in diet and food helps achieve inner peace and harmony with one's self and the surrounding world.

Another aspect of the macrobiotic diet is that the type of foods eaten should change with the seasons. In the spring and summer, the food should be lighter, cooler, and require less cooking. This change is necessary because —according to the macrobiotic philosophy—the energy of fire is abundant in the form of sunlight and does not need to be drawn from cooked food. In the autumn and winter, the opposite is true.

The time of day also plays an important role in the macrobiotic diet since it relates to atmospheric energy levels. In the morning, when upward energy is stronger, breakfast should include light foods, such as a whole grain cooked in water. In the evening, when downward energy is stronger, the meal can be larger. Lunch should be quick and light, since afternoon energy is active and expansive.

In macrobiotics, it is believed that the dietary standards that are effective for one person may not work for another. These standards may change from day to day. Therefore, this diet requires a change in thinking from a static view of life to a dynamic one.

Many people are attracted to the diet because of claims that it can prevent or cure **cancer**. While no scientific studies support these claims, there are many people who believe the diet helped rid them of the disease when such conventional treatments as chemotherapy and radiation failed. Others use the diet to help treat diabetes, **hypertension**, arteriosclerosis, and other forms of heart disease. Many of the diet's supporters believe that these and other degenerative diseases occur because the body's yin and yang are out of balance, and that a macrobiotic diet helps restore this balance.

Macrobiotic foods

The primary food in the standard macrobiotic diet is whole cereal grains, including brown rice, barley, millet, rolled oats, wheat, corn, rye, and buckwheat. A small amount of whole grain pasta and breads is allowed. Grains should comprise about 50% of the food consumed.

Fresh vegetables should account for 20–30% of the diet. The most highly recommended vegetables include green cabbage, kale, broccoli, cauliflower, collard greens, carrots, parsnips, winter squash, bok choy, onions, **parsley**, daikon radishes, and watercress. Vegetables that should be eaten only occasionally include cucumber, celery, lettuce, and most herbs. Vegetables that should be avoided include tomatoes, peppers, potatoes, eggplant, spinach, beets, and summer squash.

About 10% of the diet should consist of beans and sea vegetables. The most suitable beans are azuki, chickpeas, and lentils. Tofu and tempeh are also allowed. Other beans can be eaten several times a week. Sea vegetables include nori, wakame, kombu, hiziki, arame, and agar-agar. Another 10% of the diet should include soups made with regular or sea vegetables.

Other permitted items include sweeteners such as barley malt, rice syrup, and apple juice; such seasonings as miso, tamari, soy sauce, rice or cider vinegar, **sesame oil**, tahini, and sea salt; occasional small amounts of seeds and nuts (pumpkin, sesame, sunflower, and almonds); and white-meat fish once or twice a week. Beverages allowed include tea made from twigs, stems, brown rice, and **dandelion** root, apple juice, and good-quality water without ice.

Items not allowed include meat, dairy products, fruits, refined grains, anything with preservatives, artificial flavorings and colorings or chemicals, all canned, frozen, processed, and irradiated foods, hot spices, **caffeine**, alcohol, refined sugar, honey, molasses, and chocolate.

Preparations

There are no specific procedures involved in preparing for the diet, except to change from a diet based on meat, sugars, dairy products, and processed foods, to one based primarily on whole grains, vegetables, and unprocessed foods. Some advocates of the macrobiotic diet recommend making the switch gradually rather than all at once.

Precautions

The macrobiotic diet does not include many fruits and vegetables that are important sources of nutrients and **antioxidants**, such as **vitamin C** and **beta carotene**. If followed rigidly, the diet can also be deficient in protein, **calcium**, **vitamin B_{12}**, folate, and **iron**. Individuals accustomed to a diet high in fat can experience sudden and drastic weight loss if they switch to a rigid macrobiotic diet. In its original form, the macrobiotic diet required foods to be slowly eliminated from the diet until only rice and beans were consumed. Carried to this extreme, the diet lacks significantly in necessary vitamins and nutrients.

A macrobiotic diet may worsen cachexia (malnutrition, wasting) in cancer patients. It is not recommended for people who have intestinal blockages, gluten-sensitive enteropathy (**celiac disease**), or cereal grain **allergies**. Children, pregnant women, and individuals with intestinal disorders, hypertension (high blood pressure), kidney disease, or malnutrition should consult their physician before starting a macrobiotic diet. A diet should never be a substitute for receiving appropriate medical treatment.

Side effects

There are no negative side effects associated with a macrobiotic diet in adults, other than such minor problems as **dizziness** in some people who experience rapid weight loss. Other, sometimes serious, side effects are possible if the diet is deficient in one or more vitamins or minerals.

Research and general acceptance

Like many alternative therapies, the macrobiotic diet is controversial and not generally embraced by allopathic medicine. Most of the controversy surrounds claims that the diet can cure cancer. These claims stem from anecdotal reports and are not substantiated by scientific research. The American Medical Association opposes the macrobiotic diet. The allopathic medical community is also concerned that people with such serious diseases as cancer may use the diet as a substitute for conventional treatment.

Scientific studies in the United States and Europe have shown that a strict traditional macrobiotic diet can lead to a variety of nutritional deficiencies, especially in protein, **amino acids**, calcium, iron, **zinc**, and ascorbic acid. These deficiencies can result in drastic weight loss, **anemia**, scurvy, and hypocalcemia. In children, a strict macrobiotic diet can cause stunted growth, protein and calorie malnutrition, and bone age retardation.

KEY TERMS

Cachexia—General physical wasting and malnutrition, usually associated with such chronic diseases as cancer and AIDS.

Celiac disease—An intestinal disorder characterized by intolerance of gluten, a protein present in the grains of wheat, rye, oats, and barley.

Enteropathy—A disease of the intestinal tract.

Hypertension—Abnormally high blood pressure.

Hypocalcemia—Calcium deficiency in the blood.

Legumes—The fruit or seed of a family of plants, including beans and peas.

Scurvy—A disease characterized by loose teeth, and bleeding gums and mouth, caused by a lack of ascorbic acid (vitamin C) in the diet.

Tempeh—A dense high-fiber food product made from fermented soybeans.

Tofu—A high-protein curd made from soybeans, used in meat and dairy replacement products.

Training and certification

No special training or certification is required. There are, however, several institutes in the United States that offer courses in the macrobiotic philosophy and diet.

Resources

BOOKS

Aihara, Herman. *Basic Macrobiotics*. Oroville, CA: George Ohsawa Macrobiotic Foundation, 1998.

Bliss Lerman, Andrea. *The Macrobiotic Community Cookbook*. New York: Avery, 2003.

Dente, Gerard, and Kevin J. Hopkins. *Macrobiotic Nutrition: Priming Your Body to Build Muscle and Burn Body Fat*. North Bergen, NJ: Basic Health Publications, 2004.

Kushi, Michio, and Alex Jack. *The Macrobiotic Path to Total Health: A Complete Guide to Naturally Preventing and Relieving More Than 200 Chronic Conditions and Disorders*. New York, NY: Ballantine Books, 2004.
Kushi, Michio, and Stephen Blauer. *The Macrobiotic Way: The Complete Macrobiotic Lifestyle Book*. Garden City Park, NY: Avery Penguin Putnam, 2004.
Kushi, Michio. *The Macrobiotic Approach to Cancer: Towards Preventing and Controlling Cancer With Diet and Lifestyle*. Garden City Park, NY: Avery Penguin Putnam, 2003.
Bliss Lerman, Andrea. *Macrobiotic Community Cookbook*. Garden City Park, NY: Avery Penguin Putnam, 2003.
Pitchford, Paul. *Healing With Whole Foods: Asian Tradi tions and Modern Nutrition*. Berkeley, CA: North Atlantic Books, 2002.
Rivière, Françoise, *#7 Diet: An Accompaniment to Zen Macrobiotics,* 1st English ed. Chico, CA: George Ohsawa Macrobiotic Foundation, 2005.

PERIODICALS

"The Balance of Macrobiotics." *Natural Life* (January February 2003): 9.
Kushi, Lawrence H., et al. "The Macrobiotic Diet in Cancer." *The Journal of Nutrition* (November 2001): 3056S 64S.
Kushi, Michio, and Alex Jack. "Cancer, Diet, and Macro biotics: Relieving Cancer Naturally." *Share Guide* (September October 2002): 18 19.
"Macrobiotic Diets Can be Healthful, but Not a Cancer Cure." *Environmental Nutrition* (November 2002): 7.
Priesnitz, Wendy. "Macrobiotics for Health." *Natural Life* (January February 2004): 18.

OTHER

American Cancer Society. "Macrobiotic Diet." http://www. cancer.org/docroot/eto/content/ETO_5_3X_ Macrobiotic_ Diet.aspAmerican Cancer Society, June 1, 2005.
Macrobiotics Online. http://www.macrobiotics.org&.[cited June 14, 2004].
Trevena, James and Kasia. "The Macrobiotic Guide." 2007. http://www.macrobiotics.co.uk/

ORGANIZATIONS

American Cancer Society, 1599 Clifton Road NE, Atlanta, GA, 30329 4251, 800 ACS 2345, http://www.cancer.org.
American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, Illinois, 60606 6995, (800) 877 1600, http://www.eatright.org.
Kushi Institute, PO Box 7, Becket, MA, 01223, (800) 975 8744, (413) 623 8827, http://www.kushiinstitute.org.
National Center for Complementary and Alternative Med icine Clearinghouse, P. O. Box 7923, Gathersburg, MD, 20898, (888) 644 6226, TTY: (866) 464 3615, (866) 464 3616, http://nccam.nih.gov.
Ohsawa Macrobiotics, P.O. Box 3998, Chico, CA, 95927 3998, (530) 566 9765, (800) 232 2372, http:// www.gomf.macrobiotic.net/Info.htm.

Ken R. Wells

Macular degeneration

Definition

Macular degeneration (MD) is the progressive deterioration of the macula, the light-sensitive cells of the central retina, at the back of the eye. The retina is the sensitive membrane (soft layer) of the eye that receives the image formed by the lens and is connected with the brain by the optic nerve. As these macular cells malfunction and die, central vision becomes gray, hazy, or distorted, and eventually is lost. Peripheral (away from the center) vision is unaffected.

Description

Millions of people suffer from MD and it accounts for about 12% of all blindness in the United States. The macula contains the highest concentration of photo-sensitive cells in the retina. These cells transform light into electrical signals that are sent to the brain for processing into vision. Fine detail vision and critical color vision are located in the macula. The macula depend on nutrient diffusion from the choroid layer, a region of several delicate vascular (pertaining to blood vessels) membranes or structures behind the retina and under the macula. Anything that interferes with this nutrient supply can lead to MD.

Age-related macular degeneration (AMD or ARMD) is by far the most common type of MD. One in six Americans develops AMD between the

Macular degeneration. *(Jean-Luc Kokel / Photo Researchers, Inc.)*

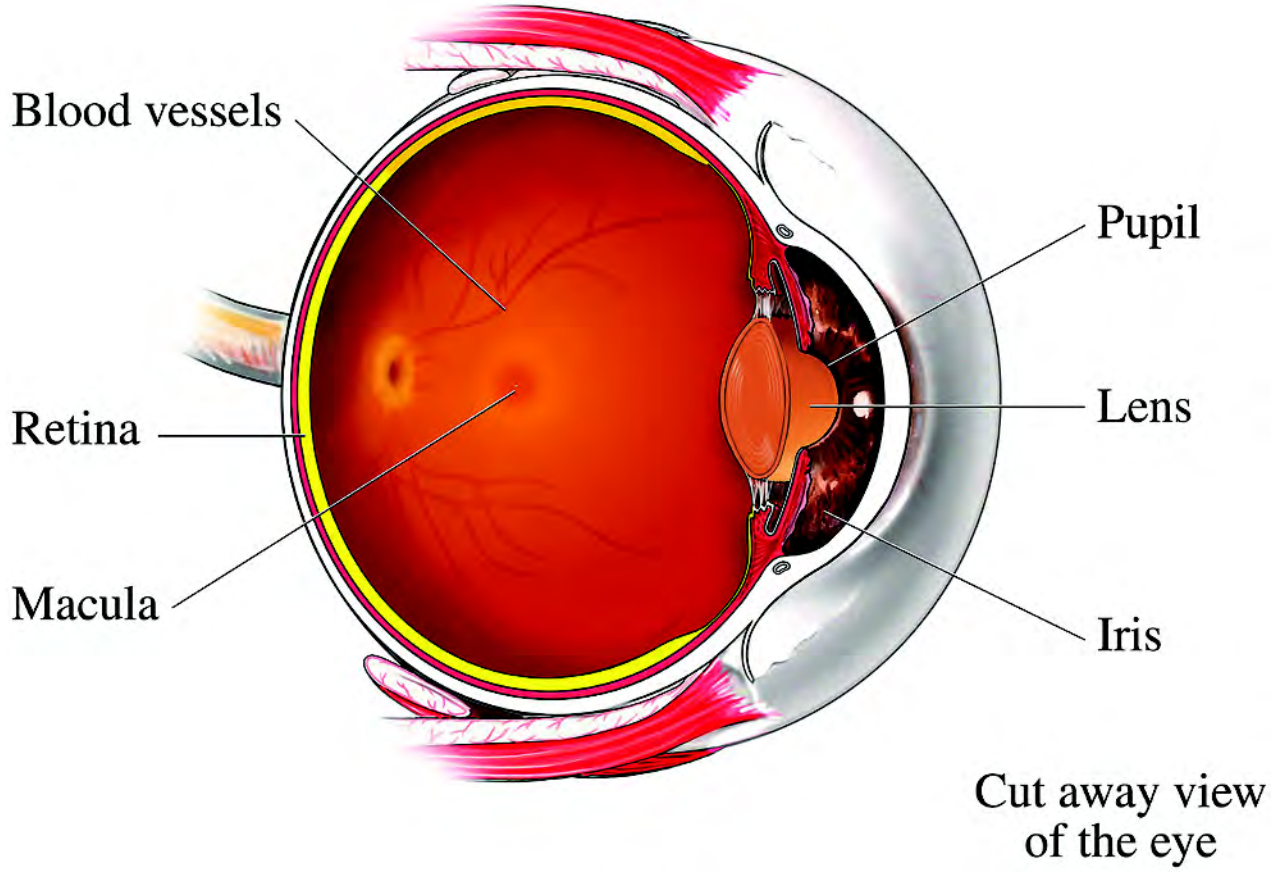


Illustration of macular degeneration of the right eye, sagittal view. Macular degeneration is the progressive deterioration of the macula, which can lead to the loss of central vision. *(© PHOTOTAKE Inc. / Alamy)*

ages of 55 and 64 and one in three Americans over 75 has AMD. About 10% of those with AMD eventually suffer severe vision loss. The incidence of AMD is expected to triple by 2025, as the population ages. Whites and Asians are more susceptible than blacks. Women and those with lighter-colored eyes are somewhat more susceptible. AMD may occur in only one eye. However there is a very high likelihood that the other eye will be affected eventually.

About 90% of AMD is the dry form. Over time, the macula thins and the pigmented retinal epithelium, a dark-colored cell layer that supports the retina, is gradually lost. About 10% of dry AMD cases progress to the wet form. In a process called choroidal neovascularization (CNV), new blood vessels proliferate in the choroid and may invade the retina. These fragile vessels can leak blood and fluid into the retina, damaging or killing macular cells and resulting in scar tissue that interferes with vision. If untreated, the macula may be destroyed. Wet AMD progresses more rapidly than dry AMD and severe vision loss typically occurs within two years.

Less common forms of MD include:

- juvenile macular degeneration (JMD), a group of inherited disorders affecting children and younger adults
- cystoid macular degeneration, the development of fluid-filled cysts (sacs) in the macular region, associated with aging, inflammation, or severe myopia (near-sightedness)
- diabetic macular degeneration
- retinal pigment epithelial detachment, a rare form of wet MD in which fluid leakage from the choroid causes the detachment or disappearance of the pigmented retinal epithelium

Causes and symptoms

Causes

Age-related macular degeneration (AMD) appears to result from a combination of hereditary,

KEY TERMS

Age-related macular degeneration (AMD, ARMD)—Macular degeneration that accompanies aging. The most common form of MD.

Amsler grid—A checkerboard pattern with a dot in the center that is used to diagnose MD.

Anthocyanosides—Flavonoid antioxidants from plant pigments that are particularly active in the eye.

Antioxidant—A substance that prevents oxidative damage, such as cellular damage caused by free radicals.

Carotenoid—A large class of red and yellow pigments found in some plants and in animal fat.

Choroid—The middle vascular layer of the eyeball, behind the retina.

Choroidal neovascularization (CNV)—The proliferation of new, fragile blood vessels in the choroid layer. Leakage from these vessels causes wet AMD.

Drusen—Yellowish-white fatty deposits on the retina, including the macula.

Electroretinogram—An instrument for measuring electrical signals from a point in the macula.

Fluorescein angiography—A method that uses a fluorescent dye for photographing blood vessels of the retina.

Free radical—A reactive atom or molecule with an unpaired electron. Oxygen free radicals can damage cells and their constituents.

Flavonoids—A group of chemical compounds naturally found in certain fruits, vegetables, teas, wines, nuts, seeds, and roots. Though not considered vitamins, they function nutritionally as biological response modifiers.

Indocyanin green angiography—A sensitive method for examining retinal blood vessels.

Lutein—An antioxidant carotenoid found in large quantities in dark-green, leafy vegetables such as spinach and kale. Lutein is deposited on the lens and macula of the eye where it protects cells from damage caused by ultraviolet and blue light.

Macula—An area of 0.1 0.2 in (3 5 mm) at the center of the retina that is responsible for sharp, central vision.

Omega-3 fatty acids.—Fatty acids from fish and vegetable oils that appear to protect against blood clots.

Ophthalmologist—A physician who specializes in eye diseases and disorders.

Ophthalmoscope—An instrument for examining the interior of the eyeball.

Optical coherence tomography (OCT) —A diagnostic method for imaging eye tissue.

Optometrist—A professional who examines eyes for visual acuity and prescribes eyeglasses or other visual aids.

Peripheral vision—Vision outside of the central vision.

Pigmented retinal epithelium—The dark-colored cell layer that supports the retina. It may thin or become detached with MD.

Photodynamic therapy (PDT)—A therapy that uses light-activated drugs to destroy rapidly-dividing cells or new blood vessels in the eye.

Retina—The nervous tissue membrane at the back of the eye, opposite the lens, that receives visual images and sends them to the brain via the optic nerve.

Visual acuity—Visual sharpness and resolving ability, usually measured by the ability to read numbers and letters.

Zeaxanthin—An antioxidant carotenoid that is the mirror image of lutein.

environmental, and metabolic factors. Over time, highly reactive free-oxygen radicals damage and destroy macular cells. Free radicals are produced by:

- bombardment of light on the macula, particularly long-term exposure to ultraviolet and blue light, including sunlight and sunlamps
- smoking, which increases the risk of AMD two- to four-fold
- a high-fat diet

The body's antioxidant systems that destroy free radicals become less effective with **aging**.

Factors that contribute to the hardening and blocking of the capillaries supplying the retina and lead to AMD include:

- smoking
- diets high in saturated fat and cholesterol
- low dietary consumption of antioxidants

The cause of choroidal neovascularization (CNV) in wet AMD is unknown. However many people with

AMD also have **cataracts** and cataract surgery increases the risk of dry AMD progressing to wet AMD.

Symptoms

AMD is painless, and in the early stages, the brain easily compensates for vision loss, particularly if AMD is restricted to one eye. Symptoms of AMD include:

- requiring more light for reading
- reduction, blurring, a blank spot, or loss of central vision while peripheral vision is unaffected
- difficulty recognizing faces
- visual distortions such as the bending of straight lines
- images appearing smaller
- changes in color perception or abnormal light sensations
- a decline of at least two lines in visual acuity as measured on a standard eye chart. For example, 20/20 vision declining to 20/80
- phantom visions, called "Charles Bonnet syndrome"

Diagnosis

Although vision loss is irreversible, early detection may halt or slow the progression of dry to wet AMD. However AMD is often fairly advanced by the time an ophthalmologist (a physician specializing in eye defects and diseases) is consulted. Tests for MD include:

- An Amsler grid, a checkerboard pattern with a black dot at the center. While staring at the dot with one eye, MD causes the straight lines to appear wavy or disappear or some areas to appear blank.
- A dilated eye exam whereby drops are used to dilate the pupils and a special magnifier called an ophthalmoscope shines a very bright light on the back of the lens to examine the retina. Gross macular changes, including scarring, thinning, or atrophy, may indicate MD. Numerous mid-sized yellow bumps called drusen, or one or more large drusen, can indicate intermediate-stage AMD. However, most people over age 42 have drusen in one or both eyes.
- Fluorescein or eye angiography, or retinal photography. An indicator dye is injected and photographs are taken to detect dye leakage from retinal blood vessels.
- Indocyanine green angiography examines choroid blood vessels that cannot be seen with fluorescein.
- Optical coherence tomography. Light waves are used to obtain cross-sectional views of eye tissue. This is easier and quicker than fluorescein angiography.
- An electroretinogram, whereby a weak or missing electrical signal from an illuminated point in the macula indicates MD.
- In a family history of MD suggesting hereditary juvenile macular degeneration (JMD), molecular genetic screening can reveal the presence of JMD-causing genes, facilitating early detection.

Treatment

Those with dry AMD should have a complete dilated eye examination at least once a year and use an Amsler grid daily to check for signs of wet AMD.

Diet

Dietary factors that can speed the progression from early-stage to advanced MD include:

- high fat consumption (70 gm versus 24 gm daily) triples the risk of advancement
- trans-fats consumption (4 gm versus 0.5 gm daily) doubles the risk
- consumption of commercial baked goods (two or more servings weekly) doubles the risk
- obesity doubles the risk of advancement

Foods containing omega-3 fats, such as nuts and fish, lower the risk of progression to advanced MD.

One study found that those with the highest dietary intake of **lutein** had a 57% lower risk for AMD. Foods high in lutein and zeaxanthin include:

- kale
- spinach
- mustard greens
- collard greens
- romaine lettuce
- leeks
- celery
- broccoli (cooked)
- peas
- corn
- zucchini
- yellow squash
- cucumbers
- orange bell peppers
- red grapes
- mangoes
- oranges

Many multi-vitamins also contain lutein.

Other factors for preventing AMD include:

- the use of sunglasses with UV protection
- maintaining normal blood pressure
- avoiding the risk factors, including smoking and secondhand smoke
- the use of supplemental estrogen by postmenopausal women is associated with a lower risk for AMD

Resources

BOOKS

Age Related Macular Degeneration. San Francisco: American Academy of Ophthalmology, 2003.

Glaser, Bert, and Lester A. Picker. *The Macular Degeneration Sourcebook: A Guide for Patients and Families*. Omaha, NE: Addicus Books, 2002.

Gragoudas, Evangelos S., et al. *Photodynamic Therapy of Ocular Diseases*. Philadelphia: Lippincott Williams & Wilkins, 2004.

Holz, F. G., et al. *Age Related Macular Degeneration*. Berlin: Springer, 2004.

Kondrot, Edward. *Healing the Eye the Natural Way: Alternative Medicine and Macular Degeneration*. 2nd ed. Carson City, NV: Nutritional Research Press, 2001.

Lim, Jennifer I., editor. *Age Related Macular Degeneration*. New York: Marcel Dekker, 2002.

Loseliani, O. R., editor. *Focus on Macular Degeneration Research*. Hauppauge, NY: Nova Science, 2004.

Price, Ira Marc, and Linda Comac. *Living Well with Macular Degeneration: Practical Tips and Essential Information*. New York: New American Library, 2001.

Rosenthal, Bruce P., and Kate Kelly. *Focus on Macular Degeneration Research*. Hauppauge, NY: Nova Science, 2004.

PERIODICALS

"Ayes For Your Eyes." *Harvard Health Letter* (February 2004).

Friedman, E. "Update of the Vascular Model of AMD: Are Statins or Antihypertensives Protective?" *British Journal of Ophthalmology* 88 (February 2004): 161 63.

Hampton, Tracy. "Scientists Take Aim at Angiogenesis to Treat Degenerative Eye Diseases." *Journal of the American Medical Association* 291 (March 17, 2004): 1309 10.

Keegan, Lynn. "Age Related Macular Degeneration and Nutrition." *Alternative Medicine Alert* 7 (February 2004): 16 21.

"Scaling Back on Fat in Foods, Especially Trans Fats, May Save Your Sight." *Environmental Nutrition* 27 (February 2004): 3.

Zarbin, M. A. "Current Concepts in the Pathogenesis of Age Related Macular Degeneration." *Archives of Ophthalmology* 122 (April 2004): 598 614.

ORGANIZATIONS

American Macular Degeneration Foundation. P.O. Box 515, Northampton, MA 01061 0515. 888 MACULAR. 413 268 7660. amdf@macular.org. http://www.macular.org.

American Optometric Association. 243 North Lindbergh Blvd., St. Louis, MO 63141 7851. 314 991 4100. http://www.aoanet.org.

Macular Degeneration Foundation. P.O. Box 531313, Henderson, NV 89053. 888 633 3937. http://www.eyesight.org.

Macular Degeneration Partnership. 8733 Beverly Boulevard, Suite 201, Los Angeles, CA 90048 1844. 888 430 9898. 310 423 6455. http://www.amd.org.

OTHER

"Age Related Macular Degeneration: What You Should Know." National Eye Institute. March 2004 [cited April 22, 2004]. http://www.nei.nih.gov/health/maculardegen/AMD_facts.htm.

"Macular Degeneration." *NWHRC Health Center*. National Women's Health Resource Center. March 4, 2004 [cited May 8, 2004]. http://www.healthywomen.org/.

Margaret Alic, Ph.D.

Magnesium

Description

The chemical element magnesium (Mg) has an atomic mass of 24.31 and atomic number 12. In its elemental form, magnesium is a silver-white metal with a density of 1.738 g/cm^3. In solution, it occurs as *cations* (positively charge ions). Magnesium is the fourth most abundant cation in the human body by weight, after **calcium**, **potassium**, and **sodium**. Ninety-nine percent of the body's magnesium is contained within its cells: about 60% in the bones, 20% in the muscles, 19% to 20% in the soft tissue, and 1% in the blood. Important to both **nutrition** and medicine, magnesium, like calcium and **phosphorus**, is considered a major mineral. Magnesium carbonate and magnesium sulfate have been used for centuries as a laxative. The name of the element comes from Magnesia, a city in Greece where large deposits of magnesium carbonate were discovered in ancient times.

Magnesium is an important element in the body because it activates or is involved in many basic processes or functions, including the following:

- as cofactor for over 300 enzymes
- oxidation of fatty acids
- activation of amino acids
- synthesis and breakdown of DNA
- neurotransmission

Recommended dietary allowance of magnesium

Age	mg/day
Children 0-6 mos.	30 (AI)
Children 7-12 mos.	75 (AI)
Children 1-3 yrs.	80
Children 4-8 yrs.	130
Children 9-13 yrs.	240
Boys 14-18 yrs.	410
Girls 14-18 yrs.	360
Men 19-30 yrs.	400
Women 19-30 yrs.	310
Men ≥ 31 yrs.	420
Women ≥ 31 yrs.	320
Pregnant women ≤ 18 yrs.	400
Pregnant women 19-30 yrs.	350
Pregnant women ≥ 31 yrs.	360
Breast feeding women ≤ 18 yrs.	360
Breast feeding women 19-30 yrs.	310
Breast feeding women ≥ 31 yrs.	320

Foods that contain magnesium

	mg
Cereal, 100% bran, 1/2 cup	129
Oat bran, 1/2 cup, dry	96
Halibut, cooked, 3 oz.	90
Almonds, roasted, 1 oz.	80
Cashew nuts, roasted, 1 oz.	75
Spinach, cooked, 1/2 cup	75
Swiss chard, cooked, 1/2 cup	75
Beans, lima, cooked, 1/2 cup	63
Shredded wheat, 2 biscuits	54
Peanuts, roasted, 1 oz.	50
Black-eyed peas, cooked, 1/2 cup	43
Brown rice, cooked, 1/2 cup	40
Beans, pinto, cooked, 1/2 cup	35

AI = Adequate Intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

- immune function
- interactions with other nutrients, including potassium, vitamin B_6, and boron

General use

Compounds of magnesium have a number of general uses, primarily in standard allopathic medicine, but also in some alternative therapies.

Nutrition

Good dietary sources of magnesium include nuts; dried peas and beans; whole grain cereals such as oatmeal, millet, and brown rice; dark green vegetables; bone meal; blackstrap molasses; **brewer's yeast**; and soy products. Dark green vegetables are important sources of magnesium because it is the central atom in the structure of chlorophyll. Drinking hard water or mineral water can also add magnesium to a person's diet.

Severe magnesium deficiency in a healthy person is unusual because normal kidneys are very efficient in keeping magnesium levels balanced. This condition, called *hypomagnesemia*, is usually caused either by disease (kidney disease, severe malabsorption, chronic **diarrhea**, **hyperparathyroidism**, or chronic **alcoholism**) or as a side effect of certain medications, most commonly diuretics, cisplatin (a **cancer** medication), and a few antibiotics. The symptoms of hypomagnesemia include disturbances of the heart rhythm, muscle tremors or twitches, seizures, hyperactive reflexes, and occasional personality changes (**depression** or agitation). A patient with hypomagnesemia may also produce Chvostek's sign, which is a facial spasm caused when the doctor taps gently over the facial nerve. This condition of painful intermittent muscle contractions and spasms is known as *tetany*. Hypomagnesemia can be treated with either oral or intravenous preparations containing magnesium.

Magnesium toxicity (hypermagnesemia) is rare because excessive amounts are usually excreted in the urine and feces. Most cases of hypermagnesemia are caused by overuse of dietary supplements containing magnesium. The symptoms of magnesium toxicity include central nervous system depression, muscle weakness, **fatigue**, and sleepiness. In extreme cases, hypermagnesemia can cause death. It can be treated with intravenous calcium gluconate along with respiratory support. Severe hypermagnesemia can be treated by hemodialysis or peritoneal dialysis.

Standard medical practice

DIAGNOSIS. The levels of magnesium in a patient's blood or body fluids can help diagnose several illnesses. A high magnesium level in the blood may indicate kidney failure, **hypothyroidism**, severe dehydration, Addison's disease, or overingestion of antacids containing magnesium. A low blood level of magnesium may indicate hypomagnesemia. Because 99% of the body's magnesium is contained in its cells, blood tests can measure only the approximately 1% of magnesium that is extra-cellular (circulating in the

bloodstream), which makes it difficult to diagnose low magnesium levels in the body overall.

Fortunately, magnesium levels in urine can also aid diagnosis. High levels of urinary magnesium may indicate overconsumption of supplemental magnesium, overuse of diuretics, hypercalcemia (too much calcium in the body), hypophosphatemia (too little phosphate in the body), or metabolic acidosis (high blood acid levels). Low levels of magnesium in the urine may point to hypomagnesemia or hypocalcemia (too little magnesium or calcium in the body), an underactive parathyroid gland, or metabolic alkalosis (high blood alkaline levels).

TREATMENT. Compounds of magnesium are used to treat tachycardia (excessively rapid heartbeat) and low levels of electrolytes (chloride, potassium, and sodium). They help manage premature labor and can be given prophylactically to prevent seizures in toxemia of **pregnancy**. Magnesium sulfate is also effective in the treatment of eclampsia, a potentially fatal seizure condition in pregnant women.

Magnesium compounds help control seizures resulting from hypomagnesemia associated with alcoholism, **Crohn's disease**, or **hyperthyroidism**. Magnesium injections are also used to treat acute **asthma** attacks.

Magnesium preparations may be given as antacids in the treatment of peptic ulcers and hyperacidity. They are also given as laxatives for the short-term relief of **constipation** or to empty the patient's bowel prior to surgery or certain diagnostic procedures. Magnesium hydroxide is used to treat patients who have been poisoned by mineral acids or arsenic.

Magnesium in the form of magnesium sulfate is known as *Epsom salts*. It can be taken by mouth as a laxative but is also used externally to reduce tissue swelling, inflammation, and **itching** from insect **bites**, heat rash, or other minor skin irritations. Epsom salts can be applied to the affected skin or body part in moist compresses or dissolved in warm bath water.

Some research indicates that magnesium deficiency may contribute to **atherosclerosis** (hardening of the arteries), as well as to necrotizing enterocolitis (NEC), a sometimes-deadly inflammation that destroys the bowel in premature infants. Magnesium may also be useful in treating **attention-deficit hyperactivity disorder** (ADHD) and migraine headaches.

Alternative medicine

HOMEOPATHY. Phosphate of magnesia is a staple homeopathic remedy, called *Magnesia phosphorica (Mag. phos.)* It is recommended for symptoms that are relieved by the application of warmth and gentle pressure, such as **hiccups** accompanied by **colic** in infants, menstrual cramps that are relieved when the woman bends forward, and abdominal **pain** without **nausea** and **vomiting**. Patients who benefit from *Mag. phos.* are supposedly less irritable or angry in temperament than those who need *Colocynthis* or *Chamomilla*.

NATUROPATHY. Naturopaths emphasize the importance of proper food selection and preparation to obtain an adequate supply of nutrients in the diet. They maintain that modern methods of agriculture promote overcropping and soil depletion, which they believe reduces the amount of magnesium (and other minerals) available from food grown in that soil. The processing and refining of wheat and rice, which discards the magnesium contained in the bran, **wheat germ**, or rice husks, also reduces the amount of magnesium in these foods. For these reasons naturopaths often recommend organic produce, which they believe contains higher levels of minerals, and suggest that they not be overcooked or boiled in too much water. In addition, this water, or "pot liquor," is often rich in magnesium that cooks out of the vegetables. It should not be discarded but saved for use in soups or stews.

Many naturopaths believe that the official government recommended daily allowance (RDA) of magnesium is too low. They think that it should be doubled to about 600 or 700 mg daily for adults. Many recommend the use of dietary supplements containing magnesium to make up the difference.

Naturopathic practitioners regard magnesium to be important in the relief or cure of the following conditions:

- Mitral valve prolapse: Magnesium deficiency may lower the body's ability to repair defective connective tissue, including defective mitral valves.
- Atherosclerosis.
- Certain psychological conditions, including apathy, decreased ability to learn, memory loss, and confusion.
- Kidney stones: Magnesium increases the solubility of certain calcium compounds that form kidney stones if they are not excreted in the urine.
- Hypertension: Hypertensive people often have lower levels of magnesium within their cells than people with normal blood pressure.
- Angina pectoris: Magnesium is thought to relax spastic arteries and help prevent arrhythmias.

- Osteoporosis: Many osteoporosis patients have low levels of magnesium in their bodies.
- Premenstrual syndrome (PMS) and menstrual cramps: Some women report relief from the symptoms of PMS when taking magnesium supplements.
- Naturopaths also treat asthma, epilepsy, autism, hyperactivity, chronic fatigue syndrome, noise-induced hearing loss, insomnia, and stress-related anxiety with supplemental magnesium.

Preparations

Dietary supplements

Naturopaths generally recommend supplemental magnesium for people with high blood **cholesterol**, postmenopausal women, women taking birth control pills, diabetics, people who eat a lot of fast food or other highly processed food, and people who drink alcohol. Many nutrition experts recommend supplements that contain a balanced ratio of calcium to magnesium, usually two parts of calcium to one of magnesium. People who increase their calcium intake should increase their dose of magnesium (and phosphate) as well because these supplements work together and complement each other.

Some naturopaths recommend taking magnesium in the form of magnesium aspartate or magnesium citrate, arguing that these compounds are more easily absorbed by the body than magnesium carbonate or magnesium oxide. Others prefer magnesium chelated with **amino acids**. Magnesium can also be obtained from herbal sources, such as red raspberries.

Standard medical preparations

Magnesium hydroxide is a common over-the-counter antacid, available as either a tablet or liquid. Most antacid tablets contain about 200 mg of magnesium hydroxide. Liquid magnesium hydroxide is sometimes called *milk of magnesia*. Magnesium carbonate works as a cathartic or laxative when combined with citric acid to produce magnesium citrate. It is often flavored with lemon or cherry to make it more pleasant to swallow. Magnesium sulfate (in the form of Epsom salts) is available over the counter, usually in half-pound or pound boxes. Epsom salts are small whitish or colorless crystals that dissolve easily in water and have a bitter or salty taste.

Magnesium for intravenous dosage is prepared as the sulfate in a 50% solution. In general, intravenous administration of magnesium is reserved for patients with such serious symptoms as seizures, preeclampsia or eclampsia of pregnancy, acute asthma attacks, or severe cardiac arrhythmias. Magnesium sulfate can also be given by intramuscular injection.

KEY TERMS

Chvostek's sign—A facial spasm caused when a doctor taps lightly on a patient's facial nerve. A positive Chvostek's sign may indicate that the patient has hypomagnesemia.

Electrolyte—A substance, such as potassium or sodium, that has an electrical charge when dissolved in a fluid, such as blood.

Epsom salts—A preparation of magnesium sulfate, used internally as a laxative or externally in compresses or warm baths to reduce swelling, inflammation, and itching from minor skin problems.

Hypermagnesemia—A condition in which the levels of magnesium in body fluids are too high, almost always caused by a combination of low calcium levels and taking too much magnesium as a dietary supplement. Patients with hypermagnesemia may have central nervous system depression, muscle weakness, fatigue, or sleepiness.

Hypomagnesemia—A condition of magnesium deficiency, the symptoms of which include heart arrhythmias, muscle tremors or twitches, seizures, hyperactive reflexes, and psychiatric symptoms.

Major mineral—One of three important inorganic elements in human nutrition, distinguished from trace elements (minor minerals) and electrolytes. Magnesium is a major mineral, along with calcium and phosphorus.

Naturopathy—A type of alternative medicine that does not use surgery or synthetic drugs to treat disease but relies on fasting and special diets to assist the body's healing processes.

Tetany—A disorder of the nervous system characterized by muscle cramps, spasms of the arms and legs, and numbness of the extremities. It is a symptom of an abnormality in calcium metabolism.

Precautions

Preparations containing magnesium should not be given as laxatives to patients with kidney disease, nausea and vomiting, diarrhea, abdominal pain, rectal bleeding, symptoms of appendicitis, or symptoms of intestinal obstruction or perforation. In addition, these preparations should not be used routinely to relieve constipation, as individuals may become

dehydrated, lose calcium from the body, or develop a dependence on them. Antacids containing magnesium should be used with caution in patients with kidney disease.

Side effects

Magnesium preparations taken internally may cause hypermagnesemia, especially with prolonged use; electrolyte imbalance; and abdominal cramps when taken as a laxative. Milk of magnesia occasionally produces nausea or diarrhea. There are no known side effects of Epsom salts when used externally.

Interactions

Milk of magnesia decrease the patient's absorption of chlordiazepoxide, digoxin, isoniazid, quinolones, and tetracycline antibiotics. Because it increases the gastrointestinal tract's mobility, magnesium can also decrease the absorption (and thereby the effectiveness) of many other drugs and supplements as well. Magnesium sulfate, if given intravenously, is incompatible with calcium gluceptate, clindamycin, dobutamine, polymyxin B sulfate, procaine, and sodium bicarbonate.

Resources

BOOKS

Nishizawa, Yoshiki, Hirotoshi Morii, and Jean Durlach, eds. *New Perspectives in Magnesium Research: Nutrition and Health*. New York: Springer, 2006.

Sircus, Mark. *Transdermal Magnesium Therapy*. Chandler, AZ: Phaelos Books and Mediawerks, 2007.

PERIODICALS

Tong, G. M., and R. K. Rude. "Magnesium Deficiency in Critical Illness." *Journal of Intensive Care Medicine* (January/February 2005): 3 17.

Khine, Khursheed, et al. "Magnesium (Mg) Retention and Mood Effects after Intravenous Mg Infusion in Pre menstrual Dysphoric Disorder." *Biological Psychiatry* (February 2006): 327 333.

Ryder, Kathryn M., et al. "Magnesium Intake from Food and Supplements Is Associated with Bone Mineral Density in Healthy Older White Subjects." *Journal of the American Geriatrics Society* (November 2005): 1875 1880.

ORGANIZATIONS

American Association of Naturopathic Physicians, 4435 Wisconsin Ave. NW, Suite 403, Washington, DC, 20016, (866) 538 2267, http://www.naturopathic.org/.

Rebecca Frey
Teresa G. Odle
David Edward Newton, Ed.D.

Magnetic therapy

Definition

Magnetic therapy is the use of magnets to relieve **pain** in various areas of the body.

Origins

Magnetic therapy dates as far back as the ancient Egyptians. Magnets have long been believed to have healing powers associated with muscle pain and stiffness. Chinese healers as early as 200 B.C. were said to use magnetic lodestones on the body to correct unhealthy imbalances in the flow of *qi,* or energy. The ancient Chinese medical text known as *The Yellow Emperor's Canon of Internal Medicine* describes this procedure. The *Vedas*, or ancient Hindu scriptures, also mention the treatment of diseases with lodestones. The word "lodestone" or leading stone, came from the use of these stones as compasses. The word "magnet" probably stems from the Greek *Magnes lithos*, or "stone from Magnesia," a region of Greece rich in magnetic stones. The Greek phrase later became *magneta* in Latin.

Physiological reactions to positive and negative magnetic fields

Positive (stressful)

Increase in acid production

Depletes oxygen production

Cellular edema (water retention)

Produces insomnia, restlessness, wakefulness

Increases free radicals

Negative (anti-stressful)

Normalizes pH

Inhibits growth of microorganisms

Negates free radicals

Produces relaxation, rest, sleep

Increases oxygen production

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Fibromyalgia—A chronic syndrome characterized by fatigue, widespread muscular pain, and pain at specific points on the body.

Lodestone—A variety of magnetite that possesses magnetic polarity.

Transcranial magnetic stimulation—A procedure used to treat patients with depression.

Sir William Gilbert's 1600 treatise, *De Magnete*, was the first scholarly attempt to explain the nature of magnetism and how it differed from the attractive force of static electricity. Gilbert allegedly used magnets to relieve the arthritic pains of Queen Elizabeth I. Contemporary American interest in magnetic therapy began in the 1990s, as several professional golfers and football players offered testimony that the devices seemed to cure their nagging aches and injuries.

Many centuries ago, the earth was surrounded by a much stronger magnetic field than it is today. Over the past 155 years, scientists have been studying the decline of this magnetic field and the effects it has had on human health. When the first cosmonauts and astronauts were going into space, physicians noted that they experienced bone **calcium** loss and **muscle cramps** when they were out of the Earth's magnetic field for any extended period of time. After this discovery was made, artifical magnetic fields were placed in the space capsules.

Benefits

Some of the benefits that magnetic therapy claims to provide include:

- pain relief
- reduction of swelling
- improved tissue alkalinization
- more restful sleep
- increased tissue oxygenation
- relief of stress
- increased levels of cellular oxygen
- improved blood circulation
- anti-infective activity

Description

There are two theories that are used to explain magnetic therapy. One theory maintains that magnets produce a slight electrical current. When magnets are applied to a painful area of the body, the nerves in that area are stimulated, thus releasing the body's natural painkillers. The other theory maintains that when magnets are applied to a painful area of the body, all the cells in that area react to increase blood circulation, ion exchange, and oxygen flow to the area. Magnetic fields attract and repel charged particles in the bloodstream, increasing blood flow and producing heat. Increased oxygen in the tissues and blood stream is thought to make a considerable difference in the speed of healing.

Preparations

There are no special preparations for using magnetic therapy other than purchasing a product that is specific for the painful area being treated. Products available in a range of prices include necklaces and bracelets; knee, back, shoulder and wrist braces; mattress pads; gloves; shoe inserts; and more.

Precautions

The primary precaution involved with magnetic therapy is to recognize the expense of this therapy. Magnets have become big business; they can be found in mail-order catalogs and stores ranging from upscale department stores to specialty stores. As is the case with many popular self-administered therapies, many far-fetched claims are being made about the effectiveness of magnetic therapy. Consumers should adopt a "let the buyer beware" approach to magnetic therapy. Persons who are interested in this form of treatment should try out a small, inexpensive item to see if it works for them before investing in the more expensive products.

Side effects

There are very few side effects from using magnetic therapy. Generally, patients using this therapy find that it either works for them or it does not. Patients using transcranial magnetic stimulation for the treatment of **depression** reported mild **headache** as their only side effect.

Research and general acceptance

Magnetic therapy is becoming more and more widely accepted as an alternative method of pain relief. Since the late 1950s, hundreds of studies have demonstrated the effectiveness of magnetic therapy. In 1997, a group of physicians at Baylor College of Medicine in Houston, Texas studied the use of magnetic therapy in 50 patients who had developed polio earlier in life. These patients had muscle and joint pain that standard

treatments failed to manage. In this study, 29 of the patients wore a magnet taped over a trouble spot, and 21 others wore a nonmagnetic device. Neither the researchers nor the patients were told which treatment they were receiving (magnetic or nonmagnetic). As is the case with most studies involving a placebo, some of the patients responded to the nonmagnetic therapy, but 75% of those using the magnetic therapy reported feeling much better.

In another study at New York Medical College in Valhalla, New York, a neurologist tested magnetic therapy on a group of 19 men and women complaining of moderate to severe burning, tingling, or numbness in their feet. Their problems were caused by diabetes or other conditions present such as **alcoholism**. This group of patients wore a magnetic insole inside one of their socks or shoes for 24 hours a day over a two-month period, except while bathing. They wore a non-magnetic insert in their other sock or shoe. Then for two months they wore magnetic inserts on both feet. By the end of the study, nine out of ten of the diabetic patients reported relief, while only three of nine non-diabetic patients reported relief. The neurologist in charge of the study believes that this study opens the door to additional research into magnetic therapy for diabetic patients. He plans a larger follow-up study in the near future.

In 2000, a federally funded study began at the University of Virginia. This study evaluated the effectiveness of magnetic mattress pads in easing the muscle pain, stiffness and **fatigue** associated with **fibromyalgia**.

Magnetic therapy is also being studied in the treatment of depression and for patients with **bipolar disorder**. A procedure called repeated transcranial magnetic stimulation has shown promise in treating this condition. In one study, patients with depression had a lower relapse rate than did those using electroconvulsive therapy. Unlike electroconvulsive therapy, patients using magnetic therapy did not suffer from seizures, memory lapses, or impaired thinking.

Progress continues on the study of magnets and the brain. In 2002, more than 2,000 patients had undergone transcranial magnetic stimulation (TMS) for treatment of depression at the University of South Carolina with promising preliminary results. TMS is less shocking to the brain than electroconvulsive therapy. Another study was testing the use of magnets for therapy of essential tremors. By using a control group with sham repetitive TMS, the researchers noted **tremor** improvement and no adverse effects from the magnet therapy. These applications of magnet therapy are still under study and are not approved by the Food and Drug Administration (FDA) but look promising.

Training and certification

There is no training or certification required for administering magnetic therapy. Magnetic therapy can be self-administered.

Resources

BOOKS

Lawrence, Ron, and Paul Rosch. *Magnet Therapy Book: The Pain Cure Alternative*. New York: Prima Publications, 1998.

PERIODICALS

Cole, Helene M. "Transcranial Magnetic Stimulation of the Cerebellum in Essential Tremor: A Controlled Study." *JAMA, The Journal of the American Medical Association* (June 19, 2002): 3061.

"Magnets for Pain Relief: Attractive but Unproven." *Tufts University Health and Nutrition Letter* (1999): 3.

"Magnets that Move Moods: New Treatment for Depression." *Newsweek* (June 24, 2002): 57.

Vallbona, C. "Evolution of Magnetic Therapy from Alternative to Traditional Medicine." *Physical Medicine Rehabilitation Clinics of North America*, 1999: 729 54.

Kim Sharp
Teresa G. Odle

Magnolia

Description

Many species of magnolia are used in both Eastern and Western herbalism. The Chinese have used the bark of *Magnolia officinalis*, called in Chinese *hou po* since the first century A.D. *M. officinalis* is a deciduous tree that grows to a height of 75 ft (22 m). It has large leaves surrounding a creamy white fragrant flower. The pungent aromatic bark is used in healing. Originally native to China where it grows wild in the mountains, *M. officinalis* is now grown as an ornamental for use in landscaping around the world.

Chinese herbalists also use the bud of *Magnolia liliflora* in healing. The Chinese name for magnolia flower is *xin yi hua*. In Chinese herbalism, magnolia bark and magnolia flower are considered different herbs with different properties and uses.

Western herbalists use other species of magnolia. These include *Magnolia virginiana, M. glauca, M. acuminate* and *M. tripetata*. Other names for magnolia

Magnolia vine. *(© Organica / Alamy)*

include white bay, beaver tree, swamp **sassafras** (not to be confused with other forms of sassafras used in the West), and Indian bark. The New World species of magnolia are smaller than their Asian counterparts, ranging in height from 6–30 ft (2–10 m). Both the bark and the root are used in **Western herbalism**.

General use

In Chinese herbalism, magnolia bark, *hou po*, is associated with the stomach, lungs, spleen, and large intestine. It is used to treat menstrual cramps, abdominal **pain**, abdominal bloating and **gas**, **nausea**, **diarrhea**, and **indigestion**. Injections of magnolia bark extract are said to cause muscle **relaxation**. It is also used in formulas to treat coughing and **asthma**. The bark is said to make the *qi* descend and is used for symptoms of disorders thought to move upward in the body.

Research suggests that compounds found in magnolia bark may have mild antibacterial and antifungal properties. These studies are in their preliminary stages, however, and have been limited to test tube research.

Magnolia flower, *xin yi hua*, is associated with the lungs. It is used to treat chronic respiratory **infections**, sinus infections, and lung congestion. Its main function is to open the airway. Little scientific research has been done on the magnolia flower.

Magnolia bark and root are also used occasionally in Western herbalism, although they are not major healing herbs. At one time, magnolia root was used to treat rheumatism, and was thought to be superior to quinine in treating **chills** and **fever**. It is not used much today. Russian herbalists use an oil extracted from the flowers and young leaves to treat **hair loss** and as an antiseptic on skin **wounds**. In homeopathic medicine a tincture of magnolia flower is a minor remedy for asthma and fainting.

Little recent scientific research has been done on magnolia in the West; however, Asian researchers have isolated a compound from *M. officinalis* known as honokiol. Honkiol is being studied for its ability to induce apoptosis, or cell self-destruction, in **cancer** cells. In Japan, honokiol is considered a useful in reducing **anxiety**; herbal preparations containing honokiol are prescribed as mild tranquilizers. Chinese researchers reported in 2007 that a mixture of honkiol and magnolol, another active ingredient in magnolia, acted as an antidepressant in rats.

Preparations

Magnolia bark is most commonly used with the following herbs:

- Agastache: for treatment of stomach flu and gastrointestinal upset
- Apricot seed and linum: for treatment of chronic constipation and hemorrhoids
- Bupleurum, inula and cyperus: for treatment of stress-related gastrointestinal disturbances All these formulas can be made into teas or are commercially available as pills or capsules.

Magnolia flower is most commonly used in xanthium and magnolia formula. It is used to relieve sinus congestion associated with a yellow discharge and to treat allergy symptoms such as runny nose. This formula can be made into a tea or is available in commercially produced capsules.

American herbalists dry magnolia bark and root and pound it into a powder or make a tincture that is taken several times daily. Russian herbalists soak the bark in vodka.

Magnolia flower. *(© D. Hurst / Alamy)*

KEY TERMS

Apoptosis—Cell self-destruction. Magnolia is thought to contain certain chemicals that cause the apoptosis of cancer cells.

Honokiol—A compound derived from magnolia that is used in some Japanese herbal preparations as a mild tranquilizer. Honokiol may also be useful in treating lung cancer.

Qi—The Chinese term for life force or vital energy.

Tincture—An alcohol-based extract prepared by soaking plant parts.

Precautions

Chinese herbalists recommend that magnolia bark not be used by pregnant women and that magnolia flower be used with caution if the patient is dehydrated.

Side effects

There are no unwanted side effects reported with normal doses of any of the different uses of magnolia. Large quantities of magnolia preparations, however, have been reported to cause **dizziness**. In addition, allergic reactions to the pollen from magnolia trees are not unusual.

Interactions

In Chinese herbalism, both magnolia bark and flowers are often used in conjunction with other herbs with no reported interactions. There are no formal studies of its interactions with Western pharmaceuticals; however, there are anecdotal reports of harmful interactions between magnolia bark and prescription weight-loss medications. In addition, magnolia should not be taken together with any medications given to lower blood pressure, as it increases their effects.

Resources

BOOKS

Bensky, Dan, et al. *Chinese Herbal Medicine: Materia Medica,* 3rd ed. Seattle, WA: Eastland Press, 2004.

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Potomac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

American Association of Oriental Medicine. PO Box 162340, Sacramento, CA 95816. (866) 455 7999 or (914) 443 4770 http://www.aaaomonline.org.

American Holistic Medical Association. PO Box 2016 Edmonds, WA 98020. 425 967 0737. http://www.holisticmedicin.org.

Centre for International Ethnomedicinal Education and Research (CIEER). http://www.cieer.org.

OTHER

"Magnolia Bark Acts Like Antidepressant." *Chinese Medicine News. November 2007* [cited February 19, 2008]. http://chinesemedicinenews.com/2008/01/08/magnolia bark may be good antidepressan.

Rebecca J. Frey, Ph. D.
Tish Davidson, A. M.

Maharishi Ayurveda *see* **Ayurvedic medicine**

Mai men dong *see* **Ophiopogon**

Maitake

Description

Maitake, *Grifola frondosa*, is a mushroom found growing wild in Japan and in forests in the eastern part of North America, where it grows on dying or already dead hardwood trees. The word *maitake* means "dancing mushroom" in Japanese; the mushroom was given this name because people were supposed to have danced for joy when they found it. It is also called "hen-in-the-woods" and can reach the size of a head of lettuce. Because maitake comes from the polypores group, it produces a bunch of leaf-like clumps that are intertwined. During Japan's feudal era, maitake was used as currency; the daimyo, or provincial nobles, would exchange maitake for its weight in silver from the shogun, the military ruler of Japan.

The mushroom is also cultivated in laboratories by growing a small amount of it on a sterile medium in a Petri dish. This culture is used to make what is called a spawn, which is then inoculated into production logs made from sawdust and grain. During the next 30 days, the spawn settles in and binds to the log. Then the logs are placed in temperature- and humidity-controlled mushroom houses until the mushrooms begin forming. They are then moved to a mushroom fruiting house. The entire procedure requires a period of 10–14 weeks.

Maitake's main ingredient is the polysaccharide beta-1.6-glucan, a complex carbohydrate substance high in sugar components bound together. The patented extracted form of this glucan is called the Maitake D-Fraction. Both terms can be used interchangeably. Two other components of maitake, named *fraction X* and *fraction ES*, were discovered by Harry Preuss, a medicine and pathology professor at Georgetown University Medical Center in Washington, DC.

General use

Although the Chinese and Japanese have used maitake in cooking and healing for many centuries, it is only in the last 20 years that studies have been conducted concerning its functions. Maitake's main functions are activating the immune system and acting as an antitumor agent. Maitake is known as an adaptogen and tonic, and as such it aids healthy people to keep their levels of blood sugar, blood pressure, **cholesterol**, and weight normal. The beta glucan in maitake is a *cell-surface carbohydrate*. This means that beta glucan aids cell communication in specific circumstances. As a polysaccharide, this glucan activates

Maitake mushroom (Grifola frondosa). *(MIXA Co., Ltd. / Alamy)*

the white blood cells, called *macrophages*, which in turn devour microorganisms that produce disease, as well as tumors.

A 1995 study at Japan's Kobe Pharmaceutical University investigated the effects of maitake's D-fraction on **cancer** in mice. Results showed 73.3-45.5% reduction in breast, lung, liver and prostrate cancer growth, 25% reduction in **leukemia**, 33.3% reduction in stomach cancer and 0–16% in bone cancer. These benefits increased 4–13% when combined with traditional chemotherapy treatment, as well as reducing chemotherapy's side effects and making it work better in treating cancer. Researchers attribute this latter result to the X and ES fractions of the mushroom. More recent studies of the use of MD-fraction in treating cancer patients have also found that its effectiveness varies somewhat depending on the type of cancer; a higher proportion of patients with cancers of the breast, lung, or liver showed improvement than patients with leukemia or brain cancers.

Another study by the same group of researchers looked at maitake's D-fraction function of activating memory T-cells. In turn, these T-cells remember the cells that started the tumor growth and nail them for destruction. The study found that maitake both decreases cancer cells and prevents them from occurring elsewhere in the body. In addition to its antitumor effects, maitake extract appears to increase cellular immunity to cancer.

KEY TERMS

Adaptogen—A herb or herbal product that helps the body adapt to a broad range of life stresses.

Glucan—A complex sugar molecule consisting of smaller units of glucose.

Spawn—Grain, often rye or millet, that has been inoculated with mushroom spores and is used to grow mushrooms commercially.

Spore—The asexual reproductive body of a mushroom or other nonflowering plant.

Tonic—A medicine or herbal preparation that is given to strengthen and invigorate the body.

Cancer research on apoptosis is one of the main areas of study. This process of programmed cell death is found to kill not only cancer cells, but all cells. At the Department of Urology, New York Medical College, *in vitro* research by Hiroshi Tazaki and his team shows that the D-fraction can kill **prostate cancer** cells.

Preuss, who discovered the fraction X (anti-diabetic) and fraction ES (anti-hypertensive) components of maitake, conducted studies based on the hypothesis that such chronic diseases of **aging** as diabetes, **hypertension** and **obesity** are connected partly to glucose/insulin disorders. From his 1998 study, Preuss concluded that maitake could positively affect the glucose/insulin balance and prevent these age-related diseases. A study done at Georgetown University in 2002 found that an extract of maitake does indeed improve glucose/insulin metabolism in insulin-resistant mice.

Maitake's affect on liver and cholesterol were discovered in two more studies at Kobe Pharmaceutical University. A 1996 study on rats with hyperlipidemia were fed either cholesterol or dried powder containing 20% maitake mushroom. Results showed that maitake altered the metabolism of fatty acids by stopping fatty acid from increasing in the liver and fatty acid levels from rising in the blood serum.

Maitake can also decrease high blood pressure. In 1994, a study at New York's Ayurvedic Medical Center, hypertensive patients took maitake concentrate two times daily for a month. Results showed their blood pressure decreased from 5–20%.

Studies have also shown maitake can help **AIDS** patients. In *Mushrooms as Medicine*, two 1992 *in vitro* studies, one in Japan and one at the United States National Cancer Institute, showed that maitake both improves T-cell activity and kills HIV. One study, using a sulfated maitake extract, stopped HIV killing T-cells by 97%. Another study, in 1996 at Memorial Sloan-Kettering Cancer Center in New York, looked at the functions of a variety of edible mushrooms, including maitake. Although the study showed that the information for mushrooms wasn't as strong as for vegetables, such as broccoli and cauliflower, the study also recommended that more research should be done regarding the use of mushrooms to treat serious diseases, such as cancer and AIDS.

In 1999, the U. S. Food and Drug Administration (FDA) granted Maitake Products approval to conduct a clinical study using maitake (in its patented D-fraction form) in people with advanced **breast cancer** and prostate cancer. The American Cancer Society (ACS) is less supportive of the claims made for maitake, stating in its guide to complementary and alternative treatments that "There is no scientific evidence that the maitake mushroom is effective in treating or preventing cancer in humans." The ACS points out that the Japanese studies of maitake have been done on mice, and that further research is necessary to show that the benefits also apply to humans.

Preparations

Maitake mushroom may be eaten fresh, made into a tea, taken as capsules, or taken as an alcohol extract.

When maitake mushroom is cooked, the taste is woodsy. The mushroom must be washed and soaked in water until it turns soft. It is sautéed in oil and used as a side dish, in stews, sauces, or in soups. Maitake mushrooms will keep from five to 10 days if properly stored in a paper bag in the refrigerator.

Dried maitake pieces may be made into a tea by using two to four grams per day, split into two preparations of tea. It is best to drink the tea between the morning and evening. To make the tea, it is first required to grind the dried maitake in a coffee grinder, then it is added to water, boiled and simmered from 20 minutes to four hours. Tea should be filtered before drinking. Grounds can be reused as long as they retain their color. Maitake can also be mixed with other tonic herbs, such as **green tea** or ginseng.

Capsules are available in 150-500 mg with a standardized D-fraction powder extract of 10 mg. They may be taken twice a day between meals or first thing in the morning. Dosage varies from one capsule of 150 mg to six capsules of 500 mg. It is best to consult with a health care provider for therapeutic doses. Taking maitake with **vitamin C** helps to increase maitake's absorption. Capsules should be stored in a cool dry place.

The FDA approved-for-clinical-study maitake products are available in D-fraction extracts of two to four ounce bottles, as well as capsules.

Precautions

Maitake is not recommended for children. Pregnant women and nursing women should consult a health care provider before taking maitake. People with such autoimmune diseases as lupus should avoid maitake. The mushroom stimulates the immune system, and their immune systems are already in overdrive.

Side effects

Side effects are rare and the only known one is possible loose bowels and stomach upset if the whole mushroom is eaten. To avoid this, take in capsule form.

Interactions

No interactions between maitake and prescription medications have been reported.

Resources

BOOKS

American Cancer Society (ACS). *ACS Guide to Comple mentary and Alternative Cancer Methods*. Atlanta, GA: American Cancer Society, 2001.

Balch, James F., MD, and Phyllis A. Balch, CNC. *Pre scription for Nutritional Healing,* 2nd ed. Garden City Park, NY: Avery Publishing Group, 1997.

PERIODICALS

Haugen, Jerry and George B. Holcomb. "Specialty Mush rooms." *The Mushroom Growers' Newsletter*, Office of Communications, U.S.Department of Agriculture.

Inoue, A., N. Kodama, and H. Nanba. "Effect of Maitake (*Grifola frondosa*) D Fraction on the Control of the T Lymph Node Th 1/Th 2 Proportion." *Biological and Pharmaceutical Bulletin* 25 (April 2002): 536 540.

Kodama, N., K. Komuta, and H. Nanba. "Can Maitake MD Fraction Aid Cancer Patients?" *Alternative Medi cine Review* 7 (June 2002): 236 239.

Manohar, V., N. A. Talpur, B. W. Echard, et al. "Effects of a Water Soluble Extract of Maitake Mushroom on Circulating Glucose/Insulin Concentrations in KK Mice." *Diabetes, Obesity and Metabolism* 4 (January 2002): 43 48.

ORGANIZATIONS

Mushroom Council. 11875 Dublin Boulevard, Suite D 262, Dublin, CA 94568. (925) 556 5970. www.mushroom council.com.

U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. www.fda.gov.

OTHER

"Maitake (*Grifola frondosa*)." Virtual Health 1998, Health Notes Online. www.vitaminbuzz.com.

"Maitake Mushrooms." JHS Natural Products. www. jhsnp.com.

Sharon Crawford
Rebecca J. Frey, PhD

Malaria

Definition

Malaria is a serious infectious disease spread by certain mosquitoes. It is most common in tropical climates. It is characterized by recurrent symptoms of **chills**, **fever**, and an enlarged spleen. The disease can be treated with medication, but it often recurs. Malaria is endemic (occurs frequently in a particular locality) in many third world countries. Isolated, small outbreaks sometimes occur within the boundaries of the United States, with most of the cases reported as having been imported from other locations.

Description

Malaria is a growing problem in the United States. Although only about 1400 new cases were reported in the United States and its territories in 2000, many involved returning travelers. In addition, locally transmitted malaria has occurred in California, Florida, Texas, Michigan, New Jersey, and New York City. While malaria can be transmitted in blood, the American blood supply is not screened for malaria. Widespread malarial epidemics are far less likely to occur in the United States, but small localized epidemics could return to the Western world. As of late 2002, primary care physicians are being advised to screen returning travelers with fever for malaria, and a team of public health doctors in Minnesota is recommending screening immigrants, refugees, and international adoptees for the disease—particularly those from high-risk areas.

The picture is far more bleak, however, outside the territorial boundaries of the United States. A recent government panel warned that disaster looms over Africa from the disease. Malaria infects between 300 and 500 million people every year in Africa, India, southeast Asia, the Middle East, Oceania, and Central and South America. A 2002 report stated that malaria kills 2.7 million people each year, more than 75 percent of them African children under

the age of five. It is predicted that within five years, malaria will kill about as many people as does **AIDS**. As many as half a billion people worldwide are left with chronic **anemia** due to malaria infection. In some parts of Africa, people battle up to 40 or more separate episodes of malaria in their lifetimes. The spread of malaria is becoming even more serious as the parasites that cause malaria develop resistance to the drugs used to treat the condition. In late 2002, a group of public health researchers in Thailand reported that a combination treatment regimen involving two drugs known as dihydroartemisinin and azithromycin shows promises in treating multidrug-resistant malaria in southeast Asia.

Causes and symptoms

Human malaria is caused by four different species of a parasite belonging to genus *Plasmodium*: *Plasmodium falciparum* (the most deadly), *Plasmodium vivax*, *Plasmodium malariae*, and *Plasmodium ovale*. The last two are fairly uncommon. Many animals can get malaria, but human malaria does not spread to animals. In turn, animal malaria does not spread to humans.

A person gets malaria when bitten by a female mosquito seeking a blood meal that is infected with the malaria parasite. The parasites enter the blood stream and travel to the liver, where they multiply. When they reemerge into the blood, symptoms appear. By the time a patient shows symptoms, the parasites have reproduced very rapidly, clogging blood vessels and rupturing blood cells.

Malaria cannot be casually transmitted directly from one person to another. Instead, a mosquito **bites** an infected person and then passes the infection on to the next human it bites. It is also possible to spread malaria via contaminated needles or in blood transfusions. This is why all blood donors are carefully screened with questionnaires for possible exposure to malaria.

It is possible to contract malaria in non-endemic areas, although such cases are rare. Nevertheless, at least 89 cases of so-called airport malaria, in which travelers contract malaria while passing through crowded airport terminals, have been identified since 1969.

The amount of time between the mosquito bite and the appearance of symptoms varies, depending on the strain of parasite involved. The incubation period is usually between eight and 12 days for falciparum malaria, but it can be as long as a month for the other types. Symptoms from some strains of *P. vivax* may not appear until eight to 10 months after the mosquito bite occurred.

KEY TERMS

Arteminisinins—A family of antimalarial products derived from an ancient Chinese herbal remedy. Two of the most popular varieties are artemether and artesunate, used mainly in southeast Asia in combination with mefloquine.

Chloroquine—An antimalarial drug that was first used in the 1940s, until the first evidence of quinine resistance appeared in the 1960s. It is now ineffective against falciparum malaria almost everywhere. However, because it is inexpensive, it is still the antimalarial drug most widely used in Africa. Native individuals with partial immunity may have better results with chloroquine than a traveler with no previous exposure.

Mefloquine—An antimalarial drug that was developed by the United States Army in the early 1980s. Today, malaria resistance to this drug has become a problem in some parts of Asia (especially Thailand and Cambodia).

Quinine—One of the first treatments for malaria, quinine is a natural product made from the bark of the Cinchona tree. It was popular until being superseded by the development of chloroquine in the 1940s. In the wake of widespread chloroquine resistance, however, it has become popular again. Quinine, or its close relative quinidine, can be given intravenously to treat severe *Falciparum* malaria.

Sulfadoxone/pyrimethamine (Fansidar)—An antimalarial drug developed in the 1960s. It is the first drug tried in some parts of the world where chloroquine resistance is widespread. It has been associated with severe allergic reactions due to its sulfa component.

The primary symptom of all types of malaria is the "malaria ague" (chills and fever), which corresponds to the "birth" of the new generation of the parasite. In most cases, the fever has three stages, beginning with uncontrollable shivering for an hour or two, followed by a rapid spike in temperature (as high as 106°F [41.4°C]), which lasts three to six hours. Then, just as suddenly, the patient begins to sweat profusely, which will quickly bring down the fever. Other symptoms may include **fatigue**, severe **headache**, or **nausea** and **vomiting**. As the sweating subsides, the patient typically feels exhausted and falls asleep. In many cases,

this cycle of chills, fever, and sweating occurs every other day, or every third day, and may last for between a week and a month. Those with the chronic form of malaria may have a relapse as long as 50 years after the initial infection.

Falciparum malaria is far more severe than other types of malaria because the parasite attacks all red blood cells, not just the young or old cells, as do other types. It causes the red blood cells to become very "sticky." A patient with this type of malaria can die within hours of the first symptoms. The fever is prolonged. So many red blood cells are destroyed that they block the blood vessels in vital organs (especially the brain and kidneys), and the spleen becomes enlarged. There may be brain damage, leading to coma and convulsions. The kidneys and liver may fail.

Malaria in **pregnancy** can lead to premature delivery, miscarriage, or stillbirth.

Certain kinds of mosquitoes belonging to the genus *Anopheles* can pick up the parasite by biting an infected human. (The more common kinds of mosquitoes in the United States do not transmit the infection.) This is true for as long as that human has parasites in his/her blood. Since strains of malaria do not protect against each other, it is possible to be reinfected with the parasites again and again. It is also possible to develop a chronic infection without developing an effective immune response.

Diagnosis

Malaria is diagnosed by examining blood under a microscope. The parasite can be seen in the blood smears on a slide. These blood smears may need to be repeated over a 72-hour period in order to make a diagnosis. Antibody tests are not usually helpful because many people developed antibodies from past **infections**, and the tests may not be readily available. A new laser test to detect the presence of malaria parasites in the blood was developed in 2002, but is still under clinical study.

Two new techniques to speed the laboratory diagnosis of malaria show promise. The first is acridine orange (AO), a staining agent that works much faster (3–10 min) than the traditional Giemsa stain (45–60 min) in making the malaria parasites visible under a microscope. The second is a bioassay technique that measures the amount of a substance called histadine-rich protein II (HRP2) in the patient's blood. It allows for a very accurate estimation of parasite development. A dip strip that tests for the presence of HRP2 in blood samples appears to be more accurate in diagnosing malaria than standard microscopic analysis.

Anyone who becomes ill with chills and fever after being in an area where malaria exists must see a doctor and mention their recent travel to endemic areas. A person with the above symptoms who has been in a high-risk area should insist on a blood test for malaria. The doctor may believe the symptoms are just the common flu virus. Malaria is often misdiagnosed by North American doctors who are not used to seeing the disease. Delaying treatment of falciparum malaria can be fatal.

Treatment

Traditional Chinese medicine

The Chinese herb qiinghaosu (the Western name is artemisinin) has been used in China and southeast Asia to fight severe malaria, and became available in Europe in 1994. It is usually combined with another antimalarial drug (mefloquine) to prevent relapse and drug resistance. It is not available in the United States and other parts of the developed world due to fears of its toxicity, in addition to licensing and other issues.

Western herbal medicine

A Western herb called **wormwood** (*Artemesia annua*) that is taken as a daily dose may be effective against malaria. Protecting the liver with herbs like **goldenseal** (*Hydrastis canadensis*), Chinese goldenthread (*Coptis chinensis*), and **milk thistle** (*Silybum marianum*) can be used as preventive treatment. These herbs should only be used as complementary to conventional treatment and not to replace it. Patients should consult their doctors before trying any of these medications.

Traditional African herbal medicine

As of late 2002, researchers were studying a traditional African herbal remedy against malaria. Extracts from *Microglossa pyrifolia*, a trailing shrub belonging to the daisy family (Asteraceae), show promise in treating drug-resistent strains of *P. falciparum*.

Allopathic treatment

Falciparum malaria is a medical emergency that must be treated in the hospital. The type of drugs, the method of giving them, and the length of the treatment depend on where the malaria was contracted and the severity of the patient's illness.

For all strains except falciparum, the treatment for malaria is usually chloroquine (Aralen) by mouth for three days. Those falciparum strains suspected to

be resistant to chloroquine are usually treated with a combination of quinine and tetracycline. In countries where quinine resistance is developing, other treatments may include clindamycin (Cleocin), mefloquin (Lariam), or sulfadoxone/pyrimethamine (Fansidar). Most patients receive an antibiotic for seven days. Those who are very ill may need intensive care and intravenous (IV) malaria treatment for the first three days.

A patient with falciparum malaria needs to be hospitalized and given antimalarial drugs in different combinations and doses depending on the resistance of the strain. The patient may need IV fluids, red blood cell transfusions, kidney dialysis, and assistance breathing.

A drug called primaquine may prevent relapses after recovery from *P. vivax* or *P. ovale*. These relapses are caused by a form of the parasite that remains in the liver and can reactivate months or years later.

Another new drug, halofantrine, is available abroad. While it is licensed in the United States, it is not marketed in this country and it is not recommended by the Centers for Disease Control and Prevention in Atlanta.

Expected results

If treated in the early stages, malaria can be cured. Those who live in areas where malaria is epidemic, however, can contract the disease repeatedly, never fully recovering between bouts of acute infection.

Prevention

Preventing mosquito bites while in the tropics is one possible way to avoid malaria. Several researchers are currently working on a malarial vaccine, but the complex life cycle of the malaria parasite makes it difficult. A parasite has much more genetic material than a virus or bacterium. For this reason, a successful vaccine has not yet been developed. A new longer-lasting vaccine shows promise, attacking the toxin of the parasite and therefore lasts longer than the few weeks of those vaccines currently used for malaria prevention. However, as of late 2002, the vaccine had been tested only in animals, not in humans, and could be several years from use.

A newer strategy involves the development of genetically modified non-biting mosquitoes. A research team in Italy is studying the feasibility of this means of controlling malaria.

Malaria is an especially difficult disease to prevent by vaccination because the parasite goes through several life stages. One recent, promising vaccine appears to have protected up to 60% of people exposed to malaria. This was evident during field trials for the drug that were conducted in South America and Africa. It is not yet commercially available.

The World Health Organization has been trying to eliminate malaria for the past 30 years by controlling mosquitoes. Their efforts were successful as long as the pesticide DDT killed mosquitoes and antimalarial drugs cured those who were infected. Today, however, the problem has returned a hundredfold, especially in Africa. Because both the mosquito and parasite are now extremely resistant to the insecticides designed to kill them, governments are now trying to teach people to take antimalarial drugs as a preventive medicine and avoid getting bitten by mosquitoes.

Travelers to high-risk areas should use insect repellant containing DEET for exposed skin. Because DEET is toxic in large amounts, children should not use a concentration higher than 35%. DEET should not be inhaled. It should not be rubbed onto the eye area, on any broken or irritated skin, or on children's hands. It should be thoroughly washed off after coming indoors.

Those who use the following preventive measures get fewer infections than those who do not:

- Between dusk and dawn, remaining indoors in well-screened areas.
- Sleep inside pyrethrin or permethrin repellent-soaked mosquito nets.
- Wearing clothes over the entire body.

Anyone visiting areas where malaria is endemic should take antimalarial drugs starting one week before they leave the United States. The drugs used are usually chloroquine or mefloquine. This treatment is continued through at least four weeks after leaving the endemic area. However, even those who take antimalarial drugs and are careful to avoid mosquito bites can still contract malaria.

International travelers are at risk for becoming infected. Most Americans who have acquired falciparum malaria were visiting sub-Saharan Africa; travelers in Asia and South America are less at risk. Travelers who stay in air conditioned hotels on tourist itineraries in urban or resort areas are at lower risk than those who travel outside these areas, such as backpackers, missionaries, and Peace Corps volunteers. Some people in Western cities where malaria does not usually exist may acquire the infection from a mosquito carried onto a jet. This is called airport or runway malaria.

A 2002 report showed how efforts in a Vietnamese village to approach prevention from multiple angles resulted in a significant drop in malaria cases. Health workers distributed bednets treated with permethrin throughout the village and also made sure they were re-sprayed every six months. They also worked to ensure early diagnosis, early treatment, and annual surveys of villagers to bring malaria under control.

Resources

BOOKS

Desowitz, Robert S. *The Malaria Capers: More Tales of Parasites and People, Research and Reality*. New York: W.W. Norton, 1993.

"Extraintestinal Protozoa: Malaria." Section 13, Chapter 161 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Labo ratories, 1999.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Illnesses*. New York: John Wiley & Sons, 1995.

PERIODICALS

Ambroise Thomas P. "[Curent Data on Major Novel Anti malarial Drugs: Artemisinin (qinghaosu) derivatives]". [Article in French]. *Bulletin of the Academy of National Medicine* 183, no.4 (1999): 797 780. Abstract.

Causer, Louise M, et al. "Malaria Surveillance United States, 2000". *Morbidity and Mortality Weekly Report* (July 12, 2002): 9 15. Abstract.

Coluzzi, M., and C. Costantini. "An Alternative Focus in Strategic Research on Disease Vectors: The Potential of Genetically Modified Non Biting Mosquitoes." *Para ssitologia* 44 (December 2002): 131 135.

"Combination Approach Results in Significant Drop in Malaria Rates in Viet Nam." *TB & Outbreaks Week* (September 24, 2002): 17. Abstract.

Devi, G., V. A. Indumathi, D. Sridharan, et al. "Evaluation of ParaHITf Strip Test for Diagnosis of Malarial Infection." *Indian Journal of Medical Science* 56 (Octo ber 2002): 489 494.

Keiser, J., J. Utzinger, Z. Premji, et al. "Acridine Orange for Malaria Diagnosis: Its Diagnostic Performance, Its Promotion and Implementation in Tanzania, and the Implications for Malaria Control." *Annals of Tropical Medicine and Parasitology* 96 (October 2002): 643 654.

Kohler, I., K. Jenett Siems, C. Kraft, et al. "Herbal Rem edies Traditionally Used Against Malaria in Ghana: Bioassay Guided Fractionation of *Microglossa pyrifo lia* (Asteraceae)." *Zur Naturforschung* 57 (November December 2002): 1022 1027.

Krudsood, S., K. Buchachart, K. Chalermrut, et al. "A Comparative Clinical Trial of Combinations of Dihy droartemisinin Plus Azithromycin and Dihydroartemi sinin Plus Mefloquine for Treatment of Multidrug Resistant *Falciparum* Malaria." *Southeast Asian Journal of Tropical Medicine and Public Health* 33 (September 2002): 525 531.

"Laser based Malaria Test could be Valuable." *Medical Devices & Surgical Technology Week* (September 22, 2002):4.

Mack, Alison. "Collaborative Efforts Under Way to Combat Malaria." *The Scientist* 10 (May 12, 1997): 1, 6.

McClellan, S. L. "Evaluation of Fever in the Returned Traveler." *Primary Care* 29 (December 2002): 947 969.

"Multilateral Initiative on Malaria to Move to Sweden." *TB & Outbreaks Week* (September 24, 2002): 17.

Noedl, H., C. Wongsrichanalai, R. S. Miller, et al. "*Plas modium falciparum*: Effect of Anti Malarial Drugs on the Production and Secretion Characteristics of Histi dine Rich Protein II." *Experimental Parasitology* 102 (November December 2002): 157 163.

"Promising Vaccine May Provide Long Lasting Protec tion." *Medical Letter on the CDC & FDA* (September 15, 2002): 14.

Stauffer, W. M., D. Kamat, and P. F. Walker. "Screening of International Immigrants, Refugees, and Adoptees." *Primary Care* 29 (December 2002): 879 905.

Thang, H. D., R. M. Elsas, and J. Veenstra. "Airport Malaria: Report of a Case and a Brief Review of the Literature." *Netherlands Journal of Medicine* 60 (December 2002): 441 443.

ORGANIZATIONS

Centers for Disease Control Malaria Hotline. (770) 332 4555.

Centers for Disease Control Travelers Hotline. (770) 332 4559.

OTHER

Malaria Foundation. http://www.malaria.org.

Mai Tran
Teresa G. Odle
Rebecca J. Frey, PhD

Malignant lymphoma

Definition

Lymphomas are a group of cancers in which cells of the lymphatic system become abnormal and start to grow uncontrollably. Because there is lymph tissue in many parts of the body, lymphomas can start in almost any organ of the body.

Description

The lymphatic system is made up of ducts or tubules that carry lymph to all parts of the body. Lymph is a milky fluid that contains lymphocytes. These, along with monocytes and granulocytes make

Swelling in the neck of a 70-year old woman with non-Hodgkin's type lymphoma, cancer of the lymph nodes. *(Dr. P. Marazzi / Photo Researchers, Inc.)*

up the leukocytes, or white blood cells, the infection-fighting and reparative bodies in the blood. Small pea-shaped organs found along the network of lymph vessels are called lymph nodes; their main function is to make and store lymphocytes. Clusters of lymph nodes are found in the pelvic region, underarm, neck, chest, and abdomen. The spleen (an organ in the upper abdomen), the tonsils, and the thymus (a small organ beneath the breastbone) are also part of the lymphatic system. Lymphocytes are held within the lymphoid tissue until they join the flow of lymph through the node. There are two main types of lymphocytes: the T cell and the B cell. Lymphomas develop from these two types. B-cell lymphomas are more common among adults, while among children, the incidence of T- and B-cell lymphomas are almost equal.

The T and the B cells perform different jobs within the immune system. When an infectious bacterium enters the body, the B cells make proteins called *antibodies,* which attach themselves to the bacteria, and flag them for destruction by other immune cells. The T cells help protect the body against viruses. When a virus enters a cell, it generally produces certain proteins that it projects onto the surface of the infected cell. T cells recognize these proteins and produce *cytokines* to destroy the infected cells. Some cytokines attract other cell types, which can digest the virus-infected cell. T cells can also destroy some types of **cancer** cells.

Lymphomas can be divided into two main types: Hodgkin's and non-Hodgkin's. There are at least 10 types of non-Hodgkin's lymphomas that are grouped (staged) by how aggressively they grow: slow growing (low grade), intermediate growing, and rapidly growing (high grade); and how far they spread.

KEY TERMS

Antibodies—Proteins made by the B lymphocytes in response to the presence of infectious agents such as bacteria or viruses in the body.

Biopsy—The surgical removal and microscopic examination of living tissue for diagnostic purposes.

Cytokines—Chemicals made by T cells that act on other cells to stimulate or inhibit their function.

Most non-Hodgkin's lymphomas begin in the lymph nodes; about 20% start in other organs, such as the lungs, liver or gastrointestinal tract. When lymphomas begin, malignant lymphocytes multiply uncontrollably and do not perform their normal functions, which affects the body's ability to fight **infections**. In addition, malignant cells may crowd the bone marrow, and, depending on the stage, prevent the production of normal red blood cells, white blood cells, and platelets. A low red blood cell count causes **anemia**, while a reduction in the number of platelets makes the person susceptible to excessive bleeding. Cancerous cells can also invade other organs through the circulatory system of the lymph, causing those organs to malfunction.

Causes and symptoms

The exact cause of non-Hodgkin's lymphomas is unknown. In general, males are at a higher risk than females, and the risk increases with age. Though it can strike people as young as 40, people between the ages of 60 and 69 are at the highest risk. In addition, the number of non-Hodgkin's cases has increased significantly in recent years, many of them due to the **AIDS** epidemic. (For reasons that are still poorly understood, AIDS patients have a higher likelihood of developing non-Hodgkin's lymphomas.)

People exposed to certain pesticides and ionizing radiation have a higher-than-average chance of developing this disease. For example, an increased incidence of lymphomas has been seen in survivors of the atomic bomb explosion in Hiroshima, and in people who have undergone aggressive radiation therapy. People who suffer from immune-deficient disorders, as well as those who have been treated with immune-suppressive drugs for heart or kidney transplants, and for conditions such as **rheumatoid arthritis** and autoimmune diseases, are at an increased risk for this disease. Some studies have shown a loose association between retroviruses, such as HTLV-I, and some rare forms of lymphoma. The Epstein-Barr virus has been

linked to Burkitt's lymphoma in African countries. However, a direct cause-and-effect relationship has not been established.

The symptoms of lymphomas are often vague and nonspecific. Patients may experience loss of appetite, weight loss, **nausea**, **vomiting**, abdominal discomfort, and **indigestion**. The patient may complain of a feeling of fullness, which is a result of enlarged lymph nodes in the abdomen. Pressure or **pain** in the lower back is another symptom. In the advanced stages, the patient may have bone pain, headaches, constant coughing, and abnormal pressure and congestion in the face, neck, and upper chest. Some may have fevers and night sweats. In most cases, patients go to the doctor because of the presence of swollen glands in the neck, armpits, or groin area. Since all the symptoms are common to many other illnesses, it is essential to seek medical attention if any of the conditions persist for two weeks or more. Only a qualified physician can correctly diagnose if the symptoms are due to lymphoma or some other ailment.

Diagnosis

Like all cancers, lymphomas are best treated when found early. However, they are often difficult to diagnose. There are no screening tests available, and, since the symptoms are nonspecific, lymphomas are rarely recognized in their early stages. Detection often occurs by chance during a routine physical examination.

When the doctor suspects lymphoma, a thorough physical examination is performed and a complete medical history taken. Enlarged liver, spleen, or lymph nodes may suggest lymphomas. Blood tests will determine the cell counts and obtain information on how well the organs, such as the kidney and liver, are functioning.

A biopsy (microscopic tissue analysis) of the enlarged lymph node is the most definitive way to diagnose a lymphoma. Once the exact form of lymphoma is known, it is then staged to determine how aggressive it is, and how far it has spread. This information helps determine the appropriate treatment. The doctor may also perform a bone marrow biopsy. During this procedure, a cylindrical piece of bone—generally from the hip—and marrow fluid are removed. These samples are sent to the laboratory for examination. Biopsies may also be repeated during treatment to see how the lymphoma is responding to therapy.

Conventional imaging tests, such as x rays, computed tomography scans (CT scans), magnetic resonance imaging, and abdominal sonograms, are used to determine the extent of spread of the disease. *Lymphangiograms* are x rays of the lymphatic system. In this procedure, a special dye, called contrast medium, is injected into the lymphatic channels through a small incision (cut) made in each foot. The dye is injected slowly over a period of three to four hours. This dye clearly outlines the lymphatic system and allows it to stand out. Multiple x rays are then taken and any abnormality, if present, is revealed.

In rare cases a lumbar puncture (spinal tap) is performed to see if malignant cells are in the fluid that surrounds the brain. In this test, the physician inserts a needle into the epidural space at the base of the spine and collects a small amount of spinal fluid for microscopic examination.

Treatment

Non-Hodgkin's lymphoma is a life-threatening disease, and a correct diagnosis and appropriate treatment with surgery, chemotherapy, and/or radiation are critical to controlling the illness.

Acupuncture, **hypnotherapy**, and **guided imagery** may be useful tools in treating the pain of lymphomas. Acupuncture uses a series of thin needles placed in the skin at targeted locations known as *acupoints;* in theory, this harmonizes the energy flow within the body, and may help improve immune system function.

In guided imagery, patients create pleasant and soothing mental images that promote **relaxation** and improve their ability to cope with discomfort and pain. Another guided-imagery technique involves creating a mental picture of pain. Once the pain is visualized, patients can adjust the image to make it more pleasing, and thus more manageable.

Herbal remedies, such as Chinese herbs and mushroom extracts, may also lessen pain and promote relaxation and healing. Some herbs, such as **ginger**, are effective in the treatment of nausea caused by chemotherapy, and others, such as **astragalus**, help build the immune system. Check with an herbal practitioner before deciding on treatment. Depending on the preparation and the type of herb, the remedies may interfere with other prescribed medications. Naturally, any other activities that promote well-being, such as **exercise**, **stress** reduction, **meditation**, **yoga**, **t'ai chi**, and **qigong** will also benefit the patient. Proper **nutrition** and some specialized **diets** may help in recovering from lymphomas.

Allopathic treatment

Treatment options for lymphomas depend on the type of lymphoma and its stage. In most cases,

treatment consists of chemotherapy, radiation therapy, or a combination of the two.

Chemotherapy uses anticancer drugs to kill cancer cells. In non-Hodgkin's lymphomas, combination therapy, which uses several drugs, has been found more effective than single-drug use. Treatment usually lasts about six months, but in some cases may be as long as a year. The drugs are administered intravenously (through a vein) or given orally. If cancer cells have invaded the central nervous system, then chemotherapeutic drugs may be instilled, through a needle in the brain or back, into the fluid that surrounds the brain. This procedure is known as intrathecal chemotherapy.

Radiation therapy, where high-energy ionizing rays are directed at specific portions of the body, such as the upper chest, abdomen, pelvis, or neck, is often used for treatment of lymphomas. External radiation therapy, where the rays are directed from a source outside the body, is the most common mode of radiation treatment.

Bone marrow transplantation is being tested as a treatment option when lymphomas do not respond to conventional therapy, or when the patient has had a relapse or suffers from recurrent lymphomas. There are two ways of doing bone marrow transplantation. In a procedure called *allogeneic* bone marrow transplant, the donor's marrow must match that of the patient. The donor can be a twin (best match), sibling, or not related at all. High-dose chemotherapy or radiation therapy is given to eradicate the lymphoma. The donor marrow is then given to replace the marrow destroyed by the therapy. In *autologous* bone marrow transplantation some of the patient's own marrow is harvested, chemically purged, and frozen. High-dose chemotherapy and radiation therapy are administered. The marrow that was harvested, purged, and frozen is then thawed and put back into the patient's body to replace the destroyed marrow.

A new option for lymphoma patients is *peripheral stem cell transplantation*. In this treatment, stem cells (immature cells from which all blood cells develop), that normally circulate in the blood are collected, treated to remove cancer cells, then returned to the patient in a process called *leukapheresis*. Researchers are exploring whether these cells can be used to restore the normal function and development of blood cells, rather than using a bone marrow transplant.

Expected results

Like all cancers, the prognosis for lymphoma patients depends on the stage of the cancer, and the patient's age and general health. When all the different types and stages of lymphoma are considered together, only 50% of patients survive five years or more after initial diagnosis. This is because some types of lymphoma are more aggressive than other types. The survival rate among children is definitely better than among older people. About 90% of children diagnosed with early-stage disease survive five years or more, while only 60-70% of adults diagnosed with low-grade lymphomas survive for five years or more. The survival rate for children with the more advanced stages is about 75-85%, while among adults it is 40-60%.

Prevention

Although the risk of developing cancer can be reduced by making wise diet and lifestyle choices, there is currently no known way to prevent lymphomas, nor are there special tests that allow early detection. Paying prompt attention to the signs and symptoms of this disease, and seeing a doctor if the symptoms persist, are the best strategies for an early diagnosis, which affords the best chance for a cure.

Resources

BOOKS

Dollinger, Malin, et al. *Everyone's Guide to Cancer Therapy*. Kansas City: Andrews McKeel Publishing, 1997.

Fauci, Anthony, et al., eds. *Harrison's Principles of Internal Medicine*. New York: McGraw Hill, 1998.

Murphy, Gerald P. *Informed Decisions: The Complete Book of Cancer Diagnosis, Treatment, and Recovery*. New York: American Cancer Society, 1997.

PERIODICALS

"Alternative Cancer Therapies Popular Today." *Cancer*. 77, no. 6 (March 1996).

ORGANIZATIONS

American Cancer Society (National Headquarters). 1599 Clifton Road, N.E. Atlanta, GA 30329. (800) 227 2345. http://www.cancer.org.

Cancer Research Institute (National Headquarters). 681 Fifth Avenue, New York, NY 10022. (800) 992 2623. http://www.cancerresearch.org.

The Lymphoma Research Foundation of America, Inc. 8800 Venice Boulevard, Suite 207, Los Angeles, CA 90034. (310) 204 7040. http://www.lymphoma.org.

National Cancer Institute. 9000 Rockville Pike, Building 31, room 10A16, Bethesda, MD 20892. (800) 422 6237. http://www.nci.nih.gov.

Paula Ford-Martin

Malignant melanoma *see* **Skin cancer**

Mandarin orange peel *see* **Tangerine peel**

Manganese

Description

The chemical element manganese (Mn) has the atomic mass 54.938 and atomic number 25. Manganese is not to be confused with the somewhat better known element **magnesium**. Manganese is a trace mineral used by some people to help prevent bone loss and alleviate symptoms associated with **premenstrual syndrome** (PMS). It may have a number of other beneficial effects as well. While most of the body's mineral content is composed of such macrominerals as **calcium**, magnesium, and **potassium**, certain trace minerals are also considered essential in very tiny amounts to maintain health and ensure proper functioning of the body. They usually act as coenzymes, working in conjunction with proteins to facilitate important chemical reactions. Even without taking manganese supplements, people with an average diet consume somewhere between 2 and 3 mg of the mineral through food and drink. While most authorities agree that manganese is a vital micronutrient, it is not known for certain if taking extra amounts can be helpful in treating **osteoporosis**, menstrual symptoms, or other problems.

Manganese, which is concentrated mainly in the liver, skeleton, pancreas, and brain, is considered important because it is used to make several key enzymes in the body and activates others. One of the enzymes made from manganese is superoxide dismutase (SOD), an antioxidant facilitator. **Antioxidants** help to protect cells from damage caused by free radicals, the destructive fragments of oxygen produced as a byproduct during normal metabolic processes. As these rogue particles travel through the body, they cause damage to cells and genes by stealing electrons from other molecules, a process referred to as oxidation. Manganese may also have some anticancer activity as well as a number of other important functions. It is believed to play a role in **cholesterol** and carbohydrate metabolism, thyroid function, blood sugar control, and the formation of bone, cartilage, and skin. While the effects of a manganese-free diet had not been thoroughly studied in people as of 2008, animal experiments suggest that a lack of manganese can be unhealthy. Manganese deficiency in animals appears to have an adverse effect on the growth of bone and cartilage, brain function, blood sugar control, and reproduction. One study of dietary supplementation with manganese and other micronutrients in Mexican infants found that children who received the supplements grew faster and taller than a control group given a placebo. The authors concluded that growth retardation in children in developing countries is linked to manganese and other micronutrient deficiencies in the diet, among other factors.

Manganese nodule. *(© blickwinkel / Alamy)*

General use

While considered necessary for general good health, manganese is also used for specific health concerns. Health food advocates have touted a number of possible benefits from using manganese supplements. Some conditions for which it has been recommended are:

- Alzheimer's disease
- anemia
- arthritis
- asthma
- cancers
- carpal tunnel syndrome
- chronic fatigue syndrome
- Chron's disease
- emphysema
- epilepsy
- Lyme's disease
- osteoporosis

As of 2008, research had produced only very limited evidence to support most of these claims. The strongest evidence appeared to involve the role of manganese in the development of strong bones. In a 2004 summary of scientific research on this point, the National Institute of Arthritis and Musculoskeletal and Skin Diseases concluded that manganese "helps certain enzymes and local regulators function properly" for optimal bone development and strength. Based on this conclusion, manganese is sometimes suggested as a possible treatment for osteoporosis, usually in combination with other trace minerals.

Recommended dietary allowance of manganese

Age	mg/day
Children 0-6 mos.	0.3 (AI)
Children 7-12 mos.	0.6 (AI)
Children 1-3 yrs.	1.2
Children 4-8 yrs.	1.5
Boys 9-13 yrs.	1.9
Girls 9-13 yrs.	1.6
Boys 14-18 yrs.	2.2
Girls 14-18 yrs.	1.6
Men ≥ 19 yrs.	2.3
Women ≥ 19 yrs.	1.8
Pregnant women	2.0
Breastfeeding women	2.6

Foods that contain manganese

	mg
Tea, green, 1 cup	1.58
Pineapple, raw, 1/2 cup	1.28
Pecans, 1 oz.	1.12
Cereal, raisin bran, 1/2 cup	.94
Brown rice, cooked, 1/2 cup	.88
Spinach, cooked, 1/2 cup	.84
Tea, black, 1 cup	.77
Almonds, 1 oz.	.74
Bread, whole wheat, 1 slice	.65
Peanuts, 1 oz.	.59
Sweet potato, mashed, 1/2 cup	.55
Beans, navy, cooked, 1/2 cup	.51
Beans, lima, cooked, 1/2 cup	.48
Beans, pinto, cooked, 1/2 cup	.48

AI = Adequate Intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

A single, very small study conducted in 1993 suggested that manganese and calcium may be a potent team in alleviating menstrual symptoms and premenstrual syndrome (PMS). Researchers from the Grand Forks Human **Nutrition** Research Center, which is affiliated with the U. S. Department of Agriculture, examined how calcium and manganese affect menstrual symptoms in women in good health. Ten women with normal menstrual cycles were studied for about 170 days. The women received 587 or 1,336 mg of calcium a day with 1.0 or 5.6 mg a day of manganese. They filled out a Menstrual Distress Questionnaire during each cycle and the results were analyzed. Getting more calcium improved mood, concentration, and behavior, and also reduced menstrual **pain** and the water retention associated with the premenstrual phase. The role of manganese appeared to be important. Despite getting higher amounts of calcium, women who received lower amounts of manganese experienced more moodiness and pain prior to their periods. This study suggested that getting adequate amounts of calcium and manganese can help to reduce the pain and other symptoms associated with menstrual periods. The results of this study had not been confirmed, however, as of 2008.

Manganese may also be important for people with other diseases. Those with **epilepsy**, diabetes, and Perthes disease tend to have low levels of the mineral, which has led to suggestions that manganese may help to prevent or treat these disorders. Almost no research exists to support these contentions, however. A handful of animal studies have indicated that manganese may play a role in controlling seizures and blood sugar levels. Manganese may also decrease the risk of colon **cancer** by raising levels of the SOD enzyme, which has antioxidant effects.

Some people take manganese to help treat muscle **strains** or **sprains**, as well as **rheumatoid arthritis**, though there was as of 2008 no convincing scientific evidence to support these uses. Theoretically, manganese may act as an anti-inflammatory agent by boosting the activity of SOD.

Preparations

The optimum daily dosage of manganese has not been established with certainty. While there is no recommended daily allowance (RDA) or daily value (DV) for manganese, the U.S. government has established what is called an adequate intake level (AI) for certain nutrients. In adults over the age of 19, the AI for manganese is 2.3 mg/day for men and 1.8 mg/day for women. Adequate intake for children and adolescents varies with age and sex. Daily dosage ranges from 0.6 mg/day for both sexes from ages 7 to 12 months; 1.2 mg/day from age 1 to 3 years; 1.5 mg/day for ages 4 to 8; 1.9 mg/day for boys and 1.6 mg/day for girls age 9 to 13; and 2.2 mg/day for males and 1.6 mg/day for females age 14 to 18.

Even without taking supplements, most women get about 2.2 mg a day of manganese through their **diets**, while men consume about 2.8 mg. Vegetarians and people who consume large amounts of wholegrain foods may get as much as 10 to 18 mg a day. Some authorities believe it is better for people to avoid manganese supplements altogether and increase their intake of foods known to contain significant amounts of the mineral. Manganese-rich foods and drinks

KEY TERMS

Calcium—A mineral necessary for strong bones and proper functioning of organs and muscles.

Osteoporosis—An age-related disease in which bones become fragile and prone to debilitating fractures.

Pancreas—An organ behind the stomach that produces digestive enzymes and hormones such as insulin.

include peanuts, pecans, pineapples and pineapple juice, shredded wheat and raisin bran cereals, and oatmeal. Other good sources are rice; sweet potatoes; spinach; whole wheat bread; and lima, pinto, and navy beans. Meat, poultry, fish, and dairy products are considered poor sources. Getting too much manganese through food and drink is not considered a significant risk because the mineral is present only in small amounts in plants and animals.

Some people take as much as 50 to 200 mg of manganese for several weeks to help treat muscle sprains or strains, but the safety and effectiveness of taking dosages this high were unknown in the late 2000s.

Precautions

Manganese is not known to be harmful when taken in recommended dosages. Extremely high intake of the mineral, however, has resulted in cases of idiopathic **Parkinson's disease**. Some studies indicate that high levels of manganese alter the blood-brain barrier, lowering the **iron** content of blood plasma while allowing the iron content of cerebrospinal fluid to rise. These cases of manganese-induced parkinsonism are usually limited to miners who inadvertently breathe manganese-rich dust or people who drink contaminated water from wells. People who eat a manganese-rich diet are not considered at risk for these types of side effects. In fact, most foods high in manganese are believed to contribute to good health.

Side effects

When taken in recommended dosages, manganese is not associated with any bothersome or significant side effects.

Interactions

Manganese interacts with certain drugs and dietary supplements. People who take oral contraceptives or antacids may require higher intake of manganese. More of the mineral may be needed in people who also take **phosphorus**, fiber, **copper**, iron, **zinc**, magnesium, or calcium.

Resources

PERIODICALS

Greiffenstein, Manfred, and Paul Lees Haley. "Neuropsychological Correlates of Manganese Exposure: A Meta analysis." *Journal of Clinical and Experimental Neuropsychology* (February 2007): 113 126.

Gwiazda, Roberto, Roberto Lucchini, and Donald Smith. "Adequacy and Consistency of Animal Studies to Evaluate the Neurotoxicity of Chronic Low Level Manganese Exposure in Humans." *Journal of Toxicology and Environmental Health: Part A* (January 2007): 594 605.

Klos, K. J., et al. "Neuropsychological Profiles of Manganese Neurotoxicity." *European Journal of Neurology* (October 2006): 1139 1141.

Wasserman, Gail A., et al. "Developmental Impacts of Heavy Metals and Undernutrition." *Basic & Clinical Pharmacology & Toxicology* (February 2008): 212 217.

OTHER

"Manganese: Health Information Summary." New Hampshire Department of Environmental Services, 2006. http://www.des.state.nh.us/factsheets/ehp/ard ehp 15.htm. (February 15, 2008).

"Micronutrient Information Center: Manganese." Linus Pauling Institute, June 2007. http://lpi.oregonstate.edu/infocenter/minerals/manganese/. (February 15, 2008).

ORGANIZATIONS

NIH Osteoporosis and Related Bone Diseases National Resource Center, Bldg. 31, Room 4C02, 31 Center Dr. MSC 2350, Bethesda, MD, 20892 2350, (301) 496 8190, http://www.niams.nih.gov/.

Greg Annussek
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Mangosteen

Description

The mangosteen is the tree *Garcinia mangostana L.*. The tree is native to tropical Asia and is thought to have been first grown as a crop in Thailand or Burma. In the 2000s, mangosteens are cultivated mainly in Thailand, Burma, Kampuchea (Cambodia), Vietnam, Malaysia, and a few places in India and the Philippines.

Mangosteens are not hardy trees, and compared to many other species, they have a short lifespan. To survive, they need a tropical continuously warm, humid climate. Young trees die at temperatures below 45°F (7.2°C), and older trees do not survive temperatures above 100°F (37.8°C) or below 40°F (4.4°C). Mangosteens also require substantial amounts of water. They do best in areas with an annual rainfall of 50 inches (130 cm) or more and can survive in swampy conditions where their roots remain constantly wet. In dry spells they need daily irrigation. As a result of their environmental requirements, mangosteens have not done well as a commercial crop when introduced in such places as Hawaii, California, Florida, tropical Africa, the islands of the Caribbean, and tropical Central America.

Mangosteens grow slowly. It can take a tree 10–20 years to reach its full height of 20–80 feet (6–25 m). Trees have an outside layer of dark brown, flaky bark and an inside layer of bark that contains bitter latex. They produce thick, largish dark green leaves in the shape of elongated ovals. The fruit of the mangosteen is the only part of the plant used for food or in healing. Under the best conditions, trees do not bear fruit until they are six years old, and often they reach the age of 10–12 years before fruiting. Mangosteen fruit is produced asexually. There is no fertilization involved, and all fruit that comes from a single tree is genetically identical. This lack of genetic variation may explain why the tree has such rigorous environmental requirements and has not been successful when introduced outside its native range.

Mangosteen fruit is uniformly dark purple, round, and slightly smaller than a tennis ball. It has a hard rind (pericarp) that can be as much as 1 inch (2.5 cm) thick. The rind makes up about two-thirds of the weight of the fruit. Inside the rind are four to eight segments of soft, moist, white fruit. The taste is both acidic and sweet. Mangosteen fruit is considered highly desirable in the areas of Asia where it grows. The fresh fruit does not keep or travel well. U.S. law forbids the importation of fresh mangosteens from Asia into the continental United States because of concerns about contamination by insect pests. Small amounts of fruit from other locations are very sporadically available in some gourmet grocery stores. Some canned mangosteen fruit may be available in the United States, most often in grocery stores specializing in products from Southeast Asia. Despite having a name that sounds like the mango fruit, mangosteens and mangos are not closely related. In the areas where it grows, the mangosteen is also called mangostan, mangouste, mangostao, manggis, mang cut, mesetor, mangis, semtah, and sementah.

General use

Mangosteen fruit has two general uses, as food and as an herbal remedy. As food, mangosteens are usually eaten raw. They can also be canned or made into jam, but processing changes their flavor. Raw fruits are high in both acids and sugars, giving them their distinctive sweet-tart flavor. A 3.5 ounce (100 g) portion of flesh provides about 60 calories and is a good source of **potassium**.

Traditionally the rind of the mangosteen fruit has been used medicinally in Southeast Asia for several thousand years as part of both Ayurvedic and **traditional Chinese medicine**. Mangosteen is used to treat dysentery, **diarrhea**, cystitis (bladder inflammation), and **gonorrhea** (a sexually transmitted disease). Made into a lotion or paste, it is applied to the skin to treat skin **wounds** and diseases such as **eczema**. In the Philippines, the bark is used to treat **fever**, and in Malaysia the root is used to regulate **menstruation**.

In 2002, a Utah company began a mangosteen craze in the United States when it promoted a mangosteen-containing drink called XanGo. XanGo is a pasteurized dietary supplement beverage that promoters claim provides the nutritional value and health benefits of mangosteens. The contents of the beverage are proprietary and are not revealed, but the company has claimed the drink provides benefits against specific diseases.

As a dietary supplement, the production of XanGo is regulate in the United States under the 1994 Dietary Supplement Health and Education Act (DSHEA). At the time the act was passed, legislators believed that because many dietary supplements come from natural sources such as plants and have been used for hundreds of years by practitioners of complementary and alternative medicine(CAM), these products did not need to be as rigorously regulated as prescription and over-the-counter drugs used in conventional medicine. DSHEA regulates dietary supplements such as XanGo in the same way that food is regulated. Like food manufacturers, manufacturers of dietary supplements do not have to prove that a supplement is either safe or effective before it can be sold to the public. Nevertheless, dietary supplement manufacturers cannot claim that their products treat or cure specific diseases. In September 2006, the United States Food and Drug Administration (FDA) sent a letter of warning to the manufacturers of XanGo to stop making claims that XanGo treated or prevented

specific diseases. The complete FDA letter can be found at the FDA Web site.

After the introduction of XanGo, dozens of health-promoting products claiming to contain mangosteen appeared on the market. These products claimed to treat bacterial **infections**, **fungal infections**, and skin infections; to promote wound healing; cure diarrhea; and prevent or cure **cancer** by killing cancer cells and acting as **antioxidants**. The basis for these claims was the presence of a group of compounds called xanthones that are found in the mangosteen fruit and the rind. Xanthone extracts have been shown in test tube and a few animal studies to have antibacterial, antifungal, and anti-inflammatory actions. In some laboratory experiments specific xanthones extracted from the mangosteen rind have killed certain cancer cells or slowed their growth. Extracts of the rind also have antioxidant properties.

Although xanthones, such as those found in mangosteen, seem to show potential health benefits in test-tube and animal studies, there is no evidence as of 2008 that these same effects will be carry over into humans, nor is there any indication of what dosage a human might need. There is also no evidence that any dietary supplements containing mangosteen offer any specific health benefits beyond their food value. Memorial Sloan-Kettering Cancer Center issued a statement in August 2007 saying that "There is no conclusive evidence regarding the efficacy and safety of mangosteen in treating cancer." This statement can be found at the center's Web site.

KEY TERMS

Antioxidant—A molecule that prevents oxidation. In the body antioxidants attach to other molecules called free radicals and prevent the free radicals from causing damage to cell walls, DNA, and other parts of the cell.

Ayurvedic medicine—A 5,000-year old system of holistic medicine developed on the Indian subcontinent. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Decoction—A preparation made by boiling an herb, then straining the solid material out. The liquid is then taken internally as a drink.

Dietary supplement—A product, such as a vitamin, mineral, herb, amino acid, or enzyme, that is intended to be consumed in addition to an individual's diet with the expectation that it will improve health.

Traditional Chinese medicine (TCM)—An ancient system of medicine based on maintaining a balance in vital energy or qi that controls emotions, spiritual, and physical well being. Diseases and disorders result from imbalances in qi (the life force), and treatments such as massage, exercise, acupuncture, and nutritional and herbal therapy are designed to restore balance and harmony to the body.

Preparations

Traditionally, mangosteen fruits are dried and the rind is ground into a powder that is used medicinally. Mixed with water mangosteen rind can be taken internally for diarrhea, or it can be made into a paste and applied to the skin. A decoction of the bark is taken internally to treat fever, and a decoction of the root is used to treat menstrual disorders.

As a dietary supplement, mangosteen is available primarily as a health beverage. These beverages are heat-treated (pasteurized) and usually contain other ingredients besides mangosteen juice. They are not equivalent to fresh mangosteen. Dried mangosteen is also incorporated into some lotions for external use. The mangosteen content of dietary supplements is not standardized, and as of the early 2000s there was no agreed-upon standard dosage of mangosteen. Because of the difficulty in cultivating and obtaining mangosteen, mangosteen dietary supplements tend to be expensive.

Precautions

Individuals with diabetes should be careful when drinking mangosteen juice products because of their high sugar content.

Side effects

There are no known side effects of mangosteen. The fruit has been eaten for centuries and used medicinally without ill effects.

Interactions

Very little is known about how mangosteen products interact with pharmaceutical drugs or other herbal remedies. Nevertheless, because of their sugar content, mangosteen juice products may adversely affect individuals who take medication to control their blood sugar level. Mangosteen products also may interfere with the action of chemotherapy drugs.

Resources

PERIODICALS

Chen, L. G., L. L. Yang, and C. C. Wang. "Anti inflammatory Activity of Mangostins from Garcinia Mangostana." *Food and Chemical Toxicology* 46, no. 2 (February 2008): 668 693.

Devi, Sampath, and K. Vijayaraghavan. "Cardioprotective Effect of Alpha mangostin, a Xanthone Derivative from Mangosteen on Tissue Defense System Against Isoproterenol induced Myocardial Infarction in Rats." *Journal of Biochemistry and Molecular Toxicology* 21, no. 6 (2007): 336 339.

Rassameemasmaung, S., A. Sirikulsathean, C. Amornchat, et al. "Effects of Herbal Mouthwash Containing the Pericarp Extract of Garcinia mangostana L on Halito sis, Plaque and Papillary Bleeding Index." *Journal of the International Academy of Peridontology*. 9, no. 1 (2007): 19 25.

Yeung, Simon. "Mangosteen for the Cancer Patient: Facts and Myths." *Journal of Integrated Oncology* 4, no. 3 (2006): 130 134.

OTHER

"About Herbs: Mangosteen." *Memorial Sloan Kettering Cancer Center,* updated August 9, 2007. http://www.mskcc.org/mskcc/html/69295.cfm (February 11, 2008).

"The Mangosteen." *Mangosteen.com* August 8, 2007. http://www.mangosteen.com (February 11, 2008).

Tish Davidson, A. M.

Manic depression *see* **Bipolar disorder**

Manuka honey

Description

Manuka honey is the natural product of honeybees who gather nectar from the blossoms of the manuka bush *(Leptospermum scoparium)*, also known as tea tree. The manuka bush is a tropical evergreen shrub in the Myrtle family native to New Zealand and southeast Australia, and grows wild and abundantly throughout New Zealand. The honey it yields is darker and richer in taste than clover honey and has been found to contain unique antibiotic properties.

General use

From ancient times honey has been a valued folk remedy throughout the world. Honey has long been used in the diet and as a potent means of fighting infection. Honey is an effective anti-inflammatory and antioxidant. The Aboriginal Maori people, indigenous to New Zealand, used honey produced from the manuka bush as a medicinal treatment for stomach ailments and **wounds**. Manuka is a word from the Mauri language, and in Mauri traditional medicine, manuka honey has a reputation as a powerful antiseptic and healing salve.

Honey has been widely available and in continual use for thousands of years. The ancient physicians Dioscorides and Aristotle distinguished from various types of honey to find those best suited for treatment of specific ailments. Honey is in common use in modern times as a home-remedy for sore throats and coughs, as a treatment for **burns** and other external injuries, and in the diet as an immune boosting, infection preventative.

All honey has healing properties due primarily to the action of glucose oxidase, an enzyme secreted by worker bees into the nectar. When the honey is exposed to oxygen and applied to a damp surface, such as when applied to a wound, a chemical interaction releases hydrogen peroxide, which acts as a disinfectant. In addition, Honey is acidic with a high sugar but low water content, a combination that limits growth of micro-organisms that become dehydrated and unable to survive in the presence of honey. Although most bacteria and other microorganisms cannot grow or reproduce in honey, honey varies widely in its antibacterial and antimicrobial properties. This bioactivity of honey depends on many factors including the type of plant pollinated, and its location. Manuka honey from New Zealand is considered one of the most medicinally potent of the hundreds of types of honey available.

The particular healing qualities of manuka honey, and its very broad spectrum of antibiotic action, has been brought to wider attention due to the work of Professor Peter Molan, a New Zealand biochemist whose extensive investigations at Waikato University and the Waikato Honey Research Unit have demonstrated what he has termed "a unique manuka factor, or UMF." This factor works independently of and synergistically with the glucose oxidase action present in all honey to impart a higher level of antibiotic action. According to Molan, writing in 2008 on the blog site *Apitherapy News* "The currently used rating system, UMF, measures the actual antibacterial activity of each batch of honey, tested against Staphylococcus aureus, the species of bacteria that is the most common cause of wound infections.". Manuka honey is stable, and its healing properties are not diminished when exposed to light, heat, or air, or when stored for long periods of time.

Anecdotal evidence and reports from clinical practice of the healing qualities and therapeutic effectiveness of manuka honey include its success in the treatment of:

- abscesses
- Burns
- Conjunctivitis
- Dyspepsia
- Gastgroenteritis
- Periodontal disease
- Persistent wounds
- Pressure sores
- Stomach ulcers
- Strep throat
- Virus

Research

German researchers have identified the natural compound Methylglyoxal (MGO) as responsible for manuka honey's unique health-giving properties. Manuka honey has a significantly higher level of antibacterial activity when compared to other honeys, according to the researchers at the Institute of Food Chemistry in Dresden, Germany, who tested samples of New Zealand manuka honey compared with other commercially available honey. They found up to 100-fold higher amounts of MGO in the New Zealand manuka honey, with amounts ranging from 38 to 761 mg/kg. The antibacterial activity of manuka honey was detected even when the honey was diluted to 15-30 percent.

In 2006, the journal *Palative Medicine* reported on the success of daily applications of topical manuka honey applied to ulcers in three hospice patients whose sores were contaminated with the so-called superbug, *methicillin-resistant Staphylococcus aureus* (MRSA) that has been a significant health problem in hospitals and schools. Research at the University of Dresden shows that a minimum of 100mg/kg methylglyoxal (MGO) must be present in the manuka honey to inhibit *Staphylococcus aureus* and other harmful bacteria.

Manuka honey has demonstrated effectiveness against the streptococci bacterium present in **strep throat infections**. It is also effective against fungi, protozoa and other infectious organisms. It is useful as a topical antimicrobial for both chronic and acute wounds and burns, and has been shown effective for athelete's foot infections and ringworm.

Manuka honey has been found to be about twice as effective as other honey against *Eschericihia coli* and *Staphylococcus aureus*, the most common causes of infected wounds.

When taken internally, manuka honey gives a boost to the immune system and helps combat infections. Its dietary use may promote the rehydration of the body and reduce the duration of **diarrhea**, **vomiting** and upset stomach. Relief from stomach ulcers is possible through manuka honey's action against the *Helicobacter pylori* microbe found in stomach ulcers. Manuka honey has been demonstrated as beneficial in treatment of **acne**, cracked skin, sore gums, **indigestion**, and eye infections.

The acid-producing bacteria *Streptococcus mitis, Streptococcus sobrinus*, and *Lactobacillus caseii* found in the mouth, have demonstrated sharp reduction of acid production in laboratory tests, when antibacterial honey is present. Results of a 2004 pilot study of the effects of manuka honey on periodontal diseases such as gingivitis and plaque indicated that there were statistically "highly significant reductions" in plaque scores and the percentage of bleeding sites in the manuka honey group. Researchers reported no significant changes in the control group, and concluded that manuaka honey could be of therapeutic value in treatment of gingivitis and periodontal disease.

Though research on manuka honey has been going forward in New Zealand and elsewhere for the past two decades, more research needs to be done with randomized controlled trials to further substantiate the qualitative differences between manuka honey and other honey, and to provide further scientific confirmation of the anecdotal and clincical practice reports of the benefits of manuka honey.

Most of the available scientific evidence substantiates the wound healing properties of honey. According to biochemist Peter C. Molan of the University of Waikato in New Zealand, honey, and in particular manuka honey, acts effectively as a wound dressing in the following ways:

- Honey provides a protective barrier preventing cross-infections
- Honey maintains a moist healing environment
- Honey produces and provides controlled delivery of hydrogen peroxide
- Honey provides a rapid healing effect
- Honey saturated dressings do not stick to wounds
- Honey reduces scarring
- Honey inhibits the odor in healing wounds
- Honey facilitates the uptake of serum into the wound
- Honey has beneficial anti-inflammatory and antioxidant properties

Preparations

Wound healing

In 2007, the U.S. Food and Drug Administration approved a honey-impregnated wound-dressing product for wound and burn care. The "medical device" Medihoney is the trademarked brand marketed by the New Zealand based natural health company Comvita. Comvita controls a large share of production of New Zealand's manuka honey.

Manuka honey dressings can also be prepared at home. Wound treatment with sterilized manuka honey should begin first by cleansing the wound with a saline solution. Apply about one tablespoon of Manuka Honey to a sterile gauze and apply to the wound, covering with a few more layers of gauze on top of the first layer. Secure with paper tape to keep the dressing in place. The dressing should be changed every 24 hours until the wound is completely healed.

Internal use

Manuka honey can be introduced into the diet as a nutritious food, with anti-inflammatory and immune boosting benefits. For stomach or peptic ulcers, a more concentrated manuaka honey product can be taken a spoon at a time on an empty stomach, or spread on a small piece of bread about twenty minutes prior to a meal. Honey can be administered in spoon size doses to soothe sore throats and cold symptoms. In clinical settings, manuka honey has been used effectively as an ointment-like dressing beneath the eyelid to treat **conjunctivitis**.

Manuka honey is available commercially in various concentrations of the trade-marked UMF or "Unique Manuka Factor," as described by New Zealand researcher Professor Peter Molan. The more concentrated product is called "active manuka honey," and is available commercially from distributers throughout the world. Strengths range from UMF 5, said to be equivalent to a 5% solution of a standard antiseptic, to UMF 20, equivalent to a 20% solution.

Precautions

Researchers warn that untreated honey may carry a risk of botulism, and if applied to a wound may introduce the rare but deadly infection. Commercially available manuka honey is sterilized by gamma irradiation to eliminate the possible risk of introducing infection. The irradiation does not bring about loss of any of manuka honey's antibacterial activity, researchers say. Increasingly, sterilized honey dressings are now among the first line of treatment for early wound infections, and no adverse reactions have been noted, even in diabetic patients. There may be a mild stinging or burning sensation with topical application of honey due to its acidic content.

Resources

PERIODICALS

Alexander, Tania, "Sweet Wonder of Honey," *The Express* (UK), April 24, 2007.

Associated Press. "Honey Making a Medical Comeback." December 26, 2007. *MSNBC. Com Health News*. http://www.msnbc.msn.com/id/22398921/. Cited March 4, 2008.

Blaser, G, et al. "Effect of Medical Honey on Wounds Colonised or Infected With MRSA," *Journal of Wound Care*. (2007) 16: 325 28.

Chambers, John. "Topical Manuka Honey for MRSA Con taminated Skin Ulcers." *Palliative Medicine* (2006) 20, No.5: 557.

Dente, Karen, "Antibacterial Properties Could Make the Nectar an Effective Treatment for Sores that Refuse to Mend." *Los Angeles Times*, September 10, 2007.

English, H.K., et al. "The Effects of Manuka Honey on Plaque and Gingivitis: A Pilot Study." *Journal of the International Academy of Periodontology*. (2004) 6, No. 2: 63 7.

Jull, A, et al. "Randomized Clinical Trial of Honey Impregnated Dressings for Venous Leg Ulcers." *British Journal of Surgery* (2008) 95: 175 82.

Kerwin, Mark. "Manuka Honey Tasty Medicine From New Zealand." Down to Earth.Org. http://www.downtoearth.org/articles/print/p_manuka_honey.htm. Cited March 3, 2008.

Mavric, Elvira, et al. "Identification and Quantification of Methylglyoxal as the Dominant Antibacterial Constituent of Manuka." *Molecular Nutrition & Food Research*. (2008) 52.

Molan, Peter. "Molan: MGO Level Not Good Indicator of Honey's Antibacterial Activity," *Apitherapy News*. January 30, 2008. http://apitherapy.blogspot.com

Molan, P.C. "Manuka Honey As A Medicine." Honey Research Unit, University of Waikato, Hamilton, New zealand.

Patton, T., et al. "Use of a Spectrophotometric Bioassay for Determination of Microbial Sensitivity to Manuka Honey." *J. Microbiol. Meth*. (2006) 64: 84 95.

Trump, Eric Frederick. "Sweet Salve: Could Honey, an Ancient Remedy, Make a Comeback in Contemporary Wound Care?" *The Washington Post*. August 7, 2007. Washingtonpost.com.

Visavadia, Bhavin G., et al. "Manuka Hondy Dressing: An Effective Treatment for Chronic Wound Infections." *British Journal of Oral and Maxillofacial Surgery* (January 2008) 46, No. 1: 55 56.

Waikato Honey Research Unit. "What's Special About Active Manuka Honey?" http://bio.waikato.ac.nz/honey/special.shtml. Cited March 4, 2008.

OTHER

Manuka Honey.Com, Summer Glow Apiaries, Ltd. http://www.manukahoney.com.

Clare Hanrahan

Marigold *see* **Calendula**

Marijuana

Description

Marijuana (marihuana), *Cannabis sativa L.*, also known as Indian hemp, is a member of the Cannabaceae or hemp family, thought to have originated in the mountainous districts of India, north of the Himalayan mountains. The herb was referred to as "hempe" in A.D. 1000 and listed in a dictionary under that English name. Supporters of Pancho Villa (1878–1923) first called the mood-altering herb they smoked marijuana in 1895 in Sonora, Mexico. The term hashish is derived from the name for the Saracen soldiers, called *hashashins*, who ingested the highly potent cannabis resin before being sent out to assassinate enemies.

Two related species of cannabis are *C. ruderalis* and *C. indica*, a variety known as Indian hemp. Indian hemp grows to a height of about 4 ft (1.2 m) and the seed coats have a marbled appearance.

The species *C. sativa L.* has many variations, depending on the origin of the parent seed and the soil, temperature, and light conditions. These factors also affect the relative amounts of 9-tetrahydrocannabinol (THC) and cannabidiol, the chemicals present in varying amounts in cannabis that determine if the plant is primarily a fiber type or an intoxicant. Generally, the species grown at higher elevations and in hotter climates exude more resin and are more medicinally potent.

Marijuana plant. *(© Organica / Alamy)*

Marijuana is a somewhat weedy plant and may grow as high as 18 ft (5.4 m). The hairy leaves are arranged opposite one another on the erect and branching stem. Leaves are palmate and compound, deeply divided into five to seven narrow, toothed, and pointed leaflets. Male and female flowers are small and greenish in color and grow on separate plants. Male flowers grow in the leaf axils in elongated clusters. The female flowers grow in spike-like clusters. The resinous blossoms have five sepals and five petals. The male and female blossoms can be distinguished at maturity. The male plant matures first, shedding its pollen and dying after flowering. Female plants die after dropping the mature seeds. Marijuana produces an abundance of quickly germinating seeds. This hardy annual is wind pollinated and has escaped from cultivation to grow wild along roadsides, trails, stream banks, and in wayside places throughout the world. The plant matures within three to five months after the seed has been sown.

History

Marijuana has been cultivated for thousands of years. Cannabis was first described for its therapeutic use in the first known Chinese pharmacopoeia, the *Pen Ts'ao*. Cannabis was called a "superior" herb by the Emperor Shen-Nung (2737–2697 B.C.), who is believed to have authored the work. Cannabis was recommended as a treatment for many common ailments. Around that same period in Egypt, cannabis was used as a treatment for sore eyes. The herb was used in India in cultural and religious ceremonies and recorded in Sanskrit scriptural texts around 1400 B.C. Cannabis was considered a holy herb, and it was characterized as the "soother of grief," "the sky flyer," and "the poor man's heaven." Centuries later, around 700 B.C., the Assyrian people used the herb they called *Qunnabu* for incense. The ancient Greeks used cannabis as a remedy to treat inflammation, **earache**, and **edema**. Shortly after 500 B.C., the historian and geographer Herodotus recorded that the people known as Scythians used cannabis to produce fine linens. They called the herb *kannabis* and inhaled the "intoxicating vapor" that resulted when it was burned. By the year 100 B.C. the Chinese were using cannabis to make paper.

Cannabis use and cultivation migrated with the movement of traders and travelers, and knowledge of the herb's value spread throughout the Middle East,

Eastern Europe, and Africa. Around A.D. 100, Dioscorides, a surgeon in the Roman Legions under the Emperor Nero, named the herb *Cannabis sativa* and recorded numerous medicinal uses. In the second century, the Chinese physician Hoa-Tho used cannabis in surgical procedures, relying on its analgesic properties. In ancient India, around 600, Sanskrit writers recorded a recipe for "pills of gaiety," a combination of hemp and sugar. By 1150, Moslems were using cannabis fiber in Europe's first paper production. This use of cannabis as a durable and renewable source of paper fiber continued for the next 750 years.

By the 1300s, government and religious authorities, concerned about the psychoactive effects on citizens consuming the herb, were placing harsh restrictions on its use. The Emir Soudon Sheikhouni of Joneima outlawed cannabis use among the poor. He destroyed the crops and ordered that offenders' teeth be pulled out. In 1484, Pope Innocent VIII outlawed the use of hashish, a concentrated form of cannabis resin. Cannabis cultivation continued, however, because of its economic value. A little more than a century later, Queen Elizabeth I issued a decree in England commanding that landowners holding 60 acres (24 ha) or more must grow hemp or pay a fine. Commerce in hemp, which was primarily valued for the strength and versatility of its fibers, was profitable and thriving. Hemp ropes and sails crossed the sea to North America with the explorers. By 1621, the British were growing cannabis in Virginia where cultivation of hemp was mandatory. In 1776, the Declaration of Independence was drafted on hemp paper. As president, both George Washington and Thomas Jefferson advocated hemp as a valuable cash crop. Jefferson urged farmers to grow the crop in place of tobacco. By the 1850s, hemp had become the third largest agricultural crop grown in North America. The United States Census of that year recorded 8,327 hemp plantations, each with 2,000 or more acres in cultivation. But the invention of the cotton gin was already bringing many changes, and cotton was becoming a prime and profitable textile fiber. More change came with the introduction of the sulfite and chlorine processes used to turn trees into paper. Restrictions on the personal use of cannabis as a mood-altering, psychoactive herb, were soon to come.

Controversy

The 1856 edition of the *Encyclopedia Britannica*, in its lengthy entry on hemp, noted that the herb "produces inebriation and delirium of decidedly hilarious character, inducing violent laughter, jumping and dancing." This inebriating effect of marijuana use has fueled controversy and led to restrictions that have surrounded marijuana use throughout history in many cultures and regions of the world. Cannabis use has been criminalized in some parts of the United States since 1915. Utah was the first state to criminalize it, followed by California and Texas. By 1923, Louisiana, Nevada, Oregon, and Washington had legal restrictions on the herb. New York prohibited cannabis use in 1927.

In 1937, the federal government passed the Marijuana Tax Act, prohibiting the cultivation and farming of marijuana. This bill was introduced to Congress by then-secretary of the Treasury Andrew Mellon, who was also a banker for the DuPont Corporation. That same year, the DuPont Chemical Company filed a patent for nylon, plastics, and a new bleaching process for paper. The 1937 Marijuana Transfer Tax Bill prohibited industrial and medical use of marijuana and classified the flowering tops as a narcotic. Restrictions on the cultivation and use of cannabis continued. Marijuana was categorized as an illegal narcotic, in the company of LSD, heroin, cocaine, and morphine. Nevertheless, illegal use continued. The FBI 1966 publication, *Uniform Crime Reports for the United States* reported that 641,642 Americans were arrested for marijuana offenses that year, with as many as 85% of these arrests for simple possession, rather than cultivation or commerce.

In a reversal of the state-by-state progression of criminalizing marijuana that led to the 1937 Marijuana Transfer Tax Bill, there is a movement underway, state by state, to endorse the legalized use of medical marijuana. By 1992, 35 states in the United States had endorsed referenda for medical marijuana. A growing body of scientific research and many thousands of years of folk use supported the importance of medical marijuana in treatment of a variety of illnesses, and the economic value of hemp in the textile, paper, and cordage industries has a long history.

Controversy and misinformation persists around this relatively safe and non-toxic herb. The World Health Organization, in a 1998 study, stated that the risks from cannabis use were unlikely to seriously compare to the public health risks of the legal drugs, alcohol and tobacco. Despite thousands of years of human marijuana use, not one death has been directly attributed to cannabis. The chief legitimate concern is the effect of **smoking** on the lungs. Cannabis smoke carries even more tars and other particulate matter than tobacco smoke, but the amount smoked is much less, especially in medical use.

General use

Every part of the cannabis plant, including buds, leaves, seeds, and root, has been used throughout the long history of this controversial herb. Despite persistent legal restrictions and criminal penalties for illicit use, marijuana continues to be widely used in the United States and throughout the world, both for its mood-altering properties and its proven medicinal applications. The conflicting opinions on the safety and effectiveness of cannabis in a climate of prohibition make any discussion of its beneficial uses politically charged.

Marijuana has analgesic, anti-emetic (anti-nausea), anti-inflammatory, sedative, anticonvulsive, and laxative actions. Clinical studies have demonstrated its effectiveness in relieving **nausea** and **vomiting** following chemotherapy treatments for **cancer**. The herb has also been shown to reduce intra-ocular pressure in the eye by as much as 45%, a beneficial action in the treatment for **glaucoma**. Cannabis has proven anticonvulsive action and may be helpful in treating **epilepsy**. Other research has documented an in-vitro tumor inhibiting effect of THC. Marijuana also increases appetite and reduces nausea and has been used with **AIDS** patients to counter weight loss and wasting that result from the disease. Several chemical constituents of cannabis have displayed antimicrobial action and antibacterial effects in research studies. The components CBC and d-9-tetrahydrocannabinol have been shown to destroy and inhibit the growth of streptococci and staphylococci bacteria.

Cannabis contains chemical compounds known as cannabinoids. Different cannabinoids seem to exert different effects on the body after ingestion. Scientific research indicates that these substances have potential therapeutic value for **pain** relief, control of nausea and vomiting, and appetite stimulation. The primary active agent identified as of 2008 was THC. This chemical may constitute as much as 12% of the active chemicals in the herb and is said to be responsible for as much as 70 to 100% of the euphoric action, or high, experienced when ingesting the herb. The predominance of this mental lightness or euphoria depends on the balance of other active ingredients and the freshness of the herb. THC degrades into a component known as cannabinol, or CBN. This relatively inactive chemical predominates in marijuana that has been stored too long prior to use. Another chemical component, cannabidiol, known as CBD, has a sedative and mildly analgesic effect and contributes to a somatic heaviness sometimes experienced by marijuana users.

In the United States in the early twentieth century, cannabis was recommended for treatment of **gonorrhea**, **angina** pectoris (constricting pain in the chest due to insufficient blood to the heart), and choking fits. It was also used for **insomnia**, **neuralgia**, rheumatism, gastrointestinal disorders, cholera, **tetanus**, epilepsy, strychnine poisoning, **bronchitis**, **whooping cough**, and **asthma**. Other phytotherapeutic (plant-based therapeutic) uses include treatment of ulcers, cancer, **emphysema**, migraine, and **anxiety**.

The federal policy prohibits physicians from prescribing marijuana, even for seriously ill patients because of possible adverse effects, and the disputed belief that cannabis is dangerously addictive. Former U.S. attorney general Janet Reno warned that physicians in any state who prescribed marijuana could lose the privilege of writing prescriptions, be excluded from Medicare, and Medicaid reimbursement, and even be prosecuted for a federal crime, according to a 1997 editorial in the *New England Journal of Medicine*. Yet in 1996, California passed a law legalizing medical use of marijuana. By 2008, 35 states had passed legislation recognizing the medical value of marijuana and about one-third of those had either legalized or decriminalized medical use of the herb. The debate in the United States over medical use of the drug continued as of 2008. Some opponents believe that the movement to legalize marijuana for medicinal purposes is led by those who want the drug legalized for recreational purposes.

Preparations

Marijuana is ingested by smoking, which quickly delivers the active ingredients to the blood system. The dried herb is also variously prepared for eating. The essential oil consists of beta caryophyllenes, humules, caryophyllene oxide, alpha-pinenes, beta-pinenes, limonene, myrcene, and betaocimene. The oil expressed from the seeds is used for massage and in making salves used to relieve muscle strain. THC extract is available legally in some countries in capsule form.

Precautions

Marijuana is considered a Class I narcotic, and federal law in the United States has restricted its use since 1937. Penalties include fines and imprisonment in some states, but the herb has been decriminalized in others. California, for example, issues cards identifying medical marijuana users and allows them to purchase the drug openly at certain clinics.

Research has shown that cannabis acts to increase heart frequency by as much as 40 beats per minute. A

study reported by the American Heart Association in February 2000 concluded that smoking marijuana can precipitate a **heart attack** in persons with pre-existing heart conditions. One hour after smoking marijuana, the likelihood of having a heart attack is four and one-half times greater than if the person had not smoked, according to the research. Marijuana also can cause a drop in blood pressure resulting in **dizziness**.

Marijuana use during **pregnancy** has been found to reduce the newborn's birth weight, a possible indication of problems. Pregnant and breastfeeding women should avoid using marijuana. Other research has shown that marijuana decreases male fertility and increases the number of abnormal sperm found in semen.

An additional health concern is the effect that marijuana smoking has on the lungs. Cannabis smoke carries more tars and other particulate matter than tobacco smoke. Long-term use is also associated with an increase in respiratory diseases such as bronchitis.

Studies have shown that motor coordination and driving ability can be impaired for up to eight hours after smoking marijuana. Individuals should avoid driving and using heavy machinery for several hours after using the herb.

Side effects

The *PDR for Herbal Medicine* reports that the most common side effect of marijuana use is psychotropic, as a euphoric state (pronounced gaiety, laughing fits) occurs almost immediately after smoking the herb. Long-term usage leads to a clear increase in tolerance for most of the pharmacological effects. Chronic use results in **laryngitis**, bronchitis, apathy, psychic decline, and disturbances of genital functions.

Some people may be hypersensitive to marijuana. They may experience paranoia or be allergic or sensitive to the plant. Chronic sinus **fungal infections** have been linked to chronic marijuana smoking. Clinical trials have shown that there is no decrease in cognitive function over time in moderate marijuana users when compared to non-users.

Interactions

Marijuana use may mask the perceived effects of alcohol and cocaine when the drugs are consumed together. Marijuana is said to exert a synergistic effect with other medicinal agents. When used with nitrous oxide it may enhance the nitrous oxide effect.

Marijuana use by individuals taking selective serotonin re-uptake inhibitors (SSRIs, used to treat **depression**) may develop manic symptoms. Use in individuals taking tricyclic antidepressants can produce delirium and racing heart (tachycardia).

KEY TERMS

Edema—Swelling of a body tissue due to collection of fluids.

Glaucoma—An eye disorder caused by damage to the optic nerve resulting in vision loss. Glaucoma is usually accompanied by inflammation and increased pressure in the eye (intraocular pressure). There are several types that may develop suddenly or gradually.

Pharmacopeia—A book containing a list of medicinal drugs and their descriptions of preparation and use.

Resources

BOOKS

Boire, Richard, and Kevin Feeney. *Medical Marijuana Law*. Berkeley, CA: Ronin, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

Yarnell, Eric, and Karen Abascal. *Clinical Botanical Medicine,* 2nd rev. ed. Larchmont, NY: Mary Ann Liebert, 2008.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

American Medical Marijuana Association, 17415 Ocean Dr., Fort Bragg, CA, 95437, http://americanmarijuana.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

National Center for Complementary and Alternative Med icine Clearinghouse, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Clare Hanrahan
Teresa G. Odle
Tish Davidson, A.M.

Marsh mallow

Description

Marsh mallow (*Althaea officinalis*) is a perennial plant that grows in salt marshes, damp meadows, and on the banks of tidal rivers and seas. It originated in

Marsh Mallow. *(© Arco Images / Alamy)*

countries adjoining the Caspian Sea, Black Sea, and in the eastern Mediterranean, and is native to Europe and western Asia. Marsh mallow is found in North America along the eastern seaboard.

The plant stems grow to a height of 3-4 ft (1-1.3 m) and have round, velvety leaves that are 2-3 in (5-7.5 cm) long. Pale pink or white flowers bloom in August or September, and the roots are thick and long. The whole plant is used medicinally. The leaves and flowers are picked when the flowers are blooming. The roots are harvested in the fall, but the plant must be two years old before the root is harvested.

The common name marsh mallow is derived from the environment in which it grows. The Latin name *Althaea* comes from the Greek word *altho*, which means to heal or to cure. The family name Malvaceae comes from the Greek word *malake*, meaning soft. Other names for marsh mallow include mallards, mauls, sweetweed, Schloss tea, and mortification root.

KEY TERMS

Chilblain—Redness and swelling of the skin often accompanied by burning, itching, and blisters. A condition caused by excessive exposure to the cold.

Decoction—An herbal tea created by boiling herbs in water. Roots, bark, and seeds are used in decoctions; boiling the herbs brings out their medicinal properties.

Enteritis—Inflammation of the bowels.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Perennial—A plant that lives for many years; comes back yearly without replanting.

Tincture—The concentrated solution of an herbal extract, usually made with alcohol.

Marsh mallow's medicinal use dates back 2,000 years. Arabian doctors created a poultice from the leaves to treat inflammation. The father of medicine, Hippocrates, used marsh mallow to remedy **bruises** and blood loss. Dioscorides wrote about the beneficial properties of marsh mallow, while Horace praised the laxative properties of the leaves and roots. Roman doctors used marsh mallow for toothaches, insect **bites**, chilblains, and irritated skin. The Chinese, Egyptians, and Romans ate a variety of marsh mallow for food. The French eat the flowers and leaves in salads. Marsh mallow was used to soothe toothaches, insect bites, **indigestion**, and **diarrhea** in Europe during medieval times. Teething babies were often given marsh mallow root to provide comfort.

Nineteenth century doctors used the roots of marsh mallow to make a **sore throat** lozenge for children and adults. They combined the cooked juice of the root with egg whites and sugar and whipped the mixture into a meringue that later hardened into a candy. The marshmallows eaten today as sweet treats were derived from this candy, but no longer contain any herbal properties.

Marsh mallow contains starch, mucilage, pectin, oil, sugar, asparagin, phosphate of lime, glutinous matter, and cellulose. It is rich in **calcium**, **zinc**, **iron**, **sodium**, **iodine**, **vitamin B complex**, and **pantothenic acid**.

General use

The main therapeutic constituent of marsh mallow is mucilage, a spongy substance of the root that is

composed of large sugar molecules. Mucilage's healing effect stems from its ability to support white blood cells against attacking microorganisms. When liquid is added to mucilage, it acquires a gel-like consistency. This gooey substance coats mucous membranes of the throat, mouth, stomach, and intestinal tract and provides relief from inflammation and **pain**. It also acts to expel phlegm from the lungs and to relax the bronchial tubes.

These anti-inflammatory and anti-irritant properties make marsh mallow a viable remedy for arthritis and joint pain; upper respiratory ailments such as **asthma**, **emphysema**, bronchial **infections**, coughs, sore throats, and lung congestion; inflamed kidneys and urinary tract disorders; and gastrointestinal disturbances including **Crohn's disease**, ulcers, **colitis**, diarrhea, dysentery, and stomach irritation.

The German Commission E has approved marsh mallow as a beneficial treatment for irritated and inflamed throat, pharyngeal, and gastric mucous membranes, and for dry coughs. Teas made from the root and leaf are licensed in Germany as standard medicinal teas. The root is also used as an ingredient in **cough** syrup and as a cough suppressant tea.

The British Herbal Compendium supports the use of marsh mallow for **gastroenteritis**, peptic and duodenal ulcers, colitis, and enteritis. In the United States, marsh mallow is an ingredient in dietary supplements and cough suppressants.

Marsh mallow provides external treatment for **cuts**, **wounds**, abscesses, **boils**, **burns**, and **varicose veins**. A gel created by adding water to finely chopped marsh mallow root may be applied to the affected area to reduce inflammation. A poultice containing **cayenne** and marsh mallow may relieve **blood poisoning**, **gangrene**, burns, bruises, and other wounds.

Preparations

Marsh mallow is available in whole bulk, tincture, and capsule forms. It can be taken internally as a tea, tincture, or capsule, or applied externally as an ointment or poultice.

A decoction may be made from the root to relieve congestion, sore throat, or dry cough. To create a decoction, 1-2 tsp of the finely chopped root is added to 1 cup of water and simmered for 10-15 minutes. The liquid is then cooled and strained. A person can drink 1 cup three times daily or as needed. An infusion can be made by steeping the crushed roots in cold water overnight. The infusion is then drunk as needed for symptomatic relief. For relief of an irritated kidney, boiling water is poured over the flowers and leaves. The mixture is covered and steeped for three hours.

To make a poultice, the leaves and/or the powdered or crushed roots are steeped in water. The mixture is then applied externally to areas of inflamed skin, **eczema**, or **dermatitis**.

For capsules, 5-6 g may be taken daily or as recommended.

For a tincture, 5 ml may be taken three times daily or as recommended.

For insect bites, the leaves are rubbed on wasp or bee **stings** to alleviate pain, inflammation, and swelling.

For sore throat, the flowers are boiled in oil and water, cooled, and used as a gargle to relieve sore throat pain.

Precautions

Diabetics should take marsh mallow with caution since high doses may lower blood sugar levels.

Children and infants may take marsh mallow in low doses.

Side effects

There are no known side effects.

Interactions

Marsh mallow may slow the absorption of other drugs when taken simultaneously.

Resources

BOOKS

Lininger, D.C., Skye. *The Natural Pharmacy*. Virtual Health, LLC, 1998.

Time Life Books. *The Alternative Advisor*. Time Life Inc., 1997.

Jennifer Wurges

Martial arts

Definition

Martial arts cover a broad range of activities that involve fighting techniques, physical exercises, and methods of mental discipline, among other skills. Martial arts originated in the ancient cultures of Asia, and are used today around the world for self-defense, **exercise**, health, spiritual growth, law enforcement, and athletic competition.

Origins

Very few activities have as many legends and myths surrounding them as do martial arts. Hundreds of practices are included under the title of martial arts, and some of these were passed down in secrecy for many generations. Furthermore, martial arts developed in countries that have been historically isolated from the Western world. Thus, there are many conflicting theories and opinions concerning the origins of martial arts. What is known is that martial arts began in the ancient cultures of Asia, including China, India, and Japan. In both China and India, artifacts from 2,000 to 4,000 years old have been found with paintings of people striking possible martial arts poses. **Qigong**, one of the oldest systems that may be considered a martial art, is believed by some historians to be 5,000 years old or older, originating in ancient China. Some scholars trace the development of martial arts much later to the sixth century A.D. According to legend, that is when a Buddhist monk from India named Bodhidharma brought Buddhism, **yoga** exercises, and **meditation** techniques to the Shaolin Monastery in China.

Martial arts involve intellectual concepts as well as physical techniques, and have been influenced by many of the religious and philosophical systems of the East. The Taoist philosophy holds that the universe operates within laws of balance and harmony, and that people must live within the rhythms of nature. Martial arts cultivate these concepts of balance and adaptation to the natural flow of events. Buddhism is believed to have introduced breathing methods, meditation, and techniques of mental and spiritual awareness to the early founders of martial arts. Chinese Confucianism was concerned with ethical behavior in daily life, and martial arts often address these concerns. Some martial arts, such as **t'ai chi** and various kung fu methods, developed from qigong. Qigong, which means "energy cultivation," is a system designed to increase the flow of the body's *qi*, the universal life energy responsible for health and strength according to Chinese philosophy. **Traditional Chinese medicine** also incorporates concepts derived from martial arts to better the understanding of the body and health. Because therapeutic exercise is one of the major modalities of treatment in traditional Chinese medicine, some martial arts masters are also expert healers. There is, in fact, a subtype of qigong known as medical qigong in China, used to treat a wide range of diseases and disorders. Although most of the research in medical qigong has been conducted in China, some of this work has been translated into English. A video is available that presents the basic concepts of medical qigong.

KEY TERMS

Dojo—A martial arts school.

Meridian—Channel through which qi travels in the body.

Qi—Basic life energy according to traditional Chinese medicine.

Qigong—Chinese system of energy cultivation techniques.

Yin/Yang—Universal characteristics used to describe aspects of the natural world.

From China, martial arts spread to other Asian countries, and eventually arrived in Japan, where many new variations developed. Karate is the generic term for Japanese martial arts. Martial arts in Japan have been influenced by Zen Buddhism and by the samurai warrior tradition, which refined many weapons as well as methods of fighting. Some Japanese schools of instruction adopted the values of bushido, Japanese for "way of the warrior." This system insists on extreme physical and mental discipline, using martial arts as a means to spiritual enlightenment. Martial arts also flourished in Korea, Vietnam, and Thailand.

Martial arts were largely unknown to the Western world until after 1945, when a few American and British veterans of World War II brought back Japanese martial arts from occupied Japan. During the 1970s, there was a surge of interest in martial arts in America, due to several popular television shows and the charismatic actor Bruce Lee. With better communication and less secrecy among teachers, Chinese martial arts, including t'ai chi and qigong, have made their way to America. Today, there are martial arts schools all across America, and martial arts are a multi-billion dollar industry. Martial arts are a popular activity for self-defense, sport, exercise, **spirituality**, and health around the world. Present-day forms of martial arts include *kalarippayattu* in southern India, *escrima* in the Philippines, *pentjak silat* in Malaysia, *karate* in Okinawa, *aikido* in Japan, and *capoeira* in Brazil.

Benefits

Martial arts teach self-defense, and can improve confidence and self-esteem. When used as exercise, martial arts can improve balance, strength, stamina, flexibility, and posture. They also enhance weight loss and improve muscle tone. On the mental level, martial

arts can teach **stress** management, improve concentration, and increase willpower. Some martial arts, such as qigong and t'ai chi, are used for longevity, disease prevention, and healing purposes, making them effective exercises for those with health conditions and for the elderly. Some teachers claim that martial arts can be used as spiritual practices, bringing balance, peace, and wisdom to dedicated practitioners.

Description

Basic concepts of martial arts

Many martial arts utilize basic concepts of traditional Chinese philosophy. Qi is the fundamental life energy of the universe. In the body, qi is the invisible vital force that sustains life. Qi is present in food, air, water, and sunlight. The breath is believed to account for the largest quantity of human qi, because the body uses air more than any other substance. All martial arts emphasize breathing techniques. Many movements and mental exercises are designed to improve the flow of qi in the body, which improves overall strength. There are many legends concerning martial arts masters who had such control of their qi that they could throw opponents across rooms merely by looking at them. Martial arts that focus on the development and use of qi are termed internal martial arts. In contrast, external martial arts focus on physical exercises, fighting methods, and the use of weapons. Many martial arts combine internal and external methods.

Qi travels through the body along channels of energy called meridians. On the meridians there are certain points (acupoints) where qi accumulates. Some martial arts teach defensive techniques that utilize the knowledge of these points on the body, which, if pressed in the correct manner, can be used to immobilize attackers. Martial arts also teach massage and exercise techniques that are designed to stimulate the energy flow along the meridians to improve health.

The concepts of yin and yang are also central to the martial arts. Yin and yang are the two separate but complimentary principles of the universe, which are always interacting, opposing, and influencing each other. Yin is associated with such qualities as cold, passivity, darkness, yielding, and inward movement. Yang is associated with heat, activity, light, assertiveness, outward movement, and so on. In martial arts, yin and yang movements are used to balance each other. For instance, a strong (yang) attack is taught to be met by a yin, or yielding, response. Martial arts cultivate an awareness and use of yin or passive qualities, which are ignored by many sports and fighting techniques. Another major yin/yang concept used in martial arts is that the more one becomes familiar with violence, the more one learns to avoid and resist it. Some martial arts, such as aikido, teach peace as their ultimate lesson.

Types of martial arts

Although there are hundreds of different martial arts, many of them have more similarities than differences. Within the major categories, there are often many sub-schools and systems developed by different teachers. Martial arts are generally classified as soft or hard, internal or external, yin or yang, but they all need to embrace these complementary aspects. Internal arts such as qigong focus on yielding and inner strength. Hard arts such as karate focus on developing muscular power and speed, and the mastery of breaking and throwing techniques delivered with devastating impact.

Karate means "empty handed." This form of fighting originated on the Japanese island of Okinawa. Karate is now the general term for an entire group of Japanese martial arts. Karate emphasizes offensive and defensive moves, and avoids grappling and wrestling. Students are taught how to deliver quick, powerful blows with nearly every part of the body, including dangerous kicks with the legs. Karate also consists of hard styles and soft styles. Some schools teach "full contact" karate, for which students wear protective equipment to absorb the blows of actual fighting.

Kung fu means "skill" in Chinese, and is the generic term for a whole spectrum of martial arts methods that developed in China. In China, kung fu is called *wushu*. Kung fu consists of thousands of hard and soft techniques, taught for both offensive and defensive positions. Kung fu uses punching, kicking, grappling, and blocking moves in addition to the use of certain weapons. Kung fu may also emphasize internal methods to increase and improve qi energy.

Aikido is a relatively new martial art, developed in the 1930s by a Japanese teacher named Morihei Ueshiba (1883–1969). Ueshiba was a religious man who wanted to invent a martial art that emphasized non-aggression. In Japanese, aikido means "connecting with life energy." Aikido teaches students a variety of techniques to disarm an attacker, including such defense moves as blocks, escapes, grabs, and falling safely to the ground. Aikido also teaches internal methods of cultivating qi energy. Aikido has been called the "way of peace," because it teaches the philosophical ideals of love and harmony as ways of reducing conflict.

Judo means "gentle way" in Japanese and was developed as an educational tool by a teacher named

Jigoro Kano in the 1800s. Judo emphasizes such defensive moves as holds and grappling, and teaches students how to disarm attackers by applying pressure to specific sensitive points on the body. Judo is performed competitively in matches.

T'ai chi chuan, also called t'ai chi, consists of a sequence of flowing movements performed very slowly. These movements emphasize posture and the flow of the body's energy (qi). Although considered a martial art and consisting of fighting postures, tai chi is used more as a meditation and health technique. In China, millions of people, particularly the elderly, use tai chi daily to improve their health and flexibility. T'ai chi developed from qigong and shares many of the same concepts of energy cultivation, making it effective for healing and prevention of illness.

Jujitsu is a Japanese martial art that emphasizes flexibility, quickness, and fluidity of motion. It consists of kicking, punching, holding, and striking moves as well as the use of weapons. *Tae kwon do* is a Korean martial art that means "kick-punch-art." Tae kwon do consists of a variety of powerful kicking and punching techniques. *Kendo* is traditional Japanese sword fighting, teaching students how to use various weapons with agility, speed, and effectiveness. Kendo also emphasizes discipline and ethics.

A martial arts session

Most martial arts classes, held in schools called *dojos*, have similarities. Sessions begin with warm-up exercises and stretches. Then, depending on the school, certain exercises will be performed to improve strength, speed, and stamina. Sparring is often used, with students competing head to head. Some schools require students to stop short of striking one another, while other schools require students to wear equipment to protect them from authentic blows. Exercises for cooling down and for flexibility are performed at the end of class.

Most martial arts use the colored belt system to rank students, although colors and rankings can vary greatly among disciplines. In general, white belts signify beginners, brown belts represent intermediate students, and black belts are given to masters, with other colors in between.

Martial arts classes take between one to two hours. Some schools allow students to attend as many classes per week as they wish, while others limit the number of classes taken. Two to three classes per week are recommended. Schools often charge a monthly fee, ranging from $50 or more. Some schools charge a flat fee for training from beginner to expert. Many schools require students to regularly participate in competitions, and fees for these may begin at $25. Students are required to purchase uniforms and equipment as well. Uniforms may cost $100 or more, and protective equipment may cost roughly the same, depending on the practice.

Preparations

Prospective martial arts students should search for the style of martial arts that best meets their objectives. Students should attend classes at various schools (dojos), and should talk to students and teachers to find the right program. Finding a good instructor may be even more important than finding the right school. Students should search for instructors with such positive qualities as patience, knowledge, and strong communication skills. Prospective students should also search for schools with adequate facilities, including padded or sprung floors, full-length mirrors, and roomy practice spaces without obstructions.

Precautions

Martial arts can be dangerous. Students are often required to take blows and falls as part of the learning process, as well as to fight with weapons. Students should search for teachers and schools who teach these methods as safely as possible. People with health conditions and injuries should consult a physician before attempting a martial art, and should find a teacher familiar with their condition.

Training and certification

Martial arts teachers are usually certified with the achievement of an advanced black belt status. Many large schools of martial arts have organizations which oversee and certify the granting of belt ranks. The Aikido Association of America recognizes training programs and certifies ranking procedures.

The USA Karate Federation is the largest organization for certifying ranking systems and schools of karate. The Chinese Kung-Fu Wu-Su Association works with kung fu schools, ranking systems, and contests.

Resources

BOOKS

Cleary, Thomas. *The Japanese Art of War*. Boston: Shamb hala, 1991.

Frantzis, Bruce. *The Power of Internal Martial Arts*. Berkeley, CA: North Atlantic, 1998.

Payne, Peter. *Martial Arts: The Spiritual Dimension*. New York: Thames and Hudson, 1981.

Stevens, John. *The Shambhala Guide to Aikido*. Boston: Shambhala, 1996.

PERIODICALS

Aikido Today. PO Box 1060, Claremont, CA 91711. (800) 445 AIKI.

Golden, Jane. "Qigong and Tai Chi as Energy Medicine." *Share Guide* (November December 2001): 37.

Inside Kung Fu. PO Box 461621, Escondido, CA 92046. (800) 877 5528.

Johnson, Jerry Alan. "Medical Qigong for Breast Disease." *Share Guide* (November December 2001): 109.

ORGANIZATIONS

Chinese Kung Fu Wu Su Association. 28 West 27th Street, New York, NY 10001. (212) 725 0535.

USA Karate Federation.1300 Kenmore Boulevard, Akron, OH 44314. (330) 753 3114.

Douglas Dupler
Rebecca J. Frey, PhD

Massage therapy

Definition

Massage therapy is the scientific manipulation of the soft tissues of the body for the purpose of normalizing those tissues and consists of manual techniques that include applying fixed or movable pressure, holding, and/or causing movement of or to the body.

Origins

Massage therapy is one of the oldest health care practices known to history. References to massage are found in Chinese medical texts more than 4,000 years old. Massage has been advocated in Western health care practices at least since the time of Hippocrates, the "Father of Medicine." In the fourth century B.C. Hippocrates wrote, "The physician must be acquainted with many things and assuredly with rubbing" (the ancient Greek term for massage was rubbing).

Woman having neck and shoulders massaged. *(© Bubbles Photolibrary / Alamy)*

The roots of modern, scientific massage therapy go back to Per Henrik Ling (1776–1839), a Swede, who developed an integrated system consisting of massage and active and passive exercises. Ling established the Royal Central Gymnastic Institute in Sweden in 1813 to teach his methods.

Modern, scientific massage therapy was introduced in the United States in the 1850s by two New York physicians, brothers George and Charles Taylor, who had studied in Sweden. The first clinics for massage therapy in the United States were opened by two Swedish physicians after the Civil War period. Doctor Baron Nils Posse operated the Posse Institute in Boston and Doctor Hartwig Nissen opened the Swedish Health Institute near the Capitol in Washington, D.C.

Although there were periods when massage fell out of favor, in the 1960s it made a comeback in a different way as a tool for **relaxation**, communication, and alternative healing. Today, massage is one of the most popular healing modalities. It is used by conventional, as well as alternative, medical communities and is now covered by some health insurance plans.

Benefits

Generally, massage is known to affect the circulation of blood and the flow of blood and lymph, reduce muscular tension or flaccidity, affect the nervous system through stimulation or sedation, and enhance tissue healing. These effects provide a number of benefits:

- reduction of muscle tension and stiffness
- relief of muscle spasms
- greater flexibility and range of motion
- increase of the ease and efficiency of movement
- relief of stress and aide of relaxation
- promotion of deeper and easier breathing
- improvement of the circulation of blood and movement of lymph
- relief of tension-related conditions, such as headaches and eyestrain
- promotion of faster healing of soft tissue injuries, such as pulled muscles and sprained ligaments, and reduction in pain and swelling related to such injuries
- reduction in the formation of excessive scar tissue following soft tissue injuries
- enhancement in the health and nourishment of skin

- improvement in posture through changing tension patterns that affect posture
- reduction in stress and an excellent stress management tool
- creation of a feeling of well-being
- reduction in levels of anxiety
- increase in awareness of the mind-body connection
- promotion of a relaxed state of mental awareness

Massage therapy also has a number of documented clinical benefits. For example, massage can reduce **anxiety**, improve pulmonary function in young **asthma** patients, reduce psycho-emotional distress in persons suffering from chronic **inflammatory bowel disease**, increase weight and improve motor development in premature infants, and may enhance immune system functioning. Some medical conditions that massage therapy can help are: **allergies**, anxiety and **stress**, arthritis, asthma and **bronchitis**, **carpal tunnel syndrome** and other repetitive motion injuries, chronic and temporary **pain**, circulatory problems, **depression**, digestive disorders, tension **headache**, **insomnia**, myofascial pain, sports injuries, and temporomandibular joint dysfunction.

Description

Massage therapy is the scientific manipulation of the soft tissues of the body for the purpose of normalizing those tissues and consists of a group of manual techniques that include applying fixed or movable pressure, holding, and/or causing movement of or to the body. While massage therapy is applied primarily with the hands, sometimes the forearms or elbows are used. These techniques affect the muscular, skeletal, circulatory, lymphatic, nervous, and other systems of the body. The basic philosophy of massage therapy embraces the concept of *vis Medicatrix naturae*, which is aiding the ability of the body to heal itself, and is aimed at achieving or increasing health and well-being.

Touch is the fundamental medium of massage therapy. While massage can be described in terms of the type of techniques performed, touch is not used solely in a mechanistic way in massage therapy. One could look at a diagram or photo of a massage technique that depicts where to place one's hands and what direction the stroke should go, but this would not convey everything that is important for giving a good massage. Massage also has an artistic component.

Because massage usually involves applying touch with some degree of pressure and movement, the massage therapist must use touch with sensitivity in order to determine the optimal amount of pressure to use for each person. For example, using too much pressure may cause the body to tense up, while using too little may not have enough effect. Touch used with sensitivity also allows the massage therapist to receive useful information via his or her hands about the client's body, such as locating areas of muscle tension and other soft tissue problems. Because touch is also a form of communication, sensitive touch can convey a sense of caring—an essential element in the therapeutic relationship—to the person receiving massage.

In practice, many massage therapists use more than one technique or method in their work and sometimes combine several. Effective massage therapists ascertain each person's needs and then use the techniques that will meet those needs best.

Swedish massage uses a system of long gliding strokes, kneading, and friction techniques on the more superficial layers of muscles, generally in the direction of blood flow toward the heart, and sometimes combined with active and passive movements of the joints. It is used to promote general relaxation, improve circulation and range of motion, and relieve muscle tension. Swedish massage is the most commonly used form of massage.

Deep tissue massage is used to release chronic patterns of muscular tension using slow strokes, direct pressure, or friction directed across the grain of the muscles. It is applied with greater pressure and to deeper layers of muscle than Swedish, which is why it is called deep tissue and is effective for chronic muscular tension.

Sports massage uses techniques that are similar to Swedish and deep tissue, but are specially adapted to deal with the effects of athletic performance on the body and the needs of athletes regarding training, performing, and recovery from injury.

Neuromuscular massage is a form of deep massage that is applied to individual muscles. It is used primarily to release trigger points (intense knots of muscle tension that refer pain to other parts of the body), and also to increase blood flow. It is often used to reduce pain. Trigger point massage and **myotherapy** are similar forms.

Acupressure applies finger or thumb pressure to specific points located on the **acupuncture** meridians (channels of energy flow identified in Asian concepts of anatomy) in order to release blocked energy along these meridians that causes physical discomforts, and re-balance the energy flow. **Shiatsu** is a Japanese form of acupressure.

The cost of massage therapy varies according to geographic location, experience of the massage therapist, and length of the massage. In the United States, the average range is from $35-60 for a one hour session. Massage therapy sessions at a client's home or office may cost more due to travel time for the massage therapist. Most sessions are one hour. Frequency of massage sessions can vary widely. If a person is receiving massage for a specific problem, frequency can vary widely based on the condition, though it usually will be once a week. Some people incorporate massage into their regular personal health and fitness program. They will go for massage on a regular basis, varying from once a week to once a month.

The first appointment generally begins with information gathering, such as the reason for getting massage therapy, physical condition and medical history, and other areas. The client is asked to remove clothing to one's level of comfort. Undressing takes place in private, and a sheet or towel is provided for draping. The massage therapist will undrape only the part of the body being massaged. The client's modesty is respected at all times. The massage therapist may use an oil or cream, which will be absorbed into the skin in a short time.

To receive the most benefit from a massage, generally the person being massaged should give the therapist accurate health information, report discomfort of any kind (whether it's from the massage itself or due to the room temperature or any other distractions), and be as receptive and open to the process as possible.

Insurance coverage for massage therapy varies widely. There tends to be greater coverage in states that license massage therapy. In most cases, a physician's prescription for massage therapy is needed. Once massage therapy is prescribed, authorization from the insurer may be needed if coverage is not clearly spelled out in one's policy or plan.

Preparations

Going for a massage requires little in the way of preparation. Generally, one should be clean and should not eat just before a massage. One should not be under the influence of alcohol or non-medicinal drugs. Massage therapists generally work by appointment and usually will provide information about how to prepare for an appointment at the time of making the appointment.

Precautions

Massage is comparatively safe; however it is generally contraindicated, i.e., it should not be used, if a person has one of the following conditions: advanced heart diseases, **hypertension** (high blood pressure), **phlebitis**, thrombosis, embolism, kidney failure, **cancer** if massage would accelerate metastasis (i.e., spread a tumor) or damage tissue that is fragile due to chemotherapy or other treatment, infectious diseases, contagious skin conditions, acute inflammation, infected injuries, unhealed **fractures**, dislocations, **frostbite**, large hernias, torn ligaments, conditions prone to hemorrhage, and psychosis.

Massage should not be used locally on affected areas (i.e., avoid using massage on the specific areas of the body that are affected by the condition) for the following conditions: **rheumatoid arthritis** flare up, **eczema**, goiter, and open skin lesions. Massage may be used on the areas of the body that are not affected by these conditions.

In some cases, precautions should be taken before using massage for the following conditions: **pregnancy**, high fevers, **osteoporosis**, diabetes, recent postoperative cases in which pain and muscular splinting (i.e., tightening as a protective reaction) would be increased, apprehension, and mental conditions that may impair communication or perception. In such cases, massage may or may not be appropriate. The decision on whether to use massage must be based on whether it may cause harm. For example, if someone has osteoporosis, the concern is whether bones are strong enough to withstand the pressure applied. If one has a health condition and has any hesitation about whether massage therapy would be appropriate, a physician should be consulted.

Side effects

Massage therapy does not have side effects. Sometimes people are concerned that massage may leave them too relaxed or too mentally unfocused. To the contrary, massage tends to leave people feeling more relaxed and alert.

Research and general acceptance

Before 1939, more than 600 research studies on massage appeared in the main journals of medicine in English. However, the pace of research was slowed by medicine's disinterest in massage therapy.

Massage therapy research picked up again in the 1980s, as the growing popularity of massage paralleled the growing interest in complementary and alternative medicine. Well designed studies have documented the benefits of massage therapy for the treatment of acute and chronic pain, acute and chronic inflammation, chronic lymphedema, **nausea**, muscle spasm, various soft tissue dysfunctions, anxiety, depression, insomnia,

and psycho-emotional stress, which may aggravate mental illness.

Premature infants treated with daily massage therapy gain more weight and have shorter hospital stays than infants who are not massaged. A study of 40 low-birth-weight babies found that the 20 massaged babies had a 47% greater weight gain per day and stayed in the hospital an average of six days less than 20 infants who did not receive massage, resulting a cost savings of approximately $3,000 per infant. Cocaine-exposed, preterm infants given massage three times daily for a 10 day period showed significant improvement. Results indicated that massaged infants had fewer postnatal complications and exhibited fewer stress behaviors during the 10 day period, had a 28% greater daily weight gain, and demonstrated more mature motor behaviors.

A study comparing 52 hospitalized depressed and adjustment disorder children and adolescents with a control group that viewed relaxation videotapes, found massage therapy subjects were less depressed and anxious, and had lower saliva cortisol levels (an indicator of less depression).

Another study showed massage therapy produced relaxation in 18 elderly subjects, demonstrated in measures such as decreased blood pressure and heart rate and increased skin temperature.

A combination of massage techniques for 52 subjects with traumatically induced spinal pain led to significant improvements in acute and chronic pain and increased muscle flexibility and tone. This study also found massage therapy to be extremely cost effective, with cost savings ranging from 15-50%. Massage has also been shown to stimulate the body's ability to naturally control pain by stimulating the brain to produce endorphins. **Fibromyalgia** is an example of a condition that may be favorably affected by this effect.

A pilot study of five subjects with symptoms of tension and anxiety found a significant response to massage therapy in one or more psycho-physiological parameters of heart rate, frontalis and forearm extensor electromyograms (EMGs) and skin resistance, which demonstrate relaxation of muscle tension and reduced anxiety.

Lymph drainage massage has been shown to be more effective than mechanized methods or diuretic drugs to control lymphedema secondary to radical mastectomy, consequently using massage to control lymphedema would significantly lower treatment costs. A study found that massage therapy can have a powerful effect upon psycho-emotional distress in persons suffering from chronic inflammatory bowel disease. Massage therapy was effective in reducing the frequency of episodes of pain and disability in these patients.

Massage may enhance the immune system. A study suggests an increase in cytotoxic capacity associated with massage. A study of **chronic fatigue syndrome** subjects found that a group receiving massage therapy had lower depression, emotional distress, and somatic symptom scores, more hours of sleep, and lower epinephrine and cortisol levels than a control group.

Training and certification

The generally accepted standard for training is a minimum of 500 classroom hours. Training should include anatomy, physiology, pathology, massage theory and technique, and supervised practice. Most massage therapists also take additional courses and workshops during their careers.

In the United States, massage therapists are currently licensed by states, the District of Columbia, and a number of localities. Most states require 500 or more classroom hours of training from a recognized training program and passing an examination.

A national certification program was inaugurated in June 1992 by the National Certification Board for Therapeutic Massage and Bodywork (NCBTMB). The NCBTMB program is accredited by the National Commission for Certifying Agencies, the chief outside agency for evaluating certification programs. Those certified can use the title Nationally Certified in Therapeutic Massage and Bodywork (NCTMB). Most states use the NCBTMB exam for their licensing exams.

A national accreditation agency, the Commission on Massage Therapy Accreditation, designed according to the guidelines of the U.S. Department of Education, currently recognizes about 70 training programs. The Accrediting Commission of Career Schools and Colleges of Technology and the Accrediting Council for Continuing Education and Training also accredit massage training programs.

Resources

BOOKS

Beck, Mark F. *Milady's Theory and Practice of Therapeutic Massage*. Milady Publishing, 1994.

Capellini, Steve. *Massage Therapy Career Guide for Hands On Success*. Milady Publishing, 1998.

Downing, George. *The Massage Book*. New York: Random House, 1998.

Loving, Jean E. *Massage Therapy: Theory and Practice*. Appleton & Lange, 1998.

PERIODICALS

Field, T., W. Sunshine, M. Hernandez Reif, and O. Quin tino. "Chronic fatigue syndrome: massage therapy effects on depression and somatic symptoms in chronic fatigue syndrome." *J Chronic Fatigue Syndrome* (1997):43 51.

Ironson, G., T. Field, F. Scafidi, and M. Hashimoto. "Massage therapy is associated with enhancement of the immune system's cytotoxic capacity." *Int J Neuro science* (February 1996):205 217.

Joachim, G. "The effects of two stress management techni ques on feelings of well being in patients with inflam matory bowel disease." *Nursing Papers* (1983):4, 5 18.

Kaarda, B., and O. Tosteinbo. "Increase of plasma beta endorphins in connective tissue massage." *Gen phar macology* (1989): 487 489.

Scafidi, F., T. Field, A. Wheeden, S. Schanberg, C. Kuhn, R. Symanski, E. Zimmerman, and E.S. Bandstra. "Cocaine exposed preterm neonates show behavioral and hormonal differences." *Pediatrics* (June 1996):851 855.

Weintraub, M. "Shiatsu, Swedish muscle massage, and trigger point suppression in spinal pain syndrome." *Am Massage Therapy J* Summer 1992; 31:3; 99 1 09.

ORGANIZATIONS

American Massage Therapy Association. www. amtamassage.org.

Elliot Greene

Mastitis *see* **Breastfeeding problems**

McDougall diet

Definition

The McDougall diet provides the structure of a low-fat, starch-based diet to promote a broad range of such health benefits as weight loss and the reversal of such serious health conditions as heart disease , without the use of drugs.

Origins

The McDougall diet began as a challenge to Dr. John McDougall by one of his patients. The patient simply asked him if he believed that diet is connected to the health problems he saw in his patients. At that time, McDougall believed the answer to this question was a definite no. The patient challenged him to ask his patients what they were eating, in order to see if there might be any relationship between their eating habits and their diseases. McDougall agreed, and the McDougall diet was born.

McDougall was a plantation physician based in the village of Honokaa, Hawaii. In his practice, he handled a variety of medical problems from delivering babies to performing brain surgery on accident victims. Although he felt a lot of satisfaction in saving people's lives, McDougall was bothered by his inability to help patients with such disease conditions as diabetes, heart disease, high blood pressure and strokes. He decided to further his education and took up another residency in internal medicine. During his internal medicine residency, McDougall did countless hours of research on the effects of diet and lifestyle on chronic illnesses. Unfortunately, the literature he read seemed to conflict with the approaches he was being taught in his residency.

McDougall began to change his own diet as he studied the literature. Over a period of a year, he began to cut out meat and dairy products and began to focus on eating more green and yellow vegetables, fruits, and whole grains. He noticed many improvements in his own health, such as lower weight, lower blood **cholesterol** levels, and lower blood pressure. The St. Helena Hospital and Health Center in Deer Park, California offered him an opportunity to present his diet program at their facilities in 1986.

Benefits

Many patients who have undertaken the McDougall diet have found an improvement in such conditions as:

- high blood pressure
- diabetes
- headaches
- constipation
- mild arthritis
- fatigue
- body odor
- oily skin
- allergies

Another possible benefit of the McDougall program is that patients may find themselves spending less for food. In addition, McDougall points to the possibility of saving considerable amounts of money by avoiding serious and costly health problems.

Description

The McDougall diet focuses on adopting a dietary regimen and lifestyle that encourages human beings' natural tendencies to be healthy. The program is based on proper foods, moderate **exercise**, adequate sunshine,

clean air and water, and surroundings that promote psychological well-being.

Specifically, the McDougall diet is a very low-fat, starch-based program. Grains, fruits and such starchy plant foods as beans, corn, pastas, potatoes, and rice provide the major components of this diet. There are some fruits and vegetables used in this program that may be quite unfamiliar to the average person. Some of these include carambola, guava, persimmon, passion fruit, daikon, endive, fava beans, bok choy, kale, kohlrabi, taro root and watercress, to name a few. In addition, some of these foods are more easily obtained and less expensive in Hawaii than they might be in the upper Midwest or Canada.

Dairy products are not used in the McDougall diet. McDougall believes that many **allergies** and such conditions as post-nasal drip are related to people's use of dairy products.

Preparations

Patients should check with their physician before they begin this or any other diet and exercise program if they have any health problems such as **heart disease**, high blood pressure, diabetes, or arthritis. People who have a major health problem, or who are on medication, should request a doctor's examination before starting this program. This examination should include a complete history and thorough medical workup to use as a baseline evaluation for performance on this program.

McDougall recommends that patients spend some time evaluating their reasons for undertaking this program. Patients should determine how well they think they will be able to stick to the program for the initial 12 days as well as whether they can stay with the program for life. Examining any aspects of their lifestyle that are harmful to their health is also important. For example, **smoking** tobacco, drinking coffee, drinking alcohol, and the use of recreational drugs are all very damaging to anyone's health. Since few people can leave their normal environment for 12 days (as people do at the live-in McDougall diet program at the St. Helena Hospital and Health Center), they may find it stressful to work on these lifestyle problems at the same time they are making radical changes in their diet.

Those undertaking this program should also prepare family and friends for the changes this program will cause in their diet. They may find their families unwilling to change, and this fact will require a different approach to the program. On the other hand, McDougall points out that family members often decide to undertake the program themselves when they see the positive changes that result from the diet.

Before undertaking the program, patients will need to stock their pantry with new foods. They will also need to check the availability of the acceptable products in their local grocery and health food stores.

Precautions

Patients should not undertake this diet program without the advice of a physician if they have any health condition or are currently on medication.

Side effects

The primary negative side effect of the McDougall diet usually comes from **caffeine** withdrawal. Many people find they suffer from headaches while abstaining from caffeine. Although giving up caffeine is not required by the program, it is strongly recommended.

Research and general acceptance

There is extensive research about the effect of lifestyle and diet on various health conditions, although research on the McDougall diet specifically has not yet been released. Anecdotal evidence suggests, however, that significant improvement in some health problems can be achieved in a relatively short period of time.

Training and certification

The McDougall diet is self-administered. No training or certification is required.

Resources

BOOKS

McDougall, John A., M.D. *The McDougall Program: 12 Days to Dynamic Health*. New York: Penguin Group, 1990.

McDougall, John A., M.D. *The McDougall Program for Women: What Every Woman Needs to Know to Be Healthy for Life*. New York: Penguin Group, 1999.

ORGANIZATIONS

The McDougall Wellness Center. P.O. Box 14039. Santa Rosa, CA 95402. (707) 576 1654. http://www.crmcdougall.com

Kim Sharp

MCTs *see* **Medium-chain triglycerides**

Measles

Definition

Measles is a viral infection that causes an illness displaying a characteristic skin rash known as an exanthem. Measles is also sometimes called rubeola, five-day measles, or hard measles.

Description

Measles **infections** appear all over the world. Incidence of the disease in the United States is down to a record low and only 86 confirmed cases were reported in the year 2000. Of these, 62% were definitely linked to foreigners or international travel. Prior to the current effective immunization program, large-scale measles outbreaks occurred on a two to three year cycle, usually in the winter and spring. Smaller outbreaks occurred during the off-years. Babies up to about eight months of age are usually protected from contracting measles, due to antibodies they receive from their mothers in the uterus. Once someone has had measles, he or she can never get it again.

Small child with measles. *(Lowell Georgia / Photo Researchers, Inc.)*

Causes and symptoms

Measles is caused by a type of virus called a paramyxovirus. It is an extremely contagious infection, spread through the tiny droplets that may spray into the air when a person carrying the virus sneezes or coughs. About 85% of those people exposed to the virus will become infected with it. About 95% of those people infected with the virus will develop the illness. Once someone is infected with the virus, it takes about seven to 18 days before he or she actually becomes ill. The most contagious time period is the three to five days before symptoms begin through about four days after the characteristic measles rash has begun to appear.

The first signs of measles infection are **fever**, extremely runny nose, red, runny eyes, and a **cough**. A few days later, a rash appears in the mouth, particularly on the mucous membrane that lines the insides of the cheek. This rash consists of tiny white dots (like grains of salt or sand) on a reddish bump. These are called Koplik's spots, and are unique to measles infection. The throat becomes red, swollen, and sore.

A couple of days after the appearance of the Koplik's spots, the measles rash begins. It appears in a characteristic progression, from the head, face, and neck, to the trunk, then abdomen, and next out along the arms and legs. The rash starts out as flat, red patches, but eventually develops some bumps. The rash may be somewhat itchy. When the rash begins to appear, the fever usually climbs higher, sometimes reaching as high as 105°F (40.5°C). There may be **nausea**, **vomiting**, **diarrhea**, and multiple swollen lymph nodes. The cough is usually more problematic at this point, and the patient feels awful. The rash usually lasts about five days. As it fades, it turns a brownish color, and eventually the affected skin becomes dry and flaky.

Many patients (about 5–15%) develop other complications. Bacterial infections, such as ear infections, sinus infections, and **pneumonia** are common, especially in children. Other viral infections may also strike the patient, including **croup**, **bronchitis**, **laryngitis**, or viral pneumonia. Inflammation of the liver, appendix, intestine, or lymph nodes within the abdomen may cause other complications. Rarely, inflammation of the heart or kidneys, a drop in platelet count (causing episodes of difficult-to-control bleeding), or reactivation of an old **tuberculosis** infection can occur.

KEY TERMS

Antibodies—Proteins made by the immune system that have the ability to recognize foreign invaders (bacteria, viruses) and stimulate the immune system to eliminate them.

Antigens—Markers on the outside of organisms (such as bacteria and viruses) which allow antibodies to recognize foreign invaders.

Encephalitis—Swelling, inflammation of the brain.

Exanthem (plural, exanthems or exanthemata)—A skin eruption regarded as a characteristic sign of such diseases as measles, German measles, and scarlet fever.

Koplik's spots—Tiny spots occurring inside the mouth, especially on the inside of the cheek. These spots consist of minuscule white dots (like grains of salt or sand) set onto a reddened bump. Unique to measles.

An extremely serious complication of measles infection is the inflammation and subsequent swelling of the brain. Called encephalitis, this can occur up to several weeks after the basic measles symptoms have resolved. About one out of every 1,000 patients develops this complication, and about 10–15% of these patients die. Symptoms include fever, **headache**, sleepiness, seizures, and coma. Long-term problems following recovery from measles encephalitis may include seizures and mental retardation.

A very rare complication of measles can occur up to 10 years or more following the initial infection. Called subacute sclerosing panencephalitis, this is a slowly progressing, smoldering, swelling, and destruction of the entire brain. It is most common among people who had measles infection prior to the age of two years. Symptoms include changes in personality, decreased intelligence with accompanying school problems, decreased coordination, and involuntary jerks and movements of the body. As the disease progresses, the patient becomes increasingly dependent, ultimately becoming bedridden and unaware of his or her surroundings. Blindness may develop, and the temperature may spike (rise rapidly) and fall unpredictably as the brain structures responsible for temperature regulation are affected. Death is inevitable.

Measles during **pregnancy** is a serious disease, leading to increased risk of a miscarriage or stillbirth. In addition, the mother's illness may progress to pneumonia.

Diagnosis

Measles is almost always diagnosed based on its characteristic symptoms, including Koplik's spots, and a rash that spreads from central body structures out towards the arms and legs. If there is any doubt as to the diagnosis, then a specimen of body fluids (mucus or urine) can be collected and combined with fluorescent-tagged measles virus antibodies. Antibodies are produced by the body's immune cells that can recognize and bind to markers (antigens) on the outside of specific organisms, in this case the measles virus. Once the fluorescent antibodies have attached themselves to the measles antigens in the specimen, the specimen can be viewed under a special microscope to verify the presence of the measles virus.

Treatment

There are a variety of general measures that can be taken to treat measles and help the patient feel more comfortable. These include:

- humidifying the air to ease cough
- drinking plenty of fluids to prevent dehydration
- keeping the room lights dim to relieve sensitivity to light
- getting plenty of rest
- eating nutritious and easily digestible food

Herbals and Chinese medicine

There are specific **acupuncture** and **acupressure** therapies for measles. The following herbals can also help relieve the symptoms associated with measles:

- Chamomile tea for restlessness.
- Echinacea plus goldenseal to clear infection, boost the immune system, and soothe skin and mucous membranes.
- A tea of lemon balm leaf, chamomile flower, peppermint leaf, licorice root, and elder flower to reduce fever and chills and increase perspiration.
- Ginger tea to reduce fever.
- Shiitake mushrooms to boost the immune system.
- Witch hazel (*Hamamelis virginiana*), chickweed (*Stellaria media*), or oatmeal baths to reduce itching.
- Eyebright (*Euphrasia officinalis*) eyewash to soothe eyes.
- Garlic to fight infection and boost the immune system.
- *Flos lonicerae* (10 g) and *Radix glycyrrhizae* (3 g) decoction to wash the mouth, eyes, and nose.

Supplements

Some studies have shown that children with measles encephalitis or pneumonia benefit from relatively large doses of **vitamin A**. Vitamin A may also heal mucous membranes. Bioflavinoids and **vitamin C** boost the immune system. **Zinc** promotes healing and is an immune system stimulant. Zinc can cause nausea and vomiting, and chronic use can cause low levels of **copper** and iron-deficiency **anemia**.

Homeopathy

Homeopathic remedies cater to the patient's specific symptoms. Remedies for common measles symptoms are listed. The patient can take 30x or 9c of the following remedies four times daily for two days:

- Apis mellifica: for swollen throat, breathing difficulty, and painful cough.
- Arsenicum album: for restlessness, feeling worse after midnight, and thirst.
- Belladonna: for high fever, red eyes, flushed face, headache, and swallowing difficulty.
- Gelsemium: for fever, droopy eyes, cough, feeling cold, and runny nose.
- Pulsatilla: for eye problems (tears, drainage, light sensitivity), dark red rash, thick yellow nasal discharge, and dry cough.

Allopathic treatment

There are no medications available to cure measles. Treatment is primarily aimed at helping the patient to be as comfortable as possible, and watching carefully so that antibiotics can be started promptly if a bacterial infection develops. Fever and discomfort can be treated with acetaminophen (Tylenol) or ibuprofen (Advil, Motrin, Nuprin). Children with measles should never be given aspirin, as this increases the risk of the fatal disease Reye's syndrome.

Expected results

The prognosis for an otherwise healthy, well-nourished child who contracts measles is usually quite good. In developing countries, however, death rates may reach 15–25%, as malnutrition, especially protein deficiency, for six months prior to the onset of measles increases the risk of death. Adolescents and adults usually have a more difficult course. Women who contract the disease while pregnant may give birth to a baby with a hearing impairment. Although only one in 1,000 patients with measles will develop encephalitis, 10–15% of those who do will die, and about another 25% will be left with permanent brain damage.

Prevention

Measles is a highly preventable infection. A very effective vaccine exists, made of live measles viruses that have been treated so they cannot cause infection. The important markers on the viruses are intact and cause the immune system to produce antibodies. In the event of a future infection with measles virus the antibodies will quickly recognize the organism and eliminate it. Measles vaccines are usually given at about 15 months of age. Prior to that age, the baby's immune system is not mature enough to initiate a reaction strong enough to ensure long-term protection from the virus. A repeat injection should be given at about 10 or 11 years of age. Outbreaks on college campuses have occurred among non-immunized or incorrectly immunized students.

Measles vaccine should not be given to a pregnant woman, however, in spite of the seriousness of gestational measles. The reason for not giving this particular vaccine during pregnancy is the risk of transmitting measles to the unborn child.

Surprisingly, new cases of measles began being reported in some countries—including Great Britain—in 2001 because of parents' fears about vaccine safety. The combined vaccine for measles, **mumps**, and **rubella** (MMR) was claimed to cause **autism** or bowel disorders in some children. However, the World Health Organization (WHO) says there is no scientific merit to these claims. The United Nations expressed concern that unwarranted fear of the vaccine would begin spreading the disease in developing countries, and ultimately in developed countries as well. Parents in Britain began demanding the measles vaccine as a separate dose and scientists were exploring that option as an alternative to the combined MMR vaccine. Unfortunately, several children died during an outbreak of measles in Dublin because they had not received the vaccine. Child mortality due to measles is considered largely preventable, and making the MMR vaccine widely available in developing countries is part of WHO's strategy to reduce child mortality by two-thirds by the year 2015.

Resources

BOOKS

Gershon, Anne. "Measles (Rubeola)." In *Harrison's Principles of Internal Medicine*, edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases*. New York: John Wiley and Sons, Inc., 1995.

"Viral Infections: Measles." Section 19, Chapter 265 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. White house Station, NJ: Merck Research Laboratories, 2002.

Ying, Zhou Zhong, and Jin Hui De. "Childhood Infections." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Borton, Dorothy. "Keeping Measles at Bay: Use These Four Techniques to Stop the Spread." *Nursing* 27, no. 12 (December 1997): 26.

Chiba, M. E., M. Saito, N. Suzuki, et al. "Measles Infection in Pregnancy." *Journal of Infection* 47 (July 2003): 40 44.

Hussey, Greg. "Managing Measles: Integrated Case Man agement Reduces Disease Severity." *British Medical Journal* 314, no. 7077 (February 1, 1997): 316+.

Jones, G., R. W. Steketee, R. E. Black, et al. "How Many Child Deaths Can We Prevent This Year?" *Lancet* 362 (July 5, 2003): 65 71.

McBrien, J., J. Murphy, D. Gill, et al. "Measles Outbreak in Dublin, 2000." *Pediatric Infectious Disease Journal* 22 (July 2003): 580 584.

"Measles United States, 2000. (From the Centers for Disease Control and Prevention)." *Journal of the American Med ical Association* 287, no. 9 (March 6, 2002): 1105 1112.

"Progress Toward Global Measles Control and Elimination, 1990 1996." *Journal of the American Medical Associa tion* 278, no. 17 (November 5, 1997): 1396+.

Scott, L. A., and M. S. Stone. "Viral exanthems." *Derma tology Online Journal* 9 (August 2003): 4.

Sur, D. K., D. H. Wallis, and T. X. O'Connell. "Vaccina tions in Pregnancy." *American Family Physician* 68 (July 15, 2003): 299 304.

"WHO: Vaccine Fears Could Lead to Unnecessary Deaths." *Medical Letter on the CDC & FDA* (March 17, 2002): 11.

ORGANIZATIONS

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847) 434 4000. http://www.aap.org.

Centers for Disease Control and Prevention. 1600 Clifton Rd., Atlanta, GA 30333. (404) 639 3311. http://www.cdc.gov.

OTHER

Zand, Janet. "Measles." *HealthWorld Online* [cited October 2002]. http://www.healthy.net/library/books/smart/measles.htm.

Belinda Rowland
Teressa Odle
Rebecca J. Frey, PhD

Meditation

Definition

Meditation is a practice of concentrated focus upon a sound, object, visualization, the breath, movement, or attention itself in order to increase awareness of the present moment, reduce **stress**, promote **relaxation**, and enhance personal and spiritual growth.

A young woman meditating. *(© Angela Hampton Picture Library / Alamy)*

Origins

Meditation techniques have been practiced for millennia. Originally, they were intended to develop spiritual understanding, awareness, and direct experience of ultimate reality. The many different religious traditions in the world have given rise to a rich variety of meditative practices. These include the contemplative practices of Christian religious orders, the Buddhist practice of sitting meditation, and the whirling movements of the Sufi dervishes. Although meditation is an important spiritual practice in many religious and spiritual traditions, it can be practiced by anyone regardless of their religious or cultural background to relieve stress and **pain**.

As Western medical practitioners begin to understand the mind's role in health and disease, there has been more interest in the use of meditation in medicine. Meditative practices are increasingly offered in medical clinics and hospitals as a tool for improving health and quality of life. Meditation has been used as the primary therapy for treating certain diseases; as an additional therapy in a comprehensive treatment plan; and as a means of improving the quality of life of people with debilitating, chronic, or terminal illnesses.

Benefits

Meditation benefits people with or without acute medical illness or stress. People who meditate regularly have been shown to feel less **anxiety** and **depression**. They also report that they experience more enjoyment and appreciation of life and that their relationships with others are improved. Meditation produces a

KEY TERMS

Dervish—A member of the Sufi order. Their practice of meditation involves whirling ecstatic dance.

Mantra—A sacred word or formula repeated over and over to concentrate the mind.

Transcendental meditation (TM)—A meditation technique based on Hindu practices that involves the repetition of a mantra.

state of deep relaxation and a sense of balance or equanimity. According to Michael J. Baime, "Meditation cultivates an emotional stability that allows the meditator to experience intense emotions fully while simultaneously maintaining perspective on them." Out of this experience of emotional stability, one may gain greater insight and understanding about one's thoughts, feelings, and actions. This insight in turn offers the possibility to feel more confident and in control of life. Meditation facilitates a greater sense of calmness, empathy, and acceptance of self and others.

Meditation can be used with other forms of medical treatment and is an important complementary therapy for both the treatment and prevention of many stress-related conditions. Regular meditation can reduce the number of symptoms experienced by patients with a wide range of illnesses and disorders. Based upon clinical evidence as well as theoretical understanding, meditation is considered to be one of the better therapies for **panic disorder**, generalized anxiety disorder, **substance dependence** and abuse, ulcers, **colitis**, chronic pain, **psoriasis**, and dysthymic disorder. It is considered to be a valuable adjunctive therapy for moderate **hypertension** (high blood pressure), prevention of cardiac arrest (**heart attack**), prevention of **atherosclerosis** (hardening of arteries), arthritis (including **fibromyalgia**), **cancer**, **insomnia**, migraine, and prevention of **stroke**. Meditation may also be a valuable complementary therapy for **allergies** and **asthma** because of the role stress plays in these conditions. Meditative practices have been reported to improve function or reduce symptoms in patients with some neurological disorders as well. These include people with **Parkinson's disease**, people who experience **fatigue** with **multiple sclerosis**, and people with **epilepsy** who are resistant to standard treatment.

Overall, a 1995 report to the National Institutes of Health on alternative medicine concluded that, "More than 30 years of research, as well as the experience of a large and growing number of individuals and health care providers, suggests that meditation and similar forms of relaxation can lead to better health, higher quality of life, and lowered health care costs." A study of health care professionals published in 2002 indicates that the majority of physicians, nurses, and occupational therapists in the United States accept meditation as a beneficial adjunct to conventional medical or surgical treatments.

Description

Sitting meditation is generally done in an upright seated position, either in a chair or cross-legged on a cushion on the floor. The spine is straight yet relaxed. Sometimes the eyes are closed. Other times the eyes are open and gazing softly into the distance or at an object. Depending on the type of meditation, the meditator may be concentrating on the sensation of the movement of the breath, counting the breath, silently repeating a sound, chanting, visualizing an image, focusing awareness on the center of the body, opening to all sensory experiences including thoughts, or performing stylized ritual movements with the hands.

Movement meditation can be spontaneous and free-form or involve highly structured, choreographed, repetitive patterns. Movement meditation is particularly helpful for those people who find it difficult to remain still.

Generally speaking, there are two main types of meditation. These types are concentration meditation and mindfulness meditation. Concentration meditation practices involve focusing attention on a single object. Objects of meditation can include the breath, an inner or external image, a movement pattern (as in tai chi or **yoga**), or a sound, word, or phrase that is repeated silently (mantra). The purpose of concentrative practices is to learn to focus one's attention or develop concentration. When thoughts or emotions arise, the meditator gently directs the mind back to the original object of concentration.

Mindfulness meditation practices involve becoming aware of the entire field of attention. The meditator is instructed to be aware of all thoughts, feelings, perceptions, or sensations as they arise in each moment. Mindfulness meditation practices are enhanced by the meditator's ability to focus and quiet the mind. Many meditation practices are a blend of these two forms.

The study and application of meditation to health care has focused on three specific approaches: 1. transcendental meditation (TM); 2. The "relaxation response," a general approach to meditation developed by Dr. Herbert Benson; and 3. mindfulness meditation, specifically

the program of mindfulness-based stress reduction (MBSR) developed by Jon Kabat-Zinn.

Transcendental meditation

TM has its origins in the Vedic tradition of India and was introduced to the West by Maharishi Mahesh Yogi. TM has been taught to somewhere between two and four million people. It is one of the most widely practiced forms of meditation in the West. TM has been studied many times; these studies have produced much of the information about the physiology of meditation. In TM, the meditator sits with closed eyes and concentrates on a single syllable or word (mantra) for 20 minutes at a time, twice a day. When thoughts or feelings arise, the attention is brought back to the mantra. According to Charles Alexander, an important TM researcher, "During TM, ordinary waking mental activity is said to settle down, until even the subtlest thought is transcended and a completely unified wholeness of awareness...is experienced. In this silent, self-referential state of pure wakefulness, consciousness is fully awake to itself alone..." TM supporters believe that TM practices are more beneficial than other meditation practices. A group of Australian researchers has recently recommended TM as a preventive strategy for **heart disease**.

The relaxation response

The relaxation response involves a similar form of mental focusing. Dr. Herbert Benson, one of the first Western doctors to conduct research on the effects of meditation, developed this approach after observing the profound health benefits of a state of bodily calm he calls "the relaxation response." In order to elicit this response in the body, he teaches patients to focus upon the repetition of a word, sound, **prayer**, phrase, or movement activity (including swimming, jogging, yoga, and even knitting) for 10–20 minutes at a time, twice a day. Patients are also taught not to pay attention to distracting thoughts and to return their focus to the original repetition. The choice of the focused repetition is up to the individual. Instead of Sanskrit terms, the meditator can choose what is personally meaningful, such as a phrase from a prayer.

Mindfulness meditation

Mindfulness meditation comes out of traditional Buddhist meditation practices. Psychologist Jon Kabat-Zinn has been instrumental in bringing this form of meditation into medical settings. In formal mindfulness practice, the meditator sits with eyes closed, focusing the attention on the sensations and movement of the breath for approximately 45–60 minutes at a time, at least once a day. Informal mindfulness practice involves bringing awareness to every activity in daily life. Wandering thoughts or distracting feelings are simply noticed without resisting or reacting to them. The essence of mindfulness meditation is not what one focuses on but rather the quality of awareness the meditator brings to each moment. According to Kabat-Zinn, "It is this investigative, discerning observation of whatever comes up in the present moment that is the hallmark of mindfulness and differentiates it most from other forms of meditation. The goal of mindfulness is for you to be more aware, more in touch with life and whatever is happening in your own body and mind at the time it is happening—that is, the present moment." The MBSR program consists of a series of classes involving meditation, movement, and group process. There are over 240 MBSR programs offered in health care settings around the world.

Meditation is not considered a medical procedure or intervention by most insurers. Many patients pay for meditation training themselves. Frequently, religious groups or meditation centers offer meditation instruction free of charge or for a nominal donation. Hospitals may offer MBSR classes at a reduced rate for their patients and a slightly higher rate for the general public.

Precautions

Meditation appears to be safe for most people. There are, however, case reports and studies noting some adverse effects. Thirty-three to 50% of the people participating in long silent meditation retreats (two weeks to three months) reported increased tension, anxiety, confusion, and depression. On the other hand, most of these same people also reported very positive effects from their meditation practice. Kabat-Zinn notes that these studies fail to differentiate between serious psychiatric disturbances and normal emotional mood swings. These studies do suggest, however, that meditation may not be recommended for people with psychotic disorders, severe depression, and other severe personality disorders unless they are also receiving psychological or medical treatment.

Side effects

There are no reported side effects from meditation except for positive benefits.

Research and general acceptance

The scientific study of the physiological effects of meditation began in the early 1960s. These studies

MAHARISHI MAHESH YOGI (1911–2008)

(Bernard Gotfryd/Hulton Archvie/Getty Images.)

Maharishi Mahesh Yogi was one of the most recognized spiritual leaders of the world. Almost single handedly, the Maharishi (meaning great sage) brought Eastern culture into Western consciousness. He emerged in the late 1950s in London and the United States as a missionary in the cause of Hinduism, the philosophy of which is called Vedanta a belief that "holds that God is to be found in every creature and object, that the purpose of human life is to realize the godliness in oneself and that religious truths are universal."

By 1967, the Maharishi became a leader among flower children and an anti drug advocate. The Maharishi's sudden popularity was helped along by such early fans as the Beatles, Mia Farrow, and Shirley MacLaine. These people, and many others, practiced Transcendental Meditation (TM), a Hindu influenced procedure that endures in America to this day.

When the 1960s drew to a close, the Maharishi began to fade from public view. The guru still had enough followers, though, to people the Maharishi International University, founded in 1971. One of the main draws of Maharishi International University was the study of TM Sidha, an exotic form of Transcendental Meditation. Sidhas believe that group meditation can elicit the maharishi effect a force strong enough to conjure world peace.

prove that meditation affects metabolism, the endocrine system, the central nervous system, and the autonomic nervous system. In one study, three advanced practitioners of Tibetan Buddhist meditation practices demonstrated the ability to increase "inner heat" as much as 61%. During a different meditative practice they were able to dramatically slow down the rate at which their bodies consumed oxygen. Preliminary research shows that mindfulness meditation is associated with increased levels of **melatonin**. These findings suggest a potential role for meditation in the treatment and prevention of breast and prostrate cancer.

Despite the inherent difficulties in designing research studies, there is a large amount of evidence of the medical benefits of meditation. Meditation is particularly effective as a treatment for chronic pain. Studies have shown meditation reduces symptoms of pain and pain-related drug use. In a four-year follow-up study, the majority of patients in a MBSR program reported "moderate to great improvement" in pain as a result of participation in the program.

Meditation has long been recommended as a treatment for high blood pressure; however, there is a debate over the amount of benefit that meditation offers. Although most studies show a reduction in blood pressure with meditation, medication is still more effective at lowering high blood pressure.

Meditation may also be an effective treatment for coronary artery disease. A study of 21 patients practicing TM for eight months showed increases in their amount of **exercise** tolerance, amount of workload, and a delay in the onset of ST-segment depression. Meditation is also an important part of Dean Ornish's program, which has been proven to reverse coronary artery disease.

Research also suggests that meditation is effective in the treatment of chemical dependency. Gelderloos and others reviewed 24 studies and reported that all of them showed that TM is helpful in programs to stop **smoking** and also in programs for drug and alcohol abuse.

Studies also imply that meditation is helpful in reducing symptoms of anxiety and in treating anxiety-related disorders. Furthermore, a study in 1998 of 37 psoriasis patients showed that those practicing mindfulness meditation had more rapid clearing of

their skin condition, with standard UV light treatment, than the control subjects. Another study found that meditation decreased the symptoms of fibromyalgia; over half of the patients reported significant improvement. Research by a group of ophthalmologists indicates that nearly 60% of a group of patients being treated for **glaucoma** found meditation helpful in coping with their eye disorder. In addition, meditation was one of several stress management techniques used in a small study of HIV-positive men. The study showed improvements in the T-cell counts of the men, as well as in several psychological measures of well-being.

Training and certification

There is no program of certification or licensure for instructors who wish to teach meditation as a medical therapy. Meditation teachers within a particular religious tradition usually have extensive experience and expertise with faith questions and religious practices but may not have been trained to work with medical patients. Different programs have varied requirements for someone to teach meditation. In order to be recognized as an instructor of TM, one must receive extensive training. The Center for Mindfulness in Medicine, Health Care and Society at the University of Massachusetts Medical Center offers training and workshops for health professionals and others interested in teaching mindfulness-based stress reduction. The Center does not, however, certify that someone is qualified to teach meditation. The University of Pennsylvania program for Stress Management suggests that a person have at least 10 years of personal experience with the practice of mindfulness meditation before receiving additional instruction to teach meditation. Teachers are also expected to spend at least two weeks each year in intensive meditation retreats.

Resources

BOOKS

Astin, John A., et al. "Meditation." In *Clinician's Complete Reference to Complementary and Alternative Medicine*, edited by Donald Novey. St. Louis: Mosby, 2000.

Baime, Michael J. "Meditation and Mindfulness." In *Essentials of Complementary and Alternative Medicine*, edited by Wayne B. Jonas and Jeffrey S. Levin. New York: Lippincott, Williams and Wilkins, 1999.

Benson, Herbert, M.D. *The Relaxation Response*. New York: William Morrow, 1975.

Kabat Zinn, John. *Full Catastrophe Living: Using the Wis dom of Your Body and Mind to Face Stress, Pain, and Illness*. New York: Dell, 1990.

Roth, Robert. *TM Transcendental Meditation: A New Introduction to Maharishi's Easy, Effective and Scien tifically Proven Technique for Promoting Better Health*. Donald I. Fine, 1994.

PERIODICALS

King, M. S., T. Carr, and C. D'Cruz. "Transcendental Meditation, Hypertension and Heart Disease." *Aus tralian Family Physician* 31 (February 2002): 164 168.

Rhee, D. J., G. L. Spaeth, J. S. Myers, et al. "Prevalence of the Use of Complementary and Alternative Medicine for Glaucoma." *Ophthalmology* 109 (March 2002): 438 443.

Schoenberger, N. E., R. J. Matheis, S. C. Shiflett, and A. C. Cotter. "Opinions and Practices of Medical Rehabili tation Professionals Regarding Prayer and Medita tion." *Journal of Alternative and Complementary Medicine* 8 (February 2002): 59 69.

ORGANIZATIONS

Insight Meditation Society. 1230 Pleasant, St. Barre, MA 01005. (978) 355 4378. FAX: (978) 355 6398. http:// www.dharma.org

Mind Body Medical Institute. Beth Israel Deaconess Medi cal Center. One Deaconess Road, Boston, MA 02215. (617) 632 9525. http://www.mbmi.org

The Center for Mindfulness in Medicine, Health Care and Society. Stress Reduction Clinic. University of Massa chusetts Memorial Health Care. 55 Lake Avenue North, Worcester, MA 01655. (508) 856 2656. Fax (508) 856 1977. jon.kabat zinn@banyan@ummed.edu http://www.umassmed.edu/cfm

Linda Chrisman
Rebecca J. Frey, PhD

Mediterranean diet

Definition

The Mediterranean diet is based upon the eating patterns of traditional cultures in the Mediterranean region. Several noted nutritionists and research projects have concluded that this diet is one of the most healthful in the world in terms of preventing a variety of illnesses including **heart disease** and **cancer**, and increasing life expectancy.

Origins

The countries that have inspired the Mediterranean diet all surround the Mediterranean Sea. These cultures have eating habits that developed over thousands of years. In Europe, parts of Italy, Greece, Portugal, Spain, and southern France adhere to principles

Mediterranean diet

Frequency	Food	Tips
Monthly	Red meats	No more than a few times month
Weekly	Sweets	Opt instead for naturally sweet fresh fruit
	Eggs	Less than 4 per week, including those in processed foods
	Poultry	A few times a week. Take the skin off and choose white meat to lower fat intake
	Fish	A few times a week
Daily	Cheese and yogurt	Cheese and yogurt are good sources of calcium. Choose low-fat varieties
	Olive oil	The beneficial health effects of olive oil are due to its high content of monounsaturated fats and antioxidants. Olive oil is high in calories, consume in moderation to reduce calorie intake
	Fruits	At least a serving at every meal. A serving of fruit is a healthy option for snacks
	Vegetables	At least a serving at every meal. Choose a variety of colors
	Beans, legumes, nuts	Beans are a healthy source of protein, and are loaded with soluble fiber, which has been shown to lower blood cholesterol levels by five percent or more. Most nuts contain monounsaturated (heart-healthy) fat. A handful of nuts is a healthy option for snacks
	Whole grains, including breads, pasta, rice, couscous, and polenta	A grain is considered whole when all three parts—bran, germ and endosperm—are present. Substitute whole wheat for white bread, brown rice for white rice and whole-wheat flour when baking. Mix pasta, rice, couscous, polenta and potatoes with vegetables and legumes
	Water	At least 6 glasses daily
	Wine (in moderation)	The U.S. Department of Agriculture defines moderation as no more than a five-ounce glass of wine daily for women and up to 2 glasses (10 ounces) daily for men
	Physical activity	Thirty minutes of cardiovascular activity a day is recommended to get in shape, burn calories and boost the metabolism

Based on the Mediterranean diet pyramid. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

of the Mediterranean diet, as do Morocco and Tunisia in North Africa. Parts of the Balkan region and Turkey follow the diet, as well as Middle Eastern countries like Lebanon and Syria. The Mediterranean region is warm and sunny, and produces large supplies of fresh fruits and vegetables almost year round that people eat many times per day. Wine, bread, olive oil, nuts, and legumes (beans and lentils) are other staples of the region, and the Mediterranean Sea has historically yielded abundant fish. The preparation and sharing of meals is a very important and festive part of Mediterranean culture as well, and Mediterranean cuisine is popular around the world for its flavors.

The first description of the traditional Mediterranean diet as it became followed in America was in a research study funded by the Rockefeller Foundation and published in 1953. The author was Leland Allbaugh, who carried out a study of the island of Crete as an underdeveloped area. Allbaugh noted the heavy use of olive oil, whole-grain foods, fruits, fish, and vegetables in cooking as well as the geography and other features of the island.

The Cretan version of the Mediterranean diet became the focus of medical research on the Mediterranean diet following the publication of Dr. Ancel Keys's Seven Country Study in 1980. Dr. Keys performed an epidemiological analysis of **diets** around the world. Epidemiology is the branch of public health that studies the patterns of diseases and their potential causes among populations as a whole. The Seven Countries Study is considered one of the greatest epidemiological studies ever performed. It was a systematic comparison of diet, risk factors for heart disease, and disease experience in men between the ages of 40 and 59 in eighteen rural areas of Japan, Finland, Greece, Italy, the former Yugoslavia, the Netherlands, and the United States from 1958 to 1970. (Women were not included as subjects because of the rarity of heart attacks among them at that time and because the physical examinations were fairly invasive). In addition to asking the subjects to keep records of their food intake, the researchers performed chemical analyses of the foods the subjects ate. It was found that the men living on the island of Crete—the location of Leland Allbaugh's 1953 study—had the lowest rate of heart attacks of any group of subjects in the study.

Several other studies have validated Keys' findings regarding the good health of people in the Mediterranean countries. The World Health Organization (WHO) showed in a 1990 analysis that four major Mediterranean countries (Spain, Greece, France, and Italy) have longer life expectancies and lower rates of heart disease and cancer than other European countries and America. The data are significant because the same Mediterraneans frequently smoke and don't have

regular **exercise** programs like many Americans, which means that other variables may be responsible. Scientists have also ruled out genetic differences, because Mediterraneans who move to other countries tend to lose their health advantages. These findings suggest that diet and lifestyle are major factors.

The Mediterranean diet gained more notice when Dr. Walter Willett, head of the **nutrition** department at Harvard University, began to recommend it. Although low-fat diets were recommended for heart disease, Mediterranean groups in his studies had very high intakes of fat, mainly from olive oil. Willett and others proposed that the risk of heart disease could be reduced by increasing one type of dietary fat—monounsaturated fat. This is the type of fat in olive oil. Willett's proposal went against conventional nutritional recommendations to reduce all fat in the diet. It has been shown that unsaturated fats raise the level of HDL **cholesterol**, which is sometimes called "good cholesterol" because of its protective effect against heart disease. Willett has also performed studies correlating the intake of meat with heart disease and cancer.

Willett, other researchers at Harvard, and the WHO collaborated in 1994 and designed the Mediterranean Food Pyramid, which lists food groups and their recommended daily servings in the Mediterranean diet. These nutritionists consider their food groups a more healthful alternative to the food groups designated by the U.S. Department of Agriculture (USDA). The USDA recommends a much higher number of daily servings of meat and dairy products, which Mediterranean diet specialists attribute to political factors rather than sound nutritional analysis.

Benefits

Preventive health care

Most of the scientific research that has been done on Mediterranean diets concerns their role in preventing or lowering the risk of various diseases.

HEART DISEASE. Mediterranean diets became popular in the 1980s largely because of their association with lowered risk of heart attacks and **stroke**, particularly in men, following the publication of the Seven Countries study. Mediterranean diets are thought to protect against heart disease because of their high levels of **omega-3 fatty acids** even though blood cholesterol levels are not lowered.

ALZHEIMER'S DISEASE. A study published in *Annals of Neurology* in 2006 reported that subjects in a group of 2000 participants averaging 76 years of age who followed a Mediterranean-type diet closely were less likely to develop Alzheimer's than those who did not. Further study is needed, however, to discover whether factors other than diet may have affected the outcome.

ASTHMA AND ALLERGIES. A group of researchers in Crete reported in 2007 that the low rate of **wheezing** and allergic **rhinitis** (runny nose) on the island may be related to the traditional Cretan diet. Children who had a high consumption of nuts, grapes, oranges, apples, and tomatoes (the main local products) were less likely to suffer from **asthma** or nasal **allergies**. Children who ate large amounts of margarine, however, were more likely to develop these conditions.

METABOLIC SYNDROME. Research conducted at a clinic in Naples, Italy, suggests that Mediterranean diets lower the risk of developing and can even help in reversing the effects of metabolic syndrome, a condition associated with **insulin resistance** and an increased risk of heart disease and type 2 diabetes. The results from this clinic were corroborated by a study done at Tufts University in Massachusetts, which found that the symptoms of metabolic syndrome were reduced even in patients who did not lose weight on the diet.

Weight loss

Some population studies carried out in Mediterranean countries (particularly Italy and Spain) have found that close adherence to a traditional Mediterranean diet is associated with lower weight and a lower body mass index. Although there are relatively few studies of Mediterranean diets as weight-reduction regimens, a research team at the Harvard School of Public Health reported in 2007 that a Mediterranean-style diet is an effective approach to weight loss for many people. A major reason for its effectiveness is the wide variety of enjoyable foods permitted on the diet combined with a rich tradition of ethnic recipes making use of these foods—which makes it easier and more pleasant for people to stay on the diet for long periods of time.

Description

The Mediterranean diet has several general characteristics:

- The bulk of the diet comes from plant sources, including whole grains, breads, pasta, polenta (from corn), bulgur and couscous (from wheat), rice, potatoes, fruits, vegetables, legumes (beans and lentils), seeds, and nuts.
- Olive oil is used generously, and is the main source of fat in the diet as well as the principal cooking oil. The total fat intake accounts for up to 35% of calories.

Saturated fats, however, make up only 8% of calories or less, which restricts meat and dairy intake.

- Fruits and vegetables are eaten in large quantities. They are usually fresh, unprocessed, grown locally, and consumed in season.
- Dairy products are consumed in small amounts daily, mainly as cheese and yogurt (1 oz of cheese and 1 cup of yogurt daily).
- Eggs are used sparingly, up to four eggs per week.
- Fish and poultry are consumed only one to three times per week (less than 1 lb per week combined), with fish preferred over poultry.
- Red meat is consumed only a few times per month (less than 1 lb per month total).
- Honey is the principle sweetener, and sweets are eaten only a few times per week.
- Wine is consumed in moderate amounts with meals (1–2 glasses daily).

Preparations

Many Mediterranean cookbooks are available that can help with planning and preparing meals. A good first step is eliminating all oils, butter, and margarine and replacing them with olive oil. Meals should always be accompanied with bread and salads. Mediterranean fruits and vegetables are generally fresh and high in quality; American consumers may find equivalents by shopping in farmers' markets and health food stores that sell organic produce. Meat intake should be reduced and replaced by whole grains, legumes, and other foods at meals. The dairy products that are used should be yogurt and cheese instead of milk, which is not often used as a beverage by Mediterraneans.

Researchers have been quick to point out that there may be other factors that influence the effectiveness of the Mediterranean diet. Getting plenty of physical exercise is important, as is reducing **stress**. Researchers have noted that Mediterraneans' attitude toward eating and mealtimes may be a factor in their good health as well. Meals are regarded as important and joyful occasions, are prepared carefully and tastefully, and are shared with family and friends. In many Mediterranean countries, people generally relax or take a short nap (siesta) after lunch, the largest meal of the day.

Precautions

People who are making any major change in their dietary pattern in general should always consult their physician first. In addition, people who are taking monoamine oxidase inhibitors (MAOIs) for the treatment of **depression** should check with their doctor, as these drugs interact with a chemical called tyramine to cause sudden increases in blood pressure. Tyramine is found in red wines, particularly aged wines like Chianti, and in aged cheeses.

People using a Mediterranean diet for weight reduction should watch portion size and monitor their consumption of olive oil, cheese, and yogurt, which are high in calories. Dieters may wish to consider switching to low-fat cheeses and yogurts.

Because olive oil is a staple of Mediterranean diets, consumers should purchase it from reliable sources. The safety of olive oil is not ordinarily a concern in North America; however, samples of olive oils sold in Europe and North Africa are sometimes found to be contaminated by mycotoxins (toxins produced by molds and fungi that grow on olives and other fruits). Some mycotoxins do not have any known effects on humans, but aflatoxin, which has been found in olive oil, is a powerful carcinogen and has been implicated in liver cancer.

KEY TERMS

Cholesterol—A white, waxy, crystalline organic steroid alcohol found in animal foods that is also produced in the body from saturated fat for several important functions. Excess cholesterol intake is linked to many diseases.

Complex carbohydrates—Organic compounds that are broken down by the body into simple sugars for energy; they are found in grains, fruits and vegetables. They are generally recommended in the diet over refined sugar and honey, because they are a steadier source of energy and often contain fiber and nutrients as well.

Legume—A family of plants used for food that includes beans, peas, and lentils. Legumes are high in protein, fiber, and other nutrients.

Organic food—Food grown without the use of synthetic pesticides and fertilizers.

Saturated fat—Fat that is usually solid at room temperature, found mainly in meat and dairy products but also in such vegetable sources as nuts, some seeds, and avocados.

Unsaturated fat—Fat found in plant foods that is typically liquid (oil) at room temperature. They can be monounsaturated or polyunsaturated, depending on their chemical structure. Unsaturated fats are the most highly recommended dietary fats.

Resources

BOOKS

Parker, Steven Paul, MD. *The Advanced Mediterranean Diet: Lose Weight, Feel Better, Live Longer*. Mesa, AZ: Vanguard Press, 2007.

Simopoulos, Artemis P., and Francesco Visioli, eds. *More on Mediterranean Diets*. New York: Karger, 2007.

Vegetarian Times Cooks Mediterranean. New York: William Morrow, 2000.

Willett, Walter, M.D. *Nutritional Epidemiology*. London: Oxford University Press, 1998.

PERIODICALS

Carollo, C., R. L. Presti, and G. Caimi. "Wine, Diet, and Arterial Hypertension." *Angiology* 58 (February March 2007): 92 96.

Chatzi, L., G. Apostolaki, I. Bibakis, et al. "Protective Effect of Fruits, Vegetables, and the Mediterranean Diet on Asthma and Allergies among Children in Crete." *Thorax*, April 5, 2007.

Dalziel, K., L. Segal, and M. de Lorgeril. "A Mediterranean Diet Is Cost Effective in Patients with Previous Myo cardial Infarction." *Journal of Nutrition* 136 (July 2006): 1879 1885.

ORGANIZATIONS

Oldways Preservation and Exchange Trust (provides infor mation on the diet), 45 Milk Street, Boston, MA, 02109, (617) 695 0600

Douglas Dupler

Medium-chain triglycerides

Description

Medium-chain triglycerides (MCTs) are a special class of fatty acids. Normal fats and oils contain long-chain fatty acids (LCTs). Compared to these fatty acids, MCTs are much shorter in length. Therefore, they resemble carbohydrates more than fat. As a result, they are more easily absorbed, digested, and utilized as energy than LCTs.

Medium-chain triglycerides are found naturally in milk fat, palm oil, and coconut oil. Commercial MCT oil, available as liquid and capsules, is obtained through lipid fractionation, the process in which MCTs are separated from other components of coconut oil. Medium-chain triglycerides were originally formulated in the 1950s as an alternative food source for patients who are too ill to properly digest normal fats and oils. The long chains of LCTs require a lot of bile acids and many digestive steps to be broken down into smaller units that can be absorbed into the bloodstream. Once in the bloodstream, they are absorbed by fat cells and stored as body fat. In contrast, the medium-chain triglycerides are more water-soluble and are able to enter the bloodstream quicker because of their shorter lengths. Once in the bloodstream, they are transported directly into the liver. Thus, MCTs are an immediately available source of energy and only a tiny percent is converted into body fat.

Medium-chain triglycerides were first used in the mid-1900s to reduce seizures with the help of the ketogenic diet. In the 1980s, MCTs became popular in sports as a substitute for normal dietary fats or oils. They quickly became a favorite energy source for many athletes, such as marathon runners, who participate in endurance sports. These athletes require a quick source of energy, which is readily supplied by carbohydrates. However, **diets** high in carbohydrates may cause rapid increase in insulin production, resulting in substantial weight gain, diabetes, and other health problems. Dietary fats or oils are not a readily available source of energy. In addition, they are believed to make the body fatter. MCT is also a form of fat; therefore, it is high in calories. Yet, unlike normal fats and oils, MCTs do not cause weight gain because they stimulate thermogenesis (the process in which the body generates energy, or heat, by increasing its normal metabolic, fat-burning rate). A thermogenic diet, which is high in medium-chain triglycerides, has been proposed as a type of weight loss regime.

General use

Endurance sport nutrition

Medium-chain triglycerides are often used by athletes to increase their endurance during sports or **exercise** regimes. MCTs are an immediate source of energy, and as such, the body can use them as an alternative energy source for muscle during endurance exercise. However, if consumed in moderate amounts (30 to 45 grams), MCTs are not very effective in either decreasing carbohydrate needs or in enhancing exercise endurance. Increased consumption may help. One study evaluated six athletes at different points during a 25-mile cycling trial. They were given either a medium-chain triglyceride beverage, a carbohydrate drink, or a combined MCT-carbohydrate mixture. The fastest speed was achieved when the athletes used the MCT-carbohydrate blend. The worst performance was associated with sport drinks containing MCT alone (without carbohydrate). Therefore, to gain significant increases in endurance, it is generally recommended

KEY TERMS

Endurance—The ability to sustain an activity over a period of time.

Hepatic encephalopathy—Brain and nervous system damage that occurs as a complication of liver disorders.

Ketones—The potentially toxic by-products of partially burned fatty acids that the body uses as an alternative fuel source when carbohydrates are not available.

Thermogenesis—The production of heat, especially within the body.

that an athlete consume at least 50 grams of MCTs per day in combination with some carbohydrates. However, dosages exceeding 30 grams often cause gastrointestinal upset, which can diminish an athlete's performance.

MCT products available in the market may have high water content or contain unwanted ingredients. Therefore, athletes should buy MCT-only products, and mix a small amount into carbohydrate soft drinks. Alternatively, they can purchase premixed MCT sport drinks, such as a brand known as SUCCEED.

Thermogenic diet

MCTs are popular among body builders because they help reduce carbohydrate intake, while allowing them ready access to energy whenever they need it. MCTs also have muscle-sparing effects. As a result, they can build muscles while reducing fats. However, this does not mean that these athletes will become healthier, because an improvement in body physique does not always correlate with higher fitness levels.

Pre-competition diet

Compared to carbohydrates, medium-chain triglycerides are a better and more efficient source of quick energy. They help conserve lean body mass because they prevent muscle proteins from being used as energy. Therefore, some athletes load up on medium-chain triglycerides the night before a competition. However, MCT intake should be raised gradually to allow the body to adapt to increasing MCT consumption. If MCT consumption abruptly increases, incomplete MCT metabolism may occur, producing lactic acid in the body and a rapid rise of ketones in the blood, which can make the person ill.

Weight-loss diet

Studies have shown that MCT may increase metabolism, which is the rate that the body burns fat. It is believed that sustained increases in metabolic rate cause the body to burn more fat, resulting in weight loss. However, for any kind of meaningful weight loss, a person would have to consume more than 50% of total daily caloric intake in the form of medium-chain triglycerides.

Treatment of seizures

A ketogenic diet, or diet containing mostly medium-chain triglycerides, offers hope for those who have seizures that cannot be controlled by currently available drugs. Excessive consumption of MCTs produces ketones in the body; therefore, this type of diet is called a ketogenic diet. It has proven effective for some epileptic patients.

Nutritional supplements

MCTs are the preferred forms of fat for many patients with fat malabsorption problems. Many diseases cause poor fat absorption. For instance, patients with pancreatic insufficiency do not have enough pancreatic enzymes to break down LCTs. In children with cystic fibrosis, thick mucus blocks the enzymes that assist in digestion. Another fat absorption condition is short-bowel syndrome, in which parts of the bowel have been removed due to disease. Stressed or critically ill patients also have a decreased ability to digest LCTs. Unlike LCTs, medium-chain triglycerides are easily absorbed by patients with malabsorption conditions. These patients benefit most from oral preparations that contain MCTs as the primary source of fat (up to 85% of fat caloric intake). Several scientific studies have shown MCT to be effective in treating fat malabsorbtion, chronic **diarrhea**, and weight loss in patients with Acquired Immune Deficiency Syndrome (**AIDS**).

Many MCT products can be found in local health food stores or ordered through pharmacies. Before purchasing these products, patients should consult their doctors or registered dietitians for advice concerning appropriate dosage and use. MCT oil is not used for cooking. However, it can be used for tube feeding in critically ill patients. Healthy people may take it orally, by itself or mixed with water, juice, ice cream, or pudding.

Preparations

Available medium-chain triglyceride products include:

- MCT oil
- sports drinks
- energy bars
- meal replacement beverages

Precautions

- People with hepatic encephalopathy, brain and nervous system damage that occurs as a complication of liver disorders, should not take MCT.
- High consumption of medium-chain triglycerides can cause abdominal pain, cramps, and diarrhea.
- Long-term high-level MCT consumption is associated with increased risk of heart disease and other conditions. Even moderate consumption of medium-chain triglycerides can increase cholesterol and triglyceride levels. Therefore, no more than 10% of a person's diet should come from MCTs.
- Diabetic athletes and those with liver disease should not use MCT products.
- MCT oil should not completely replace all dietary fats, as this would result in a deficiency of other fatty acids—essential fatty acids— that the human body needs from food sources. To avoid essential fatty acid deficiencies, a person should also include omega-3 and omega-6 fatty acids in their diets. Good sources of omega-3 include fish, fish oils, or flaxseed oil. Omega-6 fatty acids are often found in vegetable oils and evening primrose oil . The omega-3 fats have several additional health benefits, such as alleviating inflammation and protecting the body against heart disease.
- A person should not take medium-chain triglyceride products on an empty stomach, as this may cause gastric upset.
- MCT oil is not for cooking. It is usually consumed in its uncooked form as sport bars, or mixed with a carbohydrate drink, protein shake, or other products.
- MCT oil leaches into plastic bags and containers. Therefore, non-plastic containers should be used for MCT oil storage.

Side effects

There are a few adverse effects associated with MCT use. Eating foods containing medium-chain triglycerides on an empty stomach often causes gastrointestinal upset. Regular consumption of MCTs may increase **cholesterol** and triglyceride blood levels.

Interactions

There have been no reported interactions between MCTs and other drugs.

Resources

BOOKS

Antonio, Jose, and Jeffery Stout. *Supplements for Endurance Athletes*. Champaign, IL: Human Kinetics, 2002.

Ivy, John, and Robert Portman. *The Performance Zone: Your Nutrition Action Plan for Greater Endurance and Sports Performance (Teen Health Series)*. North Bergen, NJ: Basic Health Publications, Inc., 2004.

Ryan, Monique. *Sports Nutrition for Endurance Athletes*. Boulder, CO: Velo Press, 2002.

Stapstrom, Carl E. *Epilepsy and the Ketogenic Diet: Clinical Implementation & the Scientific Basis*. Totowa, NJ: Humana Press, 2004.

PERIODICALS.

Donnell, S.C., et al. "The Metabolic Response to Intrave nous Medium Chain Triglycerides in Infants After Surgery." *Alternative Medicine Review* (February 2003): 94.

"Medium Chain Triglycerides May Help Promote Weight Loss." *Obesity, Fitness & Wellness Week* (March 29, 2003): 5.

"Medium Chain Triglycerides."*Alternative Medicine Review* (October 2002): 418 20.

St Onge, M.P., and P.J. Jones. "Physiological Effects of Medium Chain Triglycerides: Potential Agents in the Prevention of Obesity." *Alternative Medicine Review* (June 2002): 260.

St Onge, M.P., et al. "Medium Chain Triglycerides Increase Energy Expenditure and Decrease Adiposity in Over weight Men." *Obesity Research* (March 2003): 395 402.

ORGANIZATIONS

American Dietetic Association (ADA) Consumer Infor mation Hotline. (800)366 1655. http://www.eatright.org.

OTHER

Klein, Samuel. "Lipid Metabolism During Exercise." HealthWorld Online. Abstract from NIH Workshop: The Role of Dietary Supplements for Physically Active People. http://www.healthy.net.

PDRhealth.com article. "Medium Chain Triglycerides." http://www.pdrhealth.com/drug_info/nmdrugprofiles/nutsupdrugs/med_0172.html.

Mai Tran

Melanoma *see* **Skin cancer**

Melatonin

Description

Melatonin is a hormone produced naturally in the pineal gland at the base of the brain. It is important in regulating sleep and may play a role in maintaining circadian rhythm, the body's natural time clock. The hypothalamus keeps track of the amount of sunlight that is taken in by the eye. The less sunlight, the more melatonin that is released by the pineal gland, thereby enhancing and regulating sleep. Melatonin can also be taken in an over-the-counter supplement sold mainly in health food stores and pharmacies.

General use

A variety of medical uses for melatonin have been reported, but in the late 2000s, its popularity resulted from its promotion as a sleep aid and a reducer of **jet lag**. However, medical experts caution that melatonin is not a harmless substance without risks. Natural melatonin production decreases with age, and the decrease is associated with some **sleep disorders**, particularly in the elderly.

A study conducted by the Institute of Medicine in 2005 found that 50 to 70 million Americans suffer from some kind of chronic sleep disorder that hinders their ability to function normally and adversely affects their health and longevity. The use of melatonin supplements became popular in the mid-1990s as a way of dealing with such sleep disorders. Numerous scientific studies have supported this practice, although there are a few studies that cast doubt on its effectiveness. People reporting the most benefit generally are those with mild and occasional **insomnia** and trouble falling asleep. Melatonin is not generally recommended for use on a regular basis since its long-term consequences are not known.

The second most popular use of melatonin is to ease the effects of jet lag, a physical condition caused by the disturbance of circadian rhythms, usually associated with air travel across several time zones. In its 2008 issue of the popular booklet *Health Information for International Travel*, the Centers for Disease Control and Prevention suggests that "limited evidence suggests melatonin is safe and well tolerated, and doses of 0.5 to 5 mg may promote sleep and decrease jet lag symptoms in travelers crossing five or more time zones."

As of 2008, questions remained about the efficacy of melatonin in treating sleep disorders and jet lag. In 2006, researchers at the University of Alberta, Canada, reported that their review of studies on melatonin conducted between 1999 and 2003 led them to conclude that "[t]here is no evidence that melatonin is effective in treating secondary sleep disorders or sleep disorders accompanying sleep restriction, such as jet lag and shift-work disorder."

Some researchers report that melatonin may be effective in reducing the effects of **aging**. In a 2007 study conducted by researchers at the University of Granada, Spain, mice whose diet included melatonin showed significantly fewer effects of aging than did a control group that received no melatonin. Further studies on the benefits, long-term effects, and proper dosage were being conducted through the National Institutes on Aging as of 2008.

In laboratory and animal experiments, melatonin appears to protect cells and boost the immune system. Melatonin supplementation is sometimes part of a holistic treatment regimen for people with HIV or **AIDS**. There have been no human trials that support this claim.

Preparations

Melatonin is available over the counter in varying doses of up to 3 mg per tablet. However, a fraction of this amount is required for insomnia, usually about 0.3 mg or less. Too much melatonin or taking it at the wrong time can interrupt normal circadian patterns. Melatonin is produced at its highest level in the pineal gland during darkness. Since melatonin occurs naturally in some foods, it can be sold as an over-the-counter dietary supplement. It is only one of two hormones (the other is **DHEA**) not regulated by the U.S. Food and Drug Administration (FDA). Natural, animal, and bovine melatonin supplements contain actual extracts from pineal glands. Synthetic melatonin is made from non-animal ingredients and is suitable for vegetarians. It is similar in molecular structure to melatonin produced in the human body.

The proper dosage of melatonin for various applications is not known, but it appears to differ greatly depending on the individual and extent of the sleep disorder. Persons starting the hormone should begin with a very low dose, 100 to 300 mcg (0.1–0.3 mg) or less and gradually increase the dosage if needed. Melatonin is quick-acting and should be taken about 30 minutes prior to bedtime. For jet lag, the general recommendation is 300 mcg just before boarding the flight and 1.5 mg after arrival before going to bed. Melatonin should not be taken during the day.

Researchers have long thought that melatonin is not available from any plant source. However, some

KEY TERMS

Circadian rhythm—The approximately 24-hour period, also known as the body's time clock, that regulates waking and sleeping periods.

Dehydroepiandrosterone (DHEA)—A hormone produced by the adrenal glands that is important in the synthesis of other hormones, especially estrogen and testosterone.

Estrogen—A hormone that stimulates development of female secondary sex characteristics.

Hypertension—Abnormally high blood pressure in the arteries.

Insomnia—A prolonged and usually abnormal inability to obtain adequate sleep.

Lymphoma—Cancer of the lymph nodes.

Pineal gland—A gland about the size of a pea at the base of the brain that is part of the endocrine system.

research showed that this view is not entirely correct. Studies have found that both cherries and walnuts contain small amounts of melatonin. The amounts of very small, however, amounting to no more than a few nanograms (billionths of a gram) of melatonin per gram of natural product. Anyone wanting to ingest melatonin from plants such as cherries or walnuts would, therefore, have to consume very large amounts of the plants.

Precautions

Women who are on estrogen or estrogen replacement therapy should not take melatonin without consulting their doctor. Since the safety of melatonin use during **pregnancy** has not been adequately studied as of 2008, women who are pregnant or breast feeding a child should not take melatonin. Also, women who are trying to get pregnant should avoid using it since some research suggests it may have a contraceptive effect. Studies in animals suggest melatonin can constrict blood vessels, which can raise blood pressure. Therefore, persons with **hypertension** or cardiovascular problems should consult with their doctor before taking the hormone. It is not recommended for people with lymphoma or **leukemia** and should not be used by children.

Side effects

Few studies have been done on the long-term effects or correct dosing of melatonin. In one study of melatonin, about 10% of patients said they experienced minor side effects such as nightmares, headaches, morning **hangover**, **depression**, and impaired sex drive.

Interactions

Melatonin should not be taken by people using certain antidepressants, such as a serotonin inhibitor (Prozac) or a monoamine oxidase inhibitor (Nardil). Interaction between melatonin and these types of antidepressants can cause a **stroke** or **heart attack**. Preliminary symptoms include confusion, sweating, shaking, **fever**, lack of coordination, elevated blood pressure, **diarrhea**, and convulsions.

Resources

BOOKS

Montilla, Pedro, and Isaac Tunez, eds. *Melatonin: Present and Future*. Hauppauge, NY: Nova Science, 2006.

Pandi Perumal, S. R., and Daniel P. Cardinali, eds. *Melatonin: Biological Basis of Its Function in Health and Disease*. Hauppauge, NY: Nova Science, 2006.

Pandi Perumal, S. R., and Daniel P. Cardinali, eds. *Melatonin: From Molecules to Therapy*. Hauppauge, NY: Nova Biomedical Books, 2007.

PERIODICALS

Pandi Perumal, Seithikurippu R., et al. "Role of the Melatonin System in the Control of Sleep: Therapeutic Implications." *CNS Drugs* (December 2007): 995–1018.

Reilly, Thomas, et al. "Coping with Jet lag: A Position Statement for the European College of Sport Science." *European Journal of Sport Science* (March 2007): 1–7.

Tekbas, Omer Faruk, et al. "Melatonin as an Antibiotic: New Insights into the Actions of this Ubiquitous Molecule." *Journal of Pineal Research* (March 2008): 222–226.

Tengattini, Sandra, et al. "Cardiovascular Diseases: Protective Effects of Melatonin." *Journal of Pineal Research* (January 2008): 16–25.

Wade, Alan, Nava Zisape, and Patrick Lemoine. "Prolonged release Melatonin for the Treatment of Insomnia: Targeting Quality of Sleep and Morning Alertness." *Aging Health* (February 2008): 11–21.

ORGANIZATIONS

National Sleep Foundation, 1522 K St. NW, Suite 500, Washington, DC, 20005, (202) 347-3471, http://www.sleepfoundation.org.

Ken R. Wells
Teresa G. Odle
David Edward Newton, Ed.D.

Melissa officinalis see **Lemon balm**

Memory loss

Definition

Memory loss can be partial or total. Most memory loss occurs as part of the normal **aging** process, but memory loss may also occur as a result of severe emotional trauma or brain damage following disease or physical trauma. Memory loss can be described as amnesia, forgetfulness, or impaired memory.

Description

Memory is often classified as immediate (retention of information for a few seconds); short-term (retention of information for several seconds or minutes); and long-term (retention of information for days, weeks, or years). In short-term memory loss, patients can remember their childhood and past events but fail to remember events that happened in the previous few minutes. In long-term memory loss, patients are unable to recall events in the remote past.

Depending on the cause, memory loss can be sudden or gradual, and it can be permanent or temporary. Memory loss resulting from trauma to the brain is usually sudden and may be either permanent or temporary. By contrast, disease-related memory loss, such as in Alzheimer's disease, occurs gradually and is usually permanent. It is barely noticeable at first but progressively gets worse.

In most cases, memory loss is temporary and usually affects memories relating to a portion of a person's experience. However, severe physical brain trauma, such as that following a severe head injury, can cause total (global) memory loss. Some patients may temporarily lose memory and consciousness, then fully recover after the event.

Causes and symptoms

The following are common causes of memory loss:

- Aging. Even in people who do not have a disease associated with memory loss, the number of new nerve cells produced in the brain's hippocampus progressively decreases with age, and this decrease affects memory.
- Nutritional deficiency. Not enough thiamine (vitamin B_1), vitamin B_{12}, and/or protein contributes to memory loss.
- Depression. Depression can cause memory loss at any age. This is one of the main reasons for forgetfulness in the elderly. Depression-related memory loss is a treatable condition.
- Diseases. Memory loss can result from such chronic disease conditions as diabetes or hypothyroidism.
- Oxygen deprivation. Such conditions as severe head trauma, surgery, strokes, or heart attacks cause a sudden reduction of oxygen to the brain, which causes widespread death of nerve cells and significant memory loss.
- Structural abnormalities in or damage to the parts of the brain associated with memory formation. Two areas of the brain that are involved in memory formation are the hippocampus and the orbitofrontal cortex.
- Free-radical damage. Free-radical molecules are unstable and highly reactive molecules. These molecules destabilize other molecules around them, resulting in damage to the body at the molecular level. Free radicals can damage the blood-brain barrier, a membrane that separates the circulating blood and the brain. A weakened barrier may not be able to prevent toxic chemicals from entering the brain. Widespread brain damage, accelerated cell death, and memory loss occur as a result.
- Chemical poisoning. Daily exposure to toxic chemicals such as alcohol, tobacco, and illicit drugs (heroine, cocaine, and amphetamines) destroys brain cells at a rapid rate. Other environmental toxins, such as lead and mercury, can penetrate the blood-brain barrier. Once inside the brain, these heavy metals kill nerve cells. This action helps explain why exposure to heavy metals has been linked to memory and learning problems in children. Even though aluminum is not considered a heavy metal, its accumulation in the brain is believed to contribute to Alzheimer's disease.
- Central nervous system (CNS) infections and inflammation of the brain. Encephalitis (an inflammatory disease of the brain) can result in the death of nerve cells, which can lead to significant memory loss. CNS infections such as toxoplasmosis and neurosyphilis can also cause significant brain damage and memory loss.
- Stress. Emotional or physical stress stimulates the release of stress hormones such as cortisol and adrenaline. Constant exposure to stress hormones results in nerve-cell death and memory loss.
- Sensory overload. When a person is trying to do too many tasks or is worrying about too many things at the same time, the brain is overloaded with information and cannot process short-term memories. Therefore, if individuals are trying to remember a

lot of information, they may forget such details as where the car keys are or what appointments need to be kept.

- Low blood sugar. Nerve cells require glucose (sugar) to generate energy. If there is not enough glucose in the blood, nerve cells starve and die. Excessively low blood sugar can send a person into shock and/or into a coma.
- Genetic factors. A rare form of Alzheimer's disease is called early-onset familial AD. This form of the disease is inherited and usually strikes between the ages of 30 and 60. Most cases of Alzheimer's disease are described as "late-onset" because they do not occur until later in life. Although late-onset AD does not appear to be an inherited illness, scientists have identified a gene that may be involved. This gene's role is to make a protein known as apolipoprotein E, or ApoE. Although all people have this gene, about 15 percent of individuals have a certain form of the gene that increases the risk for AD. Scientists are also interested in the protein beta-amyloid, which is active in persons who have Alzheimer's disease. According to a study published in 2008, the protein is also very active in healthy young people. They believe the protein helps the brain delete unnecessary memories but causes problems in people with Alzheimer's disease because they lose memories faster than they make new ones. Studies were underway as of 2008 to search for possible other genetic risk factors. In addition, Down syndrome, which is caused by an abnormal form of human chromosome 21, is characterized by memory loss relatively early in life, often when individuals are in their 30s or 40s.
- Seizures. Prolonged seizures, such as in patients with epilepsy, can cause significant memory loss.
- Severe emotional trauma. Extreme emotional trauma has been associated with sudden amnesia. Dissociative amnesia is a type of amnesia that occurs when the brain splits off, or dissociates, extremely distressing memories from conscious recollection.
- Low estrogen levels in postmenopausal women. Women often report a significant decrease in memory function immediately following menopause.

Diagnosis

To find the underlying cause of memory loss, physicians obtain a detailed medical history, which documents the pattern, symptoms, and types of memory loss. They also inquire about contributing factors that may worsen or trigger memory loss. A routine physical and detailed neuropsychological examination with a focus on memory function is conducted. In addition, they may order several diagnostic tests.

Tests used to pinpoint the exact cause of memory loss include neuroimaging; electroencephalography (EEG) for patients with seizures; blood, cerebrospinal fluid, and tissue analysis to rule out specific diseases; and cognitive tests for gauging the patient's recent and remote (long-term) memory, and possibly the patient's attention span, judgment, and word comprehension as well. The most common brief test given to evaluate a person for memory loss and other aspects of cognitive function is the Mini-Mental Status Examination, or MMSE, which is also known as the Folstein.

Available neuroimaging techniques include computed tomography or CT scan, magnetic resonance imaging (MRI), positron emission tomography (PET), and single-photon emission computed tomography (SPECT). A CT scan can detect structural abnormalities, such as brain tumors or lesions. For detection of widespread loss of neurons associated with aging or degenerative diseases, an MRI, PET, or SPECT test can be performed. These tests can show the severity and extent of nerve damage. They can also help doctors pinpoint the cause of the memory loss. A PET scan is especially useful in that it allows doctors to track and record which memory centers are stimulated in a person's brain tissue while the person is functioning.

Treatment

Dietary guidelines

The following dietary changes are recommended to lower the risk of or slow memory loss:

- Reduce sugar intake.
- Avoid eating foods that contain such additives as artificial sweeteners, monosodium glutamate (MSG), preservatives, and artificial colors. These chemicals can accumulate in the body and become toxic, causing brain damage and memory loss.
- Eat organically grown foods. Pesticides and insecticides are toxic chemicals that can affect nerve function and cause memory loss.
- Limit alcohol intake and quit smoking.
- Do not use illicit drugs.
- Drink only filtered water to avoid toxic chemicals in the water system.
- Eat a low-fat, high-fiber diet with emphasis on fresh fruits and vegetables. Raw fruits and vegetables are the best sources of the vitamins, minerals, fiber, and antioxidants that the body needs for detoxifying. Antioxidants also protect and support brain function.

- Get enough protein. Protein is necessary to maintain healthy muscles, organs, and nerve cells; it also helps maintain blood sugar levels.
- Eat cold-water fish, which are a good source of omega-3 fatty acids. Omega-3 fats are believed to reduce the risk of strokes, blood clotting, and heart attacks. These are major causes of sudden memory loss in the elderly.

Nutritional supplements

The following nutritional supplements may help restore and maximize memory:

- L-Acetylcarnitine (LAC). Studies have shown that acetylcarnitine can improve memory function in the elderly. It may even reverse memory loss in some patients who have early Alzheimer's disease.
- Phosphatidylserine (100 mg three times per day). This supplement may help improve brain function in patients suffering from age-related memory loss and appears to be most effective for patients with milder symptoms.
- Vitamin E (400–800 IU per day). A strong antioxidant, vitamin E has been shown to promote memory performance.
- Omega-3 fatty acids. Flaxseed oil (1 tablespoon per day) and fish oil capsules are good sources of omega-3 fatty acids. Omega-3 enriched eggs are also beneficial.
- Thiamine (3–8 g per day). A vitamin B_1 deficiency can be treated with supplements. Thiamine/vitamin B_1 is an antioxidant that may improve mental function in Alzheimer's patients.
- Methylcobalamin (1,000 micrograms twice daily). Methylcobalamine is a supplemental form of cyanocobalamin, or vitamin B_{12}. Many Alzheimer's patients have been found to have a vitamin B_{12} deficiency.

Herbal therapy

Alternative medicine practitioners may recommend one or more of the following herbs to help reverse memory loss and/or improve mental performance:

- *Ginkgo biloba* extract (24% ginkgo flavonglycosides: 80 mg three times per day) is the herb most well-known as a memory booster. A study in 2002, however, indicated that gingko had no effect on memory or on concentration among generally healthy adults aged 60 to 82. Yet, several other studies demonstrated that ginkgo helps improve thinking and concentration in patients with Alzheimer's disease. Ginkgo is a strong antioxidant.
- Gotu kola (*Centella asiatica*: 70 mg taken twice daily). This herb is used to help improve memory by increasing blood circulation to the brain and by keeping blood vessels strong and healthy.
- Ginseng. Studies have shown that ginseng can improve memory and enhance learning ability. The recommended dosage of Korean ginseng is typically 3 to 9 g per day. Because ginseng may elevate blood pressure, patients with heart disease or high blood pressure should consult with their doctor before using this herb.
- Huperzine A. Huperzine A is isolated from a traditional Chinese medicine known as Qian Ceng Ta, which is made from a type of club moss (*Huperzia serrata*). It is sometimes recommended for treating dementia and for improving memory. Limited studied in China indicate that it is indeed useful in the treatment of memory loss due to dementia.
- Brahmi (*Bacopa monniera*). Brahmi is a herb native to India that is used in Ayurvedic medicine and Japanese medicine as a nerve tonic and treatment for insomnia. It is believed to improve a person's ability to retain new learning. Brahmi, which is sometimes called bacopa in Western countries, contains two compounds known as bacosides A and B. It is thought that these chemicals help to prevent memory loss by improving the efficiency of impulse transmission between nerve cells in the brain. An Australian study published in 2002 reported on the effects of brahmi on 76 human subjects. It showed that brahmi has a significant effect on people's ability to remember new information, although it does not affect a person's ability to retrieve information that was known prior to the experiment.

Allopathic treatment

The method of treatment for memory loss depends on underlying causes:

- Age. The elderly can be taught simple techniques to remember things better such as repeating a person's name several times, using word association, or jotting things down in a notebook.
- Depression. Depressed patients often show enhanced memory function after they are successfully treated for depression.
- CNS infections. Patients require effective antimicrobial treatment immediately to save them from death, significant brain damage, and profound memory loss.
- Trauma. Patients' memories usually return as they recover from the accident or injury. In some causes hypnosis is useful in helping patients retrieve traumatic memories without being overwhelmed by them.

KEY TERMS

Alzheimer's disease—A degenerative brain disease caused by physiological changes inside the brain. As a result, the patient experiences impaired memory and thought processes.

Antioxidant—Any substance that reduces the damage caused by oxidation, such as the harm caused by free radicals.

Bacosides—The name of two chemicals found in brahmi that are believed to aid memory by improving the efficiency of nerve impulse transmission.

Brahmi—A herb used in Ayurvedic and Japanese medicine that is believed to improve a person's ability to remember new information. Brahmi is also called bacopa.

Dissociation—A reaction to trauma in which the mind splits off certain aspects of the traumatic event from conscious awareness. Dissociation can affect the patient's memory, sense of reality, and sense of identity.

Dissociative amnesia—A disorder characterized by loss of memory for a period or periods of time in the patient's life.

Down syndrome—A genetic disorder caused by an extra human chromosome 21 (trisomy 21), characterized by mental retardation, muscular weakness, and folds over the patient's eyelids. Individuals with Down syndrome often begin to lose their memory in midlife.

Hippocampus—A horseshoe-shaped ridge in the brain that is part of the limbic system. The hippocampus is associated with the formation of short-term memory and with the sense of spatial orientation.

Mini-Mental Status Examination (MMSE)—A brief test of memory and cognitive function that is used to evaluate the presence and extent of memory loss and to monitor the effects of treatment for memory loss.

Neuron—A nerve cell that receives, processes, saves, and sends messages. It consists of an axon, a body, and dendrites.

- Alzheimer's disease (AD). Such medications as galantamine, rivastigmine, tacrine, or donepezil are often prescribed to improve memory and cognitive functions in patients with mild to moderate AD. Doctors may prescribe memantine to treat individuals with moderate to severe AD.

Expected results

A patient's prognosis depends on the underlying causes of his or her memory loss. Partial or complete recovery can be expected when the memory loss results from treatable causes such as **depression** or nutritional deficiencies. Patients with such degenerative nerve conditions as Alzheimer's disease, however, are expected to have a slow, irreversible decline of both memory and cognitive function. Medical treatment with memory-enhancing medications and long-term care are often required.

Prevention

A person can decrease or slow age-related memory loss by taking several steps. Keeping the mind active by continually learning new information is an important strategy in this regard. By eating healthy and nutritious foods, taking nutritional supplements and **antioxidants**, reducing stresses at home and at work, and avoiding environmental toxins, one can slow or even prevent memory loss.

Resources

BOOKS

Kandel, Eric. *In Search of Memory: The Emergence of a New Science of Mind.* New York: Norton, 2007.

Lorayne, Harry. *Ageless Memory: Secrets for Keeping Your Brain Young Foolproof Methods for People Over 50.* New York: Black Dog & Leventhal, 2008.

PERIODICALS

Saey, Tina Hesman. "Alzheimer's Mystery Protein Unmasked." *Science News (*173, no. 12 (March 22, 2008): 189.

OTHER

"Alzheimer's Disease Fact Sheet." *National Institute on Aging, U.S. National Institutes of Health* October 26, 2007. http://www.nia.nih.gov/Alzheimers/Publications/adfact.htm. (April 12, 2008).

ORGANIZATIONS

Alzheimer's Disease Education & Referral (ADEAR) Center; The National Institute of Aging (NIA), PO Box 8250, Silver Spring, MD, 20907, (800) 438 4380, http://www.alzheimers.org.

American Psychiatric Association, 1000 Wilson Blvd., Suite 1825, Arlington, VA, 22209 3901, (703) 907 7300, http://www.psych.org.

NIH National Center for Complementary and Alternative Medicine; NCCAM Clearinghouse, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://nccam.nih.gov.

Mai Tran
Rebecca J. Frey, PhD
Leslie Mertz, Ph.D.

Ménière's disease

Definition

Ménière's disease is a condition characterized by recurrent vertigo (**dizziness**), **hearing loss**, and **tinnitus** (a roaring, buzzing, or ringing sound in the ears).

Description

Ménière's disease was named for the French physician Prosper Ménière, who first described the illness in 1861. It is an abnormality within the inner ear. A fluid called endolymph moves in the membranous labyrinth or semicircular canals within the bony labyrinth inside the inner ear. When the head or body moves, the endolymph moves, causing nerve receptors in the membranous labyrinth to send signals to the brain about the body's motion. A change in the volume of the endolymph fluid, or swelling or rupture of the membranous labyrinth is thought to result in Ménière's disease symptoms.

KEY TERMS

Myelin—A whitish fatty substance that acts like an electrical insulator around certain nerves in the peripheral nervous system. It is thought that the loss of the myelin surrounding the vestibular nerves may influence the development of Ménière's disease.

T cell—A type of white blood cell produced in the thymus gland that regulates the immune system's response to diseased or malignant cells. It is possible that a subcategory of T cells known as CD4 cells plays a role in Ménière's disease.

Tinnitus—A roaring, buzzing or ringing sound in the ears.

Transcutaneous electrical nerve stimulation (TENS)—A treatment in which a mild electrical current is passed through electrodes on the skin to stimulate nerves and block pain signals.

Vertigo—The medical term for dizziness or a spinning sensation.

Causes and symptoms

Causes

The cause of Ménière's disease is unknown as of 2002; however, scientists are studying several possible causes, including noise pollution, viral **infections**, or alterations in the patterns of blood flow in the structures of the inner ear. Since Ménière's disease sometimes runs in families, researchers are also looking into genetic factors as possible causes of the disorder.

One area of research that shows promise is the possible relationship between Ménière's disease and **migraine headache**. Dr. Ménière himself suggested the possibility of a link, but early studies yielded conflicting results. A rigorous German study published in late 2002 reported that the lifetime prevalence of migraine was 56% in patients diagnosed with Ménière's disease as compared to 25% for controls. The researchers noted that further work is necessary to determine the exact nature of the relationship between the two disorders.

A study published in late 2002 reported that there is a significant increase in the number of CD4 cells in the blood of patients having an acute attack of Ménière's disease. CD4 cells are a subtype of T cells, which are produced in the thymus gland and regulate the immune system's response to infected or malignant cells. Further research is needed to clarify the role of these cells in Ménière's disease.

Another possible factor in the development of Ménière's disease is the loss of myelin from the cells surrounding the vestibular nerve fibers. Myelin is a whitish fatty material in the cell membrane of the Schwann cells that form a sheath around certain nerve cells. It acts like an electrical insulator. A team of researchers at the University of Virginia reported in 2002 that the vestibular nerve cells in patients with unilateral Ménière's disease are demyelinated; that is, they have lost their protective "insulation." The researchers are investigating the possibility that a viral disease or disorder of the immune system is responsible for the demyelination of the vestibular nerve cells.

Symptoms

The symptoms of Ménière's disease are associated with a change in fluid volume within the labyrinth of the inner ear. Symptoms include severe dizziness or vertigo, tinnitus, hearing loss, and the sensation of **pain** or pressure in the affected ear. Symptoms appear suddenly, last up to several hours, and can occur as often as daily to as infrequently as once a year. A typical attack includes vertigo, tinnitus, and hearing loss; however, some individuals with Ménière's disease may experience a single symptom, like an occasional bout of slight dizziness or periodic, intense ringing in the ear. Attacks of severe vertigo can force the sufferer to have to sit or lie down, and may be accompanied by **headache**, **nausea**, **vomiting**, or **diarrhea**. Hearing

tends to recover between attacks, but becomes progressively worse over time.

Ménière's disease usually starts between the ages of 20 and 50 years; however, it is not uncommon for elderly people to develop the disease without a previous history of symptoms. Ménière's disease affects men and women in equal numbers. In most patients only one ear is affected but in about 15% both ears are involved.

Diagnosis

An estimated three to five million people in the United States have Ménière's disease, and almost 100,000 new cases are diagnosed each year. Diagnosis is based on medical history, physical examination, hearing and balance tests, and medical imaging with magnetic resonance imaging (MRI).

In patients with Ménière's disease, audiometric tests (hearing tests) usually indicate a sensory type of hearing loss in the affected ear. Speech discrimination, or the ability to distinguish between words that sound alike, is often diminished. In about 50% of patients, the balance function is reduced in the affected ear. An electronystagnograph (ENG) may be used to evaluate balance. Since the eyes and ears work together through the nervous system to coordinate balance, measurement of eye movements can be used to test the balance system. For this test, the patient is seated in a darkened room and recording electrodes, similar to those used with a heart monitor, are placed near the eyes. Warm and cool water or air are gently introduced into each ear canal and eye movements are recorded.

Another test that may be used is an electrocochleograph (EcoG), which can measure increased inner ear fluid pressure.

Treatment

Because there is no cure for Ménière's disease, most treatments are aimed at reducing its symptoms, especially tinnitus. General measures to mask the tinnitus include playing a radio or tape of white noise (low, constant sound). Exercising to improve blood circulation and reducing the intake of salt, alcohol, aspirin, **caffeine**, and nicotine may relieve Ménière's disease symptoms.

Ayurveda

Ayurvedic practitioners believe that tinnitus is a vata disorder. (Vata is one of three doshas, or body/mental types.) The patient can drink a tea prepared from 1 tsp of a mixture of **comfrey**, cinnamon, and **chamomile** two to three times a day. Yogaraj guggulu in warm water can be taken two or three times a day. Gentle massage of the mastoid bone (behind the ear) with warm **sesame oil** may help relieve tinnitus. Placing three drops of **garlic** oil into the affected ear at night may also be effective.

Homeopathy

Homeopathic remedies are chosen based on each patients specific set of symptoms. Salicylic acidum is indicated for patients who experience a roaring sound, deafness, and giddiness. **Bryonia** is recommended for patients with headache, a buzzing or roaring sound in the ear, and dizziness that is worsened by motion. Cocculus is indicated for those who experience dizziness and nausea. Conium is chosen for the patient who experiences light sensitivity and dizziness that is worsened by lying down. *Carbonium sulphuratum* is recommended for patients who experience a roaring with a tingling sensation and clogged ears. *Kali iodatum* is chosen for patients who have long-term ringing in the ears and no other symptoms. Theridion is indicated for patients who experience sensitivity to noise and dizziness with nausea and vomiting that is worsened by the slightest motion.

Other remedies

Other alternative medicine disciplines which have treatments to help relieve symptoms of Ménière's disease are:

- Acupuncture. The acupuncture ear points neurogate, kidney, sympathetic, occiput, heart, and adrenal may relieve dizziness associated with Ménière's disease. Chronic cases may be treated at the body points on the spleen, triple warmer, and kidney meridians. The World Health Organization (WHO) lists Ménière's disease as one of 104 conditions that can be treated effectively with acupuncture.
- Aromatherapy. The essential oils of geranium, lavender, and sandalwood may be added to bath water. Lavender or German chamomile oils may be used as massage oils.
- Body adjustments. Chiropractors or osteopaths may adjust the head, jaw, and neck to relieve movement restrictions that could affect the inner ear. Craniosacral therapists may gently move bones of the skull to relieve pressure on the head.
- Herbals. Ginkgo (*Ginkgo biloba*) improves circulation which may improve tinnitus and Ménière's disease. Ginkgo is a powerful antioxidant and blood thinner. Ginkgo relieves tinnitus in about half of

the patients who use it. Fenugreek (*Trigonella foenum-graecum*) tea (steeped in cold water) stops cricket noises and ringing in the ears. Chamomile (*Matricaria recutita*) promotes relaxation and may help the patient to sleep.

- Reflexology. Working the cervical spine, ear, and neck points on the hands and feet and the points on the bottoms and sides of the big toes may relieve tinnitus.
- Relaxation techniques. Biofeedback, yoga, massage, and other stress-reduction techniques can promote relaxation and divert the patient's attention away from tinnitus. Stress can worsen tinnitus and bring on an attack of Ménière's disease so relaxation techniques can be beneficial.
- Supplements. Magnesium deficiency may cause tinnitus. Magnesium supplementation may relieve the tinnitus associated with Ménière's disease and protect the ears from damage resulting from loud sounds. Vitamin B_{12} supplementation has improved tinnitus in patients deficient in this vitamin. Other supplements recommended for the treatment of Ménière's disease include vitamins C, B_1, B_2, and B_6 and zinc.
- TENS. Transcutaneous electrical nerve stimulation reduced tinnitus in 60% of the Ménière's disease patients in a study of tinnitus sufferers. Patients received six to 10 treatments biweekly. A few of the study patients reported temporary or permanent worsening of tinnitus, however, the cause of the tinnitus in these patients was not specified.

Allopathic treatment

There is no cure for Ménière's disease, but medication, surgery, and dietary and behavioral changes can help control or improve the symptoms.

A special hearing aid is available which makes a soft noise to mask the ringing and other noises associated with Ménière's disease. This device does not interfere with hearing or speech.

Medications

Symptoms of Ménière's disease may be treated with a variety of oral medicine or through injections. Antihistamines, like diphenhydramine, meclizine, and cyclizine can be prescribed to sedate the vestibular system. A barbiturate medication like pentobarbital may be used to completely sedate the patient and relieve the vertigo. Anticholinergic drugs, like atropine or scopolamine, can help minimize nausea and vomiting. Diazepam has been found to be particularly effective for relief of vertigo and nausea in Ménière's disease. There have been some reports of successful control of vertigo after antibiotics (gentamicin or streptomycin) or a steroid medication (dexamethasone) are injected directly into the inner ear. Some researchers have found that gentamicin is effective in relieving tinnitus as well as vertigo.

A newer medication that appears to be effective in treating the vertigo associated with Ménière's disease is flunarizine, which is sold under the trade name Sibelium. Flunarizine is a **calcium** channel blocker and anticonvulsant that is presently used to treat **Parkinson's disease**, migraine headache, and other circulatory disorders that affect the brain.

Surgical procedures

Surgical procedures may be recommended if the vertigo attacks are frequent, severe, or disabling and cannot be controlled by other treatments. The most common surgical treatment is insertion of a small tube or shunt to drain some of the fluid from the canal. This treatment usually preserves hearing and controls vertigo in about one-half to two-thirds of cases, but it is not a permanent cure in all patients.

The vestibular nerve leads from the inner ear to the brain and is responsible for conducting nerve impulses related to balance. A vestibular neurectomy is a procedure where this nerve is cut so the distorted impulses causing dizziness no longer reach the brain. This procedure permanently cures the majority of patients and hearing is preserved in most cases. There is a slight risk that hearing or facial muscle control will be affected.

A labyrinthectomy is a surgical procedure in which the balance and hearing mechanism in the inner ear are destroyed on one side. This procedure is considered when the patient has poor hearing in the affected ear. Labyrinthectomy results in the highest rates of control of vertigo attacks, however, it also causes complete deafness in the affected ear.

Expected results

Ménière's disease is a complex and unpredictable condition for which there is no cure. The vertigo associated with the disease can generally be managed or eliminated with medications and surgery. Hearing tends to become worse over time, and some of the surgical procedures recommended, in fact, cause deafness.

Prevention

Because the cause of Ménière's disease is not definitely known as of 2002, there are no proven strategies for its prevention. **Stress** reduction and **relaxation** may

prevent attacks of Ménière's disease. Wearing earplugs while exposed to loud sounds will help to prevent hearing damage and worsening of tinnitus.

Resources

BOOKS

"Ménière's Disease." *The Alternate Advisor: The Complete Guide to Natural Therapies and Alternative Treatments*. Edited by Robert. Richmond, VA: Time Life Books, 1997.

The Merck Manual of Diagnosis and Therapy. 17th ed., edited by Mark H. Beers and Robert Berkow. White house Station, NJ: Merck Research Laboratories, 1999.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Ménière's Disease." New York: Simon & Schuster, 2002.

PERIODICALS

Ballester, M., P. Liard, D. Vibert, and R. Hausler. "Ménière's Disease in the Elderly." *Otology and Neu rotology* 23 (January 2002): 73 78.

Corvera, J., G. Corvera Behar, V. Lapilover, and A. Ysunza. "Objective Evaluation of the Effect of Flunarizine on Vestibular Neuritis." *Otology and Neurotology* 23 (November 2002): 933 937.

Driscoll, C. L., et al. "Low Dose Gentamicin and the Treatment of Ménière's Disease: Preliminary Results." *Laryngoscope* 107 (January 1997): 83 89.

Friberg, U., and H. Rask Andersen. "Vascular Occlusion in the Endolymphatic Sac in Ménière's Disease." *Annals of Otology, Rhinology, and Laryngology* 111 (March 2002): 237 245.

Fung, K., Y. Xie, S. F. Hall, et al. "Genetic Basis of Familial Ménière's Disease." *Journal of Otolaryngology* 31 (February 2002): 1 4.

Ghosh, S., A. K. Gupta, and S. S. Mann. "Can Electro cochleography in Ménière's Disease Be Noninvasive?" *Journal of Otolaryngology* 31 (December 2002): 371 375.

Mamikoglu, B., R. J. Wiet, T. Hain, and I. J. Check. "Increased CD4+ T cells During Acute Attack of Ménière's Disease." *Acta Otolaryngologica* 122 (December 2002): 857 860.

Radtke, A., T. Lempert, M. A. Gresty, et al. "Migraine and Ménière's Disease: Is There a Link?" *Neurology* 59 (December 10, 2002): 1700 1704.

Saeed, Shakeel R. "Diagnosis and Treatment of Ménière's Disease." *British Medical Journal* 316 (January 1998): 368.

Spencer, R. F., A. Sismanis, J. K. Kilpatrick, and W. T. Shaia. "Demyelination of Vestibular Nerve Axons in Unilateral Ménié's Disease." *Ear, Nose and Throat Journal* 81 (November 2002): 785 789.

Steenerson, Ronald L., and Gaye W. Cronin. "Treatment of Tinnitus with Electrical Stimulation. *Otolaryngology Head and Neck Surgery* 121 (November 1999): 511 513.

Yetiser, S., and M. Kertmen. "Intratympanic Gentamicin in Ménière's Disease: The Impact on Tinnitus." *Interna tional Journal of Audiology* 41 (September 2002): 363 370.

ORGANIZATIONS

American Academy of Otolaryngology Head and Neck Surgery. One Prince Street, Alexandria, VA 22314. (703) 836 4444. http://www.entnet.org.

The Ménière's Network. 1817 Patterson Street, Nashville, TN 37203. (800) 545 4327. http://www. earfoundation.org.

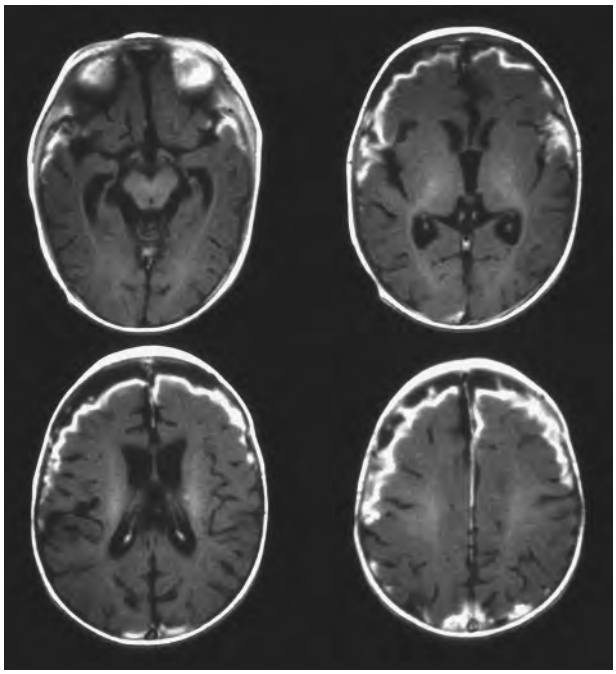
Vestibular Disorders Association. P.O. Box 4467, Portland, OR 97208 4467. (800) 837 8428. http://www. vestibular.org.

Belinda Rowland
Rebecca J. Frey, PhD

Meningitis

Definition

Meningitis is a potentially fatal inflammation of the meninges, the thin, membranous covering of the brain and the spinal cord. Meningitis is most commonly caused by infection by bacteria, viruses, or



This composite of four contrast-enhanced MRI images shows H. Influenza meningitis. *(Living Art Enterprises, LLC / Photo Researchers, Inc.)*

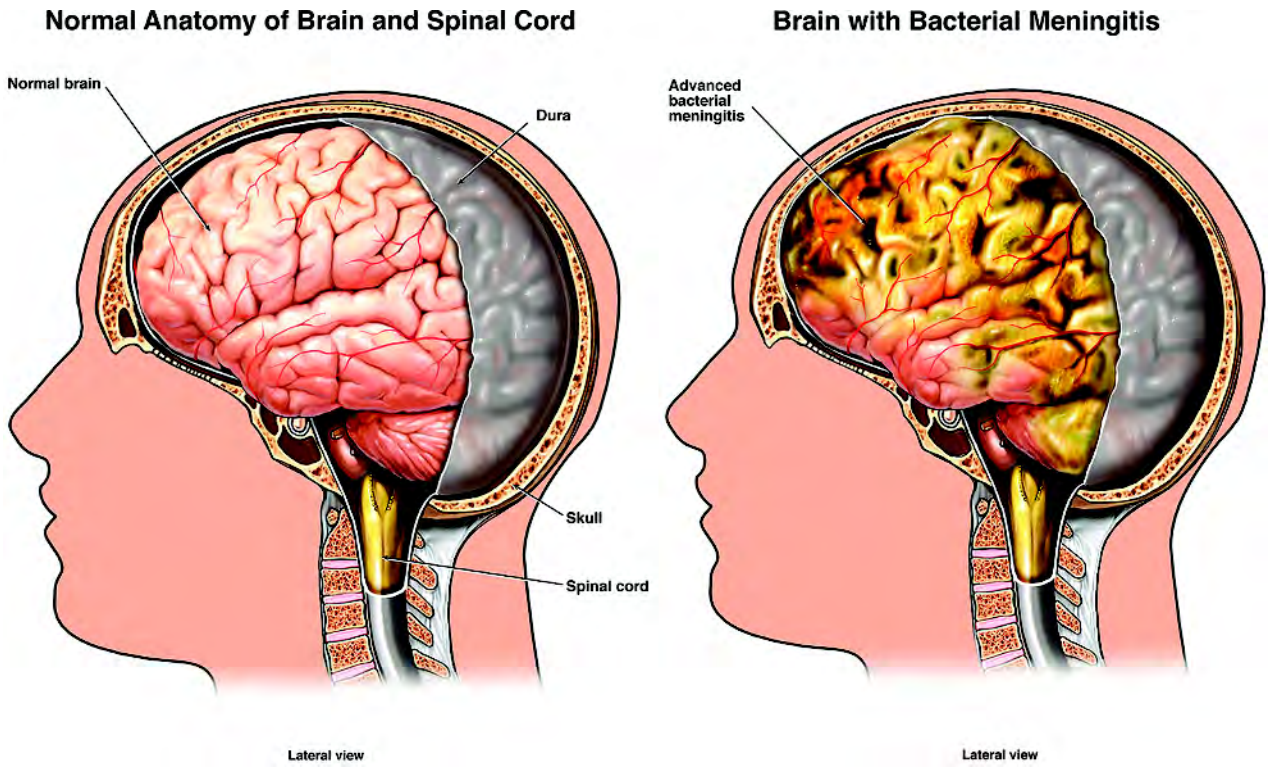


Illustration of bacterial meningitis in an adult. *(© PHOTOTAKE Inc. / Alamy)*

fungi, although it can also be caused by bleeding into the meninges, **cancer**, diseases of the immune system, and an inflammatory response to certain types of chemotherapy or other chemical agents. The most serious and the most difficult to treat types of meningitis tend to be those caused by bacteria.

Description

Meningitis is a particularly dangerous infection because of the very delicate nature of the brain. Brain cells are some of the only cells in the body that, once killed, will not regenerate themselves. Therefore, if enough brain tissue is damaged by an infection, then serious lifelong handicaps will remain.

In order to learn about meningitis, it is important to have a basic understanding of the anatomy of the brain. The meninges are three separate membranes, layered together, which encase the brain and spinal cord:

- The dura is the toughest, outermost layer, and is closely attached to the inside of the skull.
- The middle layer, the arachnoid, is important because of its involvement in the normal flow of the cerebrospinal fluid (CSF), a lubricating and nutritive fluid that bathes both the brain and the spinal cord.
- The innermost layer, the pia, helps direct blood vessels into the brain.
- The space between the arachnoid and the pia contains CSF, which helps insulate the brain from trauma. Many blood vessels, as well as peripheral and cranial nerves course through this space.

CSF, produced within specialized chambers deep inside the brain, flows over the surface of the brain and spinal cord. This fluid serves to cushion these relatively delicate structures, as well as supplying important nutrients for brain cells. CSF is reabsorbed by blood vessels located within the meninges. A careful balance between CSF production and reabsorption is important to avoid the accumulation of too much CSF.

Because the brain is enclosed in the hard, bony case of the skull, any disease that produces swelling will be damaging to the brain. The skull cannot expand at all, so when the swollen brain tissue pushes up against the skull's hard bone, the brain tissue becomes damaged and the blood supply is compromised, and this tissue may ultimately die. Furthermore, swelling on the right

KEY TERMS

Blood-brain barrier—An arrangement of cells within the blood vessels of the brain that prevents the passage of toxic substances, including infectious agents, from the blood and into the brain. It also makes it difficult for certain medications to pass into brain tissue.

Cerebrospinal fluid (CSF)—Fluid made in chambers within the brain which then flows over the surface of the brain and spinal cord. CSF provides nutrition to cells of the nervous system, as well as providing a cushion for the nervous system structures. It may accumulate abnormally in some disease processes, causing pressure on and damage to brain structures.

Fluouroquinolones—A group of medications used to treat bacterial infections in many different parts of the body. They are often used to treat bacteria that have become resistant to penicillin and other antibiotics.

Lumbar puncture (LP)—A medical test in which a very narrow needle is inserted into a specific space between the vertebrae of the lower back in order to draw a sample of CSF for further examination. Also referred to as a spinal tap.

Meninges—The three-layer membranous covering of the brain and spinal cord, composed of the dura, arachnoid, and pia. It provides protection for the brain and spinal cord, as well as housing many blood vessels and participating in the appropriate flow of CSF.

side of the brain will not only cause pressure and damage to that side of the brain, but by taking up precious space within the tight confines of the skull, the left side of the brain will also be pushed up against the hard surface of the skull, causing damage to the left side of the brain, as well.

Another way that **infections** injure the brain involves the way in which the chemical environment of the brain changes in response to the presence of an infection. The cells of the brain require a very well-regulated environment. Careful balance of oxygen, carbon dioxide, sugar (glucose), **sodium**, **calcium**, **potassium**, and other substances must be maintained in order to avoid damage to brain tissue. An infection upsets this balance, and brain damage can occur when the cells of the brain are either deprived of important nutrients or exposed to toxic levels of particular substances.

The cells lining the brain's tiny blood vessels (capillaries) are specifically designed to prevent many substances from passing into brain tissue. This is commonly referred to as the blood-brain barrier. The blood-brain barrier prevents various substances that could be poisonous to brain tissue (toxins), as well as many agents of infection, from crossing from the blood stream into the brain tissue. While this barrier is obviously an important protective feature for the brain, it also serves to complicate treatment in the case of an infection by making it difficult for medications to pass out of the blood and into the brain tissue where the infection is located.

Causes and symptoms

The most common infectious causes of meningitis vary according to an individual's age, habits, living environment, and health status. While nonbacterial types of meningitis are more common, bacterial meningitis is more potentially life-threatening. Three bacterial agents are responsible for about 80% of all bacterial meningitis cases. These bacteria are *Haemophilus influenzae* type b, *Neisseria meningitidis* (causing meningococcal meningitis), and *Streptococcus pneumoniae* (causing pneumococcal meningitis).

In newborns, the most common agents of meningitis are those that are contracted from the newborn's mother, including Group B streptococci (becoming an increasingly common infecting organism in the newborn period), *Escherichia coli*, and *Listeria monocytogenes*. The highest incidence of meningitis occurs in babies under a month old, with an increased risk of meningitis continuing through about two years of age.

Older children are more frequently infected by bacteria, including *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*.

Adults are most commonly infected by either *S. pneumoniae* or *N. meningitidis*, with pneumococcal meningitis the more common. Certain conditions predispose to this type of meningitis, including **alcoholism** and chronic upper respiratory tract infections (especially of the middle ear, sinuses, and mastoids).

N. meningitidis is the only organism that can cause epidemics of meningitis. For instance, cases have been reported when a child in a crowded day care situation or a military recruit in a crowded training camp has fallen ill with meningococcal meningitis.

There have been case reports in recent years of meningitis caused by *Streptococcus bovis*, an organism that is ordinarily found in the digestive tract of such animals as cows and sheep; and *Pasteurella multocida*, an organism that usually infects rabbits. Other atypical

cases of meningitis include several caused by the anthrax bacillus. These cases have a high mortality rate.

Viral causes of meningitis include the herpes simplex virus, the **mumps** and **measles** viruses (against which most children are protected due to mass immunization programs), the virus that causes **chickenpox**, the **rabies** virus, and a number of viruses that are acquired through the **bites** of infected mosquitoes.

A number of medical conditions predispose individuals to meningitis caused by specific organisms. Patients with **AIDS** (acquired immunodeficiency syndrome) are more prone to getting meningitis from fungi, as well as from the agent that causes **tuberculosis**. Patients who have had their spleens removed, or whose spleens are no longer functional (as in the case of patients with sickle cell disease) are more susceptible to other infections, including meningococcal and pneumococcal meningitis.

The majority of meningitis infections are acquired by transmission through the blood. A person may have another type of infection (for instance, infection of the lungs, throat, or tissues of the heart) caused by an organism that can also cause meningitis. If this initial infection is not properly treated, the organism will continue to multiply, find its way into the blood stream, and be delivered in sufficient quantities to invade past the blood-brain barrier. Direct spread occurs when an organism spreads to the meninges from infected tissue next to or very near the meninges. This can occur, for example, with a severe, poorly treated ear or **sinus infection**.

Patients who suffer from skull **fractures** possess abnormal openings to the sinuses, nasal passages, and middle ears. Organisms that usually live in the human respiratory system without causing disease can pass through openings caused by such fractures, reach the meninges, and cause infection. Similarly, patients who undergo surgical procedures or who have had foreign bodies surgically placed within their skulls (such as tubes to drain abnormal amounts of accumulated CSF) have an increased risk of meningitis.

Organisms can also reach the meninges via an uncommon but interesting method called intraneural spread. This involves an organism invading the body at a considerable distance away from the head, spreading along a nerve, and using that nerve as a sort of ladder into the skull, where the organism can multiply and cause meningitis. Herpes simplex virus is known to use this type of spread, as is the rabies virus.

The classic symptoms of meningitis (particularly of bacterial meningitis) include **fever**, **headache**, **vomiting**, sensitivity to light (photophobia), irritability, severe **fatigue** (lethargy), stiff neck, and a reddish purple rash on the skin. Untreated, the disease progresses with seizures, confusion, and eventually coma.

A very young infant may not show the classic signs of meningitis. Early in infancy, a baby's immune system is not yet developed enough to mount a fever in response to infection, so fever may be absent. However, checking an infant's temperature to see if it is high or low could be an indication. Some infants with meningitis have seizures as their only identifiable symptom. Similarly, debilitated elderly patients may not have fever or other identifiable symptoms of meningitis.

Damage due to meningitis occurs from a variety of phenomena. The action of infectious agents on the brain tissue is one direct cause of damage. Other types of damage may be due to the mechanical effects of swelling and compression of brain tissue against the bony surface of the skull. Swelling of the meninges may interfere with the normal absorption of CSF by blood vessels, causing accumulation of CSF and damage from the resulting pressure on the brain. Interference with the brain's carefully regulated chemical environment may cause damaging amounts of normally present substances (carbon dioxide, potassium) to accumulate. Inflammation may cause the blood-brain barrier to become less effective at preventing the passage of toxic substances into brain tissue.

Diagnosis

A number of techniques are used when examining a patient suspected of having meningitis to verify the diagnosis. Certain manipulations of the head (lowering the head, chin towards chest, for example) are difficult to perform and painful for a patient with meningitis.

The most important test used to diagnose meningitis is the lumbar puncture (LP), commonly called a spinal tap. Lumbar puncture involves the insertion of a thin needle into a space between the vertebrae in the lower back and the withdrawal of a small amount of CSF. The CSF is then examined under a microscope to look for bacteria or fungi. Normal CSF contains set percentages of glucose and protein. These percentages will vary with bacterial, viral, or other causes of meningitis. For example, bacterial meningitis causes a smaller than normal percentage of glucose to be present in CSF, as the bacteria are essentially "eating" the host's glucose, and using it for their own **nutrition** and energy production. Normal CSF should contain no infection-fighting cells (white blood cells), so the presence of white blood cells in CSF is another

indication of meningitis. Some of the withdrawn CSF is also put into special lab dishes to allow growth of the suspected infecting organism, which can then be identified more easily. Special immunologic and serologic tests may also be used to help identify the infectious agent.

In rare instances, CSF from a lumbar puncture cannot be examined because the amount of swelling within the skull is so great that the pressure within the skull (intracranial pressure) is extremely high. This pressure is always measured immediately upon insertion of the LP needle. If it is found to be very high, no fluid is withdrawn because doing so could cause herniation of the brain stem. Herniation of the brain stem occurs when the part of the brain connecting to the spinal cord is thrust through the opening at the base of the skull into the spinal canal. Such herniation will cause compression of those structures within the brain stem that control the most vital functions of the body (breathing, heart beat, consciousness). Death or permanent debilitation follows herniation of the brain stem.

Treatment

Because meningitis is a potentially deadly condition, doctors should be contacted immediately for diagnosis and treatment. Alternative treatments should be used only to support the recovery process following appropriate antibiotic treatments, or used concurrently with antibiotic treatments.

General recommendations

Patients should be well rested in bed, preferably in a darkened room. They should be given lots of fluids and nutritious foods. Patients should avoid processed foods and those with high fat and sugar content. Fats are difficult to digest in severely ill patients; sugar tends to depress the immune system and impede recovery process. Patients should also take **vitamin A** (up to 10,000 IU per day), B-complex vitamins (up to 1,500 mg per day), and **vitamin C** (up to 2 g per day) to help keep the body strong and prevent future infections. Additionally, the patient may consider taking other **antioxidants**, **essential fatty acids** (EFAs), and/or participate in therapies, such as **massage therapy** and movement therapies (e.g., **t'ai chi**).

Other treatments

Alternative therapies, such as **homeopathy**, **traditional Chinese medicine**, and Western herbal medicine may help patients regain their health and build up their immune systems. The recovering individual, under the direction of a professional alternative therapist, may opt to include mushrooms into his or her diet to stimulate immune function. Contact an experienced herbalist or homeopathic practitioner for specific remedies.

Allopathic treatment

Antibiotics are the first line of treatment for bacterial meningitis. In recent years, however, doctors have turned to such newer medications as vancomycin or the fluoroquinolones to treat bacterial meningitis because strains of *S. pneumoniae* and *N. meningitidis* have emerged that are resistant to penicillin and the older antibiotics. Because of the effectiveness of the blood-brain barrier in preventing the passage of substances into the brain, medications must be delivered directly into the patient's veins (intravenously) at very high doses. Antiviral drugs (acyclovir) may be helpful in shortening the course of viral meningitis, and antifungal medications are available as well. Patients who develop seizures will require medications to halt the seizures and prevent their return.

Expected results

Viral meningitis is the least severe type of meningitis, and patients usually recover with no long-term effects from the infection. Bacterial infections, however, are much more severe, and progress rapidly. Without very rapid treatment with the appropriate antibiotic, the infection can swiftly lead to coma and death in less than a day's time. While death rates from meningitis vary depending on the specific infecting organism, the overall death rate is just under 20%.

The most frequent long-term effects of meningitis include deafness and blindness, which may be caused by the compression of specific nerves and brain areas responsible for the senses of hearing and sight. Some patients develop permanent seizure disorders, requiring lifelong treatment with antiseizure medications. Scarring of the meninges may result in obstruction of the normal flow of CSF, causing abnormal accumulation of CSF. This may be a chronic problem for some patients, requiring the installation of shunt tubes to drain the accumulation regularly.

Some cases of sudden and unexplained death in adults have been attributed to rapidly developing meningitis.

Prevention

Prevention of meningitis primarily involves the appropriate treatment of other infections an individual may acquire, particularly those that have a track record of seeding to the meninges (such as ear and sinus infections). Preventive treatment with antibiotics

is sometimes recommended for the close contacts of an individual who is ill with meningococcal or *H. influenzae* type b meningitis. A meningococcal vaccine exists, and is sometimes recommended to individuals who are traveling to very high risk areas. A vaccine for *H. influenzae* type b is now given to babies as part of the standard array of childhood immunizations.

Resources

BOOKS

"Meningitis." *The Medical Advisor: The Complete guide to Alternative & Conventional Treatments. Home Edition.* Richmond, VA: Time Life Inc., 1997.

Ray, C. George. "Central Nervous System Infections." In *Sherris Medical Microbiology: An Introduction to Infectious Diseases*, edited by Kenneth J. Ryan. Nor walk, CT: Appleton and Lange, 1994.

Swartz, Morton N. "Bacterial Meningitis." In *Cecil Text book of Medicine*, edited by J. Claude Bennett and Fred Plum. Philadelphia: W.B. Saunders, 1996.

PERIODICALS

Aronin, S. I. "Current Pharmacotherapy of Pneumococcal Meningitis." *Expert Opinion on Pharmacotherapy* 3 (February 2002): 121 129.

Black, M., and D. I Graham. "Sudden Unexplained Death in Adults Caused by Intracranial Pathology." *Journal of Clinical Pathology* 55 (January 2002): 44 50.

Green, B. T., K. M. Ramsey, and P. E. Nolan. "*Pasteurella multocida* Meningitis: Case Report and Review of the Last 11 Years." *Scandinavian Journal of Infectious Dis ease* 34 (2002): 213 217.

Meissner, Judith W. "Caring for Patients With Meningitis." *Nursing* (July 1995): 50+.

Schuchat, Anne, et al. "Bacterial Meningitis in the United States in 1995." *New England Journal of Medicine* (October 2, 1997).

Tasyaran, M. A., O. Deniz, M. Ertek, and K. Cetin. "Anthrax Meningitis: Case Report and Review." *Scan dinavian Journal of Infectious Diseases* 34 (2002): 66 67.

Tunkel, A. R., and W. M. Scheld. "Treatment of Bacterial Meningitis." *Current Infectious Disease Reports* 4 (February 2002): 7 16.

Vilarrasa, N., A. Prats, M. Pujol, et al. "*Streptococcus bovis* Meningitis in a Healthy Adult Patient." *Scandinavian Journal of Infectious Diseases* 34 (2002): 61 62.

ORGANIZATIONS

American Academy of Neurology. 1080 Montreal Avenue, St. Paul, MN 55116. (612) 695 1940. http:// www.aan.com

Meningitis Foundation of America. 7155 Shadeland Sta tion, Suite 190, Indianapolis, IN 46256 3922. (800) 668 1129. http://www.musa.org/welcome.htm

Mai Tran
Rebecca J. Frey, PhD

Menopause

Definition

Menopause represents the irreversible end of ovulation and **menstruation**. Technically menopause refers to the final menstrual period after which a woman can no longer conceive children. Nevertheless, menopause is not an abrupt event, but a gradual process that involves many physical and hormonal changes before fertility ceases. Menopause is not a disease that needs to be treated, but a natural result of **aging**. However, the changes that occur during the time surrounding menopause can cause symptoms of widely varying severity that a women may wish to treat. Women have many options for managing these symptoms.

Description

Perimenopause is the time surrounding menopause. It can last for several years, and many women have irregular periods and other changes during this time. Although it is not easy to pinpoint when menopause begins, doctors agree that it is complete when a woman has not had a menstrual period for a full year.

There is no method to determine when the ovaries will begin to scale back, but a woman can get a general idea of when she will experience menopause based on her family history, body type, and lifestyle. A woman is likely to enter menopause at about the same age as her mother and sisters. Women who are smokers are more likely to begin menopause earlier than non-smokers. Women who began menstruating early will not necessarily stop having periods early. Eight out of every 100 women stop menstruating before age 40. At the other end of the spectrum, five out of every 100

Signs and symptoms of menopause

- Changes in periods (they may be shorter or longer, heavier or lighter, or have more or less time in between)
- Hot flashes
- Night sweats
- Trouble sleeping through the night
- Vaginal dryness
- Mood changes
- Hair loss or thinning on the head, more hair growth on the face

Although menopause itself is the time of a woman's last period, symptoms can begin several years before that in a stage called peri-menopause. Menopause and peri-menopause affect every woman differently. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

continue to have periods until they are almost 60. The average age of menopause is 51.

Causes and symptoms

Once a woman enters puberty, her body releases one of the more than 400,000 eggs (ova) that are stored in her ovaries, about every 28 days in response to the interaction of several hormones. Blood supply to the womb (uterus) increases, and the lining of the uterus thickens in anticipation of receiving a fertilized egg. If the egg is not fertilized, the level of progesterone, the hormone mainly responsible for this uterine thickening, drops, and the uterine lining is sloughed off along with some blood. This menstrual flow is visible evidence ovulation has occurred.

By the time a woman reaches her late 30s or 40s, her ovaries begin to produce less of the female hormones estrogen and progesterone and to release eggs less regularly. As the levels of hormones fluctuate, the menstrual cycle begins to change. Some women may have longer periods with heavy flow followed by shorter cycles and very little bleeding. Others will begin to miss periods entirely. These irregular menstrual cycles make it more difficult for a woman to become pregnant. The gradual decline of estrogen also causes a wide variety of changes in tissues that respond to estrogen including the vagina, vulva, uterus, bladder, urethra, breasts, bones, heart, blood vessels, brain, skin, hair, and mucous membranes. Less immediately, the long-term lack of estrogen can make a woman more vulnerable to **osteoporosis**.

The most common symptom of perimenopause include:

- changes in the menstrual cycle
- hot flashes
- night sweats
- insomnia
- mood swings and increased irritability
- memory or concentration problems
- vaginal dryness
- heavy bleeding
- fatigue
- depression
- changes in the thickness and texture of hair
- headaches
- heart palpitations
- sexual disinterest
- urinary changes
- weight gain

Diagnosis

The clearest indication of menopause is the absence of a period for one full year. If it has been at least three months since a woman's last period, a follicle-stimulating hormone (FSH) test might be helpful in determining whether menopause has occurred. FSH levels rise steadily as a woman ages. The FSH test alone cannot be used as proof that a woman has entered early menopause. A better measure of menopause is to determine the levels of FSH, estrogen, progesterone, testosterone, and related hormones at mid-cycle. These tests are not routinely performed as most women can recognize the symptoms of perimenopause and menopause. They can, however, be helpful diagnostic tests in younger women who are showing symptoms of perimenopause.

Treatment

Decisions about if and how to treat symptoms associated with perimenopause should be made by a woman and her health care provider after taking into consideration her medical history and current research findings. Some women report success in using natural remedies to treat the unpleasant symptoms of menopause, although alternative therapies have only received significant attention in the United States in the last decade or so. Debate continues until scientific studies can prove these treatments' effectiveness on menopausal symptoms.

For women nearing menopause, alternative medical practitioners and traditional healthcare professionals generally recommend a diet high in fresh fruits, fresh vegetables, whole grains, nuts, seeds, and fresh vegetable juices and low in sugary treats and fats, especially animal fats. Calorie and portion control becomes more important as metabolism slows. Because a decrease in estrogen accelerates bone loss, women should make sure they get enough **calcium**. Most often a calcium supplement is recommended in addition to dairy products that provide calcium. Women generally need less **iron** after menopause because they no longer bleed monthly.

Herbs

Herbs have been used to relieve menopausal symptoms for centuries. In reasonable quantities, many herbs are relatively safe. Often adverse reactions to herbs come not from the herbs themselves, but from contaminants. Because the United States Food and Drug Administration (FDA) does not regulate herbal products as strictly as pharmaceutical medicines, contamination, mislabeling, or accidental overdose is

possible. Herbs should be purchased from a recognized company or through a qualified herbal practitioner. Herbal practitioners recommend a dose based on a woman's history, body size, lifestyle, diet, and reported symptoms. Women who choose to take herbs for menopausal symptoms should learn as much as possible about herbs and work with a qualified practitioner such as an herbalist, a traditional Chinese doctor, or a naturopathic physician.

The following list of herbs include those that herbalists recommend to treat menopausal symptoms:

- black cohosh (*Cimicifuga racemosa*): >): hot flashes and other menstrual complaints
- black currant (*Ribes migrum*): breast tenderness
- chaste tree/chasteberry (*Vitex agnus-castus*): hot flashes, excessive menstrual bleeding, moodiness
- chickweed (*Stellaria media*): hot flashes
- evening primrose oil (*Oenothera biennis*): mood swings, irritability, breast tenderness
- fennel (*Foeniculum vulgare*): hot flashes, digestive gas, bloating
- flaxseed (*Linum usitatissimum*): excessive menstrual bleeding, breast tenderness, and other symptoms, including dry skin and vaginal dryness
- ginkgo (*Ginkgo biloba*): memory problems
- ginseng (*Panax ginseng*): hot flashes, fatigue, vaginal thinning
- hawthorn (*Crataegus laevigata*): memory problems, fuzzy thinking
- horsetail (*Equisetum arvense*): osteoporosis
- lady's mantle (*Alchemilla vulgaris*): excessive menstrual bleeding
- Licorice (*Glycyrrhiza glabra*) root: general menopausal symptoms
- Mexican wild yam (*Dioscorea villosa*) root: vaginal dryness, hot flashes, general menopause symptoms
- motherwort (*Leonurus cardiaca*): night sweats, hot flashes
- oat straw (*Avena sativa*): mood swings, anxiety
- passionflower (*Passiflora incarnata*): insomnia, pain
- raspberry leaf (*Rubus idaeus*): normalizes hormonal system
- sage (*Salvia officinalis*): mood swings, headaches, night sweats
- skullcap (*Scutellaria lateriflora*): insomnia
- sesame oil (*Sesamum orientale*): vaginal dryness (applied topically)
- valerian (*Valeriana officinalis*): insomnia
- violet (*Viola odorata*): hot flashes.

Natural estrogens (phytoestrogens)

Phytoestrogens are estrogen compounds found in plants. Proponents of plant estrogens (including soy products) believe that plant estrogens are better than synthetic estrogens, but science has not yet proved this. The results of small preliminary trials suggest that the estrogen compounds in soy products (soy is very high in plant estrogens) can relieve the severity of **hot flashes** and lower **cholesterol**. In one study at Bowman-Gray Medical School in North Carolina, women were able to ease their menopausal symptoms such as hot flashes by eating a large amount of fruits, vegetables, and whole grains, together with 4 oz of tofu four times a week. However, no one has shown that plant estrogens can provide these benefits without causing the same negative side effects as estrogen replacement therapy. In addition, it is difficult to judge how much estrogen is in various plant products as there is no requirement for standardization. Many women believe that natural or plant-based means harmless. In large doses, phytoestrogens can promote the abnormal growth of cells in the uterine lining. Unopposed estrogen of any type can lead to an increased risk of **cancer**.

Several studies have shown that a **black cohosh** extract (Remifemin) relieved menopausal symptoms as well as or better than estrogen and that it showed the greatest promise among alternative treatments. In a 2007 study conducted at the University of Pennsylvania and published in *International Journal of Cancer*, Remifemin was also shown to reduce the risk of **breast cancer**. The United States Office of Dietary Supplements considers the evidence from studies of black cohosh promising but cautions that the long-term safety of this herb has not been established and recommends that if women choose to use black cohosh extract, they do so for no more than six months.

Flaxseeds also are a good source of phytoestrogens. Other sources include **red clover** leaf, **licorice**, wild yam, chickpeas, pinto beans, lima beans, and pomegranates. In 2003, red clover leaf was thought to offer relief for hot flashes, but in two short clinical trials, it failed to demonstrate hot flash relief.

Homeopathy

Women interested in homeopathic remedies for menopausal symptoms should consult a homeopathic physician. The following homeopathic remedies are often recommended to alleviate specific groups of symptoms:

- lachesis: hot flashes, irritability, talkativeness, tightness around abdomen, dizziness, fainting

- sepia: bleeding between periods, chilliness, tearfulness, withdrawal from loved ones, sinking feeling in stomach
- pulsatilla: tearfulness, thirstless, feels better with others, avoids heat, hot flashes, varicose veins, hemorrhoids
- sulfur: philosophical personality, feeling hot, itching and burning of vagina and rectum
- lycopodium: low self esteem, bloated after eating, infrequent menstruation, low blood sugar, weak digestion, belching
- *Argentum nitricum:* gas, indigestion, craving for sweets and chocolate, panic attacks, fear of crossing bridges
- Magnesium phosphoricum: severe cramping
- transitional formula: hot flashes, night sweats, insomnia, skin-crawling sensation
- women's formula: perimenopause, PMS, irregular cycles, infertility, absent or excessive bleeding, menopausal discomfort
- vital formula: anxiety, headaches, palpitations, PMS, mood swings

Yoga

Many women find that **yoga** can ease menopausal symptoms. Yoga focuses on helping women unite the mind, body, and spirit to create balance. Because yoga has been shown to balance the endocrine system, some experts believe it may affect hormone-related problems. Studies have found that yoga can reduce **stress**, improve mood, boost a sluggish metabolism, and slow the heart rate. Specific yoga positions deal with particular problems, such as hot flashes, mood swings, vaginal and urinary problems, and other pains.

Exercise

Exercise helps ease hot flashes by lowering the amount of circulating FSH and by raising endorphin levels (which drop during a hot flash). Even exercising 20 minutes three times a week can significantly reduce hot flashes. Weight bearing exercises help to prevent osteoporosis. Regular exercise also provides many health benefits unrelated to menopause.

Acupuncture

This ancient Asian art involves placing very thin needles into different parts of the body to stimulate the system and unblock energy. It is usually painless and has been used for many menopausal symptoms including **insomnia**, hot flashes, and irregular periods. Practitioners believe that **acupuncture** can facilitate the opening of blocked energy channels, allowing the life force energy (chi) to flow freely. This allows the menopausal woman to keep her energy moving. Blocked energy usually increases the symptoms of menopause.

Acupressure and massage

Therapeutic massage involving **acupressure** can bring relief from a wide range of menopause symptoms by placing finger pressure at the same meridian points on the body that are used in acupuncture. There are more than 80 different types of massage, including foot **reflexology**, **Shiatsu** massage, and **Swedish massage**, but they all are based on the idea that boosting the circulation of blood and lymph benefits health. Breast massage (rubbing **castor oil** or olive oil on the breasts for five minutes three times a week) is claimed to help balance hormone levels, help the uterus contract during menstruation, and prevents cramping pains.

Biofeedback

Some women have been able to control hot flashes through **biofeedback**, a painless technique that helps a person train her mind to control her body. A biofeedback machine provides information about body processes (such as heart rate) as the woman relaxes her body. Using this technique, it is possible to control the body's temperature, heart rate, and breathing.

Other treatments

Therapeutic touch, an energy-based practice, may relieve menopausal symptoms. Cold compresses on the face and neck can ease hot flashes. Sound or **music therapy** may relieve stress and other menopausal symptoms. **Prayer** or **meditation** can help improve coping ability.

Dietary supplements

Women should discuss the use of dietary supplements with their health care provider. Some supplements interfere with the action of traditional pharmaceuticals and herbal remedies. Other supplements are harmful in large quantities. Supplementation with calcium, **vitamin D**, **vitamin K**, **boron**, **manganese**, **magnesium**, and phosphorous may aid in preventing osteoporosis. **Vitamin E** supplementation may reduce hot flashes and risk of **heart disease**.

Allopathic treatment

When a woman enters menopause, her levels of estrogen drop and symptoms, such as hot flashes and vaginal dryness, begin. Before 2002, many physicians treated these symptoms with hormone replacement

therapy (HRT). HRT treats these symptoms by increasing estrogen and progesterone levels enough to suppress symptoms. However, in the summer of 2002, preliminary results from a large Women's Health Initiative study were released that showed HRT could have significantly harmful effects (harmful enough that the study was stopped early). The study found that a combination of estrogen and progestin (a form of progesterone) HRT caused the following when compared to a placebo (no hormones):

- increased risk of heart attack, stroke, and blood clots
- increased risk of invasive breast cancer
- increased risk of dementia
- decreased risk of colorectal cancer
- decreased risk of bone fractures

Treatment with estrogen alone produced the following results:

- no change in the risk of heart attacks
- increased risk of stroke and blood clots
- unclear changes in the risk of breast cancer
- no change in the risk of colorectal cancer
- decreased risk of bone fractures
- no data available on changes in risk of dementia

At the time the results of the Women's Health Initiative became available, about 9 million American women were using HRT. Most physicians now no longer routinely recommend HRT to treat menopausal symptoms. Nevertheless, under certain circumstances when symptoms associated with menopause are so severe as to interfere with activities of daily life, a short course of HRT may be prescribed. Some doctors believe that short-term use of estrogen for those women with severe symptoms of hot flashes or night sweats is a sensible choice as long as they do not have a history of breast cancer. However, other doctors believe that in almost all cases the risks of HRT outweigh the benefits. The decision should be made by a woman and her doctor after taking into consideration her medical history and situation. Women who choose to take hormones should have an annual mammogram, breast exam, and pelvic exam and should report any unusual vaginal bleeding or spotting (a sign of possible **uterine cancer**).

Postmenopausal treatment for osteoporosis

Raloxifene (Evista, Keoxifene) is a drug that is used to treat osteoporosis (bone loss) in postmenopausal women. It does not increase the risk breast cancer, although it may increase breast tenderness. It may also worsen hot flashes and cause uterine bleeding. It is not a treatment for symptoms associated with

KEY TERMS

Endometrium—The lining of the uterus that is shed with each menstrual period.

Estrogen—Female hormone produced by the ovaries and released by the follicles as they mature. Responsible for female sexual characteristics, estrogen stimulates and triggers a response from at least 300 tissues, and may help some types of breast cancer to grow. After menopause, the production of the hormone gradually stops.

Follicle-stimulating hormone (FSH)—The pituitary hormone that stimulates the ovary to mature egg capsules (follicles). It is linked with rising estrogen production throughout the cycle. An elevated FSH (above 40) indicates menopause.

Hormone—A chemical messenger secreted by a gland that is released into the blood, and that travels to distant cells where it exerts an effect.

Hormone replacement therapy (HRT)—The use of estrogen and progesterone to replace hormones that the ovary no longer supplies. HRT is no longer used as long-term therapy for postmenopausal women.

Hot flash—A wave of heat that is one of the most common perimenopausal symptoms, triggered by the hypothalamus' response to estrogen withdrawal.

Hysterectomy—Surgical removal of the uterus.

Ovary—One of the two almond-shaped glands in the female reproductive system responsible for producing eggs and the hormones estrogen and progesterone.

Phytoestrogen—An estrogen-like substance produced by plants.

Placebo—a pill or liquid given during the study of a drug or dietary supplement that contains no medication or active ingredient. Usually study participants do not know if they are receiving a pill containing the drug or an identical-appearing placebo.

Progesterone—The hormone that is produced by the ovary after ovulation to prepare the uterine lining for a fertilized egg.

Testosterone—Male hormone produced by the testes and (in small amounts) in the ovaries. Testosterone is responsible for some masculine secondary sex characteristics such as growth of body hair and deepening voice.

Uterus—The female reproductive organ that contains and nourishes a fetus from implantation until birth. Also known as the womb.

menopause. Several other drugs are also available to help reduce the risk of **fractures** in postmenopausal women with osteoporosis. In 2002, the FDA approved teriparatide (Forteo) for the treatment of osteoporosis. Ibandronate (Boniva) and alendronate (Fosamax) are also used to treat osteoporosis in postmenopausal women.

Testosterone replacement

The ovaries also produce a small amount of male hormones (about 300 micrograms), which decrease slightly as a woman enters menopause. Most women never need testosterone replacement. Testosterone can improve the libido, and decrease **anxiety** and **depression**. Adding testosterone is especially beneficial to women who have had hysterectomies. Testosterone also eases breast tenderness and helps prevent bone loss. Side effects include mild **acne** and some facial hair growth.

Expected results

Menopause is a natural condition of aging. Some women have no problems with menopause, while others notice significant unpleasant symptoms. Results of allopathic and alternative treatments vary from one woman to another.

Prevention

Menopause cannot be prevented, although some of the symptoms can be relieved by the treatments listed above.

Resources

BOOKS

Boston Women's Health Book Collective. *Our Bodies, Our selves: Menopause*. New York: Simon & Schuster, 2006.

Jones, Marcia. *Menopause for Dummies,* 2nd ed. Indianap olis, IN: Wiley Pub., 2006.

Lee, John R. and Virginia Hopkins. *What Your Doctor May Not Tell You About Menopause: The Breakthrough Book on Natural Hormone Balance*. New York: Warner Books, 2004.

Manson, JoAnn E. and Shari Bassuk. *Hot Flashes, Hor mones, & Your Health*. New York: McGraw Hill, 2007.

Northrup, Christiane. *The Wisdom of Menopause: Creating Physical and Emotional Health and Healing During the Change,* rev. ed. New York: Bantam Books, 2006.

Wingert, Pat and Barbara Kantrowitz. *Is It Hot in Here? Or Is It Me?: The Complete Guide to Menopause*. New York: Workman Pub., 2006.

OTHER

"Hormone Therapy News." April 3, 2007 [cited February 19, 2008, 2008]. *National Women's Health Network*. http://www.nwhn.org/hrt_statement_apr3 07.

"Menopause" *Federation of Feminist Women's Health Centers*. October 5, 2007 [cited February 19, 2008, 2008]. http://www.fwhc.org/menopause/index.htm.

"Menopause Infocenter" *Holistic Online*. [cited February 19, 2008]. http://www.holisticonline.com/remedies/hrt/hrt_home.htm.

"Menopause Online" *Menopause Online*. [cited February 19, 2008]. http://www.menopause online.com.

ORGANIZATIONS

American Holistic Medical Association, PO Box 2016 , Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

American Menopause Foundation, Inc, Empire State Bldg., 350 Fifth Ave., Ste. 2822, New York, NY, 10118, (212) 714 2398, http://www.americanmenopause.org.

Federation of Feminist Women's Health Centers, 14220 Interurban Ave South #140, Seattle, WA, 98168 , http://www.fwhc.org/menopause.

National Women's Health Network, 514 10th Street NW, Suite 400, Washington, DC, 20004, (202) 628 7814, http://www.nwhn.org.

North American Menopause Society, PO Box 94527, Cleveland, OH, 44101, (216) 844 8748, http://www.menopause.org.

Belinda Rowland
Teresa G. Odle
Tish Davidson, A. M.

Menstrual cramps *see* **Dysmenorrhea**

Menstruation

Definition

Menstruation is the monthly discharge through the vagina of the blood and tissues that are laid down in the uterus in preparation for **pregnancy**.

Description

The cyclic production of hormones that culminates in the release of a mature egg (ovum) is called the menstrual cycle, which begins during puberty and ends at **menopause**. The first menstrual cycle is called menarche. Hormones that control the menstrual cycle are produced by the hypothalamus, pituitary gland, and ovaries. The beginning of a menstrual cycle is marked by the maturation of an egg in an ovary and preparation of the uterus (womb) to establish

pregnancy. Menstruation occurs when pregnancy has not been achieved.

The menstrual cycle is divided into four phases and is, on average, 28 days long (21–45 days). The onset of menstruation, called a period, monthly, menses, or menstrual period, begins a new menstrual cycle and is considered day one. This first phase usually lasts five days. Menstruation occurs in response to drops in the level of the hormone progesterone. It is estimated that a woman has 500 menstrual periods in her lifetime.

The second phase of the menstrual cycle is called the follicular or proliferative phase. The ovary, in response to increasing levels of follicle stimulating hormone, begins the egg maturation process. Although 10–20 eggs begin to develop within follicles of the ovaries, usually only one egg reaches maturity. Follicles are clusters of cells that encase a developing egg, hence the name "follicular phase." Developing follicles release the hormone estrogen that stimulates the lining of the uterus, called the endometrium, to grow (proliferate) in preparation to receive an embryo (an egg that has been fertilized and begun dividing) and establish pregnancy. This phase usually lasts through day 13.

The ovulation phase occurs in response to a surge in luteinizing hormone and is marked by the release of a mature egg from the follicle. Ovulation usually occurs on day 14.

The fourth phase is called the luteal, secretory, premenstrual, or postovulatory phase, and usually lasts from days 15–28. During this phase, the empty follicle, now called the corpus luteum, releases the hormone progesterone which further prepares the uterus for implantation of an embryo. The endometrium thickens because of cell growth, changes in blood vessels and glands, and increases in fluid. If pregnancy does not occur, the fall in progesterone levels initiates the onset of a new menstrual cycle. However, if pregnancy does occur, progesterone levels remain high, and the endometrium is not shed.

In the United States, menstruation typically begins at 12.8 years of age in Caucasian girls and 12.4 years of age for African American girls. Factors that help to dictate the age at which menarche occurs include race, mother's age at menarche, nutritional status, body fat, as well as climate and elevation. Studies have shown that a body fat level of 17% is necessary for menstruation to begin.

Women who live together or work in close proximity tend to find that their cycles begin to coincide. During the menstrual cycle, the body releases hormones called pheromones, which may signal surrounding women's cycles to begin.

Puberty signals the maturation of a young woman's reproductive hormones. As a girl reaches puberty, the pituitary gland in the brain starts to produce the hormones that signal the ovaries to begin functioning. The interaction between these hormones and the hormones estrogen and progesterone causes the lining of the uterus to swell and thicken in anticipation of a fertilized egg. If the egg is not fertilized, the lining is discharged through the vagina, resulting in menstrual bleeding.

Menstrual problems

Women may experience menstrual cycles that fall outside the norm as described above. Menstrual problems include missing a period; change in the length of the cycle; changes in the flow, color, or consistency of menstrual blood; and extreme **pain** or other menstrual symptoms.

Women may also experience emotional distress or wide mood swings during the luteal phase of the menstrual cycle. The fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, or DSM-IV, lists premenstrual dysphoric disorder (PMDD) in an appendix of criteria sets for further study. To meet full criteria for PMDD, a patient must have at least five out of 11 emotional or physical symptoms during the week preceding the menses for most menstrual cycles over the previous 12 months. Although the DSM-IV definition of PMDD as a mental disorder is controversial because of fear that it could be used to justify prejudice or job discrimination against women, there is evidence that a significant proportion of premenopausal women suffer emotional distress or impairment in job functioning in the week before their menstrual period. One group of researchers estimates that 3–8% of women of childbearing age meet the strict DSM-IV criteria for PMDD, with another 13–18% having symptoms severe enough to interfere with their normal activities.

Causes and symptoms

Menstruation is not an illness, but a normal part of the menstrual cycle. However, menstrual problems do occur, and are due to varying causes.

Amenorrhea

Amenorrhea, the absence of menstruation, can be either primary or secondary. Primary amenorrhea is failure to menstruate by age 16 years in girls who have normal puberty or two years after sexual maturation

has occurred. Primary amenorrhea may be caused by genetic disorders, hormonal imbalance, brain defects, or physical abnormality of the reproductive organs. In 2003, a group of researchers reported on a new genetic mutation associated with primary amenorrhea. In addition, certain systemic diseases may delay puberty and menstruation. Delayed menstruation may occur in athletes, especially gymnasts, ballerinas, and long-distance runners because of insufficient body fat. Amenorrhea associated with athletic training and professional dance is a growing health concern, however, because it often occurs together with eating disorders and a loss of bone mass that can lead to early **osteoporosis**.

Secondary amenorrhea refers to the absence of menstruation after an interval of normal menstruation. It is identified as not menstruating for three months in females with irregular menstrual cycles, six months in females with normal menstrual cycles, and 18 months in females who had just started menstruating. Secondary amenorrhea can be caused by pregnancy, weight loss, excessive **exercise**, breast feeding, disease, or menopause. Menopause takes place when the ovaries stop producing estrogen, causing periods to become irregular and then stop. It generally occurs when a woman is between 48 and 52 years of age.

Dysfunctional and abnormal uterine bleeding

Dysfunctional uterine bleeding is excessive or irregular bleeding from the uterus. It is caused by uncontrolled estrogen production that leads to excessive build up of the endometrium.

Abnormal uterine bleeding is excessive bleeding during menstruation, frequent bleeding, and/or irregular bleeding. Abnormal bleeding can be caused by fibroids (noncancerous uterine growths), **endometriosis** (when endometrium spreads outside of the uterus), uterine **infections**, **hypothyroidism**, clotting problems, intrauterine devices (IUD), or **cancer**.

Dysmenorrhea

Dysmenorrhea is painful and difficult menstruation. Studies have found that 60–92% of adolescents suffer from dysmenorrhea. It usually begins six to 12 months following menarche. Symptoms may be severe enough to cause missed work or school and prevent participation in normal activities. Risk factors for developing dysmenorrhea may include long menstrual periods, **obesity**, early age at menarche, **smoking**, and alcohol use.

Primary dysmenorrhea is believed to be caused by high levels of prostaglandins (fatty acids that stimulate muscle contractions, among other activities) which cause painful uterine **muscle spasms**. Symptoms of primary dysmenorrhea occur when bleeding starts and may include moderate to severe menstrual pain (cramping, spasmodic, and labor-like or a dull ache), **nausea**, **vomiting**, **headache**, **fatigue**, **low back pain**, thigh pain, and **diarrhea**.

Secondary dysmenorrhea is caused by conditions such as endometriosis, abnormalities of the pelvic organs, **pelvic inflammatory disease**, fibroids, **ovarian cysts**, tumors, **inflammatory bowel disease**, and salpingitis (inflammation of the fallopian tube). Symptoms of secondary dysmenorrhea usually occur a few days before bleeding starts. The symptoms depend upon the specific cause of dysmenorrhea, but pain is the hallmark symptom.

A study released in 2003 found that oral contraceptives did not impact the mood of most women during the premenstrual timeframe. The study found that, among those taking oral contraceptives, mood declined in women who had a history of **depression** and that mood improved in women with early-onset premenstrual disturbances of mood as well as those with painful menstruation.

Heavy periods

Many women experience heavy menstrual bleeding during their periods, called menorrhagia. Heavy periods cause more blood loss than normal periods or may last longer than seven days. Women suffering from menorrhagia may lose up to 92% of their total fluid and tissue in the first three days of their cycle. Heavy menstruation is common in young girls who have just started their periods.

Menorrhagia is often caused by a failure to ovulate, which leads to a deficiency of progesterone. Without progesterone, the uterine lining becomes unstable and periods tend to be longer and unpredictable. Toxins in the bloodstream tend to settle in the endrometrial tissue. When this tissue is shed each month, so are the toxins. Heavy periods may be a toxin-excretion technique.

A deficiency in **vitamin A** or **iron**, or hypothyroidism may also cause heavy periods. Painful heavy periods may be linked to endometriosis, fibroids, pelvic inflammatory disease, or the use of an intrauterine device (IUD). A single heavy period that takes place later in the cycle may be a miscarriage.

Tampon use

Many women use tampons to absorb their monthly flow. There has been much controversy over the safety

of tampons. The use of high-absorbency tampons has been shown to cause **toxic shock syndrome** (TSS), a bacterial infection caused when tampons left in too long create tiny breaks in the vaginal lining and allow bacteria to enter the blood stream. Symptoms of TSS are high **fever**, rash, muscle and joint aches, and diarrhea. In the 2000s TSS has become uncommon, but women have died from it.

To reduce the risk of TSS, the United States Food and Drug Administration (FDA) recommends that women use the lowest absorbency tampon required to meet their needs. It is also suggested that tampons be left in for no longer than four to eight hours. Alternatives to tampons are sanitary pads, reusable menstrual collection cups, and washable cloth pads.

One controversy was sparked in the early 1990s over the use of dioxin in tampons. Dioxin is a chemical byproduct of bleach that is a carcinogen. Tampons in the United States are bleached with chlorine during production so they will have a fresher appearance. Research conducted using monkeys showed that dioxin exposure may be linked to endometriosis.

In 1992, an investigation revealed that FDA scientists had found trace amounts of dioxin in some tampons. Further FDA research determined that the tampons subsequently manufactured were produced in a dioxin-free process. However, trace amounts of dioxin may be absorbed from the air, water, or ground. These levels are generally nondetectable and, according to the FDA, do not pose a health risk.

Premenstrual syndrome

Premenstrual syndrome (PMS) is a condition that occurs during the premenstrual phase of the menstrual cycle. The cause is unclear but theories include: abnormal hormone levels, other biochemical abnormalities, inappropriate diet, nutrient deficiencies, psychological factors, or a combination of many factors.

Emotional and mental symptoms include fatigue, mood swings, irritability, nervousness, confusion, depression, tearfulness, and **anxiety**. Physical symptoms are bloating, discomfort, breast tenderness, cravings, weight gain, **acne**, change in bowel movements, joint pains, and **dizziness**.

Other menstrual problems

- A missed period can be caused by pregnancy, stress, increased exercise, emotions, grief, and illness, among others.
- Metrorrhagia is bleeding in between normal episodes of menstruation. It may be caused by ovulation, hormonal factors, cervical lesions, or uterine cancer.
- Polymenorrhoea is bleeding associated with menstrual cycles that are shorter than 21 days. It may be caused by hormonal or ovulatory problems.
- Oligomenorrhea is infrequent menstruation with 35 days to six months between menstrual cycles. Researchers discovered that women with a menstrual cycle of 40 days or longer are twice as likely as women with average-length cycles to develop type II (adult-onset) diabetes mellitus. It is thought that long or highly irregular menstrual cycles may be associated with insulin resistance.

Diagnosis

Menstrual problems can be diagnosed and treated by gynecologists. Most menstrual problems would be diagnosed by taking a detailed medical history (with an emphasis on menstrual history) and performing a physical exam, which would include a pelvic exam. Pelvic exams have two components: the manual exam and the speculum exam. During the manual exam, the doctors insert one or two fingers into the vagina and press their other hand on the lower abdomen to feel the uterus and ovaries. A speculum exam involves inserting a speculum (a metal or plastic tool for opening the vagina) to allow viewing of the vagina and cervix, and to obtain smears for Pap testing (sampling of cervical cells) or culture if an infection is suspected.

Ultrasound exam, in which internal organs are visualized using sound waves, may be performed. Abnormal findings from the examination and laboratory tests may warrant laparoscopy in which a thin, wand like instrument is inserted into an incision in the navel to visualize abdominal organs.

Urine tests may be performed to diagnose pregnancy or infection. Blood tests to determine hormone levels, as well as other blood parameters, may be performed. Patient history and physical exam findings may suggest specific illnesses that would require additional laboratory testing.

The patient may be asked to fill out a diary in which daily menstrual symptoms are recorded over a period of three to six months. In some cases, the patient may be referred to a psychiatrist for evaluation for PMDD.

Treatment

There are many alternative treatments for menstrual problems. Because menstrual difficulties may be

due to a serious condition, patients should consult a doctor before self-treating.

Diet

Phytoestrogens are estrogen-like compounds produced by certain plants. Food sources of phytoestrogens include soy products, flaxseeds, chick peas, pinto beans, french beans, lima beans, and pomegranates. Phytoestrogens can lighten menstruation and lengthen menstrual cycles. By contrast, researchers have found that women who were fed soy-based formulas in infancy instead of cow's milk are more likely to report heavy menstrual bleeding and painful periods in adult life.

PMS symptoms may be relieved by avoiding **caffeine**, sugar, salt, white flour, red meat, dairy, butter, monosodium glutamate (MSG), fried foods, and processed foods during the two weeks prior to menstruation. Foods that help to fight PMS include steamed green vegetables, salad, beans, grains, and fruit. To obtain **essential fatty acids** (omega-3 and omega-6) women can eat flaxseeds, sesame seeds, pumpkin seeds, salmon, mackerel, and tuna.

Herbal remedies and Chinese medicine

A variety of herbal remedies may alleviate symptoms associated with menstrual problems. These include:

- black cohosh (*Cimicifuga racemosa*): mood swings, tension, establishing ovulation (an important source of phytoestrogens). The German Commission E, however, states that women should not take black cohosh for menstrual problems for longer than six months because of the risk of side effects.
- black haw (*Viburnum prunifolium*): cramps
- chamomile (*Matricaria recutita*): mood swings, tension, and cramps
- cramp bark (*Viburnum opulus*): cramps
- dandelion (*Taraxacum dang gui*): fluid retention and bloating
- dong quai (*Benincasa cerifera*): PMS symptoms, cramps, irregular cycles, heavy bleeding, or bleeding in between cycles
- fenugreek (*Trigonella foenum-graecum*): irregular bowel movements
- feverfew (*Chrysanthemum parthenium*): headaches and PMS symptoms
- ginger (*Zingiber officinale*): cramps, irregular cycles, heavy bleeding, or bleeding in between cycles
- goldenseal (*Hydrastis canadensis*): heavy bleeding
- horsetail (*Equisetum arvense*): heavy bleeding
- licorice: PMS symptoms
- milk thistle (*Silybum marianum*) extract: heavy bleeding
- nettle (*Urtica dioica*) extract: heavy bleeding
- peppermint (*Mentha piperita*): mood swings and tension
- raspberry tea: cramps, irregular cycles, heavy bleeding, or bleeding in between cycles
- red clover (*Trifolium pratense*): phytoestrogen source
- rosemary (*Rosmarinus officinalis*): cramps
- shepherd's purse (*Capsella bursa–pastoris*): heavy bleeding
- St. John's wort (*Hypericum perforatum*): depression associated with PMS
- valerian (*Valeriana officinales*): mood swings and tension
- vitex: PMS symptoms
- wild yam: phytoestrogen source
- yarrow (*Achillea millefolium*): cramps

Supplements

The following supplements may treat menstrual problems:

- Calcium deficiency may be associated with PMS.
- Iron supplementation can treat anemia.
- Magnesium pidolate supplementation reduced dysmenorrhea symptoms by up to 84%, especially on days two and three.
- Niacin may help to relieve cramps.
- Omega-3 fatty acids deficiency is associated with dysmenorrhea pain (in one small study, patients taking omega-3 fatty acids had lower pain scores).
- Thiamine (vitamin B_1) cured dysmenorrhea in 87% of the patients for up to two months after treatment.
- Vitamin A may be useful to treat heavy bleeding in women who have vitamin A deficiencies.
- Vitamin B complex may help hormonal function, prevent anemia, reduce water retention, and relieve stress.
- Vitamin E may reduce mood swings and menstrual cramps.

Other treatments

Other treatments for menstrual problems include:

- Acupressure. Acupressure can relieve pain, reduce stress, and improve circulation.
- Acupuncture. This treatment is associated with improvement or cure of dysmenorrhea and PMS and decreased use of pain medications. A National Institutes of Health

(NIH) panel concluded that acupuncture may be a useful treatment for menstrual cramps. A study released in 2008 found that acupuncture is an effective treatment for patients suffering from dysmenorrhea. In the study, acupuncture was associated with improvements in both pain and quality of life.

- Aromatherapy. Massage with essential oils: rose, ylang-ylang, bergamot, and/or geranium oils for mood swings; lavender, sandalwood, and clary sage oils for menstrual cramps; and chamomile, cypress, melissa, lavender, and jasmine oils for irregular menstruation or amenorrhea.
- Biofeedback. Weekly biofeedback therapy for 12 weeks led to significant reduction in PMS symptoms.
- Chiropractic. Spinal manipulation may help to ease cramps.
- Exercise. Regular, moderate aerobic exercise reduces or eliminates menstrual pain, improves PMS, reduces the amount of menstrual bleeding, reduces the risk for endometriosis, and reduces cyclic breast pain and cysts. Yoga stretching can relieve back and thigh pain.
- Homeopathy. Homeopathic remedies include: lachesis or sepia for PMS, cimicifuga, colocynthis, or magnesia phosphorica for cramps, and pulsatilla or aconitum for irregular menstruation or amenorrhea.
- Hydrotherapy. Soaking in a hot tub or using a moist heating pad relaxes uterine muscles which relieves cramping.
- Reflexology. Ear, hand, and foot reflexology led to a significant decrease in PMS symptoms that lasted for several months following treatment.
- Transcutaneous electric nerve stimulation (TENS). In four small studies using TENS for the treatment of dysmenorrhea, 42%–60% of the patients experienced at least moderate relief of symptoms. TENS worked faster than naproxen and there was less need for NSAIDs.

Allopathic treatment

The treatment for amenorrhea depends upon the cause. Primary amenorrhea may require hormonal therapy.

Patients with dysfunctional or abnormal uterine bleeding may be prescribed iron supplements to treat **anemia**. Naproxen **sodium** (Aleve) reduces excessive blood loss. Oral contraceptives are often prescribed to treat abnormal bleeding. High doses of estrogens may cause vomiting, which means that anti-emetics (drugs to prevent vomiting) may also be necessary. Excessive bleeding may require hospitalization for observation and treatment.

KEY TERMS

Amenorrhea—Lack of menstruation.

Dysmenorrhea—Painful menstruation.

Endometrium—The lining of the uterus that is shed during menstruation.

Follicle—The cluster of cells that surround the developing egg.

Hormones—Chemical messengers that control the events associated with the menstrual cycle.

Menarche—The first menstrual period or the establishment of the menstrual function.

NSAIDs—Nonsteroidal anti inflammatory drugs such as ibuprofen and naproxen.

Oligomenorrhea—Scanty or infrequent menstrual periods.

Phytoestrogens—Estrogen-like compounds derived from plants.

Toxic shock syndrome (TSS)—A potentially serious bacterial infection associated with the use of tampons to absorb menstrual flow.

Uterus—The organ that carries and provides nutrition to a developing baby. Also called the womb.

Primary dysmenorrhea is usually successfully treated with nonsteroidal anti-inflammatory drugs (NSAIDs); aspirin is not strong enough to be effective. NSAIDs are numerous and include ibuprofen (Advil, Motrin, Nuprin), Naproxen (Aleve), and fenamates (Meclomen). Oral contraceptives (birth control pills) may be used if NSAIDs fail. Treatment of secondary dysmenorrhea involves treating the causative condition and may involve medications or surgery.

Because the cause(s) of PMS are unclear, treatment usually focuses on relieving symptoms. A study released in 2007 found that both acetaminophen and ibuprofen were effective in treating the pain associated with menstruation. Ibuprofen was found to be the more potent pain reliever.

With regard to PMDD, medications that have been reported to be effective in treating it include the tricyclic antidepressants and the selective serotonin reuptake inhibitors (SSRIs). Effective treatments other than medications include cognitive **behavioral therapy** (CBT), aerobic exercise, and dietary supplements containing **calcium**, **magnesium**, and vitamin B_6.

Expected results

Most menstrual problems can be successfully treated using conventional or alternative treatments.

Prevention

Avoiding sodium and caffeine may reduce some menstrual symptoms. Regular moderate aerobic exercise or **yoga** is often beneficial for menstruation difficulties. Getting yearly pelvic exams and Pap smears help to identify problems before they become advanced.

Resources

BOOKS

PERIODICALS

Dawood, Yusoff, and Firyal S. Khan Dawood. "Clinical Efficacy and Differential Inhibition of Menstrual Fluid Prostaglandin F2a in a Randomized, Double Blind, Crossover Treatment with Placebo, Acetami nophen, and Ibuprofen in Primary Dysmenorrhea." *American Journal of Obstetrics & Gynecology* 196, no. 1 (January 2007): 35.

Witt, Claudia M. et al. "Acupuncture in Patients with Dys menorrhea: A Randomized Study on Clinical Effec tiveness and Cost Effectiveness in Usual Care." *American Journal of Obstetrics & Gynecology* 198, no. 2 (February 2008): 166.

ORGANIZATIONS

American College of Obstetricians and Gynecologists (ACOG), 409 Twelfth St. SW, PO Box 96920, Wash ington, DC, 20090 6920, http://www.acog.org.

American Psychiatric Association (APA), 1400 K St. NW, Washington, DC, 20005, (888) 357 7924, http://www. psych.org.

Feminist Women's Health Center, 106 East E St., Yakima, WA, 98901, (509) 575 6473 x112, http://www. fwhc.org.

National Women's Health Network, 514 Tenth St. NW, Suite 400, Washington, DC, 20004, (202) 628 7814, http://www.womenshealthnetwork.org.

Belinda Rowland
Rebecca J. Frey, PhD
Rhonda Cloos, RN

Mercurius vivus

Description

Mercurius vivus is the Latin name for a homeopathic remedy made from elemental mercury. The English word quicksilver is a literal translation of the Latin. Although Samuel Hahnemann, the founder of homeopathic medicine, also formulated a soluble preparation of mercury that he called *Mercurius solubilis*, most contemporary American homeopaths regard these two preparations as essentially the same remedies and use them to treat the same symptom profiles.

General use

Homeopathic medicine operates on the principle that "like heals like." This means that a disease can be cured by treating it with substances that produce the same symptoms as the disease, while also working in conjunction with the homeopathic law of infinitesimals. In opposition to traditional medicine, the law of infinitesimals states that the *lower* a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

The homeopathic *Materia Medica* indicates that, *Mercurius vivus* is the remedy of choice for acute disorders of the skin and mucous membranes characterized by severe inflammation with pus formation and possibly areas of broken or raw skin. Disorders with this symptom profile include:

- eye infections with discharges of pus
- bacterial infections with pus behind the eardrum
- sore throats with open patches of skin and pus formation
- urinary tract infections
- diseases of the skin such as herpes and boils

Other disorders that are treated with *Mercurius vivus* include backache, **chickenpox**, colds, **diarrhea**, **influenza**, **indigestion**, mouth ulcers, and **toothache** accompanied by heavy salivation.

The general symptoms that would suggest *Mercurius vivus* treatment to a homeopath include heavy, foul-smelling perspiration, foul-smelling breath and **body odor**, and copious, drooling salivation. *Mercurius vivus* patients are easily irritated by temperature or other environmental changes, and they are comfortable only within a narrow range of moderate circumstances. They tend to tremble or shake, are generally weak, and easily tired by activity. These patients are slow to respond to treatment and infected parts of the body take a long time to heal and often appear severely diseased.

A female *Mercurius vivus* patient is likely to have heavy periods with painful cramps and **anxiety**. A nursing mother will produce milk that has a bad taste to the infant. A male patient may have burning

pain on urination accompanied by thick mucus or pus from the urethra. The inflammatory sensations associated with *Mercurius vivus* symptoms are present throughout the body. The mouth and gums are typically sore and inflamed, and the patient may complain of a metallic taste in the mouth. The gums may ooze blood when touched, and the patient often has lost several teeth. If the patient has a **headache**, it will have a burning quality. The *Mercurius vivus* patient may also have feelings of gnawing or burning in the chest and abdomen. There may be little appetite for food, but often an intense thirst or desire for cold drinks.

In **homeopathy**, certain remedies are thought to be especially effective in people with specific personality and physical traits. The mental and psychological symptoms of *Mercurius vivus* patients include restlessness, an agitated quality, and a tendency toward impatience and willfulness. The patient may jabber or chatter rather than talking at a normal pace and may act on impulse. These impulses sometimes lead to violence; *Mercurius vivus* patients may act out suicidal or murderous thoughts. Other personality traits of the *Mercurius vivus* patient are quarrelsomeness and dissatisfaction.

In homeopathic practice, the circumstances or factors that make the patient feel better or worse are considered as important a part of the symptom profile as the physical indications. These circumstances, which include weather, time of day, level of activity, light or noise, body position, sleeping patterns, etc., are known as modalities. With *Mercurius vivus* patients, the modalities that make the patient's condition worse include temperature extremes, open air, drafts, a warm bed, evening, being touched, lying on the right side, feeling sweaty, or eating something sweet. Those that make the patient feel better include moderate temperatures, dry weather, and sitting up while at rest.

Preparations

There are two homeopathic dilution scales, the decimal (x) scale with a dilution factor of 1:10 and the centesimal (c) scale with a dilution factor of 1:100. The most common form of *Mercurius vivus* preparation on the market is 30c or 30x tablets, although the remedy is also available in liquid form. The abbreviation 30c means that one part of mercury has been diluted with 99 parts of water or alcohol. This process of dilution, along with vigorous shaking of the remedy, has been repeated 30 times to achieve the desired potency. A potency of 30x means that one part of the medicine is mixed with nine parts of alcohol or water; thus 30x means that this decimal dilution has been repeated 30 times. In homeopathic practice, the strength of the remedy is in inverse proportion to the amount of chemical or plant extract in the alcohol or water; thus a 30c preparation of *Mercurius vivus* is considered a much higher potency than a 30x preparation. The tablet form of a homeopathic remedy is made by pouring the diluted liquid over sugar pills.

Precautions

Taken by itself, mercury is poisonous to humans and can cause irreversible damage to the nervous system even if the patient survives. Other symptoms of **mercury poisoning** include burning thirst, swelling and discoloration of the membranes lining the mouth, abdominal pain, bloody diarrhea, and shock. Samuel Hahnemann's interest in accidental poisonings from medicines that were commonly used in the eighteenth century is one reason why mercury was one of the first substances that he studied. Since ancient times, mercury had been used for medicinal purposes to cleanse **fever** victims of toxins. In the modern world, however, mercury poisoning is more likely to result accidentally from breathing metallic vapors given off in certain industrial processes rather than from mercury-based medicines. Standard homeopathic preparations of *Mercurius vivus* are so dilute that they are highly unlikely to cause mercury poisoning even if the patient takes a sizable overdose.

Side effects

Homeopathic remedies rarely have side effects in the usual sense of the phrase because they are so dilute. On the other hand, a homeopathic remedy may sometimes appear to be making a patient's symptoms temporarily worse as part of the healing process. This worsening is called an aggravation. Aggravations are regarded by homeopaths as an indication that the remedy is effectively stimulating the patient's body to heal itself. *Mercurius vivus* patients appear to be more likely to experience aggravations than patients given other remedies.

Interactions

Homeopathic preparations are so dilute that the chances of their interacting with conventional prescription medications are minimal to nonexistent. On the other hand, a typical homeopathic *Materia Medica* will include some brief notes about the interactions of some remedies. The action of *Mercurius vivus* is thought to be intensified by **belladonna**, **silica**, and *Hepar sulphuricum*.

KEY TERMS

Aggravation—In homeopathy, a temporary worsening or intensification of the patient's symptoms prior to improvement and healing.

Materia medica—A Latin phrase that means "the materials of medicine." In homeopathy, a *materia medica* is a book that lists the various homeopathic remedies together with the symptoms that they treat.

Modality—A factor or circumstance that makes a patient's symptoms better or worse. Modalities include such factors as time of day, room temperature, external stimuli, the patient's level of activity, sleep patterns, etc.

Resources

BOOKS

Chernin, Dennis. *The Complete Homeopathic Resource for Common Illnesses*. Berkeley, CA: North Atlantic Books, 2006.

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. 3rd ed. rev. New York: Tarcher, 2004.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Poto mac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

American Institute of Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314 (888) 445 9988. http://homeopathyusa.org.

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790. http://www.homeopathic.org/contact.htm.

OTHER

"Mercurius Vivus" *ABC Homeopathy*. [cited February 19, 2008]. http://abchomeopathy.com/r.php/Merc.

"British Homeopathic Library." *Hom Inform*. [cited Febru ary 19, 2008]. http://www.hom inform.org.

Rebecca Frey, Ph. D.
Tish Davidson, A. M.

Mercury poisoning

Definition

Mercury poisoning occurs when a person has ingested, inhaled, or had skin or eye contact with the toxic (poisonous) heavy metal mercury and suffers damage to the nervous system and other systems of the body. Mercury, which has the chemical symbol of Hg, is liquid at room temperature, like a few other elements. Because it easily converts to a gas, it is extremely volatile. There are three forms of mercury circulating throughout the environment, and all three forms are toxic to humans and many other living organisms to varying degrees.

Elemental mercury, also known as quicksilver, is mercury in its metallic (solid) elemental form. Elemental mercury is also referred to as mercury-zero. It is frequently found in the home in glass thermometers. It is also found in fluorescent light bulbs, thermostats, some pesticides, switches, preservatives, some paints, and in some dental amalgam fillings—although there are often mercury-free options available. In the past, according to a State of Michigan publication *Mercury Poisoning*, it was used as the active ingredient in ointments, animal worming medicines, antiseptics, disinfectants, diuretics and fungicides. As of 2008, the publication states, it is present in seed fungicides, anti-slime fungicides used by the pulp and paper industries, by-products of burning coal, mining tailings (residue), and wastes from chlorine-alkali industries. In its solid state, elemental mercury is less toxic than some of its other forms, but it is still very volatile. The most toxic effect of elemental mercury occurs when its extremely dangerous vapor is inhaled, which is most likely to occur in an industrial setting.

Elemental mercury can be converted by bacteria into a charged ion (an electrically charged atom or group of atoms) known as mercury-two. There are two dangerous aspects to this form. First, unlike elemental mercury, it readily dissolves in water and combines with other ions to form new compounds. Second, bacteria can change mercury-two into one of mercury's most toxic organic compounds, methylmercury, which is capable of being dissolved in water and thus finds its way into the food chain, where it enters fish and other animals. Large, long-lived fish such as swordfish are most likely to have high levels of methylmercury. The mercury found in fish can be dangerous for a developing fetus, for babies, and young children. It can be passed to infants through breast milk. Breastfeeding women, pregnant women, and women who may become pregnant are advised by the United States Food and Drug Administration (FDA) to avoid eating large, long-lived fish such as shark and swordfish, and to limit other fish consumption to an average of 12 ounces a week (an average portion of fish is about six ounces). The FDA also recommends that the fish eaten be varied regularly and

that the same type of fish or shellfish not be eaten more than once a week.

Inorganic mercury takes the form of various compounds known as mercuric salts. Mercuric salts are used in various folk medicines, particularly in some Chinese herbal preparations and in some Mexican remedies. Exposure to mercuric salts over a long term can cause kidney and nerve damage.

Description

Many people do not take the risk of mercury poisoning seriously because they have played with elemental or liquid mercury or broken thermometers containing mercury without experiencing negative health effects. While these "small" mercury exposures can appear to be free of detectable health consequences, even a small spill can have serious effects, including hospitalization and even death, if improperly cleaned up, if there is poor ventilation, or the mercury is exposed to heat. It is extremely important, therefore, that any mercury spill, even a small one, be properly cleaned up. If not, the home, school, or workplace may be contaminated. Poisoning from elemental mercury is most likely to occur during inhalation of mercury vapors. The danger lies in the fact that after it is inhaled into the lungs in vapor form, mercury passes into the blood stream. The person who inhales mercury requires immediate medical treatment.

Inhalation of mercury vapor might happen in a factory where mercury is used. Most small household spills of elemental mercury are not dangerous if cleaned up correctly. Elemental mercury usually passes right through the body if swallowed, so this is usually not poisonous to a person with a healthy digestive system. Elemental mercury is not easily absorbed by the skin, so touching elemental mercury is usually not enough to cause poisoning. But if elemental mercury is spilled in the home, from a broken thermometer or fluorescent light, for example, it must be correctly and carefully cleaned up. It should not be swept up with a broom or vacuumed because doing so can break the mercury into small particles and spread it. Spilled mercury should be sucked up with an eyedropper, scooped up with paper, or picked up with sticky tape. Then the mercury should be sealed in three layers of plastic bags and disposed of according to local hazardous waste procedures. Any clothes or rags that have been exposed to mercury should also be discarded, rather than washed in a washing machine, which would further spread the mercury. The area of the spill should be ventilated for several days.

Inorganic mercury, or mercury salts, have long been used in folk medicines. Exposure to inorganic mercury through folk medicines can cause poisoning, which can lead to kidney damage, tissue death, and nerve damage. Calomel, or mercurous chloride, and cinnabar, or mercuric sulfide, are two common toxic inorganic mercury compounds that should not be ingested. Folk medicines containing calomel, cinnabar, or other mercuric salts should also not be used on the skin.

Several Chinese herbal medicines have been identified as containing dangerous amounts of mercury and arsenic. These are usually prepared as an herbal ball. Known Chinese herbal medicines to avoid are: An Gong Niu Huang Wan, Da Huo Luo Wan, Niu Huang Chiang Ya Wan, Niu Huang Chiang Hsin Wan, Ta Huo Lo Tan, Tsai Tsao Wan, and Dendrobium Moniliforme Night Sight Pills.

Poisoning from organic mercury is perhaps the most troubling form of mercury exposure. Organic mercury is widespread in the environment, and there is a lot of debate about how it can most safely and cost-effectively be cleaned up. Some mercury finds its way into the atmosphere naturally, from volcanoes for example. But much of the mercury that finds its way into the food supply comes from industrial pollution. Mercury is emitted by power plants that burn fossil fuel and travels through the air. It deposits in bodies of water, where it is first taken up by plankton (floating animal and plant life). Fish that feed on plankton accumulate organic mercury in their bodies, and fish that eat those fish accumulate even more. This process, called bioaccumulation, concentrates the mercury in animals at the top of the food chain.

Because mercury can travel great distances through the air, the problem of mercury pollution affects all of North America and is a global environmental issue. As of 2008, the debate continued on how much mercury is safe and how it should be regulated. In the United States, the Environmental Protection Agency (EPA) is responsible for monitoring mercury emissions. In 2004, the EPA promulgated new rules on mercury emissions, which were criticized by some politicians and environmental groups as too lenient. The FDA, the United States government agency responsible for food safety, revised its findings on the mercury in fish several times during the early 2000s.

Some studies suggest that mercury exposures of up to four times the limits in the FDA guidelines may be safe for people. There are many health benefits to eating fish, and the mercury level in any individual fish meal may vary greatly. Most states in the United

States post warnings on consuming fish or certain types of fish caught in lakes and streams. Specific bodies of water or specific species of fish may have been found to be more dangerous than others. People who fish for sport or for subsistence should check with local government agencies about warnings for eating local fish.

Causes and symptoms

Common home products that contain elemental mercury, such as lights, thermostats, thermometers, and appliances are not dangerous to humans unless they are broken, mercury is released, and there is exposure to mercury vapors because of improper cleanup.

In June 1997, Karen Wetterhahn, 48, a Dartmouth College **cancer** research scientist whose specialty was dangerous heavy metals, died of dimethylmercury poisoning, ten months after she spilled one to several drops of it on her rubber gloves while she was studying how mercury prevents cells from repairing themselves. Tests after the spill revealed that the mercury could pass quickly through the rubber latex gloves without damaging them. Three months after the spill, Wetterhahn experienced two episodes of **nausea** and **vomiting**. Two months later, she began losing her balance and having speaking and hearing difficulties. At the time she was hospitalized, tests showed 80 times the lethal dose of mercury in her blood. She then went into a coma and died. The chairman of the Dartmouth chemistry department, John S. Winn, explained that although methylmercury looks like water, it is three times as dense and is readily absorbed by the body. He also said that about 100 laboratories around the world work with dimethylmercury. Dartmouth officials in a letter to the American Chemical Society urged those who work with dimethylmercury to wear neoprene gloves with long cuffs and to have frequent blood and urine testing.

In 1963, a new filling for dental cavities, non-gamma-two amalgam, was introduced as a solution to conventional amalgam being prone to corrosion and mechanical weakness. Non-gamma-two amalgam quickly caught on, despite the fact that it caused a much-increased mercury emission, and replaced conventional amalgam. In the early 1980s, dentists were regularly using elemental mercury amalgam for dental fillings. However, dentists and other health professionals who had turned to holistic or alternative medicine began to publicize the toxicity of amalgam fillings and advocate their replacement with a non-toxic composite material. One study reported that people with amalgam filings had mercury vapors in their mouths that were nine times greater than people without the filings. If the person with the amalgam filing chewed, the level of vapor increased six-fold, giving the people with amalgam filings vapor levels that were 54 times greater than those without amalgam filings. The level continued to increase as the people brushed their teeth or after they drank hot beverages. Although these findings may seem extreme, they come from only one study. The American Dental Association (ADA) has not found sufficient evidence of the dangers of amalgam fillings to recommend against them. Starting January 1, 2008, Norway banned the use of amalgam fillings in most circumstances. This ban, however, pertained to environmental effects of mercury, not concerns about the safety of the fillings.

Environmental mercury can be extremely dangerous. Walter Crinnion described the effects of the pollution of Minamata Bay in Japan by methylmercury and the neurotoxicity suffered by inhabitants of the area that came to be known Minamata disease: ataxia (lack of normal coordination of voluntary muscles), speech impairment, constriction of visual fields, hypoesthesia (reduced capacity to feel sensation), dysarthria (slurred, slow speech from inability to coordinate mouth muscles), hearing impairment, and sensory disturbances. As the mercury contamination spread, these symptoms did also. Forty years after the spill and almost 30 years since a fishing ban was put into effect in the area, problems continued predominantly in the fishing villages. Males complained of stiffness, poor ability to feel sensation, hand tremors, **dizziness**, loss of **pain** sensation, cramping, atrophy (wasting away) of upper arm muscles, arthralgia (pain in the joints), **insomnia**, and lumbago (back pain). Females had significantly higher complaints of leg tremors, **tinnitus** (ringing in the ears or head), loss of touch sensation, atrophy of leg muscles, and muscular weakness.

The symptoms of poisoning from inorganic mercury may include nausea and vomiting, abdominal pain, bloody **diarrhea**, and decreased urination. If inorganic mercury is applied to the skin, the skin may eventually redden or discolor. Skin contact with inorganic mercury can lead to nerve damage. The symptoms of nerve damage are weakness, numbness, and tingling.

The symptoms of poisoning from organic mercury include **fatigue**, **headache**, **depression**, memory problems, **hair loss**, tremors, and/or a metallic taste in the mouth. These symptoms are also caused by many other common conditions, so organic mercury poisoning can be difficult to diagnose. The doctor will ask the individual questions about possible workplace, home, or dietary exposure to mercury to help make a diagnosis.

Diagnosis

Measurement of mercury in the urine is the recommended method of diagnosing metallic and inorganic mercury poisoning. Organic mercury cannot be measured by urinalysis because it does not leave the body in urine. If the urine collection cannot be done over 24 hours, spot urine samples should be collected at the same time each day.

Extent of exposure to organic mercury, including methylmercury and metallic and inorganic mercury, can be measured by a blood test. Unexposed people usually have less than 2 µg/100mL of mercury in their blood. Early effects of toxicity are indicated when the blood concentration exceeds 3 µg/100 mL.

Treatment

It is worth noting that some herbal and folk treatments for health problems can be a source of mercury. The herbal preparations listed under the "Description" heading above are known to have large concentrations of inorganic mercury. A person prescribed a Chinese herbal ball preparation may want to ask the practitioner about mercury and be alert for symptoms of mercury exposure. Some Mexican skin creams and stomach remedies may also be sources of mercury.

Fish oil supplements are a popular non-prescription treatment used by many people who hope to lower the risk of **heart disease**, lower **cholesterol** levels, and improve mental function. Because in the United States, the manufacture of nutritional supplements is not regulated like pharmaceuticals are, fish oil supplements may vary greatly from maker to maker and so exposure to organic mercury from fish oil supplements is not readily quantifiable. It makes most sense for a person taking fish oil supplements to determine—if necessary by contacting the manufacturer directly—what kinds of fish are used for the oil, and if mercury levels have been tested for that brand.

Alternative treatment—by a naturopathic physician, a holistic medical doctor or osteopathic physician, or a homeopathic practitioner—is based on physical examination, biochemical testing, and an extensive history, including a history of family illness. After the doctor evaluates all of this information, treatment may include a comprehensive diet tailored to the individual patient; vitamins, minerals, enzymes, **amino acids** and or homeopathic remedies tailored to the individual; removal of toxins from patient's environment and diet; removal of amalgam fillings; necessary **chiropractic** adjustments; counseling; supplementary physical treatment; **stress** reduction and proper **exercise**; a stress-free home with help, if needed; a **detoxification** program; use of a sauna; and chelation, a recognized treatment for **heavy metal poisoning**, the intravenous injection of ethylenediamine tetraacetic (EDTA) that will chemically bind with the heavy metal and allow it to be removed from the body in the urine.

KEY TERMS

Bioaccumulation—The buildup of a toxin or other substance within a food chain, as larger predators retain the substance from the bodies of prey they eat.

Allopathic treatment

A person diagnosed with mercury poisoning may be prescribed a drug that binds the mercury and thus helps the body excrete it quickly. The body naturally excretes metallic and inorganic mercury in the urine even without treatment. A doctor may recommend that a person diagnosed with mercury poisoning avoid eating any fish or shellfish. Further monitoring of blood and urine can determine whether mercury levels are falling. The nervous system, mouth, lungs, eyes and skin, target organs for exposure, should also be periodically checked.

Expected results

For adults, small levels of mercury poisoning typically constitute a reversible problem. The body can rid itself of mercury if the exposure to mercury is halted. Symptoms such as fatigue and memory problems seem to go away as mercury levels fall. However, large doses of mercury can cause permanent organ, brain, and neurological damage, or be fatal. For children and developing fetuses, even very low levels of mercury poisoning can cause long-term neurological problems. Mercury exposure before birth has been linked to lower intelligence and delays in learning motor skills.

Prevention

Avoiding mercury is the best way to prevent mercury poisoning. Folk remedies that may contain mercury should not be consumed or rubbed on the skin. People should follow local guidelines about eating fish caught in local waters and should follow federal guidelines for consumption of commercial fish. Much of the scientific literature on long-term exposure to mercury from fish is still mixed, and consumers should try to stay up to date on the FDA recommendations for consumption.

Resources

BOOKS

Eisler, Ronald. *Mercury Hazards to Living Organisms*. Boca Raton, FL: CRC/Taylor & Francis, 2006.

Harmon, Daniel E. *Fish, Meat, and Poultry: Dangers in the Food Supply*. New York: Rosen Central, 2008.

National Wildlife Federation *Poisoning Wildlife: The Reality of Mercury Pollution*. Reston, VA: National Wildlife Federation, 2006.

PERIODICALS

Morrissey, Michael T. "Mercury in Seafood: Facts and Discrepancies." *Food Technology* (August 2006): 132.

Saldana, M., et al. "Diet related Mercury Poisoning Resulting in Visual Loss." *British Journal of Ophthal mology* 90, no. 11 (November 2006): 1432 1435.

Strom, Sean M. "Total Mercury and Methylmercury Resi dues in River Otters from Wisconsin." *Archives of Environmental Contamination and Toxicology* 54, no. 3 (April 2008): 546 555.

Ruth Ann Carter
Helen Davidson

Mesoglycan

Description

Mesoglycan is a mucopolysaccharide complex that is extracted from calf aorta or synthetically created and taken in pill or capsule form as a dietary supplement. Mucopolysaccharides are long molecular chains of sugar. They are used by the body in the building of connective tissues, such as cartilage, tendons, and ligaments. The substance is related to the blood-thinning drug heparin, and the supplements **glucosamine** and **chondroitin**. Both are used to treat joint pain and arthritis.

General use

Aortic glycosaminoglycans and mucopolysaccharides such as mesoglycan are used to treat diseases of blood vessels, joints, and cartilage such as:

- atherosclerosis
- varicose veins
- phlebitis
- hemorrhoids
- arthritis
- bursitis
- headaches
- ulcers
- angina
- allergies

There is some evidence that mucopolysaccharides and the related aortic glycosaminoglycans may slow the development of **atherosclerosis** (hardening of the arteries) by lowering **cholesterol** levels in the blood. In one study, a group of men with early atherosclerosis was given a 200 mg daily dose of aortic glycosaminoglycans, while another group received no treatment. After 18 months, the layering of the vessel lining in the untreated group was 7.5 times greater than in the treated group.

Heparan sulfate and dermatan sulfate are the two main components of mesoglycan. These substances have a protective effect on the walls of blood vessels.

Mesoglycan is an active ingredient found in the aloe vera plant. There have been studies that have found mesoglycan to be effective in treating inflammation, AIDS, and **cancer**. One clinical trial conducted in the 1980s showed that **AIDS** patients who took oral mucopolysaccharides showed a 70% improvement in their symptoms.

Mucopolysaccharides have also been shown to reduce inflammation in diseases such as arthritis, gastric reflux, and ulcerative **colitis**. There is also evidence suggesting that mesoglycan can slow the progression of arthritic diseases.

Preparations

Dosage ranges from 24-200 mg per day for one to six months, depending on the condition being treated. In a study patients with deep vein thrombosis, a dosage of 72 mg per day was found to be effective. An oral dosage of mesoglycan of 72-96 mg per day for 10-13 weeks has been used to treat hyperlipidemia. A dosage of 24-50 milligrams per day is used to treat patients with arterial disease.

Initially, mesoglycan and other mucopolysaccharides were only available through injections. They are now available in oral form.

Some common names for preparations containing mucopolysaccharides include chondroitin and glucosamine. Glucosamine stimulates the production of glycosaminoglycans and proteoglycans, the building blocks of cartilage. If the body does not produce enough glucosamine on its own, the joints can dry out, crack, or wear away completely. If the joints have no protection from glucosamine, they can become swollen, inflamed, and very painful, a common condition known as **osteoarthritis**.

Researchers believe that taking glucosamine can help the body stimulate its own production of protective cartilage around joints. Combining glucosamine together with chrondroitin is thought to increase the overall effectiveness, although some practitioners prescribe glucosamine alone.

Precautions

Mesoglycan and other aortic glycosaminoglycans are basically compounds found naturally in the body, so they are generally considered to be safe to take, even in large quantities. There is some ability, however, for aortic glycosaminoglycans to reduce blood clotting. Maximum safe dosages for young children, pregnant or nursing women, or in those with liver or kidney disease have not been determined.

The Dietary Supplement Health and Education Act of 1994 permits the marketing of a product labeled as a "dietary supplement" without the approval of any government agency as long as the labeling includes a disclaimer stating that it has not been evaluated by the Food and Drug Administration (FDA), and that the product is not intended to diagnose, treat, or prevent any disease. Purity of dietary supplements cannot be guaranteed. Because of this, consumers should **exercise** caution when using any dietary supplement and be sure to discuss the use of dietary supplements with their physician or health practitioner. Currently, the only known medical condition that precludes the use of mesoglycan is hemorrhagic disease.

Side effects

In many studies, mesoglycan was found to be tolerated well. Gastrointestinal discomfort and **nausea** are side effects sometimes reported. With intramuscular injections of mesoglycan, injection site reactions may occur.

Interactions

If you are taking any type of prescription or other medication that decreases blood clotting such as coumadin (warfarin), heparin, trental (pentoxifylline) or aspirin, do not use aortic glycosaminoglycans or mucopolysaccharides without the advice of a physician.

Resources

BOOKS

The Columbia Encyclopedia. 6th ed., New York: Columbia University Press, 2000.

PERIODICALS

Lotti T., I. Ghersetich, C. Comacchi, and J. Jorizzo. "Cutaneous Small Vessel Vasculitis." *Journal of the American Academy of Dermatology*. (1998): 1 38.

"Glucosamine for Arthritis." *The Medical Letter on Drugs and Therapeutics*. (1997): 91 92.

OTHER

"Mesoglycan." Micromedex Database. (December 1999).

Kim Sharp

Metabolic therapies

Definition

Metabolic therapies differ considerably according to practitioner; however they typically involve a belief that **cancer** and certain other diseases are caused by imbalances in a patient's metabolism. These imbalances are caused by accumulations of toxins in the body. Treatment involves removing these toxins and strengthening the immune system and biochemical processes.

Origins

The origins of metabolic therapies are as varied as the therapies themselves. One of the best-known proponents was Harold Manners, a biology professor who claimed in 1977 to have cured cancer in mice using injected laetrile, **vitamin A**, and **digestive enzymes**. Manner left the academic world and started a clinic in Tijuana, Mexico before he died in 1988.

Benefits

In addition to cancer, metabolic therapies have also been used against arthritis, **multiple sclerosis**, and other diseases believed linked to metabolic imbalances.

Description

Metabolic therapies are an eclectic and controversial mix of treatment protocols, including the following:

- American biologics: Abstinence from caffeine, sugar and refined carbohydrates, as well as excess animal protein; enemas and colonic irrigation; laetrile; embryonic live cell therapy involving adrenal and cerebral tissues; vitamin C and other dietary supplements.
- Evers therapy: Laetrile; magnetic field therapy; hyperbaric oxygen; diet; Eversol chelation therapy; shark cartilage; Koch vaccination; injections of frozen thymus and other cells; detoxification.

KEY TERMS

Laetrile—The chemical amygdalin, obtained from apricots, peaches, and bitter almonds.

Metabolism—The physical and chemical changes that allow the body to grow, function, and to convert food into energy.

- Gerson therapy: Low-salt vegan diet; hourly intake of fresh fruit and vegetable juices; three or four coffee enemas a day; dietary supplements including thyroid extracts, pancreatin, pepsin, niacin, and potassium.
- Issels' whole body therapy: Removal of mercury dental fillings and infected teeth; vaccines; organic diet with acidophilus support; abstinence from coffee, tea, tobacco; hyperthermia (provoking a fever to strengthen the immune system); hemotogenic oxidation therapy (to stimulate an immune response within the blood); informal psychotherapy.
- Kelley-Gonzalez diet: Individualized diet, often including large quantities of raw fruits, juices, raw and steamed vegetables, cereals, and nuts; abstinence from red meat, white sugar, chicken, refined grain products, and soy; freeze-dried pancreatic enzymes; frequent coffee enemas and laxative purging; as many as 150 dietary supplements a day.
- Manner metabolic diet therapy: Laetrile; enzymes; daily coffee enemas; vitamins, minerals, and other supplements; direct injections of enzymes into tumors; psychological counseling.
- Revici therapy: Intravenous doses of selenium, oxygen, copper, calcium, and other substances intended to balance body chemistry.

Precautions

Generally the controversial and unproven nature of these therapies, combined with the seriousness of the diseases they are intended to treat, make the ongoing involvement of a competent medical professional strongly advisable. One major drawback to trying alternative cancer therapies is that opportunities may be lost for timely application of other, more effective therapies.

Side effects

Concern has been expressed that patients on some metabolic **diets** may risk electrolyte imbalances or even death. Further concern exists about the safety of enzyme injections and the toxicity of megavitamin therapy. Laetrile has been linked to life-threatening cyanide toxicity.

Research and general acceptance

Most metabolic therapies for cancer are well outside the comfort zone of traditional medical practitioners. Some proponents have experienced considerable opposition from regulators and law-enforcement officials.

Training and certification

Metabolic therapies are usually offered in small medical clinics that have developed their own treatment protocols. A number of these clinics are clustered in northwestern Mexico, just a few miles from the United States border. There, practitioners are easily accessible to visiting Americans, yet outside the jurisdiction of United States regulators.

Resources

ORGANIZATIONS

American Cancer Society. 1599 Clifton Road, N.E., Atlanta, GA 30329. (800) 227 2345.

David Helwig

Methionine

Description

Methionine ($C_5H_{11}NO_2S$) is an essential, sulfur–containing amino acid. It is the source of **sulfur** for numerous compounds in the body, including the **amino acids** cysteine and taurine. The body uses sulfur in the development of hair follicles and to promote healthy hair, skin, and nail growth. Sulfur also increases the liver's production of **lecithin** (which reduces **cholesterol**), reduces liver fat, protects the kidneys, helps the body to excrete heavy metals, and reduces bladder irritation by regulating the formation of ammonia in the urine. Methionine is a lipotropic—a nutrient that helps prevent fat accumulation in the liver, and usually helps detoxify metabolic wastes and toxins.

S–adenosyl–L–methionine (SAM, or SAMe) is an active compound made from methionine and adenosine triphosphate (ATP), an enzyme found in muscle tissue. SAMe is manufactured within the body and is found in almost every tissue, but it can also be made synthetically. It acts as a methyl donor in a variety of biochemical pathways. Methylation reactions are essential for the **detoxification** of harmful products

of metabolism, and the synthesis of numerous physiological agents including neurotransmitters, cartilage, and **glutathione**. (Glutathione is a chemical that plays an important role in biological oxidation–reduction processes, and as a coenzyme. It can combine with toxic substances to form water soluble compounds that can be excreted through the kidneys.)

Methionine is considered essential because it cannot be manufactured in the body and must be obtained through diet. This particular amino acid is found only in meat, fish, eggs, and dairy products. Natural and synthetic methionine supplements are available, as well as supplements containing SAMe.

General use

Acetaminophen overdose

Methionine is used to treat acetaminophen (paracetamol) poisoning that may result in liver damage. Preparations containing both methionine and acetaminophen have been formulated for use in situations where overdose may occur.

Arthritis

Most people with arthritis rely on continuous doses of non–steroidal, anti–inflammatory drugs (NSAIDs) such as ibuprofen, aspirin, and naproxen for **pain** relief. SAMe has several advantages over these standard painkillers. It provides effective pain relief and has fewer side effects than these drugs. Users are generally able to tolerate SAMe better than they can other drugs, which is a significant issue for arthritis sufferers. While NSAIDs can cause gastrointestinal bleeding, SAMe can protect against injury to the stomach. Another advantage is that SAMe may actually have a protective effect on joints and even repair cartilage.

Depression

SAMe is beneficial for most forms of **depression**. In Europe, SAMe is prescribed more often than any other type of antidepressant. Many studies have shown SAMe to be as effective as other antidepressant drugs. It works more quickly and has fewer side effects. SAMe may boost the activity of several brain chemicals involved in mood, such as norepinephrine, dopamine, and serotonin.

Liver function

Methionine levels help determine the liver's concentration of sulfur–containing compounds and SAMe improves and normalizes liver function. SAMe is used in Europe in the treatment of **cirrhosis** and liver damage caused by alcohol. It is essential for the production of glutathione. Methionine itself has a protective effect on glutathione and prevents depletion during toxic overload, which can protect the liver from the damaging effects of toxic compounds.

Through methylation, SAMe is able to inactivate estrogens to prevent estrogen–induced cholestasis (suppressed bile flow) in pregnant women and those on oral contraceptives. It also increases membrane fluidity, restoring several factors that promote bile flow. Treatment with SAMe can also help decrease serum bilirubin (pigment in the blood that can cause **jaundice**) in patients with Gilbert's syndrome, a condition characterized by a chronically elevated serum bilirubin level.

Neurological disorders

SAMe improves the binding of neurotransmitters to receptor sites in the brain. It is essential for the regeneration of neuron axons following injury, and for the formation of myelin sheaths (a fatty substance) that surround axons. Alzheimer's and Parkinson's patients have very low levels of SAMe, and methionine may help treat some symptoms of **Parkinson's disease**.

Persons with **AIDS** have low levels of methionine, which may explain some of the nervous system deterioration that can occur to cause symptoms such as **dementia**. Methionine may improve memory recall in persons with AIDS–related nervous system degeneration, and SAMe may be used in the treatment of HIV–related motor and sensory changes in the extremities.

Low levels of methionine in pregnant women are related to an increased risk of neural tube defects (NTDs) in the fetus. Neural tube defects are caused by the failure of the neural tube to close properly during the formation of the central nervous system in the developing embryo. Mothers whose methionine intake is adequate during the period from three months prior to conception through the first trimester of **pregnancy** have a significantly lowered risk of having a baby with a neural tube defect.

Other uses

In Europe, SAMe has been used in clinical studies to treat **anxiety**, **schizophrenia**, demyelination diseases, and dementia. Oral doses of methionine have also been given to lower urinary pH and to help in the treatment of liver disorders. SAMe's ability to inactivate estrogens supports the use of methionine in conditions of presumed estrogen excess such as PMS.

Methionine in combination with several **antioxidants** may reduce pain and recurrences of attacks of **pancreatitis** (inflammation of the pancreas). SAMe also improves the symptoms of **fibromyalgia** patients, who suffer from chronic muscle pain, non–restorative sleep, and profound **fatigue**.

Cancer researchers are also studying the role of methionine in a special diet for patients diagnosed with colon cancer.

Preparations

Amino acid requirements vary according to body weight. Most average–size adults require approximately 800–1,000 mg of methionine per day. Infants require five times that amount, and children need twice that amount. Dosage rates of SAMe for conditions such as depression, fibromyalgia, liver ailments, migraines, and **osteoarthritis** are 200–400 mg, two or three times per day. Before taking SAMe supplementation, a physician or qualified health practitioner should be consulted.

The usual oral dose of methionine for acetaminophen poisoning is 2.5 g every four hours for four doses starting less than 10–12 hours after acetaminophen ingestion. It may also be given intravenously.

Precautions

Homocysteine is an amino acid that the liver produces after ingesting methionine. Increased methionine intake, in the presence of inadequate intake of **folic acid**, vitamin B_6, and **vitamin B_{12}**, may increase the homocysteine in the blood and increase the risk of **heart disease**, or **stroke**. A doctor should be consulted to determine if any nutrient supplementation is needed.

Homocystine is the amino acid formed by the oxidation of homocysteine; homocystinuria is an inherited disorder in which there is excess homocystine in the plasma that is excreted in the urine. People with homocystinuria may benefit from a diet low in methionine, and should consult a physician before taking a supplement.

Patients with acidosis (condition of increased acidity in body fluids) or established liver insufficiency should not take methionine, and it should be used with caution in patients with severe liver disease.

A person who is already taking prescription medications for depression should not attempt to take SAMe, since it increases the efficiency of these medications. Those suffering from bipolar (manic–depressive) disorders should not take SAMe, since its antidepressant properties may induce or heighten the manic phase of this condition.

Women who are healthy and eat a well–balanced diet do not require methionine supplementation during pregnancy or while breastfeeding. They should talk to their doctors before using any kind of supplement.

KEY TERMS

Amino acids—Raw materials used by the body to manufacture proteins, which are vital components of all human cells.

Antioxidant—A substance that inhibits oxidation of another substance, such as low density lipoprotein (LDL). LDL can cause plaque build up and hardening of the arteries.

Methionine—An essential sulfur containing amino acid, found in protein foods.

Methylation—The process by which a methyl group (CH_3) is added to some compound, ion, or other chemical species.

Neural tube defects (NTDs)—A group of birth defects caused by failure of the neural tube to close completely during the formation of the baby's central nervous system. Recent research indicates that methionine deficiency in pregnant women increases the risk of NTDs in their newborns.

SAMe—An active compound made from methionine and adenosine triphosphate (ATP), an enzyme found in muscle tissue.

Side effects

No toxic dosage of methionine has been determined, but it may cause **nausea**, **vomiting**, drowsiness, and irritability in moderate amounts. Supplementation of up to 2 g methionine daily for long periods of time has not produced any serious side effects.

Interactions

There are no well–known drug interactions with methionine.

Resources

BOOKS

Methionine A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego: ICON Health Publications, 2004.

PERIODICALS

Koc, Ahmeti, and Vadim Gladyshev. "Methionine Sulfox ide Reduction and the Aging Process." *Annals of the New York Academy of Sciences* (April 2007): 383 396.

Mischoulon, David, and Maurizio Fava. "Role of S adenosyl L methionine in the Treatment of Depres sion: A Review of the Evidence." *American Journal of Clinical Nutrition* (November 2002): 1158S 1161S.

Shippy, R. Andrew, et al. "S adenosylmethionine (SAM e) for the Treatment of Depression in People Living with HIV/AIDS." *BMC Psychiatry* (November 2004): 38 43.

Tchantchou, F., et al. "S adenosyl Methionine: A Connec tion between Nutritional and Genetic Risk Factors for Neurodegeneration in Alzheimer's Disease." *Journal of Nutrition, Health, and Aging* (November December 2006): 541 544.

Van Brummelen, R., and D. du Toit. "L methionine as Immune Supportive Supplement: A Clinical Evalua tion." *Amino Acids* (July 2007): 157 163.

OTHER

MayoClinic.com. "SAMe." http://www.mayoclinic.com/health/same/NS_patient same (February 18, 2008).

VitaminStuff.com. "Methionine." http://www.vitamin stuff.com/methionine.html (February 18, 2008).

Wikipedia. "S adenosyl Methionine." http://en.wikipedia. org/wiki/S adenosylmethionine (February 18, 2008).

Melissa C. McDade
Rebecca J. Frey, PhD

Methylcobalamin *see* **Vitamin B_{12}**

Mexican yam

Description

Mexican yam is one of some 850 species of yam in the Dioscoreaceae family. It is a perennial plant with twisting, climbing vines that grows in warm tropical climates. There are also some twists and turns related to this plant's identity and its use as a herbal remedy.

The wild yam (*Dioscorea villosa*) is a climbing plant that is native to the southeast United States and Canada. Such wild yam species as *Dioscorea floribunda* as well as *Dioscorea villosa* are native to Mexico. These plants are used for the herbal preparations known as Mexican yam and Mexican wild yam. Mexican wild yam also grows in the southeastern United States and Appalachia.

An extract of this plant is used as a herbal remedy called Mexican yam, wild yam, and Mexican wild yam. It is sold as a "natural hormone" cream and oral remedy. Mexican wild yam is also known as **colic** root, China root, rheumatism root, devil's bones, and yuma.

There is another twist to this plant's identity. Although the Mexican yam has fleshy edible roots, this is not the yam that people associate with Thanksgiving dinner. That yam is actually the sweet potato, a vegetable that is the root of a trailing plant. It is a member of the morning glory family. The identification of the sweet potato as a yam is can be traced to the pre-Civil War era of slavery in the United States. The sweet potato reminded slaves from sub-Saharan Africa of the yam plants in their homeland.

General use

Mexican yam has long had a reputation as a woman's herb. During the eighteenth and nineteenth centuries, wild yam was used to treat menstrual **pain** and conditions related to childbirth . Pregnant women used wild yam to combat nausea , ease aching muscles, and prevent miscarriages.

Wild yam was also used as a colic remedy. Furthermore, the plant's anti-inflammatory properties were thought to be effective in the treatment of rheumatoid arthritis.

Most of those uses were forgotten after Japanese researchers in 1936 discovered that wild yam contained diosgenin, a chemical that scientist Russell Marker used in the 1940s to create synthetic progesterone and the hormone **DHEA**.

Synthetic progesterone

Marker worked with species of Mexican yams. Others used his technique for manufacturing progesterone to develop such products as the birth control pill and steroid drugs. During the 1990s, companies began marketing Mexican yam products as a source of natural progesterone and DHEA.

Mexican yam products are also advertised as treatments for menstrual problems and **osteoporosis**. They are sometimes recommended for hormone replacement therapy during menopause, and sometimes the natural hormones are said to slow down the aging process. In addition, Mexican yam and wild yam products are said to boost progesterone effects that fall during the last half of the month. A rise in hormones could help a woman conceive.

This marketing, in terms of the progesterone content and the results, has drawn criticism for misleading consumers. Herbal expert Varro Tyler described this campaign as a "wild yam scam" in his book, *Tyler's Honest Herbal.*

Mexican yam. *(©PlantaPhile, Germany. Reproduced by permission.)*

Contemporary uses of Mexican yam

Although Mexican yam cream does not provide natural progesterone, the herb can be used for cramping conditions like menstrual pain. It can help to build up good **cholesterol** levels while alleviating poor circulation, nervousness and restlessness. In addition, wild yam root tea has been suggested as a means of increasing a woman's ability to conceive.

Preparations

Mexican yam cream is marketed with the promise that it is natural progesterone. The cream is applied to the skin based on a woman's condition. Dosages are based on the outcome expected.

Mexican yam's other uses

Mexican yam is sold as a powdered herb, liquid extract, tincture, and in capsule form. While there are general dosage recommendations for wild yam, instructions on commercial packages should be followed since product strength can vary.

Wild yam tea, which is also known as an infusion, is made by pouring 1 cup (240 mL) of boiling water over 1–2 tsp (1.5–2.5 g) of the dried herb. The mixture is steeped for 10–15 minutes and then strained. Wild yam tea can be drunk three times a day.

A tincture of wild yam in an alcohol solution can be taken 3–4 times a day. A single dosage consists of 2–3 mL (approximately 1.2 tsp) of wild yam.

Wild yam capsules contain the dried root. The average dosage is 1–2 pills, taken three times daily.

Mexican yam combinations

Mexican yam can be combined with other herbs to treat a range of conditions. The following conditions can be treated by these combination remedies:

- Menstrual cramps can be treated with a tea made with wild yam and cramp bark. Those herbs can also be blended into a tea with such herbs as motherwort, fresh oats, and chamomile.
- Relief for rheumatoid arthritis may come from a combination of wild yam and black cohosh.

KEY TERMS

Diosgenin—A compound found in wild yam that has been used to make synthetic progesterone.

- For kidney stones, wild yam can be combined in a tea with such herbs as cramp bark, hydrangea root, and yarrow.

Precautions

Mexican wild yam is safe if taken within prescribed therapeutic dosages, according to the *PDR (Physician's Desk Reference) for Herbal Medicines*. The book draws on the findings of Germany's Commission E, a government agency that studies herbal remedies for approval as over-the-counter drugs. An English version of the German Commission E *Monographs* was published in 1997.

Pregnant and nursing women, as well as patients with hormone imbalances, **depression**, or hormone-sensitive cancers should avoid wild yam unless they are under the guidance of a clinical herbalist or physician.

Furthermore, although wild yam root tea has been suggested as a method for a woman to become pregnant, the herb should not be used during the last half of a menstrual period.

Side effects

Large doses of Mexican yam may produce **nausea**. There is also a risk of poisoning.

Interactions

There are no known interactions when Mexican yam is taken with standard medications, other herbs, or dietary supplements.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Tyler, Varro, and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660. Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200. Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

Liz Swain

Middle ear infection *see* **Ear infection**

Migraine headache

Definition

Migraine is a type of **headache** marked by severe head **pain** lasting several hours or more.

Description

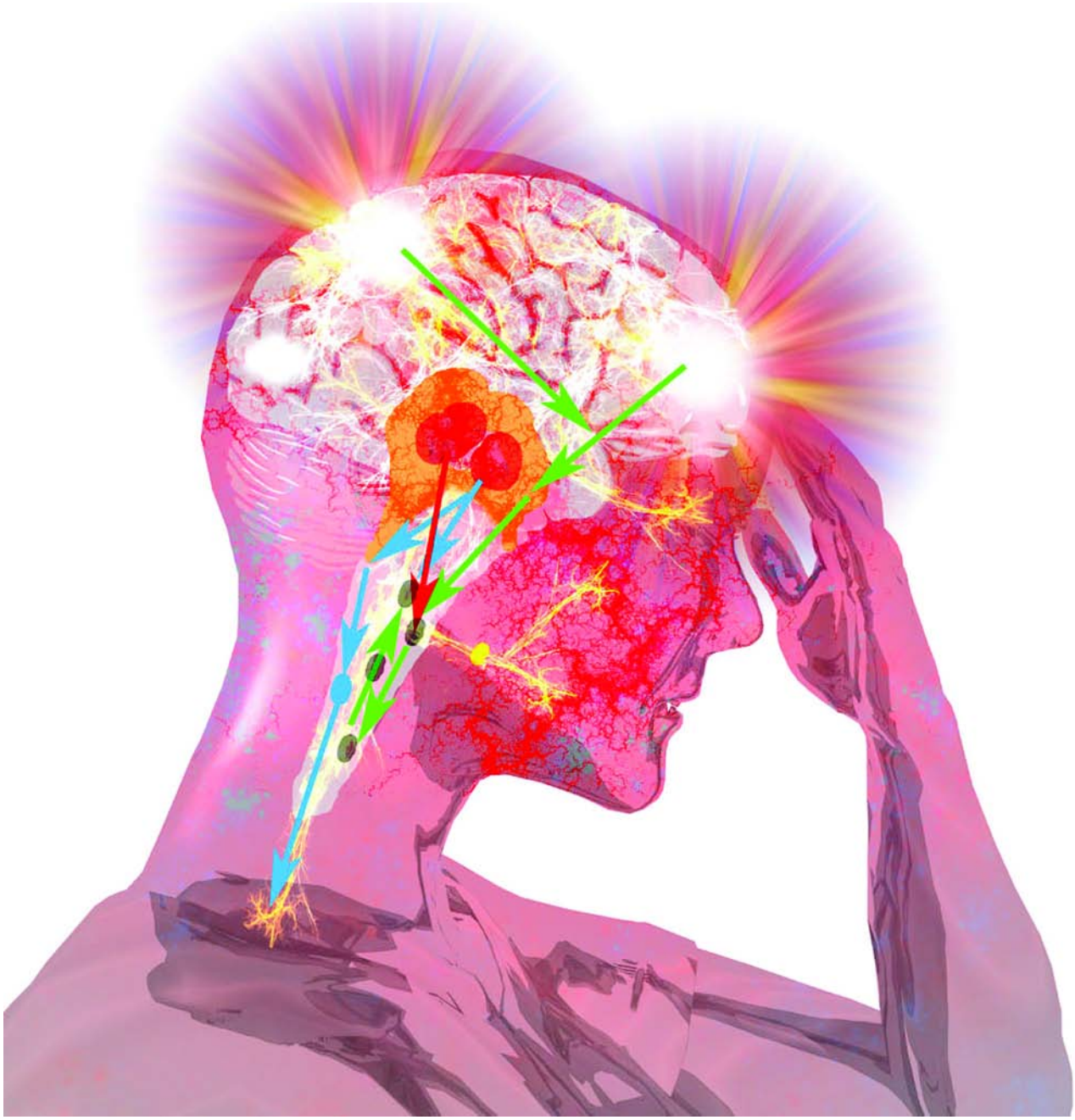
Migraine is an intense and often debilitating type of headache. The term *migraine* is derived from the Greek word *hemikrania*, meaning "half the head," because the classic migraine headache affects only one side of the person's head. Migraines affect as many as 24 million people in the United States, and are responsible for billions of dollars in lost work, poor job performance, and direct medical costs. Approximately 18% of women and 6% of men experience at least one migraine attack per year. Currently, one American in 11 now suffers from migraines, more than three times as many are women, with most of them being between the ages of 30 and 49. Migraines often begin in adolescence, and are rare after age 60.

Two types of migraine are recognized. Eighty percent of migraine sufferers experience "migraine without aura" (common migraine). In "migraine with aura," or classic migraine, the pain is preceded or accompanied by visual or other sensory disturbances, including hallucinations, partial obstruction of the visual field, numbness or tingling, or a feeling of heaviness. Symptoms are often most prominent on one side of the head or body, and may begin as early as 72 hours before the onset of pain.

Causes and symptoms

Causes

The physiological basis of migraine has proved difficult to uncover. There are a multitude of potential triggers for a migraine attack, and recognizing one's own set of triggers is the key to prevention.



Anatomy of a migraine. Sensory triggers cause the thalamus to interact with the trigeminal nucleus and nerve (red arrow) and dilate blood vessels in face and brain. Pain signals sent to the brainstem nuclei (green arrows). The hypothalamus may also send signals to the brainstem and gut to induce pain, nausea, and vomiting (blue arrows). *(© PHOTOTAKE Inc. / Alamy)*

PHYSIOLOGY. The most widely accepted hypothesis of migraine suggests that a migraine attack is precipitated when pain-sensing nerve cells in the brain (called nociceptors) release chemicals called neuropeptides. At least one of the neurotransmitters, substance P, increases the pain sensitivity of nearby nociceptors. This process is called sensitization.

Other neuropeptides act on the smooth muscle surrounding cranial blood vessels. This smooth muscle regulates blood flow in the brain by relaxing or contracting, thus dilating (enlarging) or constricting the enclosed blood vessels. At the onset of a migraine headache, neuropeptides are thought to cause muscle **relaxation**, allowing vessel dilation and

KEY TERMS

Aura—A group of visual or other sensations that precedes the onset of a migraine attack.

Autogenic training—A form of self-hypnosis developed in Germany that appears to be beneficial to migraine sufferers.

Coenzyme Q_{10}—A substance used by cells in the human body to produce energy for cell maintenance and growth. It is being studied as a possible preventive for migraine headaches.

Nociceptor—A specialized type of nerve cell that senses pain.

Transcutaneous electrical nerve stimulation (TENS)—A treatment in which a mild electrical current is passed through electrodes on the skin to stimulate nerves and block pain signals.

increased blood flow. Other neuropeptides increase the leakiness of cranial vessels, allowing fluid leak, and promote inflammation and tissue swelling. The pain of migraine is thought to result from this combination of increased pain sensitivity, tissue and vessel swelling, and inflammation. The aura seen during a migraine may be related to constriction in the blood vessels that dilate in the headache phase.

GENETICS. Susceptibility to some types of migraine is inherited. A child of a migraine sufferer has as much as a 50% chance of developing migraines. If both parents are affected, the chance rises to 70%. In 2002, a team of Australian researchers identified a region on human chromosome 1 that influences susceptibility to migraine. It is likely that more than one gene is involved in the inherited forms of the disorder. Many cases of migraine, however, have no obvious familial basis. It is likely that the genes that are involved set the stage for migraine, and that full development requires environmental influences, as well.

Two groups of Italian researchers have recently identified two loci on human chromosomes 1 and 14 respectively that are linked to migraine headaches. The locus on chromosome 1q23 has been linked to familial hemiplegic migraine type 2, while the locus on chromosome 14q21 is associated with migraine without aura.

TRIGGERS. A wide variety of foods, drugs, environmental cues, and personal events are known to trigger migraines. It is not known how most triggers set off the events of migraine, nor why individual migraine sufferers are affected by particular triggers but not others.

Common food triggers include:

- alcohol
- caffeine products, as well as caffeine withdrawal
- chocolate
- foods with an extremely high sugar content
- dairy products
- fermented or pickled foods
- citrus fruits
- nuts
- processed foods, especially those containing nitrites, sulfites, or monosodium glutamate (MSG)

Environmental and event-related triggers include:

- stress or time pressure
- menstrual periods, menopause
- sleep changes or disturbances, including oversleeping
- prolonged overexertion or uncomfortable posture
- hunger or fasting
- odors, smoke, or perfume
- strong glare or flashing lights

Drugs that may trigger migraine include:

- oral contraceptives
- estrogen replacement therapy
- Theophylline
- Reserpine
- Nifedipine
- Indomethicin
- Cimetidine
- oversuse of decongestants
- analgesic overuse
- benzodiazepine withdrawal

Symptoms

Migraine without aura may be preceded by elevations in mood or energy level for up to 24 hours before the attack. Other pre-migraine symptoms may include **fatigue**, **depression**, and excessive yawning.

Aura most often begins with shimmering, jagged arcs of white or colored light progressing over the visual field in the course of 10–20 minutes. This may be preceded or replaced by dark areas or other visual disturbances. Numbness and tingling are common, especially of the face and hands. These sensations may spread, and may be accompanied by a sensation of weakness or heaviness in the affected limb.

Migraine pain is often present only on one side of the head, although it may involve both, or switch sides during attacks. The pain is usually throbbing, and may

range from mild to incapacitating. It is often accompanied by **nausea** or **vomiting**, painful sensitivity to light and sound, and intolerance of food or odors. Blurred vision is also common.

The pain tends to intensify over the first 30 minutes to several hours, and may last from several hours to a day, or longer. Afterward, the affected person is usually weary, and sensitive to sudden head movements.

Diagnosis

Ideally, migraine is diagnosed by a careful medical history. Unfortunately, migraine is underdiagnosed because many doctors tend to minimize its symptoms as "just a headache." According to a 2003 study, 64% of migraine patients in the United Kingdom and 77% of those in the United States never receive a correct medical diagnosis for their headaches.

So far, laboratory tests and such imaging studies as computed tomography (CT scan) or magnetic resonance imaging (MRI) scans have not been useful for identifying migraine. However, these tests may be necessary to rule out a brain tumor or other structural causes of migraine headache in some patients.

Treatment

At the onset of symptoms, the migraine sufferer should seek out a quiet, dark room and attempt to sleep. Placing a cold, damp cloth or a cold pack on the forehead may help. Additionally, tying a headband tightly around the head can relieve migraines.

Migraine headaches are often linked with food **allergies** or intolerances. Identification and elimination of the offending food or foods can decrease the frequency of migraines and/or alleviate these headaches altogether.

Alternative treatments for migraine include:

- Acupressure. Pressing on the Gates of Consciousness (GB 20) points can relieve migraine.
- Acupuncture. A National Institutes of Health (NIH) panel concluded that acupuncture may be a useful treatment for headache.
- Aromatherapy. The essential oil rosemary eases migraine pain.
- Autogenic training. Autogenic training is a form of self-hypnosis developed in Germany in the 1930s that has been shown in several studies to relieve the pain of migraine.
- Cognitive behavior therapy.
- Herbals. Valerian (*Valeriana officinalis*), passionflower (*Passiflora incarnata*), feverfew (*Chrysanthemum parthenium*), ginger, ginkgo (*Ginkgo biloba*), goldenseal (*Hydrastis canadensis*), hawthorn (*Crataegus oxyacantha*), linden, wood betony (*Stachys officinalis*), skullcap (*Scutellaria lateriflora*), or cramp bark (*Viburnum opulus*) may relieve migraines.
- Hydrotherapy. Contrast showers, in which a short hot shower is followed by a longer cold shower, may halt an oncoming migraine. A hot enema can temporarily relieve migraine pain.
- Naturopathy. Migraine headaches are one of the most common reasons for consulting naturopathic practitioners. Naturopaths typically treat migraine with a combination of nutritional therapy and mind/body techniques.
- Relaxation techniques. Meditation, yoga, hypnosis, visualization, breathing exercises, or progressive muscular relaxation may halt the progression of a migraine.
- Supplements. Clinical studies have shown that vitamin B_2 (riboflavin), magnesium, 5-HTP, or melatonin can reduce the severity of migraines.
- Transcutaneous electrical nerve stimulation (TENS).

Allopathic treatments

Nonsteroidal anti-inflammatory drugs (NSAIDs) acetaminophen (Tylenol), ibuprofen (Motrin), and naproxen (Aleve) are helpful for early and mild headache. Excedrin Migraine is a combination product that is indicated for migraine headache.

More severe or unresponsive attacks may be treated with ergotamine (botulinum toxin), dihydroergotamine, sumatriptan (Imitrex), beta-blockers and **calcium** channel-blockers, antiseizure drugs, antidepressants (SSRIs), meperidine, or metoclopramide. Some of these drugs are also available as nasal sprays, intramuscular injections, or rectal suppositories when vomiting prevents taking the drug by mouth.

Sumatriptan and other triptan drugs (zolmitriptan, rizatriptan, naratriptan, almotriptan, and frovatriptan) should not be taken by people with any kind of vascular disease because they cause coronary artery narrowing. Otherwise these drugs have been shown to be very safe.

Continued use of some antimigraine drugs can lead to "rebound headache," marked by frequent or chronic headaches, especially in the early morning hours. Rebound headache can be avoided by using antimigraine drugs under a doctor's supervision, with the minimum dose necessary to treat symptoms. Tizanidine (Zanaflex) has been reported to be effective in treating rebound headaches when taken together with an NSAID.

Expected results

Most people can control migraines through recognizing and avoiding triggers, and by using effective treatments. Some people with severe migraines do not respond to preventive or drug therapy. Migraines usually wane in intensity by age 60 and beyond.

Prevention

The frequency of migraine headaches may be lessened by avoiding triggers. It is useful to track these triggers by keeping a headache journal.

One substance that is being studied as a possible migraine preventive is **coenzyme Q_{10}**, a compound used by cells to produce energy needed for cell growth and maintenance. Coenzyme Q_{10} has been studied as a possible complementary treatment for **cancer**. Its use in preventing migraines is encouraging and merits further study.

A study published in early 2003 reported that three drugs currently used to treat disorders of muscle tone are being explored as possible preventive treatments for migraine. They are botulinum toxin type A (Botox), baclofen (Lioresal), and tizanidine (Zanaflex). Early results of open trials of these medications are positive.

Anti-epileptic drugs, which are also known as anticonvulsants, are also being studied as possible migraine preventives. As of 2003, **sodium** valproate (Epilim) is the only drug approved by the Food and Drug Administration (FDA) for prevention of migraine. Such newer anticonvulsants as gabapentin (Neurontin) and topiramate (Topamax) are presently being evaluated as migraine preventives.

A natural preparation made from butterbur root (*Petasites hybridus*) has been sold in Germany since the 1970s as a migraine preventive under the trade name Petadolex. Petadolex has been available in the United States since December 1998 and has passed several clinical safety and postmarketing surveillance trials.

Other possible preventive measures include: eating at regular times, not skipping meals, reducing the use of **caffeine** and pain-relievers, restricting physical exertion (especially on hot days), and keeping regular sleep hours, but not oversleeping. Other measures include:

- Aerobic exercise, which can reduce the frequency of migraines.
- Biofeedback thermal control was found to be as effective as medications in preventing migraines.
- Celery juice consumed twice daily may help to prevent migraines.
- Feverfew was shown to reduce the severity and frequency of migraines. This herb should not, however, be used during pregnancy or by people taking blood-thinning medications.
- Ginger may help prevent migraines.
- Pulsing electromagnetic fields. A preliminary study found that pulsing electromagnetic fields reduced the frequency of migraines.
- Relaxation techniques can reduce migraine frequency.
- Supplementation with magnesium and riboflavin was shown to prevent migraines.

Resources

BOOKS

American Council on Headache Education. *Migraine: The Complete Guide*. New York: Dell, 1994.

"Migraine. " Section 14, Chapter 168 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Headaches." New York: Simon & Schuster, 2002.

PERIODICALS

Bendtsen, L. "Sensitization: Its Role in Primary Headache." *Current Opinion in Investigational Drugs* 3 (March 2002): 449 453.

Corbo, J. "The Role of Anticonvulsants in Preventive Migraine Therapy." *Current Pain and Headache Reports* 7 (February 2003): 63 66.

Danesch, U., and R. Rittinghausen. "Safety of a Patented Special Butterbur Root Extract for Migraine Preven tion." *Headache* 43 (January 2003): 76 78.

Diamond, S., and R. Wenzel. "Practical Approaches to Migraine Management." *CNS Drugs* 16 (2002): 385 403.

Freitag, F. G. "Preventative Treatment for Migraine and Tension Type headaches : Do Drugs Having Effects on Muscle Spasm and Tone Have a Role?" *CNS Drugs* 17 (2003): 373 381.

Lea, R. A., A. G. Shepherd, R. P. Curtain, et al. "A Typical Migraine Susceptibility Region Localizes to Chromo some 1q31." *Neurogenetics* 4 (March 2002): 17 22.

Lipton, R. B., A. I. Scher, T. J. Steiner, et al. "Patterns of Health Care Utilization for Migraine in England and in the United States." *Neurology* 60 (February 11, 2003): 441 448.

Marconi, R., M. De Fusco, P. Aridon, et al. "Familial Hemiplegic Migraine Type 2 is Linked to 0.9Mb Region on Chromosome 1q23" *Annals of Neurology* 53 (March 2003): 376 381.

Pryse Phillips, William E.M., et al. "Guidelines for the Nonpharmacologic Management of Migraine in Clin ical Practice." *Canadian Medical Association Journal* 159 (July 14, 1998): 47 54.

Rozen, T. D., M. L. Oshinsky, C. A. Gebeline, et al. "Open Label Trial of Coenzyme Q_{10} as a Migraine Preventive." *Cephalalgia* 22 (March 2002): 137 141.
Sheftell, F. D., and S. J. Tepper. "New Paradigms in the Recognition and Acute Treatment of Migraine." *Headache* 42 (January 2002): 58 69.
Sinclair, Steven. "Migraine Headaches: Nutritional, Bota nical and Other Alternative Approaches." *Alternative Medicine Review* 4 (1999): 86 95.
Soragna, D., A. Vettori, G. Carraro, et al. "A Locus for Migraine Without Aura Maps on Chromosome 14q21.2 q22.3." *American Journal of Human Genetics* 72 (January 2003): 161 167.
Stetter, F., and S. Kupper. "Autogenic Training: A Meta Analysis of Clinical Outcome Studies." *Applied Psy chophysiology and Biofeedback* 27 (March 2002): 45 98.
Tepper, S. J., and D. Millson. "Safety Profile of the Trip tans." *Expert Opinion on Drug Safety* 2 (March 2003): 123 132.

ORGANIZATIONS

American Council for Headache Education. 19 Mantua Road, Mt. Royal, NJ 08061. (609) 423 0043 or (800) 255 2243. http://www.achenet.org
National Headache Foundation. 428 West St. James Place, Chicago, IL 60614. (773) 388 6399 or (800) 843 2256. http://www.headaches.org
U. S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http:// www. fda.gov.

OTHER

"Migraine." *American Medical Association*. (cited December 2002). http://www.ama assn.org/special/migraine.

Belinda Rowland
Rebecca J. Frey, PhD

Milk Thistle. *(© blickwinkel / Alamy)*

Milk thistle

Description

Milk thistle (*Silybum marianum* or *Cardus marianum*) is a plant used for treating liver disorders, breast-feeding problems, and other illnesses. The active ingredient of the herb, silymarin, is found in the ripe seeds of the plant. The milk thistle plant has a long stem, green leaves with white spots, and pink to purple spiky flowered head (which true to its name, resembles a thistle). The plant is native to Europe and grows in the wild in the United States and South America. Other common names for the plant include Mary thistle, St. Mary thistle, Marian thistle, and lady's thistle.

The medicinal benefits of milk thistle have been valued for more than 2,000 years. Written records show that as early as the first century, Romans were using the plant as a liver-protecting agent. The plant was also frequently used throughout the Middle Ages, and it is in the herbal literature of this period that the medicinal properties of milk thistle seeds are first noted. Nicholas Culpepper, a British herbalist, wrote about the value of the herb in treating diseases of the liver and spleen in the late eighteenth century, and by the end of the next century, records show that American physicians were also prescribing the substance. Silymarin was first isolated from the milk thistle plant by German scientists in the 1960s.

The leaves and stem of the milk thistle plant are edible, and can be used in salads or eaten raw. The plant was cultivated as a vegetable in Europe through the end of the nineteenth century.

General use

Milk thistle is prescribed for a number of medicinal uses, including liver disease treatment and prevention, HIV treatment, lactation problems, gallbladder

KEY TERMS

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with disease processes such as cancer.

Flavonoid—Any of a group of aromatic compounds that includes many common pigments, such as the anthocyanins and flavones.

Tincture—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture. Tinctures can also be prepared using vinegar or glycerin instead of alcohol.

disorders, mushroom poisoning, and **psoriasis**, a chronic skin disease characterized by reddish patches.

Liver disease

Milk thistle is thought to promote the growth of new liver cells, and to prevent toxins from penetrating through healthy liver cells by binding itself to the cell membranes. It is prescribed for **cirrhosis**, **hepatitis**, and other liver disorders. Several clinical studies have demonstrated that individuals with cirrhosis who take daily doses of milk thistle extract have a lower mortality rate than those who took a placebo (or sugar pill). While further research needs to be completed, a 2001 article reports that clinical trials show that milk thistle (at 140 mg three times per day) did indeed improve survival among cirrhosis patients.

In addition, milk thistle may have a protective effect on the liver, and is sometimes prescribed for patients who take medications that can cause liver damage (e.g., Thorazine, Haldol), or those who are exposed to liver-damaging substances such as lead. A large, controlled trial sponsored by the National Center for Complementary and Alternative Medicine (NCCAM) and the National Institutes of health (NIH) of milk thistle's medicinal value in the treatment of hepatitis and liver injury was scheduled to begin in the year 2000.

HIV treatment

Milk thistle is sometimes prescribed for HIV-positive patients to protect the liver from diseases such as hepatitis and from the hepatotoxic effects of other medications prescribed for HIV treatment.

Lactation problems

Milk thistle is frequently prescribed for breast-feeding mothers to promote increased breast milk secretion. Although the herb is considered safe for nursing mothers, it should be acquired from a reputable source and prescribed by an herbalist, naturopathic physician, or other healthcare professional familiar with its use.

Cancer prevention

The active chemical components of the milk thistle, silymarin (a complex of flavonoids) and its constituent, silibin, act as **antioxidants**. These substances have been shown to slow cell growth in some types of **cancer**.

Gallbladder disorders

Milk thistle may prevent inflammation of the gallbladder ducts and clear up **jaundice**.

Death cap mushroom poisoning

Milk thistle is the only known antidote for death cap mushroom (*Amanita phalloides*) poisoning. Ingesting this deadly mushroom can destroy the liver by shutting down protein production in liver cells. Milk thistle neutralizes these toxins and protects the liver. Milk thistle may also be helpful in acetaminophen overdosage.

Psoriasis

Because the liver neutralizes certain toxins associated with psoriasis attacks, milk thistle is believed to help prevent psoriasis outbreaks by promoting proper liver function.

Several other dermatological uses for the herb are currently under investigation. The antioxidant properties of the herb may have a healing effect on skin **wounds** and **burns**. Milk thistle has also been proposed as a cosmetic agent to retain skin tone and quality. Further studies are needed to prove the efficacy of the herb for these applications.

Preparations

Milk thistle is available in seed form, in capsules, and in extracts and tinctures. A tincture is an herbal preparation made by diluting the herb in alcohol. Tinctures of milk thistle can be taken in 1 or 2 ml doses three times a day.

Milk thistle seed has a low level of water solubility, so infusions (or teas) made from the herb are weaker than milk thistle tinctures and extracts. An

infusion of milk thistle can be prepared by pouring a cup of boiling water over one teaspoon of seeds that have been ground to a fine texture. After the mixture steeps for 10-20 minutes, the herb is strained out and the mixture can be drunk. Instead of straining, the herb can also be placed into an infuser ball, tea bag, or a piece of cheesecloth or muslin and removed after steeping. Individuals can drink two to three cups of the infusion daily.

Milk thistle seed can also be taken by mouth in a dose of 1 tsp of fresh ground seeds daily. The herb should always be stored in an airtight container in a cool location away from bright light to maintain its potency.

Precautions

Individuals who suspect they have a liver disorder should always seek care from a healthcare professional.

Milk thistle should always be obtained from a reputable source that observes stringent quality control procedures and industry-accepted good manufacturing practices. Consumers should look for the designations "U.S.P." (*U.S. Pharmacopeia*) or "NF" (*National Formulary*) on milk thistle labeling. Herbal preparations prepared under USP or NF guidelines meet nationally recognized strength, quality, purity, packaging, and labeling standards as recommended by the U. S. Food and Drug Administration (FDA).

Botanical supplements are regulated by the FDA; however, they currently do not have to undergo any approval process before reaching the consumer market, and are classified as nutritional supplements rather than drugs. Legislation known as the Dietary Supplement Health and Education Act (DSHEA) was passed in 1994 in an effort to standardize the manufacture, labeling, composition, and safety of botanicals and supplements, and in January 2000, the FDA's Center for Food Safety and Applied **Nutrition** (CFSAN) announced a 10-year plan for establishing and implementing these regulations by the year 2010.

Pregnancy

Milk thistle is considered safe to use during **pregnancy** and in women who breastfeed. However, there are currently no long-term studies on use of the herb during pregnancy or lactation. A woman should speak with her healthcare practitioner before taking any herbs and/or medications during pregnancy.

Side effects

Milk thistle may cause mild **nausea** and **diarrhea**, or loose stools. The herb may also cause an allergic reaction in some individuals, particularly those with known **allergies** to plants in the Asteraceae family (thistles, daisies, artichokes). No other widely reported side effects are known when milk thistle is taken in proper therapeutic dosages. However, people with chronic medical conditions should consult with their healthcare professionals before taking the herb.

Interactions

There are no reported negative interactions between milk thistle and other medications and herbs, although certain drugs with the same therapeutic properties as milk thistle may enhance the effect of the herb. Again, individuals should consult their healthcare provider if they are taking other medications concurrently with milk thistle.

Resources

BOOKS

Medical Economics Corporation. *The PDR for Herbal Medicines*. Montvale, NJ: Medical Economics Corpo ration, 1998.

Hoffman, David. *The Complete Illustrated Herbal*. New York: Barnes & Noble Books, 1999.

PERIODICALS

Tyler, Varro. "This weed is a potent healer; protect your body from environmental toxins with milk thistle." *Prevention* 50, no. 1 (October 1998):79.

Walsh, Nancy. "Milk Thistle for Liver Disease (Alternative Medicine: An Evidence Based Approach." *Internal Medicine News* (January 1, 2002): 10.

ORGANIZATIONS

Office of Dietary Supplements. National Institutes of Health. Building 31, Room 1B25, 31 Center Drive, MSC 2086, Bethesda, Maryland 20892 2086. (301) 435 2920 Fax: (301) 480 1845. http://odp.od.nih.gov/ods.

Paula Ford-Martin
Teresa Odle

Mind/body medicine

Definition

Mind/body medicine, also known as behavioral medicine, is the field of medicine concerned with the ways that the mind and emotions influence the body and physical health.

Origins

There was a time not long ago when Western medicine believed that health depended solely upon the physical mechanisms of the body. That is, a person is made up only of physical and chemical reactions that can be measured and manipulated scientifically. The notion that the mind and body live in separate compartments, so to speak, goes back to certain philosophers of classical antiquity. This concept of mind/body separation was also present in such religious groups as the Gnostics and some sects on the fringes of medieval Christianity. The scientific version of this split between mind and body is generally traced back to the seventeenth-century French philosopher Rene Descartes, whose thinking aided the development of science. It has taken a lot of time and research, three centuries after Descartes, for mainstream medicine to begin to accept that the mind plays a major role in health and disease.

The idea that the mind and body interact is not new, however. It can be traced to the Wisdom literature in the Old Testament and to Hippocrates, the father of Western medicine. The ancient Hebrews attributed some physical illnesses to grief or anger. Hippocrates believed that health depends upon a balance of the body, mind and environment, and that disease is caused by imbalances in these areas. As modern science progressed, the mind and emotions became neglected, since researchers found it difficult to measure and quantify mental states with the scientific methods and equipment that were so highly valued.

In the early 1900s, Harvard physiologist Walter Cannon coined the term "fight-or-flight response" for the body's reaction to threats, a response that causes increases in heart rate, blood pressure, blood sugar, muscle tension and respiration. During the 1950s, Hans Selye of McGill University pioneered research in what he called **stress**. Selye determined that the fight-or-flight response could be triggered by psychological factors as well as by physical threats. Stress includes having fight-or-flight reactions in situations where there is no immediate threat except mental perceptions and worries. Stress is not necessarily negative, except when people fail to cope with it effectively. Selye's work laid the groundwork for researchers to determine that stress and reactions to it play an integral role in health and disease.

Other mind/body relationships became apparent to medical researchers. The so-called **placebo effect** has been studied by doctors and psychologists for years. In clinical experiments, people who are given inert substances made to look like medicines, such as sugar pills, often experience the same improvements as those patients who are given real medications. It is estimated that nearly one out of every three patients improves with medication simply because of the placebo effect, and not because of the drug itself. Researchers have also noted that some conditions and illnesses have no physical explanations. Doctors termed these conditions psychosomatic illnesses, as they seem to be caused by the psyche, or mind.

Researchers then theorized that certain personality types are susceptible to particular conditions. For instance, "Type A" personalities tend to be aggressive, ambitious, and always rushed. They tend to cope with stress by getting angry and upset. Researchers have found that these personalities are more prone to **heart disease**, high blood pressure, and other stress-related conditions. "Type B" personalities are those who cope with stressful situations with communication and balance instead of anger and aggression, and have been found to be less prone to stress-related conditions. Researchers have added a "Type C" personality, who tends to suppress emotions and has trouble with self-expression. Some clinicians have proposed a link between suppressed emotions and the development of **cancer**.

In the past few decades, researchers have begun to unravel the complex ways in which the mind and body interact. Many findings have demonstrated that the

KEY TERMS

Behavioral medicine—The branch of medicine that studies mind/body relationships.

Fight-or-flight response—The body's reaction to threats.

Mantra—A sacred word or formula repeated over and over to concentrate the mind.

Placebo—A pharmacologically inactive substance disguised as a real medication.

Psychoneuroimmunology—The study of the relationships among mind, nervous system, and immune response.

Psychosomatic—A type of physical illness caused by mental factors.

Relaxation response—The calming of bodily responses through relaxation techniques.

Vipassana—A Buddhist meditative practice that emphasizes deep attentiveness to the present moment.

mind and body are intimately interconnected. Medical science has shown that the nervous system works closely with the immune system, systems that were at one time believed to be separate. Nerve endings have been found that connect directly to important components of the immune system called lymph nodes. This connection demonstrates that there is a physical link between the mind and the immune system. Studies have also shown that thoughts and emotions alone can influence the activity of immune system cells.

In the 1970s, Dr. Herbert Benson at Harvard Medical School discovered what he called the "relaxation response." Benson observed that trained **yoga** specialists (yogis) could control bodily functions that had previously been believed to be autonomic, or beyond the control of the mind. During **meditation**, these yogis could reduce their heart rates, blood pressure, metabolism, body temperature, and other physiological processes to surprising levels. Other people who were then taught meditation were able to reach deep states of **relaxation** and calmness as well. This relaxation response, as Benson termed it, is essentially the opposite of the fight-or-flight response. The relaxation response reduces blood pressure, respiration, heart rate, oxygen consumption, muscle tension, and other bodily processes that are elevated by stress. Researchers soon began to theorize that if stress could have harmful effects on health, then the relaxation response might have the opposite effect. It wasn't long before the Harvard Mind/Body Medical Institute was founded, and other major medical clinics followed by integrating mind/body practices and studies into their health programs. A new field opened up in academic medicine called **psychoneuroimmunology** (PNI), which is the study of how the mind and nervous system affect the immune system. Studies have since shown that the mind and emotions play roles in many diseases, including cancer, diabetes, heart disease, gastrointestinal problems, and **asthma**.

In 1993, Dr. David Eisenberg wrote in the *New England Journal of Medicine* about a study that showed that one out of every three adults in America had used some form of unconventional medicine. Of those alternative treatments, mind/body practices were used most often. The popular PBS series by journalist Bill Moyers, called *Healing and the Mind*, brought mind/body medicine into millions of homes. Dr. Benson of Harvard claims that mind/body medicine should no longer be considered alternative. Despite the acclaim and success, however, there is still resistance to the simple idea that the mind is an important part of health, and many mainstream doctors still adhere to the belief that medicine is just a matter of "drugs killing bugs."

Benefits

Mind/body therapies have shown promise in treating cancer, heart disease, **hypertension**, asthma, and mental illness. They have been used as effective complementary therapies alongside such conventional treatments as surgery and chemotherapy. Mind/body therapies have also been shown to increase quality of life, reduce **pain**, and improve symptoms for people with chronic diseases and health conditions. They may also help control and reverse certain diseases, particularly those that are stress-related. By reducing stress, mind/body therapies may even prevent many diseases. Another benefit of mind/body therapies is that they pose very little risk. Some are inexpensive, and most have few side effects.

Description

There are many alternative techniques that draw upon the interconnections between mind and body. These include **art therapy**, assertiveness training, autogenic training, bioenergetics, **biofeedback**, **breath therapy**, mental imagery, dance and **movement therapy**, dreamwork, Gestalt therapy, group therapy, hypnosis, meditation, mindfulness training, Jungian psychoanalysis, postural integration, **prayer** and faith healing, progressive relaxation, psychodrama, **psychotherapy**, Reichian therapy, support groups, and yoga. Some of the most widely used techniques are meditation, mindfulness training, biofeedback, breath therapy, hypnosis, mental imagery, and movement therapies, which are discussed below.

Costs can vary widely for mind/body treatments, depending on the type and the medical training of the practitioner. Many insurance companies will reimburse some mind/body treatments and training sessions; consumers should be aware of their insurance provisions.

Meditation

There are many forms of meditation, but they all have the same goal, which is to calm and focus the mind. As beginning meditators find out, however, calming and clearing the mind of thoughts and worries is easier said than done. When performed on a regular basis, meditation is an efficient way of promoting the relaxation response. Meditation is used to ease the discomfort of many health problems, including stress-related conditions, chronic pain, panic disorders, tension headaches, and asthma. A 2002 report stated research shows that transcendental meditation can reduce hardening of the arteries, eventually helping reduce risk of **heart attack** and **stroke**.

Meditation can be practiced anywhere, but a quiet and peaceful setting is recommended. Meditators should sit or lie in a comfortable position. Sitting with the spine as straight as possible without straining is the most commonly recommended position. Breathing during meditation should be deep, calm and slow. The meditator may concentrate on the breath or on a still object such as a flower or candle flame. The meditator often may repeat a soft sound, word, or phrase, known as a mantra. Mantras can be affirmative statements, prayers, or humming sounds. The goal of the meditator is to concentrate deeply in order to reduce the amount of thinking, and to calm the worries and thoughts that typically fill the mind. When thoughts or distractions arise, the meditator should allow them to pass without directing attention toward them.

Meditation should be done twice a day, for 20 minutes at a time, preferably at consistent times to develop discipline. It can be learned from books or tapes, but instruction is widely available and recommended, as beginners can find properly meditating and quieting the mind to be difficult at first.

Mindfulness training

This form of mental discipline was made popular by Dr. Jon Kabat-Zinn, a psychologist at the University of Massachusetts Medical Center, who has written some popular books on mind/body medicine. Kabat-Zinn uses mindfulness training to help patients deal with chronic illnesses and pain. Mindfulness training is also good for stress-related conditions, and those undergoing difficult treatments like surgery or chemotherapy. Practitioners of mindfulness claim it helps them experience more pleasure and less stress in their everyday activities.

Mindfulness training originates from a Buddhist practice called *vipassana*. Its basic idea is that deep awareness of the present moment is the essential discipline. Lack of awareness and attention can lead to stress and bad health habits. To be mindful is to participate fully in whatever one is doing at the present moment, whether reading, walking, working, eating, exercising, relaxing, etc. When a person pays full attention to the present moment without judgment, then worries about the past and future tend to disappear, and stress levels are also significantly reduced.

Mindfulness training teaches that painful situations and emotions should be experienced with full attention as well, which helps people to confront and accept them. Mindfulness training also uses techniques like the body scan, in which the patient focuses full attention on each part of the body in succession. This technique helps people become more aware of their bodies and learn to control their reactions to stress, change, and illness.

Biofeedback

Biofeedback uses special instruments that measure and display heart rate, perspiration, muscle tension, brain wave activity, body temperature, respiratory patterns, and other indicators of stress and physiological activity. Patients can observe their measurements and learn to consciously control functions that were previously unconsciously controlled. Biofeedback also helps people learn how to initiate the relaxation response quickly and effectively.

Biofeedback is used to treat hypertension, stress-related headaches, migraine headaches, attention-deficit disorder, and diabetes. Biofeedback is used often in physical therapy to rehabilitate damaged nerves and muscles. It is also an approved treatment for a vascular disorder called **Raynaud's syndrome**. Patients with this syndrome experience blanching and numbness in their hands and feet in response to cold or emotional stress. A 2002 study showed that biofeedback helped children with a disease called vesicoureteral reflux (an abnormal backflow or urine from the bladder to the ureter) learn to correct reflux. This helped the children avoid surgery and prolonged antibiotic therapy.

Breath therapy

Breath therapy works on the premise that breathing plays a central role in the body and mind. People who are under stress tend to breathe rapidly and shallowly, whereas slow and deep breathing has been shown to reduce stress and promote the relaxation response. In **Ayurvedic medicine** and **traditional Chinese medicine**, the breath is considered the most important metabolic function. In yoga, there is a science of breathing techniques known as pranayama, which is designed to reduce stress and promote health.

Breath therapy is often used in conjunction with meditation and other mind/body techniques. It can be learned from books and tapes, or can be learned from a yoga or mind/body specialist. It is an inexpensive treatment, and once learned can be practiced easily anywhere.

Hypnosis

Hypnosis is deeply focused attention that brings about a trance state that is somewhere between waking and sleeping. During hypnosis, the mind is very open to suggestion. Mental imagery is often used in conjunction with hypnosis to maximize positive thinking and healing.

Hypnosis, or **hypnotherapy**, is used to reduce stress, **anxiety**, and pain, and help patients suffering from chronic diseases. It is also used to assist people in overcoming bad health habits, and addictions to nicotine, alcohol and drugs. Some dentists use hypnosis to help patients relax during dental procedures. Research continues to show the benefits of hypnosis. In 2002, a summary of recent studies included one that evaluated the effectiveness of self–hypnosis for patients undergoing angioplasty and other medical procedures. They required half the sedation of patients in control groups, and their procedures took less time. Pregnant adolescents who were counseled on hypnosis needed less anesthesia during delivery, needed less pain medication after delivery, and left the hospital sooner than patients in the control groups. Hypnosis is best performed by trained hypnotherapists, who can teach techniques of self-hypnosis to the patient.

Mental imagery

This technique uses the imagination to stimulate healing responses in the body, as studies have shown that the imagination can cause the same activity in the brain and immune system as real events. Patients are taught to imagine places or situations in which they have felt happy, healthy, or safe. Patients can also focus on images that increase confidence, reduce stress, and promote healing. Cancer patients are taught to imagine that their immune cells are eliminating cancer cells from their bodies. Heart attack sufferers are taught to imagine their hearts getting healthy and strong. Women can mentally rehearse **childbirth**, and patients imagine themselves successfully going through surgery as preparation for the real event.

Mental imagery has shown promise treating immune system problems, and is used often in cancer treatment and **AIDS** cases. It has been used to treat **irritable bowel syndrome** and asthma. Mental imaging techniques are also used in conjunction with many other mind/body techniques like meditation and hypnosis, as it is an efficient means of promoting positive mental attitudes. Mental imaging techniques can be learned from books, audiotapes, videos, and from professional therapists and teachers.

Movement therapy

Movement routines such as **dance therapy** have been shown to have a significant mind/body element. In these therapies, which also include **martial arts**, yoga, and tai chi, strict routines of physical movements are designed to involve high levels of mental concentration and awareness of the body. Movement therapies are good for people who have trouble sitting still for meditation, and are an excellent way of improving physical strength and mental health at the same time.

Precautions

Mind/body practices are safe and have few side effects. They should not, however, be relied upon solely when other medical care is required, particularly for serious conditions like heart disease, cancer, or diabetes. Consumers should also seek out reliable and properly trained practitioners, particularly in those practices and states for which certification is not required by law.

Research and general acceptance

Because of its increasing acceptance by mainstream medicine, mind/body medicine has been the subject of intense research. Studies have shed new light on everything from the minute interactions of the immune and nervous systems to the effective results of individual therapies like meditation and **guided imagery**. Other studies have indicated relationships between stress and disease. Some eye-opening results have been observed as well, such as studies that have shown that cancer and heart disease patients utilizing mind/body techniques had significantly longer survival rates on average than those patients who did not use mind/body therapies. Despite increasingly proven benefits to mind–body medicine, few health plans pay for the treatments.

Training and certification

Training programs and certification criteria tend to vary with individual therapies and states.

The Biofeedback Certification Institute of America lists certified biofeedback practitioners. Address: 10200 W. 44th Ave., Suite 304. Wheatridge, CO 80033. (303) 420-2902.

The American Society of Clinical Hypnosis is the largest organization for certifying hypnotherapists. Address: 2200 East Devon Ave., Suite 291. Des Plaines, IL 60018. (708) 297-3317.

The Wellness Community provides information on support groups organized throughout the country. Address: 2716 Ocean Park Blvd., Suite 1040. Santa Monica, CA 90405. (310) 314-2555.

The Academy for Guided Imagery provides resources for mental imaging treatments. Address: PO Box 2070. Mill Valley, CA 94942. (800) 726-2070.

ANDREW WEIL (1942–)

Dr. Andrew Weil, a Harvard educated physician, adds credibility and expertise to the natural healing methods he espouses in his best selling books, on his Internet Web site, in his talk show appearances, and in his popular audio CD of music and meditation. Weil's *Spontaneous Healing* spent more than a year on the best seller list, and his 1997 book, *Eight Weeks to Optimum Health*, also was a runaway best seller. Perhaps the best known proponent of naturalistic healing methods, Weil has been trying to establish a field he calls integrative medicine. He is director of Tucson's Center for Integrative Medicine, which he founded in 1993. In 1997, he began training doctors in the discipline at the University of Arizona, where he teaches.

After getting his bachelor's degree in botany from Harvard University, Weil applied for admission to Harvard Medical School in 1964. During his second year, he led a group of students who argued they could succeed better studying on their own than going to classes; in fact, the group got higher scores on their final exams than their classmates. After graduating from Harvard Medical School, he volunteered at the notorious counter cultural Haight Asbury Free Clinic in San Francisco, CA. Later in 1969, Weil got a job in Washington, DC, with the National Institute of Mental Health's Drug Studies Division. From 1971 to 1975, he traveled extensively in South America and Africa, soaking up information about medicinal plants, shamanism, and natural healing techniques. He never returned to the practice of conventional medicine.

His approach to alternative medicine is eclectic, mingling traditional medicine with herbal therapy, acupuncture, homeopathy, chiropractic, hypnotism, cranial manipulation, and other alternative healing methods. Though his books discuss the benefits of everything from healing touch to herbal cures, Weil doesn't dismiss the benefits of standard Western medicine when appropriate.

The Vipassana Meditation Center is a resource for those interested in mindfulness training and meditation. Address: PO Box 24. Shelbourne Falls, MA 01370. (413) 625-2160.

Resources

BOOKS

Benson, Herbert, MD. *The Relaxation Response*. New York: Random House, 1992.

Borysenko, Joan. *Minding the Body, Mending the Mind*. New York: Bantam, 1988.

Cousins, Norman. *Head First: The Biology of Hope and the Healing Power of the Human Spirit*. New York: Viking, 1990.

Goleman, Daniel, and Joel Gurin, eds. *Mind/Body Medicine*. Yonkers, NY: Consumer Reports Books, 1993.

Kabat Zinn, Jon. *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness*. New York: Dell, 1990.

PERIODICALS

Advances: The Journal of Mind Body Health. 9292 West KL Ave. Kalamazoo, MI 49009. (616) 375 2000.

"Hypnosis: Theory and Application Part II." *Harvard Mental Health Letter* (June 2002).

Jesitus, John. "Mind and Body Medicine: Putting Mind Over Health Matters (Feature Story)." *Managed Healthcare Executive* (April 2002): 33.

Morain, Claudia. "Biofeedback Speeds Resolution of Reflux in Children." *Urology Times* (April 2002): 23.

"Research Briefs: Meditation Reduces Atherosclerosis." *GP* (May 13, 2002):4.

ORGANIZATIONS

The Mind/Body Medical Institute. Deaconess Hospital. 1 Deaconess Road. Boston MA 02215.

Center for Mind Body Medicine. 5225 Connecticut Ave. NW, Suite 414. Washington, DC 20015. (202) 966 7338.

Center for Attitudinal Healing. 19 Main Street. Tiburon, CA 94920. (415) 435 5022.

Douglas Dupler
Teresa G. Odle

Mindfulness meditation *see* **Meditation**

Mistletoe

Description

Mistletoe is a parasitic evergreen plant that lives on trees such as oaks, elms, firs, pines, apples, and elms. The parasitic plant has yellowish flowers; small, yellowish green leaves; and waxy, white berries. There are many species of this plant in the Viscacea and Loranthacea plant families. European mistletoe (*Viscum album*) and American mistletoe (*Phoradendron leucarpum*) are used as medical remedies. In addition to Europe and North America, mistletoe is also found in Australia and Korea.

Mistletoe berries are poisonous to cats and other small animals. There is, however, some debate about

Mistletoe. *(© Holt Studios International Ltd. / Alamy)*

KEY TERMS

Amenorrhea—Abnormal absence or suppression of menstruation.

Chorea—A nervous system disorder that causes involuntary jerking or spasms. Also known as St. Vitus dance.

Orthostatic—Related to or caused by an upright position.

Pharmacognosist—A person involved in pharmacognosy, the science concerned with the medical products of plants in their natural state.

Subcutaneous—Beneath the skin.

Vertiginous attacks—Attacks of vertigo or dizziness.

how toxic the berries are to humans, and there is controversy about whether it is safe to use mistletoe as a remedy. Mistletoe is also known as mystyldene, all-heal, bird lime, golden bough, and devil's fuge.

General use

Mistletoe is known popularly as the plant sprig that people kiss beneath during the Christmas season. That custom dates back to pagan times when, according to legend, the plant was thought to inspire passion and increase fertility.

In the centuries since then, mistletoe has acquired a reputation as a nearly all-purpose herbal remedy. In the seventeenth century, French herbalists prescribed mistletoe for nervous disorders, epilepsy, and the spasms known as the St. Vitus dance.

Mistletoe has also been used in folk medicine as a digestive aid, heart tonic, and sedative. It was used to treat arthritis, hysteria and other mental disturbances, **amenorrhea**, **wounds**, asthma, bed wetting, infection, and to stimulate glands.

For centuries, mistletoe also served as a folk medicine treatment for **cancer**, and the plant is currently used in Europe to treat tumors. Iscador is an extract of the European mistletoe plant that is said to stimulate the immune system and kill cancer cells. It reportedly reduces the size of tumors and improves the quality of life. One team of researchers in France has found evidence that mistletoe extracts increase the efficiency of the body's natural killer cells in destroying cancer cells. A German study published in 2002 indicates that Iscador does indeed inhibit tumor growth. Another recent German case study of an 80-year-old woman with metastasized **breast cancer** documented that the patient lived for 41 months after first being given Iscador, with good quality of life. Iscador is one brand name of the mistletoe extract in Europe, and other brand names include Helixor and Eurixor.

Other contemporary uses of mistletoe include treatment of rheumatism, **anxiety**, migraine headaches, dizziness, high blood pressure, relief of spasms, **asthma**, rapid heartbeat, **diarrhea**, hysteria, and amenorrhea. Research continues on the use of mistletoe to treat **AIDS** patients.

There are some differences among the species. American mistletoe is said to cause a rise in blood pressure, while its European counterpart is believed to lower blood pressure.

Although mistletoe appears to be a multipurpose remedy, there is disagreement among medical experts about the safety and effectiveness of this herb. The

number of possible interactions with other medications described below indicates that mistletoe should be used with caution.

Preparations

In alternative medicine, the leaves, twigs, and sometimes the berries of mistletoe are used. In Europe, mistletoe remedies range from tea made from mistletoe leaves to injections of Iscador. While European research indicates that mistletoe is safe and effective, sources in the United States maintain that the berries are poisonous and that the herb can cause liver damage.

Since mistletoe has not been tested by the United States Food and Drug Administration (FDA), many experts urge caution until more research is completed. European research includes work completed by Germany's Commission E, a governmental agency that studies herbal remedies for approval as over-the-counter drugs. An English version of the German Commission E monographs was published in 1997 and was the basis for the *PDR (Physicians' Desk Reference) for Herbal Medicines*.

Home remedies

Mistletoe tea may be taken for high blood pressure, asthma, epilepsy, nervousness, diarrhea, hysteria, whooping cough, amenorrhea, vertiginous attacks, and chorea. The tea is prepared by adding 1 tsp (5 g) of finely cut mistletoe to 1 cup (250 ml) of cold water. The solution is steeped at room temperature for 12 hours and then strained. Up to 12 cups of tea may be consumed each day.

Mistletoe wine is prepared by mixing 8 tsp (40 g) of the herb into 34 oz (1 L) of wine. After three days, the wine can be consumed. Three to four glasses of medicinal wine may be consumed each day.

Mistletoe must be stored away from light and kept above a drying agent.

Cancer treatment

Iscador, the European extract, may be injected before surgery for cancers of the cervix, ovary, breast, stomach, colon, and lung. Cancer treatments can take several months to several years. The treatment is given by subcutaneous injection, preferably near the tumor. Iscador may be injected into the tumor, especially tumors of the liver, cervix, or esophagus.

The dosage of Iscador varies according to the patient's age, sex, physical condition, and type of cancer. The treatment usually is given in the morning three to seven days per week. As treatment continues, the dosage may be increased or adjusted.

European cancer research has been conducted since the 1960s, and most has involved European mistletoe. However, researchers believe there may be some similar active components in other species. In the United States, some cancer patients may qualify for participation in clinical trials of Iscador.

Advocates of Iscador believe it can stimulate the immune system, kill cancer cells, inhibit the formation of tumors, and extend the survival time of cancer patients. They maintain that mistletoe can help prevent cancer and serve as companion therapy for standard cancer treatments. They also think that mistletoe could possibly repair the DNA that is decreased by chemotherapy and radiation.

In general, however, American researchers are skeptical about European claims regarding mistletoe as an effective cancer remedy. The latest information summary on mistletoe extracts, updated in May 2002 and available from the National Cancer Institute web site, states that "There is no evidence from well-designed clinical trials that mistletoe or any of its components are effective treatments for human cancer."

AIDS treatment

Mistletoe extract has been used to combat AIDS. In 1998 European studies, Iscador injections were used to improve the immune response. Experts reported from early results that when patients were given Iscador, no additional progression of HIV was seen. The combination of Iscador with standard therapy could be potentially beneficial, but more research is needed.

In 1996, the first United States patent was issued for T4GEN, a pharmaceutical version of the mistletoe extract. ABT Global Pharmaceutical of Irvine, California (the patent owner) has developed the synthetic version to be tested and potentially approved as a drug by the FDA. As of summer 2000, there have been no further announcements about T4GEN research.

Precautions

Opinions are sharply divided on how safe and effective the herb is as a home remedy and in the treatment of conditions like cancer and AIDS. There is controversy about which parts of the plants are poisonous. Although the berries are classified as poisonous in the United States, some sources say that eating berries is only dangerous for babies, and only if handfuls are consumed. Pregnant or breast-feeding women, however, should not use the plant.

According to a report from the **Hepatitis** Foundation International, mistletoe is toxic to the liver. However, the *PDR for Herbal Medicines* advises that there are no health hazards when mistletoe is taken properly and in designated therapeutic dosages. Other sources state that mistletoe's toxicity could cause cardiac arrest.

People considering mistletoe should consult with their doctor or practitioner. Until there is definitive proof otherwise, there is a risk that the herbal remedies will conflict with conventional treatment.

Herbal experts including Varro Tyler advise against using mistletoe as a beverage or home remedy until more definitive research is completed. Tyler, a respected pharmacognosist, is the coauthor of the *Tyler's Honest Herbal*.

Side effects

Mistletoe may be potentially toxic to the liver. For people diagnosed with hepatitis, use of an herb like mistletoe may cause additional liver damage. However, advocates of mistletoe point out that the herb has been tested in Europe. That research indicated less severe side effects. Mistletoe extracts can produce **chills**, **fever**, **headache**, chest **pain**, and orthostatic circulatory disorders.

Commercial mistletoe extracts may produce fewer side effects. The body temperature may rise and there may be flu-like symptoms. The patient may experience **nausea**, abdominal pain, and (if given the extract injection) inflammation around the injection sight. In a slight number of cases, allergy symptoms have resulted.

Interactions

Mistletoe shouldn't be used by people who take monoamine oxidase (MAO) inhibitor antidepressants like Nardil. Potential reactions include a dangerous rise in blood pressure and a lowering of blood **potassium** levels (hypokalemia). In addition, mistletoe appears to interfere with the action of antidiabetic medications; to increase the activity of diuretics; and to increase the risk of a toxic reaction to aspirin or NSAIDs. Cancer patients considering mistletoe treatment should first consult with their doctor or practitioner.

Resources

BOOKS

Albright, Peter. *The Complete Book of Complementary Therapies*. Allentown, PA: People's Medical Society, 1997.

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine Publishing, 1995.

Collinge, William. *The American Holistic Health Association Complete Guide to Alternative Medicine*. New York: Warner Books, 1996.

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, NJ: 1998.

Time Life Books Editors. *The Alternative Advisor*. Alexandria, VA: Time Life Books, 1997.

Tyler, Varro, and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

PERIODICALS

Kroz, M., F. Schad, B. Matthes, et al. "Blood and Tissue Eosinophilia, Mistletoe Lectin Antibodies and Quality of Life in a Breast Cancer Patient Undergoing Intra tumoral and Subcutaneous Mistletoe Injection." [in German] *Forschende Komplementarmedizin und Klassische Naturheilkunde* 9 (June 2002): 160 167.

Maier, G., and H. H. Fiebig. "Absence of Tumor Growth Stimulation in a Panel of 16 Human Tumor Cell Lines by Mistletoe Extracts in Vitro." *Anticancer Drugs* 13 (April 2002): 373 379.

Mengs, U., D. Gothel, and E. Leng Peschlow. "Mistletoe Extracts Standardized to Mistletoe Lectins in Oncol ogy: Review on Current Status of Preclinical Research." *Anticancer Research* 22 (May June 2002): 1399 1407.

Tabiasco, J., et al. "Mistletoe Viscotoxins Increase Natural Killer Cell Mediated Cytotoxicity." *European Journal of Biochemistry* 269 (May 2002): 2591 2600.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX 78720. (512) 331 8868. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

National Cancer Institute (NCI). NCI Public Inquiries Office, Suite 3036 A, 6116 Executive Boulevard, MSC8322, Bethesda, MD, 20892.(800) 422 6237. www.nci.nih.gov/cancerinfo/pdq/cam/mistletoe.

Liz Swain
Rebecca J. Frey, PhD

Monkshood *see* **Aconite**

Mononucleosis

Definition

Infectious mononucleosis is caused by the Epstein-Barr virus, which in teenagers and young adults may result in acute symptoms that last for several weeks. **Fatigue** and low energy can linger for several months.

Remedies for mononucleosis

Therapy	Description	Target symptom
Aromatherapy	Add lavender or eucalyptus to a warm bath	Fatigue
Herbal medicine	Echinacea; yarrow or edler flower tea	Fight infection and fever, strengthen immune system
Home remedies	Rest, drink fluids; gargle with salt water; and massage lower back	Fatigue, dehydration, and sore throat
Mind/body	Meditation, biofeedback, and guided imagery	Stress-induced fatigue
Diet	Eat fresh fruits and vegetables. Avoid caffeine, sugars, and animal proteins	Strengthen immune system and increase energy
Yoga	Cobra pose	Fatigue

(Illustration by Corey Light. Cengage Learning, Gale)

Description

Infectious mononucleosis (IM), also called mono or glandular **fever**, is commonly transmitted among teenagers and young adults by kissing; hence, it is sometimes called the kissing disease.

By age 35 to 40, approximately 95% of the population has been infected with the Epstein-Barr virus (EBV) that causes IM. Although anyone can develop mononucleosis, primary (first) **infections** commonly occur in young adults between the ages of 15 and 35. Symptoms of IM are particularly common in teenagers. In the developed world, 15 to 20% of people are infected during adolescence and about half of these teens become ill. Among adults, 30 to 50% of those contracting IM become ill. Males and females are equally susceptible, and in the United States whites are 30 times more likely than blacks to contract IM.

Typically IM runs its course in about four weeks. However, people with weakened or suppressed immune systems, such as **AIDS** or organ-transplant patients, are especially vulnerable to potentially serious complications from mononucleosis.

Following IM, the EBV remains dormant (latent) in a few cells in the throat and blood for the remainder of one's life. Periodically the virus may reactivate and be transmitted through saliva; however, IM symptoms rarely reoccur.

Causes and symptoms

Causes

Infectious mononucleosis is caused by the first infection with the Epstein-Barr virus, also called herpes virus 4. It is one of the most common human viruses and is endemic throughout the world. EBV is a member of the herpes family of DNA viruses. This family of viruses includes those that cause cold sores, **chickenpox**, and **shingles**. Most people are infected with multiple strains of EBV. The different EBV strains are found in separate parts of the body: the circulating lymphocytes (white blood cells), cell-free blood plasma, or the oral cavity.

EBV is spread by contact with viral-infected saliva through coughing, **sneezing**, kissing, or the sharing of items such as drinking glasses, eating utensils, straws, toothbrushes, or lip gloss. However, EBV is not highly contagious, and household members have only a very small risk of infection unless there is direct contact with infected saliva.

Symptoms

Less than 10% of children under age ten develop symptoms with EBV infection. The incubation period after exposure to EBV is generally about four to six weeks. An infected person can transmit EBV during this period and for as long as five months after symptoms disappear.

The first symptoms of IM are usually general weakness and extreme fatigue. An infected person may require 12 to 16 hours of sleep daily prior the development of other symptoms. IM symptoms are similar to cold or flu symptoms:

- Fever and chills occurs in about 90% of IM cases. EBV is most contagious during this stage of the illness.
- An enlarged spleen, causing pain in the upper left of the abdomen, occurs in about 50 to 60% of infections.
- Sore throat and/or swollen tonsils occurs in less than 50% of mononucleosis infections.
- Swollen lymph glands (nodes) in the neck, armpits, and/or groin develop in less than 50% of infections.
- Jaundice (yellowing of the skin and eyes) develops in more than 20% of patients, depending on age, and indicates an inflamed or enlarged liver.
- A red skin rash, particularly on the chest, occurs in about 5% of infections.

Acute symptoms include the following:

- loss of appetite
- stomach pain and/or nausea
- muscle soreness and/or joint pain
- headache
- chest pain
- coughing
- rapid or irregular heartbeat These acute symptoms usually last one to two weeks.

Splenic enlargement generally peaks during the fourth week after symptoms appear and then subsides. However, an enlarged spleen may rupture in 0.1 to 0.2% of cases, causing sharp **pain** on the left side of the abdomen. Additional symptoms of a ruptured spleen include light-headedness, a fast heart rate, and difficulty breathing. Splenic rupture most often occurs within the first three weeks and is the most common cause of death from mononucleosis. It requires immediate medical attention and may require emergency surgery to stop the bleeding.

There are other rare—but potentially life-threatening—complications of mononucleosis:

- Neurological complications affecting the central nervous system may develop in 1 to 2% of infections. Bell's palsy is a temporary condition caused by weakened or paralyzed facial muscles on one side of the face.
- The heart muscle may become inflamed.
- A significant number of the body's red blood cells or platelets may be destroyed and there may be reduced numbers of circulating red and white blood cells.

Diagnosis

A variety of conditions can produce symptoms similar to those of IM; however, if cold or flu-like symptoms persist for longer than two weeks, mononucleosis may be suspected. Mononucleosis is usually diagnosed by a blood test called a mono spot test that measures antibodies to EBV. Antibodies may not be detectable until the second or third week after the onset of symptoms. The antibodies peak between weeks two and five and can persist at low levels for up to a year.

About 90% of IM cases show a positive mono spot. Infants and young children do not make the type of antibodies that are measured by the mono test. If the mono spot is inconclusive, additional blood tests may be performed that measure an increase in the overall number of white blood cells or an increase in abnormal-appearing lymphocytes that make antibodies against EBV. Other tests can identify at least six specific types of EBV antibodies that may be present in the blood.

Treatment

The most effective treatment for infectious mononucleosis is rest, followed by a gradual return to normal activities. If the spleen is enlarged, all contact sports, heavy lifting, and jarring activity such as cheerleading, should be avoided until the enlargement has subsided completely. Since mononucleosis can involve the liver, it is important not to consume alcohol.

Although there is no cure for mononucleosis, alternative remedies may help the body to fight the infection and relieve symptoms. Medical practitioners recommend eating four to six small daily meals of unprocessed foods, fresh fruits, and vegetables. It is important to drink plenty of water. Meat, sugar, saturated fats, and caffeinated and decaffeinated drinks should be avoided. Gargling with salt water (one half teaspoon in one cup of warm water) or sucking on lozenges may relieve a **sore throat**.

Vitamins A, B-complex, and C, and **magnesium**, **calcium**, and **potassium** supplements can boost the immune system and increase energy levels.

Herbals

Herbal remedies may help treat mononucleosis, although they are unproven:

- astragalus (*Astragalus membranaceus*) for physical weakness
- cleavers (*Galium* species) to cleanse the lymphatic system

- echinacea (*Echinacea augustifolia*) to boost the immune system
- elder (*Sambucus nigra*) flower to reduce fever
- garlic to fight viral infection
- goldenseal (*Hydrastis canadensis*) to relieve sinus congestion
- slippery elm bark and licorice can be gargled to soothe a sore throat
- St. John's wort (*Hypericum perforatum*) to relieve anxiety and depression
- vervain (*Verbena officinales*) to relieve anxiety and depression and treat jaundice
- wild indigo (*Baptisia tinctoria*) to cleanse the lymphatic system
- yarrow (*Achillea millefolium*) to reduce fever

Other remedies

The following treatments may help relieve symptoms of mononucleosis:

- Acupressure point Lung 6 may boost lung function and the immune system.
- Aromatherapy with bergamot, eucalyptus, and lavender essential oils may relieve fatigue and other symptoms.
- Chinese medicine uses acupuncture and Xiao Chai Hu Wan (Minor Bupleurum pills) in combination with other herbs.
- Homeopathic physicians choose remedies based on a patient's specific symptoms.
- Relaxation techniques such as biofeedback, visualization, meditation, and yoga can reduce fatigue by relieving stress.

Allopathic treatment

Acetaminophen (Tylenol) or ibuprofen (Advil, Motrin) may relieve symptoms of IM. Aspirin should not be given to children or teens because it has been linked to the development of Reye's syndrome, a potentially fatal illness.

Although antibiotics are ineffective for treating EBV, a sore throat from mononucleosis can be complicated by a streptococcal infection, **sinus infection**, or an **abscess** or pocket of infection on the tonsils. Such bacterial infections can be treated with antibiotics. A five-day course of corticosteroid anti-inflammatory medications (Prednisone) occasionally is prescribed for breathing difficulties caused by swollen tonsils or lymph nodes in the neck or throat.

KEY TERMS

Antibody—A specific protein produced by the immune system in response to a specific antigen such as a foreign protein.

Endemic—A disease that is always prevalent in a particular location.

Epstein-Barr virus (EBV)—An endemic DNA-containing herpes virus that causes infectious mononucleosis.

Immune system—The body system that recognizes and eliminates foreign pathogens and materials.

Lymph glands or nodes—The filtering components of the lymphatic system that can swell during infection.

Lymphatic system—The vessels, nodes, and organs that carry the clear lymph fluid, containing lymphocytes and other white blood cells, throughout the body and that filter the blood to remove dead cells and other debris.

Lymphocytes—White blood cells that are involved in the immune response, including antibody-producing cells.

Reye's syndrome—A very rare, often-deadly, childhood condition that can occur after a viral infection.

Spleen—A large lymphatic organ, located just under the left rib cage, that filters the blood.

Prognosis

Most people with IM begin to return to their normal daily routines within two to three weeks, but it may take up to six months for normal energy levels to return.

A large study suggested that EBV infection increases the risk for Hodgkin lymphoma, a highly treatable **cancer** of the lymphatic system. About one-third of Hodgkin tumors contain EBV and about one in 1,000 young adults with mononucleosis develop the cancer, typically about four years after IM.

The development of two other rare types of cancer—Burkitt's lymphoma and nasopharyngeal carcinoma—appears to be associated with EBV. There also is some evidence that people with high levels of antibodies against EBV are at a higher risk of developing **multiple sclerosis**.

Prevention

Even though IM is not highly contagious, there is no way to completely avoid infection with EBV. In the

majority of cases, IM is without symptoms. Furthermore, EBV can be transmitted long after the symptoms of infection are gone and, indeed, periodically throughout the remainder of life. Good hygiene, particularly hand washing and the habit of not sharing toothbrushes or eating utensils may help prevent EBV infection.

Resources

BOOKS

Hoffmann, Gretchen. *Mononucleosis*. New York: Marshall Cavendish Benchmark, 2006.

Tselis, Alex, and Hal B. Jenson, eds. *Epstein Barr Virus*. New York: Taylor & Francis, 2006.

Umar, Constantine S. *New Developments in Epstein Barr Virus Research*. New York: Nova Science, 2006.

PERIODICALS

Arias, Donya C. "Vaccine for Mono Showing Promise." *Nation's Health* 38, no. 1 (February 2008): 13.

White, P. D. "What Causes Prolonged Fatigue After Infectious Mononucleosis and Does it Tell Us Anything About Chronic Fatigue Syndrome?" *Journal of Infectious Diseases* 196, no. 1 (July 1, 2007): 4 6.

ORGANIZATIONS

National Institute of Allergy and Infectious Diseases, National Institutes of Health. 6610 Rockledge Drive, MSC 6612, Bethesda, MD, 20892 6612, (866) 284 4107, http://www.niaid.nih.gov.

Margaret Alic, PhD

Morinda citrifolia *see* **Noni**

Morning sickness

Definition

Morning sickness is the **nausea** and **vomiting** experienced during **pregnancy**, particularly in the first trimester. Although it is called morning sickness, it can and usually does occur at any time of the day or night.

Description

Morning sickness is characterized by extreme nausea and vomiting. It varies widely in intensity; some women experience only minor stomach upset for a very brief time period, while others become so ill that they have difficulty keeping food and fluids down and functioning normally.

In the majority of women, morning sickness symptoms subside toward the end of the first trimester (at 12–14 weeks). However, some women continue to experience nausea well into the second trimester, and some mothers of multiples (twins, triplets, etc.) may have morning sickness throughout their pregnancy.

KEY TERMS

Infusion—Introduction of a substance directly into a vein or tissue by gravity flow.

Ptyalism—Excess salivation.

Causes and symptoms

The exact cause of morning sickness is unknown, but several factors are thought likely to contribute to the illness, including:

- Hormones. The pregnancy hormone hCG enters the bloodstream in high levels in the first trimester of pregnancy. These high hormone levels may trigger activity in the nausea and vomiting center of the brain, which is located in the brainstem.
- Muscle relaxation in the digestive tract. During pregnancy, the muscles of the gastrointestinal tract relax, slowing the digestion somewhat and possibly contributing to nausea.
- Heightened sense of smell. Pregnant women experience a heightened sense of smell during pregnancy that can transform unpleasant odors into unbearable, nausea-producing scents.
- Excessive salivation. The phenomena ptyalism, or excess saliva, is another symptom of pregnancy that can cause nausea in some women.
- Postnasal drip. Many pregnant women experience postnasal drip and/or nasal congestion, triggered by high levels of estrogen in their bloodstream. Estrogen increases the blood flow throughout the body, including the mucous membrane of the nose. This postnasal drip contributes to upset stomach in many pregnant women.

Diagnosis

Because it is such a common occurrence, morning sickness is easily diagnosed in pregnant women. A healthcare practitioner should question the patient about her pregnancy symptoms during each prenatal visit. In women who are visiting their healthcare providers because of unexplained nausea, morning sickness is sometimes the first symptom or sign of pregnancy.

Nausea and vomiting accompanied by abdominal **pain** may indicate a more serious problem than simple

morning sickness, such as gall bladder or pancreatic disease. Women who experience pain symptoms in conjunction with their nausea should contact their healthcare provider or an emergency medical facility immediately.

Treatment

There are a number of remedies for morning sickness. These include:

- Eat small, frequent meals. When the stomach is empty, it produces acid that irritates the stomach lining. In addition, an empty stomach can cause low blood sugar, which can also cause nausea.
- Eat foods high in proteins and complex carbohydrates. Protein foods (e.g., eggs, cheese, and yogurt) and complex carbohydrates (e.g., whole-grain breads and cereals, dried beans and peas, and baked potatoes) discourage stomach upset and are also beneficial to both mother and baby.
- Avoid foods and beverages that do not sound appealing. Pregnant women usually experience at least one food aversion. The more appetizing a food appears to be, the more likely it is to stay down.
- Stay hydrated. Dehydration can worsen nausea, so pregnant women should drink plenty of fluids. If a woman has an aversion to fluids, she can eat foods with a high water content, such as watermelon, grapes, and other fruits.
- Try a vitamin B_6 supplement. Vitamin B_6 reduces nausea in some women, and is not harmful in recommended doses during pregnancy. Women should consult their healthcare practitioner before taking supplements.
- Eat or drink ginger. Ginger (*Zingiber officinale*) settles the stomach for some women. Ginger tea and foods made with ginger (such as ginger snaps) are usually available at grocery or health food stores.
- Try an herbal infusion. An infusion, or tea, of two parts black horehound (*Ballota nigra*), one part meadowsweet (*Filipendula ulmaria*), and one part chamomile (*Chamaemelum nobile*), taken three times a day, can soothe morning sickness for some women. Women should always consult their healthcare practitioner before taking herbal remedies during pregnancy.
- Wear sea bands. Sea bands are elastic bands worn around the wrists which place pressure on the inner wrist, an acupressure point for controlling nausea. They are usually used for controlling carsickness and seasickness.
- Keep the mouth fresh. Mints and regular tooth brushing can decrease excess saliva. Using a mouth rinse and/or brushing the teeth after vomiting is a good idea to control tooth decay and lessen stomach upset.
- Stay well rested. Fatigue and stress can make morning sickness worse.

Allopathic treatment

Some women with extreme cases of morning sickness may develop a condition known as hyperemesis gravidarium (excessive vomiting during pregnancy). These women are at risk for dehydration and insufficient weight gain, and may require bed rest and intravenous **nutrition** and fluids if vomiting cannot be controlled.

Several antiemetic, or antivomiting, medications are available for pregnant women. Antiemetic medication should always be prescribed by a physician familiar with its use and with the patient's medical history. Antiemetics may be contraindicated (or not recommended) for patients with certain medical conditions. They may also interact with other medications.

Expected results

Morning sickness treatments have varying success. Some women will find one or more remedies that can completely cure their nausea, while others may remain sick throughout their pregnancy. In addition, women expecting two or more babies usually experience heightened morning sickness due to the higher level of pregnancy hormones in their bodies, and may suffer from nausea and vomiting for a longer time than women with a single pregnancy. However, for the majority of pregnant women, nausea stops or at least diminishes by the end of the first trimester.

Prevention

The best cure for preventing bouts of nausea is to eat frequently. Many women find that eating six small meals or snacks a day (morning, mid-morning, noon, afternoon, evening, and bedtime) prevents stomach upset. Getting adequate rest can also help to keep morning sickness at bay.

Resources

BOOKS

Eisenberg, Arlene et al. *What to Expect When You're Expecting*. 2d ed. New York: Workman Publishing Company, 1996.

Hoffman, David. *The Complete Illustrated Herbal*. New York: Barnes & Noble Books, 1999.

Paula Ford-Martin

Mosquito plant *see* **Pennyroyal**

Motherwort

Description

Motherwort (*Leonurus cardiaca*) is a perennial plant native to Europe and temperate parts of central Asia. It has been introduced into North America and now grows wild there. A different species, called Chinese motherwort (*Leonurus heterophyllus*), is used by Chinese herbalists in many of the same ways as *Leonurus cardiaca* is used in the West.

Motherwort grows mainly in poor soil or on wastelands, although it is sometimes cultivated in gardens. The plant grows to about 3 ft (1 m) tall. It has a stem that is often red-violet in color and hairy. The hairy, palm-shaped leaves are a dull green, with the upper surface darker than the under surface. The small flowers range from white to pink to red depending on the plant. flowers and leaves are dried and used medicinally. The leaves are at their most potent when harvested just after the plant flowers. Motherwort is also the source of a dark green dye. The plant has astringent properties and an unpleasant smell. Other names for motherwort include lion's tail, lion's ear, throw-wort, heartwort, and *yi mu cao*.

General use

Motherwort has a long history of traditional uses in many different cultures. The Latin name, *cardiaca* refers to the heart, and motherwort has traditionally been used to treat heart-related conditions. These include nervous heart complaints such as palpitations, cardiac arrhythmia (irregular beat), and fast heartbeat. It has also been used as a general tonic to strengthen the heart and to treat cardiac insufficiency. Modern herbalists continue to prescribe motherwort for these conditions.

Motherwort is also used as a mild general sedative, as a calming agent, and as a treatment for **epilepsy**. Scientists have isolated many different active compounds in motherwort. Leonurine and stachydine, both found in the herb, have been show to lower blood pressure and calm the central nervous system in studies using laboratory animals and animal hearts. Scientific investigation into the central nervous system and cardiac effects of motherwort is ongoing with mixed results. As of 2008, the German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, had found that there is adequate evidence to suggest that motherwort is effective in the treatment of nervous heart complaints and thyroid dysfunction.

Motherwort. *(© Petra Wegner / Alamy)*

Motherwort is also used to treat female conditions related to **menstruation** and **childbirth**. The herb is often given to stimulate menstruation when it is absent (**amenorrhea**) or irregular and delayed (**dysmenorrhea**). At childbirth it is taken to aid labor, and after childbirth it is given to help the uterus relax and return to normal. There appear to be no scientific studies that specifically relate to the effects of motherwort on the reproductive system, so these traditional uses of the herb can be neither confirmed nor denied. Other Western uses of motherwort include treatment for **asthma**, **hyperthyroidism**, flatulence (**gas**), and **insomnia**. It is also used externally as a douche for **vaginitis**.

Chinese herbalists use Chinese motherwort to treat problems of the heart, liver, and kidneys. In addition to the heart and reproductive uses known to Western herbalists, Chinese practitioners use motherwort to treat

KEY TERMS

Tincture—An alcohol-based extract prepared by soaking plant parts.

water retention, in conjunction with other herbs, such as **hawthorn**, to prevent **stroke** and to treat certain kinds of **eczema**. Some Chinese researchers have reported that Chinese motherwort, *Leonurus heterophyllus*, can prevent **blood clots**. Motherwort is an ingredient in several common Chinese herbal formulas, including leonuris and achyranthes.

Motherwort is also used occasionally in homeopathic medicine for the treatment of heart conditions, flatulence, and overactive thyroid (hyperthyroidism).

Preparations

Motherwort is normally prepared by adding about 1 tsp of leaves to 1 cup (8 oz or 250 ml) of boiling water. The resulting infusion is taken twice a day. This infusion has a bitter and unpleasant taste. Honey, lemon, or other flavorings may be added to make its taste more acceptable. Motherwort is also available as a tincture. The normal dose is 2–6 ml daily.

Precautions

Pregnant women should not take motherwort because of its effects on the uterus. Women who have heavy menstrual flow should also avoid motherwort. Anyone who has a heart disorder or who is taking any medication for a heart condition should consult a doctor before taking motherwort. People who are taking medication for thyroid disorders should also consult a doctor before using this herb.

Side effects

Motherwort has a long history of use without any negative side effects being reported when the herb is taken internally as an infusion or tincture. However, some people break out in a rash when handling motherwort leaves.

Interactions

There has been little scientific study of the interaction of motherwort and pharmaceuticals. As noted above, however, people who are taking medications for heart, thyroid, or other serious medical conditions should consult a doctor before taking motherwort. The herb has been used in herbal mixtures for centuries without any known herbal interactions.

Resources

BOOKS

Bensky, Dan, et al.*Chinese Herbal Medicine: Materia Medica,* 3rd ed. Seattle, WA: Eastland Press, 2004.
Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.
Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. 3rd ed. rev. New York: Tarcher, 2004.
Foster, Steven and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.
PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomson Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation, P. O. Box 60016, Poto mac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.
American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.
American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://holisticmedicine.org.
Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.
National Center for Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (703) 548 7790, http://www.homeopathic.org/contact.htm.

Tish Davidson, A. M.

Motion sickness

Definition

Motion sickness is a condition characterized by uncomfortable sensations of **dizziness**, **nausea**, and **vomiting** that people experience when their sense of balance and equilibrium is disturbed by constant motion. Riding in a car, aboard a ship or boat, or riding on a swing all cause stimulation of the vestibular system and visual stimulation that often lead to discomfort. While motion sickness can be bothersome, it is not a serious illness, and can be prevented.

Description

Motion sickness is a common problem, with nearly 80% of the general population suffering from it at one time in their lives. People with migraine

KEY TERMS

Acupressure—Often described as acupuncture without needles, acupressure is a traditional Chinese medical technique based on theory of *qi* (life energy) flowing in energy meridians or channels in the body. Applying pressure with the thumb and fingers to acupressure points can relieve specific conditions and promote overall balance and health. Also known as dian xue.

Acupuncture—Based on the same traditional Chinese medical foundation as acupressure, acupuncture uses sterile needles inserted at specific points to treat certain conditions or relieve pain.

Antiemetic—A medication that helps control nausea; also called an antinausea drug.

Neurological system—The system that initiates and transmits nerve impulses including the brain, spinal cord, and nerves.

Optokinetic—A reflex that causes a person's eyes to move when their field of vision moves.

Vertigo—A feeling of dizziness together with a sensation of movement and a feeling of rotating in space.

Vestibular system—The brain and parts of the inner ear that work together to detect movement and position.

headaches or Ménière's syndrome, however, are more likely than others to have recurrent episodes of motion sickness. Researchers at the Naval Medical Center in San Diego, California, reported in 2003 that 70% of research subjects with severe motion sickness had abnormalities of the vestibular system; these abnormalities are often found in patients diagnosed with migraines or **Ménière's disease**.

While motion sickness may occur at any age, it is more common in children over the age of two, with the majority outgrowing this susceptibility.

When looking at why motion sickness occurs, it is helpful to understand the role of the sensory organs. The sensory organs control a body's sense of balance by telling the brain what direction the body is pointing, the direction it is moving, and if it is standing still or turning. These messages are relayed by the inner ears (or labyrinth), the eyes, the skin pressure receptors, such as in those in the feet, and the muscle and joint sensory receptors (which track what body parts are moving). The central nervous system (the brain and spinal cord), is responsible for processing all incoming sensory information.

Motion sickness and its symptoms surface when conflicting messages are sent to the central nervous system. An example of this is reading a book in the back seat of a moving car. The inner ears and skin receptors sense the motion, but the eyes register only the stationary pages of the book. This conflicting information may cause the usual motion sickness symptoms of dizziness, nausea, and vomiting.

Causes and symptoms

While all five of the body's sensory organs contribute to motion sickness, excess stimulation to the vestibular system within the inner ear (the body's "balance center") has been shown to be one of the primary reasons for this condition. Balance problems, or vertigo, are caused by a conflict between what is seen and how the inner ear perceives it, leading to confusion in the brain. This confusion may result in higher heart rates, rapid breathing, nausea, and sweating, along with dizziness and vomiting. There are people who suffer from constant motion sickness. Names for these conditions vary, such as positional dizziness.

Pure optokinetic motion sickness is caused solely by visual stimuli; that is, by what is seen. The optokinetic system is the reflex that allows the eyes to move when an object moves. Many people suffer when they view rotating or swaying images, even if they are standing still. Optokinetic motion sickness is of particular concern to the civilian aviation industry as well as to military aerospace programs. In the United States, both the Federal Aviation Agency (FAA) and the National Aeronautics and Space Administration (NASA) have research programs for the prevention and treatment of optokinetic motion sickness.

Additional factors that may contribute to the occurrence of motion sickness include:

- Poor ventilation lowers a person's threshold for experiencing motion.
- Anxiety or fear also lowers the threshold.
- Food. Physicians recommend avoiding heavy meals of spicy or greasy foods before and during a trip.
- Alcohol. A drink is often thought to help calm the nerves, but in this case it could upset the stomach further. A hangover for the next morning's trip may also lead to motion sickness.
- Pregnancy. Susceptibility in women to vomiting during pregnancy appears to be related to motion sickness, although the precise connections are not well understood.

- Genetic factors. Research suggests that some people inherit a predisposition to motion sickness. This predisposition is more marked in some ethnic groups than in others; one study published in 2002 found that persons of Chinese or Japanese ancestry are significantly more vulnerable to motion sickness than persons of British ancestry.

Often viewed as a minor annoyance, some travelers are temporarily immobilized by motion sickness, and a few continue to feel its effects for hours and even days after a trip (the "mal d'embarquement" syndrome). For those with constant motion sickness, it may not stop at all.

Diagnosis

Most cases of motion sickness are mild and self-treatable disorders. If symptoms such as dizziness become chronic, a doctor may be able to help alleviate the discomfort by looking further into a patient's general health. Questions regarding medications, head injuries, recent **infections**, and other questions about the ear and neurological system will be asked. An examination of the ears, nose, and throat, as well as tests of nerve and balance function, may also be completed.

Severe cases of motion sickness symptoms, and those that become progressively worse, may require additional specific tests. Diagnosis in these situations deserves the attention and care of a doctor with specialized skills in diseases of the ear, nose, throat, equilibrium, and neurological system.

Treatment

Alternative treatments for motion sickness have become widely accepted as a standard means of care. They include herbal therapy, **acupressure**, and **homeopathy**.

Herbal therapy

Ginger (*Zingiber officinale*) in its various forms is often used to calm the stomach, and it is now known that the oils it contains (gingerols and shogaols) appear to relax the intestinal tract in addition to mildly depressing the central nervous system. Some of the most effective forms of ginger include the powdered, encapsulated form; ginger tea prepared from sliced ginger root; or candied pieces. All forms of ginger should be taken on an empty stomach when treating motion sickness.

Acupressure

Placing manual pressure on the Neiguan or Pericardium-6 **acupuncture** point (located about three finger-widths above the wrist on the inner arm), either by acupuncture, acupressure, or a mild, electrical pulse, has shown to be effective against the symptoms of motion sickness. Elastic wristbands sold at most drugstores are also used as a source of relief due to the pressure they place in this area. Pressing the small intestine 17 (just below the earlobes in the indentations behind the jawbone) may also help in the functioning of the ear's balancing mechanism.

Homeopathy

There are several homeopathic remedies that work specifically for motion sickness. They include *Cocculus*, *Petroleum*, *Ipecacuanha*, and *Tabacum*.

Traditional Chinese medicine

In **traditional Chinese medicine**, cases of chronic motion sickness would be considered a "wind" disorder because it is an abnormality movement as the wind causes. Herbs and acupuncture may treat this.

Allopathic treatment

There are a variety of medications to help ease the symptoms of motion sickness, and most of these are available without a prescription. Known as over-the-counter (OTC) medications, it is recommended that these be taken 30-60 minutes before traveling to prevent motion sickness symptoms, as well as during an extended trip.

Drugs

The following OTC drugs consist of ingredients that have been considered safe and effective for the treatment of motion sickness by the Food and Drug Administration:

- Marezine (and others). Includes the active ingredient cyclizine and is not for use in children under age six years.
- Benadryl (and others). Includes the active ingredient diphenhydramine and is not for use in children under age six years.
- Dramamine (and others). Includes the active ingredient dimenhydrinate and is not for use in children under age two years.
- Bonine (and others). Includes the active ingredient meclizine and is not for use in children under age 12 years.

Each of these active ingredients, including such other antiemetics as cinnarizine, are antihistamines whose main side effect is drowsiness. Caution should be used when driving a vehicle or operating machinery,

and alcohol should be avoided when taking any drug for motion sickness. Medications for motion sickness may also cause **dry mouth** and occasional blurred vision. People with **emphysema**, chronic **bronchitis**, **glaucoma**, or difficulty urinating due to an enlarged prostate should not use these drugs unless directed by their physician.

The side effects of cinnarizine and the other antihistamine antiemetics indicate that they should not be used by members of flight crews responsible for the control of aircraft or for other tasks that require sustained attention and alertness.

Longer trips may require a prescription medication called scopolamine (Transderm Scop). Scopolamine gel is most effective when smeared on the arm or neck and covered with a bandage. In chronic cases, such antiseizure drugs as clonazepam (Klonopin) are used.

Another prescription drug that is sometimes given for motion sickness is ondansetron (Zofran), which was originally developed to treat nausea associated with **cancer** chemotherapy. Unlike cyclizine, ondansetron appears to be safe for use in children under the age of six.

Several newer antiemetic medications are under development. The most promising of these newer drugs is a class of compounds known as neurokinin-1 (substance P) antagonists. The neurokinins are being tested for the control of nausea following cancer chemotherapy as well as nausea related to motion sickness. In March 2003 the Food and Drug Administration (FDA) approved the first of this new class of antiemetic drugs. Known as aprepitant, it is sold under the trade name Emend.

Expected results

While there is no cure for motion sickness, its symptoms can be controlled or even prevented. Most people respond successfully to the variety of treatments, or avoid the unpleasant symptoms through prevention methods.

Prevention

Because motion sickness is easier to prevent than treat once it has begun, the best treatment is prevention. The following steps may help deter the unpleasant symptoms of motion sickness before they occur:

- Avoiding reading while traveling, and choosing a seat that faces forward.
- Always riding where the eyes may see the same motion that the body and inner ears feel. Safe positions include the front seat of the car while looking at distant scenery; the deck of a ship where the horizon can be seen; and sitting by the window of an airplane. The least motion on an airplane is in a seat over the wings and the worst is in the tail section.
- Maintaining a fairly straight-ahead view.
- Eating a light meal before traveling, or avoiding food altogether.
- Avoiding conversation with another traveler who is having motion sickness.
- Taking a motion sickness medication at least 30–60 minutes before travel begins, or as recommended by a physician.
- Learning to live with the condition. Even those who frequently endure motion sickness can learn to travel by anticipating the conditions of their next trip. Research also suggests that increased exposure to the stimulation that causes motion sickness may help decrease its symptoms on future trips.

Resources

BOOKS

Blakely, Brian W., and Mary Ellen Siegel. "Peripheral Ves tibular Disorders." In *Feeling Dizzy: Understanding and Treating Dizziness, Vertigo, and Other Balance Disor ders*. New York: Macmillan, 1995.

"Motion Sickness." In *The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments*. Rich mond, VA: Time Life, Inc., 1996.

Pelletier, Dr. Kenneth R. *The Best Alternative Medicine*. New York: Simon and Schuster, 2002.

PERIODICALS

Black, F. O. "Maternal Susceptibility to Nausea and Vom iting of Pregnancy: Is the Vestibular System Involved?" *American Journal of Obstetrics and Gynecology* 185 (May 2002)(Supplement 5): S204 S209.

Bos, J. E., W. Bles, and B. de Graaf. "Eye Movements to Yaw, Pitch, and Roll About Vertical and Horizontal Axes: Adaptation and Motion Sickness." *Aviation, Space, and Environmental Medicine* 73 (May 2002): 434 444.

Hamid, Mohamed, MD, PhD, and Nicholas Lorenzo, MD. "Dizziness, Vertigo, and Imbalance." *eMedicine*, 17 September 2002. http://emedicine.com/neuro/ topic693.htm.

Harm, D. L., and T. T. Schlegel. "Predicting Motion Sick ness During Parabolic Flight." *Autonomic Neuroscience* 31 (May 2002): 116 121.

Hoffer, M. E., K. Gottshall, R. D. Kopke, et al. "Vestibular Testing Abnormalities in Individuals with Motion Sickness." *Otology and Neurotology* 24 (July 2003): 633 636.

Keim, Samuel, MD, and Michael Kent, MD. "Vomiting and Nausea." *eMedicine*, 29 April 2002. http://emedicine. com/aaem/topic476.htm.

Liu, L., L. Yuan, H. B. Wang, et al. "The Human Alpha(2A) AR Gene and the Genotype of Site 1296 and the Susceptibility to Motion Sickness." [in Chinese] *Sheng Wu Hua Xue Yu Sheng Wu Wu Li Xue Bao (Shanghai)* 34 (May 2002): 291 297.
Loewen, P. S. "Anti Emetics in Development." *Expert Opinion on Investigational Drugs* 11 (June 2002): 801 805.
Nicholson, A. N., et al. "Central Effects of Cinnarizine: Restricted Use in Aircrew" *Aviation, Space, and Envi ronmental Medicine* 73 (June 2002): 570 574.
O'Brien, C. M., G. Titley, and P. Whitehurst. "A Compar ison of Cyclizine, Ondansetron and Placebo as Prophylaxis Against Postoperative Nausea and Vomit ing in Children." *Anaesthesia* 58 (July 2003): 707 711.
Patel, L., and C. Lindley. "Aprepitant A Novel NK1 Receptor Antagonist." *Expert Opinion in Pharmaco therapy* 4 (December 2003): 2279 2296.

ORGANIZATIONS

Civil Aerospace Medical Institute. P. O. Box 20582, Okla homa City, OK 73125. (202) 366 4000. www.cami.jccbi. gov.
National Aeronautics and Space Administration, Office of Biological and Physical Research. www.spaceresearch. nasa.gov.
Vestibular Disorders Association. PO Box 4467, Portland, OR 97208 4467. (800) 837 8428. http://www.teleport. com/veda.

Mai Tran
Rebecca J. Frey, PhD

Mountain grape *see* **Barberry**

Movement therapy

Definition

Movement therapy refers to a broad range of Eastern and Western movement approaches used to promote physical, mental, emotional, and spiritual well-being. Some forms of movement therapy that combine deep-tissue manipulation and postural correction with movement education are also known as bodywork therapies.

Origins

Movement is fundamental to human life. In fact movement is life. Contemporary physics tells us that the universe and everything in it is in constant motion. We can move our body and at the most basic level our body is movement. According to the somatic educator Thomas Hanna, "The living body is a moving body—indeed, it is a constantly moving body." The poet and philosopher Alan Watts eloquently states a similar view, "A living body is not a fixed thing but a flowing event, like a flame or a whirlpool." Centuries earlier, the great Western philosopher Socrates understood what modern physics has proven, "The universe is motion and nothing else."

Since the beginning of time, indigenous societies around the world have used movement and dance for individual and community healing. Movement and song were used for personal healing, to create community, to worship, to ensure successful crops, and to promote fertility. Movement is still an essential part of many healing traditions and practices throughout the world.

Western movement therapies generally developed out of the realm of dance. Many of these movement approaches were created by former dancers or choreographers who were searching for a way to prevent injury, attempting to recover from an injury, or who were curious about the effects of new ways of moving. Some movement therapies arose out of the fields of physical therapy, psychology, and bodywork. Other movement therapies were developed as way to treat an incurable disease or condition.

Eastern movement therapies, such as **yoga**, **qigong**, and **t'ai chi** began as a spiritual or self-defense practices and evolved into healing therapies. In China, for example, Taoist monks learned to use specific breathing and movement patterns in order to promote mental clarity, physical strength, and support their practice of **meditation**. These practices, later known as qigong and t'ai chi, eventually became recognized as ways to increase health and prolong life.

Benefits

The physical benefits of movement therapy include greater ease and range of movement, increased balance, strength and flexibility, improved muscle tone and coordination, joint resiliency, cardiovascular conditioning, enhanced athletic performance, stimulation of circulation, prevention of injuries, greater longevity, **pain** relief, and relief of rheumatic, neurological, spinal, **stress**, and respiratory disorders. Movement therapy can also be used as a meditation practice to quiet the mind, foster self-knowledge, and increase awareness. In addition, movement therapy is beneficial in alleviating emotional distress that is expressed through the body. These conditions include eating disorders, excessive clinging, and **anxiety** attacks. Since movements are related to thoughts and feelings, movement therapy can also bring about changes in attitude and emotions.

KEY TERMS

Bodywork—A term that covers a variety of therapies that include massage, realignment of the body, and similar techniques to treat deeply ingrained stresses and traumas carried in the tissues of the body.

Equine-facilitated therapy—Another term for therapeutic riding.

Qigong—A traditional form of Chinese energy therapy that includes physical exercises, breathing techniques, postures, and mental discipline. Internal qigong refers to exercises practiced to maintain one's own health and vitality; external qigong refers to the transfer of energy from a qigong master to another person for healing purposes. External qigong is also known as medical qigong.

T'ai chi—A Chinese system of meditative physical exercise, characterized by slow methodical circular and stretching movements.

Yoga—A method of joining the individual self with the divine, universal spirit, or cosmic consciousness. Physical and mental exercises are designed to help achieve this goal, also called self-transcendence or enlightenment. On the physical level, yoga postures, called asanas, are designed to tone, strengthen, and align the body. On the mental level, yoga uses breathing techniques (pranayama) and meditation (dyana) to quiet, clarify, and discipline the mind.

People report an increase in self-esteem and self-image. Communication skills can be enhanced and tolerance of others increased. The physical openness facilitated by movement therapy leads to greater emotional openness and creativity.

Movement therapy is being studied more intensively as a useful adjunct to rehabilitation programs for victims of **stroke** or spinal cord injuries. Actor Christopher Reeves, who was paralyzed in a 1995 accident just below the two top vertebrae in his neck, recovered feeling throughout most of his body and took small steps in a swimming pool. Reeves credited his improvement, which many doctors considered impossible, to exercising five hours every day. Some neuroscientists studied Reeves and other patients with spinal cord injuries to test the hypothesis that movement itself can cause damaged nerves to regenerate.

Another important benefit of movement therapy that is increasingly recognized by mainstream as well as alternative practitioners is social support. Many people, particularly those suffering from **depression** related to physical illness or other forms of stress, find that taking a yoga class or other group form of movement therapy relieves feelings of loneliness and isolation. People who have taken therapeutic riding have reported that the positive relationship they develop with their horse helps them relate better to other animals and to people.

Description

There are countless approaches to movement therapy. Some approaches emphasize awareness and attention to inner sensations. Other approaches use movement as a form of **psychotherapy**, expressing and working through deep emotional issues. Some approaches emphasize alignment with gravity and specific movement sequences, while other approaches encourage spontaneous movement. Some approaches are primarily concerned with increasing the ease and efficiency of bodily movement. Other approaches address the reality of the body "as movement" instead of the body as only something that runs or walks through space.

The term movement therapy is often associated with **dance therapy**. Some dance therapists work privately with people who are interested in personal growth. Others work in mental health settings with autistic, brain injured and learning disabled children, the elderly, and disabled adults.

Laban movement analysis (LMA), formerly known as Effort-Shape is a comprehensive system for discriminating, describing, analyzing, and categorizing movements. LMA can be applied to dance, athletic coaching, fitness, acting, psychotherapy, and a variety of other professions. Certified movement analysts can "observe recurring patterns, note movement preferences, assess physical blocks and dysfunctional movement patterns, and the suggest new movement patterns." As a student of Rudolf Laban, Irmgard Bartenieff developed his form of movement analysis into a system of body training or reeducation called Bartenieff fundamentals (BF). The basic premise of this work is that once the student experiences a physical foundation, emotional, and intellectual expression become richer. BF uses specific exercises that are practiced on the floor, sitting, or standing to engage the deeper muscles of the body and enable a greater range of movement.

Authentic movement (AM) is based upon Mary Starks Whitehouse's understanding of dance, movement, and depth psychology. There is no movement

instruction in AM, simply a mover and a witness. The mover waits and listens for an impulse to move and then follows or "moves with" the spontaneous movements that arise. These movements may or may not be visible to the witness. The movements may be in response to an emotion, a dream, a thought, pain, joy, or whatever is being experienced in the moment. The witness serves as a compassionate, non judgmental mirror and brings a "special quality of attention or presence." At the end of the session the mover and witness speak about their experiences together. AM is a powerful approach for self development and awareness and provides access to preverbal memories, creative ideas, and unconscious movement patterns that limit growth.

Gabrielle Roth (5 Rhythms movement) and Anna Halprin have both developed dynamic movement practices that emphasize personal growth, awareness, expression, and community. Although fundamentally different forms, each of these movement/dance approaches recognize and encourage our inherent desire for movement.

Several forms of movement therapy grew out of specific bodywork modalities. **Rolfing** movement integration (RMI) and Rolfing rhythms are movement forms which reinforce and help to integrate the structural body changes brought about by the hands-on work of Rolfing (structural integration). RMI uses a combination of touch and verbal directions to help develop greater awareness of one's vertical alignment and habitual movement patterns. RMI teacher Mary Bond says, "The premise of Rolfing Movement Integration . . . is that you can restore your structure to balance by changing the movement habits that perpetuate imbalance." Rolfing rhythms is a series of lively exercises designed to encourage awareness of the Rolfing principles of ease, length, balance, and harmony with gravity.

The movement education component of **Aston-Patterning** bodywork is called neurokinetics. This movement therapy teaches ways of moving with greater ease throughout every day activities. These movement patterns can also be used to release tension in the body. Aston fitness is an **exercise** program which includes warm-up techniques, exercises to increase muscle tone and stability, stretching, and cardiovascular fitness.

Rosen method movement (an adjunct to Rosen method bodywork) consists of simple fun movement exercises done to music in a group setting. Through gentle swinging, bouncing, and stretching every joint in the body experiences a full range of movement. The movements help to increase balance and rhythm and create more space for effortless breathing.

The movement form of **Trager psychophysical Integration** bodywork, Mentastics, consists of fun, easy swinging, shaking, and stretching movements. These movements, developed by Dr. Milton Trager, create an experience of lightness and freedom in the body, allowing for greater ease in movement. Trager also worked successfully with polio patients.

Awareness through movement, the movement therapy form of the **Feldenkrais** method, consists of specific structured movement experiences taught as a group lesson. These lessons reeducate the brain without tiring the muscles. Most lessons are done lying down on the floor or sitting. Moshe Feldenkrais designed the lessons to "improve ability . . . turn the impossible into the possible, the difficult into the easy, and the easy into the pleasant."

Ideokinesis is another movement approach emphasizing neuromuscular reeducation. Lulu Sweigart based her work on the pioneering approach of her teacher Mabel Elsworth Todd. Ideokinesis uses imagery to train the nervous system to stimulate the right muscles for the intended movement. If one continues to give the nervous system a clear mental picture of the movement intended, it will automatically select the best way to perform the movement. For example, to enhance balance in standing, Sweigart taught people to visualize "lines of movement" traveling through their bodies. Sweigart did not train teachers in ideokinesis but some individuals use ideokinetic imagery in the process of teaching movement.

The Mensendieck system of functional movement techniques is both corrective and preventative. Bess Mensendieck, a medical doctor, developed a series of exercises to reshape, rebuild and revitalize the body. A student of this approach learns to use the conscious will to relax muscles and releases tension. There are more than 200 exercises that emphasize correct and graceful body movement through everyday activities. Unlike other movement therapy approaches this work is done undressed or in a bikini bottom, in front of mirrors. This allows the student to observe and feel where a movement originates. Success has been reported with many conditions including **Parkinson's disease**, muscle and joint injuries, and repetitive strain injuries.

The **Alexander technique** is another functional approach to movement therapy. In this approach a teacher gently uses hands and verbal directions to subtly guide the student through movements such as sitting, standing up, bending and walking. The Alexander technique emphasizes balance in the neck-head relationship. A teacher lightly steers the students head

into the proper balance on the tip of the spine while the student is moving in ordinary ways. The student learns to respond to movement demands with the whole body, in a light integrated way. This approach to movement is particularly popular with actors and other performers.

Pilates or physical mind method is also popular with actors, dancers, athletes, and a broad range of other people. Pilates consists of over 500 exercises done on the floor or primarily with customized exercise equipment. The exercises combine sensory awareness and physical training. Students learn to move from a stable, central core. The exercises promote strength, flexibility, and balance. Pilates training is increasingly available in sports medicine clinics, fitness centers, dance schools, spas, and physical therapy offices.

Many approaches to movement therapy emphasize awareness of internal sensations. Charlotte Selver, a student of somatic pioneer Elsa Gindler, calls her style of teaching sensory awareness (SA). This approach has influenced the thinking of many innovators, including Fritz Perls, who developed gestalt therapy. Rather than suggesting a series of structured movements, visualizations, or body positions, in SA the teacher outlines experiments in which one can become aware of the sensations involved in any movement. A teacher might ask the student to feel the movement of her breathing while running, sitting, picking up a book, etc. This close attunement to inner sensory experience encourages an experience of body-mind unity in which breathing becomes less restricted and posture, coordination, flexibility, and balance are improved. There may also be the experience of increased energy and aliveness.

Gerda Alexander Eutony (GAE) is another movement therapy approach that is based upon internal awareness. Through GAE one becomes a master of self-sensing and knowing which includes becoming sensitive to the external environment, as well. For example, while lying on the floor sensing the breath, skin or form of the body, one also senses the connection with the ground. GAE is taught in group classes or private lessons which also include hands-on therapy. In 1987, after two years of observation in clinics throughout the world, GAE became the first mind-body discipline accepted by the World Health Organization (WHO) as an alternative health-care technique.

Kinetic awareness developed by dancer-choreographer Elaine Summers, emphasizes emotional and physical inquiry. Privately or in a group, a teacher sets up situations for the student to explore the possible causes of pain and movement restrictions within the body. Rubber balls of various sizes are used as props to focus attention inward, support the body in a stretched position and massage a specific area of the body. The work helps one to deal with chronic pain, move easily again after injuries and increase energy, flexibility, coordination, and comfort.

Body-mind centering (BMC) was developed by Bonnie Bainbridge Cohen and is a comprehensive educational and therapeutic approach to movement. BMC practitioners use movement, touch, **guided imagery**, developmental repatterning, dialogue, music, large balls, and other props in an individual session to meet the needs of each person. BMC encourages people to develop a sensate awareness and experience of the ligaments, nerves, muscles, skin, fluids, organs, glands, fat, and fascia that make up one's body. It has been effective in preventing and rehabilitating from chronic injuries and in improving neuromuscular response in children with **cerebral palsy** and other neurological disorders.

Continuum movement has also been shown to be effective in treating neurological disorders including spinal chord injury. Developed by Emilie Conrad and Susan Harper, continuum movement is an inquiry into the creative flux of our body and all of life. Sound, breath, subtle and dynamic movements are explored that stimulate the brain and increase resonance with the fluid world of movement. The emphasis is upon unpredictable, spontaneous or spiral movements rather than a linear movement pattern. According to Conrad, "Awareness changes how we physically move. As we become more fluid and resilient so do the mental, emotional, and spiritual movements of our lives."

More recently, a form of movement therapy that involves horses has gained fresh attention. It is variously known as therapeutic riding or equine-assisted therapy. Therapeutic riding originated with a Swedish horsewoman who lost her ability to walk when she contracted polio in 1946, and was determined to recover by returning to horseback riding. She eventually won a silver medal in the 1952 Olympics. Therapeutic riding programs allow persons with physical, psychological, or learning disabilities to gain self-esteem and social growth as well as improved balance, body awareness, and physical strength.

Such Eastern movement therapies as yoga, t'ai chi, and qigong are also effective in healing and preventing a wide range of physical disorders, encouraging emotional stability, and enhancing spiritual awareness. There are a number of different approaches to yoga. Some emphasize the development of physical strength, flexibility, and alignment. Other forms of yoga emphasize inner awareness, opening, and meditation.

Precautions

Persons who are seriously ill, acutely feverish, or suffering from a contagious infection should wait until they have recovered before beginning a course of movement therapy. As a rule, types of movement therapy that involve intensive manipulation or stretching of the deeper layers of body tissue are not suitable for persons who have undergone recent surgery or have recently suffered severe injury. With regard to emotional or psychiatric disturbances, persons who are recovering from abuse or receiving treatment for any post-traumatic syndrome or dissociative disorder should consult their therapist before undertaking a course of movement therapy. While movement therapy is often recommended as part of a treatment plan for these disorders, it can also trigger flashbacks or dissociative episodes if the movement therapist is unaware of the client's history. It is always best to consult with a knowledgeable physician, physical therapist, or mental health therapist before a course of movement therapy.

Research and general acceptance

Although research has documented the effects of dance therapy, qigong, t'ai chi, yoga, Alexander technique, awareness through movement (Feldenkrais), and Rolfing, other forms of movement therapy have not been as thoroughly researched.

Training and certification

Training and certification vary widely with each form of movement therapy. Many approaches require several years of extensive training and experience with the particular movement form. Movement therapies that are also considered forms of bodywork have an umbrella national certification board, listed below under Resources. Therapeutic riding programs are accredited by the North American Riding for the Handicapped Association (NARHA), which also credentials riding instructors.

Resources

BOOKS

Halprin, Anna. *Dance as a Healing Art: Returning to Health Through Movement and Imagery*. Life Rhythm, 1999.

Hartley, Linda. *Wisdom of the Body Moving: An Introduction to Body Mind Centering*. Berkeley, CA: North Atlantic Press, 1995.

Knaster, Mirka. *Discovering the Body's Wisdom*. New York, NY: Bantam Books, 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Sound Mind, Sound Body. New York: Simon & Schuster, 2002.

PERIODICALS

Bagnall, A. M., P. Whiting, R. Richardson, and A. J. Sow den. "Interventions for the Treatment and Manage ment of Chronic Fatigue Syndrome/Myalgic Encephalomyelitis. (Effectiveness Bulletin)." *Quality and Safety in Health Care* 11 (September 2002): 284 288.

Batty, G. David, and I Min Lee. "Physical Activity for Preventing Strokes: Better Designed Studies Suggest That It is Effective." *British Medical Journal* 325 (August 17, 2002): 350 351.

Cottingham, John T., and Jeffrey Maitland. "Integrating Manual and Movement Therapy With Philosophical Counseling for Treatment of a Patient With Amyotro phic Lateral Sclerosis: A Case Study That Explores the Principles of Holistic Intervention." *Alternative Thera pies Journal* (March 2000): 120 128.

Crandall, Melissa. "Healing Horses." *ASPCA Animal Watch* 22 (Winter 2002): 21 25.

Shute, Nancy. "A Super Feeling." *U. S. News & World Report*, September 23, 2002, 58.

Stanten, Michele, and Selene Yeager. "Kinder, Gentler Workouts: These No Sweat Exercises Offer More Than Just Relaxation." (Fitness News). *Prevention* 54 (July 2002): 74 75.

Vidrine, M., P. Owen Smith, and P. Faulkner. "Equine Facilitated Group Psychotherapy: Applications for Therapeutic Vaulting." *Issues in Mental Health Nursing* 23 (September 2002): 587 603.

ORGANIZATIONS

American Yoga Association. www.americanyogaassociation.org.

Canadian Taijiquan Federation. P.O. Box 421, Milton, Ontario L9T 4Z1. www.canadiantaijiquanfederation.ca.

Feldenkrais Guild of North America. 3611 S.W. Hood Avenue, Suite 100, Portland, OR 97201. (800) 775 2118 or (503) 221 6612. Fax: (503) 221 6616. www.feldenkrais.com.

The Guild for Structural Integration. 209 Canyon Blvd. P.O. Box 1868. Boulder, CO 80306 1868. (303) 449 5903. (800) 530 8875. www.rolfguild.org.

International Association of Yoga Therapists (IAYT). 4150 Tivoli Avenue, Los Angeles, CA 90066.

North American Riding for the Handicapped Association (NARHA). P. O. Box 33150, Denver, CO 80233. (303) 452 1212 or (800) 369 RIDE. www.narha.org.

Patience T'ai Chi Association. 2620 East 18th Street, Brooklyn, NY 11235. (718) 332 3477. www.patiencetaichi.com.

Qigong Human Life Research Foundation. PO Box 5327. Cleveland, OH 44101. (216) 475 4712.

The Society of Teachers of the Alexander Technique. www.stat.org.uk.

The Trager Institute. 21 Locust Avenue, Mill Valley, CA 94941 2806 (415) 388 2688. Fax: (415) 388 2710. www. trager.com.

OTHER

National Certification Board for Therapeutic Massage and Bodywork. 8201 Greensboro Drive, Suite 300. McLean, VA 22102. (703) 610 9015.

NIH National Center for Complementary and Alternative Medicine (NCCAM) Clearinghouse. P. O. Box 8218, Silver Spring, MD 20907 8218. TTY/TDY: (888) 644 6226. Fax: (301) 495 4957. Web site: http://www.nccam.nih.gov.

Linda Chrisman
Rebecca J. Frey, PhD

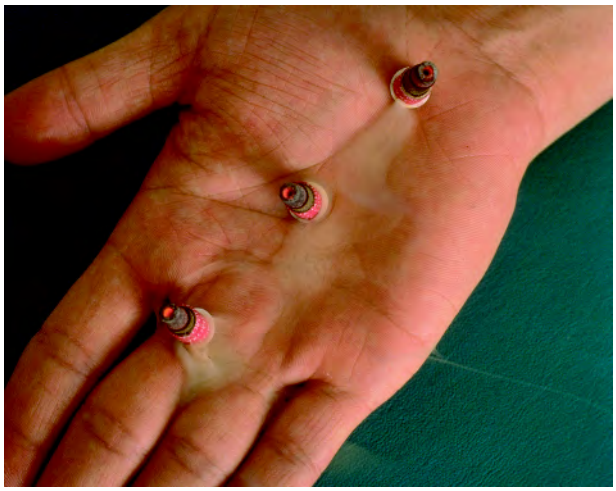
Moxibustion

Definition

Moxibustion is a technique used in traditional Chinese medicine in which a stick or cone of burning mugwort, *Artemesia vulgaris*, is placed over an inflamed or affected area on the body. The cone is placed on an acupuncture point and burned. The cones is removed before burning the skin. The purpose is to stimulate and strengthen the blood and the life energy, or *qi*, of the body.

Origins

The actual Chinese character for **acupuncture** literally translates into "acupuncture-moxibustion." More than 3,000 years ago, during the Shang Dynasty in China, hieroglyphs of acupuncture and moxibustion were found on bones and tortoise shells, meaning the practice precedes that date. The root word, "moxa" is actually derived from the Japanese.



Moxibustion hand acupuncture for stomach, kidneys and chest. *(© PHOTOTAKE Inc. / Alamy)*

Benefits

Moxibustion is used for people who have a cold or stagnant condition. The moxa stick is burned to warm up the blood and qi that are not circulating well. It is particularly known for its ability to turn breech presentation babies into a normal head-down position that is considered safer during **childbirth**. In a 1998 study published in the *Journal of the American Medical Association*, 75% of the pregnant women in the study had breech fetuses that turned in the normal position. Moxibustion significantly increases fetal movements in pregnant women. Moxibustion is also used to treat inflammations. For example, if treating a patient with tendinitis, the moxa stick is burned over the elbow area. It is also highly regarded for menstrual cramps, where the stick is waved over the abdominal area. Often, the cramps disappear immediately.

Moxa on acupuncture points is frequently done with acupuncture treatment for many kinds of ailments. The treatment brings warmth and helps strengthen the activity of the blood.

Description

Moxibustion is the burning of **mugwort** over inflamed and affected areas of the body. The mugwort can come in sticks that closely resemble the circumference and length of a cigar. Moxa cones can also be burned. The mugwort, called *Ai Ye* in **traditional Chinese medicine**, is positioned over acupuncture points to stimulate the qi and blood. In breech presentation babies, the acupoint BL 67, located on the outside of the little toe, is stimulated. For menstrual cramps, the meridian called the Ren Channel, the center line of the lower abdomen, is treated. Moxibustion is almost always used in conjunction with acupuncture, as a complementary technique. In Japan, there are practitioners who are separately licensed to practice as specialists in moxibustion. It is used for a wide variety of ailments, depending on the patient's needs and history. Therefore, it is difficult to cite costs and length of the treatment. For menstrual cramps, moxibustion can be used once. For breech presentation, the turning may occur during the treatment. Similar to acupuncture, it is sometimes covered by insurance and workers' compensation. Patients can be taught how to treat themselves, and moxa sticks are easily purchased.

Preparations

Because patients who undergo moxibustion treatment are also getting acupuncture, it is sometimes

Moxibustion. *(© Photo Researchers, Inc. Reproduced by permission.)*

recommended to consult a physician prior to this therapy.

Precautions

Moxibustion is specifically used for patients with a cold or stagnant constitution. Therefore, if any patient has too much heat, they should not undergo moxibustion treatment. An expert practitioner can advise patients in these matters.

Side effects

Because moxibustion often includes the burning of **smoking** mugwort sticks, patients who have respiratory problems should avoid the use of smoking moxa sticks. Smokeless moxa sticks are available, and patients who have respiratory difficulties may opt for this method. There is also the occasional report of external **burns** if the moxa stick is held too close to the patient, although this is rare.

Research and general acceptance

Moxibustion has been used in traditional Chinese medicine for centuries, and as a result, it is widely accepted in Asia. It is gaining popularity in the west, in particular, for its ability to turn breech presentation babies. Several studies in the *Journal of the American Medical Association* have praised the use of this therapy.

Training and certification

Although moxibustion alone does not require a particular licensing or accreditation process, because it is used with acupuncture, the practitioner must have an acupuncture license in the United States.

Resources

BOOKS

Cheng, Kinnong. *Chinese Acupuncture and Moxibustion*. China Books and Periodicals, 2000.

Cui Yongqiang. *Test: Chinese Acupuncture and Moxibus tion*. China Publishing and Trading, 1993.

Fei, X., and M. Jianhua. *Acupuncture and Moxibustion*. IOS Press, 2000.

Cheng, Dan An et al. *Acupuncture and Moxibustion Formu las and Treatments*. China Books and Periodicals, Blue Poppy Press, 1996.

PERIODICALS

Cardini, Francesco, and Huang Weixing. "Moxibustion for Correction of Breech Presentation: A Randomized Controlled Trial." *Journal of the American Medical Association* (Nov 11, 1998).

ORGANIZATIONS

American Association of Oriental Medicine. 433 Front Street, Catasauqua, PA 18035. (888) 500 7999. aaom1 @aol.com. http://www.aam.org.

OTHER

About.com. http://altmedicine.about.com/health/altmedi cine/library/weekly/blatherpm.htm?rnk rl&terms moxibustion.

Nanjng University of Traditional Chinese Medicine. http:// www.njutcm.edu.cn/index.html.

Katherine Y. Kim

MS *see* **Multiple sclerosis**

MSM

Description

Methylsulfonylmethane, or MSM, is also known as methyl sulfone and dimethylsulfone ($DMSO_2$). It is a sulfur-bearing compound that exists naturally in

many fruits, vegetables, grains, and animals, including humans. Its presence and activity was discovered while working with its parent compound, DMSO, of which it is an oxidized metabolite (hence the O_2 designation). Although 55,000 papers have been written on DMSO, research on MSM has been more limited. A wide range of therapeutic benefits are attributed to it, along with a high degree of safety, and a low degree of toxicity. Actor James Coburn, crippled by **rheumatoid arthritis**, praised MSM's **pain** relieving benefits.

The history of MSM, as derived from DMSO, includes the following highlights:

- DMSO was first synthesized in a nineteenth century Russian lab, and was investigated for its usefulness as a solvent (a dissolver of other substances).
- British scientist Lovelock, working with red blood cells and cryogenics—the science of "alive freezing," reported DMSO as a uniquely helpful agent.
- Stanley Jacob, M.D., an American working in the 1950s to perfect kidney transplants, found Lovelock's report on cryogenic uses of DMSO, and met with DMSO chemist researcher, Robert Herschler, Ph.D.
- Drs. Jacob and Herschler discovered that DMSO, in addition to being useful in transplant surgery, facilitated delivery of other medications through the skin into the body, and that it had significant pain relieving and anti-inflammatory properties. They also discovered an undesirable effect of DMSO—a fishy taste and body odor.
- DMSO was approved for veterinary use (1970) in the treatment of joint and muscle related problems.
- In Russia (1973), prescription DMSO began use for the treatment of pain related to autoimmune disorders, arthritis, and diabetic ulcers. (One source reports as of 1999, more than 125 countries are using DMSO more safely and less expensively than drugs used for the same conditions in the United States.)
- In 1978, DMSO was approved by the United States Food and Drug Administration (FDA) for human use in the treatment of interstitial cystitis only, a painful inflammatory condition affecting many women.
- With lagging FDA approval, Herschler continued research and discovered that approximately 15% of DMSO turns into MSM in the body, and that the MSM metabolite produced the pain-relieving and anti-inflammatory benefits without the unpleasant odor side effect.
- Since that time, Drs. Jacob and Herschler, and others by anecdote, have found MSM to be clinically helpful in treating many more conditions, and that it is extremely safe, and has no known toxicity.

MSM occurs naturally in some foods including cow's milk (its highest source). One source specifies the presence of MSM—in descending order—in unpasteurized cow's milk, coffee, tomatoes, tea, Swiss chard, beer, corn, and **alfalfa**. Some reports say that natural levels of MSM decline with age. Dr. Herschler believes that the average diet is deficient in MSM because of the foods that are eaten or the way in which they are prepared. However, other sources refute the need for supplementing **sulfur** in the form of MSM, claiming that dietary sources of sulfur are sufficient. Sulfur-containing foods include cabbage, Brussels sprouts, broccoli, cauliflower (these are all known as cruciferous vegetables), sunflower seeds, **garlic**, onions, asparagus, avocados, beans, peas, mustard, horseradish, lentils, soybeans, and yogurt. Dietary sources of the three sulfur-containing amino acids—methionine, cystine, and cysteine—include meat, fish, poultry, eggs, milk, cheeses, and nuts, The cruciferous vegetables are reported to contain other sulfur compounds in addition to the sulfur-bearing **amino acids**. Nevertheless, many anecdotes cite the benefit of supplementing the diet with MSM.

General use

Because of its yellow color, the ancients named sulfur "the sun carrier." Sulfur is the fourth most common mineral in the human body. Through the ages, its curative uses have motivated many pilgrimmages to hot springs and sulfur baths around the world. Sulfur's uses within the human body are numerous. In many tissues, it is important in biological processes including nerve signal transmission, facilitative enzymatic processes, insulin production, carbohydrate metabolism regulation, **detoxification**, and waste removal.

MSM, with a 34% bio-availablility of sulfur according to one source, is reported to be useful in treating musculoskeletal, respiratory, circulatory, eliminative, autoimmune, and degenerative disorders. One of the most widely reported benefits is the relief of pain, inflammation, and **muscle spasms**, especially when related, but not limited to, **osteoarthritis** and autoimmune disorders such as lupus, scleroderma, and rheumatoid arthritis. MSM is said to reduce and improve the quality of scar tissue; promote improved healing of joints, tendons, ligaments and collagen support structures; soften, renew and strengthen the skin; and increase blood flow. It is reported to improve mucus membranes, thereby reducing food and airborne allergic reactions, and symptoms related to **asthma** and **emphysema**; improve vascular smooth muscle growth, reducing the risk of coronary artery disease; and improve athletic performance by reducing lactic acid effects, strengthening muscle elasticity and suppleness,

KEY TERMS

Amino acids—Compound molecules from which protein is built. Some are considered essential, meaning the body cannot manufacture them; they must be supplied in the diet.

Cryogenics—A science examining the freezing of living tissue for preservation and use at a later time.

Epsom salts—The common name given to a crystalline compound of magnesium, which, when dissolved in water and taken internally, functions as a laxative. It is also used externally in baths or soaks as an anti-inflammatory and detoxifying remedy.

Interstitial cystitis—An inflammatory, and sometimes scarring, condition of the bladder that affects many women.

Lactic acid—A by-product of muscular work out; slow clearance of lactic acid from tissues is associated with muscular fatigue.

Oxidized metabolite—The result of a process in which one molecule or substance is utilized by the body by first adding oxygen.

Synergistic effect—A compounding effect greater than the effect otherwise expected from adding the involved components.

and enhancing **fatigue** recovery times. It is reported to have an antiparasitic effect, especially against the parasite giardia. Another reported benefit is its tonic effect on the bowels, which increases peristalsis (waves of motion that move food along the digestive tract). This benefit is helpful to the elderly, those with sluggish colons, and those addicted to laxatives. At least one report noted possible anticancer activity.

Preparations

MSM is commonly available in these forms: powder, capsule, lotion, or gel. By itself, the powder is said to have a bitter taste. Users are advised to put the prescribed amount on the forward part of the tongue, followed by a large glass of water. In this way, the powder is dissolved in the stomach, and its bitter taste is not registered by the taste buds, which are located on the back of the tongue. Plenty of water throughout the day is also advised, due to its detoxifying action.

Suggested dosages range widely, from one to three grams daily, and up to 18 grams daily with medical supervision. One report suggests taking from two to six grams daily; the optimal dose depends on body size, age, and the severity of the condition being treated. Dr. Jacob recommends that, "A couple of grams a day would be a good general dosage," and higher doses may be useful to achieve a therapeutic effect. An example of a higher dose is three to four grams, taken for relief of allergy symptoms.

The elderly may benefit with as little as one tenth of a gram (100 mg) daily, up to five grams. Encapsulated preparation dosage recommendations may vary according to how many other ingredients—glucosamine sulfate or **chondroitin**, for example—are included in the preparation. Recommended amounts for topical applications of gel or lotion may also vary. Some sources advise adding an extra amount of powder to a gel or lotion for enhanced effect.

Precautions

MSM has blood thinning effects; therefore caution and consultation with a healthcare professional is especially advised when using medications such as warfarin (commonly known as Coumadin), aspirin, herbals such as ginkgo (**Ginkgo biloba**), and other supplements such as fish and flax oils, which contain Omega-3. An essential fatty acid, Omega-3 also has blood thinning properties.

Product purity is another concern. There are precautions against contamination by other ingredients including bacteria or DMSO, a chemical solvent that is not approved for use by the FDA. One company's product was recalled due to bacterial contamination. However, no related injuries were reported.

Dilution of the more expensive MSM product with less expensive bulk filler ingredients like Epsom salts, is a caution to buyers. ConsumerLab, LLC, lists many of these products on their Web site, with additional ingredients and test findings.

One product reported that it achieved "GRAS" (generally regarded as safe) status. The named product, as others, may derive mainly from pine tree lignan. A plant cell wall constituent, lignan facilitates the transport of nutrients up and down the stem or tree trunk. MSM may therefore facilitate movement and metabolism of other drugs, supplements, or nutrients within the body. Several reports caution that the sulfur of MSM must not be confused with sulfa drugs or with sulfites used as food preservatives. Some persons demonstrate allergic reaction to one or both of these.

Several sources report that few well-designed human studies have been conducted or reported. This factor contributes to the charge that MSM is unproven, while the array of anecdotal testimony points to the contrary.

Side effects

Side effects include gastrointestinal disturbance, such as **diarrhea**; **headache**; decreased ability to fall asleep (may occur if taken at bedtime); skin that is softer; nails that are thicker; and hair that is harder. Some reports have claimed that diarrhea or GI disturbances such as hyperacidity, **nausea**, and inflammation that are part of a **stress** response prior to taking MSM may clear "dramatically" by using MSM.

Interactions

Favorable interactions

Two sources report syngergistic interactions that reduced swelling and scarring in trauma patients, involving combinations of MSM and **vitamin C**. This occurred with additional use of the digestive proteins for starch and cellulose (amylase and cellulase, respectively), fats (**lipase**), sugars (sucrase, maltase and lactase), and **bromelain** (from pineapples). The addition of **glucosamine** HCL is reported to improve MSM effects when used for osteoarthritis.

Unfavorable interactions

Unfavorable interactions may include blood thinning medications such as Coumadin (warfarin), aspirin, and fish or flax (Omega-3) oil. One source reports studies involving prevention, regression, and promotion of tumor growth. Unfavorable interactions between MSM and chemotactic or chemopreventive agents may exist. The counsel of a knowledgeable healthcare professional is advised.

Resources

BOOKS

Jacob, M.D., Stanley W., Ronald M. Lawrence M.D., Ph.D., and Martin Zucker. *The Miracle of MSM, the Natural Solution for Pain*. New York: Penguin Putnam, 1999.

OTHER

Challem, Jack. "MSM and DMSO." *The Nutrition Reporter*. November 25, 2000. [Cited May 13, 2004]. http://www.thenutritionreporter.com/MSM and DMSO.html.

Consumer Labs, LLC. *Product Review: Joint Supplements (Glucosamine, Chondroitin and MSM)* November 2, 2003. [Cited May 13, 2004]. http://www.consumerlab.com/results/gluco.asp.

"Eye and Nasal Drops." *Ophthalmology Times* September 15, 2001. [Cited May 13, 2004] http://galenet.galegroup.com/servlet/HWRC.

Lang, Kerry L. *Methylsulfonylmethane (MSM)*. June 17, 2001. [Cited May 13, 2004] http://www.quackwatch.org/01QuackeryRelatedTopics/DSH/msm.htm.

"Lignisul MSM achieves GRAS status." *Nutraceuticals World*. May 2003. [Cited May 13, 2004] http://galenet.galegroup.com/servlet/HWRC.

"Methylsulfonylmethane (MSM)." *Alternative Medicine Review*. November 2003. [Cited May 13, 2004] http://galenet.galegroup.com/servlet/HWRC.

"MSM to Quell Arthritis Symptoms." *Tufts University Health & Nutrition Letter* January 2002. [Cited May 13, 2004] http://galenet.galegroup.com/servlet/HWRC.

Nature doctor.*MSM MethylSulfonylMethane*. [Cited May 13, 2004] http://www.pages.prodigy.net/naturedoctor/msm.html.

"Sulfur (MSM)." [Cited May 13, 2004] http://www.all natural.com/msm.html.

"What is MSM?" *MSM Information Center* [Cited May 13, 2004] http://www.health n energy.com/msminfo.htm.

Katherine E. Nelson, N.D.

Mugwort

Description

Mugwort (*Artemisia vulgaris*) also known as common artemisia, felon herb, St. John's herb, chrysanthemum weed, sailor's tobacco, and moxa is a perennial member of the Compositae family, and a close relative of **wormwood** (*Artemisia absinthium L.*). Mugwort's generic name is from that of the Greek moon goddess Artemis, a patron of women. Mugwort has long been considered an herbal ally for women with particular benefit in regulating the menstrual cycle and easing the transition to **menopause**. The common name may be from the old English word *moughte* meaning "moth," or *mucgwyrt*, meaning "midgewort," referring to the plant's folk use to repel moths and other insects.

Mugwort has a long history of folk tradition and use. Anglo-Saxon tribes believed that the aromatic mugwort was one of the nine sacred herbs given to the world by the god Woden. It was used as a flavoring additive to beer before **hops** (*Humulus lupulus*) became widely used. Mugwort is considered a magical herb, with special properties to protect road-weary travelers against exhaustion. The Romans planted mugwort by roadsides where it would be available to passersby to put in their shoes to relieve aching feet. St. John the Baptist was said to have worn a girdle of mugwort when he set out into the wilderness. Some of the magic in mugwort is in its reputed ability to induce prophetic and vivid dreams when the herb is placed near the bed or under the sleeper's pillow. In Pagan ceremony, a garland or belt of mugwort is worn while dancing

Mugwort (*Artemisia vulgaris*). *(© blickwinkel / Alamy)*

around the fire during summer solstice celebrations. The herb is then thrown into the fire to ensure continued protection throughout the coming year.

Mugwort is a tall and hardy European native with stout, angular, slightly hairy stems tinged with a purple hue. Leaves, which may be as long as 4 in (10 cm), are deeply divided with numerous lance-shaped, pointed segments, which may be toothed or entire. They are arranged alternately along the erect, grooved stem and are a dark green on top and pale green with downy hairs on the underside. Mugwort has a pungent aroma when the leaves are crushed. In late summer the small reddish-yellow disk flowers cluster in long spikes at the top of the plant. Mugwort may reach to 6 ft (2 m) or more in height. This tenacious herb has naturalized throughout North America and may be found growing wild in rocky soils, along streams and embankments, and in rubble and other waste places, particularly in the eastern United States. In some areas, including North Carolina and Virginia, mugwort is characterized as a noxious, alien weed. Mugwort root is about 8 in (20 cm) long with many thin rootlets. It spreads from stout and persistent rhizomes.

General use

Mugwort leaf and stem are used medicinally. Mugwort acts as a bitter digestive tonic, uterine stimulant, nervine, menstrual regulator, and antirheumatic. The volatile oil of mugwort includes thujone, linalool, borneol, pinene, and other constituents. The herb also contains hydroxycoumarins, lipohilic flavonoids, vulgarin, and triterpenes.

Mugwort acts as an emmenagogue, an agent that increases blood circulation to the pelvic area and uterus and stimulates **menstruation**. It is a useful remedy for painful and irregular menstruation. A compress of the herb has been used to help promote labor and assist with expulsion of the afterbirth. A mild infusion of mugwort is useful as a digestive stimulant. It is helpful in cases of mild **depression** and nervous tension. The herb also may stimulate the appetite. A weak infusion of mugwort has sedative properties that may quiet restlessness and **anxiety**. Its antispasmodic action may relieve persistent **vomiting**, and has been used in the treatment of **epilepsy**. Mugwort added to bath water is an aromatic and soothing treatment for relief of aches in the muscles and joints. In a clinical trial, crushed fresh mugwort leaves applied to the skin were shown to be effective in eradicating **warts**. Taken as an infusion, mugwort is helpful in ridding the system of pinworm infestation. Dried mugwort leaf also acts as a natural tinder, useful in holding a smoldering fire. The dried herb has also been smoked as a nicotine-free tobacco. A species of mugwort (*A. douglasiana*), common in the southwestern United States, was used by some western Native Americans as a prevention for poison **oak** rash. The fresh mugwort leaf was rubbed over areas of exposed skin before walking into poison oak habitat. The two plants often grow near one another.

In Chinese medicine mugwort, known as *Ai ye* or *Hao-shu* is highly valued as the herb used in **moxibustion**, a method of heating specific **acupuncture** points on the body to treat physical conditions. Mugwort is carefully harvested, dried and aged, then it is shaped into a cigar-like roll. This "moxa" is burned close to the skin to heat the specific pressure points. It has been used in this way to alleviate rheumatic pains aggravated by cold and damp circumstances. Mugwort has also been used in various size cones that are places on the skin directly or on top of an herb or some salt and burned. In Japan, some practitioners only use moxa for treatment.

A study published in the *Journal of the American Medical Association* reported on the successful use of moxibustion in reversing breech birth positions. The study found that 75% of 130 fetuses had reversed their

KEY TERMS

Antioxidant—Any substance that reduces the damage caused by oxidation, such as the harm caused by free radicals.

Artemisinin—An antimalarial agent derived from an ancient Chinese herbal remedy. Two of the most popular varieties are artemether and artesunate, used mainly in Southeast Asia in combination with mefloquine.

Emmenagogue—A type of medication that brings on or increases a woman's menstrual flow.

Mugwort-spice syndrome—A type of food allergy that occurs in people who are sensitized to mugwort, celery, carrots, and other spices. It often takes the form of a skin rash.

Tonic—Characterized by tonus, a state of partial contraction that is maintained at least in part by a continuous bombardment of motor impulses.

Volatile oil—The fragrant oil that can be obtained from a plant by distillation. The word "volatile" means that the oil evaporates in the open air.

position after moxibustion treatment of the mother. The technique is said to stimulate the acupuncture point known as BL67, located near the toenail of the fifth toe, stimulating circulation and energy flow and resulting in an increase in fetal movements.

In Chinese medicine, mugwort is ingested to stop excessive or inappropriate menstrual bleeding.

Mugwort has also been used in Brazilian folk medicine as a remedy for stomach ulcers. Researchers have found that the plant contains **antioxidants** which help to explain its protective effects on gastric tissues.

More recently, mugwort has attracted attention as the source of a natural compound, artemisinin, which has been shown to have antimalarial properties. Artemisinin is a promising natural remedy for **malaria** because of its low toxicity and its effectiveness against drug-resistant mutations of the malaria parasite. In addition to its effectiveness in treating malaria, artemisinin is also being tested as a possible anticancer drug. A group of researchers in Mississippi has shown that artemisinin is toxic to several different types of human **cancer** cells.

Preparations

Mugwort is harvested just as the plant comes into flower, before the blossoms are fully open. The leaves are removed from the stalks and dried on paper-lined trays in a light, airy room, away from direct sunlight. The flowerheads should be dried intact and the dried herb stored in clearly-labeled, tightly-sealed, dark glass containers.

For infusion, 1 oz of fresh mugwort leaf, less if dried, is placed in a warmed glass container. One pint of fresh, nonchlorinated boiling water is added to the herb. The mixture is covered to prevent loss of volatile oils. The tea should be infused for five to 10 minutes. A mild infusion is best. After straining, it is recommended to drink two cups of mugwort tea per day. Use should be discontinued after six days.

Four ounces of finely-cut fresh or powdered dry herb can be combined with 1 pt of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts and have a 50/50 ratio of alcohol to water. The mixture should be kept in a dark place for about two weeks, shaking several times each day. It can then be strained and stored in a tightly capped, dark glass bottle. Dosage recommendations vary, with some herbalists cautioning against ingestion of mugwort in medicinal preparations.

In **traditional Chinese medicine**, the herb is burned slightly in a pan before simmering with other herbs to stop menstrual bleeding.

Precautions

Mugwort should be avoided during **pregnancy** and lactation. The herb is a uterine stimulant. Women should avoid its use during lactation as the chemical constituent thujone may be passed to the baby through the mother's milk. Mugwort should no be ingested if uterine inflammation or pelvic infection is present.

Side effects

High doses of mugwort may cause liver damage, **nausea**, and convulsions.

Some people develop a **contact dermatitis**, or allergic skin rash, if they are in contact with mugwort and certain other spices. This food allergy has been called the mugwort-spice syndrome, or sometimes the mugwort-celery-spice syndrome. Other foods and spices that are part of this syndrome include carrots, paprika, curry, cumin, birch, and pepper. In addition, mugwort pollen has been reported to cause **asthma** in susceptible children.

Interactions

People who are allergic to mugwort are also highly likely to be allergic to **chamomile** and should not take preparations made from either herb.

Resources

BOOKS

Culpeper, Nicholas. *Culpeper's Complete Herbal & English Physician*. IL: Meyerbooks, 1990.

Foster, Steven, and Duke, James A. *Peterson Field Guides, Eastern/Central Medicinal Plants*. NY: Houghton Mif flin Company, 1990.

Mabey, Richard. *The New Age Herbalist*. New York: Simon & Schuster, Inc., 1988.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993

Palaise, Jean. *Grandmother's Secrets, Her Green Guide to Health From Plants*. NY: G.P. Putnam's Sons, 1974.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

PERIODICALS

Anliker, M. D., S. Borelli, and B. Wuthrich. "Occupa tional Protein Contact Dermatitis from Spices in a Butcher: A New Presentation of the Mugwort Spice Syndrome." *Contact Dermatitis* 46 (February 2002): 72 74.

Bibi, H., D. Shosheyov, D. Feigenbaum, et al. "Com parison of Positive Allergy Skin Tests Among Asthmatic Children from Rural and Urban Areas Living Within Small Geographic Area." *Annals of Allergy, Asthma and Immunology* 88 (April 2002): 416 420.

Bilia, A. R., D. Lazari, L. Messori, et al. "Simple and Rapid Physico Chemical Methods to Examine Action of Antimalarial Drugs with Hemin: Its Application to *Artemisia annua* Constituents." *Life Sciences* 70 (Janu ary 4, 2002): 769 778.

Galal, A. M., S. A. Ross, M. A. Elsohly, et al. "Deoxyarte misinin Derivatives from Photooxygenation of Anhy drodeoxydihydroartemisinin and Their Cytotoxic Evaluation." *Journal of Natural Products* 65 (February 2002): 184 188.

Moneret Vautrin, D. A., M. Morisset, P. Lemerdy, et al. "Food Allergy and IgE Sensitization Caused by Spices: CICBAA Data (Based on 589 Cases of Food Allergy)." *Allergie et immunologie (Paris)* 34 (April 2002): 135 140.

Repetto, M. G., and S. F. Llesuy. "Antioxidant Properties of Natural Compounds Used in Popular Medicine for Gastric Ulcers." *Brazilian Journal of Medicine and Bio logical Research* 35 (May 2002): 523 534.

ORGANIZATIONS

American College of Allergy, Asthma, and Immunology. 85 West Algonquin Road, Suite 550, Arlington Heights, IL 60005. (847) 427 1200. www.acaai.org.

Herb Research Foundation. 1007 Pearl Street, Suite 200, Boulder, CO 80302. (303) 449 2265. www. herbs.org.

OTHER

Grieve, Mrs. M. "A Modern Herbal, Mugwort." Botani cal.com. http://www.botanical.com/botanical/mgmh/m/mugwor61.html.

Hoffmann, David L. "Mugwort." *Health World Online*. http://www.healthy.net.

Clare Hanrahan
Rebecca J. Frey, PhD

Mullein

Description

Mullein (*Verbascum thapsus*) also known as great mullein, is a dramatic biennial herb of the Scrophular-iaceae or figwort family. The family name of this European native may have derived from the word scrofula, a disease that is now understood to be a form of **tuberculosis**. In Ireland mullein was widely cultivated as a remedy for tuberculosis. The seed is said to have arrived on the North American continent in the dirt used as ballast in old sailing vessels. At least five species of mullein have naturalized in North America. This sturdy and adaptive herb is found on roadsides, rocky and gravely banks, and in marginal areas throughout the world. It thrives in full sun and adapts well to arid conditions. The seeds of this hardy plant, particularly *V. blattaria,* may remain viable as long as 70 years.

Mullein (Verbascum thapsus). *(© Geoffrey Kidd / Alamy)*

Mullein is known by many names reflecting the numerous medicinal and practical uses people have found for this beneficial wayside herb throughout its long association with human communities. Among the common names for mullein are flannel leaf, beggar's blanket, velvet plant, feltwort, tinder plant, candlewick plant, witch's candle, Aaron's rod, lady's **foxglove**, donkey's ears, hag's taper, candlewick plant, torches, and Quaker rouge. This last name was given because the leaves were sometimes used as a natural rouge rubbed vigorously on the cheeks to give a rosy glow, particularly among young women whose cultures have shunned cosmetics. Mullein has been known for centuries as Gordolobo in Mexico, where it was used by the Nahuatl and other indigenous cultures long before the coming of the conquistadors. Gordolobo is still sold in medicinal herbs stands throughout Mexico as a remedy for **hemorrhoids** and **varicose veins** as well as throat ailments.

Like many plants of European origin, mullein was credited with power over witches and evil spirits. It was considered one of 23 important healing herbs in medieval Jewish medical practice. Mullein's large stalk was used as a ceremonial torch as far back as ancient Rome. Stripped of its leaves and dipped in tallow, the cylindrical spike could hold a flame when carried aloft from place to place. One name for mullein is miner's candle. During the 1849 California gold rush, the mine shafts were aglow with mullein torches carried by the prospectors. The leaves were used as tinder to start fires, or as a smudge, burned over the embers of Native American campfires. The smoke was inhaled to relieve pulmonary congestion. Mullein leaf, which some tribes called "big tobacco," was mixed with nicotine leaf and smoked to relieve **asthma**. The leaves were boiled to make a hot poultice to treat **gout** and painful joints. Mullein's thick, soft leaves lined the shoes of many common folk during the winter months to provide extra warmth. The leaves were also warmed over a hot rock and fitted to the foot to relieve **fatigue**. Figs were wrapped in the leaves to ripen and keep, and the flowers were used to add blonde highlights to the hair, or soaked in oil to make ear drops.

Mullein's branching, spindle-shaped root produces a low-lying basal rosette of broadly lance-shaped leaves in the first year of growth. Dense and downy white hairs give mullein's light-green leaves a soft texture somewhat like the fine pile of velvet. These leaves winter over from the first year's growth. They may reach 15-20 in (38-50 cm) in length and 8 in (20 cm) across. In its second season mullein transforms, reaching skyward with a single, pithy and fibrous stem stout enough hold itself erect when in full leaf. Small yellow, five-petaled blossoms each form a golden cup and encircle the upper few feet of the stem, opening randomly. The usually solitary stem, which may grow to 10 ft (3 m) high, is sometimes branched. The leaves clasp the stem, growing alternately, and are increasingly smaller toward the top of the stem, an arrangement that facilitates the flow of rain water to the roots.

General use

The flowers, leaves, and root of mullein have been used as healing remedies for centuries. Mullein leaf and flower were listed as an official medicine in the United States *National Formulary* from 1916 to 1936. The plant contains mucilage, triterpene saponins, volatile oil, flavonoids, and bitter glycosides. The efficacy of these compounds in the quantity found in mullein is questioned by at least one researcher. However, in the realm of folk medicine, practiced for centuries, mullein is valued as a demulcent, emollient, antispasmodic, astringent, diuretic, vulnerary, and expectorant. Mullein is approved by the German Commission E, an advisory panel for herbal medicine, for treatment of respiratory catarrh. Studies have confirmed the anti-inflammatory action of mullein. Mullein tea, made from the flowers and leaf, is a beneficial remedy for **bronchitis**, **sore throat**, **tonsillitis**, dry coughs, and hoarseness. The flowers have bactericidal and sedative properties and are generally considered more medicinally potent than the leaves. Their bactericidal activity was confirmed by researchers at Clemson University, who reported in 2002 that mullein extracts are effective against several species of disease bacteria, including *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, and *Klebsiella pneumoniae*.

An oil extract of mullein flowers relieves **earache**, and the blossom tea can ease **headache pain** and promote sleep. The fresh leaves, traditionally boiled in milk and consumed daily, are an Irish folk remedy for tuberculosis. When this mixture is applied externally in poultice form, it is helpful in the treatment of **boils**, carbuncles, skin ulcers, chilblains, and hemorrhoids.

Preparations

Mullein leaves should be harvested before the herb is in blossom, leaving at least two thirds of the foliage on the plant. The flowers should be harvested just as they open. Blossoms are short-lived and drop easily from the plant. Roots are best harvested in the fall of the year. Leaves and blossoms should be dried in a single layer on paper-lined trays in a light, warm, and airy room out of direct sunlight. The medicinal

KEY TERMS

Antispasmodic—A drug or other substance that relieves mild cramping or muscle spasms.

Catarrh—Inflammation of a mucous membrane, especially of the nose and air passages.

Chilblains—Redness and swelling of the skin often accompanied by burning, itching, and blisters. A condition caused by excessive exposure to the cold.

Demulcent—A gelatinous or oily substance that has a protective or soothing influence on irritated mucous membranes.

Diuretic—An herbal preparation or medication given to increase urinary output.

Expectorant—A drug that promotes the discharge of mucus from respiratory system.

Mucilage—A gummy, gelatinous substance found in the stems of borage that is useful for treating throat irritations.

properties of the flowers are diminished if they lose their color, so care should be taken in the drying process.

Oil extraction: Combine one cup of mullein blossoms in one-half cup of olive oil in a glass double boiler over low flame. Heat slowly for about three hours. Strain with cheesecloth to remove all plant parts. Pour the oil into small, dark glass bottles, tightly sealed and clearly labeled for storage. A cold extraction can also be prepared. Cover flowers in olive oil in a glass container with a lid and set aside on a sunny windowsill to steep for seven to 10 days. Strain before storing in dark glass bottles.

Infusion: Place 2 oz of finely cut fresh (less if dried) mullein leaf and blossom in a warmed glass container. Bring 2.5 cups of fresh, nonchlorinated water to the boiling point, add it to the herbs. Cover. Infuse the tea for about 10 minutes. Strain carefully, as mullein's fine hairs are an irritant. The blossoms are sweeter to the taste than the leaf. The prepared tea will store for about two days in the refrigerator. Drink three cups a day.

Syrup: Using fresh blossoms and leaves, prepare a strong infusion of mullein. Combine the infusion with a 50/50 mixture of honey and brown sugar. Use 24 oz of sweetener for each 2.5 cups of the herbal infusion. Heat mixture in a glass or enamel pot; stir frequently as the mixture thickens. Cool and pour into a clearly labeled glass bottles. Refrigerate for storage. Take 1 tsp of syrup three times a day, or every two hours if needed for chronic coughs.

Precautions

The seeds of some species of mullein are considered toxic. The seeds of the species *N. phlomoides* contains a type of poisonous saponin and are slightly narcotic. They have been used to intoxicate fish to make them easier to catch. The Clemson researchers, however, found that mullein extract has this effect on fish only at high concentrations.

Although mullein is safe to use by itself, it is sometimes mixed with such other herbs as **comfrey**, **echinacea**, Irish moss, **yarrow**, **garlic**, or ginseng in a variety of commercial herbal preparations. The Food and Drug Administration (FDA) has issued consumer warnings about thirteen different herbal syrups, powders, capsules, or other dietary supplements containing mullein since 1999. Because the FDA classifies herbal preparations as dietary supplements and does not subject them to the approval process that prescription drugs must pass, consumers should purchase herbs and herbal products only from established manufacturers. People who would like to try mullein as an alternative remedy for sore throats might want to use the herb by itself first before trying herbal mixtures.

Side effects

There have been isolated case reports of people developing **contact dermatitis** (allergic skin rash) from mullein plants.

Interactions

Mullein has been reported to inhibit the effectiveness of antidiabetic drugs. It intensifies the effects of muscle relaxants and lithium. Persons taking prescription diuretics should consult a physician before taking mullein, as it may interact with the prescription drugs to cause a loss of **potassium** from the body.

Resources

BOOKS

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies. Emmaus, PA: Rodale Press, Inc., 1997.

Thomson, William A. R. *Medicines From The Earth*. SF: Harper & Row, 1983.
Tyler, Varro E., Ph.D. *Herbs of Choice*. New York: Pharmaceutical Products Press, 1994.
Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.
Weiss, Gaea, and Shandor Weiss. *Growing & Using The Healing Herbs*. NY: Wings Books, 1992.

PERIODICALS

Ertle, Lynn. "Mullein the Maligned." *The Herb Quarterly* (Summer) 1977.
Lev, E. "Some Evidence for the Use of Doctrine of Signatures in the Land of Israel and Its Environs During the Middle Ages." [in Hebrew] *Harefuah* 141 (July 2002): 651 655.
Turker, A. U., and N. D. Camper. "Biological Activity of Common Mullein, a Medicinal Plant." *Journal of Ethnopharmacology* 82 (October 2002): 117 125.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.
Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. www.swsbm.com.
United States Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition. 5100 Paint Branch Parkway, College Park, MD 20740. (888) SAFEFOOD. www.cfsan.fda.gov.

Clare Hanrahan
Rebecca J. Frey, PhD

Multiple chemical sensitivity

Definition

Multiple chemical sensitivity—also known as MCS syndrome, environmental illness, idiopathic environmental intolerance, chemical **AIDS**, total allergy syndrome, or simply MCS—is a disorder in which a person develops symptoms from exposure to chemicals in the environment. With each incidence of exposure, lower levels of the chemical will trigger a reaction and the person becomes increasingly vulnerable to reactions triggered by other chemicals.

Medical experts disagree on the cause of the syndrome, and as to whether MCS is a clinically recognized illness. In a 1992 position statement that remained unchanged as of early 2000, the American Medical Association's Council on Scientific Affairs did not recognize MCS as a clinical condition due to a lack of accepted diagnostic criteria and controlled studies on the disorder. A more recent discussion of methodological problems in published studies of MCS, as well as recommendations for patient care, may be found in the 1999 position paper on MCS drafted by the American College of Occupational and Environmental Medicine (ACOEM). As of 2003, however, many researchers in Europe as well as the United States regard MCS as a contemporary version of neurasthenia, a concept first introduced by a physician named George Miller Beard in 1869.

Description

Multiple chemical sensitivity typically begins with one high-dose exposure to a chemical, but it may also develop from long-term exposure to a low level of a chemical. Chemicals most often connected with MCS include: formaldehyde; pesticides; solvents; petrochemical fuels such as diesel, gasoline, and kerosene; waxes, detergents, and cleaning products; latex; tobacco smoke; perfumes and fragrances; and artificial colors, flavors, and preservatives. People who develop MCS are commonly exposed in one of the following situations: on the job as an industrial worker; residing or working in a poorly ventilated building; or living in conditions of high air or water pollution. Others may be exposed in unique incidents.

Because MCS is difficult to diagnose, estimates vary as to what percentage of the population develops MCS. However, most MCS patients are female. The median age of MCS patients is 40 years old, and most experienced symptoms before they were 30 years old. There is also a large percentage of Persian Gulf War veterans who have reported symptoms of chemical sensitivity since their return from the Gulf in the early 1990s.

Causes and symptoms

Chemical exposure is often a result of indoor air pollution. Buildings that are tightly sealed for energy conservation may cause a related illness called **sick building syndrome**, in which people are thought to develop symptoms from chronic exposure to airborne environmental chemicals such as formaldehyde from the furniture, carpet glues, and latex caulking. A person moving into a newly constructed building, which has not had time to degas (or air out), may experience the initial high-dose exposure that leads to MCS.

The specific biochemical and physiological mechanisms in humans that lead to MCS are not well understood. A recent hypothesis, however, suggests that MCS is the end result of four different mechanisms of sensitization acting to reinforce one

KEY TERMS

Capsaicin—A colorless, bitter compound that is present in cayenne and gives it its heat.

De-gas—To release and vent gases. New building materials often give off gases and odors and the air should be well circulated to remove them.

Neurasthenia—Nervous exhaustion; a disorder with symptoms of irritability and weakness, commonly diagnosed in the late 1800s.

Sick building syndrome—An illness related to multiple chemical sensitivity in which a person develops symptoms in response to chronic exposure to airborne environmental chemicals found in a tightly sealed building.

another. Further research is required to test this hypothesis.

The symptoms of MCS vary from person to person and are not chemical-specific. Symptoms are not limited to one physiological system, but primarily affect the respiratory and nervous systems. Symptoms commonly reported are **headache**, **fatigue**, weakness, difficulty concentrating, short-term **memory loss**, **dizziness**, irritability and **depression**, **itching**, numbness, burning sensation, congestion, **sore throat**, hoarseness, shortness of breath, **cough**, and stomach pains.

One commonly reported symptom of MCS is a heightened sensitivity to odors, including a stronger emotional reaction to them. A Japanese study published in late 2002 reported that patients diagnosed with MCS can identify common odors as accurately as most people, but regard a greater number of them as unpleasant.

One test that has been devised to evaluate patients with MCS is the capsaicin inhalation test. Capsaicin is an alkaloid found in hot peppers that is sometimes used in topical creams and rubs for the treatment of arthritis. When inhaled, capsaicin causes coughing in healthy persons as well as those with **allergies** that affect the airway; however, persons with MCS cough more deeply and frequently than control subjects when given a dose of capsaicin. Although the test is not diagnostic in the strict sense, it has been shown to be an effective way of identifying patients with MCS.

Diagnosis

Multiple chemical sensitivity is a twentieth-century disorder, becoming more prevalent as more human-made chemicals are introduced into the environment in greater quantities. It is especially difficult to diagnose because it presents no consistent or measurable set of symptoms and has no single diagnostic test or marker. For example, a 2002 study of PET scans of MCS patients found no significant functional changes in the patients' brain tissues. Physicians are often either unaware of MCS as a condition, or refuse to accept that MCS exists. They may be unable to diagnose it, or may misdiagnose it as another degenerative disease, or may label it as a psychosomatic illness (a physical illness that is caused by emotional problems). Their lack of understanding generates frustration, **anxiety**, and distrust in patients already struggling with MCS. However, a new specialty of medicine is evolving to address MCS and related illnesses: occupational and environmental medicine. A physician looking for MCS will take a complete patient history and try to identify chemical exposures.

Some MCS patients may be helped by a psychologic evaluation, particularly if they show signs of panic attacks or other anxiety disorders. It is known that many patients with MCS suffer from comorbid depression and anxiety. In addition, MCS patients appear to have high rates of mood disorders compared to **asthma** patients as well as normal test subjects.

A 1999 consensus statement signed by 34 physicians and MCS researchers and published in the *Archives of Environmental Health* lists six criteria for MCS diagnosis:

- The MCS symptoms are chronic.
- The symptoms are reproducible with repeated chemical exposure.
- Low levels of chemical exposure trigger symptoms.
- Symptoms occur with multiple, unrelated chemicals.
- Symptoms improve when the chemicals are removed.
- Symptoms involve multiple organ systems.

Treatment

The most effective treatment for MCS is to avoid the chemicals that trigger the symptoms. Avoidance becomes increasingly difficult as the number of offending chemicals increases; things as seemingly harmless as air freshener devices, scented soaps, and perfume can trigger serious reactions in MCS patients. Individuals with MCS often remain at home where they are able to control the chemicals in their environment. In many cases, it may be recommended that an individual turn one room in his or her home, usually the bedroom, into an environmentally safe haven by

removing all known chemical irritants and furnishing it with 100% natural materials. The isolation that is a necessary part of treatment for MCS patients limits their abilities to work and socialize, so supportive counseling is often appropriate.

Many MCS patients undergo food-allergy testing and testing for accumulated pesticides in the body to learn more about their condition and what chemicals to avoid. Eliminating foods with artificial colors and flavors, preservatives, monosodium glutamate, and other additives can help to lessen MCS symptoms, as can choosing pesticide-free, organically grown fruits and vegetables.

Some MCS patients find relief with **detoxification** programs of **exercise** and sweating, and chelation of heavy metals. **Acupuncture** can give added support to any treatment program for MCS patients. **Yoga**, massage, and **aromatherapy** may be helpful in relieving **stress** symptoms associated with MCS. However, great care should be taken when selecting aromatherapy oils for MCS patients, and the practice is best left to a trained aromatherapist familiar with MCS. **Essential oils** should be verified as 100% unadulterated and nonchemically extracted. If a negative reaction results from the use of a particular oil, the MCS patient should stop using it immediately and consult his or her healthcare professional.

A number of herbs may be prescribed to treat the symptoms of MCS. They should also be prescribed and selected with great care, especially in those patients who suffer from known food allergies. Herbs should be recommended by a trained herbalist or naturopathic healthcare professional, and small sample doses may be administered before trying full dosage strength in order to check for an allergic reaction. **Milk thistle** (*Silybum marianum*) can be useful for cleansing the liver after chemical damage.

Allopathic treatment

Some doctors may recommend antihistamines, analgesics, and other medications to combat the symptoms of MCS. Care must be taken in prescribing these substances, as they may provoke a reaction in some MCS patients.

Expected results

Once MCS sets in, sensitivity continues to increase and a person's health continues to deteriorate. Strictly avoiding exposure to triggering chemicals for a year or more may improve health.

Prevention

Multiple chemical sensitivity is difficult to prevent because even at high-dose exposures, different people react differently. Ensuring adequate ventilation in situations with potential for acute high-dose or chronic low-dose chemical exposure, as well as wearing the proper protective equipment in industrial situations, will minimize the risk.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition, text revision. Washington, DC: American Psychiatric Association, 2000.

Gibson, Pamela. *Multiple Chemical Sensitivity: A Survival Guide*. Oakland, CA: New Harbinger Publications, 2000.

Hu, Howard, and Frank E. Speizer. "Specific Environmen tal and Occupational Hazards." In *Harrison's Princi ples of Internal Medicine*. 14th ed., edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

"Multiple Chemical Sensitivity Syndrome." Section 21, Chapter 287 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Bornschein, S., C. Hausteiner, A. Drzezga, et al. "PET in Patients With Clear Cut Multiple Chemical Sensitivity (MCS)." *Nuklearmedizin* 41 (December 2002): 233 239.

Bornschein, S., C. Hausteiner, T. Zilker, and H. Forstl. "Psychiatric and Somatic Disorders and Multiple Chemical Sensitivity (MCS) in 264 'Environmental Patients'." *Psychological Medicine* 32 (November 2002): 1387 1394.

Caccappollo vanVliet, E., K. Kelly McNeil, B. Natelson, et al. "Anxiety Sensitivity and Depression in Multiple Chemical Sensitivities and Asthma." *Journal of Occu pational and Environmental Medicine* 44 (October 2002): 890 901.

Johansson, A., O. Lowhagen, E. Millqvist, and M. Bende. "Capsaicin Inhalation Test for Identification of Sen sory Hyperreactivity." *Respiratory Medicine* 96 (Sep tember 2002): 731 735.

Ojima, M., H. Tonori, T. Sato, et al. "Odor Perception in Patients with Multiple Chemical Sensitivity." *Tohoku Journal of Experimental Medicine* 198 (November 2002): 163 173.

Pall, M. L. "NMDA Sensitization and Stimulation by Per oxynitrite, Nitric Oxide, and Organic Solvents as the Mechanism of Chemical Sensitivity in Multiple Chem ical Sensitivity." *FASEB Journal* 16 (September 2002): 1407 1417.

Schafer, M. L. "On the History of the Concept Neurasthenia and Its Modern Variants Chronic Fatigue Syndrome,

Fibromyalgia and Multiple Chemical Sensitivities" [in German] *Fortschritte der Neurologie Psychiatrie* 70 (November 2002): 570 582.
Ternesten Hasseus, E., M. Bende, and E. Millqvist. "Increased Capsaicin Cough Sensitivity in Patients with Multiple Chemical Sensitivity." *Journal of Occupational and Environmental Medicine* 44 (November 2002): 1012 1017.

ORGANIZATIONS

American Academy of Environmental Medicine. P.O. Box CN 1001 8001, New Hope, PA 18938. (215) 862 4544.
American College of Occupational and Environmental Medicine (ACOEM). 1114 North Arlington Heights Road, Arlington Heights, IL 60004. (847) 818 1800. www.acoem.org.

OTHER

"Multiple Chemical Sensitivities: Idiopathic Environmental Intolerance." Position Statement by the American College of Occupational and Environmental Medicine (ACOEM), April 26, 1999. www.acoem.org/position/statements.asp?CATA_ID 46.

Paula Thivierge
Rebecca J. Frey, PhD

Symptoms of multiple sclerosis

Symptoms

Numbness in one or more limbs, typically occurring on one side of the body at a time, or on the bottom half of the body.

Tingling in one or more limbs and chest

Tremors, or unsteady gait

Lack of muscular coordination

Blurred vision, double vision, or loss of vision (often in one eye at a time, with pain during eye movement

Incontinence

Exhaustion and weakness in limbs/Fatigue

Dizziness

Electric-shock sensations that occur with certain head movements

(Illustration by Corey Light. Cengage Learning, Gale)

Multiple sclerosis

Definition

Multiple sclerosis is a chronic, degenerative disease of the central nervous system (CNS). The CNS is comprised of the brain and the spinal cord. In the CNS, the nerves are covered by a protective layer called the myelin sheath. Myelin helps keep the nerve healthy. It also improves nerve conduction. In multiple sclerosis, inflammation causes the nerves to gradually lose this myelin cover. This repeated inflammation and erosion leads to scarring (sclerosis), which impairs the nerve's ability to conduct impulses. Eventually, even the nerves themselves are affected. Because the nervous system controls and coordinates a number of body functions, patients with MS gradually lose a variety of functions, including memory and the ability to see, speak or walk.

Description

Multiple sclerosis is a chronic debilitating disease that affects as many at 350,000 in the United States alone (2.5 million worldwide). Most patients are first diagnosed of the disease at age 20-40. However, the disease may appear as early as age 12 or as late as age 50. MS strikes women earlier in life. Women are also affected more frequently than men and whites more often than other races.

Causes and symptoms

The causes of multiple sclerosis are still unknown, although many factors are suspected. In the United States, whites are diagnosed with MS twice as often as blacks or Hispanics. Asians are the least affected. There is some consensus, however, that the following factors may contribute to the development of multiple sclerosis:

- *Genetic heredity*. Family members of multiple sclerosis patients have a 1 in 50 chance of having MS; the odds for people without an affected family member are 1 in 1,000. If an identical twin is diagnosed with MS, the remaining twin has a 1 in 3 chance of becoming affected as well. Recent research has shown that several autoimmune diseases, including MS, share a common genetic link. In other words, patients with MS might share common genes with family members that have other autoimmune diseases like systemic lupus, rheumatoid arthritis, and others.
- *Viral infection*. Most MS patients have high levels of antibodies to measles and other viruses. Therefore,

multiple sclerosis may be the body's delayed immune reaction to viruses such as measles, *Herpes simplex*, rubella, and parainfluenza. A 2001 study also suggested that Epstein-Barr virus, the virus that causes mononucleosis, probably increases risk of MS.

- *Autoimmune reaction*. Scientists know that MS is an autoimmune disorder, an illness in which the body attacks its own myelin as if it were a foreign substance. Although research has identified which immune cells are responsible and how they are activated, no one knows what causes the immune system to begin this attack.
- *Geography*. Countries in the temperate zones (above 40°) such as Northern Europe, North America, Australia, and New Zealand have significantly higher incidence of multiple sclerosis than countries in the tropics. In the United States, people who live below the 37th parallel develop MS at a rate of 57–78 cases per 100,000 people. Those who live above the line have a prevalence rate of 110–140 cases per 100,000 people.
- *Diet*. Studies have shown that populations at high risk of developing multiple sclerosis tend to consume a lot of dairy products and animal fats. On the contrary, in countries such as Japan, people eat few dairy products but consume lots of fish, soy-rich foods, and seeds, which are good sources of essential fatty acids. The incidence rates in these countries are very low. Thus, essential fatty acid deficiency due to excessive consumption of saturated fats may contribute to the development of multiple sclerosis.

Diagnosis

In order to determine whether or not a patient has multiple sclerosis, doctors often rely on the Schumacher criteria:

- Patient's symptoms indicate neurological damage in more than one areas.
- Patient's symptoms have worsened for more than six months.
- There are at least two events (each lasting for more than one day) separated by at least one month.
- Neurological exam of the patient shows abnormal central nervous system function.
- Symptoms reflect damage in the white matter of the CNS only.
- Patient is older than 10 but less than 50 years old.
- Patient does not have stroke, lupus, or any disease that may have similar symptoms.

A diagnosis of multiple sclerosis is made when patient's symptoms fit Schumacher's criteria and neurological exams, MRI, and laboratory results also show corresponding abnormalities. In 2001, a panel convened by the National Multiple Sclerosis Society wrote new diagnostic criteria for MS, the first update in about 20 years. The new criteria formally recommend MRI and outline how doctors should use the results of tests like cerebral spinal fluid analysis.

KEY TERMS

Exacerbations—Increase in severity of a disease or condition.

Myelin—A fatty sheath surrounding nerves throughout the body that helps them conduct impulses more quickly.

Relapse—A return to a disease state, after recovery appeared to be occurring. In alcoholism, relapse refers to a patient beginning to drink alcohol again after a period of avoiding alcohol.

Remission—A disappearance of a disease and its symptoms. Complete remission means that all disease is gone. Partial remission means that the disease is significantly improved, but residual traces of the disease are still present. A remission may be due to treatment or may be spontaneous.

MS symptoms vary significantly in terms of severity, intensity and duration. Sensory symptoms are the first warning signs. Many patients notice color distortion, blurred or double vision, and temporary blindness. Their senses of smell, hearing, touch, and taste are also affected. They experience muscle weakness and difficulty walking, as well as **muscle spasms** and numbness, tingling, or prickling ("pins and needles") sensations called *paresthesias*. As the disease progresses, sudden partial or complete paralysis of the arms or legs is common, as are an inability to speak clearly, move without tremors, or hear clearly. Mental functions are also affected. Patients can not concentrate or remember as clearly as before. They often become depressed. They may laugh or cry uncontrollably. As conditions worsen, they lose control of bodily functions. Some patients find that hot weather exacerbates their symptoms. Cold baths or air conditioning may help during these periods. There are also periods, called remissions, in which patients are free of symptoms; remission can be complete or partial.

While there is a rare, rapidly progressing form of MS that can be fatal in as little as a few days or weeks,

MS generally affects the quality of life more than it diminishes life expectancy. Most patients can look forward to decades of life after diagnosis. Many are able to continue to live a relatively normal life for at least 20 years after onset, although some patients become disabled within a few months of being diagnosed. In addition, because MS patients are frequently forced into immobility and spend a lot of time sitting in wheelchairs, they are susceptible to such common complications of the disabled as urinary tract **infections**, skin ulcers, pneumonia, or pulmonary embolism (blood clot in the lung) in addition to side effects from prescribed drugs.

Treatment

Nutritional therapy

Many multiple sclerosis patients follow a low-fat diet developed by Dr. Roy Swank, who recommends his diet to slow down disease progression. The following are his recommendations:

- Consume no more than 10 g of saturated fat per day.
- Limit polyunsaturated fat consumption to 50 g or less per day.
- Take 1 tbsp of cod liver oil per day to supplement essential fatty-acid intake. Cod liver oil is a good source of omega-3 fatty acid, one of the two essential fatty acids.
- Consume adequate amount of protein in the diet, preferably plant protein such as soy, beans, seeds, and nuts.
- Eat more fish, a good source of omega-3 fatty acid. Swank recommends having fish three or more times per week. Omega-3 fatty acid is believed to support myelin production and improve nerve function.

In addition to following the Swank diet, Dr. Michael Murray and Dr. Joseph Pizzorno, the authors of the book *Encyclopedia of Natural Medicine* also recommend the following nutritional supplements:

- *Flaxseed oil*. Murray and Pizzorno recommend replacing the fish oil in Swank's diet with flaxseed oil because the latter can provide both omega-3 and omega-6 fatty acids. Omega-6 fats, studies have shown, also help alleviate MS symptoms.
- *Antioxidants* such as selenium , vitamin C, and vitamin E. Patients with multiple sclerosis often have antioxidant deficiency.
- *Vitamin B_{12}*. MS patients often lack Vitamin B_{12}, and correcting this deficiency is believed to help decrease myelin destruction.

Exercise and physical therapy

Almost any form of **exercise** or **movement therapy** is beneficial for MS patients. For patients too weak to exercise alone, a massage or assisted physical therapy should be helpful to improve circulation to the limbs and promote well-being. Those that are less restricted may find **t'ai chi**, **qigong**, **yoga**, martial arts, conventional cardiovascular exercise, and/or water aerobics helpful.

Other treatments

Other alternative treatments such as aromatherapy (body massage with **rosemary** or juniper **essential oils**) and **hydrotherapy** (hot or cold baths used to treat affected areas, also a program of exercise performed in water) may also improve muscle strength in MS patients. Chinese herbs, especially ginseng, are also helpful in managing the disease. Wearing a cooling vest may also help, according to a 2001 study. The vest cools patients (without affecting their temperatures) and also appears to promote production of white cell nitrous oxide, which may play a role in MS.

Allopathic treatment

Standard treatment consists of an exercise program, diet modification, and medication. Three relatively new drugs may be prescribed: beta-interferon A (Avonex), which can limit the progressions of disability; beta-interferon-B (Betaseron), which reduces the number and severity of relapses; and Glatiramer acetate (Copaxone), which helps prevent relapse in patients with the relapsing-remitting (RR) type of MS. (These are patients who have a period of time with no or few symptoms [remission] following acute exacerbations [relapse] of disease.) All are administered by injection. These drugs have significant side effects including **fever**, tiredness, weakness, chills, muscle aches and inflammation at injection sites. Avonex may be better tolerated than Betaseron.

For symptomatic treatment of muscle spasm, Baclofen is most effective; its dosage must be carefully tailored to specific patient's needs. An implantable infusion pump that delivers the drug directly into the spinal cord can be used for patients with severe spasticity. Diazepam (valium) is sometimes given together with baclofen to increase its effectiveness. Alternative antispastic drugs are tizanidine and dantrolene. Steroids such as methylprednisolone and prednisone are also sometimes used to treat flare-ups.

Expected results

Patients whose symptoms worsen quickly right after diagnosis, those who have significant impairment in muscle movement or brain functions at onset and who have very abnormal magnetic resonance imaging (MRI) results at the beginning have poor prognosis. On the other hand, patients who recover quickly after the initial symptoms or those who experience only sensory impairment for five years or more after diagnosis often are able to maintain work longer and live longer than those with chronic progressive multiple sclerosis.

Prevention

There is no way to prevent the onset of multiple sclerosis, though a diet low in saturated fat may be helpful.

Resources

BOOKS

Burton Golberg Group. "Multiple Sclerosis." In *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

Holland, Nancy J., T. Jock Murray, and Stephen C. Rhein gold. *Multiple Sclerosis: A Guide for the Newly Diag nosed*. New York, NY: Demos Vermande, 1996.

Murray, Michael T., and Joseph E. Pizzorno. "Multiple Sclerosis." In *Encyclopedia of Natural Medicine. Revised 2nd ed.* Rocklin, CA: Prima Publishing, 1998.

Rudick, Richard A. "Multiple Sclerosis and Related Conditions." In *Cecil Textbook of Medicine, 21st ed.* W.B. Saunders Company, 2000.

PERIODICALS

Acherio, Alberto, et al. "Epstein Barr Virus Antibodies and Risk of Multiple Sclerosis: A Prospective Study." *JAMA, The Journal of the American Medical Associa tion*.286; no. 24 (December 26, 2001):3083 3086.

Moran, M. "Autoimmune Diseases Could Share Common Genetic Etiology."*American Medical News*.44; no. 38: (October 8, 2001):38.

Vastag, B. "New Diagnostic Criteria for MS Issued." *JAMA, The Journal of the American Medical Associa tion*.286; no. 14(October 10, 2001):1703.

"Wearing Colling Vest Helps Improve Symptoms." *Pain and Central Nervous System Week*.(October 6, 2001).

ORGANIZATIONS

Multiple Sclerosis Association of America (MSAA). 706 Haddonfield Road. Cherry Hill, NJ 08002 2652. (800) LEARN MS(532 7667) Fax: (609) 661 9797. http:// www. msaa.com.

Multiple Sclerosis Foundation, Inc. (MSF). 6350 North Andrews Avenue. Fort Lauderdale, FL 33309. (800) 441 7055 Fax: (954) 938 8708.

National Multiple Sclerosis Society (NMSS). 733 3rd Ave nue. New York, NY 10017 3288. (800) 344 4867 or (212) 986 3240. http://www.nmss.org.

OTHER

Lazoff, Marjorie, MD. "Multiple Sclerosis." *Emedicine.com* http://www.emedicine.com/emerg/topic321.htm

Mai Tran
Teresa Odle

Mum *see* **Chrysanthemum flower**

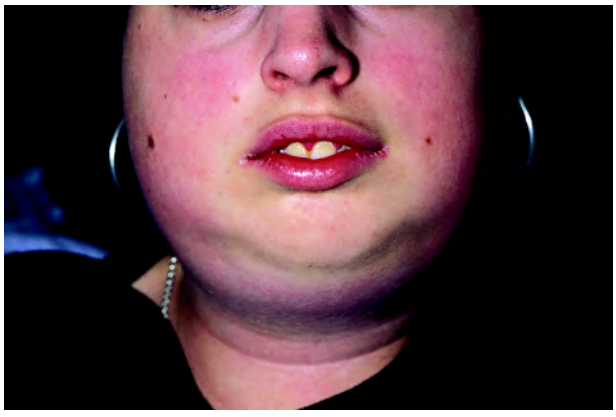
Mumps

Definition

Mumps is a relatively mild short-term viral infection of the salivary glands that usually occurs during childhood. Typically, mumps is characterized by a painful swelling of both cheek areas, although the person could have swelling on one side or no perceivable swelling at all. The salivary glands are also called the parotid glands; therefore, mumps is sometimes referred to as an inflammation of the parotid glands (epidemic parotitis). The word mumps comes from an old English dialect word that means lumps or bumps within the cheeks.

Description

Mumps is a very contagious infection that spreads easily in such highly populated areas as day care centers and schools. Although not as contagious as **measles** or **chickenpox**, mumps was once quite common.



Mumps is an acute generalized virus infection, commonly causing enlargement of the salivary glands, especially the parotid gland. *(© Hercules Robinson / Alamy)*

Prior to the release of a mumps vaccine in the United States in 1967, approximately 92% of all children had been exposed to mumps by the age of 15. In these pre-vaccine years, most children contracted mumps between the ages of four and seven. Mumps epidemics came in two to five year cycles. The greatest mumps epidemic was in 1941 when approximately 250 cases were reported for every 100,000 people. In 1968, the year after the live mumps vaccine was released, only 76 cases were reported for every 100,000 people. By 1985, less than 3,000 cases of mumps were reported throughout the entire United States, which works out to about 1 case per 100,000 people. The reason for the decline in mumps was the increased usage of the mumps vaccine. However, 1987 noted a five-fold increase in the incidence of the disease because of the reluctance of some states to adopt comprehensive school immunization laws. Since then, state-enforced school entry requirements have achieved student immunization rates of nearly 100% in kindergarten and first grade. In 1996, the Centers for Disease Control and Prevention (CDC) reported only 751 cases of mumps nationwide, or, in other words, about one case for every five million people.

KEY TERMS

Autism—A developmental disability that appears early in life, in which normal brain development is disrupted and social and communication skills are retarded, sometimes severely.

Encephalitis—Inflammation of the brain, usually caused by a virus. The inflammation may interfere with normal brain function and may cause seizures, sleepiness, confusion, personality changes, weakness in one or more parts of the body, and even coma.

Epidemic parotitis—The medical name for mumps.

Immunoglobulin G (IgG)—Immunoglobulin type gamma, the most common type found in the blood and tissue fluids.

Meningitis—An infection or inflammation of the membranes that cover the brain and spinal cord. It is usually caused by bacteria or a virus.

Orchitis—Inflammation of one or both testes, accompanied by swelling, pain, fever, and a sensation of heaviness in the affected area.

Paramyxovirus—A genus of viruses that includes the causative agent of mumps.

Parotitis—Inflammation and swelling of one or both of the parotid salivary glands.

Causes and symptoms

The paramyxovirus that causes mumps is harbored in the saliva and is spread through **sneezing**, coughing, and other direct contact with another person's infected saliva. Once the person is exposed to the virus, symptoms generally become noticeable in 14–24 days. Initial symptoms include **chills**, **headache**, loss of appetite, and a lack of energy. However, an infected person may not experience these initial symptoms. Swelling of the salivary glands in the face (parotitis) generally occurs within 12–24 hours of the above symptoms. Accompanying the swollen glands is **pain** on chewing or swallowing, especially with acidic beverages, such as lemonade. A **fever** as high as 104°F (40°C) is also common. Swelling of the glands reaches a maximum on about the second day and usually disappears by the seventh day. Once a person has contracted mumps, he or she becomes immune to the disease, despite how mild or severe symptoms may have been.

While the majority of cases of mumps are uncomplicated and pass without incident, some complications can occur. Complications are, however, more noticeable in adults who get the infection. In 15% of cases, the covering of the brain and spinal cord becomes inflamed (**meningitis**). Symptoms of meningitis usually develop within four or five days after the first signs of mumps. These symptoms include a stiff neck, headache, **vomiting**, pain with bending or flexing the head, and a lack of energy. Mumps meningitis is usually resolved within seven days, and damage to the brain is exceedingly rare.

Mumps infection can spread into the brain causing inflammation of the brain (encephalitis). Symptoms of mumps encephalitis include the inability to feel pain, seizures, and high fever. Encephalitis can occur during the parotitis stage or one to two weeks later. Recovery from mumps encephalitis is usually complete, although complications, such as seizure disorders, have been noted. Only about 1 in 100 patients with mumps encephalitis dies from the complication.

About one-quarter of all post-pubertal males who contract mumps can develop a swelling of the scrotum (orchitis) about seven days after the parotitis stage. Symptoms include marked swelling of one or both testicles, severe pain, fever, **nausea**, and headache. Pain and swelling usually subside after 5–7 days, although the testicles can remain tender for weeks.

Girls occasionally suffer an inflammation of the ovaries, or oophoritis, as a complication of mumps, but this condition is far less painful than orchitis in boys.

As of late 2002, some researchers in Europe are studying the possibility that mumps increases a person's risk of developing **inflammatory bowel disease** (IBD) in later life. This hypothesis will require further research, as present findings are inconclusive.

Diagnosis

When mumps reaches epidemic proportions, diagnosis is relatively easy on the basis of the physical symptoms. The doctor will take the child's temperature, gently palpate (touch) the skin over the parotid glands, and look inside the child's mouth. If the child has mumps, the openings to the ducts inside the mouth will be slightly inflamed and have a "pouty" appearance. With so many people vaccinated today, a case of mumps must be properly diagnosed in the event the salivary glands are swollen for reasons other than viral infection. For example, in persons with poor oral hygiene, the salivary glands can be infected with bacteria. In these cases, antibiotics are necessary. Also in rare cases, the salivary glands can become blocked, develop tumors, or swell due to the use of certain drugs, such as **iodine**. A test can be performed to determine whether the person with swelling of the salivary glands actually has the mumps virus.

Researchers in London have reported the development of a bioassay for measuring mumps-specific IgG. This test allows a doctor to check whether an individual patient is immune to mumps, and allow researchers to measure the susceptibility of a local population to mumps in areas with low rates of vaccination.

Treatment

Nutritional therapy

Nutritional therapy may alleviate pain and aid healing. A nutritionist or naturopath may recommend the following:

- drinking lots of fluids to replace fluid loss
- eating only such easy-to-digest foods as soups, broth or bland foods
- taking multivitamin/mineral supplement to help boost the immune function

Homeopathy

A number of homeopathic remedies can be used in the treatment of mumps. For example, **belladonna** may be useful for flushing, redness, and swelling. **Bryonia** (wild **hops**) may be useful for irritability, lack of energy, or thirst. **Phytolacca** (poke root) may be prescribed for extremely swollen glands. A homeopathic physician should always be consulted for appropriate doses for children, and remedies that do not work within one day should be stopped. A homeopathic preparation of the mumps virus can also be used prophylactically or as a treatment for the disease.

Herbal therapy

Several herbal remedies may be useful in helping the body recover from the infection or may help alleviate the discomfort associated with the disease. **Echinacea** (*Echinacea* spp.) can be used to boost the immune system and help the body fight the infection. Other herbs taken internally, such as cleavers (*Galium aparine*), **calendula** (*Calendula officinalis*), and phytolacca (poke root), target the lymphatic system and may help to enhance the activity of the body's internal filtration system. Since phytolacca can be toxic, it should only be used by patients under the care of a skilled practitioner. Topical applications are also useful in relieving the discomfort of mumps. A cloth dipped in a heated mixture of vinegar and **cayenne** (*Capsicum frutescens*) can be wrapped around the neck several times a day. Cleavers or calendula can also be combined with vinegar, heated, and applied in a similar manner.

Acupressure

Acupressure can be used effectively to relieve pain caused by swollen glands. The patient can, by using the middle fingers, gently press the area between the jawbone and the ear for two minutes while breathing deeply.

Allopathic treatment

When mumps occurs, the illness is usually allowed to run its course. The symptoms, however, are treatable. Because of difficulty swallowing, the most important challenge is to keep the patient fed and hydrated. The individual should be provided a soft diet, consisting of cooked cereals, mashed potatoes, broth-based soups, prepared baby foods, or foods put through a home food processor. Aspirin, acetaminophen, or ibuprofen can relieve some of the pain due to swelling, headache, and fever. Avoiding fruit juices and other acidic foods or beverages that can irritate the salivary glands is recommended, as is avoiding dairy products that can be hard to digest. In the event of complications, a physician should be contacted at once. For example, if orchitis occurs, a physician should be

called. Also, supporting the scrotum in a cotton bed on an adhesive-tape bridge between the thighs can minimize tension. Ice packs are also helpful.

Expected results

When mumps is uncomplicated, the prognosis for full recovery is excellent. In rare cases, however, a relapse occurs after about two weeks. Complications can also delay complete recovery.

Prevention

A vaccine exists to protect against mumps. The vaccine preparation (MMR) is usually given as part of a combination injection that helps protect against measles, mumps, and **rubella**. MMR is a live vaccine administered in one dose between the ages of 12-15 months, 4-6 years, or 11-12 years. Persons who are unsure of their mumps history and/or mumps vaccination history should be vaccinated. Susceptible health care workers, especially those who work in hospitals, should be vaccinated. Because mumps is still prevalent throughout the world, susceptible persons over age one who are traveling abroad would benefit from receiving the mumps vaccine.

The mumps vaccine is extremely effective, and virtually everyone should be vaccinated against this disease. There are, however, a few reasons why people should *not* be vaccinated against mumps:

- Pregnant women who contract mumps during pregnancy have an increased rate of miscarriage, but not birth defects. As a result, pregnant women should not receive the mumps vaccine because of the possibility of damage to the fetus. Women who have had the vaccine should postpone becoming pregnant for three months following vaccination.
- Unvaccinated persons who have been exposed to mumps should not get the vaccine, as it may not provide protection. The person should, however, be vaccinated if no symptoms result from exposure to mumps.
- Persons with minor fever-producing illnesses, such as an upper respiratory infection, should not get the vaccine until the illness has subsided.
- Because mumps vaccine is produced using eggs, individuals who develop hives, swelling of the mouth or throat, dizziness, or breathing difficulties after eating eggs should not receive the mumps vaccine.
- Persons with immune deficiency diseases and/or those whose immunity has been suppressed with anti-cancer drugs, corticosteroids, or radiation should not receive the vaccine. Family members of immunocompromised people, however, should get vaccinated to reduce the risk of mumps.
- The CDC recommends that all children infected with human immunodeficiency disease (HIV) who are asymptomatic should receive an MMR vaccine at 15 months of age.

The mumps vaccine has been controversial in recent years because of concern that its use was linked to a rise in the rate of childhood **autism**. The negative publicity given to the vaccine in the mass media led some parents to refuse to immunize their children with the MMR vaccine. One result has been an increase in the number of mumps outbreaks in several European countries, including Italy and the United Kingdom.

In the fall of 2002, the *New England Journal of Medicine* published a major Danish study disproving the hypothesis of a connection between the MMR vaccine and autism. A second study in Finland showed that the vaccine is not associated with aseptic meningitis or encephalitis as well as autism. Since these studies were published, American primary care physicians have once again reminded parents of the importance of immunizing their children against mumps and other childhood diseases.

Resources

BOOKS

"Viral Infections: Mumps." Section 19, Chapter 265 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. White house Station, NJ: Merck Research Laboratories, 1999.

Zand, Janet, Allan N. Spreen, and James B. LaValle. "Mumps." *Smart Medicine for Healthier Living*. Gar den City Park, NY: Avery Publishing Group, 1998.

PERIODICALS

Gabutti, G., M. C. Rota, S. Salmaso, et al. "Epidemiology of Measles, Mumps and Rubella in Italy." *Epidemiology and Infection* 129 (December 2002): 543 550.

Kimmel, S. R. "Vaccine Adverse Events: Separating Myth From Reality." *American Family Physician* 66 (December 1, 2002): 2113 2120.

Madsen, K. M., A. Hviid, M. Vestergaard, et al. "A Pop ulation Based Study of Measles, Mumps, and Rubella Vaccination and Autism." *New England Journal of Medicine* 347 (November 7, 2002): 1477 1482.

Makela, A., J. P. Nuorti, and H. Peltola. "Neurologic Dis orders After Measles Mumps Rubella Vaccination." *Pediatrics* 110 (November 2002): 957 963.

McKie, A., D. Samuel, B. Cohen, and N. A. Saunders. "A Quantitative Immuno PCR Assay for the Detection of Mumps Specific IgG." *Journal of Immunological Methods* 270 (December 1, 2002): 135 141.

Nielsen, S. E., O. H. Nielsen, B. Vainer, and M. H. Claesson. "Inflammatory Bowel Disease Do Microorganisms

Play a Role?" [in Danish] *Ugeskrift for laeger* 164 (December 9, 2002): 5947 5950.
Pugh, R. N., B. Akinosi, S. Pooransingh, et al. "An Out break of Mumps in the Metropolitan Area of Walsall, UK." *International Journal of Infectious Diseases* 6 (December 2002): 283 287.

ORGANIZATIONS

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847) 434 4000. http://www.aap.org.
Centers for Disease Control and Prevention. 1600 Clifton Rd., NE, Atlanta, GA 30333. (800) 311 3435, (404) 639 3311. http://www.cdc.gov

OTHER

Recommended Childhood Immunization Schedules, United States, 1995. June 16, 1995, Volume 44, RR 5. Can be purchased from Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402 9325. (202) 783 3238.
Update: Vaccine Side Effects, Adverse Reactions, Contrain dications, and Precautions. September 6, 1996, Volume 45, RR 12. Can be purchased from Superintendent of Documents, U. S. Government Printing Office, Wash ington, DC 20402 9325. (202) 783 3238.

Mai Tran
Rebecca J. Frey, PhD

Muscle spasms & cramps

Definition

Muscle spasms and cramps are spontaneous, often painful muscle contractions.

Description

Most people are familiar with the sudden **pain** of a muscle cramp. The rapid, uncontrolled contraction, or spasm, happens unexpectedly. Sometimes it can happen during or following athletic activity or a workout. It can also happen with either no stimulation or some trivially small one. The muscle contraction and pain last for several minutes, and then slowly ease. Cramps may affect any muscle, but are most common in the calves, thighs, feet, and hands. While painful, they are harmless, and in most cases, not related to any underlying disorder. Nonetheless, cramps and spasms can be manifestations of many neurological or muscular diseases.

The terms cramp and spasm are often used interchangeably. They can be somewhat vague because they are sometimes used to also include types of abnormal muscle activity other than sudden painful contraction. These include stiffness at rest, slow muscle **relaxation**, and spontaneous contractions of a muscle at rest (fasciculation or clonism). Fasciculation is a type of painless muscle spasm, marked by rapid, uncoordinated contraction of many small muscle fibers that people often describe as a sort of "muscle fluttering." For a physician, a critical part of diagnosis is to distinguish these different meanings and to allow the patient to describe the problem as precisely as possible.

Causes and symptoms

Normal voluntary muscle contraction begins when electrical signals are sent from the brain through the spinal cord along nerve cells called motor neurons. These include both the upper motor neurons within the brain and the lower motor neurons within the spinal cord and leading out to the muscle. At the muscle, chemicals released by the motor neuron stimulate the internal release of **calcium** ions from stores within the muscle cell. These calcium ions then interact with proteins within the muscle cell, causing chains of the proteins actin and myosin to slide past one another with a ratchet-like motion. This motion pulls their fixed ends closer, thereby shortening the cell and, ultimately, contracting the muscle itself. Recapture of calcium and unlinking of actin and myosin allows the muscle fiber to return to its resting length (i.e., relax).

Abnormal contraction may be caused by abnormal activity at any stage in this process. Certain mechanisms within the brain and the rest of the central nervous system monitor the length of the muscles and help regulate contraction. Interruption of these mechanisms can cause spasm. Motor neurons that are overly sensitive may fire below their normal thresholds. The muscle membrane itself may be hypersensitive, causing contraction without stimulation. Calcium ions may not be recaptured quickly enough, causing prolonged contraction.

Interruption of brain mechanisms and overly sensitive motor neurons may result from damage to the nerve pathways. Possible causes include **stroke**, **multiple sclerosis**, **cerebral palsy**, neurodegenerative diseases, trauma, spinal cord injury, and such nervous system poisons as strychnine, **tetanus** toxin, and certain insecticides. Nerve damage may lead to a prolonged or permanent muscle shortening called contracture. However, most muscle spasms are not caused by disease, but more commonly by physical activity or **stress**.

KEY TERMS

Actin—A protein that functions in muscular contraction by combining with myosin.

Fasciculation—Small involuntary muscle contractions visible under the skin.

Motor neuron—A nerve cell that specifically controls and stimulates voluntary muscles.

Myosin—A protein found in muscle tissue that interacts with another protein called actin during muscle contraction.

Myotonia—The inability to normally relax a muscle after contracting or tightening it.

Changes in muscle responsiveness may be due to or associated with:

- Prolonged exercise. Relaxation of a muscle actually requires energy to be expended. The energy is used to recapture calcium and to unlink the actin and myosin. This causes the muscles fibers to lengthen because the unlinked chains slide back to their resting positions. Normally, sensations of pain and fatigue signal that it is time to slow down or stop. Resting allows the muscles to restore their supplies of energy. Ignoring or overriding those warning signals can lead to such severe energy depletion that the muscle cannot be relaxed, causing a cramp. For example, this is why long distance runners may cramp up after a run. The lack of blood flow deprives the muscles of their source of energizing oxygen and nutrients and removal of fatigue causing waste. Rigor mortis, the stiffness of a corpse within the first 24 hours after death, is also due to this phenomenon.
- Using a muscle inappropriately. Muscle cramps in such sports as golf or tennis are sometimes caused by an incorrect grip on the club or racket, or an incorrect swing.
- Anemia adversely effects blood flow to the muscles and can cause cramping and spasms.
- Dehydration and salt depletion. This may be brought on by protracted vomiting or diarrhea, or by copious sweating during prolonged exercise, especially in high temperatures. Loss of fluids and salts—especially sodium, potassium, magnesium, and calcium—can disrupt ion balances in both muscle and nerves. This can prevent them from responding and recovering normally, and can lead to a cramp.
- Metabolic disorders that affect the energy supply in muscle. These are inherited diseases in which particular muscle enzymes are deficient. They include deficiencies of myophosphorylase (McArdle's disease), phosphorylase b kinase, phosphofructokinase, phosphoglycerate kinase, and lactate dehydrogenase.
- Myotonia. Myotonia is a condition that causes stiffness due to delayed relaxation of the muscle, but does not cause the spontaneous contraction usually associated with cramps. However, many patients with myotonia do experience cramping from exercise. Symptoms of myotonia are often worse in the cold. Myotonias include myotonic dystrophy, myotonia congenita, paramyotonia congenita, and neuromyotonia.
- Vascular disease, such as arteriosclerosis, Reynaud's disease, and diabetic vasculopathy, decreases blood flow to muscles, which can cause cramping.
- Exposure to cold can also decrease blood flow, resulting in cramping and muscle spasms.

Fasciculations may be due to **fatigue**, cold, medications, metabolic disorders, nerve damage, or neurodegenerative disease, including amyotrophic lateral sclerosis. Most people experience brief, mild fasciculations from time to time, usually in the calves.

The pain of a muscle cramp is intense, localized, and often debilitating. Coming on quickly, it may last for minutes and fade gradually. Contractures develop more slowly, over days or weeks, and may be permanent if untreated. Fasciculations may occur at rest or after muscle contraction, and may last several minutes.

Diagnosis

Abnormal contractions are diagnosed through a careful medical history, physical and neurological examination, and electromyography of the affected muscles. Electromyography records electrical activity in the muscle during rest and movement.

Treatment

Most cases of simple cramps require no medical treatment. However, because cramps hurt, a person suffering a cramp will want to stop the cramp. An effective method for stopping a cramp involves contracting the muscle that causes the opposite action of the cramping muscle. This technique requires some training and knowledge of muscular anatomy, so it may be more effective if done by a therapist. Gently and gradually stretching and massaging the affected muscle may ease the pain and hasten recovery.

A massage technique that can work is applying broad pressure on the cramping muscle. Applying ice can help if cramps persist. Fluid and salt replacement, by drinking water or properly prepared "sports drinks," and/or eating fruits and salads bearing **sodium**, **potassium**, **magnesium**, and calcium (bananas are a good source) can also help.

Cramps may be treated or prevented with gingko (*Ginkgo biloba*) or Japanese quince (*Chaenomeles speciosa*). Supplements of **vitamin B_{12}**, folate, **vitamin E**, **niacin**, calcium, and magnesium may also help. Taken at bedtime, they may help to reduce the likelihood of night cramps.

Guided imagery, relaxation, and **meditation** may all help lessen the pain associated with muscle cramps and spasms and may also dissipate the cramp or spasm.

Allopathic treatment

More prolonged or regular cramps may be treated with drugs such as carbamazepine, phenytoin, or quinine. Treatment of underlying metabolic or neurologic disease, where possible, may help relieve symptoms. Identified **anemia** can be treated with **iron** supplementation.

Prevention

The likelihood of developing cramps may be reduced by eating a healthy diet with appropriate levels of minerals, and getting regular **exercise** and adequate rest to build up energy reserves in muscle. Exercise should be accompanied by a proper stretching program. Avoiding exercising in extreme heat helps prevent heat cramps. Heat cramps can also be avoided by drinking ample amounts of water before prolonged exercise in hot weather. For intense activity over one hour, drinking fluid containing some sodium plus 4–8% carbohydrate in the form of sugars (glucose or sucrose) or starch (maltodextrin) is useful. Fluid temperature should be cool (45–55°F or 7.2–12.8°C). Taking a warm bath before bedtime may increase circulation to the legs and reduce the incidence of nighttime leg cramps.

Resources

BOOKS

Bradley, Walter G., et al. *Neurology in Clinical Practice*. 2nd ed. Woburn, MA: Butterworth Heinemann, 1995.

PERIODICALS

Horton, John F., David M. Lindsay, and Brian R. Macintosh. "Abdominal Muscle Activation of Elite Male Golfers with Chronic Low Back Pain." *Medicine and Science in Sports and Exercise* 33 (October 2001): 1647 1654.

Elliot Greene
Rebecca J. Frey, PhD

Muscle strain *see* **Sprains and strains**
Muscle testing *see* **Applied kinesiology**
Mushrooms *see* **Maitake; Reishi mushroom; Shiitake mushroom**

Music therapy

Definition

Music therapy is a technique of complementary medicine that uses music prescribed in a skilled manner by trained therapists. Programs are designed to help patients overcome physical, emotional, intellectual, and social challenges. Applications range from improving the well being of geriatric patients in nursing homes to lowering the **stress** level and **pain** of women in labor. Music therapy is used in many settings, including schools, rehabilitation centers, hospitals, hospices, nursing homes, community centers, and sometimes even in the home.

Origins

Music has been used throughout human history to express and affect human emotion. In biblical accounts, King Saul was reportedly soothed by David's harp music, and the ancient Greeks expressed thoughts

A music therapist with a disabled child. *(Abraham Menashe / Photo Researchers, Inc.)*

about music having healing effects as well. Many cultures are steeped in musical traditions. It can change mood, have stimulant or sedative effects, and alter physiologic processes such as heart rate and breathing. The apparent health benefits of music to patients in Veterans Administration hospitals following World War II lead to it being studied and formalized as a complementary healing practice. Musicians were hired to continue working in the hospitals. Degrees in music therapy became available in the late 1940s, and in 1950, the first professional association of music therapists was formed in the United States. The National Association of Music Therapy merged with the American Association of Music Therapy in 1998 to become the American Music Therapy Association.

Benefits

Music can be beneficial for anyone. Although it can be used therapeutically for people who have physical, emotional, social, or cognitive deficits, even those who are healthy can use music to relax, reduce stress, improve mood, or to accompany **exercise**. There are no potentially harmful or toxic effects other than the risk that listening to loud music poses by contributing to hearing loss. Music therapists help their patients achieve a number of goals through music, including improvement of communication, academic strengths, attention span, and motor skills. They may also assist with **behavioral therapy** and pain management.

Physical effects

Brain function physically changes in response to music. The rhythm can guide the body into breathing in slower, deeper patterns that have a calming effect. Heart rate and blood pressure are also responsive to the types of music that are listened to. The speed of the heartbeat tends to speed or slow depending on the volume and speed of the auditory stimulus. Louder and faster noises tend to raise both heart rate and blood pressure; slower, softer, and more regular tones produce the opposite result. Music can also relieve muscle tension and improve motor skills. It is often used to help rebuild physical patterning skills in rehabilitation clinics. Levels of endorphins, natural pain relievers, are increased while listening to music, and levels of stress hormones are decreased. This latter effect may partially explain the ability of music to improve immune function. A 1993 study at Michigan State University showed that even 15 minutes of exposure to music could increase interleukin-1 levels, a consequence which also heightens immunity.

KEY TERMS

Adjunctive—Refers to a form of treatment that is not strictly necessary to a therapy regimen but is helpful. Music therapy is an example of an adjunctive form of treatment.

Entrainment—The patterning of body processes and movements to the rhythm of music.

Physiologic—Refers to physiology, particularly normal, healthy, physical functioning.

Mental effects

Depending on the type and style of sound, music can either sharpen mental acuity or assist in **relaxation**. Memory and learning can be enhanced, and this used with good results in children with learning disabilities. This effect may also be partially due to increased concentration that many people have while listening to music. Better productivity is another outcome of an improved ability to concentrate. The term "Mozart effect" was coined after a study showed that college students performed better on math problems when listening to classical music.

Emotional effects

The ability of music to influence human emotion is well known, and is used extensively by moviemakers. A variety of musical moods may be used to create feelings of calmness, tension, excitement, or romance. Lullabies have long been popular for soothing babies to sleep. Music can also be used to express emotion nonverbally, which can be a very valuable therapeutic tool in some settings.

Description

Goals

Music is used to form a relationship between the therapist and the patient. The music therapist sets goals on an individual basis, depending on the reasons for treatment, and selects specific activities and exercises to help the patient progress. Objectives may include development of communication, cognitive, motor, emotional, and social skills. Some of the techniques used to achieve this are singing, listening, instrumental music, composition, creative movement, **guided imagery**, and other methods as appropriate. Other disciplines may be integrated as well, such as dance, art, and psychology. Patients may develop musical abilities as a result of therapy, but this is not

a major concern. The primary aim is to improve the patient's ability to function.

Techniques

Learning to play an instrument is an excellent musical activity to develop motor skills in individuals with developmental delays, brain injuries, or other motor impairment. It is also an exercise in impulse control and group cooperation. Creative movement is another activity that can help to improve coordination, as well as strength, balance, and gait. Improvisation facilitates the nonverbal expression of emotion. It encourages socialization and communication about feelings as well. Singing develops articulation, rhythm, and breath control. Remembering lyrics and melody is an exercise in sequencing for **stroke** victims and others who may be intellectually impaired. Composition of words and music is one avenue available to assist the patient in working through fears and negative feelings. Listening is an excellent way to practice attending and remembering. It may also make the patient aware of memories and emotions that need to be acknowledged and perhaps talked about. Singing and discussion is a similar method, which is used with some patient populations to encourage dialogue. Guided Imagery and Music (GIM) is a very popular technique developed by music therapist Helen Bonny. Listening to music is used as a path to invoke emotions, picture, and symbols from the patient. This is a bridge to the exploration and expression of feelings.

Music and children

The sensory stimulation and playful nature of music can help to develop a child's ability to express emotion, communicate, and develop rhythmic movement. There is also some evidence to show that speech and language skills can be improved through the stimulation of both hemispheres of the brain. Just as with adults, appropriately selected music can decrease stress, **anxiety**, and pain. Music therapy in a hospital environment with those who are sick, preparing for surgery, or recovering postoperatively is appropriate and beneficial. Children can also experience improved self-esteem through musical activities that allow them to succeed.

Newborns may enjoy even greater benefits from music. Premature infants experience more rapid weight gain and an earlier discharge from the hospital than their peers who are not exposed to music. There is also anecdotal evidence of improved cognitive function in premature infants from listening to music.

Music and rehabilitation

Patients with brain damage from stroke, traumatic brain injury, or other neurologic conditions have been shown to exhibit significant improvement as a result of music therapy. This is theorized to be partially the result of entrainment, which is the synchronization of movement with the rhythm of the music. Consistent practice leads to gains in motor skill ability and efficiency. Cognitive processes and language skills often benefit from appropriate musical intervention.

Music and the elderly

The geriatric population can be particularly prone to anxiety and **depression**, particularly in nursing home residents. Chronic diseases causing pain are also not uncommon in this setting. Music is an excellent outlet to provide enjoyment, relaxation, relief from pain, and an opportunity to socialize and reminisce about music that has had special importance to the individual. It can have a striking effect on patients with **Alzheimer's disease**, even sometimes allowing them to focus and become more responsive for a time. Music has also been observed to decrease the agitation that is so common with this disease. One study shows that elderly people who play a musical instrument are more physically and emotionally fit as they age than their nonmusical peers.

Music and psychiatric disorders

Music can be an effective tool for treating the mentally or emotionally ill. **Autism** is one disorder that has been particularly researched. Music therapy has enabled some autistic children to relate to others and have improved learning skills. **Substance abuse**, **schizophrenia**, paranoia, and disorders of personality, anxiety, and affect are all conditions that may be benefited by music therapy. In these groups, participation and social interaction are promoted through music. Reality orientation is improved. Patients are helped to develop coping skills, reduce stress, and express their feelings.

In the treatment of psychotic disorders, however, the benefits of music therapy appear to be limited. One study of patients diagnosed with schizophrenia or schizoaffective psychosis found that while music therapy improved the patients' social relationships, these benefits were relatively short-lived.

Music and hospice care

Pain, anxiety, and depression are major concerns with patients who are terminally ill, whether they are

in hospice or not. Music can provide some relief from pain, through release of endorphins and promotion of relaxation. It can also provide an opportunity for the patient to reminisce and talk about the fears that are associated with death and dying. Music may help regulate the rapid breathing of a patient who is anxious, and soothe the mind. The Chalice of Repose project, headquartered at St. Patrick Hospital in Missoula, Montana, is one organization that attends and nurtures dying patients through the use of music, in a practice they called music-thanatology by developer Therese Schroeder-Sheker. Practitioners in this program work to relieve suffering through music prescribed for the individual patient.

Music and gynecologic procedures

Research has proven that women require less pharmaceutical pain relief during labor if they make use of music. Listening to music that is familiar and associated with positive imagery is the most helpful. During early labor, music will promote relaxation. Maternal movement is helpful to get the baby into a proper birthing position and dilate the cervix. Enjoying some "music to move by" can encourage the mother to stay active for as long as possible during labor. The rhythmic auditory stimulation may also prompt the body to release endorphins, which are a natural form of pain relief. Many women select different styles of music for each stage of labor, with a more intense, or faster-moving piece feeling like a natural accompaniment to the more difficult parts of labor. Instrumental music is often preferred.

The benefits of music therapy during **childbirth** have also been shown to apply to other surgical procedures. Women who have listened to music tapes during gynecologic surgery have more restful sleep following the procedure and less postoperative soreness.

Precautions

Patients making use of music therapy should not discontinue medications or therapies prescribed by other health providers without prior consultation.

Research and general acceptance

There is little disagreement among physicians that music can be of some benefit for patients, although the extent of its effects on physical well-being is not as well acknowledged in the medical community. Acceptance of music therapy as an adjunctive treatment modality is increasing, however, due to the growing diversity of patient populations receiving music therapy. Research has shown that listening to music can decrease anxiety, pain, and recovery time. There are also good data for the specific subpopulations discussed. A therapist referral can be made through the AMTA.

Training and certification

Music therapists are themselves talented musicians; they also study the ways in which music can be applied to specific groups and circumstances. Coursework includes classes regarding music history and performance, behavioral science, and education. The American Music Therapy Association dictates what classes must be included in order for a music therapy program to be certified. There are approximately 70 colleges with approved curricula. A six-month internship follows the completion of the formal music therapy program, and the graduate is then able to take a national board exam to gain certification.

Resources

BOOKS

Campbell, Don. *The Mozart Effect*. Avon Books, 1997.
Cassileth, Barrie. *The Alternative Medicine Handbook*. W. W. Norton & Co., Inc., 1998.
Dillard, James, and Terra Ziporyn. *Alternative Medicine for Dummies*. IDG Books Worldwide, Inc., 1998.
Sears, William, and Martha Sears. *The Birth Book*. Little, Brown & Co., 1994.
Woodham, Anne, and David Peters. *Encyclopedia of Healing Therapies*. DK Publishing, Inc., 1997.

PERIODICALS

Good, M., J. C. Anderson, M. Stanton Hicks, et al. "Relaxation and Music Reduce Pain After Gyneco logic Surgery." *Pain Management Nursing* 3 (June 2002): 61 70.
Gregory, D. "Four Decades of Music Therapy Behavioral Research Designs: A Content Analysis of *Journal of Music Therapy* Articles." *Journal of Music Therapy* 39 (Spring 2002): 56 71.
Hayashi, N., Y. Tanabe, S. Nakagawa, et al. "Effects of Group Musical Therapy on Inpatients with Chronic Psychoses: A Controlled Study." *Psychiatry and Clinical Neuroscience* 56 (April 2002): 187 193.
Magee, W. L., and J. W. Davidson. "The Effect of Music Therapy on Mood States in Neurological Patients: A Pilot Study." *Journal of Music Therapy* 39 (Spring 2002): 20 29.
Robinson, A. "Music Therapy and the Effects on Laboring Women." *Kentucky Nurse* 50 (April June 2002): 7.
Standley, J. M. "A Meta Analysis of the Efficacy of Music Therapy for Premature Infants." *Journal of Pediatric Nursing* 17 (April 2002): 107 113.

ORGANIZATIONS

American Music Therapy Association, Inc. 8455 Coles ville Road, Suite 1000 Silver Spring, ML 20910. (301) 589 3300. http://www.musictherapy.org.

The Chalice of Repose Project at St. Patrick Hospital, 312 East Pine Street, Missoula, MT 59802. (406)329 2810 Fax: (406)329 5614. http://www.saintpatrick.org/chalice/.

Judith Turner
Rebecca J. Frey, PhD

Myocardial infarction *see* **Heart attack**
Myocarditis *see* **Heart disease**

Myopia

Definition

Myopia is the medical term for nearsightedness. People with myopia see objects more clearly when they are close to the eye, while distant objects appear blurred or fuzzy. Reading and close-up work may be clear, but distance vision is blurry.

Description

Myopia affects about 30% of the population in the United States. To understand myopia it is necessary to have a basic knowledge of the main components involved in the eye's focusing system: the cornea, lens, and retina. The cornea is a tough, transparent, dome-shaped tissue that covers the front of the eye (not to be confused with the white, opaque sclera). The cornea lies in front of the iris (the colored part of the eye). The lens is a transparent, double-convex structure located behind the iris. The retina is a thin membrane that lines the rear of the eyeball. Light-sensitive retinal cells convert incoming light rays into electrical signals that are sent along the optic nerve to the brain, which then interprets the images. In people with normal vision, parallel light rays enter the eye and are bent by the cornea and lens (a process called refraction) to focus precisely on the retina, providing a crisp, clear image. In the myopic eye, the focusing power of the cornea (the major refracting structure of the eye) and the lens is too great with respect to the length of the eyeball. Light rays are bent too much, and they converge in front of the retina. This results in what is called a refractive error. In other words, an overly focused, fuzzy image is sent to the brain.

There are many types of myopia. Some common types include:

- physiologic
- pathologic
- acquired

By far the most common, physiologic myopia develops sometime between the ages of five to 10 years and gradually progresses until the eye is fully grown. This may include refractive myopia (cornea and lens-bending properties are too strong) and axial myopia (the eyeball is too long). Pathologic myopia is a far less common abnormality. This condition begins as physiologic myopia, but rather than stabilizing, the eye continues to enlarge at an abnormal rate (progressive myopia). This more advanced type of myopia may lead to degenerative changes in the eye, or degenerative myopia. Acquired myopia occurs after infancy. This condition may be seen in association with uncontrolled diabetes and certain types of **cataracts**. Antihypertensive drugs and other medications can also affect the refractive power of the lens.

Causes and symptoms

Myopia is said to be caused by an elongation of the eyeball. This means that the oblong (as opposed to normal spherical) shape of the myopic eye causes the cornea and lens to focus at a point in front of the retina. A more precise explanation is that there is an inadequate correlation between the focusing power of the cornea and lens and the length of the eye.

Myopia is considered to be primarily a hereditary disorder, meaning that it runs in families. People are generally born with a small amount of **hyperopia** (farsightedness), but as the eye grows this decreases and myopia does not become evident until later. Because of this, it is sometimes argued that myopia is not inherited, but acquired. Some eyecare professionals believe that a tendency toward myopia may be inherited, but the actual disorder results from a combination of environmental and genetic factors. Environmental factors include close work, **stress**, and eye strain.

The symptoms of myopia are blurred distance vision, eye discomfort, squinting, and eye strain.

Diagnosis

The diagnosis of myopia is typically made during the first several years of elementary school when a teacher notices a child having difficulty seeing the chalkboard, reading, or concentrating. The teacher or school nurse often recommends an eye exam by an ophthalmologist or optometrist. An ophthalmologist—M.D. or D.O. (Doctor of Osteopathy)—is a medical doctor trained in the diagnosis and treatment of eye problems. Ophthalmologists also perform eye surgery. An optometrist (O.D.) diagnoses and manages and/or treats eye and visual disorders. In many states,

KEY TERMS

Accommodation—The ability of the lens to change its focus from distant to near objects and vice versa. It is achieved through the action of the ciliary muscles that change the shape of the lens.

Cornea—The clear, dome-shaped outer covering of the eye that lies in front of the iris and pupil. The cornea lets light into the eye.

Diopter (D)—A unit of measure for describing the refractive power of a lens.

Laser-assisted in-situ keratomileusis (LASIK)—A procedure that uses a cutting tool and a laser to modify the cornea and correct moderate to high levels of myopia (nearsightedness).

Lens—The transparent, elastic, curved structure behind the iris (colored part of the eye) that helps focus light on the retina. Also refers to any device that bends light waves.

Ophthalmologist—A physician who specializes in the anatomy and physiology of the eyes and in the diagnosis and treatment of eye diseases and disorders.

Optic nerve—A bundle of nerve fibers that carries visual messages from the retina in the form of electrical signals to the brain.

Optometrist—A health care professional who examines and tests the eyes for disease and treats visual disorders by prescribing corrective lenses and/or vision therapy. In many states, optometrists are licensed to use diagnostic and therapeutic drugs to treat certain ocular diseases.

Orthokeratology—A method of reshaping the cornea using a contact lens. It is not considered a permanent method to reduce myopia.

Peripheral vision—The ability to see objects that are not located directly in front of the eye. Peripheral vision allows people to see objects located on the side or edge of their field of vision.

Photorefractive keratectomy (PRK)—A procedure that uses an excimer laser to reshape the cornea and permanently correct nearsightedness (myopia).

Radial keratotomy (RK)—A surgical procedure involving the use of a diamond-tipped blade to make several spoke-like slits in the peripheral (non-viewing) portion of the cornea to improve the focus of the eye and correct myopia by flattening the cornea.

Refraction—The turning or bending of light waves as the light passes from one medium or layer to another. In the eye it means the ability of the eye to bend light so that an image is focused onto the retina. Also used to describe the determination and measurement of the eye's focusing system by an optometrist or ophthalmologist.

Refractive eye surgery—A general term for surgical procedures that can improve or correct refractive errors of the eye by permanently changing the shape of the cornea.

Retina—The inner, light-sensitive layer of the eye containing rods and cones. The retina transforms the image it receives into electrical signals that are sent to the brain via the optic nerve.

Visual acuity—Sharpness or clearness of vision.

optometrists are licensed to use diagnostic and therapeutic drugs.

A patient's distance vision is tested by reading letters or numbers on a chart posted a set distance away (usually 20 ft, or 6 m). The doctor has the patient view images through a variety of lenses to obtain the best correction. The doctor also examines the inside of the eye and the retina. An instrument called a slit lamp is used to examine the cornea and lens. The eyeglass prescription is written in terms of diopters (D), which measure the degree of refractive error. Mild to moderate myopia usually falls between -1.00D and -6.00D. Normal vision is commonly referred to as 20/20 to describe the eye's focusing ability 20 ft away from an object. For example, 20/50 means that a myopic person must be 20 ft away from an eye chart to see what a normal person can see at 50 ft (15 m). The larger the bottom number, the greater the myopia.

Treatment

Nutritional therapy

The following nutritional supplements may help improve vision:

- Vitamin A: essential vitamin for healthy eyes.
- Bioflavonoids. These plant chemicals can help myopic people see better, especially at night.
- Zinc: may improve night vision.
- Ginkgo extract: increases blood supply to the eye. It may help prevent deterioration in vision.

Eye exercises

Some eye care professionals recommend exercises to help improve circulation, reduce eye strain, and relax the eye muscles. The **Bates method** is a common set of exercises. It is possible that by combining exercises with changes in behavior, the progression of myopia may be slowed or prevented. Alternative treatments include: visual therapy (also referred to as vision training or eye exercises); discontinuing close work; reducing eye strain (taking a rest break during periods of prolonged near vision tasks); and wearing bifocals to decrease the need to accommodate when doing close-up work.

Acupuncture

Acupuncture, by acting on eye muscles, causes changes in the shape of the eyeball and thus, may be able to correct nearsightedness. Approximately 10 sessions followed by daily eye exercises are needed to see significant and prolonged results.

Allopathic treatment

People with myopia have three main options for treatment: eyeglasses, contact lenses, and for those who meet certain criteria, refractive eye surgery.

Eyeglasses

Eyeglasses are the most common method used to correct myopia. Concave glass or plastic lenses are placed in frames in front of the eyes. The lenses diverge the light rays so they focus further back, directly upon the retina, producing clear distance vision.

Contact lenses

Contact lenses are a second option for treatment. Contact lenses are extremely thin round discs of plastic that are worn on the eye in front of the cornea. Contact lenses offer several benefits over glasses, including: better vision, less distortion, clear peripheral vision, and cosmetic appeal. In addition, contacts don't steam up from changes in temperature or perspiration.

Refractive eye surgery

Recommended for people who find glasses and contact lenses inconvenient and uncomfortable, refractive eye surgery improves myopic vision by permanently changing the shape of the cornea so light rays focus properly on the retina. These procedures are performed on an outpatient basis and generally take 10-30 minutes. There are three types of corrective surgeries available as of 1998: (1) radial keratotomy, (2) photorefractive keratectomy, and (3) laser-assisted in-situ keratomileusis (LASIK). Each of these surgery techniques changes rapidly in price and effectiveness. Patients should investigate the procedures and ask many questions of their doctors or others who have had the procedures before having them done.

RADIAL KERATOTOMY. Radial keratotomy (RK), the first of these procedures made available, is considered the riskiest. The surgeon uses a delicate diamond-tipped blade, a microscope, and microscopic instruments to make several spoke-like, "radial" incisions in the non-viewing (peripheral) portion of the cornea. The slits surgically alter the curve of the cornea, making it flatter, which may improve the focus of images onto the retina.

PHOTOREFRACTIVE KERATECTOMY. Photorefractive keratectomy (PRK) involves the use of a computer to measure the shape of the cornea. Using these measurements, the surgeon applies a computer-controlled laser to make modifications to the cornea. The PRK procedure flattens the cornea by vaporizing small amounts of tissue from the cornea's surface. Photorefractive keratectomy can be used to treat mild to moderate forms of myopia. The cost is approximately $2,000 per eye.

LASER-ASSISTED IN-SITU KERATOMILEUSIS. Laser-assisted in-situ keratomileusis (LASIK) is the newest of these procedures. It is recommended for moderate to severe cases of myopia. A variation on the PRK method, LASIK uses lasers and a cutting tool called a microkeratome to form a circular flap on the cornea. The flap is flipped back to expose the inner layers of the cornea. The cornea is treated with a laser to change the shape and focusing properties, then the flap is replaced.

Myopia treatments under research include corneal implants and permanent, surgically placed contact lenses.

Expected results

Glasses and contact lenses can (but not always) bring vision to 20/20. Refractive surgery can make permanent improvements for the right myopic candidate. Ophthalmologists continue to improve upon and develop new techniques to correct myopia. Alternative treatments have not been widely studied.

Prevention

Myopia is generally considered a hereditary condition, which means that it runs in families. From this perspective there is nothing that can be done to prevent

this disorder. However, because the percentage of people with myopia in the United States has steadily increased over the last 50 years, some believe that the condition results from a combination of genetic and environmental factors. If this is true, then it may be possible to prevent or control myopia by reducing close work, reading and working in good light, maintaining good **nutrition**, and practicing visual therapy (when recommended). In fact, a 2002 study showed that children's **diets** high in starches may be adding to the high prevalence of myopia. Diets high in refined starches from breads and cereals increase insulin levels, which in turn affect development of the eyeball. Increasing protein consumption has been shown to slow the progression of myopia in children.

Eye strain can be prevented by using sufficient light for reading and close work, and by wearing corrective lenses as prescribed. Everyone should have regular eye exams to see if the prescription has changed or if any other problems have developed. This is particularly important for people with high (degenerative) myopia who may be at a greater risk of developing retinal detachments or other problems.

Resources

BOOKS

Birnbaum, Martin H. *Optometric Management of Nearpoint Vision Disorders*. Boston: Butterworth Heinemann, 1993.

Curtin, Brian J. *The Myopias: Basic Science and Clinical Management*. Philadelphia: Harper & Row, 1985.

Rosanes Berrett, Marilyn B. *Do You Really Need Eye glasses?* Barrytown, NY: Station Hill Press, 1990.

The Burton Goldberg Group. "Vision Disorders." *Alterna tive Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

"Vision Disorders." *Reader's Digest Guide to Medical Cures & Treatments*. Canada: The Reader's Digest Associa tion, Inc., 1996.

Zinn, Walter J., and Herbert Solomon. *Complete Guide to Eyecare, Eyeglasses, and Contact Lenses*. Hollywood, FL: Lifetime Books, 1996.

PERIODICALS

Carey, Benedict. "Goodbye Glasses: New Surgery Can Deliver Sharp Vision to the Nearsighted Without a Single Cut of the Scalpel (Photorefractive Keratotomy)." *Health* 10 (September 1996): 46.

"Catching Your Eye (Photorefractive Keratotomy Evalua tion.)" *People's Medical Society Newsletter* 15 (August 1996): 6.

Fox, Douglas."Blinded by Bread: Are Diets High in Starch Making Kids Short Sighted?." *New Scientist* (April 6, 2002): 9 11.

"Insight on Eyesight: Seven Vision Myths: Blind Spots About Vision Can Cause Needless Worry, Wasted Effort, and Unnecessary Treatment." *Consumer Reports on Health* 9 (April 1997): 42.

"9 Ways to Look Better: If You Want to Improve Your Vision Or Just Protect What You Have Try These Eye Opening Moves." *Men's Health* 13 (Jan. Feb. 1998): 50.

Schwartz, Leslie. "Visionquest (Use of Lasers in Treatment of Nearsightedness or Myopia)." *Shape* 16 (March 1997): 28.

ORGANIZATIONS

American Academy of Ophthalmology. P.O. Box 7424, San Francisco, CA 94120 7424. (415) 561 8500. http:// www.eyenet.org.

American Optometric Association. 243 N. Lindbergh Blvd., St. Louis, MO 63141. (314) 991 4100. http://www. aoanet.org.

Myopia International Research Foundation. 1265 Broad way, Room 608, New York, NY 10001. (212) 684 2777.

National Eye Institute. NIH Bldg. 31, 9000 Rockville Pike, Bethesda, MD 20892. (301) 496 5248. http://www. nei.nih.gov.

Mai Tran
Teresa G. Odle

Myotherapy

Definition

Myotherapy is a method intended to relieve **pain**, and is based on the application of pressure at trigger points throughout the body. Trigger points are defined as hypersensitive locations in the muscles that cause pain in response to undue **stress**. They may be caused by occupational or other injuries as well as by disease, physical stress, and emotional stress. Trigger points rarely occur in the same location where the pain is felt. Myotherapy is founded on the notion that relief of tension in the muscle followed by revitalization of the relieved muscle through stretching, promotes healing and reduces the disposition of the muscle and the nerve to cause further pain.

Origins

Myotherapy developed out of trigger-point therapy, a method of pain relief developed by Dr. Janet Travell. Fitness expert Bonnie Prudden built on Travell's method to investigate certain parallels that she perceived between the injection of pain relievers into nerve locations in trigger-point therapy and the potential to relieve pain similarly through external physical pressure on the nerve points. She spent approximately

four years investigating and experimenting with the idea. During that time, she studied anatomy and developed a new pain-relief therapy that she named myotherapy. Its name is derived from the Greek prefix "myo," meaning muscle. Within 10 years, she had established a certified training program for myotherapy technicians.

Benefits

Myotherapy is claimed to be effective in eliminating 95 percent of all physical pain associated with muscular discomfort and to be successful in patients suffering from many types of head, back, and **neck pain**. It is also used to relieve the discomfort of **carpal tunnel syndrome**, **fibromyalgia**, and arthritis, and to reduce swelling in patients who have **multiple sclerosis**.

In addition, some athletes seek myotherapy to experience enhanced physical performance.

Description

Myotherapy is used to eliminate pain and swelling through the application of pressure at strategically located nerve sites called trigger points. Unlike many other techniques to alleviate **muscle spasms**, myotherapy is not based on topical or internal medication.

Myotherapy treatment is a two-step process. The therapist first locates and diffuses the trigger points of pain by applying pressure to those locations. This process is designed to relieve the pain and also to relax the muscles associated with the specific discomfort. Secondly, the patient undergoes a series of exercises during the therapy session to progressively stretch the muscles that have been relaxed by the pressure therapy. Therapy generally continues for fewer than 10 sessions.

The age of the patient who undergoes myotherapy is significant only in determining the number of trigger points that might cause muscle pain. Because practitioners believe trigger points accumulate over time, they expect older patients to usually have developed more trigger points.

Preparations

As with most treatments, patients should have a physical examination done by a qualified doctor or technician before undergoing this pain-relief technique. Patients should seek clearance for treatment from a general practitioner (M.D.), osteopath (D.O.), doctor of podiatric medicine (D.P.M.), doctor of **chiropractic** (D.C.), doctor of **naturopathic medicine** (N.M.D.), registered nurse practitioner (R.N.P.), or physical therapist (P.T.) before myotherapy treatment. Patients who undergo myotherapy to relieve the discomfort of **temporomandibular joint syndrome** (TMJ) or other facial pain should consult a dentist (D.D.S.) for a clearance examination. Preparatory examination is necessary to determine that no structural anatomical problem is causing the pain, because problems of this nature require medical treatment that cannot be replaced by myotherapy.

KEY TERMS

Trigger points—Hypersensitive muscle locations that cause pain in response to undue stress.

To benefit fully from myotherapy, adherents note that the patient should have a positive attitude and willingness to give up any emotional investment in the pain syndrome. They assert that myotherapy requires full commitment to the therapy sessions and an attitude of self-healing to bring about relief.

Precautions

To facilitate recuperation from pain relief, myotherapy patients are advised to involve a relative, friend, or other trusted acquaintance who can learn the technique as well as the patient's personal pressure points. This buddy system allows the patient to renew the effects of the myotherapy sessions in the event of a relapse.

Side effects

Myotherapy has no known side effects. For anatomical pathology patients, however, medical attention is necessary before seeking myotherapy treatment. This examination is crucial in order to eliminate any physical abnormalities that may be the source of the patient's discomfort.

Athletes who gain enhanced performance following myotherapy may consider the improvement a positive side effect.

Research and general acceptance

Many myotherapists operate as self-employed practitioners in private clinics. In addition, certified myotherapists hold positions in hospitals, doctors' offices, dental offices, and clinics.

Training and certification

Certified myotherapists undergo a two-year program of education and training in preparation for certification. After the completion of the training

BONNIE PRUDDEN (1914-)

(AP/Wide World Photos. Reproduced by permission.)

Fitness expert Bonnie Prudden was born on January 29, 1914, in New York City. She attended Columbia University Extension School, Grand Central School of Art, and Weidman Humphrey School of Dance. Prudden served as the director of both the ski patrol and Red Cross disaster units in New York State from 1939 1949. She founded and directed the Institute for Physical Fitness in White Plains, New York in 1950.

Prudden came to the attention of the American public in 1955 after she used the Kraus Weber test to assess the physical fitness levels of children worldwide. Prudden's test results revealed that 58% of American children were unfit and scored worse than the children of underdeveloped nations. She presented her test results to President Dwight Eisenhower, and her actions ultimately inspired what has come to be called the President's Council on Physical Fitness and Sport.

During the era before videotape, Prudden released six exercise recordings and authored 19 books on fitness. She hosted the first nationally televised exercise show and established physical fitness programs at schools, hospitals, and other institutions. Prudden, the mother of two daughters, was credited with inventing the first pre and post natal exercise programs for women. Additionally, over 500,000 babies learned rudimentary water skills as a result of her mother and baby, swim and gym classes.

Prudden altered her focus in 1976 when she discovered the theory of myotherapy, the use of applying pressure to trigger points in the body to lessen muscle spasms and pain and to improve circulation. In 1979, after some investigation, she established the Bonnie Prudden Two year School of Physical Fitness and Myotherapy. She explained the basics of myotherapy in her 1980 book, *Pain Erasure,* and later published *Bonnie Prudden's Complete Guide to Pain Free Living,* followed by *Fitness Guide for the After 50 Crowd.* Additionally she presented seminars on the topic.

Bonnie Prudden has received many honors, including a Safety Award from Eastern Amateur Ski Association and a Service to Youth Award from Young Men's Christian Association.

regimen, the candidate must pass a board examination in order to receive official recognition as a Certified Bonnie Prudden Myotherapist. The training sessions total 1,300 hours prior to the board-certification examination. To retain myotherapist credentials, a program of continuing education involving 45 hours of enrichment and update training on a bi-annual basis is required.

Resources

BOOKS

Prudden, Bonnie. *Pain Erasure*. New York: M. Evans and Company, Inc., 2002.

Davies, Clair and Amber Davies. *The Trigger Point Therapy Workbook: Your Self Treatment Guide for Pain Relief*. Second edition. Oakland, CA: New Harbinger Publications, 2004.

ORGANIZATIONS

Bonnie Prudden Myotherapy(r). P.O. Box 65240. Tucson, AZ 85728. (800)221 4634. http://www.bonnieprudden.com (accessed February 15, 2008).

Gloria Cooksey
Leslie Mertz, Ph.D.

Myrrh

Description

Myrrh (*Commiphora molmol,C. abyssinica*, or *C. myrrha*) is a close relative and member of the Burseraceae family, native to the eastern Mediterranean, Ethiopia, the Arabian peninsula, and Somalia. Myrrh

Myrrh. *(©PlantaPhile, Germany. Reproduced by permission.)*

is a shrubby desert tree known variously as gum, myrrh tree, guggal gum, guggal resin, didin, and didthin. Myrrh is an Arabic word meaning bitter. The highly valued aromatic gum resin of myrrh has a bitter, pungent taste and a sweet, pleasing aroma. A particularly treasured variety of myrrh is known as *karam* or Turkish myrrh.

Myrrh grows to a height of about 9 ft (2.7 m). The light gray trunk is thick and the main branches are knotted with smaller branches protruding at a right angle and ending in sharp spines. The hairless, roughly toothed leaves are divided into one pair of small, oval leaflets with a larger, terminal leaflet. The yellow-red flowers grow on stalks in an elongated and branching cluster. The small brown fruit is oval, tapering to a point.

During the time of the Egyptian pharaoh Thutmose III, around the fifteenth century B.C., the pharaoh's aunt, Queen Hatshepsut, sent an expedition to Africa and the "Land of Punt" where myrrh trees were abundant. The Queen wanted to please the god Amon by surrounding his temple with living myrrh trees. The mission was successful and the story of the expedition was depicted on the walls of the temple built to enclose the Queen's tomb. According to legend Queen Hatshepsut was promised "life, stability and satisfaction . . . forever" by the well-pleased god, and the revered myrrh tree was introduced to the Egyptian people.

Myrrh has been used since ancient times in incense, perfumes, and holy ointments. The Egyptians used myrrh in embalming compounds and burned pellets of myrrh to repel fleas. Archeological evidence indicates that myrrh was carried in small pouches that wealthy persons hung around the neck for fragrance. The Ebers Papyrus, believed to have been found in the necropolis outside Thebes, provides evidence of Egyptian medicinal use of myrrh. This ancient document contains as many as 800 medicinal recipes using such plants as myrrh, **peppermint**, **aloe**, **castor oil**, and numerous other herbs in common use today. Myrrh was mentioned in the bible as a component of the bitter solution offered to the crucified Jesus during Roman times. The herb was traditionally mixed with wine and offered to prisoners prior to execution to ease **pain**.

The use of myrrh medicinally was recorded in China in A.D. 600 during the Tang Dynasty. Myrrh is used today in Chinese medicine to treat **wounds**, relieve painful swelling, and to treat menstrual pain due to blood stagnation. Myrrh is called *mo yao* in China.

Myrrh was a highly valued commodity for commerce on ancient spice routes, and is woven into legend and myth. In Syrian legend the myrrh tree is named for the daughter of Thesis, a Syrian king. She was transformed by the gods into a myrrh tree to escape her father's murderous wrath.

General use

Myrrh is the sweet-smelling oleo-gum resin that naturally exudes from wounds or **cuts** in the stems and bark of several species of this shrubby desert tree. This sap forms a thick, pale yellow paste as it seeps out. It then hardens into a mass about the size of a walnut, taking on a reddish-brown color. The volatile oil contained in the resin consists of sesquiterpenes, triterpenes, and mucilage. The tannin content gives myrrh its astringent action. Powdered myrrh has been endorsed by the German advisory Commission E as a beneficial treatment for mild inflammations in the throat and mouth. Myrrh acts as a broad-spectrum antiseptic and can be applied directly to sores and wounds.

Taken internally in tincture or capsule form, myrrh is a beneficial treatment for loose teeth, gingivitis, and bad breath. The tincture may also be applied directly to a tooth to relieve tooth ache. It is antifungal, and has been used to treat **athlete's foot** and candida. Some research indicates that myrrh is effective in reducing **cholesterol** levels. It is a tonic remedy said to relax smooth muscles, increase peristaltic action, and stimulate gastric secretions. The myrrh resin has antimicrobial properties and acts to stimulate macrophage activity in the blood stream. The herb is being studied for its potential as an anticancer medication. Taken internally in tincture or capsule form, myrrh is useful for relieving gastric distress and as an expectorant, though this folk application has not been confirmed by experimental evidence. Myrrh is burned as incense and used to repel mosquitoes. It is also a component in healing salves used in veterinary medicine. In Chinese medicine, it is used for wounds, **bruises**, and bleeding.

Preparations

Myrrh is available in capsule, powder, and tincture form. It is pulverized into powder, and prepared as a tincture. It is found combined with other ingredients in dental powders, mouthwash preparations, and toothpaste. Myrrh is used as fragrance in cosmetics, perfumes, and soaps, and as flavoring in foods.

Tincture: Four ounces of powdered myrrh are combined with 1 pt of brandy, gin, or vodka in a glass container, with enough alcohol to cover the herb. A 50/50 ratio of alcohol to water is generally recommended. The mixture should be placed away from light for about two weeks, and shaken several times each day. Strain and store in a tightly capped, dark glass bottle. A standard dose is 1 or 2 ml of the tincture three times a day.

Essential oil: Myrrh's essential oil is pale yellow to amber in color. It is obtained by steam distillation. The essential oil is commercially available from numerous sources. It is said to be beneficial when used as a chest rub to treat **bronchitis**, and externally in diluted form on ulcers and wounds.

Gargle: One teaspoon of dry, powdered myrrh should be combined with 1 tsp of boric acid. One pint of boiling water is poured over the mixture and steeped for 30 minutes, then strained. This mixture is a good gargle preparation, according to herbalist John Lust.

Precautions

Myrrh should be avoided during **pregnancy** and should not be administered to children. It should be kept away from the eyes and mucous membranes and out of children's reach.

Side effects

According to the *PDR For Herbal Medicine*, "No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages."

Interactions

No interactions are reported.

Resources

BOOKS

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. Lynn Sonberg Book Associ ates, 1996.

Foster, Steven and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston New York: Houghton Mifflin Company, 1990.

Kowalchik, Claire, and William H. Hylton. *Rodale's Illus trated Encyclopedia of Herbs*. Pennsylvania: Rodale Press,1987.

Lust, John. *The Herb Book*. NY: BantamBooks, 1974.
Magic And Medicine of Plants. The Reader's Digest Asso ciation, Inc. 1986.
Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.
PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.
Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

OTHER

"Myrrh Essential Oil for Aromatherapy." *Nature's Sunshine Products*. http://www.herbs4u.com/oils_myrrh.html.
Mrs. M. Grieve. "A Modern Herbal, Myrrh." *Botanical.com*. http://ww.botanical.com/botanical/mgmh/m/myrrh 66.html.
"Myrrh (Commiphora molmol)." *MotherNature.com*. http://ww.mothernature.com/ency/Herb/Myrrh.asp.
"Bridges for Peace." *Gold, Frankincense, and Myrrh*. http://www.serve.com/Bridges/dfjevery1295.htm.

Clare Hanrahan

Myrtle *see* **Periwinkle**

N

Nail problems *see* **Ingrown nail**

Narcolepsy

Definition

Narcolepsy is a neurological disorder characterized by uncontrollable episodes of sleepiness during the day. Episodes can last from a few seconds to more than an hour and can significantly interfere with daily activities.

Description

People with narcolepsy often fall asleep suddenly, anywhere at any time, even in the middle of a conversation. They may sleep for just a few seconds or for up to a half hour, and then reawaken feeling alert until they fall asleep again. The condition affects 135,000 Americans. **Sleep apnea** (difficulty in breathing while sleeping) is the leading cause of excessive daytime sleepiness. Narcolepsy is the second leading cause.

The attacks of sleepiness that are the hallmark of this condition may be mildly inconvenient or deeply disturbing. Some people continue to function during the sleep episodes, even talking and putting things away, but will reawaken with no memory of what they had been doing while briefly asleep.

Narcolepsy is related to the dreaming part of sleep known as rapid eye movement (REM) sleep. Normally, people fall asleep for about 90 minutes of non-REM sleep followed by REM sleep. However, people with narcolepsy enter REM sleep immediately; then, after reawakening, REM sleep recurs inappropriately throughout the day.

Causes and symptoms

Scientists believe narcolepsy is caused by a deficiency of the brain cells that make a substance called hypocretin; genetics are a factor in the condition, as well. Hypocretin, which is secreted by the hypothalamus, is responsible for enhancing wakefulness. Researchers are unsure why the hypocretin-secreting neurons are destroyed in some individuals; one possibility is that a person's immune system is a factor.

Cross-ethnic studies indicate significant variations in the prevalence of narcolepsy in different countries, with the Japanese having a very high rate and Israeli Jews one of the lowest in the world. One study of five European countries found that the prevalence of narcolepsy is higher in the United Kingdom and Germany than in Italy, Portugal, and Spain.

In the late 1990s, three independent research groups discovered a neuropeptide system in the hypothalamus, a gland in the brain that regulates body temperature and appetite. The discovered system, which was called the hypocretinergic system, regulates sleep and wakefulness. The nerve cells, or neurons, in this part of the hypothalamus secrete substances known as hypocretins or orexins, which regulate the sleep/wake cycle in humans. There are two of these compounds, known as orexin-A and orexin-B, or as hypocretin-1 and hypocretin-2. As of 2002, narcolepsy was thought to be an orexin deficiency syndrome; that is, it develops when a person's hypothalamus does not secrete enough orexins to keep the person from falling asleep at inappropriate times. Samples of cerebrospinal fluid taken from patients with narcolepsy contain little or no orexins. MRI scans of these patients indicate that there is some loss of brain tissue in the hypothalamus itself, suggesting that the neurons responsible for secreting orexins have died.

Symptoms of narcolepsy typically appear during adolescence; however, studies have shown that they may also begin in childhood. The disorder itself may not be diagnosed for many years after the first appearance of symptoms. The primary symptom is an overwhelming feeling of **fatigue**, together with sleep attacks that may occur with or without warning. About 75% of patients also experience cataplexy, a sudden loss of

muscle control lasting a few seconds to 30 minutes resulting in physical collapse without any loss of consciousness. Episodes of narcolepsy can be triggered by emotions such as laughter, fear, or anger. Other symptoms include sleep paralysis and hypnogogic (vivid) hallucinations as the person wakes up or falls asleep. Some patients may also have trouble staying asleep at night.

Diagnosis

If a person has both excessive daytime sleepiness and cataplexy, narcolepsy can be diagnosed on the basis of patient history alone. Lab tests, however, can confirm a diagnosis. Tests at a **sleep disorders** clinic include an overnight polysomnogram (sleep monitored with electrocardiography, video, and respiratory parameters) followed by a multiple sleep latency test, which measures sleep onset and how quickly REM sleep occurs. In narcolepsy, sleep latency is usually less than five minutes. First REM period latency is also abnormally short.

A genetic blood test can reveal certain antigens in people who have a tendency to develop narcolepsy. Positive blood test results suggest, but do not prove, the existence of narcolepsy.

As of 2002, the diagnosis of narcolepsy could be confirmed by taking a sample of the patient's cerebrospinal fluid by a spinal tap and testing it for the presence of hypocretin-1. Patients with narcolepsy have no hypocretin-1 in their spinal fluid.

Treatment

Several short naps scheduled throughout the day may help relieve some of the sleepiness associated with narcolepsy. The botanical remedy **yohimbe** (*Pausinystalia yohimbe*) may also be useful in promoting alertness. As with any herbal preparation or medication, individuals should check with their healthcare professional before taking the remedy to treat narcolepsy.

Allopathic treatment

Patients can be treated with amphetamine-like stimulant drugs (Dexedrine) to control drowsiness and sleep attacks. The symptoms of abnormal REM sleep (cataplexy, sleep paralysis, and hypnogogic hallucinations) are treated with antidepressants.

In the 2000s nonamphetamine wake-promoting drugs were available to treat narcolepsy. These medications lack the unpleasant side effects of amphetamines, particularly jitteriness and **anxiety**. Modafinil (Provigil) is the most commonly prescribed of the psychostimulants. Modafinil is believed to stimulate the neurons in the brain that are responsible for a person's wakefulness.

Patients who do not like taking high doses of stimulants may choose to nap every couple of hours to relieve daytime sleepiness and take smaller doses of stimulants.

KEY TERMS

Cataplexy—A symptom of narcolepsy in which there is a sudden episode of muscle weakness triggered by emotions. The muscle weakness may cause the person's knees to buckle or the head to drop. In severe cases, the patient may become paralyzed for a few seconds to minutes.

Hypnogogic hallucinations—Dream-like auditory or visual hallucinations that occur while falling asleep.

Hypocretins—Chemicals secreted in the hypothalamus that regulate the sleep/wake cycle.

Hypothalamus—A gland in the forebrain that controls heartbeat, body temperature, thirst, hunger, body temperature and pressure, blood sugar levels, and other functions.

Orexin—Another name for hypocretin, a chemical secreted in the hypothalamus that regulates the sleep/wake cycle. Narcolepsy is sometimes described as an orexin deficiency syndrome.

Sleep paralysis—An abnormal episode of sleep in which the patient cannot move for a few minutes, usually occurring on falling asleep or waking up. Often found in patients with narcolepsy.

Expected results

Narcolepsy can be a devastating disease that impairs a person's ability to work, play, and engage in meaningful activities. In severe cases, an inability to work and drive can interfere with daily life, leading to **depression** and a loss of independence. Drug treatments can ease symptoms but will not cure the disease. Narcolepsy is not a degenerative disease, and patients are not expected to develop new neurologic symptoms. Lifespan is normal if common sense is exercised regarding such hazards as automobile accidents.

Resources

PERIODICALS

Chen, Infei. "From Faithful Dogs and Difficult Fish: Insight into Narcolepsy." *New York Times* (October 23, 2007).

ORGANIZATIONS

Narcolepsy Network, 10921 Reed Hartman Highway, Cincinnati, OH, 45242, (513) 891 3522, http://www.websciences.org/narnet/.

National Sleep Foundation, 1522 K St. NW, Suite 500, Washington, DC, 20005, (202)347 3471, http://www.sleepfoundation.org.

Stanford Center for Narcolepsy, Stanford University School of Medicine, 701 B Welch Rd., Room 146, Palo Alto, CA, 94304, (650) 725 6517, http://www med.stanford.edu/school/Psychiatry/narcolepsy.

Paula Ford-Martin
Rebecca J. Frey, PhD
Rhonda Cloos, RN

KEY TERMS

Medicine bundle—A leather bag or animal skin in which a Native American healer carries herbs, stones, and various ritual objects as a sign of his or her healing powers.

Peyote—One of the dried tops of the mescal cactus. Peyote contains mescaline, a hallucinogen that is sometimes used in Native American healing ceremonies.

Shaman—In certain indigenous tribes or groups, a person who acts as an intermediary between the natural and supernatural worlds. Shamans are regarded as having the power or ability to cure illnesses.

Native American medicine

Definition

According to Ken "Bear Hawk" Cohen, "Native American medicine is based on widely held beliefs about healthy living, the repercussions of disease-producing behavior, and the spiritual principles that restore balance." These beliefs are shared by all tribes; however, the methods of diagnosis and treatment vary greatly from tribe to tribe and healer to healer.

Origins

The healing traditions of Native Americans have been practiced in North America since at least 12,000 years ago and possibly as early as 40,000 years ago. Although the term Native American medicine implies that there is a standard system of healing, there are approximately 500 nations of indigenous people in North America, each representing a diverse wealth of healing knowledge, rituals, and ceremonies.

Many aspects of Native American healing have been kept secret and are not written down. The traditions are passed down by word of mouth from elders, from the spirits in vision quests, and through initiation. It is believed that sharing healing knowledge too readily or casually will weaken the spiritual power of the medicine.

There are, however, many Native American healers who recognize that writing down their healing practices is a way to preserve these traditions for future generations. Many also believe that sharing their healing ways and values may help all people to come into a healthier balance with nature and all forms of life.

Benefits

Native American medicine can benefit anyone who sincerely wishes to live a life of wholeness and balance. These benefits may be physical, emotional, or spiritual. There is, however, the understanding that "the diseases of civilization," or white man's diseases, often need white man's medicine. In those cases, Native American medicine can be an important part of an integrative approach to healing. For example, the most successful programs for treating alcohol addiction in Native communities have combined Western approaches to psychological counseling, social work, and traditional Native American healing practices.

Such inherited conditions as birth defects or retardation are not easily treatable with Native American medicine. Native healers also believe that some illnesses are the result of a patient's behavior. Sometimes they will not treat a person because they do not want to interfere with the life lessons the patient needs to learn. Other illnesses are not treated because they are "callings" or initiation diseases. Native healer Medicine Grizzly Bear Lake explains, "The calling comes in the form of a dream, accident, sickness, injury, disease, near-death experience, or even actual death."

Description

Native American medicine is based upon a spiritual view of life. A healthy person is someone who has a sense of purpose and follows the guidance of the Great Spirit. This guidance is written upon the heart of every person. To be healthy, a person must be committed to a path of beauty, harmony, and balance. Gratitude, respect, and generosity are also considered

to be essential for a healthy life. Ken Cohen writes, "Health means restoring the body, mind, and spirit to balance and wholeness: the balance of life energy in the body; the balance of ethical, reasonable, and just behavior; balanced relations within family and community; and harmonious relationships with nature."

Theories of disease causation and even the names of diseases vary from tribe to tribe. Diseases may be thought to have internal or external causes or sometimes both. According to Cherokee medicine man Rolling Thunder, negative thinking is the most important internal cause of disease. Negative thinking includes not only negative thoughts about oneself but also feelings of shame, blame, low self-esteem, greed, despair, worry, **depression**, anger, jealousy, and self-centeredness. Johnny Moses, a Nootka healer, says "No evil sorcerer can do as much harm to you as you can do to yourself."

Diseases have external causes too. "Germs are also spirits," according to Shabari Bird of the Lakota Nation. A person is particularly susceptible to harmful germs if they live an imbalanced life, have a weak constitution, engage in negative thinking, or are under a lot of **stress**. Other people or spirits may also be responsible for an illness. Another external source of disease is environmental poisons. These poisons include alcohol, impure air, water, and some types of food.

Native American healers believe that disease can also be caused by physical, emotional, or spiritual trauma. These traumas can lead to mental and emotional distress, loss of soul, or loss of spiritual power. In these cases the healer must use ritual and other ways to physically return the soul and power to the patient. Some diseases are caused when people break the "rules for living." These rules may include ways of showing respect for animals, people, places, ritual objects, events, or spirits.

Native American healers have several different techniques for diagnosing an illness. These may include a discussion of one's symptoms, personal and family history, observation of non-verbal cues like posture or tone of voice, and medical divination. More important than the particular technique is the healer's intuition, sensitivity, and spiritual power.

There is no typical Native American healing session. Methods of healing include **prayer**, chanting, music, smudging (burning **sage** or aromatic woods), herbs, laying-on of hands, massage, counseling, imagery, **fasting**, harmonizing with nature, dreaming, sweat lodges, taking hallucinogens (e.g., peyote), developing inner silence, going on a shamanic journey, and ceremony. Family and community are also important in many healing sessions. Sometimes healing happens quickly. Sometimes a long period of time is needed for healing. The intensity of the therapy is considered to be more important than the length of time required. Even if the healing happens quickly, however, a change in life style is usually required in order to make the healing last.

A medicine bundle may also be used in Native American healing. The medicine bundle is a bag made of leather or an animal pelt in which the healer carries an assortment of ritual objects, charms, herbs, stones, and other healing paraphernalia. The bundle is a concrete token of the medicine power that the spirits have given the healer, either for healing in general or for healing a particular illness. The bundles vary according to clan, tribe, and individual.

Native American medicine is not covered by insurance unless perhaps the practitioner is a licensed health care provider. Most Native healers do not charge a set fee for their services. Healing is considered to be "a gift from the Great Spirit." Gifts to the healer are welcomed, however. The offering of a gift "ensures success of treatment because healing spirits appreciate generosity." Gifts may include groceries, cloth, money, or another personal expression of respect and appreciation. Frequently the only gift that is required is a pouch of tobacco.

Preparations

The medicine person tells the patient what preparations are necessary before the healing ceremony.

Precautions

A medicine person is essential to ensure safe healing through Native American medicine. People with **hypertension** should watch themselves during a sweat lodge ceremony for a possible increase in blood pressure. People with **asthma** may have difficulty when sage or cedar is used in a ceremony. People who are claustrophobic may find the close, hot, dark environment of a sweat lodge overwhelming.

Side effects

Some herbs may cause **vomiting**, **nausea**, or **diarrhea**. From the Native American point of view these reactions are usually welcomed and considered a form of purging or cleansing of the physical body.

Research and general acceptance

There has been no formal scientific research conducted on Native American healing practices. Medicine people do not write down their practices out of

fear that they might be misused by people who are not trained in their sacred ways. The most prominent users of this form of medicine are Native Americans or others who want a spiritually based approach to medicine.

Training and certification

Native American medicine has been passed down by word of mouth for thousands of years. Healing power can come from one's ancestors, another healer, or through training and initiation. Generally, healers train under one primary mentor. Today, however, with the ease of long-distance travel and communication, many healers have several mentors. Training as a medicine person is a long process that requires strength, sacrifice and patience. Denet Tsosi, a Navajo medicine man, said that it took him six years to learn one of the chants.

Resources

BOOKS

Beck,P. V., and A. L. Walters. *The Sacred: Ways of Knowledge, Sources of Life*. Tsaile (Navajo Nation), AZ: Navajo Community College Press, 1977.

Cohen, Ken. *Honoring the Medicine: Native American Healing*. New York: Ballantine, 1999.

Cohen, Ken "Bear Hawk". "Native American Medicine." In *Essentials of Complementary and Alternative Medicine,* ed.Wayne B. Jonas, M.D. and Jeffrey S. Levin, Ph.D, M.P.H. New York: Lippincott Williams and Wilkins, 1999.

Krippner, Stanley, and P. Welch. *Spiritual Dimensions of Healing*. New York: Irvington Publishers, 1992.

Lyon, William S. *Encyclopedia of Native American Healing*. New York: W. W. Norton and Co., 1998.

Mehl Madrona, Lewis, M.D. *Coyote Medicine: Lessons from Native American Healing*. New York: Fireside, 1997.

Nauman, Eileen. "Native American Medicine". In *Clinician's Complete Reference to Complementary and Alternative Medicine,* ed. Donald W. Novey, M.D. St. Louis, MO: Mosby, 2000.

ORGANIZATIONS

American Indian Science and Engineering Society (AISES). 5661 Airport Blvd. Boulder, CO 80301 2339. (303) 939 0023. Fax: (303) 939 8150. aisehq@spot.colorado.edu. http://www.colorado.edu/aises.

The Buffalo Trust. P.O. Box 89. Jemez Springs, NM 87025 0089. (505) 829 3635. Fax: (505) 829 3450. natachee@aol.com.

Cultural Survival. 96 Mount Auburn St. Cambridge, MA 02138. (617) 441 5400. Fax (617) 441 5417. csinc@cs.org. http://www.cs.org.

Dine College, Office of Continuing Education. P.O. Box 731. Tuba City, AZ 86045. (520) 283 6321. Fax (520) 283 4590. nccce@crystal.ncc.cc.nm.us.

Linda Chrisman

Natrum muriaticum

Description

Natrum muriaticum is the homeopathic remedy commonly known as table salt or **sodium** chloride. Salt is the second most common substance in nature, water being the first. Salt is an important component in regulating the balance of body fluids. Salt is a constituent in both body fluids and tissues. Excessive salt intake inhibits proper absorption of nutrients and weakens the nervous system, while a lack of salt creates a lack of fluid, resulting in an emaciated and withered appearance.

Salt was not extensively used for medicinal purposes until the time of Samuel Hahnemann, the father of **homeopathy**. While ancient physicians did employ salt in the treatment of liver enlargement and other swellings,

Natrum muriaticum, also known as sodium chloride, seen here as crystallized salt deposits beside China's Dead Sea, Xinjiang. *(© Natural Visions / Alamy)*

KEY TERMS

Polychrest—A homeopathic remedy that is used in the treatment of many ailments.

Succussion—The act of shaking diluted homeopathic remedies as part of the process of potentization.

salt had little medicinal value until Hahnemann's studies of the remedy in the early nineteenth century.

Natrum muriaticum (*Nat. mur.*) is a slow acting remedy that responds well to chronic ailments. It is seldom prescribed for acute conditions, and then only when symptoms specific to the remedy are present. This polychrest is a very powerful and deep acting remedy and makes long lasting changes, often continuing to bring about results for several years.

Nat. mur. increases production of red blood cells and albumin, a protein found in animal and vegetable tissues. It does not cure by supplying the amount of salt that the body needs, but acts to alter and restore the tissues of the body so they can assimilate the body's needs for salt from food. By bringing the body into a state of health, *Nat. mur.* reduces the patient's susceptibility to colds, fevers, and other ailments.

General use

Nat. mur. ailments typically come about as a result of emotional excitement, trauma, bad news, grief, disappointed love, fright, suppression of emotions, sexual excess, and head injuries. Exposure to the sun and intake of alcohol or salt may also cause *Nat. mur.* ailments. These conditions may weaken the immune system and create illness.

This remedy is frequently indicated in emaciated persons, teething children, persons who are congested and catch cold easily, the elderly, or awkward, pubescent girls who suffer from headaches and menstrual irregularities. *Nat. mur.* children are frequently serious. They dislike excessive physical contact and hate to be teased. These children often have frightening dreams about being robbed.

Nat. mur. is indicated when the following remedy picture is present. The patient's face is pale and waxy and her body has an emaciated appearance. Her face and hair may be oily, while the lips and corners of the mouth are dry and cracked. She is weak, both in body and mind, and is absent-minded and forgetful. The mucous from bodily discharges has the constituency of egg whites. A craving for salty, sour, or bitter foods is present, as is an aversion to bread, fats, or rich foods. The patient is thirsty for cold drinks even though she is constantly chilly and suffers from a lack of vital heat. She is sensitive to light touch and pressure. Cold sores on the lips or mouth may appear frequently, often as a result of suppressed emotions or as a companion to **fever**. The body may exude a sour smell. Hangnails are prevalent. Complaints are better from open air, but worse from warmth or heat.

Mentally she is depressed, sad, easily startled, sensitive, anxious, irritable, restless, angry, moody, nervous, easily offended, and indifferent. She dwells on past occurrences and is fearful of crowds, of an impending situation or calamity, thunderstorms, or being robbed. The patient wishes to be alone and demonstrates introverted behavior. To avoid being hurt she may avoid intimacy. She is very emotional but does not like to express her emotions in public and retires to the safety of her own home to cry. Her emotions are exaggerated and her moods often alternate radically. She may appear to desire consolation, but when it is offered she becomes angry or rejects it. She acts in a hasty or rushed manner and cannot urinate in public.

Symptoms are generally worse in the morning around 10 A.M., at night, from the cold, the heat of summer, sun exposure, open air, consolation, suppression of sweat, physical and mental exertion, lying on the left side, after eating, from noise, from pressure or touch, and before, after, and during **menstruation**. Symptoms are better from bathing in cold water, lying down, from sweating, or through rest.

Specific indications

Nat. mur. patients frequently suffer from digestive ailments, oftentimes from the suppression of emotions. The stomach is distended with **gas**, there is a slowness of bowel function, and digestion takes a long time. Other indications include stomach **pain**, **heartburn**, liver pain two or three hours after eating, excessive hunger and thirst, a constant need to urinate, an aversion to bread, and a craving for salty, sour, and bitter foods. An empty feeling in the stomach may occur at 10 A.M. Symptoms are often relieved upon eating. The patient is frequently constipated. When stools do occur, they are dry and hard and often difficult to expel. They may be preceded by rumbling in the abdomen and flatulence. *Nat. mur.* is a good remedy for **indigestion** caused by the consumption of rich food, which often causes green, watery **diarrhea**. Symptoms are worse from eating starchy food.

The *Nat. mur.* woman is greatly affected by her menstrual cycle. Her mental symptoms are increased

before menstruation, and she may suffer from headaches, **nausea**, skin eruptions, weakness, back pains, heart palpitations, and pains in her abdomen and loins. She is discontented and lacks enjoyment of any kind. Her cycle is either early or late. After the menstrual flow has stopped, the woman may still suffer from **depression**, **headache**, or cramps.

The headaches typical of *Nat. mur.* are centered in the forehead and temples, although they may occur at the back of the head. Headaches are often caused by emotional excitement, grief, anger, head injuries, eye strain, **anemia**, or malnutrition. The pain is of a bursting or throbbing nature. The headache is accompanied by nausea, **vomiting**, **dry mouth**, and extreme thirst. The eyes are sore and watery. The headache is worse from 10 A.M. to 3 P.M., after eating, light, noise, motion, mental strain, lying down, and during menstruation. It is often relieved by sweating.

The **cough** is dry, hacking, and irritating. It is worse during fever, and may be accompanied by a bursting headache. Involuntary urination may occur while coughing or **sneezing**.

The cold is accompanied by watery eyes, postnasal drip, thirst, stuffy nose, dry lips, sneezing, and white mucus. The patient may lose his sense of smell and taste. The same symptoms occur in **hay fever**.

The fever is hot and burning. The patient is chilled and may be nauseous, sleepy, restless, and dazed. His face is flushed and he may talk without stopping. He is also excessively thirsty.

The **sore throat** is dry and burning. The voice is hoarse and the patient can only swallow liquids. There may be a sensation described as a lump in the throat.

Preparations

The homeopathic remedy is created by dissolving sodium chloride in hot, boiling water. The mixture is then filtered and crystallized through evaporation. The resulting substance is then dissolved in water and succussed to create the final preparation.

Natrum muriaticum is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or healthcare practitioner should be consulted.

The recommended dose of *Nat. mur.* should not be exceeded.

Side effects

There are no known side effects, although individual aggravations may occur.

Interactions

When taking any homeopathic remedy, use of **peppermint** products, coffee, or alcohol should be avoided. These products may cause the remedy to be ineffective.

Resources

BOOKS

Cummings, Stephen, M.D., and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Natural hormone replacement therapy

Definition

Natural hormone replacement therapy (NHRT) is the use of non-synthetic, bio-identical hormones (estrogens, progesterone, and/or testosterone), derived from plants), to treat hormone imbalances and deficiencies. The first oral contraceptive pill was originally derived from Dioscorea species, wild yam; later soy was used as the precursor for oral contraceptive hormones.

Origins

Chinese medicine has made use of phytohormones for thousands of years. Natural progesterone was first crystallized from plants in 1938. NHRT was developed in the late 1970s and became available commercially in the early 1980s. By 1989 micronized (very finely ground) progesterone was developed for better absorption into the bloodstream. The use of NHRT has increased as women have become increasingly dissatisfied with conventional hormone replacement therapy (HRT) because of ineffectiveness, side effects, and/or growing concerns about risks, especially breast and **uterine cancer** risk.

KEY TERMS

Androgen—Sex hormones that are predominant in males.

Andropause—Midlife hormonal changes in men.

Bioavailability—The amount of a substance that can enter the bloodstream and be utilized effectively by the body.

Bioidentical—Molecules that are identical in chemical formulae and similar or identical in chemical structures, actions, and effects to naturally occurring biological molecules.

Compounding pharmacy—A pharmacy that uses bulk materials to fill prescriptions according to a physician's formulation; a formulating pharmacy.

Dehydroepiandrosterone (DHEA)—A hormone precursor to testosterone, estrogen, and other hormones.

Diosgenin—A phytohormone extracted from Mexican yams that is used to make natural progesterone.

Estrogen—A class of steroid hormones that are predominant in females. The term often refers to the three major estrogens: estriol, estradiol, and estrone.

Follicle-stimulating hormone (FSH)—A hormone that stimulates the development of egg follicles in the ovaries, egg maturation, and the production of estrogen.

Isoflavone—A phytoestrogen found in soybeans and other plants that sometimes is used as an estrogen supplement.

Menopause—The permanent cessation of menstruation; also called the change of life or climacteric.

Micronized—A crystal that is ground to a very fine powder.

Osteoporosis—A disease in which bone is lost and new bone formation is slowed. It usually occurs in older people, particularly postmenopausal women.

Phytohormones—Steroid hormones found in plants, including phytoestrogens and phytoandrogens.

Premenstrual syndrome (PMS)—Symptoms including lower back and abdominal pain, nervous irritability, and/or breast tenderness, occurring during the week prior to the onset of menstruation.

Progesterone—An important hormone, particularly in women, that declines sharply during menopause.

Receptor—A cell-surface molecule that binds a specific hormone to produce a specific biological effect.

Stigmasterol—A plant steroid that is extracted from soybeans and used to produce natural human hormones.

Testosterone—A steroid hormone that is predominant in males.

Benefits

NHRT often alleviates symptoms of hormone imbalances and deficiencies that may occur at any stage of life after puberty. In particular, NHRT is used to support hormone balance in the body during and after **menopause**, when estrogens, progesterone and testerone decline. It also is used in men to treat andropause that often affects middle-aged men as testosterone levels fall. Menopausal and andropausal symptoms often subside within months to years without any treatment. The symptoms also often improve after one to three months of NHRT use.

Low levels of estrogen, progesterone, and testosterone may be associated with chronic diseases of **aging**.

- heart disease
- bone loss and osteoporosis
- cancer
- digestive problems
- high cholesterol levels
- Alzheimer's disease

Some researchers claim that NHRT may slow the aging process and help prevent:

- fibroblastic or lumpy breasts
- heart disease
- osteoporosis
- cancer

Reported benefits of testosterone NHRT therapy in men include:

- increased muscle mass and lower body fat
- increased sex drive
- increased energy levels
- improved concentration and productivity

Description

Human sex hormones

The major steroid sex hormones—estrogen, progesterone, and testosterone—control gender and the aging process. They help maintain health and have profound effects on emotions and behavior. Cells throughout the body have receptor molecules on their surfaces that bind specific hormones. Receptor-binding causes a series of reactions within the cell that are specific for the hormone and cell type.

In the human body **cholesterol** is converted into pregnenolone, which is converted into both progesterone and dehydroepiandrosterone (**DHEA**). These hormones, in turn, can be converted into estrogens, testosterone, and other hormones.

High levels of sex hormones are produced in the developing fetus and then almost disappear until puberty. Estrogen and progesterone are at high levels during the reproductive years and are extremely high during **pregnancy**. With aging, the levels of sex hormones decline. When ovulation ceases at menopause, progesterone production drops to very low levels. Estrogen and progesterone have opposing effects in the body, balancing each other. At various times in their lives, many women experience hormone imbalances or sudden changes in hormone levels. During menopause the ratio of estrogen to progesterone may increase. During andropause the ratio of testosterone to estrogen may decline.

Although the body produces many forms of estrogen, the term usually refers to the three major types:

- Estriol is the weakest estrogen.
- Estradiol is the most active estrogen. Nearly every cell in the body has estradiol receptors, making it extremely important for cell and organ function.
- Estrone is made from testosterone derivatives in fat cells of postmenopausal women.

The body also produces several different types of testosterone.

NHRT hormones

The hormones used in NHRT are considered to be "bioidentical" to human sex hormones. The chemical formulae of NHRT hormones are identical to the corresponding hormones produced in the human body. They are very similar or identical to human hormones in their chemical structures, modes of action, and interactions with cell-surface receptors and other hormones. Receptors do not distinguish between the body's own hormones and natural hormones. Therefore natural hormones do not compete with endogenous hormones for receptor sites; rather they supplement and balance the endogenous hormones. In contrast, the synthetic hormones used in conventional HRT are processed and synthesized from chemicals or animal products and are not chemically or biologically identical to human hormones. Synthetic hormones can compete with or replace the body's own hormones because some receptors mistake them for endogenous hormones.

Prescription-strength natural hormones usually are produced from stigmasterol extracted from soybeans. They are chemically altered so as to be bioidentical to human forms such as progesterone or the human estrogens. Progesterone and testosterone may be micronized for NHRT. Over-the-counter (OTC) natural progesterone creams usually are derived from diosgenin extracted from the giant **Mexican yam**. NHRT hormones are manufactured for pharmaceutical companies that make standard-dosage medications and for compounding or formulating pharmacies that make up individualized medications.

Testosterone is often supplied as DHEA. Pharmaceutical-grade DHEA is available without a prescription.

NHRT delivery

Natural estriol, estradiol, estrone, and progesterone are available as:

- oral capsules
- oral tablets
- gel caps
- lozenges, drops, or sprays that are absorbed through the mucous membranes under the tongue
- transdermal creams and gels applied to the skin
- injectable solutions
- suppositories
- implants

Estradiols are available as skin patches (Estraderm, Vivelle, Climera) that slowly and continuously release estrogen through the skin into the bloodstream, bypassing the liver. The patches are worn at all times and changed once or twice per week.

Oil-based micronized oral progesterone appears to be most-readily utilized by the body, since the oil protects the progesterone from stomach acids. Some research suggests that a natural vitamin-E base (tocopherol) is more effective and least toxic. Mineral-oil-based preparations may not be effectively absorbed and/or metabolized.

Testosterone as DHEA is available as:

- oral tablets
- lozenges
- transdermal or vaginal creams
- patches

NHRT creams and gels are absorbed rapidly through the skin in areas with high blood flow, such as the lower neck, upper chest, inner wrists, or hands. Lower dosages are used for NHRT creams and gels because they are absorbed into the bloodstream more efficiently than oral NHRT. Transdermal preparations bypass the gastrointestinal tract and the liver where side effects are more likely to occur. With creams and gels, individual dosages can be adjusted easily, according to symptom relief. Low-dosage natural progesterone creams are available without a prescription. However, absorption of transdermals is highly variable between patients. Those with dry skin, poor circulation, etc. absorb less transdermally. Studies also show that transdermal delivery of hormones may result if very high blood levels over time. More research is need in this area, but for this reason some physicians do not prefer transdermal delivery forms.

Some NHRTs mix highly concentrated estrogen, progesterone, and sometimes testosterone in a propylene glycol base for rapid absorption through the skin. Only one to four drops are required daily, costing as little as $70 per year.

Forms of NHRT

Typical NHRTs include:

- estradiol gel applied daily
- micronized ethinyl estradiol (Estrace) as 0.3–2.5-mg daily tablets
- estriol (80%) and estradiol (20%) as 1.25- or 2.3-mg twice-daily tablets (Biestrogen)
- estriol (80%), estradiol (10%), and estrone (10%), as a 2.5–5% gel applied daily (Triest), or as 1.25- or 2.5-mg, twice-daily tablets (Triestrogen)
- micronized progesterone as 50-, 100-, or 200-mg peanut-oil-based tablets or capsules (oral micronized progesterone, Prometrium)
- micronized progesterone as a 5% cream (percutaneous progesterone cream) or gel
- combined NHRT as 1.25-mg Triestrogen tablets and oral micronized progesterone (50–100 mg), twice daily
- oral micronized testosterone as 1.25–5-mg tablets
- micronized testosterone as a 1% cream or gel (Androgel), applied to the inner thigh or scrotum once or twice daily

Vaginal creams, tablets, and rings are not significantly absorbed into the bloodstream. However they can be useful for treating menopausal symptoms such as urinary problems, vaginal dryness, and thinning of the vaginal wall, which can cause painful intercourse. Vaginal NHRTs include:

- micronized estriol cream, 0.5 mg per g of base (Estriol)
- micronized estradiol cream, 1 mg per g of base (Estrace)
- estradiol as a silicone ring with a 2-mg reservoir, changed every 90 days (Estring)
- progesterone gel, 4 or 8% (Crinone)

Most effective NHRTs require a prescription and may be covered by insurance.

Women's symptoms & NHRT

The dosages and duration of NHRT vary according to response, as determined by symptom relief. Dosages in women may be cycled to correspond to the menstrual cycle.

Symptoms of hormone imbalance in teenagers and young women with normal menstrual cycles include:

- acne
- mood swings
- stress syndromes
- night sweats
- sleep disturbances
- premenstrual syndrome (PMS)

A typical NHRT is micronized progesterone cream, 4–6 mg per kg (2.2 lb) body weight, rubbed daily on the neck, upper chest, and inner wrists, for the entire month or for two weeks prior to **menstruation**, depending on symptoms. It is not used on the face in the presence of **acne**.

Symptoms of hormone imbalances in women in their twenties and thirties with normal menstrual cycles, in addition to the above, may include:

- occasional or postpartum (after giving birth) depression
- infertility
- bloating from salt and fluid retention
- migraine headaches
- breast tenderness
- decreased attention span
- weight gain
- food cravings

Typical NHRTs for three months to one year:

- micronized progesterone cream, 4-6 mg per kg (2.2 lb) body weight, daily
- estradiol, 6–8 µg per kg body weight.

In addition to the above symptoms, hormone imbalances in premenopausal women (aged 35 to over 40), with regular or irregular menstruation, may cause:

- sleep disorders
- hair loss
- hot flashes
- depression
- loss of libido
- digestive problems
- anxiety

Typical NHRTs for three months to one year:

- Micronized progesterone, 4–6 mg per kg (2.2 lb) body weight, daily
- Estradiol, 7–9 micro;g per kg (2.2 lb) body weight, daily

NHRT may be particularly appropriate for perimenopausal symptoms in women aged 40–55. Their symptoms can be similar to those listed above, but may be more pronounced. Menstruation may have ceased or cycles may be irregular. Typical NHRTs:

- micronized progesterone cream, 5–7 mg per kg (2.2 lb) body weight
- estradiol, 6–9 µg. per kg (2.2 lb) body weight
- testosterone cream, 10 µg per kg (2.2 lb) body weight, applied to the labia and around the clitoris

Daily NHRT is continued for two to four months, followed by a five-day break.

Menopausal and postmenopausal women (usually aged 55 or older) may have, in addition to any of the above symptoms:

- bone loss
- cardiac disease
- urinary incontinence

Typical NHRTs:

- micronized progesterone cream, 5–7 mg per kg (2.2 lb) body weight, daily
- estradiol, 6–9 µg per kg (2.2 lb) body weight, daily.

Men's symptoms and NHRT

Symptoms of low testosterone levels or hormone imbalances in andropausal men are very similar to those in women. Additional symptoms may include:

- fatigue
- nighttime urination
- impotence or decreased ability to maintain an erection
- decrease in muscle-building ability
- inability to lose weight

A natural androgen replacement protocol, lasting 3–14 months, might consist of:

- pine pollen, 0.5–5 gm, once or twice daily; a one-quarter-teaspoon tincture, three times daily; 5–10 gm daily in warm milk, in Chinese and Korean medicine
- David's lily flower, one-quarter-teaspoon tincture, twice daily
- Panax/tienchi ginseng tincture, one-third teaspoon daily
- nettle root (*Urtica dioica*), 300–1,200 mg daily
- tribulus (*Tribulus terrestris*), 250–500 mg standardized extract as pills or tablets, three times per day
- pregnenolone, a primary steroid hormone (prohormone) in men and women, 5–50 mg daily
- androstenedione (andro), 50–100 mg, one to three times per day, as a pill dissolved under the tongue
- androstenediol (andiol, 4-andiol, androdiol), 100 mg once or twice daily
- DHEA, 25–50 mg daily
- zinc, 20–40 mg daily
- celery juice, daily from three fresh stalks
- a diet high in oatmeal, corn, and pine nuts

Zinc is required for the transformation of **androstenedione** to testosterone. Zinc preparations usually include **copper** to prevent copper depletion.

Ginseng as an androgen replacement:

- Asian ginseng as 1–9 gm daily tablets
- Asian white (20–40 drops) and Kirin or dark red (5–20 drops) as a daily tincture
- Asian ginseng combined with tienchi (*Panax pseudoginseng*), one to one, one-third teaspoon daily in water
- Siberian ginseng

Foods & supplements

Most researchers believe that the human body cannot utilize the phytoestrogens in soy or the progesterone in yams; nor can the body transform these phytohormones into biologically available hormones. However some researchers believe that phytoestrogens called isoflavones (genistein and daidzein) found in soy can serve as short-term estrogen supplements. **Soy protein** in a low-fat diet reduces the risk of **heart disease** and isoflavones may help prevent bone

loss. Isoflavones are found in tofu, tempeh, and soy drinks but not in soy oil.

Wild Mexican yam creams may contain phytoestrogens; however they are ineffective as progesterone supplements because they contain only a progesterone precursor which is inactive in the human body.

Phytoandrogens have been reported to increase androgen levels and the androgen-to-estrogen ratio in men. Foods containing high levels of phytoandrogens:

- celery
- parsnips
- corn
- oats (*Avena sativa*)
- garlic (*Allium sativum*)
- onions
- pine nuts

Foods that lower androgen levels and suppress androgenic activity in men include:

- licorice
- black cohosh (*Cimicifuga racemosa*), which is very high in estrogen and sometimes used to treat hot flashes in menopausal women
- hops, one of the most powerful estrogenic foods
- grapefruit, which interferes with removal of estrogen from the body

Preparations

Blood hormone levels may be measured before and/or during NHRT:

- Follicle-stimulating hormone (FSH): high FSH levels indicate low sex hormone production and menopause.
- Estrogen blood tests measure how much of one type of estrogen is circulating in the blood and the total amount present in the bloodstream. However most estrogen in the body is bound to other molecules or cell receptors and cannot be measured.

Other tests include:

- Saliva hormone testing: inexpensive as performed by mail-order laboratories or with home test kits
- Urine testing reveals how much hormone is excreted through the kidneys over a 24-hour period. It is expensive and may be difficult to interpret.
- Yearly bone mineral density tests for those using NHRT to improve bone density
- Annual pelvic ultrasounds can be used to monitor the effectiveness of NHRT. These tests are inexpensive and enable the physician to view the thickness of the uterine lining and the shape of the ovaries, both of which are affected directly by estrogen and progesterone. Pelvic ultrasound also can detect and monitor ovarian cysts that may develop with hormone therapies.

Testosterone and/or DHEA levels in the blood or saliva are monitored regularly when DHEA is used in NHRT. However hormone levels are constantly changing and most tests reflect only the measurable hormone present at a single point in time.

Precautions

Although they are approved by the U. S. Food and Drug Administration, natural hormones are not regulated as drugs. Most large manufacturers use standardized labeling and dosages of active ingredients. Nevertheless, the bioavailability—the amount of active ingredient that enters the bloodstream and can be utilized effectively—is not known for most NHRTs. The results of oral NHRT may be inconsistent since many factors can affect their bioavailability. Although many OTC products are labeled as natural hormones, they contain very low concentrations and their bioavailability is unknown. They may be useful if only a small amount of hormone supplementation is required.

NHRTs, especially androgen replacement, have not been well-studied. There have been no clinical safety trials. It is not known whether NHRT carries risks similar to some HRTs, including increased risk for **breast cancer**, coronary heart disease, **stroke**, and pulmonary embolism (a blood clot in an artery of the lung). Androgen replacement therapies should not be used by adolescent males.

Some synthetic hormone products may be labeled as "natural" because they are synthesized from naturally occurring substances. For example, synthetic estrogen is manufactured from the urine of pregnant horses. Some prescription hormones contain bioidentical estrogen but synthetic progesterone.

Side effects

There have been very few reports of side effects from NHRT in women. Since the estrogens used in NHRT are bioidentical to human estrogens and tend to be weaker than the synthetic estrogens used in HRT, they are expected to have fewer side effects. Furthermore, NHRT can be halted and resumed at any time without side effects.

Natural androgen replacement therapy may cause irritability and other side effects in men, particularly in coffee-drinkers. Ginseng has many side effects and should be used with caution. Very high zinc intake also can have numerous side effects.

Research and general acceptance

The few research studies that have included NHRT have had positive results. NHRT practitioners claim that it is safer and more effective than HRT.

Training and certification

Most NHRTs are available only as prescriptions from a medical or naturopathic physician or nurse practitioner. Most doctors who use NHRT rely on personal research and the experiences of their patients.

Resources

BOOKS

Buhner, Stephen Harrod. *Vital Man: Natural Health Care for Men at Midlife*. New York: Avery, 2003.

Northrup, Christiane. *The Wisdom of Menopause*. New York: Bantam, 2001.

Schwartz, Erika. *The Hormone Solution*. New York: Warner, 2002.

Schwartz, Erika. *The 30 Day Natural Hormone Plan: Look and Feel Young Again Without Synthetic HRT*. New York: Warner, 2004.

PERIODICALS

Karmon, Eran. "'Natural' Alternative to Hormone Replace ment Therapy Replaces Woman's Estrogen." *Knight Ridder Tribune Business News* (August 21, 2002): 1.

Ward, Elizabeth M. "Health Concerns at Menopause: HRT Vs. Natural Remedies for Relief." *Environmental Nutrition* 25, no. 1 (January 2002): 1.

Watt, P. J., et al. "A Holistic Programmatic Approach to Natural Hormone Replacement." *Family and Com munity Health* 26 (January March 2003): 53 63.

ORGANIZATIONS

American Menopause Foundation. 350 Fifth Ave., Suite 2822, New York, NY 10118. (212) 714 2398. http:// www.americanmenopause.org.

National Women's Health Information Center. 8550 Arlington Blvd., Suite 300, Fairfax, VA 22031. (800) 994 9662. http://www.4woman.gov.

Natural Woman Foundation. 8539 Sunset Blvd, No. 135, Los Angeles, CA 90069. (888) 489 6626. Chriscoprd@ aol.com. http://www.naturalwoman.org.

North American Menopause Society. P.O. Box 94527, Cleveland, OH 44101. 440 442 7550. info@menopause. org. http://www.menopause.org.

OTHER

"Alternative Therapies for Managing Menopausal Symp toms." National Center for Complementary and Alter native Medicine. August 2, 2002 [cited April 27, 2004]. http://nccam.nci.nih.gov/health/alerts/menopause.

Margaret Alic, PhD

Natural hygiene diet

Definition

The natural hygiene diet is a system of healthy living whereby moral, physical, and environmental pollution is strictly avoided, and natural healthy food is chosen in preference over processed food. The principle is to provide everything the body needs to be healthy, and to avoid anything that may hinder health and well being.

Origins

Actually, early in the twentieth century, there were similar "natural hygiene" movements or health culture societies advocating exercise, the consumption of healthy foods, and massage. The American Natural Hygiene Society was founded in 1948, and as such is the oldest and largest natural hygiene organization in the world. The Society publishes the *Health Science* magazine. The British Natural Hygiene Society was founded in 1959 by Keki Sidhwa and two other natural hygienists. Their magazine, *Hygienist,* which is published quarterly, was started in 1959, making it the oldest natural hygiene publication. Both organizations aim to educate and inform, and they can also recommend practitioners and clinics.

Benefits

This regime is designed to cleanse the body of all toxic matter, so that it is free to work, instead of being hampered by stored wastes that reduce the efficiency of the human organism. Together with improved nutrition, this should bring about a complete transformation for most people. Less sleep may be needed, and there should be a general feeling of increased well being and energy, which will almost certainly help the individual to make better and more productive use of his or her time.

It is possible that an improvement may be noticed in powers of recall; many people complain of loss of memory in our time, and this may be due to a combination of **stress** and a toxic body system.

Proponents say improvement in symptoms of conditions such as arthritis, migraine, hypoglycemia, diabetes, and more can be expected. In addition, the principles of natural hygiene often lead to unexpected benefits, such as improvements in the appearance and texture of skin, and the condition of hair and fingernails, the disappearance of eye bags, and less body odor.

KEY TERMS

Denatured—Changed from its natural state and robbed of nutrients.

Hypoglycemia—A condition characterized by abnormally low levels of glucose in the blood.

Description

The term "natural hygiene" refers more to a way of life than merely to a diet. For some time, proponents have asserted that their recommendations can provide the foundation for a healthy, fulfilling life that is disease-free and emotional ennui that have become commonplace in so-called modern society. These, and many other diseases of modern life, are due to the multi-faceted pollution of ourselves and our planet, and a denatured diet. Together, it is considered that they cause poisoning and the stifling of the body's natural strength and vitality. Natural hygienists reason that since the body "constructs itself" after the fertilization of the ovum, it must also have powers of repair and renewal in order to maintain the organism, if given the right conditions.

Natural hygiene concerns every aspect of a human being's life, because everything—the physical, the spiritual, and the moral—affects the well being of the individual and society. The theory is that people should obey their natural instincts, and that only when they have achieved perfect health, will they be able to achieve their full potential as human beings.

Natural hygienists believe that mankind is naturally good and virtuous, but will not display these traits unless they are following all the principles of healthy lifestyle. The theories of natural hygiene, they claim, if properly adhered to will allow mankind to achieve supreme heights of achievement at all levels of his being.

If given the right circumstances and facilities, the human body, believed to be perfect in its creation, will be able to preserve itself in an optimum state, and efficiently perform repairs when needed, quickly returning to a state of total well being. The prerequisites for total well being are pure air, pure water, sufficient rest and sleep, and uncontaminated food of a high quality that will provide all the necessary nutrients in a readily available form. In addition to these, satisfactory human companionship should be sought, as well as protection from extreme cold and extreme heat, sunshine, sufficient exercise, a purpose in life, and in general, an atmosphere conducive to all that is good concerning human life.

An essential concept of natural hygiene is that to be healthy is normal, and healing is a biological process that cannot be bought. The same natural laws apply whether one is sick or well, and that which makes a well person sick can never make a sick person well. Allopathic medicine, in treating merely the symptoms of disease, in many instances actually worsens the condition in the long run.

A simple example of this would be the administering of laxatives to a patient suffering from **constipation**, as opposed to finding the underlying cause of the constipation. With time, laxatives cause the bowels to become even more sluggish, and so the cycle continues. Natural hygiene aims to correct the cause.

The first step, when embarking on a regime of natural hygiene, is to rid the body of accumulated toxins. There are many aspects to be taken into account for this procedure. Usually, the first to be considered is the gastrointestinal tract, but in addition, the skin, liver, gallbladder, lymphatic system, lungs, kidneys, and bladder all need to be detoxified in order to facilitate perfect functioning of the human organism. Although cleansing is of major concern, natural hygiene therapists caution that it is also very important to ensure that the body has access to fresh, clean air, clean water, and good food while the **detoxification** is in process, so that the body can rebuild itself. They warn that cleansing without rebuilding will weaken a body and its immune system.

There are many variations on this, but basically this consists of **fasting** the body at some time, and feeding it mainly fruits and vegetables that will have a dual effect of cleansing and rebuilding. Usually, food combining is an important aspect of the **nutrition** of natural hygiene, and requires that a protein food is never eaten with a starch food. They should be taken at different meals with a minimum of four hours between each meal. Fruit is recommended to be eaten by itself, but since it digests quickly only half an hour need pass before other food can be consumed.

To follow the natural hygiene way of living at home, the only expenses that will be incurred are the cost of **organic food**, which can be more expensive than ordinary food. However, if patients feel that they would benefit from a trip to a natural hygiene clinic, information can be obtained from some natural hygiene organizations.

Preparations

Those wishing to treat themselves in accordance with natural hygiene principles are required to follow a mainly raw diet that includes all the nutrients and enzymes that

will help to flush toxins from the body, while at the same time building health. However, it is wise to consult a natural hygienist before beginning treatment.

There are special formulas for speeding the elimination of toxins, which can be obtained from practitioners who specialize in natural hygiene. Information regarding these treatments can be obtained from various national organizations.

Precautions

When undertaking a cleansing diet, it is important not to impose anything too harsh on the body. If an individual is suffering from acute toxicity, it may be better advised to proceed slowly and cautiously with the process of detoxification, particularly if the patient is continuing as normal with his/her everyday life.

Side effects

There are few side affects associated with the practice of natural hygiene. Some may experience what is known as a "healing crisis" while the body is throwing off toxins. Symptoms may include headaches, **nausea**, or sensitivity. These symptoms are transient, and may normally be relieved with herbal teas, a walk in the fresh air, or by simply lying in a darkened room for a while.

Under very rare circumstances, an individual may have such a toxic condition that it would be dangerous for him/her to undertake cleansing without assistance. When the body is subjected to poisons, whether in their food, in the air, or from the water they drink, the body attempts to deal with them in such a way that they will cause the least harm to the body. Thus, they may be stored in the liver, or in fatty deposits under the skin.

When a person who has poisons stored in such a way undergoes a fast, or undertakes some other method to flush poisons from the body, sometimes the flushing causes large amounts of toxins to enter the blood system at the same time. Without proper supervision or consultation, and without the correct step being taken, the results could possibly be fatal.

Research and general acceptance

There is a large body of research to support the theories of natural hygienists, although most of it is not accepted by allopathic practitioners. General belief exists that detoxification can improve the effectiveness of many healing therapies. Though many nutritionists see numerous health benefits in eating natural foods and greater amounts of fruits and vegetables, they may warn against eating large amounts of any particular kind of food. For example, eating too many fruits and vegetables at one time can cause **diarrhea**. Fasting may be dangerous for some individuals—those with weakened immune systems, the elderly, or pregnant women. It may also cause muscle weakness and **dizziness** in healthy individuals.

However, many people continue to seek assistance from clinics dispensing some form of natural hygiene and are satisfied with the results. Keki Sidhwa, the president of the British Natural Hygiene Society, has records covering many years of successful treatment of his patients, where many leave from his clinic days or weeks later in a better state of health.

Training and certification

The American College of Health Science awards degrees up to PH.D. standard, but these are not yet accredited by mainstream education in the United States. Practitioners must be members of one of the national associations.

Resources

BOOKS

Diamond, Marilyn, and Harvey Diamond. *Fit For Life II*. New York: Warner Books Inc. 1989.

PERIODICALS

Hunter, Beatric Trum. "Improving the Quality of One's Life (Book Corners)." *Townsend Letter for Doctors and Patients* (July 2002): 131.

ORGANIZATIONS

The American Natural Hygiene Society. PO Box 30630, Tampa, FL 33630 813 855 6607. anhs@anhs.org ANHS. http://www.anhs.org.

The British Natural Hygiene Society. Shalimar, 3 Harold Grove, Frinton on Sea, Essex, England, CO13 9BD. 011 44 1255 672823. http://members.rotfl.com/bnhs.

OTHER

Holistic Healing Webpage. http://www.holisticmed.com/detox/dtx intro.txt.

Living Nutrition. http://www.livingnutrition.com/articles/art 1.html.

Patricia Skinner
Teresa G. Odle

Naturopathic medicine

Definition

Naturopathic medicine is a branch of medicine in which a variety of natural medicines and treatments are used to heal illness. It uses a system of medical diagnosis

and therapeutics based on the patterns of chaos and organization in nature. Naturopathy is founded on the premise that people are naturally healthy, and that healing can occur through removing obstacles to a cure and by stimulating the body's natural healing abilities. The foundations of health in natural medicine are diet, **nutrition**, **homeopathy**, physical manipulation, **stress** management, and **exercise**.

Naturopaths are general practitioners who treat a wide variety of illnesses. They believe in treating the "whole person"—the spirit as well as the physical body—and emphasize preventive care. They often recommend changes in diet and lifestyle to enhance the health of their patients.

KEY TERMS

Clinical nutrition—The use of diet and nutritional supplements as a way to enhance health and prevent disease.

Cryosurgery—Freezing and destroying abnormal cells.

Herb—In naturopathy, a plant or plant derivative or extract prescribed for health or healing.

Homeopathy—A holistic system of treatment developed in the eighteenth century. It is based on the idea that substances that produce symptoms of sickness in healthy people will have a curative effect when given in very dilute quantities to sick people who exhibit those same symptoms. Homeopathic remedies are believed to stimulate the body's own healing processes.

Hydrotherapy—The use of water (hot, cold, steam, or ice) to relieve discomfort and promote physical well-being. Also called water therapy.

Physical manipulation—The use of deep massage, spinal alignment, and joint manipulation to stimulate tissues.

Ultrasound—A painless and non-invasive procedure in which sound waves are bounced off the kidneys. These sound waves produce a pattern of echoes that are then used by a computer to create pictures of areas inside the kidney (sonograms).

Origins

People have always seen connections between diet and disease; many therapies are built around special **diets**. Naturopathy began in the eighteenth and nineteenth centuries, as the industrial revolution forced many people into unhealthy lifestyles, and the European custom of "taking the cure" at natural spas became popular. Benedict Lust, who believed deeply in natural medicine, organized naturopathy as a formal system of healthcare in the 1890s. By the early 1900s, it was flourishing.

The first naturopaths in the United States emphasized the healing properties of a nutritious diet, as did a number of their contemporaries. In the early twentieth century, for instance, John Kellogg, a physician and vegetarian, opened a sanitarium that used such healing methods as **hydrotherapy**, often prescribed by today's naturopaths. His brother Will produced such health foods as corn flakes and shredded wheat. The Post brothers helped make naturopathic ideas popular and emphasized the value of whole grains over highly refined ones. Together with one of their employees, C. W. Post, they eventually went on to start the cereal companies that bear their names.

In the early 1900s, most states licensed naturopaths as physicians. There were 20 medical schools of naturopathic medicine. From early on, naturopathic physicians were considered "eclectic," since they drew on a variety of natural therapies and traditions for treating their patients.

In the 1930s, naturopathy dramatically declined for several reasons. Allopathic medicine finally stopped using such therapies as bloodletting and heavy metal poisons as curative compounds. New therapies were more effective and less toxic. Allopathic medical schools became increasingly well-funded by foundations with links to the emerging drug industry. In addition, allopathic physicians became much more organized and came to wield considerable political clout. Naturopathy has experienced a resurgence over the last 20 years, however. The lay public is aware of the connections between a healthful diet and lifestyle and avoiding chronic disease. In addition, conventional medicine is often unable to treat these chronic diseases. Patients are now health care consumers, and will seek their own resolution to health problems that cannot be resolved by conventional physicians. As a result, even medical groups that once considered naturopathy ineffective are now beginning to accept it.

Benefits

Naturopathic medicine is useful for treating chronic as well as acute diseases. It is sometimes used in conjunction with allopathic care to enhance wellness and relieve chronic symptoms, such as **fatigue** and **pain**. A naturopath treats a wide range of health problems, ranging from back pain to **depression**.

A naturopathic physician will spend extra time interviewing and examining the patient to find the underlying cause for a medical problem. Emotional and spiritual symptoms and patterns are included in the assessment. The naturopath often spends more time educating patients in preventive health, lifestyle, and nutrition than most M.D.s.

Description

Naturopathic medicine modalities include a variety of healing treatments, such as diet and clinical nutrition, homeopathy, **botanical medicine**, soft tissue and spinal manipulation, ultrasound, and therapeutic exercise. A naturopath provides complete diagnostic and treatment services in such specialties as obstetrics and pediatrics. Some are also licensed midwives.

Naturopaths consider health to be not just the absence of disease, but complete physical, mental and social well being. Naturopathic physicians often say that diseases must be healed not just by suppressing symptoms, but by rooting out the true cause. Symptoms are actually viewed as the body's natural efforts to heal itself and restore balance.

A typical office visit to a naturopath takes about an hour. During the first visit, the doctor will ask detailed questions about the patient's symptoms, lifestyle, history of illness, and state of his or her emotions. The naturopath will take a complete medical history, and may order lab tests such as urine and blood tests. A naturopath may talk with the patient about the possible causes for an illness—poor diet, life stresses, occupational dangers, and mental, emotional, and spiritual problems. Naturopaths believe that even widely varying symptoms can sometimes be traced to one underlying cause. Often environmental or metabolic toxins or serious stress bring on an illness.

As with most doctors, treatment by a naturopath can range from one office visit to many. Some acute illnesses can be alleviated with one or two visits. Other chronic diseases need regular weekly or monthly attention. Clinical care provided by naturopathic physicians are covered by insurance in a number of states in the United States.

Preparations

There are about 1,500 naturopathic physicians in the United States practicing as of 2004; nearly 80% of these practitioners entered the profession following the revival of interest in naturopathy in the late 1970s. Consumers can find naturopaths by contacting the American Association of Naturopathic Physicians (AANP) or logging on to their web site. Naturopaths recommended by the AANP have met requirements for state licensure and have taken a national exam that qualifies them to practice. Qualified naturopaths can also be found through the local branch of the national or state association of naturopathic physicians. It is sometimes useful to request names from another health care provider who knows naturopathic practitioners in the community.

Precautions

A good naturopath is always willing to work with the patient's other physicians or health care providers. To avoid drug interactions and to coordinate care, it is important for a patient to inform his or her allopathic doctor about supplements prescribed by a naturopath.

Many naturopaths give childhood vaccinations, but some do not. If a parent is concerned about immunizations, it is best to go to an allopathic doctor for vaccinations.

Naturopaths are not licensed to perform major surgery, or prescribe narcotics and antidepressant drugs. They must also consult an oncologist when treating a **cancer** patient.

Side effects

Although naturopathic remedies are derived from natural sources and pose much less risk than allopathic drugs do, there are certain side effects associated with the use of some herbal preparations. One problem they can pose is through interactions with prescription medicines. It is important for a patient to inform his or her allopathic physician about any natural remedies or herbs prescribed by a naturopath.

It is also important to note that the U.S. Food and Drug Administration (FDA) considers medicinal herbs to be dietary supplements, not drugs; as a result, they are not subject to the same regulations as prescription medications. Because herbal remedies come from natural sources, the active ingredients may not always be in the same concentration from bottle to bottle, since plants naturally vary. To guard against using too little or too much of a natural remedy, patients should use herbs and supplements recommended by a naturopath or those produced by well-respected companies.

Research and general acceptance

Medical research in naturopathy has increased dramatically in the United States within the last 10 years. Naturopathic research often employs case histories,

BENEDICT LUST (1872–1945)

German healer, Benedict Lust, is credited with nam ing the natural medical technique of naturopathy. He was married to Louisa Lust who was a student of another natur opathy pioneer, Arnold Rikli.

Benedict, who was born in Germany in 1872, immi grated to the United States in 1892 but returned to his native Germany when he contracted tuberculosis. In Germany he met Father Sebastian Kneipp who treated and cured Lust using hydrotherapy. Lust subsequently returned to the United States as Kneipp's representative to publicize the cure. He founded the Water Cure Institute in New York City and established Kneipp Societies throughout the United States.

Lust acquired degrees in osteopathy and medicine and drew from his combined knowledge to devise the healing art of naturopathy. In 1901 he organized the Naturopathic Society of America, and he founded the American School of Naturopathy. He purchased the rights to the term naturopathy from John H. Scheel in 1902 and publicized himself as a naturopath. Lust's school initially offered a two year, post graduate curric ulum and later expanded into a four year residential pro gram. The school received a charter in 1905 and, thereafter, awarded degrees in naturopathy and chiro practic. Lust established a second school devoted to teaching the principles of massage and physiotherapy. Additionally he offered home study courses in naturop athy and started a magazine about naturopathy.

Lust later reorganized the Naturopathic Society of America at the national level, calling the group the Amer ican Institute of Naturopathy. Likewise in 1919, he com bined the independent Kneipp Societies into a unified group, called the American Naturopathic Association (ANA). In 1921 the ANA elected Lust to a lifetime term as president of the society. Benedict Lust, a staunch propo nent of natural healing and natural food remedies, champ ioned the cause of the naturopath and spent much of his lifetime battling the American Medical Association for legitimacy.

summaries of practitioners' clinical observations, and medical records. Some studies by naturopaths in the United States have also met today's scientific gold standard; they were double-blind and placebo-controlled. Much naturopathic research has also been done in Germany, France, England, India, and China.

Some mainstream medical practitioners remain distrustful of naturopathy, however. Such problems as health-food store employees without naturopathic credentials giving health-related advice to customers, or occasional rare cases of **infections** caused by naturopathic injections, continue to damage the reputation of this form of alternative medicine.

Single-treatment studies

Research in naturopathy tends to focus on single treatments used by naturopaths, rather than naturopathy as a whole. In 1998, an extensive review of such single-treatment studies found that naturopathic healing methods were effective for 15 different medical conditions, including **osteoarthritis**, **asthma**, and middle ear infections. A study of 8,341 men in with damaged heart muscles in 1996 revealed that supplementation with **niacin**, a B vitamin, was associated with an 11% reduced risk of mortality over 15 years. In 1996, a study showed **St. John's wort** was effective as prescription antidepressants in relieving depression, and had fewer side effects.

Women's health

Naturopathic studies have also demonstrated benefits in the arena of women's health issues. In recent years, more women than men have been drawn to naturopathy because of its holistic emphasis, its tradition of relative equality between practitioner and patient, and its philosophy of eclecticism and freedom of choice in healing methods. In one classic 1993 study, women with **cervical dysplasia** or abnormal Pap smears were treated by naturopaths with topical applications of herbs and dietary supplements. These medications included Bromelian, an enzyme from the pineapple; **bloodroot**; marigold; **zinc** chloride; and suppositories made from herbal and nutritional ingredients, such as **echinacea**, **vitamin A**, and **vitamin E**. Thirty-eight of the 43 women in the study had normal Pap smears and normal tissue biopsies after treatment. The study concluded that these protocols might benefit the health of patients undergoing more traditional treatments for cervical dysplasia, such as cryosurgery.

Other more recent research has documented the benefits of such nutritional foods as soy in relieving **hot flashes** and vaginal dryness. Nutritional supplements prescribed by naturopaths to enhance women's health during **menopause** have also proven effective; in general, naturopathy appears to be as useful as conventional medicine for treating menopausal symptoms. Research shows vitamin E supplements are helpful for

50% of postmenopausal women with thinning vaginal tissue. Studies also reveal that **bioflavonoids** with **vitamin C** and gamma-oryzanol, a substance taken from rice bran oil, can relieve hot flashes.

Another area of women's health concerns that naturopathy has taken seriously is a growing preference for skin care and beauty products derived from natural sources rather than from chemical laboratories. Such products are often more beneficial to the skin and less likely to cause **rashes** or other allergic reactions.

Training and certification

Naturopathic medical students attend a four-year medical school and are educated in many of the same basic sciences as MDs, including anatomy and pathology. In the last two years, they also study such holistic therapies as nutrition, homeopathic medicine, botanical medicine, psychology, hydrotherapy, and counseling. The naturopathic curriculum places a strong emphasis on disease prevention and optimizing wellness.

After his or her education, a naturopath takes a national qualifying examination known as the Naturopathic Physicians Licensing Examination or NPLEX. A doctor should have graduated from a school that qualifies him or her to take these examinations. As of 2003, these schools include the National College of Naturopathic Medicine in Portland, Oregon; Bastyr University in Seattle, Washington; Southwest College of Naturopathic Medicine in Tempe, Arizona; Canadian College of Naturopathic Medicine in Toronto, Canada; and the University of Bridgeport College of Naturopathic Medicine in Bridgeport, Connecticut.

Some states license naturopathic physicians. As of late 2003, those states included Hawaii, Alaska, Washington, Oregon, Utah, Montana, Arizona, Connecticut, New Hampshire, Vermont, Maine, and Kansas, in addition to the territories of Puerto Rico and the Virgin Islands. Training via a correspondence school does not qualify a naturopath for licensure or to take the national qualifying examination.

Resources

BOOKS

Better Homes and Gardens. *Smart Choices in Alternative Medicine*. Meredith Books, 1999.

Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine Publishing Inc., 1995.

Pelletier, Dr. Kenneth R. *The Best Alternative Medicine*. New York: Simon and Schuster, 2000.

PERIODICALS

Cramer, E. H., P. Jones, N. L. Keenan, and B. L. Thompson. "Is Naturopathy as Effective as Conventional Therapy for Treatment of Menopausal Symptoms?" *Journal of Alternatie and Complementary Medicine* 9 (August 2003): 529 538.

Engelhart, S., F. Saborowski, M. Krakau, et al. "Severe *Serratia liquefaciens* Sepsis Following Vitamin C Infu sion Treatment by a Naturopathic Practitioner." *Jour nal of Clinical Microbiology* 41 (August 2003): 3986 3988.

Hudson, Tori. "Naturopathic Medicine, Integrative Medi cine and Women's Health." *Townsend Letter for Doc tors and Patients* (November 2001): 136.

Hudson, Tori, N.D. "Six Paths to Menopausal Wellness." *Herbs for Health* (Jan/Feb 2000): 47 50.

Kurtzweil, Paula. *An FDA Guide to Dietary Supplements*. FDA Consumer, 1998.

Lee, A. C., and K. J. Kemper. "Homeopathy and Naturop athy: Practice Characteristics and Pediatric Care." *Archives of Pediatric and Adolescent Medicine* 154, no. 1 (January 2000): 75 80.

Mills, E., R. Singh, M. Kawasaki, et al. "Emerging Issues Associated with HIV Patients Seeking Advice from Health Food Stores." *Canadian Journal of Public Health* 94 (September October 2003): 363 366.

ORGANIZATIONS

American Association of Naturopathic Physicians. 601 Valley Street, Suite 105, Seattle, WA 98109. (206) 298 0126. http://www.naturopathic.org

Naturopathic Physicians Licensing Examination Board (NPLEX). P. O. Box 69657, Portland, OR 97201. (503) 250 9141. http://www.nabne.org/html/index2.html.

Barbara Boughton
Rebecca J. Frey, PhD

Nausea

Definition

Nausea is the sensation of having a queasy stomach or being about to vomit. **Vomiting**, or emesis, is the expelling of undigested food through the mouth.

Description

Nausea is a reaction to a number of causes that include overeating, infection, or irritation of the throat or stomach lining. Persistent or recurrent nausea and vomiting should be checked by a doctor.

A doctor should be called if nausea and vomiting occur:

KEY TERMS

Acupuncture—Based on the same traditional Chinese medical foundation as acupressure, acupuncture uses sterile needles inserted at specific points to treat certain conditions or relieve pain.

Antiemetic—A medication that helps control nausea; also called an antinausea drug.

Dehydration—An excessive loss of water from the body. It may follow vomiting, prolonged diarrhea, or excessive sweating.

Diabetic coma—A life-threatening, reduced level of consciousness that occurs in persons with uncontrolled diabetes mellitus.

Emesis—An act or episode of vomiting.

- after eating rich or spoiled food or taking a new medication
- repeatedly or for 48 hours or longer
- following intense dizziness

It is important to see a doctor if nausea and vomiting are accompanied by:

- yellowing of the skin and whites of the eyes
- pain in the chest or lower abdomen
- trouble with swallowing or urination
- dehydration or extreme thirst
- drowsiness or confusion
- constant, severe abdominal pain
- a fruity breath odor

A doctor should be notified if vomiting is heavy and/or bloody; if the vomitus looks like coffee grounds or feces; or if the patient has been unable to keep food down for 24 hours.

An ambulance or emergency response number should be called immediately if:

- Diabetic shock is suspected.
- Nausea and vomiting continue after other symptoms of viral infection have subsided.
- The patient has a severe headache.
- The patient is sweating and having chest pain and trouble breathing.
- The patient is known or suspected to have swallowed a drug overdose or poisonous substance.
- The patient has a high body temperature, muscle cramps, and other signs of heat exhaustion or heat stroke.
- Nausea, vomiting, and breathing problems occur after exposure to a known allergen.

Causes and symptoms

Persistent, unexplained, or recurring nausea and vomiting can be symptoms of a variety of serious illnesses. It can be caused by simply overeating or drinking too much alcohol. It can be due to **stress**, certain medications, or illness. For example, people who are given morphine or other opioid medications for **pain** relief after surgery sometimes feel nauseated by the drug. Such poisonous substances as arsenic and other heavy metals cause nausea and vomiting. **Morning sickness** is a consequence of pregnancy-related hormone changes. **Motion sickness** can be induced by traveling in a vehicle, plane, or on a boat. Many patients experience nausea after eating spoiled food or foods to which they are allergic. Patients who suffer **migraine headache** often experience nausea. **Cancer** patients on chemotherapy are often nauseated. **Gallstones**, **gastroenteritis**, and stomach ulcer may cause nausea and vomiting. Such infectious illnesses as dengue **fever** and severe acute respiratory syndrome (SARS) may be accompanied by nausea and vomiting. These symptoms should be evaluated by a physician.

Diagnosis

Diagnosis is based on the severity, frequency, and duration of symptoms, and other factors that could indicate the presence of a serious illness.

Treatment

Getting a breath of fresh air or getting away from whatever is causing the nausea can solve the problem. Eating olives or crackers or sucking on a lemon can calm the stomach by absorbing acid and excess fluid. Coke syrup is another proven antiemetic remedy.

Vomiting relieves nausea immediately but can cause dehydration. Sipping clear juices, weak tea, and some sports drinks help replace lost fluid and minerals without irritating the stomach. Food should be reintroduced gradually, beginning with small amounts of dry, bland food like crackers and toast.

Biofeedback

Biofeedback uses **exercise** and deep **relaxation** to control nausea.

Acupuncture

Acupuncture is increasingly regarded as a useful adjunct to treating nausea. A growing body of literature

shows that acupuncture is effective in treating nausea associated with **pregnancy**, surgery, and chemotherapy for cancer. The most effective acupuncture point for nausea appears to be PC-6.

A few patients, however, may experience temporary nausea as a side effect of acupuncture. It is not considered a serious side effect.

Acupressure

Acupressure (applying pressure to specific areas of the body) may be helpful in reducing nausea and vomiting and relaxes the gastrointestinal tract. Acupressure can be applied by wearing a special wristband or by applying firm pressures to the:

- back of the jawbone
- webbing between the thumb and index finger
- top of the foot
- inside of the wrist
- base of the rib cage

Nutritional therapy

- Rehydration. It is very important to replace fluid loss through prolonged vomiting. However, patients should take fluid in slowly to prevent shock to the body. Fruit juice or soup are even better than plain water because they also contain glucose and salt, which may also be deficient.
- Avoid eating solids right away. Patients should wait until the body has enough rests and the stomach has a chance to settle down before starting on solid foods.
- Bland foods. To avoid overworking the digestive system too soon, patients should resume eating with bland food such as toast or yogurt. In addition, they should not try to eat too much right away, as this also stresses out the digestive system.
- Lactaid. Lactaid helps prevent upset stomach in persons allergic to milk.

Herbal treatments

There are several herbal remedies that can help alleviate short bouts of nausea and vomiting.

- Chamomile (*Matricaria recutita*) or lemon balm (*Melissa officinalis*) tea may relieve symptoms.
- Ginger (*Zingiber officinale*), a very effective herbal remedy for nausea, can be drunk as tea or taken as candy or powered capsules. Ginger has been shown in several studies to relieve morning sickness associated with pregnancy.
- Peppermint tea is effective in alleviating nausea and vomiting associated with indigestion.
- Stomach tea, a combination of anise seed, fennel, peppermint and thyme, is a good herbal treatment for gas.
- Strong green tea can stop nausea especially if it is caused by eating spoiled foods.

Homeopathy

Depending on a patient's specific condition, a homeopathic practitioner may prescribe one of the following remedies: *Arsenicum album*, *Carbo vegetabilis*, *Ignatia*, homeopathic **ipecac**, and *Nux vomica*.

Aromatherapy

Peppermint or **lavender** oil when inhaled, calms the body and reduces nausea and vomiting.

Allopathic treatment

Meclizine (Bonine), a medication for motion sickness, also diminishes the feeling of queasiness in the stomach. Dimenhydrinate (Dramamine), another motion-sickness drug, is not effective on other types of nausea and may cause drowsiness.

Newer drugs that have been developed to treat postoperative or postchemotherapy nausea and vomiting include ondansetron (Zofran) and granisetron (Kytril). Another treatment that has been found to lower the risk of nausea after surgery is intravenous administration of supplemental fluid before the operation.

Prevention

Massage, **meditation**, **yoga**, and other relaxation techniques can help prevent stress-induced nausea. Antinausea medication taken before traveling can prevent motion sickness. Sitting in the front seat, focusing on the horizon, and traveling after dark can also minimize symptoms.

Food should be fresh, properly prepared, and eaten slowly. Overeating, tight-fitting clothes, and strenuous activity immediately after a meal should be avoided.

Resources

BOOKS

"Functional Vomiting." Section 3, Chapter 21 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Chapter 5, "Acupuncture: From the Yellow Emperor to Magnetic Resonance Imaging (MRI)." New York: Simon & Schuster, 2002.

Reader's Digest's Guide to Medical Cures & Treatment: A Complete A to Z Sourcebook of Medical Treatment,

Alternative Options and Home Remedies. Canada: The Reader's Digest's Association, 1996:310.

Zand, Janet, Allan N. Spreen, and James B. LaValle. "Nausea and Vomiting." In *Smart Medicine for Healthier Living: A Practical A to Z Reference to Nat ural and Conventional Treatments for Adults*. Garden City Park, NY: Avery Publishing Group,1999: 437 439.

PERIODICALS

Ali, S. Z., A. Taguchi, B. Holtmann, and A. Kurz. "Effect of Supplemental Pre Operative Fluid on Postoperative Nausea and Vomiting." *Anaesthesia* 58 (August 2003): 780 784.

Brunk, Doug. "Acupuncture Gains Favor as Adjunct. (Controlling Headaches, Nausea, Dizziness)." *Pediatric News* 35 (December 2001): 1 2.

Cepeda, M. S., J. T. Farrar, M. Baumgarten, et al. "Side Effects of Opioids During Short Term Administration: Effect of Age, Gender, and Race." *Clinical Pharmacol ogy and Therapeutics* 74 (August 2003): 102 112.

Chung, A., L. Bui, and E. Mills. "Adverse Effects of Acu puncture. Which Are Clinically Significant?" *Canadian Family Physician* 49 (August 2003): 985 989.

O'Brien, C. M., G. Titley, and P. Whitehurst. "A Compar ison of Cyclizine, Ondansetron and Placebo as Pro phylaxis Against Postoperative Nausea and Vomiting in Children." *Anaesthesia* 58 (July 2003): 707 711.

Ratnaike, R. N. "Acute and Chronic Arsenic Toxicity." *Postgraduate Medical Journal* 79 (July 2003): 391 396.

Tan, M. "Granisetron: New Insights Into Its Use for the Treatment of Chemotherapy Induced Nausea and Vomiting." *Expert Opinion in Pharmacotherapy* 4 (September 2003): 1563 1571.

Tiwari, A., S. Chan, A. Wong, et al. "Severe Acute Respi ratory Syndrome (SARS) in Hong Kong: Patients' Experiences." *Nursing Outlook* 51 (September October 2003): 212 219.

Treish, I., S. Shord, J. Valgus, et al. "Randomized Double Blind Study of the Reliefband as an Adjunct to Stand ard Antiemetics in Patients Receiving Moderately High to Highly Emetogenic Chemotherapy." *Supportive Care in Cancer* 11 (August 2003): 516 521.

Walling, Anne D. "Ginger Relieves Nausea and Vomiting During Pregnancy." *American Family Physician* 64 (November 15, 2001): 1745.

OTHER

"Nutrition Tips for Managing Nausea and Vomiting." *Mayo Clinic*. http://www.mayohealth.org/mayo/9709/ htm/eating5.htm.

Mai Tran
Rebecca J. Frey, PhD

NDV *see* **Newcastle disease virus**

Nearsightedness *see* **Myopia**

Neck pain

Definition

Neck **pain** is a nonspecific symptom of discomfort in the neck.

Description

Neck pain has a number of possible causes. Depending on the cause, neck pain may be experienced as limited to the neck itself (localized) or as radiating to the shoulders and upper arm. An individual may experience the pain as a dull ache, a sharp stabbing or burning sensation, or a feeling resembling a muscle cramp. Neck pain is often accompanied by stiffness or difficulty moving the neck.

Causes and symptoms

Possible causes of neck pain include:

- Trauma. Whiplash injuries from car accidents and fractures or sprains from rough contact sports or fights are examples of traumatic causes of neck pain.
- Chronic strain on the muscles and tendons of the neck. This stress is often related to the individual's occupation, as some jobs require workers to hold their neck and shoulders in one position for long periods. Computer programmers, dentists and dental hygienists, professional musicians (especially string and woodwind players), dancers, and long-distance truck drivers are especially vulnerable to this type of neck pain. In addition, teenagers who work are at higher risk of chronic neck pain than teenagers who participate in sports. Poor posture can also contribute to chronic strain on the neck.
- Degenerative disorders that affect the neck and spine. These include osteoarthritis, ankylosing spondylitis, and osteoporosis.
- A herniated disk in one of the cervical (neck) vertebrae. In a herniated disk, the disk projects outward between the vertebrae and can put pressure on a nerve.
- Congenital abnormalities. People who are born with abnormally shaped vertebrae or loose joints in the neck region may develop neck pain when the vertebrae begin to put pressure on the spinal cord.
- Rheumatoid arthritis (RA).
- Fibromyalgia.
- Infectious diseases. One of the earliest signs of mumps, meningitis, encephalitis, and poliomyelitis is stiffness and soreness in the neck.

- Cancer. Malignant tumors in the neck cause pain when they grow large enough to press on nerve endings and the spinal cord.
- Climatic factors. People whose jobs require them to work in drafty areas or outdoors in cold weather are at higher risk of developing neck pain.

Diagnosis

Diagnosis of neck pain is complicated not only by the number of possible causes but also by the fact that many patients suffer from two or more conditions at the same time. In most cases, the physician will begin by trying to determine if the neck pain is caused by a primary disorder in the neck and shoulder region or if the pain is the result of a systemic disease that is affecting the neck.

Patient history

Taking a careful patient medical and lifestyle history is particularly important in cases of neck pain because of the number of possible causes. A thorough history will include questions about the patient's occupation and sports or hobbies as well as a medical history.

Physical examination

The physician begins by touching, or palpating, the patient's neck and shoulder girdle. Because the underlying bones and muscles in the neck are close to the surface, an experienced examiner can feel swollen glands, tumorous swellings, **muscle spasms**, or abnormal protrusions between the vertebrae. The doctor then turns the patient's head gently from side to side to determine the neck's range of motion and whether movement worsens the pain. Examination of the inside of the patient's mouth and throat allows the doctor to check the salivary glands, which are swollen and inflamed if the patient has **mumps**.

Diagnostic imaging

An x ray of the neck may be ordered if the doctor suspects traumatic injury, **osteoarthritis**, **osteoporosis**, **rheumatoid arthritis**, a **herniated disk**, or congenital deformities. Chronic strain disorders of the neck do not always appear on a plain x ray. If **cancer** is suspected, the patient may be given a computed tomography (CT) scan of the head, neck, and chest, as well as a gallium scan and a bronchoscopy, laryngoscopy, and esophagoscopy. The patient's lungs and upper gastrointestinal tract are examined because most cancerous tumors in the neck are secondary tumors (metastases) from primary cancers located elsewhere in the body. The doctor may also order a CT scan before scheduling a lumbar puncture if the patient appears to have **meningitis** or another infection of the central nervous system.

Laboratory tests

The doctor may order a blood test to distinguish rheumatoid arthritis (RA) from **systemic lupus erythematosus** (SLE) or other inflammatory diseases. Abnormal values for the proteins in blood serum are often present in RA. In addition, a sample of the patient's joint fluid may be taken. Laboratory tests are most important, however, if the doctor suspects that neck pain is due to a central nervous system infection. *Central nervous system infections are medical emergencies and require rapid treatment with intravenous antibiotics*. Following a CT scan, a sample of the patient's spinal fluid is withdrawn through a lumbar puncture and cultured in order to identify the specific organism causing the infection.

Treatment

Most forms of alternative treatment for neck pain are directed at the milder forms of chronic pain caused by occupational or emotional **stress**. Many of them can be performed as self-help or self-treatment.

Lifestyle modification

Neck pain caused by chronic stress on the muscles of the neck can interfere significantly with overall quality of life as well as efficiency at work. Work-related neck pain may require a change in occupation or a modification of the equipment that the individual uses (e.g., an ergonomic chair for people who work long hours at the computer). People who have poor posture may benefit from various types of **exercise** or **movement therapy**. In some cases, **psychotherapy** may help to lower stress or relieve the painful feelings that are often associated with poor posture.

Acupressure and acupuncture

Acupressure and **shiatsu** are traditional Chinese and Japanese therapies that make use of pressure points (sometimes called acupoints) on the body to release muscular pain and tension. For most types of neck pain, the therapist makes use of acupoints on the neck and upper shoulders. **Acupuncture** as an alternative treatment for neck pain has become increasingly popular in the West since the early 1990s. While some studies indicate that acupuncture is effective in relieving pain in the neck and upper shoulders, other researchers as of 2008 were not convinced.

Chiropractic

Neck pain is a common reason for seeking **chiropractic** treatment. A chiropractor treats neck pain by checking the cervical vertebrae for misalignment, which is called subluxation in chiropractic terminology. The misaligned vertebra is then moved back into proper position with manual pressure. A chiropractic adjustment is thought to restore normal functioning by reducing the stress on the joints, by lowering muscle tension resulting from subluxation, and by minimizing pressure on the spinal nerves. Some health insurance policies pay for chiropractic treatment.

Movement therapies

Both traditional **hatha yoga** and **breema**, a newer form of movement therapy, claim to treat neck pain by reducing or eliminating some of the underlying causes. Teachers of **yoga** maintain that the postures improve the flexibility of the spine and keep the disks between the vertebrae well nourished by spinal fluid. In breema, instructors individualize the exercises, so that persons with neck pain can be given a set of exercises for that specific problem. In addition, both yoga and breema emphasize the importance of cultivating healthy spiritual and emotional attitudes toward the body, thus lowering the level of psychological stress that often contributes to neck pain. Other systems that help to re-educate patients in body movement include **Feldenkrais**, the **Alexander technique**, and Hanna **somatics**.

Reiki, reflexology, and polarity balancing

These methods of treatment rely on light or indirect contact with the affected area rather than on touching it with the techniques used in traditional massage. All three systems of treatment regard neck pain as a symptom of energy imbalance in the body. **Reiki** and **polarity therapy** practitioners seek to realign the energy flow by placing the hands lightly on or over parts of the body that are thought to redirect the energy. In **reflexology**, the feet are regarded as a map of the entire body. Neck pain would be treated by massaging the base of the large toes, which represent the neck area.

Traditional Chinese medicine

In **traditional Chinese medicine**, neck pain is treated by *Tui na* massage, followed by a herbal poultice on the neck; by suction cups, a traditional remedy for arthritis; or by skin scraping, a technique often used for ailments in the neck area. To perform **cupping**, the practitioner flames the inside of a glass suction cup with a cotton ball dipped in alcohol and lighted. The heat from the fire reduces air pressure inside the cup, which is then pressed on the sore area and removed after 15 to 20 minutes. This treatment withdraws excess moisture from the tissues. In skin scraping, the skin on the back and sides of the neck is scraped with a coin dipped in salt water or by pinching a fold of skin, pulling sharply, and letting it fall back. These motions are performed rapidly until bright red stripes appear. Skin scraping is done to release excess heat and energy from the treated area.

Magnetic field therapy

Magnetic field therapy, which involves the application of a pulsed magnetic field to an injured area of the body, gained in popularity in the early 2000s as a treatment for chronic muscular and joint pain. It is thought that magnetic treatments relieve pain by increasing the flow of oxygenated blood to injured tissue. Some studies indicate that magnetic field therapy is useful in relieving chronic neck pain, particularly pain associated with whiplash injuries.

Allopathic treatment

Medications

Some forms of neck pain can be treated by medication. Osteoporosis is often treated with such compounds as alendronate (Fosamax) or etidronate (Didronel). These medications are intended to prevent further weakening of the bone. Pain caused by osteoarthritis, **fibromyalgia**, rheumatoid arthritis, or **ankylosing spondylitis** is usually treated with aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs, e.g., Advil, Motrin). Patients with RA may also be given injections of gold salts or methotrexate (MTX, Rheumatrex). Pain from severe fibromyalgia may be treated with local anesthetics or muscle relaxants.

Appliances

Patients with neck pain caused by traumatic injury, chronic muscular strain, a herniated disk, some forms of osteoarthritis, or congenital deformity may need to have the neck temporarily kept from moving (immobilized) in order to heal. A cervical collar may be used in milder cases. Chronic or severe pain may require more extensive bracing or traction and a period of bed rest.

Surgery

Surgical treatment may be needed to replace damaged joints in severe cases of osteoarthritis or rheumatoid arthritis. Herniated disks occasionally require surgery to fuse the vertebrae around the disk. Some patients with severe cases of ankylosing spondylitis

KEY TERMS

Ankylosing spondylitis—A type of arthritis that causes gradual loss of flexibility in the spinal column. It occurs most commonly in males between the ages of 16 and 35 and may be initiated by a food allergy component, such as an allergy to wheat.

Bronchoscopy—A procedure in which a thin, flexible, lighted tube that is threaded through the airways to view the air passages in the lungs.

Cervical—Relating to the top part of the spine that is composed of the seven vertebrae of the neck and the disks that separate them.

Chiropractic—A method of treatment based on the interactions of the spine and the nervous system. Chiropractors adjust or manipulate segments of the patient's spinal column in order to relieve pain and increase the healthy flow of nerve energy.

Fibromyalgia—A chronic disorder causing pain in the bones and muscles along with severe fatigue.

Herniated—Characterized by an abnormal protrusion of a body part. In a herniated disk, the disk protrudes into the spinal canal between the vertebrae.

Nonsteroidal anti-inflammatory drugs (NSAIDs)—These compounds, which include aspirin, ibuprofen, and indomethacin, are first-choice drugs for treating pain associated with arthritis and autoimmune disorders.

Osteoporosis—A condition found in older individuals in which bones decrease in density and become fragile and more likely to break. It can be caused by lack of vitamin D and/or calcium in the diet.

Palpation—The examination of the body using the sense of touch.

Rheumatoid arthritis—A disease characterized by inflammation and degeneration of connective tissue in multiple joints at a young age.

Subluxation—A partial or incomplete dislocation of the bones that form a joint.

Systemic lupus erythematosus (SLE)—A chronic, inflammatory, autoimmune disorder in which the individual's immune system attacks, injures, and destroys the body's own organs and tissues. It may affect many organ systems, including the skin, joints, lungs, heart, and kidneys.

may need to have the cervical spine stabilized by surgery. Most cancers of the neck are removed surgically after a course of radiation treatment.

Expected results

The results of treatment for neck pain vary widely because of the number of possible causes. While mild arthritis and minor stress injuries in the neck respond well to treatment, cancers in the neck have low survival rates because they are often stage III or stage IV metastases of cancers elsewhere in the body.

Prevention

Some potential causes of neck pain are difficult to prevent because they involve a genetic predisposition or component. These include ankylosing spondylitis, osteoarthritis, and RA. Others are easier to prevent by lifestyle choices. Attention to proper posture; the choice of office chairs and other furniture proportioned to the person's height and size; and exercise breaks from office work, study, or musical practice can help to lower the risk of neck pain from chronic muscular stress. Diet as well as exercise is a prominent factor in the prevention of osteoporosis. Observing safety guidelines and wearing protective equipment during contact sports can lower the risk of trauma to the neck. The use of certain types of shoulder harness while driving appears to lower the risk of whiplash injuries. Lastly, **meditation** and other spiritual practices are effective in lowering the level of emotional stress that often underlies chronic neck pain.

Resources

BOOKS

Amir, Fred. *Rapid Recovery from Back and Neck Pain: A Nine Step Recovery Plan,* 2nd ed. Santa Clara, CA: Health Advisory Group, 2002.

Bensky, Dan, et al. *Chinese Herbal Medicine: Materia Medica,* 3rd ed. Seattle, WA: Eastland Press, 2004.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

McKenzie, Robin. *Treat Your Own Neck,* 4th ed. Minneap olis, MN: Orthopedic Physical Therapy Products, 2006.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914)443 4770, http://www.aaaomonline.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

American Physical Therapy Association, 1111 North Fairfax Street, Alexandria, VA, 22314 1488, (800)

999 APTA (2782), (703) 684 APTA (2782), http://www.apta.org.

American Polarity Therapy Association, 122 N. Elm Street, Suite 512, Greensboro, NC, 27401, (336) 574 1121, http://www.polaritytherapy.org.

Touch for Health Kinesiology Association, PO Box 392, New Carlisle, OH, 45344 0392, (800) 466 8342, (937) 845 3404, http://www.tfhka.org.

Rebecca J. Frey, PhD
Tish Davidson, A.M.

Neem

Description

Neem is a compound that has a long history of use in both traditional Indian medicine and Ayurveda. Many of the popular herbal treatments in these two systems are still derived from it. Neem is a large evergreen tree, *Azadirachta indica*, in the mahogany family. It grows naturally in India and Sri Lanka, and has been successfully transplanted to other regions including West Africa, Indonesia, and Australia. The tree has small white flowers and produces a smooth, yellow-green fruit. All parts of the tree have medical uses. In India, neem is sometimes called "the village pharmacy." Over 100 pharmacologically active substances have been identified in this plant, and it has many traditional applications.

General use

Neem's wide variety of reported benefits include use in the treatment of **fever**, gastrointestinal disease, dermatologic (skin) disorders, immune dysfunction, respiratory disease, parasites, inflammatory conditions, and **infections** by some bacteria, fungi, and viruses. Some components have been shown to have antimalarial properties. The seeds contain an insecticidal substance that is EPA approved for use on non-food crops.

Some viral diseases have been treated by components of neem. It may inhibit the multiplication of viruses and prevent them from entering and infecting cells. Some of the diseases that have reportedly been relieved include colds, flu, and conditions caused by herpes, such as **chickenpox** and **shingles**.

Neem appears to be an appropriate treatment for numerous dermatologic indications. Its anti-inflammatory and **pain** relieving activity make it potentially useful against **psoriasis**, **eczema**, **acne**, **dermatitis**, and an assortment of fungal conditions. The neem leaf has been shown to have activity that suppresses the fungi that cause **athlete's foot**, ringworm, and *Candida*. Seed oil and aqueous leaf extracts have been used to treat **jock itch**, another fungal infection. The oil and leaf extract may be applied externally in the form of lotions and soaps. Leaf preparations may also be used internally for the **detoxification** properties. Poultices made from the leaf have antiseptic and astringent properties that treat **wounds** and **boils**.

Both internal and external parasites may be sensitive to the effects of neem. External parasites, such as lice and mites, are often treated in India with aqueous extracts of neem leaves. A medical research center in Nagercoil, India, found that a combination of neem and **turmeric** cured 97% of patients with **scabies** within 3–15 days of treatment. Teas are used against internal parasites, including intestinal **worms**. Perhaps one of the most interesting claims for neem is for the prevention and treatment of **malaria**. Leaf extracts are said to have the same effectiveness as quinine and chloroquine, the conventional medications that are used. Some studies show that even chloroquine-resistant **strains** of malaria are sensitive to neem, particularly a component called Irodin A. The recommended preventative measure is to chew and consume the leaves on a daily basis.

Twigs and leaves of the neem tree may be used for oral hygiene, and neem bark extracts used in toothpastes and mouthwashes are active against gingivitis. Ayurveda holds that neem has healthful properties for teeth and gum tissue.

Ayurvedic tradition holds that neem bark improves resistance to disease. It appears that certain carbohydrates contained in the bark do indeed stimulate the production of antibodies. One source recommends a cyclical use of neem to strengthen the immune system in order to lower the incidence of infections, particularly in people who have conditions that compromise the immune system.

Some studies show that neem can lower blood sugar levels. It has traditionally been used in Indian medicine for diabetes, and research with animals confirms this potential. Neem is an approved medication for the treatment of diabetes in India. Several forms of the supplement, including leaf extracts and teas, have been shown to have beneficial effects on reducing blood sugar.

There are several components of neem that may make it valuable in the treatment of both **osteoarthritis** and **rheumatoid arthritis**. It is a proven anti-inflammatory that decreases histamine and other

Neem plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

mediators of inflammation in the body. Some of the important chemicals in neem that contribute to this effect are nimbidin, limonoids, and catechin. Warmed neem oil is also recommended for external use to reduce pain and inflammation in affected joints.

Neem has documented spermicidal properties when used intravaginally in women, and is sometimes used as a contraceptive. It is also being studied as a birth control measure for use by males.

Other claims for neem are extensive. They include treatment of high blood pressure, **cholesterol**, heart arrhythmia, kidney disorders, **indigestion**, **anxiety**, **epilepsy**, and many more. Some cancers may possibly be affected by the use of neem products. Consult a practitioner of Ayurveda or other expert in the use of botanicals for guidance in appropriate indications and products.

In addition to the treatment of human diseases and disorders, neem is being intensively studied as a natural insect repellent and pesticide. Studies in India and Pakistan have shown that it is an effective mosquito repellent. In 2002, the United States Department of Agriculture (USDA) reported that neem seed extract is toxic to the larvae of the Florida root weevil and other pests that attack citrus trees. As of 2000, 70 different patents had been granted for neem products intended for agricultural use.

Researchers in the textile industry are also finding uses for neem in the production of natural compounds for treating fabric. Neem seed hulls can be used to support the growth of fungi that produce an enzyme that will remove dye from cloth.

Preparations

There are many forms and routes of use for neem. Some of the preparations include seed oil, aqueous extracts of the leaf, powder from the leaf, smoke from burning dried leaves, and leaf pastes. Topically, neem oil and leaf extracts are incorporated into some soaps and lotions for the treatment of skin conditions. These act to relieve inflammation and kill some of the infectious causes of conditions including acne and many fungi. A decoction of the bark is used externally for **hemorrhoids**. Some bark extracts are also especially bactericidal.

KEY TERMS

Ayurveda—In Sanskrit, *Ayur,* means life, and *veda* means knowledge. Ayurveda is a system of holistic medicine from India that aims to bring the individual into harmony with nature. It provides guidance regarding food and lifestyle, so that healthy people can stay healthy and people with health challenges can improve their health.

Decoction—An herbal extract produced by mixing an herb in cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. The decoction is then strained and drank hot or cold. Decoctions are usually chosen over infusion when the botanical or herb in question is a root, seed, or berry.

Gingivitis—Inflammation of the gums in which the margins of the gums near the teeth are red, puffy, and bleeding. It is most often due to poor dental hygiene.

Scabies—A contagious parasitic skin disease caused by a tiny mite and characterized by intense itching.

Sequela (plural, sequelae)—An abnormal condition resulting from a previous disease or disorder.

The directions for use and application of products vary depending on the formulation. Refer to the label information or consult a health care provider.

Precautions

Due to a lack of sufficient study data and possible toxicity, it is inadvisable for children and pregnant or nursing women to use neem. Those who have impaired liver or kidney function should also use great caution. Large doses of seed or seed components may be toxic.

Traditional Ayurvedic practitioners advise against the use of neem if the patient suffers from obvious wasting or **fatigue**.

Side effects

The long history of the use of neem in India appears to show that there is a low incidence of side effects when used appropriately. Infants have suffered severe sequelae, and even death as a result of internal use of neem. Avoid using neem products on children.

Interactions

No clinically significant interactions between neem and other supplements or medications have been reported as of 2002.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Roseville, Calif.: Prima Publishing, 1999.

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. New York: DK Publishing, Inc., 1996.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Compre hensive Database*. Calif.: Therapeutic Research Faculty, 1999.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*. New York: Simon & Schuster, 2002.

PERIODICALS

Siddiqui, B. S., F. Afshan, S. Faizi, et al. "Two New Triter penoids from *Azadirachta indica* and Their Insecticidal Activity." *Journal of Natural Products* 65 (August 2002): 1216 1218.

Verma, P., and D. Madamwar. "Production of Ligninolytic Enzymes for Dye Decolorization by Cocultivation of White Rot Fungi *Pleurotus ostreatus* and *Phanero chaete chrysosporium* Under Solid State Fermenta tion." *Applied Biochemistry and Biotechnology* 102 103 (July December 2002): 109 118.

Weathersbee, A. A., 3rd, and Y. Q. Tang. "Effect of Neem Seed Extract on Feeding, Growth, Survival, and Reproduction of *Diaprepes abbreviatus* (Coleoptera: Curculionidae)." *Journal of Economic Entomology* 95 (August 2002): 661 667.

ORGANIZATIONS

The Ayurvedic Institute. 11311 Menaul NE, Albuquerque, NM 87112. (505) 291 9698. www.ayurveda.com.

National Institute of Ayurvedic Medicine. 584 Milltown Road, Brewster, NY 10509. (845) 278 8700. www.niam.com.

United States Department of Agriculture. Washington, DC 20250. www.usda.gov.

OTHER

Selvester, Joseph. "Neem: The Village Pharmacy." *The Original Neem Company*. http://www.askjoseph.com/Ayurveda/villagepharmacy.htm. (1999).

Judith Turner
Rebecca J. Frey, PhD

Nerve pain *see* **Neuralgia**

Nettle

Description

Nettle is a member of the Urticaceae family, which includes as many as 500 species worldwide. Many species are tropical. The stinging nettle (*Urtica dioica*)

Nettle plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

grows wild in nitrogen-rich soil on the edges of fields, stream banks, waste places, and close to stables and human habitations throughout the United States and Europe. This fibrous perennial is found throughout the world in temperate regions from Japan to the Andes Mountains. The plant seeds itself, and, in favorable conditions, nettle spreads freely from its tough, creeping yellow root. The hairy, erect, single stalks grow in dense clusters giving the plant a bushy look. The square stems produce heart-shaped, alternate leaves with pointed tips and deeply serrated edges. Leaves are dark green on the top and are a paler green and downy on the underside. The plant grows as tall as 4 ft (1.2 m). Leaves and stems are covered with needlelike hairs that pierce the skin on contact. The plant delivers a sharp sting and a lingering irritation caused by a combination of formic acid, serotonin, acetylcholine, and 5-hydroxytryptamine injected through the tiny needlelike hairs.

The common name nettle is taken from the Anglo-Saxon word *noedl* meaning "needle." Nettle's tiny green flowers grow in dangling clusters in the angles formed by the stalk and stem of the leaf. Flowers bloom from July to September. Each small fruit contains just one seed. Male and female flowers usually grow on separate plants of the stinging nettle, hence the species name *dioica*, meaning "separate," or "two houses." The genus name, *Urtica*, is taken from the Latin *uro*, "to burn." Small nettle (*U. urens*), an annual, usually has both male and female flowers on the same branched cluster. Its properties and uses are similar to those of the stinging nettle.

Older herbals cite the planet Mars with dominion over this common wayside plant. Nettle was certainly used in many battles. Roman nettle (*U. pilulifera*) is said to have been brought to Britain by Caesar's troops, who used the plant to flail themselves in an effort to keep warm in the cool, damp climate. Nettle's fibrous characteristics rival those of hemp and flax. Nettle fibers were woven into fabric for sails and ropes, and for German army uniforms as recently as World War I.

General use

Despite its piercing defense, the stinging nettle has long been valued as a medicinal and nutritional treasure. Nettle has astringent, expectorant, galactagogue (milk producing), tonic, anti-inflammatory, hemostatic, and diuretic properties. The plant is rich in chlorophyll, and a good source of **beta carotene**; vitamins A, C, and E; tannins; **iron**; **calcium**; phosphates; and various other minerals, especially **silica**. The active ingredients include water-soluble polysaccharides that stimulate the immune system, and large protein-sugar molecules known as lectins. The entire plant may be used in various medicinal preparations.

Nettle leaf is used in a simple infusion as a tonic decoction to cleanse the blood. Nettle can also be combined with **yellow dock** (*Rumex crispis*), **dandelion** (*Taraxacum officinale*), cleavers (*Galium aparine*), and **burdock root** (*Arctium lappa*). In folk medicine, the plant was used in a practice known as urtication. The fresh herb was thrashed across the skin to induce a stinging, burning sensation used to relieve the deeper **pain** of rheumatism. A leaf infusion, or a homeopathic tincture of nettle, may also be helpful as supportive therapy for rheumatism. With sufficient water intake, nettle acts as a diuretic and is helpful in treating arthritis and rheumatism. A team of German researchers has reported that the anti-inflammatory effect of nettle is related to its suppression of a type of cell that stimulates the inflammatory response.

An early twentieth-century herbalist reported that the juice of the fresh leaves and root (or the dried leaf when burned and inhaled) was useful to treat **asthma**. Nettle seeds, when ingested, were once thought to be beneficial in the treatment of **bites** from "mad dogs" or the stinging of "venomous creatures," according to Nicolas Culpeper, a seventeenth century doctor. Seeds were also used as an antidote to poisonous herbs such as nightshade (*Solanum dulcamara*) and henbane (*Hyoscyamus niger*), though no recent studies support this use.

Nettle is thought to be particularly helpful for treating urinary tract problems. An infusion of the leaves may be used for inflammatory diseases of the lower urinary tract. The infusion is thought to flush the system and to help expel kidney gravel. It has also been used internally to stop bleeding. An ointment preparation of the aerial parts, or a strong infusion, can be applied externally to relieve **hemorrhoids**. Nettle can increase and enrich the flow of milk in breast-feeding mothers.

Clinical studies have confirmed stinging nettle's benefit to men in reducing symptoms of benign prostatic hyperplasia (a noncancerous enlargement of the prostate gland). A concentrated root extract of nettle is sometimes combined with **saw palmetto** (*Serenoa repens*) and the bark of the pygeum evergreen tree (*Pygeum africanum*) to treat the early stages of the disease. The herbal combination helps to increase the urinary volume and maximize the rate of urine flow. German research suggests that active ingredients in the nettle root may reduce prostate swelling.

During allergy season, a tincture of the fresh herb, or an infusion as a tea, may reduce symptoms of **hay fever**, such as itchy eyes and **sneezing**. However, a study published in 2002 indicates that the antiallergic effects attributed to nettle require further study. Nettle's expectorant properties have been beneficial for coughs and have been used to expel phlegm from the lungs and stomach. The freshly gathered and cooked herb was used as a nutritive potherb in folk medicine to treat consumption. Nettle continues to be valued by wild-food foragers as an early spring potherb, rich in minerals. Nettle juice may be used as a vegetarian substitute for rennet to curdle milk when making cheese.

When boiled with equal parts vinegar and water, a decoction of the plant (particularly the root) is a beneficial and conditioning hair and scalp rinse useful in cases of **dandruff** and thinning hair. A nettle rinse won't restore hair to a bald head. However, it will lend a shine and enhance the color of the hair one does have. A small piece of cotton soaked in a nettle decoction and placed in the nostril can be used to stop a nosebleed. The root, when boiled, will produce a yellow dye, and the leaves produce a permanent, light green dye for wool.

Preparations

Numerous commercial preparations of the herb are available in the form of capsules, dried leaf for tea, homeopathic tinctures, or ointments. The medicinal potency of the herb will vary depending on the growing conditions and the manner and care with which the herb is harvested and prepared.

The fresh leaves and stems should be gathered from young plants on a dry day, just before the plant flowers. Caution should be used when harvesting to avoid the sting. Nettle's aerial parts may be used fresh or dried. To dry, the bunches are hung upside down out of direct sun in an airy room. The root is harvested in the fall when the plant has died back. It is washed thoroughly. Large roots may be chopped into slices while fresh and spread on a tray in a warm, sunny room for several days. Dried plant parts are stored in sealed containers in a dark place.

To make an infusion, 2 oz of fresh, finely chopped nettle leaves are combined with 2.5 cups of fresh, non-chlorinated water (2 tbsp of the dried herb may be used). This mixture is brought to a boil, removed from the heat, and covered. The tea is steeped for about 10 minutes. It is then strained and can be drunk warm or cold. The prepared tea can be stored for about two days in the refrigerator. Dosage for a general tonic is 3 or 4 cups per day. Ample fresh water should be drunk when using nettle as a diuretic tea.

To make a decoction, 2 oz of fresh or 1 tbsp of dried root is combined in a nonmetallic pan with 2.5 cups of water. The mixture is simmered for two minutes, then steeped for 10 minutes. The mixture is then strained.

To extract the juice, an abundance of nettle leaves and stems are gathered. A household food processor or juicer may be used to pulp the plant parts. The resulting pulp is then squeezed through a sieve. The juice is then sealed in dark glass containers and refrigerated.

To make an essential oil, the fresh nettle leaves and stems are packed in a large glass container. They are then covered completely with olive oil. A lid is placed on the container and the mixture is left on a sunny windowsill for two to three weeks. It is stirred daily. After this time period, the mixture is strained through cheesecloth and the oil is stored in a dark glass container.

To make an ointment, beeswax or petroleum jelly is melted in the top of a glass or ceramic double boiler. Finely chopped nettle leaf and stems are stirred in. The mixture is heated on low for about two hours. The mixture is strained through cheesecloth and, with gloved hands, the liquid is squeezed from the cloth. The liquid is then poured into clean, dark glass storage containers while still warm. The containers should be sealed with tight-fitting lids and stored away from direct sunlight.

Precautions

Gloves should always be worn when nettle is harvested to avoid the sharp sting. According to folk tradition, fresh yellow dock leaves may alleviate the burning when rubbed on nettle **stings**. When using stinging nettle preparations to irrigate and flush out the urinary tract, or as a treatment of kidney gravel, abundant fluid intake is required. Stinging nettle preparations are not to be used in the treatment of fluid retention brought on by reduced heart or kidney function. This plant should never be harvested after flowers appear because if harvested at this time, the plant can cause urinary tract damage.

Side effects

Aside from the distinctive sting when touching the fresh plant, there are few side effects from use of the herb in properly prepared therapeutic doses. Mild gastrointestinal distress may occasionally occur. Some people are allergic to nettle.

This plant should not be consumed raw because it can irritate mucous membranes. Leaves of the young plant can be safely consumed when cooked as a nutritional potherb. Boiling the young leaves and stems disarms the stinging hairs. Drying the herb also disarms the stinging hairs. The uncooked, mature nettles should not be eaten.

Interactions

Nettle appears to intensify the effects of nonsteroidal anti-inflammatory drugs, or NSAIDs, which are commonly given for arthritis and similar conditions. While this increased effect may be beneficial to patients with arthritis, they should nonetheless consult a healthcare provider before taking nettle.

Resources

BOOKS

The Alternative Advisor. Time/Life, 1999.

Lust, John. *The Herb Book*. New York: Bantam Books, 1994.

The PDR Family Guide to Natural Medicines And Healing Therapies. New York: Three Rivers Press, 1999.

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

PERIODICALS

Broer, J., and B. Behnke. "Immunosuppressant Effect of IDS 30, a Stinging Nettle Leaf Extract, on Myeloid Dendritic Cells in Vitro." *Journal of Rheumatology* 29 (April 2002): 659 666.

Jaber, R. "Respiratory and Allergic Diseases: From Upper Respiratory Tract Infections to Asthma." *Primary Care* 29 (June 2002): 231 261.

Lowe, F. C., and E. Fagelman. "Phytotherapy in the Treatment of Benign Prostatic Hyperplasia." *Current Opinions in Urology* 12 (January 2002): 15 18.

Schulze Tanzil, G., B. Behnke, S. Klingelhöfer, et al. "Effects of the Antirheumatic Remedy Hox Alpha A New Stinging Nettle Leaf Extract On Matrix Metalloproteinases in Human Chondrocytes in Vitro." *Histology and Histopathology* 17 (April 2002): 477 485.

Vahlensieck, W., Jr. "With Alpha Blockers, Finasteride and Nettle Root Against Benign Prostatic Hyperplasia. Which Patients Are Helped by Conservative Therapy?" [in German] *MMW Fortschritte der Medizin* 144 (April 18, 2002): 33 36.

ORGANIZATIONS

American Botanical Council. 6200 Manor Road, Austin, TX 78714 4345. (512) 926 4900. www.herbalgram.org.

OTHER

"Nettle." *MotherNature.com*. http://www.mothernature.com/ency/Herb/Nettle.asp. (1998).

Clare Hanrahan
Rebecca J. Frey, PhD

Neural therapy

Definition

Neural therapy is a comprehensive healing system that focuses on the relief of chronic **pain** and long-term illness. These symptoms, practitioners say, can be stopped by injecting local anesthetics into scars, **acupuncture** points peripheral nerves, and glands. Other, less-invasive methods may also be used to correct "short circuits" and restore electrical conductivity in the body.

Origins

The earliest known use of neural therapy was in 1925, when two German doctors treated migraine headaches by injecting a local anesthetic (Novocain)

A patient is injected with a local anesthetic as part of neural therapy. *(Horacio Sormani / Photo Researchers, Inc.)*

into the veins. The injections immediately aborted not only the headaches but also a number of other symptoms (**dizziness**, **nausea**, a visual "flashing" sensation) also associated with migraine. In 1940, Dr. Ferdinand Huneke, a German physician, found that injecting procaine (Novocain) into an osteomyelitis scar on a patient's leg seemed to instantly cure chronic pain in her shoulder. Now called the lightning reaction or Huneke phenomenon, it showed that injuries in one part of the body may cause symptoms elsewhere in the body. Although it is still not fully understood, neural therapy has been widely practiced since the 1940s in both Europe and South America. More recently, some neural therapists have employed less-invasive procedures involving electricity, lasers, and other light sources.

Benefits

Neural therapy has been used in the treatment of hundreds of conditions. These include **depression**, hormonal imbalances, dizziness, **allergies**, **asthma**, skin diseases, **hemorrhoids**, ulcers, chronic bowel problems, prostrate and bladder problems, **headache** (including migraine), kidney disease, arthritis, back pain, as well as whiplash and other soft-tissue injuries.

Description

The most common procedures used by practitioners of neural therapy involve injections of procaine (Novocain), lidocaine, other local anesthetics, or saline solution into scars, glands, ganglia, peripheral nerves, acupuncture points, and other tissues. These injections are intended to correct abnormal electrical signaling caused by injuries, or to detoxify tissues or

KEY TERMS

Anesthetics—Drugs that cause a loss of feeling, especially of pain. Some anesthetics also cause a loss of consciousness.

enhance the effectiveness of drugs or nutrients. Other substances that may be injected include nutrients, isopathic dilutions of toxic substances, or diluted traditional medicines such as Benadryl or Demerol. It is argued that all scars cause problems and must be injected at least once. A typical course of treatment may involve between one and six sessions at a frequency of twice a week.

Precautions

Neural therapy involves invasive procedures that should be done only by properly licensed practitioners. It is not advisable for patients with allergies to local anesthetics. Anyone with serious illness should avoid using neural therapy as a sole method of treatment. In such cases, advice should also be sought from a medical practitioner. Neural therapy is thought, in some cases, to activate repressed psychological trauma. Patients may wish to consider whether their practitioner is competent to deal with the resurrection of these subconscious memories. Neural therapy is considered ineffective against **cancer** and metabolic disorders.

Side effects

When carried out by a competent, experienced therapist, neural therapy is considered generally free of adverse side effects. However, in one case reported in a German medical journal, serious internal bleeding resulted from an attempt to inject the adenoids. This indicates that life-threatening side effects are possible when neural therapists inject deeply into internal structures and organs, the article warned.

Research and general acceptance

Neural therapy has gained considerable acceptance among medical doctors and other practitioners in Germany, but is not widely known outside of Europe and South America. Its effectiveness as a pain-management tool is generally accepted, but there has been little scientific research into other claimed therapeutic benefits.

Training and certification

In Germany, neural therapy is available from many orthodox medical practitioners. Elsewhere in the world, a variety of medical doctors, osteopaths, dentists, naturopaths, chiropractors, and acupuncturists have undergone training in the discipline. The American Academy of Neural Therapy offers workshops, videos, and course manuals. Early in 2000, this group was moving toward board certification of neural therapists.

Resources

ORGANIZATIONS

American Academy of Neural Therapy. 410 East Denny Way, Suite 18, Seattle, WA, 98122. (206) 749 9967. http://www.Neuraltherapy.com.

David Helwig

Neuralgia

Definition

Neuralgia describes a variety of rare and painful conditions in which shooting, stabbing, burning, **pain**; electric-like shocks; or tingling, pins and needles, or numbness occur along the course of a nerve, usually in the head or neck.

Description

Neuralgia attacks tend to by cyclic, often coming and going without warning. They can last for minutes, hours, days, or longer, depending on the patient, and range from mild to debilitating. Often, no physical cause can be found, although some forms of neuralgia may be triggered when nerves are compressed by injuries, arteries, tumors, or, in rare cases, as the result of nerve damage from **multiple sclerosis**. Neuralgia is an uncommon condition, with trigeminal neuralgia occuring most often. Other types are occipital neuralgia, glossopharyngeal neuralgia, and postherpetic neuralgia. Most neuralgia patients are 50 or older, although younger patients can be affected as well.

Causes and symptoms

Most neuralgias appear suddenly, with no apparent physical basis for the pain, which can be severe. Other neuralgias may follow an injury, with pain, burning, tingling, or numbness in whatever part of the body the affected nerve supplies.

Trigeminal neuralgia (TN) also called *tic douloureux*, from the French for "painful spasm," is a disorder of the fifth cranial nerve, whose three branches supply the face. (There are 12 pairs of cranial nerves that supply the human head.) Most TN patients are 50 or older, with more women affected than men. Early attacks are short—one to two minutes long—but excruciating, with stabbing, shooting, pain on one side of the face. The location depends on which branch of the nerve is affected. At first, weeks or months separate incidents, but as the condition progresses the time between attacks shortens. Eventually, the area becomes hypersensitive, and painful bouts can even be triggered by eating, drinking, talking, cold, or even touching the face.

Glossopharyngeal is a relatively rare neuralgia, marked by recurring attacks of severe pain that occur for no apparent reason in the throat, ears, and neck. Glossopharyngeal neuralgia patients also tend to be middle-aged, but are more often male than female. The attacks can occur without warning, but, like other facial neuralgias, can also be triggered by **sneezing**, swallowing, talking, yawning, or clearing the throat.

Occipital neuralgia is caused by pain from one of the two occipital nerves that supply the back of the head. Unlike TN or glossopharyngeal neuralgia, occipital neuralgia may occur in conjunction with muscle tension or migraine headaches, with the spasms of nerve pain on top of nearly continual aching.

Although most neuralgias have no known cause, one type, postherpetic neuralgia (PHN) is only seen following an outbreak of **shingles**, a painful, blistering rash caused by the Herpes zoster virus, the same virus that causes chicken pox. Herpes zoster lives in nerve tissue, and never goes away, even after the initial outbreak of chicken pox has disappeared. Older people, especially those with weak immune systems, can suffer a relapse, with the rash appearing along the course of the nerve that is affected. This produces the searing pain of neuralgia, which can be made even worse by the touch of clothing, bedclothes, or another person. PHN and TN are the most common types of neuralgia.

Diagnosis

Physicians begin with a thorough examination, and often include a CT scan or MRI. These will sometimes uncover an artery or tumor that is compressing the nerve and creating the symptoms, but very often no obvious medical problem is found.

KEY TERMS

Desensitization—A treatment for phobias which involves exposing the phobic person to the feared situation. It is often used in conjunction with relaxation techniques. Also used to describe a technique of pain reduction in which the painful area is stimulated with whatever is causing the pain.

Dorsal root entry zone (DREZ)—A type of nerve surgery for postherpetic neuralgia that is occasionally used when the patient can get no other pain relief. The surgery destroys the area where damaged nerves join the central nervous system, thereby interfering with inappropriate pain messages from nerves to the brain.

Glossopharyngeal neuralgia—Sharp recurrent pain deep in the throat that extends to the area around the tonsils and possibly the ear. It is triggered by swallowing or chewing.

Occipital neuralgia—Pain on one side of the back of the head caused by entrapment or pinching of an occipital nerve.

Postherpetic neuralgia—Persistent pain that occurs as a complication of a herpes zoster infection. Although the pain can be treated, the response is variable.

Shingles—An disease caused by an infection with the *Herpes zoster* virus, the same virus that causes chickenpox. Symptoms of shingles include pain and blisters along one nerve, usually on the face, chest, stomach, or back.

Transcutaneous electrical nerve stimulation (TENS)—A technique used to control chronic pain. Electrodes placed over the painful area deliver a mild electrical impulse to nearby nerve pathways, thereby blocking transmission of pain signals to the brain.

Trigeminal neuralgia or tic douloureux—An affliction of the trigeminal or fifth cranial nerve. The condition is characterized by attacks of shooting, stabbing pain on one side of the face. These episodes are triggered by touching the affected area.

In addition, trigeminal neuralgia can be identified by several distinctive traits, many of which apply to other neuralgias as well:

- The patient has attacks of pain in the face that last less than two minutes.
- The pain follows the path of the trigeminal (or another) nerve.
- The pain is described as sudden, sharp, stabbing or burning, and severe.
- The pain may be triggered by certain activities.
- There are no symptoms between attacks.
- In many patients, TN can be positively diagnosed if the drug carbamazepine (Tegretol) diminishes the pain of an attack.

Glossopharyngeal neuralgia is identified in the same way as TN, that is, the patient complains of stabbing, spasmodic pain that follows the Glossopharyngeal nerve. A positive diagnosis is usually achieved if the pain stops when the nerve is blocked with a local anesthesia.

Occipital neuralgia is caused by pain from one of the two occipital nerves that supply the back of the head. Unlike TN or glossopharyngeal neuralgia, occipital neuralgia may occur in conjunction with muscle tension or migraine headaches, with the spasms of nerve pain on top of nearly continual aching. X rays and CT scans can help indicate if the nerve is compressed; numbing the nerve with anesthetics can pinpoint the cause.

Treatment

Trigeminal neuralgia was identified almost 2,000 years ago. Early treatments, like most medicine in those days, were mostly topical (applied to the skin) and ineffective. Today, the most effective treatments for neuralgia are allopathic, but alternative therapies may help support the patient's general well being and improve overall health.

Nutritional therapy

B-complex vitamins, taken orally or given by intramuscular injection, are important for a healthy nervous system, and may supplement medical treatment. A whole foods diet with adequate protein, carbohydrates, and fats that also includes yeast, liver, **wheat germ**, and foods that are high in B vitamins is important. **Essential fatty acids**, such as flax or **fish oil**, may also help reduce inflammation.

Herbal therapy

Capsaicin cream, made from capsicum, a substance found in hot peppers, has sometimes been helpful in desensitizing painful areas in postherpetic neuralgia. Capsaicin may diminish the amount of "substance P," a chemical used by nerves to send pain signals to the brain. **St. John's wort**, an antidepressant, may help the other forms of neuralgia, which

are often treated allopathically with tricyclic antidepressants (TCAs)

Acupuncture

Some patients found that **acupuncture** was helpful in treating their neuralgia pain, especially that of postherpetic neuralgia. Others were unable to obtain relief from the procedure.

Chiropractic

Chiropractors can manipulate the jawbone, neck or spine to treat neuralgia pain. Like most alternative treatments for neuralgia, this is effective for some patients and not for others.

Homeopathy

Homeopathic treatment can also be tried. An experienced homeopathic practitioner will prescribe remedies to bolster the paitient's general health, tailoring remedies to the patient's overall personality profile as well as specific symptoms.

Other alternative therapies

The pain of neuralgia may also be relieved by **hydrotherapy** (hot shower or bath), deep massage, **reflexology** (massaging reflex points in the feet relating affected painful areas in the body) or **yoga** exercises. In addition, **guided imagery**, **biofeedback** therapy, and hypnosis may be beneficial. Patients should also consider **t'ai chi**, **qigong**, and other **movement therapy**.

Patients may also be helped by transcutaneous electrical nerve stimulation (TENS), in which a weak electrical current applied to the skin interferes with the nerve's ability to send pain signals to the brain. Although somewhat controversial, initial results, especially for postherpetic neuralgia, are promising.

Allopathic treatment

Once a diagnosis of neuralgia has been established, physicians prescribe drugs to alleviate the pain. The anticonvulsant drug carbamazepine (Tegretol) is often an effective treatment for TN, relieving or reducing the pain within a day or two. Unfortunately, it can also cause **dizziness**, drowsiness, **nausea**, and double vision, as well as other side effects. If Tegretol is not well tolerated, doctors can try another anitconvulsant, like gabapentin (Neurontin), antispasmodics like baclofen (Lioresal), or anti-anxiety drugs like clonazepam (Klonopin). These drugs are also frequently prescribed for other forms of neuralgia as well.

Injecting local anesthetics into the nerve can stop the pain for a few hours, and for some patients this is effective for a much longer time. Lidocaine cream may be somewhat helpful in treating PHN, probably by temporarily desensitizing nerves just under the skin. Lidocaine may also help atypical forms of TN. Alcohol and glycerin injections that destroy part of the nerve (and thereby its ability to transmit pain) may also be an option.

One particularly unpleasant, but evidently successful, method of treating neuralgia seems to be desensitization. This means that if a patient is bothered by the touch of clothing on the skin, the therapist may rub a towel briskly over the area for a few minutes. If the patient has trouble tolerating heat or cold, warm or cold water may be applied. Although initially quite painful, this method gradually diminishes the frequency and intensity of the patient's pain, apparently by overwhelming (and eventually reducing) the nerve's ability to send messages to the brain.

For PHN, the best treatment seems to be prevention. People with shingles should see a doctor as soon as the rash develops so they can receive treatment to ease the severity of the outbreak and minimize the risk of developing postherpetic neuralgia. It is not clear, however, whether treatment can prevent subsequent neuralgia. If PHN does develop, TCAs—especially amitriptyline—are often helpful. It's important to **stress**, though, that early attention to either a shingles outbreak or PHN episode will reduce the incidence and severity of future attacks. Some patients receive complete pain relief after treatment. Others are able only to reduce the pain (to greater or lesser degrees), while for a very few treatment is completely ineffective. For these patients PHN becomes a lifelong, chronic condition; most cases, however, moderate on their own and disappear within five years. In 2002, clinical trials showed that gabapentin (Neurontin) was effective in treating patients with PHN with relatively low adverse effects.

As a last resort, surgery may bring relief for those neuralgia patients not helped by pharmaceuticals. Most procedures try to reduce the nerve's ability to send pain signals to the brain. One of the most promising is dorsal root entry zone (DREZ) lesioning, which uses radio frequency to disrupt the nerves that are causing pain. Some studies showed that as many as 80% of DREZ patients were helped.

Expected results

Only a few neuralgia patients will not be helped by some combination of drugs and surgery. PHN, in

particular, tends to fade away on its own, and only 2–3% of patients have pain that lasts a year or longer. For those unfortunate few, however, PHN can become a lifelong, debilitating condition.

Resources

BOOKS

Althoff, Susanne, Patricia N. Williams, Dianne Molvig, and Larry Schuster. *A Guide to Alternative Medicine*. Lin colnwood, IL: Publications International, Ltd., 1997.

Gottlieb, Bill, ed. "Sciatica." In *New Choices in Natural Healing: Over 1,800 of the Best Self Help Remedies from the World of Alternative Medicine*. Emmaus, PA: Rodale Press, 1995.

Loeser, J. "Cranial Neuralgias." In *The Management of Pain*. 2nd ed. Philadelphia: Lea & Febiger, 1990.

"Neuralgia." In *The Hamlyn Encyclopedia of Complemen tary Medicine*. Great Britain: Reed International Books Limited, 1996.

PERIODICALS

Fields, H. "Treatment of Trigeminal Neuralgia." *The New England Journal of Medicine* 334 (April 1996): 1125 1126.

"Neurontin." *Formulary* 334 (July 2002): 335.

ORGANIZATIONS

American Chronic Pain Association. PO Box 850, Rocklin, CA 95677. (916) 632 0922.

National Chronic Pain Outreach. PO Box 274, Millboro, VA 24460. (540) 997 5004.

Trigeminal Neuralgia/Tic Douloureux Association. PO Box 340, Barnegat Light, NJ 08006. (609) 361 1014.

Amy Loerch Strumolo
Teresa G. Odle

Neurolinguisitic programming

Definition

Neurolinguistic programming (NLP) is aimed at enhancing the healing process by changing the conscious and subconscious beliefs of patients about themselves, their illnesses, and the world. These limiting beliefs are "reprogrammed" using a variety of techniques drawn from other disciplines including **hypnotherapy** and **psychotherapy**.

Origins

NLP was originally developed during the early 1970s by linguistics professor John Grinder and psychology and mathematics student Richard Bandler, both of the University of California at Santa Cruz.

Studying the well-known psychotherapist Virginia Satir, the hypnotherapist Milton Erickson, the anthropologist Gregory Bateson, and others whom they considered "charismatic superstars" in their fields, Grinder and Bandler identified psychological, linguistic and behavioral characteristics that they said contributed to the greatness of these individuals. On the other hand, they found that persons experiencing emotional difficulties could be similarly identified by posture, breathing pattern, choice of words, voice tone, eye movements, body language, and other characteristics.

Grinder and Bandler then focused on using these indicators to analyze and alter patterns of thought and behavior. After publishing their findings in two books in 1975, Grinder and Bandler parted company with themselves, with a number of other collaborators, and with the University of California, continuing their work on NLP outside the formal world of academia. As a result, NLP split into a number of competing schools.

Popularized by television "infomercial" personality Anthony Robbins and others, NLP was quickly adopted in management and self-improvement circles. During the 1990s, there was growing interest in NLP's healing potential.

Benefits

Neurolinguistic programming has been used to change the limiting beliefs of patients about their prospects of recovery from a wide variety of medical conditions including **Parkinson's disease**, **AIDS**, migraines, arthritis, and **cancer**. Practitioners claim to be able to cure most **phobias** in less than one hour, and to help in making lifestyle changes regarding **exercise**, diet, **smoking**, etc. NLP has also been used to treat **allergies**. In other fields, claimed benefits include improved relationships, communication, motivation, and business performance.

Description

In a health-care context, practitioners of neurolinguistic programming first seek to identify the negative attitudes and beliefs with which a client has been "programmed" since birth. This is accomplished by asking questions and observing physical responses such as changes in skin color, muscle tension, etc. Then, a wide variety of techniques is employed to "reprogram" limiting beliefs. For example, clients with chronic illness such as AIDS or cancer might be asked to displace the despair and loss of identity caused by the disease by visualizing themselves in

vigorous health. Treatment by NLP practitioners is often of shorter duration than that of other alternative practitioners, but NLP self-help seminars and courses can be quite expensive.

For those who wish to try self-treatment with NLP, a wide variety of books, audio tapes, and videos are available.

Precautions

NLP is particularly popular in the self-improvement and career-development fields, and some trainers and practitioners have little experience in its use for healing. Practitioners should be specifically asked about this.

Because NLP is intended to enhance the healing process, it should not be used independently of other healing methods. In all cases of serious illness, a physician should be consulted.

Side effects

NLP is believed to be generally free of harmful side effects.

Research and general acceptance

Although some physicians and mental health practitioners employ principles of neurolinguistic programming, the field is generally considered outside of mainstream medical practice and academic thinking.

Training and certification

Since the originators of NLP parted company more than 20 years ago, a number of schools have been established to offer training and certification. Consumers should be aware that, in some cases, there has been considerable competition and even litigation among individuals and institutions involved in NLP. At the time of publication, there was no umbrella organization covering these institutions or offering uniform standards of training and certification.

Resources

ORGANIZATIONS

Association for NLP. PO Box 78, Stourbridge, UK DY8 2YP.

Australian Association of Professional Hypnotherapists and NLP Practitioners, Inc. PO BOX 1526, Southport, Gold Coast, Queensland 4215, Australia. http://www.members.tripod.com/~aaphan/index.html.

International NLP Trainers Association, Ltd. Coombe House, Mill Road, Fareham, Hampshire, UK PO16 0TN. (044) 01489 571171.

Society of Neuro Lingustic Programming. PO Box 424, Hopatcong, NJ 07843. (201) 770 3600.

David Helwig

Niacin

Description

Niacin, also known as vitamin B_3 or nicotinic acid, is important for the normal function of many bodily processes. Like other B vitamins, it is water-soluble and plays a role in turning food into energy and in the metabolism of fats and carbohydrates. Niacin can also act as an antioxidant within cells, which means it can destroy cell-damaging free radicals. In conjunction with **riboflavin** and **pyridoxine**, it helps to keep the skin, intestinal tract, and nervous system

Recommended dietary allowance of niacin

Age	mg/day
Children 0-6 mos.	2 (AI)
Children 7-12 mos.	4 (AI)
Children 1-3 yrs.	6
Children 4-8 yrs.	8
Children 9-13 yrs.	12
Boys 14-18 yrs.	16
Girls 14-18 yrs.	14
Men ≥ 19 yrs.	16
Women ≥ 19 yrs.	14
Pregnant women	18
Breastfeeding women	17

Foods that contain niacin	mg
Cereal, fortified, 1 cup	20-27
Tuna, light packed in water, 3 oz.	11.3
Chicken, light meat, 3 oz.	10.6
Salmon, 3 oz.	8.5
Cereal, unfortified, 1 cup	5-7
Turkey, light meat, 3 oz.	5.8
Beef, lean, 3 oz.	3.1
Pasta, enriched, 1 cup cooked	2.3
Bread, whole wheat, 1 slice	1.1
Asparagus, cooked, 1/2 cup	1
Carrots, raw, 1/2 cup	0.6
Coffee, brewed, 1 cup	0.5

AI = Adequate Intake
mcg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

functioning smoothly. The term *vitamin B_3* may also include the amide form of nicotinic acid, known as nicotinamide or niacinamide.

General use

The recommended daily allowance (RDA) of niacin for children from one to three years of age is 6 mg. It is 8 mg at four to eight years, and 12 mg at nine to 13 years. For males from age 14 to 18, the RDA is 16 mg; for females of that age range, 14 mg. Males 19 years and older require 16 mg, while females in that age range should have 14 mg per day. The RDA for pregnant females is 18 mg, and for lactating females, 17 mg. As of 2008, no RDA had been set for children under the age of one year, although an adequate intake (AI) is thought to be 2 mg for the first six months of life, and 4 mg for the next six months.

Niacin can be taken in very large doses to decrease blood **cholesterol** levels and reduce the risk of **heart attack**. Niacin is an important part of the treatment of familial hyperlipidemia, an inherited disorder characterized by high blood cholesterol levels and increased risk of heart disorders. The amount of niacin required is between 2 and 3 g per day. Although treatment with niacin is considered one of the best strategies for normalizing blood cholesterol levels, it should not be undertaken without professional medical advice and supervision. Niacin has been singled out as a dietary supplement for which people frequently exceed the upper limits of safe intake. One Canadian study found that 47% of adults who were taking dietary supplements were taking niacin above recommended levels.

Certain conditions preclude the use of high doses of niacin. These disorders include **gout**, diabetes, peptic ulcer, liver or kidney disease, and high blood pressure requiring medication. Even in the absence of these conditions, a patient on high doses of niacin should be closely monitored to be sure the therapy is both effective and without complications. A frequent, harmless but unpleasant side effect of this therapy is extreme flushing of the face and neck. An alternative form of nicotinic acid that does not cause flushing is **inositol** hexaniacinate. Slow-release niacin also causes less flushing, but it should not be taken as there is higher risk of liver inflammation.

There is some evidence that niacin used on a long-term basis can prevent the onset of juvenile diabetes in many susceptible children. Those who have been newly diagnosed with juvenile diabetes may also benefit by extending the time that the pancreas continues to produce a small amount of insulin. The advice of a healthcare provider should be sought for these uses.

Inositol hexaniacinate can be helpful for people suffering from intermittent claudication. This condition causes leg **pain** with **exercise** due to poor blood flow to the legs. Dilation of the blood vessels caused by the inositol hexaniacinate relieves this condition to some extent, allowing the patient to walk farther with less pain.

Other conditions that may be benefited by supplemental niacin include vertigo, **tinnitus**, **premenstrual syndrome** (PMS) headaches, and **osteoarthritis**. Raynaud's phenomenon reportedly may be improved by large doses of inositol hexaniacinate. A healthcare provider should be consulted for these uses. Niacin is not effective for the treatment of **schizophrenia**.

Preparations

Natural sources

Tuna is one of the best sources of niacin, but many other foods contain the vitamin. Most processed grain products are fortified with niacin, as well as other B vitamins. Although niacin is not destroyed by cooking, it does leach into water, so cooking with minimal liquid best preserves it. The amino acid tryptophan is widely found in foods high in protein, and about half of the tryptophan consumed is used to make niacin. Cottage cheese, milk, fowl, and tuna are some of the foods that are high in tryptophan.

Supplemental sources

Niacin can be purchased as an oral single vitamin product. A balanced B complex supplement is preferred over high doses of an individual vitamin unless there is a specific contraindication. Supplements should be stored in a cool, dry place, away from light, and out of the reach of children.

Deficiency

A serious deficiency of niacin causes a condition called pellagra. Once quite common in all countries, it has become rare outside areas in which poor **nutrition** is still the norm. Affected groups include refugees displaced by war as well as populations affected by such emergency situations as famine. The symptoms of pellagra include **dermatitis**, **dementia**, and **diarrhea**.

Milder deficiencies of niacin can cause similar, but less severe symptoms. Dermatitis, especially around the mouth, and other **rashes** may occur, along with **fatigue**, irritability, poor appetite, **indigestion**, diarrhea, **headache**, and possibly delirium.

Risk factors for deficiency

Severe niacin deficiency is uncommon in most parts of the world, but some people may need more than the RDA in order to maintain good health. Vegans, and other individuals who do not eat animal protein, should consider taking a balanced B vitamin supplement. Others who may need extra niacin and other B vitamins are people under high **stress**, including those experiencing chronic illnesses, liver disease, sprue, or poor nutritional status. People over 55 years old are more likely to have a poor dietary intake. Certain metabolic diseases also increase the requirement for niacin. Those who abuse nicotine, alcohol, or other drugs are very frequently deficient in B vitamins, but use of niacin with alcohol can cause seriously low blood pressure. A healthcare professional can determine if supplementation is appropriate.

Precautions

Niacin should not be taken by anyone with a B vitamin allergy, kidney or liver impairment, severe hypotension, unstable **angina**, arterial hemorrhage, or coronary artery disease. Supplemental niacin can exacerbate peptic ulcers. Diabetics should use caution as supplements of either niacin or niacinamide can alter medication requirements to control blood glucose. Supplements can raise uric acid levels and aggravate gout in people with this condition. Pregnant women should not take high doses of niacin, or any supplement, except on the advice of a healthcare provider.

Health care should be sought immediately if certain symptoms occur following niacin supplementation. These include abdominal pain, diarrhea, **nausea**, **vomiting**, yellowing of the skin, faintness, or headache. Such symptoms may indicate excessively low blood pressure or liver problems. Heart palpitations and elevated blood sugar are also potential effects.

Side effects

High doses of niacin can cause a harmless but unpleasant flushing sensation as well as darkening of the urine. The no-flush form can lessen this complication.

Interactions

Niacin supplements should not be taken by anyone on medication for high blood pressure, due to the vitamin's potential to reduce blood pressure. Isoniazid, a drug used to treat **tuberculosis**, inhibits the body's ability to make niacin from tryptophan. Extra niacin may be required. Supplements may also be needed by women taking oral contraceptives. Concomitant use of niacin with statin class drugs to lower cholesterol can cause myopathy. Cholestyramine and cholestipol, older medications to lower cholesterol, should be taken at a different time than niacin or they will reduce its absorption. Transdermal nicotine used with niacin is likely to cause flushing and **dizziness**. Carbamazepine, an antiseizure medication, is more likely to cause toxicity in combination with niacin.

KEY TERMS

Antioxidant—Any substance that reduces the damage caused by oxidation, such as the harm caused by free radicals.

Gout—A metabolic disorder characterized by sudden recurring attacks of arthritis caused by deposits of crystals that build up in the joints due to abnormally high uric acid blood levels. In gout, uric acid may be overproduced, underexcreted, or both.

Myopathy—Any abnormal condition or disease of muscle tissue, characterized by muscle weakness and wasting.

Pellagra—A condition caused by a dietary deficiency of niacin, one of the B vitamins. Symptoms include dementia, diarrhea, and dermatitis.

Sprue—A disorder in which the absorption of nutrients from the diet by the small intestine (malabsorption) is impaired, resulting in malnutrition. Two forms of sprue exist: tropical sprue, which occurs mainly in tropical regions; and celiac sprue, which occurs more widely and is due to sensitivity to wheat protein gluten.

Resources

BOOKS

Elliot, Charlyn M. *Vitamin B: New Research*. Hauppauge, NY: Nova Science, 2008.

PERIODICALS

Birjmohun, R. S., et al. "Safety and Tolerability of Pro longed release Nicotinic Acid in Statin treated Patients." *Current Medical Research and Opinion* (July 2007): 1707 1713.

Ganji, Shobha H., et al. "Effect of Niacin on Lipoproteins and Atherosclerosis." *Future Lipidology* (October 2006): 549 557.

"Niacin ER Combinations Effective in Lipid Metabolism Disorders." *Inpharma* (November 17, 2007): 2.

Sanyal, Sanjukta, Richard H. Karas, and Jeffrey T. Kuvin. "Present day Uses of Niacin: Effects on Lipid and Non lipid Parameters." *Expert Opinion on Pharmacotherapy* (August 2007): 1711 1717.

Suryadevara, Ramya S., Richard H. Karas, and Jeffrey T. Kuvin. "Use of Extended release Niacin in Clinical Practice." *Future Lipidology* (February 2008): 9 16.

ORGANIZATIONS

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, www.eatright.org.

World Health Organization (WHO), Avenue Appia 20, 1211, Geneva, 27, Switzerland, +41 22 791 2111, www.who.int.

Judith Turner
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Night blindness

Definition

Night blindness is the inability or reduced ability to see in dim light or darkness. It also refers to the condition in which the time it takes for the eyes to adapt to darkness is prolonged.

Description

Night blindness, also called nyctalopia, is a symptom of several different diseases or conditions. All of the possible causes of night blindness are associated with the way in which the eye receives light rays. Light travels through the cornea and lens and lands on the retina at the back of the eye. The retina is composed of photoreceptors. Photoreceptors are specialized nerve cells that receive light rays and convert them into electrical signals, which are then transmitted to the brain, creating an image.

There are two types of photoreceptors, rods and cones. There are three million cones and 100 million rods in each eye. The two different photoreceptors are similar in structure, however, rods have a larger outer segment than cones. The outer segments of photoreceptors contain light-sensitive photopigments which change shape whenever light rays strike them. Rods contain the photopigments retinal and rhodopsin, whereas cones contain retinal and three different opsins. Rhodopsin is only able to discriminate between different degrees of light intensity, whereas the opsins of cones distinguish between light wavelengths in the red, blue, and green ranges. Hence, rods see only black and white, but cones see colors. Also, rods enable the eyes to detect motion and provide peripheral vision.

KEY TERMS

Cones—Receptor cells, located in the retina of the eye, that allow the perception of colors.

Photoreceptors—Specialized nerve cells (rods and cones) in the retina that are responsible for vision.

Retina—The inner, light-sensitive layer of the eye containing rods and cones. The retina transforms the image it receives into electrical signals that are sent to the brain via the optic nerve.

Retinitis pigmentosa—A group of inherited degenerative eye disorders characterized by deterioration of the retina. This deterioration of the retina causes vision impairment and ultimately blindness, usually by the time the individual reaches middle age.

Rhodopsin—The light-sensitive photopigment contained in rods which discriminates between different levels of light intensity.

Rods—Photoreceptors, located in the retina of the eye, that are highly sensitive to low levels of light.

Rods are responsible for vision in dim light, and cones are responsible for vision in bright light. The rods are spread throughout the retina, but the cones are only in the center of the retina. Vision in dim light or darkness is blurry because of the connections between the photoreceptors and the nerve cells which are linked to the brain. Each rod must share this connection to the brain with several other rods so the brain does not know exactly which rod produced the signal. Alternatively, vision in bright light is sharp because each cone has its own connection to the brain so the brain can determine exactly where on the retina the signal originated.

Another feature of rods is that they must adapt to darkness. This is best exemplified by walking into a dark movie theater. At first, one can see very little. With time, vision improves and one is able to discern objects. Ultimately, one can see moderately well. This dark adaptation process occurs because of the chemical nature of rhodopsin. Rhodopsin is decomposed in bright light making the rods nonfunctional. In darkness, rhodopsin is regenerated faster than it can be decomposed. Dark adaptation takes about 15–30 minutes and, when complete, increases light sensitivity by about 100,000 times.

Causes and symptoms

Several different conditions and diseases can cause night blindness.

These include:

- Cataracts. This condition is characterized by a cloudiness of the lens.
- Congenital night blindness. This is an inherited, stable disease in which persons suffer from night blindness. Recent advances in gene mapping have identified several mutations responsible for this form of night blindness.
- Liver conditions. Reduced night vision can be linked to poor liver functioning, due to a variety of conditions, which impairs vitamin A metabolism.
- Macular degeneration. Degeneration of the macula retinae, a specialized region of the retina, can cause night blindness.
- Retinitis pigmentosa. This is an inherited eye disease in which there is progressive deterioration of the photopigments of the photoreceptors, eventually resulting in blindness. The rods are destroyed early in the course of disease resulting in night blindness. Night blindness in children may be an early indicator of retinitis pigmentosa. Recent genetic studies have identified mutations related to retinitis pigmentosa on human chromosome 19.
- Vitamin A deficiency. Night blindness is commonly caused by a deficiency in vitamin A, in fact, it is one of the first indicators of vitamin A deficiency.
- Xerophthalmia. This condition is characterized by dryness of the conjunctiva (the membrane that covers the eyelids and exposed surface of the eye) and cornea, light sensitivity, and night blindness. It is caused by vitamin A deficiency. Xerophthalmia rarely occurs in countries with adequate supplies of milk products.
- Zinc deficiency. Zinc is a mineral that is necessary for vitamin A to improve vision.

Diagnosis

Night blindness can be diagnosed and treated by an ophthalmologist, a physician who specializes in eye disorders. Opticians can only dispense eye glasses but optometrists may be able to diagnose and treat vision problems.

Diagnosis begins with a detailed medical history regarding the night blindness. Questions include: severity of night blindness, when night blindness began, did it occur gradually or suddenly, etc. An eye examination is performed. A slit lamp examination, in which a narrow beam of intense light is used to examine the internal components of the eye, may also be performed. Additional testing may be performed based upon the results of these standard tests.

Treatment

Changes in vision should never be taken lightly. Because night blindness can be a symptom of a serious disease, an ophthalmologist should be consulted before a person embarks on self treatment.

Persons who experience night blindness should not drive during the evening or at night. Additional safety precautions should be taken. Alternative remedies may be effective at reducing night blindness, particularly when caused by a **vitamin A** deficiency.

Food remedies and supplements

Because night blindness can be caused by a vitamin A deficiency, supplementation with vitamin A, or eating foods rich in vitamin A, may help reduce symptoms. Vitamin A was found to slow the progression of retinitis pigmentosa. Foods rich in vitamin A include dairy products, egg yolks, fish liver oil, and liver. Pregnant women should consult a physician before taking vitamin A supplements because of the link between this vitamin and birth defects.

Vitamin A in humans is primarily obtained by conversion of beta-carotene, a pigment found in fruits and vegetables. Food sources for beta-carotene include apricots, asparagus, broccoli, brussel sprouts, cantaloupe, carrots, cherries, kale, lettuce, mango, mustard greens, papaya, peaches, pumpkin, red cabbage, seaweed, spinach, sweet potatoes, watermelon, winter squash, and yams.

Zinc is necessary to transport vitamin A from the liver to the retina, so zinc supplementation (up to 25 mg daily) may help improve night vision. Docosahexaenoic acid (DHA) helps to increase rhodopsin levels and lines the photoreceptor cells of the retina. DHA is converted from **omega-3 fatty acids**, both of which are found in certain fish oils. The suggested daily dose of DHA (from fish oils) is 500–1000 mg.

Herbal remedies

Herbals which may improve night vision include:

- bilberry (*Vaccinium myrtillus*)
- blueberry (*Vaccinium*) juice
- dandelion (*Taraxacum officinale*)
- eyebright (*Euphrasia officinalis*)
- matrimony vine (*Lycii fructus*, kou chi tza) berries
- passionflower (*Passiflora incarnata*)
- Queen Anne's lace (*Daucus carota sativas*)
- rose (*Rosa* species) flower eye wash
- yellow dock (*Rumex crispus*) leaves

Colored light therapy

One researcher found that some persons have reduced levels of photocurrent transmission (transmission of light signals from the eye to the brain) which can cause, among other things, night blindness. Colored **light therapy**, in which colored light stimulates the brain, can reduce night blindness caused by this photocurrent deficit. In colored light therapy, patients look at a device that cycles through 11 wave bands of color. Treatment involves 25–30 sessions over a period of four to six weeks.

Allopathic treatment

Night blindness caused by vitamin A deficiency will be treated with vitamin A supplements. Night vision devices are available which collect and magnify tiny amounts of light to help persons with night blindness see as well as they can during daylight.

Vitamin A supplementation may slow the progress of retinitis pigmentosa. There is no cure for retinitis pigmentosa or **macular degeneration**, but there are treatments, including laser surgery and the drug thalidomide, which slow down the growth of blood vessels. **Cataracts** require surgery.

Expected results

Vitamin A can effectively treat night blindness in persons who have a deficiency of this nutrient.

Prevention

Vitamin A may prevent night blindness and slow the progression of eye conditions, such as macular degeneration, which cause night blindness. Wearing sunglasses during the day can prevent eye damage.

Resources

PERIODICALS

Ramser, J., G. Wen, Y. Demirci, et al. "A Complete Gene Catalogue of Human Xp11.4 Harboring Disease Loci for Diabetes Mellitus Type I, Mental Retardation and Retinal Disturbances." *American Journal of Human Genetics* 69 (October 2001): 655.

Vithana, E. N., L. Abu Safieh, M. J. Allen, et al. "A Human Homologue of Yeast Pre mRNA Splicing Gene, PRP31, Underlies Autosomal Dominant Retinitis Pig mentosa on Chromosome 19q13.4 (RP11)." *American Journal of Human Genetics* 69 (October 2001): 229.

ORGANIZATIONS

The Foundation Fighting Blindness. 11435 Cronhill Drive, Owings Mills, MD 21117 2220. (888) 394 3937. info@blindness.org http://www.blindness.org.

OTHER

Haas, Elston M. "Vitamin A." *HealthWorld Online*. [cited October 2002]. http://www.healthy.net/hwlibrarybooks/haas/vitamins/avit.htm.

Belinda Rowland
Rebecca J. Frey, PhD

Non-Hodgkins lymphoma *see* **Malignant lymphoma**

Noni

Description

Noni, the common name for *Morinda citrifolia,* is a medicinal herbal substance derived from the noni tree, which is found in various areas of the South Pacific. Other names for the herb include morinda, Indian mulberry, nona, nonu, Polynesian bush fruit, Tahitian noni juice, and cheesefruit.

The noni tree is an evergreen shrub, up to 20 ft (6 m) tall, that grows in tropical areas of the South Pacific, including Australia, Malaysia, the West Indies, India, Vietnam, the Philippines, Taiwan, and Hawaii. Its branches and trunk are coarse, tough wood, and the leaves are glossy, oval, and dark green. Year-round, the tree yields a small fruit, which is cream-colored and about the size of a small potato. The noni fruit is noted for its bitter taste, unpleasant smell, and reportedly strong healing properties. Other parts of the plant also are used medicinally, including the leaves, bark, flowers, and roots.

Noni was first found in India, and migrating peoples may have carried it around regions in the Pacific. In Polynesia, the plant is considered a sacred healing herb with many uses. American soldiers stationed there during World War II were reportedly given noni as a health tonic. Other peoples of the South Pacific, including in Hawaii and Tahiti, use noni as a medicinal herb. Traditional uses of all parts of the plant for various conditions are numerous. Noni has been commercially grown for hundreds of years in the South Pacific region. The fruit is also a food source used by South Pacific peoples. The principal regions for commercial cultivation of noni are Hawaii, French Polynesia, and Tahiti.

Noni juice became an increasingly popular health drink during the 1990s, when a group of Hawaiians began internationally marketing the juice as an herbal remedy. Since then, many claims have been made

Noni (Morinda citrifolia) is a medicinal herbal substance derived from the noni tree, which is found in various areas of the South Pacific. *(inga spence / Alamy)*

about its healing powers, a few of which have been somewhat validated by controlled studies. However, there is a lack of research to conclusively back up the optimistic claims regarding the herb's healing powers, and most evidence of the herb's success exists in testimonial accounts.

General use

Traditionally, the fruit has been used for **aging**, diabetes, **halitosis**, **hemorrhoids**, tumors, **tuberculosis**, high blood pressure, and as a tonic for overall health and energy. The leaves have been ingested in remedies for arthritis, digestive problems, parasites, and dysentery (severe infection of the lower digestive tract characterized by acute **diarrhea** and dehydration). Topically, the leaves, fruit, and roots are used in poultices for arthritis and joint **pain**, headaches, for **burns** and lesions, poisonous **bites**, and to improve signs of aging.

Noni is used by some **cancer** patients for its anti-cancer and tumor-reducing possibilities. Some sufferers from immune-compromised diseases such as **AIDS** and **chronic fatigue syndrome** use noni to boost immune system function. People with diabetes and **hypoglycemia** have reported that noni helps stabilize blood sugar levels in the body. People with arthritis, joint pain, and inflammatory conditions have used noni. It is also used as a sedative, painkiller, and sleeping aid. Noni juice is recommended to remove parasites, to cleanse the digestive tract and improve digestion, and to control weight. It is used as a general health tonic to improve energy and resistance and to slow the effects of aging. It is also used for **asthma**; digestive disorders including ulcers; **irritable bowel syndrome**; **constipation** and diarrhea; and **fibromyalgia**, a condition characterized by **fatigue** and chronic pain.

Scientific studies

A substance called ursolic acid found in the leaves of the noni plant has been shown to have anti-cancer properties in the body. A Japanese study found that noni fruit contains another substance (damnacanthal) that has some effectiveness against pre-cancerous cells. Some evidence points to noni's ability to increase

immune system activity, due to substances found in the fruit (including a chemical called proxeronine). The leaves of the plant contain chemicals that may lower blood sugar levels, as well as reduce pain and inflammation. One study showed that laboratory mice with **lung cancer** had much longer survival times when given noni juice daily. A French study determined that the roots of the noni plant contain natural sedatives, while another study pointed to a compound that noni leaves may contain that is anti-malarial and anti-parasitic in its effects. Finally, surveys of noni users have indicated testimonial success with the use of noni for cancer, strokes, diabetes, and as a general health and energy improver. Noni has been shown to contain vitamins, minerals, and **antioxidants**.

Preparations

Noni is available in several forms, including bottled juice from the fruit; essential oil; capsules containing dried fruit, leaves, roots, or combinations thereof; tablets; teas; and topical sprays. Organically grown sources of the supplement are recommended. Noni is best taken on an empty stomach, and can be taken daily. Between one quarter of an ounce and one ounce of the juice is a recommended daily dosage for adults. Up to ten ounces of the juice may be taken by those seeking therapeutic use of the herb and who are under the supervision of a health professional. Consumers should follow manufacturers' recommendations for capsules, tablets, and teas. In capsule form, it is estimated that 1,200 mg equals roughly one ounce of the juice.

Precautions

Although few allergic reactions to noni have been observed, consumers should ingest small amounts of the herb (one tablespoon of the juice) at first to test for adverse reactions. Noni should not be used by pregnant or nursing women, as there is insufficient evidence of its safety during **pregnancy** or for infants.

Side Effects

Reported side effects from the use of noni include **indigestion**; allergic reactions including **rashes**, swelling, and difficulty swallowing; diarrhea; and constipation.

Interactions

The use of noni with potassium-sparing drugs is not recommended, due to the high **potassium** content in the herb. It is recommended that noni not be taken with food, as stomach acid may render one of its active ingredients ineffective. Noni can cause discoloration of the urine and may interfere with diagnostic urine tests. Noni juice may increase the risk of hyperkalemia (higher than normal blood potassium levels) in people with kidney problems by elevating potassium levels in the body.

Resources

BOOKS

Elkins, Rita. *The Noni Revolution*. Woodland Publishing, 2002.

Solomon, Neil, M.D. *The Noni Phenomenon*. Direct Source Publishing, 1999.

OTHER

Cancer Research Center of Hawaii: The Noni Study. http://www.hawaii.edu/crch/CenStudyNoni.htm.

International Noni Certification Council (INCC). http://www.incc.org.

Douglas Dupler

Nosebleeds

Definition

A nosebleed is characterized by bleeding from the interior of the nasal cavity. It can be caused by heat, dry air, trauma to the nose, certain medications, or a medical condition.

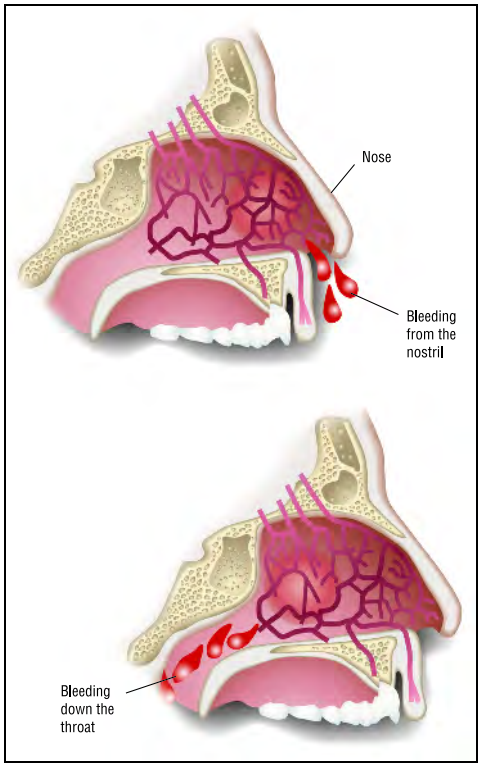
Description

Anterior nosebleeds, or bleeding of the nose that comes from near the nose opening, are the most common nosebleeds in children. Children are twice as likely to experience nosebleeds as adults are. Bleeding that originates from deep within the nasal cavity is known as a posterior nosebleed, the type usually experienced by adults.

Causes and symptoms

The most common causes of nosebleeds are:

- Low humidity. Hot and dry climates can dry out the nasal cavities.
- Nasal trauma. Injuries to the nose can cause bleeding. Excessive nose picking can also injure the interior of the nose.
- Cold, allergies, and sinus infections. Excessive nose blowing and irritation to the mucous membrane can cause bleeding.



Two types of nosebleeds. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

- Medications. Bleeding can be triggered by certain medications, particularly those with anticoagulant (or blood thinning) properties.

Nosebleeds can also be symptomatic of less common, but more serious, medical conditions. These include:

- nasal polyps
- high blood pressure
- blood clotting disorders (i.e., thrombocytopenia, liver disease)
- leukemia
- malaria

Diagnosis

A nosebleed is easily diagnosed by sight. Further examination of the nasal cavity may be necessary to determine the source of the bleeding, and a medical history should be taken if the cause of the nosebleed is not readily apparent.

Treatment

The first step in treating a nosebleed is to stop the bleeding. An individual experiencing a nosebleed should lightly blow his or her nose, and then pinch both nostrils to encourage clotting of the blood flow. The nose should be pinched close for five to 10 minutes, or until bleeding has stopped. In most cases, this will resolve the nosebleed.

If pinching does not stop blood flow completely, an astringent can also be used to dry up the blood flow. A piece of cotton soaked in **witch hazel** (*Hamamelis virginiana*) can be inserted into the bleeding nostril(s) to tighten and seal the blood vessels. Sniffing a small pinch of powdered **yarrow** (*Achillea millefolium*) can also stop bleeding.

KEY TERMS

Astringent—A substance or compound that causes contraction or constriction of soft tissue.

Cauterization—Sealing tissue or blood vessels by burning with a heat source or electrical current.

Allopathic treatment

Use of a spray decongestant is sometimes recommended to shrink blood vessels and stop bleeding. In severe cases where bleeding from the nose does not stop after 20 minutes, professional emergency care should be sought. Surgery to remove nasal polyps may be required in patients with this problem. In some cases of repeated, serious nosebleeds, cauterization of the blood vessels in the nasal passages is necessary.

Expected results

Most nosebleeds will resolve by themselves in 10–15 minutes. Nutritional and environmental measures can prevent further occurrences in many cases.

Prevention

The following precautions can prevent or lessen the frequency of nosebleeds:

- Vitamin C. An adequate supply of vitamin C is necessary to form collagen, the connective tissue that strengthens blood vessel walls.
- Humidify the air. Using a humidifier in the home and office can prevent nosebleeds caused by a dry environment.
- Vitamin E. Rubbing liquid vitamin E in the nose keeps the mucous membrane moist.

Resources

BOOKS

Hoffmann, David. *The Complete Illustrated Herbal*. New York: Barnes & Noble Books, 1999.

Paula Ford-Martin

Notoginseng root

Description

Notoginseng root is a frequently prescribed herb in Chinese medicine. The scientific names for the plant are *Panax notoginseng* and *Panax pseudoginseng*. The herb is also referred to as pseudoginseng, and in Chinese it is called Tien qi ginseng, San qi, three-seven root, and Mountain paint. Notoginseng belongs to the same scientific genus, *Panax*, as Asian ginseng. In Latin, the word *panax* means "cure-all," and the family of ginseng plants is one of the most famous and frequently used of all families of herbs.

Notoginseng grows naturally in China and Japan. The herb is a perennial with dark green, compound leaves and red clusters of berries. It is both cultivated and gathered from forests, with wild plants being the most expensive. The root of the plant is used medicinally, and tea is sometimes made from the leaves. At the top of the root is a section called the "age root," which has notches that indicate the age of the particular root. Chinese herbalists consider roots older than three years to be the most effective medicinally. Notoginseng root has a very bitter flavor.

Notoginseng plant. *(© Arco Images / Alamy)*

Notoginseng root has been used in Chinese medicine for thousands of years. One of China's most famous herbalists once said that the root was "more valuable than gold." The herb is used as a general tonic, or a medicine to tone and strengthen the entire system. In particular, notoginseng is considered a blood and heart tonic. Chinese herbalists regard it as having a neutral to warm energy. In **traditional Chinese medicine**, notoginseng is believed to act on the heart and kidney meridians, which are the channels that contain the flow of qi (life energy) in the body. The herb was given the name "mountain paint" because herbalists sometimes recommend a liquid solution of it to reduce swelling and **boils** on the body.

General use

Notoginseng is used to treat external and internal bleeding, including **nosebleeds** as well as bloody stools and urine. Notoginseng has been used in the United States for some years to control postpartum bleeding in women and heavy bleeding associated with **menopause**. Some herbalists recommend notoginseng as an alternative to hormone replacement therapy.

Notoginseng is also used as a general tonic for the heart and circulatory system, and for such specific problems as coronary **heart disease** and high **cholesterol**. Chinese herbalists prescribe notoginseng to relieve the **pain** of **angina** pectoris, a condition that results in sharp pain in the chest region. Notoginseng is also used for painful **menstruation**, and for swelling and boils on the skin.

Research and general acceptance

Considerable research has been performed on notoginseng root in China and Japan over the years, but many of these findings have not been translated into English. Researchers from Western institutions have also taken a more recent interest in herbal treatments and have conducted their own notoginseng-related studies, many of which have been published since 2000.

From notoginseng, researchers have isolated chemicals called saponins and flavonoids, substances that are active biologically in the body. Some of the saponins in notoginseng are believed to provide the raw materials for the creation of important hormones that regulate energy levels and sexual function.

Ginsenoside compounds are a group of saponins of special interest to biologists because they are found only among species in the Panax genus, and they are believed to be the primary source of these plants' pharmacological activity. Notoginseng has especially high concentrations of these compounds.

Notoginseng possesses anti-inflammatory properties, and research published in 2007 suggested that it may be helpful in treating arthritis, which is a chronic inflammatory condition that affects the joints. According to the study, notoginseng inhibits the secretion of a certain arthritis-related regulatory protein, known as a cytokine, and this contributes to notoginseng's anti-inflammatory effects.

In addition, notoginseng has been reported to stimulate the immune system. Other research has pointed to notoginseng's benefits for the heart and circulatory system, and the results of a preliminary study suggest that it may be useful in treating coma patients by decreasing pressure on brain tissue inside the skull.

Notoginseng also has been reported to have positive effects on the blood. It lowers low density lipoprotein (bad cholesterol), and is believed to help dissolve clots. At the same time, it is reputed to stop bleeding both internally and externally. Notoginseng root is one of the main herbs prescribed in Chinese medicine for traumatic injuries. In fact, the root has been distributed to members of armed forces in Asian countries to be used in case of traumatic injury and bleeding.

Possible newer uses for notoginseng root include treatment of HIV, or human immunodeficiency virus, infection. In 2002, researchers reported that they had isolated a compound known as a xylanase, which is a type of enzyme found in plant roots, from the roots of *Panax notoginseng*. According to their study, the new xylanase appeared to inhibit HIV-1 reverse transcriptase, which is an enzyme that allows HIV to integrate itself into the chromosomes inside a cell.

Researchers have also reported that an herbal product that combined extracts of **American ginseng**, *Panax quinquefolium*, and *Ginkgo biloba* showed promise as a treatment for **attention-deficit hyperactivity disorder**. They studied the treatment over a four-week span in three dozen children who were 3–17 years old and had been diagnosed with ADHD, and saw positive results.

Preparations

Notoginseng is available in Asian markets and some health food stores. It comes as dried root, powder, and in capsules. The root is sometimes steamed and then powdered, which is believed to increase its healing effects for the blood. The powdered root can also be applied topically to **wounds** and swelling on the skin.

Notoginseng users sometimes decoct the dried root into a tea by briefly boiling and then simmering it for more than an hour. A daily dosage of the root by this method may be between 3–9 g. Some users instead stir 1–3 g of the powder into tea or juice as a daily serving. The dried root can be used in cooking as well. A common method of taking the herb in China is to prepare it with chicken or soups.

KEY TERMS

Meridian—In traditional Chinese medicine, meridians are the invisible channels that run beneath the skin and through which the body's energy (chi) flows. Meridian also refers to a section of a sphere, such as the line connecting the North and South Poles on the face of the Earth.

Qi—Universal life energy, according to Traditional Chinese Medicine, that is found in the body, air, food, water, and sunlight.

Traditional Chinese medicine—Ancient Chinese healing system involving acupuncture, herbal remedies, dietary therapies, and other healing techniques.

Precautions

Herbalists note that notoginseng root can usually be safely taken in normal doses, but advise that women avoid it during **pregnancy**. Some also recommend that persons who have heart or blood-vessel problems use caution when taking some notoginseng preparations.

Interactions

Notoginseng has been reported to interact with warfarin and heparin, which are medications to thin the blood, or anticoagulants; and with ticlopidine, a drug given to prevent blood platelets from clumping and to prolong bleeding time. Patients taking any of these medications may wish to avoid preparations containing notoginseng.

Resources

BOOKS

Fan Warner, J.W. *Manual of Chinese Herbal Medicine*. Boston: Shambhala, 2003.

Lu, Henry C. *Chinese Natural Cures: Traditional Methods for Remedy and Prevention*. New York: Black Dog & Leventhal Publishers, 2006.

Teeguarden, Ron. *The Ancient Wisdom of the Chinese Tonic Herbs*. New York: Grand Central Publishing, 2000.

PERIODICALS

Frishman, William H., Stephen T. Sinatra, and Mohammed Moizuddin. " The use of herbs for treating cardiovas cular disease." *Seminars in Integrative Medicine*. Vol ume 2, no. 1, March 2004: 23 25.

ORGANIZATIONS

American Herbalists Guild. 141 Nob Hill Road, Cheshire, CT 06410. (203) 272.6731. www.americanherbalists guild.com (accessed February 15, 2008).

Douglas Dupler
Rebecca J. Frey, Ph.D.
Leslie Mertz, Ph.D.

Nursing problems *see* **Breastfeeding problems**

Nutmeg

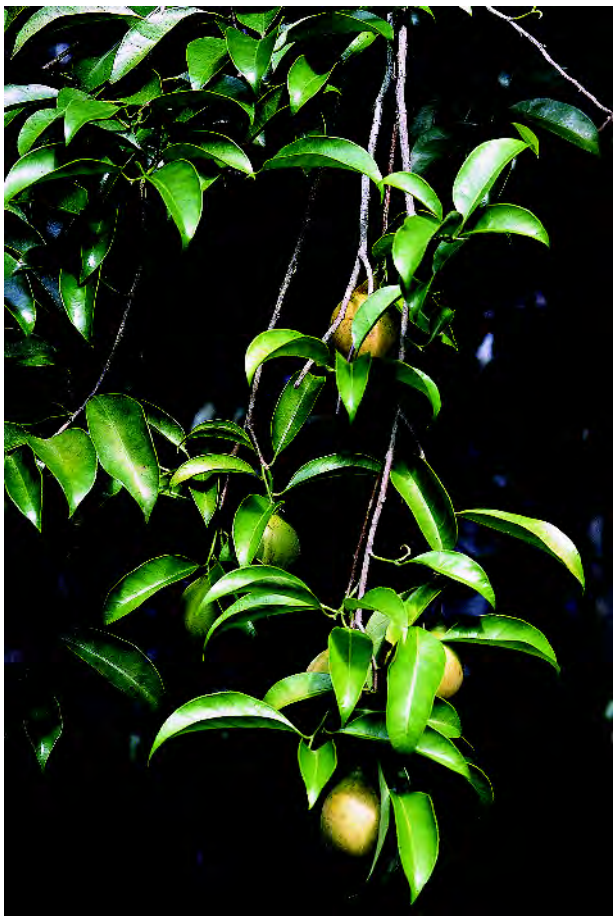
Description

Nutmeg is known by many names, such *Myristica fragrans*, mace, magic, muscdier, muskatbaum, myristica, noz moscada, nuez moscada, and nux moschata. Nutmeg is most commonly used as a cooking spice, comes from the fruit of a 50 ft (15 m) tall tropical evergreen tree. This tree grows in Indonesia, New Guinea, and the West Indies. The bark is smooth and grayish brown with green young branches and leaves. The oblong, fleshy fruit, called the nutmeg apple, contains a nut from which nutmeg is made. The dried nut and essential oil are both used as medicine.

Nutmeg is used in both Western and Chinese herbal medicine. It is most popular as a spice in food and drinks, and is also used in cosmetics and soaps. In ancient Greece and Rome, where nutmeg was rare and expensive, people thought it stimulated the brain. The Arabs have used nutmeg since the seventh century.

General use

Nutmeg relaxes the muscles, sedates the body, and helps remove **gas** from the digestive track. It is most commonly used for stomach problems such as **indigestion**. It is also used for chronic nervous disorders, kidney disorders, and to prevent **nausea** and **vomiting**. In Chinese medicine, nutmeg is used to treat abdominal **pain**, **diarrhea**, inflammation, **impotence**, liver disease, and vomiting. In the Middle East, some cultures are said to use nutmeg in love potions as an aphrodisiac. The essential oil of nutmeg is used for rheumatic pain, toothaches, and bad breath. In Germany, it is used for problems related to the stomach and intestines, but this use is controversial. In **homeopathy**, nutmeg is used to treat **anxiety** or **depression**. Although nutmeg has been used to treat many ailments, it hasn't been proven to be useful or effective for any and it can be harmful. Nutmeg is used in medicines such as Vicks Vaporub, Agua del Carmen, Aluminum Free Indigestion, Incontinurina, Klosterfrau Magentoniuum, Melisana, and Nervospur.



Nutmeg tree branch. *(©PlantaPhile, Germany. Reproduced by permission.)*

Preparation

Nutmeg is made from the nut of the nutmeg apple. It is removed from the fruit and slowly dried. As an herbal medicine, nutmeg is commonly used in capsules (200 mg), powders, and essential oil. As a cooking

KEY TERMS

Anxiogenic—Tending to produce anxiety.

Homeopathy—A holistic system of treatment developed in the eighteenth century. It is based on the idea that substances that produce symptoms of sickness in healthy people will have a curative effect when given in very dilute quantities to sick people who exhibit those same symptoms. Homeopathic remedies are believed to stimulate the body's own healing processes.

Rheumatic—Refers to any of a variety of disorders marked by inflammation, deterioration, or metabolic damage of the body's connective tissues, especially the joints.

Trimyristin—A chemical found in nutmeg that causes anxiety.

spice, the nut is ground and cooked in food. The skin of the nuts is ground to produce another spice, called mace. Nutmeg butter, a mixture of fatty and essential oil, is made by chopping and steaming the nuts until they form a paste.

Some of the suggested doses of nutmeg can be harmful. For nausea, other stomach problems, and chronic diarrhea, one or two capsules or nutmeg kernel as a single dose or three to five drops of essential oil on a lump of sugar or on a teaspoon of honey is suggested. For diarrhea, 4-6 tbsp of powder could be taken every day. For a **toothache**, one or two drops of essential oil can be applied to the gum around the toothache to relieve pain; a visit to the dentist care is still necessary.

In Chinese medicine, 250–500 mg of nutmeg mixed with other herbs is recommended, once or twice a day. It can be taken in powder plain, capsules, pills, or infusion, and should be taken on an empty stomach. When used as a digestive stimulant in Chinese medicine, it is said to work best when ground and cooked in food.

Precautions

Nutmeg is not recommended for use as a medicine because it is too risky. An overdose of nutmeg is harmful and sometimes deadly. There are more effective treatments for all of the ailments that nutmeg could be used for.

Pregnant women should not use nutmeg because it can cause a miscarriage. Women who are breastfeeding should not use nutmeg either. Nutmeg should be used with caution in patients with psychiatric illnesses, as it can cause feelings of anxiety. Touching the nuts can cause an allergic skin reaction. In the home, nutmeg should be kept out of the reach of children and pets.

Side effects

There are no known side effects from using nutmeg properly. Too much nutmeg, however, can cause serious health problems and even death. Early symptoms of an overdose of nutmeg (one to three nuts) are thirst, nausea, and feelings of urgency. There may also be experiences of altered consciousness; this can range from mild to intensive hallucinations, and results in a stupor that lasts from two to three days. Sometimes shock and seizures occur. Immediate medical attention is necessary when someone has taken too much nutmeg.

Interactions

Recent studies of the anxiogenic, or anxiety-causing, effects of nutmeg indicate that it counteracts such tranquilizers as diazepam (Valium), ondansetron (Zofran), and buspirone (BuSpar). The specific substance in nutmeg that is responsible for this effect is a compound called trimyristin. There are, however, no known medical conditions that contraindicate the use of nutmeg in small quantities.

Resources

BOOKS

Fetrow, Charles W., and Jaun R. Avila. *Professional's Handbook of Complementary & Alternative Medicines*. Springhouse, 1999.

The PDR Family Guide to Natural Medicines & Healing Therapies. Three Rivers Press, 1999.

The PDR for Herbal Medicines. Medical Economics Com pany, 1998.

Reid, D. *A Handbook of Chinese Healing Herbs*. Shambhala, 1995.

PERIODICALS

Sonavane, G. S., et al. "Anxiogenic Activity of *Myristica fragrans* Seeds." *Pharmacology, Biochemistry and Behavior* 71 (January February 2002): 239 244.

OTHER

"Semen Myristicae." China med.net.http://www.china med.net/research_center.html.

Lori De Milto
Rebecca J. Frey, PhD

Nutrition

Definition

Good nutrition can help prevent disease and promote health. There are six categories of nutrients that the body needs to acquire from food: protein, carbohydrates, fat, fibers, vitamins and minerals, and water.

Proteins

Protein supplies **amino acids** to build and maintain healthy body tissue. There are 20 amino acids considered essential because the body must have all of them in the right amounts to function properly. Twelve of these are manufactured in the body but the other eight amino acids must be provided by the diet. Foods from animal sources such as milk or eggs often contain all these essential amino acids while a variety of plant products must be taken together to provide all these necessary protein components.

Fat

Fat supplies energy and transports nutrients. There are two families of fatty acids considered essential for the body: the omega-3 and **omega-6 fatty acids**. **Essential fatty acids** are required by the body to function normally. They can be obtained from canola oil, **flaxseed** oil, cold-water fish, or **fish oil**, all of which contain **omega-3 fatty acids**, and primrose or **black currant seed oil**, which contain omega-6 fatty acids. The American diet often contains an excess of omega-6 fatty acids and insufficient amounts of omega-3 fats. Increased consumption of omega-3 oils is recommended to help reduce risk of cardiovascular diseases and **cancer** and alleviate symptoms of **rheumatoid arthritis**, **premenstrual syndrome**, **dermatitis**, and **inflammatory bowel disease**.

Foods high in sugar

- Chewing gum
- Chocolate bar
- Chocolate milk
- Fruit yogurt
- Jelly beans
- Ice cream
- Liqueurs
- Peanut butter and jelly sandwich
- Pork and beans
- Soda

(Illustration by Corey Light. Cengage Learning, Gale)

Carbohydrates

Carbohydrates are the body's main source of energy and should be a major part of total daily caloric intake. There are two types of carbohydrates: simple carbohydrates (such as sugar or honey) or complex carbohydrates (such as grains, beans, peas, or potatoes). Complex carbohydrates are preferred because these foods are more nutritious yet have fewer calories per gram compared to fat and cause fewer problems with overeating than fat or sugar. Complex carbohydrates also are preferred over simple carbohydrates for diabetics because they allow better blood glucose control.

Fiber

Fiber is the material that gives plant texture and support. Although it is primarily made up of carbohydrates, it does not have a lot of calories and usually is not broken down by the body for energy. Dietary fiber is found in plant foods such as fruits, vegetables, legumes, nuts, and whole grains.

There are two types of fiber: soluble and insoluble. Insoluble fiber, as the name implies, does not dissolve in water because it contains a high amount of cellulose. Insoluble fiber can be found in the bran of grains, the pulp of fruit and the skin of vegetables. Soluble fiber is the type of fiber that dissolves in water. It can be found in a variety of fruits and vegetables such as apples, oatmeal and oat bran, rye flour, and dried beans.

Although they share some common characteristics such as being partially digested in the stomach and intestines and have few calories, each type of fiber has its own specific health benefits. Insoluble fiber speeds up the transit of foods through the digestive system and adds bulk to the stools, therefore, it is the type of fiber that helps treat **constipation** or **diarrhea** and helps prevent colon cancer. On the other hand, only soluble fiber can lower blood **cholesterol** levels. This type of fiber works by attaching itself to the cholesterol so that it can be eliminated from the body, preventing cholesterol from re-circulating and being reabsorbed into the bloodstream.

Vitamins and minerals

Vitamins are organic substances present in food and required by the body in a minute amount for regulation of metabolism and maintenance of normal growth and functioning. The most commonly known vitamins are A, B_1 (**thiamine**), B_2 (**riboflavin**), B_3 (**niacin**), B_5 (**pantothenic acid**), B_6 (**pyridoxine**), B_7 (**biotin**), B_9 (**folic acid**), B_{12} (cobalamin), C (ascorbic acid), D, E, and K. The B and C vitamins are water-soluble, excess amounts of which are excreted in the urine. The A, D, E, and K vitamins are fat-soluble and will be stored in the body fat.

Minerals are vital to our existence because they are the building blocks that make up muscles, tissues, and bones. They also are important components of many life-supporting systems, such as hormones, oxygen transport, and enzyme systems.

There are two kinds of minerals: the major (or macro) minerals and the trace minerals. Major minerals are the minerals that the body needs in large amounts. The following minerals are classified as major: **calcium**, **phosphorus**, **magnesium**, **sodium**, **potassium**, **sulfur**, and chloride. They are needed to build muscles, blood, nerve cells, teeth, and bones. They also are essential electrolytes that the body requires to regulate blood volume and acid-base balance.

Unlike the major minerals, trace minerals are needed only in tiny amounts. Even though they can be found in the body in exceedingly small amounts, they are also very important to the human body. These minerals participate in most chemical reactions in the body. They also are needed to manufacture important hormones. The following are classified as trace minerals: **iron**, **zinc**, **iodine**, **copper**, **manganese**, fluoride, **chromium**, **selenium**, molybdenum, and **boron**.

Many vitamins (such as vitamins A, C, and E) and minerals (such as zinc, copper, selenium, or manganese) act as **antioxidants**. They protect the body against the damaging effects of free radicals. They scavenge or mop up these highly reactive radicals and change them into inactive, less harmful compounds. In so doing, these essential nutrients have been claimed to help prevent cancer and many degenerative diseases, such as premature **aging**, **heart disease**, autoimmune diseases, arthritis, **cataracts**, **Alzheimer's disease**, and **diabetes mellitus**.

Water

Water helps to regulate body temperature, transport nutrients to cells, and rid the body of waste materials.

Origins

Unlike plants, human beings cannot manufacture most of the nutrients they need to function. They must eat plants and/or other animals. Although nutritional therapy came to the forefront of the public's awareness in the late Twentieth century, the notion that food affects health is not new. John Harvey Kellogg was an early health food pioneer and an advocate of a **high-fiber diet**. An avowed vegetarian, he believed that meat products were particularly detrimental to the colon. In the 1870s, Kellogg founded the Battle Creek Sanitarium, where he developed a diet based on nut and vegetable products.

Benefits

Good nutrition helps individuals achieve general health and well-being. In addition, dietary modifications might be prescribed for a variety of complaints including **allergies**, **anemia**, arthritis, colds, **depression**, **fatigue**, gastrointestinal disorders, high or low blood pressure, **insomnia**, headaches, **obesity**, **pregnancy**, premenstrual syndrome (PMS), respiratory conditions, and **stress**.

Nutritional therapy also may be involved as a complement to the allopathic treatments of cancer, diabetes, and **Parkinson's disease**. Other specific dietary measures include the elimination of food additives for attention deficit hyperactivity disorder (ADHD), gluten-free **diets** for **schizophrenia**, and dairy-free diets for chronic respiratory diseases.

A high-fiber diet helps prevent or treat the following health conditions:

- High cholesterol levels. Fiber effectively lowers blood cholesterol levels. It appears that soluble fiber binds to cholesterol and moves it down the digestive tract so that it can be excreted from the body. This prevents the cholesterol from being reabsorbed into the bloodstream.
- Constipation. A high-fiber diet is the preferred non-drug treatment for constipation. Fiber in the diet adds more bulk to the stools, making them softer and shortening the time foods stay in the digestive tract.
- Hemorrhoids. Fiber in the diet adds more bulk and softens the stool, thus reducing painful hemorrhoidal symptoms.
- Diabetes. Soluble fiber in the diet slows down the rise of blood sugar levels following a meal and helps control diabetes.
- Obesity. Dietary fiber makes a person feel full faster.

- Cancer. Insoluble fiber in the diet speeds up the movement of the stools through the gastrointestinal tract. The faster food travels through the digestive tract, the less time there is for potential cancer-causing substances to work. Therefore, diets high in insoluble fiber help prevent the accumulation of toxic substances that cause cancer of the colon. New studies released in 2003 seemed to confirm these findings. Because fiber reduces fat absorption in the digestive tract, it also may prevent breast cancer.

A diet low in fat also promotes good health and prevents many diseases. Low-fat diets can help treat or control the following conditions:

- Obesity. High fat consumption often leads to excess caloric and fat intake, which increases body fat.
- Coronary artery disease. High consumption of saturated fats is associated with coronary artery disease.
- Diabetes. People who are overweight tend to develop or worsen existing diabetic conditions due to decreased insulin sensitivity.
- Breast cancer. A high dietary consumption of fat is associated with an increased risk of breast cancer.

Description

The four basic food groups, as outlined by the United States Department of Agriculture (USDA) are:

- dairy products (such as milk and cheese)
- meat and eggs (such as fish, poultry, pork, beef, and eggs)
- grains (such as bread, cereals, rice, and pasta)
- fruits and vegetables

The USDA recommendation for adults is that consumption of meat, eggs, and dairy products should not exceed 20% of total daily caloric intake. The rest (80%) should be devoted to vegetables, fruits, and grains. For children age two or older, 55% of their caloric intake should be in the form of carbohydrates, 30% from fat, and 15% from proteins. In addition, saturated fat intake should not exceed 10% of total caloric intake. This low-fat, high-fiber diet is believed to promote health and help prevent many diseases, including heart disease, obesity, and cancer.

Allergenic and highly processed foods should be avoided. Highly processed foods do not contain significant amounts of essential trace minerals. Furthermore, they contain lots of fat and sugar as well as preservatives, artificial sweeteners and other additives. High consumption of these foods causes buildup of these unwanted chemicals in the body and should be avoided. Food allergy causes a variety of symptoms including food cravings, weight gain, bloating, and water retention. It also may worsen chronic inflammatory conditions such as arthritis.

Preparations

An enormous body of research exists in the field of nutrition. Mainstream Western medical practitioners point to studies that show that a balanced diet, based on the USDA Food Guide Pyramid, provides all of the necessary nutrients. However, the USDA is working to revise the pyramid for the first time in a decade. Other pyramids are suggested by various research agencies, many of which emphasize different nutrition areas. A Harvard University researcher emphasizes whole grains and plant oils over meat, dairy and refined carbohydrates. Some nutritionists believe that the USDA will modify the Food Pyramid to reflect similar modifications. The basic pyramid will likely not change, but explanations about the types of fats, grains and carbohydrates that are best to choose are likely.

In the first revision of the Food Guide Pyramid in 2003, the USDA proposed new patterns about how much Americans eat. Calorie recommendations and vitamin intake will be based on a person's age, sex, and activity level. The complete revision was proposed for final publishing in the winter of 2005. As of early 2004, the Food Guide Pyramid recommends the following daily servings in six categories:

- Grains: Six or more servings
- Vegetables: Five servings
- Fruits: Two to four servings
- Meat: Two to three servings
- Dairy: Two to three servings
- Fats and oils: Use sparingly

A new food guide pyramid for various vegetarian diets has been released by the American Dietetic Association (ADA). The guide helps vegetarians obtain the vitamins and minerals they need from whole grains, vegetables, fruits, legumes, nuts and other protein-rich foods.

Precautions

Individuals should not change their diets without the advice of nutritional experts or health care professionals. Certain individuals, especially children, pregnant and lactating women, and chronically ill patients should only change their diets under professional supervision.

Side effects

It is best to obtain vitamins and minerals through food sources. Excessive intake of vitamins and mineral supplements can cause serious physiological problems. 2001 guidelines to help nutritionists counsel cancer patients in use of complementary and alternative medicine reported that 73% of cancer patients used these therapies in addition to their allopathic treatment. Of those, only about 38% discussed the alternative therapies with their physicians. Patients using dietary supplements should document their use, discuss them with their doctor or nutritionist, and watch standard cautions like possible interactions with prescribed drugs, cumulative effects of several supplements containing the same vitamin or mineral, and to stop taking the supplements if adverse reactions occur.

The following is a list of possible side effects resulting from excessive doses of vitamins and minerals:

- vitamin A: Birth defects, irreversible bone and liver damage
- vitamin B_1: Deficiencies in B_2 and B_6
- vitamin B_6: Damage to the nervous system
- vitamin C: affects the absorption of copper; diarrhea
- vitamin D: Hypercalcemia (abnormally high concentration of calcium in the blood)
- phosphorus: affects the absorption of calcium
- zinc: affects absorption of copper and iron; suppression of the immune system

Research and general acceptance

Due to a large volume of scientific evidence demonstrating the benefits of the low-fat, high-fiber diet in disease prevention and treatment, this diet has been accepted and advocated by both complementary and allopathic practitioners.

Resources

BOOKS

Bruce, Debra Fulghum, and Harris H. McIlwain. *The Unofficial Guide to Alternative Medicine*. New York: Macmillan, 1998.

Cassileth, Barrie R. *The Alternative Medicine Handbook*. New York: W.W. Norton, 1998.

Credit, Larry P., Sharon G. Hartunian, and Margaret J. Nowak. *Your Guide to Complementary Medicine*. Gar den City Park, New York: Avery Publishing Group, 1998.

U.S. Preventive Services Task Force Guidelines. "Counseling to Promote a Healthy Diet." *Guide to Clinical Preventive Services, 2nd edition*. http://cpmcnet.columbia.edu/texts/gcps/gcps0066.html.

Winick, Myron. *The Fiber Prescription*. New York: Random House, Inc., 1992.

PERIODICALS

Halbert, Steven C. "Diet and Nutrition in Primary Care: From Antioxidants to Zinc." *Primary Care: Clinics in Office Practice* (December 1997): 825 843.

Mangels, Reed. "New Vegetarian Food Guide." *Vegetarian Journal* (July August 2003): 12.

Shapiro, Alice C., et al. "Guidelines for Responsible Nutrition Counseling on Complementary and Alternative Medicine." *Nutrition Today* (November December 2001): 291 297.

Sugarman, Carole. "USDA Proposes New Intake Patterns for Food Guide Pyramid." *Food Chemical News* (Sept. 15, 2003): 1.

Turner, Lisa. "Good 'n Plenty." *Vegetarian Times* (February 1999):48

"Two Studies Find High fiber Diet Lowers Colon Cancer Risk." *Ca* (July August 2003): 201.

VanBeusekom, Mary. "Converted Food Pyramid: the USDA Revises its Decade old Food Guidelines." *MPLS St. Paul Magazine* (August 2003): 60 64.

Vickers, Andrew, and Catherine Zollman. "Unconventional approaches to nutritional medicine." *British Medical Journal* (November 27, 1999): 1419.

ORGANIZATIONS

American Association of Nutritional Consultants. 810 S. Buffalo Street, Warsaw, IN 46580. (888) 828 2262.

American Dietetic Association. 216 W.Jackson Boulevard, Suite 800, Chicago, IL 60606 6995. (800) 366 1655. http://www.eatright.org/.

Teresa G. Odle

Nutritional supplements *see* **Orthomolecular medicine**

Nux vomica

Description

Nux vomica is the homeopathic remedy that is created from the seeds of the strychnos *Nux vomica* tree. Also known as poison nut or **vomiting** nut, this tree is an evergreen tree that is native to East India, Burma, Thailand, China, and Northern Australia.

The tree belongs to the *Loganiaceae* family and has small flowers and orange colored fruits that are the size of an apple or orange. Inside the fruit are five seeds surrounded by a jelly-like pulp. The ash gray seeds are round and measure 1 in (2.5 cm) in diameter and are

The main alkaloids in the seeds of nux vomica are strychnine and brucine. Strychnine by itself is extremely poisonous, but when given in small doses to humans it promotes appetite, aids digestion, and increases the frequency of urination. *(Bon Appetit / Alamy)*

.25 in (0.6 cm) thick. The seeds are coated with downy hairs that give them a satiny appearance.

The main alkaloids in the seeds are strychnine and brucine. These alkaloids give the seeds their bitter taste. Strychnine by itself is extremely poisonous, but when given in small doses to humans it promotes appetite, aids digestion, and increases the frequency of urination. In the nineteenth century it was used as a central nervous stimulant. In larger doses, however, strychnine produces a loss of appetite, hypersensitivity, **depression**, **anxiety**, and rigidity and stiffness of arms and legs. Toxic doses may cause convulsions and death. Some historians think that Alexander the Great died from drinking wine poisoned by strychnine.

Medicinal use of the nut dates back to the middle of the sixteenth century, where it was written about extensively by Valerius Cordus. Germans used the nut as a treatment for **worms**, **rabies**, hysteria, rheumatism, **gout**, and as an antidote for the plague.

General use

Nux vomica is one of the most frequently used homeopathic remedies, especially for acute conditions. Homeopaths prescribe this polychrest for hangovers, back **pain**, digestive problems, headaches, **allergies**, colds, flu, emotional **stress**, **constipation**, menstrual problems, and **hemorrhoids**.

Nux vomica affects the nervous system. When taken by a healthy person the remedy causes **muscle spasms and cramps**, and even convulsions. It affects all five senses and bodily reflexes and causes extreme sensitivity to light, touch, noise, and smells.

KEY TERMS

Gastritis—Inflammation of the lining of the stomach.

Placebo—An inactive substance with no pharmacological action that is administered to some patients in clinical trials to determine the relative effectiveness of another drug administered to a second group of patients.

Polychrest—A homeopathic remedy that is used in the treatment of many ailments.

Strychnine—A colorless, crystalline poison obtained from the seeds of *Nux vomica*.

Succussion—The act of shaking diluted homeopathic remedies as part of the process of potentization.

The remedy is primarily indicated in ailments that are caused by abuse of narcotic drugs, alcohol, coffee, or tobacco, overindulgence in rich food and drink, and mental strain brought about by too much work. *Nux vomica* patients are typically thin and dark-complected workaholics who wear themselves down by working late, eating heavily, neglecting **exercise**, and overindulging in mood-altering foods such as coffee or alcohol. They are hurried and have an overactive mind, even at night, which is why they often suffer from **insomnia**. Their digestive systems are weakened by the rich, spicy, stimulating food and drink they crave and consume. As such, they suffer from **diarrhea**, constipation, hemorrhoids, digestive problems, and an overall weakened vitality. *Nux vomica* patients catch colds easily and are hypersensitive to light, touch, noise, smells, and the effect of medicines. They are also sensitive to the cold and dislike cold weather immensely. Patients may be tidy and fastidious.

Children who require *Nux vomica* are mischievous, stubborn, sensitive, and easily offended. They like to get their own way and become difficult if they do not.

Mentally, *Nux vomica* patients are irritable, impatient, jealous, suspicious, malicious, never satisfied or content, anxious, argumentative, critical, stubborn, and rude. They have a violent temper and are often suicidal. They also have a difficult time concentrating and their memory often fails them.

Physically they may suffer from **muscle spasms** and twitching of muscles, emaciation, **anemia**, internal muscle tension, numbness of the affected part, an ineffectual urge to urinate, cramping pains, and heat in the stomach, chest, uterus, head, face, and palms of

the hands. The complaints are generally right-sided, especially in conditions of **tonsillitis**, hernias, and renal **colic**.

Symptoms are generally worse in the morning, at night (particularly after midnight or from 3:00 to 4:00 A.M.), in cold or open air, in dry weather, after eating, from cold food and drinks, from lying down or lying on the painful side, during the menstrual cycle, from mental strain, loss of sleep, and from use of alcohol, coffee, and tobacco. Symptoms are better with warmth, warm food and drinks, wet weather, and sleep.

Specific indications

The headaches indicative of *Nux vomica* are concentrated in the forehead (over the eyes) or back of the head. The pains are sharp, bursting pains and the scalp may feel sore and bruised. Constipation and other gastric symptoms are often present. This **headache** is typical of a **hangover** headache. It may be caused by alcohol, cold wind, damp weather, insomnia, mental strain, or overeating. The headache is aggravated by eating, cold air, moving the eyes, or shaking the head. Stillness and quiet relieves the headache, as does pressure, rising in the morning, or lying in bed at night.

The *Nux vomica* cold occurs as a result of exposure to cold, dry wind or from **indigestion**. Colds generally settle in the nose, throat, chest, and ears. Colds are accompanied by a hoarse voice, headache, **sore throat**, **sneezing**, **chills**, a tickling **cough**, **fever**, and bone pains. The voice sounds nasal from the stuffy nose, which is plugged in open air and at night. The nose emits a watery discharge during the day and in a warm room. The patient has a desire for cold water and the eyes are watery. Colds are better from fresh air and worse upon rising in the morning and after eating. The **earache** that accompanies the cold is made worse by swallowing. The ear is itchy and painful.

Flus and **hay fever** both exhibit the *Nux vomica* cold symptoms. The flu may be accompanied by an aching, sore sensation. The hay fever may last throughout the year.

The cough is a dry, tickling cough that comes about in violent fits. It is accompanied by headaches, a sore throat, and pain in the abdomen. Coughs are worse after midnight, from mental exertion, in cold air, and after eating. They are relieved by hot drinks and from fresh air.

Sore throat pains spread to the ears. The throat is raw and the patient may feel as though there is "a lump in his throat." The sore throat is worse from swallowing and cold air.

Fever is accompanied by chills, shivering, and an aching of the back, arms and legs. The fever begins early in the morning around 6:00 or 7:00 A.M. The fever is hot and dry and is often one-sided. The patient becomes chilled when he moves around in bed or when a limb becomes uncovered. He is thirsty and may perspire. The gastric symptoms typical of this remedy may occur with the fever.

Digestive complaints are brought about by overindulging in rich, spicy foods, alcohol, tobacco, or coffee. Disturbances include diarrhea, constipation, and abdominal pains and may be accompanied by **nausea**, vomiting, and indigestion. The patient feels bloated and full. The abdomen is painful and cramped and the patient may be doubled over. He may strain to urinate, defecate, or vomit. The pains are relieved by passing **gas** or passing a stool, from hot drinks, loose clothing, and warmth.

Menstrual difficulties occur throughout the cycle. The period is early, late, or too long. The menses may be heavy and clotted and accompanied by back pain and violent cramps that are aggravated by air or the cold and relieved by warmth and pressure.

Insomnia is caused by excitement, mental exertion, or the effects of alcohol. The patient is sleepy but as soon as her head hits the pillow she is awake. She often wakes up early in the morning, around 3:00 A.M., and cannot get back to sleep.

Recent research

Because *Nux vomica* is prescribed so frequently in homeopathic treatment, it has figured in several different areas of research into homeopathic remedies:

- Gastritis. Studies were done as early as 1966 comparing patients who received *Nux vomica* 4X for gastritis compared with a group that received a placebo. While one study showed that twice as many patients responded to the homeopathic remedy as responded to the placebo, other studies found no difference in the rate of response.
- Alcoholism. A study published in 2001 reported that *Nux vomica* reduced alcohol intake in rats that had been conditioned to crave alcohol. The rise in the number of animal studies using *Nux vomica*, however, has led to some debate among homeopaths regarding the morality of experimentation on animals.
- Abnormal psychology. The compilation of the Constitutional Type Questionnaire, or CTQ, as a homeopathic psychological research instrument has led to studies comparing its findings to those of mainstream psychological measures. One group of researchers reported that subjects who fit the *Nux*

vomica profile on the CTQ scored high in neurotic traits as well as high in chemical intolerance.

Preparations

The seeds of the tree are ground until powdered then mixed with milk sugar. This solution is then diluted and succussed to create the final preparation.

Nux vomica is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or healthcare practitioner should be consulted.

The recommended dose should not be exceeded, as the strychnine in *Nux vomica* is poisonous. People should be careful to use only preparations made by established manufacturers, as cases of accidental strychnine poisoning from non-homeopathic herbal preparations containing *Nux vomica* have been reported.

Side effects

There are no known side effects at recommended dosages, but individual aggravations may occur.

Interactions

When taking any homeopathic remedy, use of **peppermint** products, coffee, or alcohol should be avoided. These products may cause the remedy to be ineffective.

Resources

BOOKS

Cummings, M.D., Stephen, and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Homeopathy. New York: Simon & Schuster, 2002.

PERIODICALS

Bell, I. R., C. M. Baldwin, G. E. Schwartz, and J. R. Davidson. "Homeopathic Constitutional Type Ques tionnaire Correlates of Conventional Psychological and Physical Health Scales: Individual Difference Charac teristics of Young Adults." *Homeopathy* 91 (April 2002): 63 74.

Chan, T. Y. "Herbal Medicine Causing Likely Strychnine Poisoning." *Human and Experimental Toxicology* 21 (August 2002): 467 468.

Sukul, N. C., S. Ghosh, S. P. Sinhababu, and A. Sukul. "Strychnos *Nux vomica* Extract and Its Ultra High Dilution Reduce Voluntary Ethanol Intake in Rats." *Journal of Alternative and Complementary Medicine* 7 (April 2001): 187 193.

Thurneysen, A. "*Nux vomica* and Animal Experiments." *Homeopathy* 91 (January 2002): 59.

ORGANIZATIONS

Foundation for Homeopathic Education and Research. 21 Kittredge St., Berkeley, CA 94704. (510) 649 8930.

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206) 776 4147.

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790. www.homeopathic.org.

Jennifer Wurges
Rebecca J. Frey, PhD

O

Oak

Description

Oak is the common name for many acorn-producing trees and shrubs that are members of the beech, or Fagaceae, family. Oak trees are classified as members of the genus *Quercus*, a Latin word said to be derived from a Celtic word meaning "fine tree." Worldwide there are more than 600 different species of oak. They thrive across the Northern Hemisphere in China, Japan, Europe, the British Isles, and in all of the continental United States except for Alaska. More than half of the 600 species are native to North America. Yet only about 60 varieties grow north of Mexico. In the forests of northern areas that have short summer growing seasons and long winters, such as Canada, northern Europe, and Siberia, varieties of oak are very scarce.

The oak family is a diverse group of trees and shrubs, influenced by climatic and environmental changes. Recent studies indicate that global warming contributes to oak dieback by speeding up the reproduction of beetles and fungi that attack oak trees. There are oaks that grow to heights of about 100 ft (30.5 m), while other types never grow larger than a small shrub. In warmer climates, oaks are evergreens, keep their leaves all year long, and are often used as ornamental trees in parks. In colder climates, they usually drop their leaves in autumn.

Many of these deciduous oaks have leaves that turn brilliant gold or scarlet in the autumn. In spring small, yellow green flowers appear. The male flowers hang in clusters called catkins and have profuse amounts of pollen. This oak pollen is carried by the wind to fertilize female flowers that produce acorns. Oak trees grow very slowly. In 80 years, it's estimated that one will grow to no more than 2 ft (0.6 m) in diameter. Oaks do not even produce acorns for their first 20 years, but they live a very long time. Average life expectancy for most oaks is between 200 and 400 years, and there are oak trees over 800 years old that are still alive.

Oaks are divided into two basic categories: white and red. The leaves of most of these are characteristically lobed, and depending upon the variety, can have anywhere from five to 11 lobes. Historically, the oak has been considered sacred by many civilizations. Abraham's Oak, the Oak of Mamre, is thought to be on the spot where the bible states Abraham pitched his tent. Legend states that anyone defacing this tree will lose their firstborn son. Both the ancient Greeks and Romans revered the oak, but its longest association has been with the British Isles. The Druids considered it to have both medicinal and mystical significance. For centuries, an oak sprig was inscribed on English coins. Legend states that King Arthur's round table was made from one gigantic slice of a very ancient oak tree. Oak has been used as a medicine since the ancient Greek and Roman times. The famous Roman doctor Galen first used oak leaves to heal **wounds**.

The American white oak, *Quercus alba*, and the English oak, *Quercus robur*, have bark with similar healing qualities. Oak bark contains saponins, tannins, calcium oxalate, starch, glycosides, oak-red, resin, pectin, levulin, and quercitol.

General use

Oak wood as timber is prized for its strength, elasticity, and durability. It is ideal for making furniture, barrels, railroad ties, and in the past, ships. Oak acorns are a source of food for wildlife and have been used as fodder for farm animals in the past. A flour made from ground acorns was also a part of the diet of Native Americans. The tannin in oak bark is used in leather preparation. Cork is made from the bark of some species that grow only in Spain and Portugal.

Recent advances in molecular genetics have shown that DNA from samples of oak can be isolated and analyzed. This type of analysis has a variety of potential applications in archaeology and forensic investigations.

English Oak with acorn. *(© ImageState / Alamy)*

KEY TERMS

Bowel astringent—A substance that causes bowel tissue to dry and shrink by reducing its ability to absorb water.

Dermatitis—Inflammation of the skin.

Diuretic—A group of medications that increase the amount of urine produced and relieve excess fluid buildup in body tissues. Diuretics may be used in treating high blood pressure, lung disease, premenstrual syndrome, and other conditions.

Forensic—Pertaining to courtroom procedure or evidence used in courts of law.

Leukorrhea—White discharge from the vagina, normally occurring during the menstrual cycle, pregnancy, lactation, and menopause. A change in color, amount, or odor is a symptom of a reproductive tract disorder.

Staphylococcus—Any of several species of spherical bacteria that occur in groups of four or in irregular clusters. They can infect various parts of the body, especially the skin and mucous membranes.

Tannin—An astringent compound found in chamomile, oak bark, and certain other plants. Tannin in large quantities can interfere with iron absorption.

Oak used to make wine barrels has been found to increase the antioxidant activity of wines aged in the barrels as well as adding a distinctive aroma to the wine. The increase in antioxidant activity can be measured by a new technique known as electron paramagnetic resonance, or EPR.

Oak bark is used in medicine as a bowel astringent to treat **diarrhea** and as an anti-inflammatory gargle for soothing sore throats. It can be used topically for such skin inflammations as **dermatitis**, as an enema for hemorrhoids, or as a douche for vaginal **infections** and leukorrhea. A study in 1980 showed some evidence that oak bark may prevent kidney stone formation and act as a diuretic. A 1990 Russian study demonstrated that oak bark had antibacterial activity against *Staphylococcus*. One study in 1994 showed that oak bark could reduce serum cholesterol levels in animals.

Preparations

One teaspoonful of pulverized oak bark powder can be added to 1 cup of water, boiled, and then simmered at a reduced heat for 15 minutes to make an oak bark tea. This tea can be taken internally as an intestinal astringent up to three times per day. Oak bark is also available in both an extract and a tincture. For rinses, compresses, and gargles, 20 g of pulverized bark should be dissolved in 1 qt (1 L) of water, and prepared in the same manner as the tea. Oak bark is also available as snuff, tablets, and capsules.

Precautions

Oak bark should not be used externally over large areas of skin damage or used as a full bath. Oak bark for gargles, enemas, or douches should not be used for more than two weeks before consulting a doctor. A doctor should also be consulted for any episode of diarrhea that lasts longer than three days despite treatment with oak bark.

Side effects

No side effects have been reported when oak preparations are used at recommended dosage levels. Patients occasionally experience mild stomach upset or **constipation** if the dosage is exceeded.

Interactions

Oak bark preparations are believed to inhibit or reduce the absorption of such alkaline drugs as antacids. In addition, oak bark has been found to reduce the effectiveness of codeine and atropine.

Resources

BOOKS

Grieve, M., and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes and Noble Publishing, 1992.

Hoffman, David, and Linda Quayle. *The Complete Illustrated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. Barnes and Noble Publishing, 1999.

PERIODICALS

Deguilloux, M. F., M. H. Pemonge, and R. J. Petit. "Novel Perspectives in Wood Certification and Forensics: Dry Wood as a Source of DNA." *Proceedings of the Royal Society of London, Series B, Biological Sciences* 269 (May 22, 2002): 1039 1046.

Diaz Playa, E. M., J. R. Reyero, F. Pardo et al. "Influence of Oak Wood on the Aromatic Composition and Quality of Wines with Different Tannin Contents." *Journal of Agriculture and Food Chemistry* 50 (April 24, 2002): 2622 2626.

Kamata, N., N. Kamata, K. Esaki, et al. "Potential Impact of Global Warming on Deciduous Oak Dieback Caused by Ambrosia Fungus *Raffaelea sp*. Carried by Ambrosia Beetle *Platypus quercivorus* (Coleoptera: Platypodidae) in Japan." *Bulletin of Entomological Research* 92 (April 2002): 119 126.

Troup, G. J., and C. R. Hunter. "EPR, Free Radicals, Wine, and the Industry: Some Achievements." *Annual of the New York Academy of Science* (May 2002): 345 347.

ORGANIZATIONS

Herbal Advisor. http//www.AllHerb.com

OnHealth Herbal Index. "Oak Bark." http//www.OnHealth.com

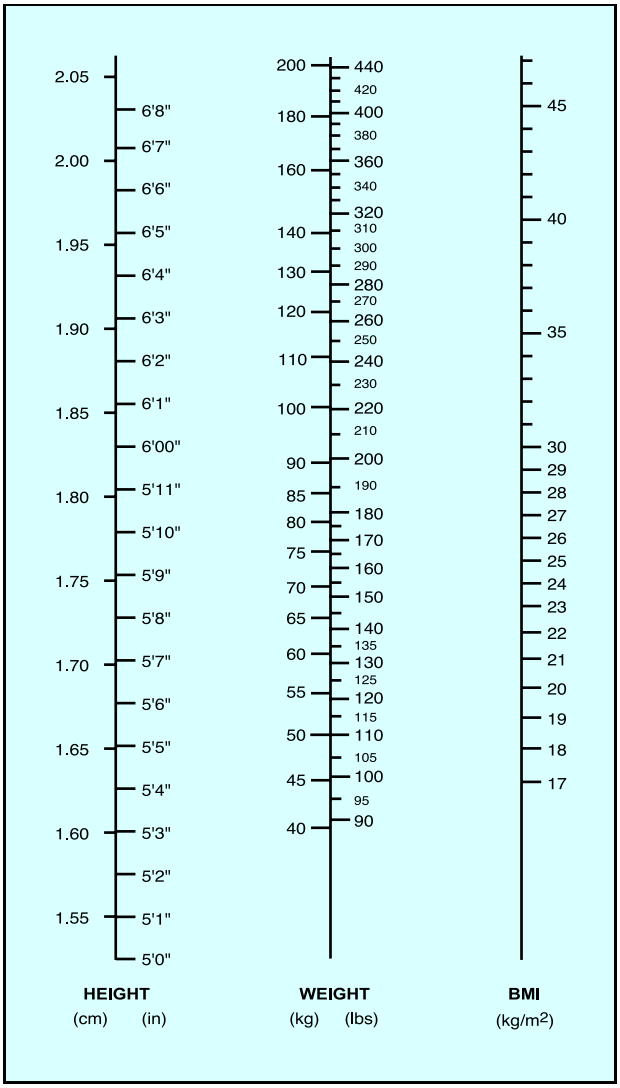
Joan Schonbeck
Rebecca J. Frey, PhD

Oatstraw *see* **Wild oat**

Obesity

Definition

Obesity is an abnormal accumulation of body fat, usually 20% or more over an individual's ideal body weight. Obesity is associated with increased risk of illness, disability, and death.



(Illustration by Argosy Inc. Cengage Learning, Gale)

The branch of medicine that deals with the study and treatment of obesity is known as bariatrics. As obesity has become a major health problem in the United States, bariatrics has become a separate medical and surgical specialty.

Description

Obesity traditionally has been defined as body weight at least 20% above the weight corresponding to the lowest death rate for individuals of a specific height, sex, and age (designated as the ideal weight). Twenty to forty percent over ideal weight is considered mildly obese; 40–100% over ideal weight is considered moderately obese; and 100% over ideal weight is considered severely, or morbidly, obese. According to some estimates, approximately 25% of the United

Percentage of healthy, overweight, and obese adults in the United States

Age ≥20 yrs.	Healthy weight BMI 18.5 to 24.9	Overweight BMI 25.0—29.9	Obese BMI 30 and above
All Adults	32.9%	34.1%	32.2%
Women	35.4%	28.6%	34.6%
Men	30.4%	39.7%	31.1%

SOURCE: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services

(Illustration by GGS Information Services. Cengage Learning, Gale)

States population can be considered obese, 4 million of whom are morbidly obese. Other studies state that over 50% of American adults are obese, based on body mass index (BMI) measurements. Excessive weight can result in many serious, and potentially deadly, health problems, including **hypertension**, Type II **diabetes mellitus** (non-insulin dependent diabetes), increased risk for coronary disease, increased unexplained **heart attack**, hyperlipidemia, **infertility**, and a higher prevalence of colon, prostate, endometrial, and possibly, **breast cancer**. Approximately 300,000 deaths a year are attributed to obesity, prompting leaders in public health, such as former Surgeon General C. Everett Koop to label obesity "the second leading cause of preventable deaths in the United States."

Causes and symptoms

The mechanism for excessive weight gain is clear—more calories are consumed than the body **burns**, and the excess calories are stored as fat (adipose) tissue. However, the exact cause is not as clear and likely arises from a complex combination of factors. Genetic factors significantly influence how the body regulates appetite and the rate at which it turns food into energy (metabolic rate). Studies of adoptees confirm this relationship. The majority of adoptees followed a pattern of weight gain that more closely resembled that of their birth parents than their adoptive parents. A genetic predisposition to weight gain, however, does not automatically mean that a person will be obese. Eating habits and patterns of physical activity also play a significant role in the amount of weight a person gains.

Some recent studies have indicated that the amount of fat in a person's diet may have a greater impact on weight than the number of calories the food contains. Carbohydrates like cereals, breads, fruits and vegetables, and protein (fish, lean meat, turkey breast, skim milk) are converted to fuel almost as soon as they are consumed. Most fat calories are immediately stored in fat cells, which add to the body's weight and girth as they expand and multiply. There is continuing research on the theory that fat is metabolized as fuel and energy and that only excess carbohydrates are converted to stored fat. Current evidence shows that weight gain comes mostly from total calories consumed, rather than from the amount of carbohydrates. A study published in 2002 found that low-fat **diets** are no more effective in weight reduction programs than low-calorie diets. At any rate, a sedentary life-style, particularly prevalent in affluent societies like the United States, can contribute to weight gain. Psychological factors, such as **depression** and low self-esteem may, in some cases, also play a role in weight gain.

KEY TERMS

Adipose tissue—Fat tissue.

Appetite suppressant— A drug that decreases feelings of hunger. Most work by increasing levels of serotonin or catecholamine, chemicals in the brain that control appetite.

Bariatrics—The branch of medicine that deals with the prevention and treatment of obesity and related disorders.

Ghrelin—A recently discovered peptide hormone secreted by cells in the lining of the stomach. Ghrelin is important in appetite regulation and maintaining the body's energy balance.

Hyperlipidemia—A condition characterized by abnormally high levels of lipids in blood plasma.

Hyperplastic obesity—Excessive weight gain in childhood, characterized by an increase in the number of new fat cells.

Hypertension—Abnormally high arterial blood pressure, which if left untreated can lead to heart disease and stroke.

Hypertrophic obesity—Excessive weight gain in adulthood, characterized by expansion of already existing fat cells.

Ideal weight—Weight corresponding to the lowest death rate for individuals of a specific height, gender, and age.

Leptin—A protein hormone that affects feeding behavior and hunger in humans. At present it is thought that obesity in humans may result in part from insensitivity to leptin.

At what stage of life a person becomes obese can effect his or her ability to lose weight. In childhood, excess calories are converted into new fat cells (hyperplastic obesity), while excess calories consumed in adulthood only serve to expand existing fat cells (hypertrophic obesity). Since dieting and **exercise** can only reduce the size of fat cells, not eliminate them, persons who were obese as children can have great difficulty losing weight, since they may have up to five times as many fat cells as someone who became overweight as an adult.

Obesity can also be a side effect of certain disorders and conditions, including:

- Cushing's syndrome, a disorder involving the excessive release of the hormone cortisol
- hypothyroidism, a condition caused by an underactive thyroid gland
- neurologic disturbances, such as damage to the hypothalamus, a structure located deep within the brain that helps regulate appetite
- consumption of certain drugs, such as steroids, antipsychotic medications, or antidepressants

The major symptoms of obesity are excessive weight gain and the presence of large amounts of fatty tissue. Obesity can also give rise to several secondary conditions, including:

- arthritis and other orthopedic problems, such as lower back pain
- heartburn
- high cholesterol levels
- high blood pressure
- menstrual irregularities or cessation of menstruation (amenorhhea)
- shortness of breath that can be incapacitating
- skin disorders, arising from the bacterial breakdown of sweat and cellular material in thick folds of skin or from increased friction between folds

Diagnosis

Dignosis of obesity is made by observation and by comparing the patient's weight to ideal weight charts. Many doctors and obesity researchers refer to the body mass index (BMI), which uses a height-weight relationship to calculate an individual's ideal weight and personal risk of developing obesity-related health problems. Physicians may also obtain direct measurements of an individual's body fat content by using calipers to measure skin-fold thickness at the back of the upper arm and other sites. The most accurate means of measuring body fat content involves immersing a person in water and measuring relative displacement; however, this method is very impractical and is usually only used in scientific studies requiring very specific assessments. Women whose body fat exceeds 30% and men whose body fat exceeds 25% are generally considered obese.

Doctors may also note how a person carries excess weight on his or her body. Studies have shown that this factor may indicate whether or not an individual has a predisposition to develop certain diseases or conditions that may accompany obesity. "Apple-shaped" individuals who store most of their weight around the waist and abdomen are at greater risk for **cancer**, **heart disease**, **stroke**, and diabetes than "pear-shaped" people whose extra pounds settle primarily in their hips and thighs.

Treatment

Treatment of obesity depends primarily on the degree of a person's overweight and his or her overall health. However, to be successful, any treatment must affect life-long behavioral changes rather than short-term weight loss. "Yo-yo" dieting, in which weight is repeatedly lost and regained, has been shown to increase a person's likelihood of developing fatal health problems than if the weight had been lost gradually or not lost at all. Behavior-focused treatment should concentrate on:

- What a person eats and how much. This aspect may involve keeping a food diary and developing a better understanding of the nutritional value and fat content of foods. It may also involve changing grocery shopping habits (e.g. buying only what is on a prepared list and going only on a certain day), timing of meals (to prevent feelings of hunger, a person may plan frequent small meals), and actually slowing down the rate at which a person eats.
- How a person responds to food. This may involve understanding what psychological issues underlie a person's eating habits. For example, one person may binge eat when under stress, while another may always use food as a reward. In recognizing these psychological triggers, an individual can develop alternate coping mechanisms that do not focus on food.
- How people spend their time. Making activity and exercise an integral part of everyday life is a key to achieving and maintaining weight loss. Starting slowly and building endurance keeps individuals from becoming discouraged. Varying routines and trying new activities also keeps interest high.

For most who are mildly obese, these behavior modifications entail lifestyle changes they can make

independently while being supervised by a family physician. Other mildly obese persons may seek the help of a commercial weight loss program (e.g. Weight Watchers). The effectiveness of these programs is difficult to assess, since programs vary widely, dropout rates are high, and few employ members of the medical community. However, programs that emphasize realistic goals, gradual progress, sensible eating, and exercise can be very helpful and are recommended by many doctors. Programs that promise instant weight loss or feature severely restricted diets are not effective and, in some cases, can be dangerous.

For individuals who are moderately obese, medically supervised behavior modification and weight loss are required. While doctors will put most moderately obese patients on a balanced low-calorie diet (1200–1500 calories a day), they may recommend that certain individuals follow a very low-calorie liquid protein diet (400–700 calories) for as long as three months. This therapy, however, should not be confused with commercial liquid-protein diets or commercial weight-loss shakes and drinks. Doctors tailor these diets to specific patients, monitor patients carefully, and use them for only a short period of time. In addition to reducing the amount and type of calories consumed by the patient, doctors will recommend professional therapists or psychiatrists who can help the individual effectively change his or her behavior in regard to eating.

The Chinese herb **ephedra** (*Ephedra sinica*, or ma huang), combined with exercise and a low-fat diet in physician-supervised weight-loss programs, can cause at least a temporary increase in weight loss. However, the large doses of ephedra required to achieve the desired result can also cause:

- anxiety
- heart arrhythmias
- heart attack
- high blood pressure
- insomnia
- irritability
- nervousness
- seizures
- strokes
- death

Ephedra should not be used by anyone with a history of diabetes, heart disease, or thyroid problems. It is not recommended for long-term use, and can cause serious medical or psychiatric problems if used too long. An article that appeared in the *Journal of the American Medical Association* in early 2003 advised against the use of ephedra.

Diuretic herbs, which increase urine production, can cause short-term weight loss but cannot help patients achieve lasting weight control. The body responds to heightened urine output by increasing thirst to replace lost fluids, and patients who use diuretics for an extended period of time eventually start retaining water again anyway. In moderate doses, **psyllium**, a mucilaginous herb available in bulk-forming laxatives like Metamucil, absorbs fluid and makes patients feel as if they have eaten enough. Red peppers and mustard help patients lose weight more quickly by accelerating the metabolic rate. They also make people more thirsty, so they crave water instead of food. Walnuts contain serotonin, the brain chemical that tells the body it has eaten enough. **Dandelion** (*Taraxacum officinale*) can raise metabolism and counter a desire for sugary foods.

The amino acid 5-hydroxytryptophan, or **5-HTP**, which is extracted from the seeds of the *Griffonia simplicifolia* plant, is thought to increase serotonin levels in the brain. Serotonin is a neurotransmitter, or brain chemical, that regulates mood and thus can be linked to mood-related eating behaviors. When physical and mental **stress** reduces serotonin levels in the body, 5-HTP may be helpful in regulating mood by boosting serotonin levels. Individuals should consult with their healthcare professional before taking 5-HTP, as the amino acid may interact with other medications and can have potentially serious side effects.

Acupressure and **acupuncture** can also suppress food cravings. Visualization and **meditation** can create and reinforce a positive self-image that enhances the patient's determination to lose weight. By improving physical strength, mental concentration, and emotional serenity, **yoga** can provide the same benefits. Also, patients who play soft, slow music during meals often find that they eat less food but enjoy it more.

Eating the correct ratio of protein, carbohydrates, and good-quality fats can help in weight loss via enhancement of metabolism. Support groups and self-help groups such as Overeaters Anonymous and TOPS (Taking Off Pounds Sensibly) that are informed about healthy, nutritious, and balanced diets can offer an individual the support he or she needs to maintain this type of eating regimen.

Allopathic treatment

For individuals who are severely obese, dietary changes and behavior modification may be accompanied by surgery to reduce or bypass portions of the stomach or small intestine. The risks of obesity surgery have declined in recent years, but it is still only

performed on patients for whom other strategies have failed and whose obesity seriously threatens their health. Other surgical procedures are not recommended, including liposuction, a purely cosmetic procedure in which a suction device is used to remove fat from beneath the skin, and jaw wiring, which can damage gums and teeth and cause painful **muscle spasms**.

A newer approach to weight loss is the development of functional foods, which are food products that incorporate natural compounds shown to help in weight loss programs. These compounds include carbohydrates with a low glycemic index, which help to suppress appetite; **green tea** extract, which increases the body's energy expenditure; and **chromium**, which encourages the body to burn stored fat rather than lean muscle tissue. Functional food products are currently undergoing clinical testing.

Appetite suppressant drugs are sometimes prescribed to aid in weight loss. These drugs work by increasing levels of serotonin or catecholamine, which are brain chemicals that control moods and feelings of fullness. Appetite suppressants, though, are not considered truly effective, since most of the weight lost while taking them is usually regained after stopping. Also, suppressants containing amphetamines can be potentially abused by patients. While most of the immediate side effects of these drugs are harmless, the long-term effects in many cases, are unknown. Two drugs, dexfenfluramine hydrochloride (Redux) and fenfluramine (Pondimin) as well as a combination fenfluramine-phentermine (Fen/Phen) drug, were taken off the market when they were shown to cause potentially fatal heart defects. In 1999, the United States Food and Drug Administration (FDA) approved a new prescription weight loss drug, Orlistat. Unlike other anti-obesity drugs that act as appetite suppressants, Orlistat encourages weight loss by inhibiting the body's ability to absorb dietary fat. The drug can cause side effects of abdominal cramping, **gas**, and **diarrhea**.

Other weight-loss medications available with a doctor's prescription include:

- Sibutramine (Meridia)
- Diethylpropion (Tenuate, Tenuate Dospan)
- Mazindol (Mazanor, Sanorex)
- Phendimetrazine (Bontril, Prelu-2)
- Phentermine (Adipex-P, Fastin, Ionamin, Oby-Cap)

Phenylpropanolamine (Acutrim, Dextarim) is the only nonprescription weight-loss drug approved by the FDA. These over-the-counter diet aids can boost weight loss by 5%. Combined with diet and exercise and used only with a doctor's approval, prescription anti-obesity medications enable some patients to lose 10% more weight than they otherwise would. Most patients regain lost weight after discontinuing use of either prescription medications or nonprescription weight-loss products.

Prescription medications or over-the-counter weight loss products can cause:

- constipation
- dry mouth
- headache
- irritability
- nausea
- nervousness
- sweating

None of the weight loss drugs should be used by patients taking monoamine oxidate inhibitors (MAO inhibitors).

Doctors sometimes prescribe fluoxetine (Prozac), an antidepressant that can increase weight loss by about 10%. Weight loss may be temporary and side effects of this medication include diarrhea, **fatigue**, **insomnia**, **nausea**, and thirst. Weight loss drugs currently being developed or tested include ones that can prevent fat absorption or digestion, reduce the desire for food and prompt the body to burn calories more quickly, and regulate the activity of substances that control eating habits and stimulate overeating.

Expected results

As many as 85% of dieters who do not exercise on a regular basis regain their lost weight within two years. In five years, the figure rises to 90%. Repeatedly losing and regaining weight (yo-yo dieting) encourages the body to store fat and may increase a patient's risk of developing heart disease. The primary factor in achieving and maintaining weight loss is a lifelong commitment to regular exercise and sensible eating habits.

Prevention

Obesity experts suggest that a key to preventing excess weight gain is monitoring fat consumption rather than counting calories, and the National **Cholesterol** Education Program maintains that only 30% of calories should be derived from fat. Only one-third of those calories should be contained in saturated fats (the kind of fat found in high concentrations in meat, poultry, and dairy products). Because most people eat more than they think they do, keeping a detailed food

diary is a useful way to assess eating habits. Eating three balanced, moderate-portion meals a day—with the main meal at mid-day—is a more effective way to prevent obesity than **fasting** or crash diets. Exercise increases the metabolic rate by creating muscle, which burns more calories than fat. When regular exercise is combined with regular, healthful meals, calories continue to burn at an accelerated rate for several hours. Finally, encouraging healthful habits in children is a key to preventing childhood obesity and the health problems that follow in adulthood.

New directions in obesity treatment

The rapid rise in the incidence of obesity in the United States since 1990 has prompted researchers to look for new treatments. One approach involves the application of antidiabetes drugs to the treatment of obesity. Metformin (Glucophage), a drug that was approved by the Food and Dug Administration (FDA) in 1994 for the treatment of type 2 diabetes, shows promise in treating obesity associated with **insulin resistance**.

Another field of obesity research is the study of hormones, particularly leptin, which is produced by fat cells in the body, and ghrelin, which is secreted by cells in the lining of the stomach. Both hormones are known to affect appetite and the body's energy balance. Leptin is also related to reproductive function, while ghrelin stimulates the pituitary gland to release growth hormone. Further studies of these two hormones may lead to the development of new medications to control appetite and food intake.

A third approach to obesity treatment involves research into the social factors that encourage or reinforce weight gain in humans. Researchers are looking at such issues as the advertising and marketing of food products; media stereotypes of obesity; the development of eating disorders in adolescents and adults; and similar questions.

Resources

BOOKS

Ackerman, Norman. *5 HTP: The Natural Way to Overcome Depression, Obesity, and Insomnia*. New York: Bantam Books, 1999.

Flancbaum, Louis, MD, with Erica Manfred and Deborah Biskin. *The Doctor's Guide to Weight Loss Surgery*. West Hurley, NY: Fredonia Communications, 2001.

Harris, Dan R., ed. *Diet and Nutrition Sourcebook*. Detroit, MI: Omnigraphics, 1996.

"Nutritional Disorders: Obesity." Section 1, Chapter 5 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Aronne, L. J., and K. R. Segal. "Weight Gain in the Treatment of Mood Disorders." *Journal of Clinical Psychiatry* 64 (2003 Supplement 8): 22 29.

Bell, S. J., and G. K. Goodrick. "A Functional Food Product for the Management of Weight." *Critical Reviews in Food Science and Nutrition* 42 (March 2002): 163 178.

Brudnak, M. A. "Weight Loss Drugs and Supplements: Are There Safer Alternatives?" *Medical Hypotheses* 58 (January 2002): 28 33.

Colquitt, J., A. Clegg, M. Sidhu, and P. Royle. "Surgery for Morbid Obesity." *Cochrane Database Systems Review* 2003: CD003641.

Espelund, U., T. K. Hansen, H. Orskov, and J. Frystyk. "Assessment of Ghrelin." *APMIS Supplementum* 109 (2003): 140 145.

Hundal, R. S., and S. E. Inzucchi. "Metformin: New Understandings, New Uses." *Drugs* 63 (2003): 1879 1894.

Pirozzo, S., C. Summerbell, C. Cameron, and P. Glasziou. "Advice on Low Fat Diets for Obesity (Cochrane Review)." *Cochrane Database Systems Review* 2002: CD003640.

Schurgin, S., and R. D. Siegel. "Pharmacotherapy of Obesity: An Update." *Nutrition in Clinical Care* 6 (January April 2003): 27 37.

Shekelle, P. G., M. L. Hardy, S. C. Morton, et al. "Efficacy and Safety of Ephedra and Ephedrine for Weight Loss and Athletic Performance: A Meta Analysis." *Journal of the American Medical Association* 289 (March 26, 2003): 1537 1545.

Tataranni, P. A. "Treatment of Obesity: Should We Target the Individual or Society?" *Current Pharmaceutical Design* 9 (2003): 1151 1163.

Veniant, M. M., and C. P. LeBel. "Leptin: From Animals to Humans." *Current Pharmaceutical Design* 9 (2003): 811 818.

ORGANIZATIONS

American Dietetic Association. (800) 877 1600. www.eatright.org.

American Obesity Association (AOA). 1250 24th Street NW, Suite 300, Washington, DC 20037. (202) 776 7711 or (800) 98 OBESE. www.obesity.org.

American Society of Bariatric Physicians. 5453 East Evans Place, Denver, CO 80222 5234. (303) 770 2526. www.asbp.org.

American Society for Bariatric Surgery. 7328 West University Avenue, Suite F, Gainesville, FL 32607. (352) 331 4900. www.asbs.org.

North American Association for the Study of Obesity. 8630 Fenton St., Suite 412, Silver Spring, MD, 20910. (301) 563 6526. www.naaso.org.

Overeaters Anonymous. P.O. Box 44020, Rio Rancho, New Mexico, 87174 4020. (505) 891 2664. www.overeatersanonymous.org.

Weight control Information Network (WIN). 1 WIN Way, Bethesda, MD 20892 3665. (202) 828 1025 or (877) 946 4627.

Paula Ford-Martin
Rebecca J. Frey, PhD

Obsessive-compulsive disorder

Definition

Obsessive-compulsive disorder (OCD) is a type of **anxiety** disorder characterized by distressing repetitive thoughts, impulses, or images that are intense, frightening, absurd, or unusual. These thoughts are followed by ritualized actions that are usually bizarre and irrational. These ritual actions, known as compulsions, help reduce anxiety caused by the individual's obsessive thoughts. Often described as the "disease of doubt," the sufferer usually knows the obsessive thoughts and compulsions are irrational but, on another level, fears they may be true.

Description

Almost one out of every 40 people will suffer from obsessive-compulsive disorder at some time in their lives. The condition is two to three times more common than either **schizophrenia** or manic **depression**, and strikes men and women of every ethnic group, age, and social level. Because the symptoms are so distressing, sufferers often hide their fears and rituals but cannot avoid acting on them. OCD sufferers are often unable to decide if their fears are realistic and need to be acted upon.

Most people with obsessive-compulsive disorder have both obsessions and compulsions, but occasionally a person will have just one or the other. The degree to which this condition can interfere with daily living also varies. Some people are barely bothered, while others find the obsessions and compulsions to be profoundly traumatic and spend a great deal of time each day in compulsive actions.

Obsessions are intrusive, irrational thoughts that keep popping up in a person's mind, such as, "My hands are dirty, I must wash them again." Typical obsessions include fears of dirt, germs, contamination, and violent or aggressive impulses. Other obsessions include feeling responsible for others' safety, or an irrational fear of hitting a pedestrian with a car. Additional obsessions may involve intrusive sexual thoughts. The patient may fear acting out the strong sexual thoughts in a hostile way. People with obsessive-compulsive disorder may have an intense preoccupation with order and symmetry, or be unable to throw anything out.

Compulsions usually involve repetitive rituals such as excessive washing (especially handwashing or bathing), cleaning, checking and touching, counting, arranging, or hoarding. As the person performs these acts, he may feel temporarily better, but there is no long lasting sense of satisfaction or completion after the act is performed. Often, a person with obsessive-compulsive disorder believes that if the ritual isn't performed, something dreadful will happen. While these compulsions may temporarily ease **stress**, short-term comfort is purchased at a heavy price–time spent repeating compulsive actions and a long-term interference with life.

The difference between OCD and other compulsive behavior is that while people who have problems with gambling, overeating, or **substance abuse** may appear to be compulsive, these activities also provide pleasure to some degree. The compulsions of OCD, on the other hand, are never pleasurable.

KEY TERMS

Anxiety disorder—This is the experience of prolonged, excessive worry about circumstances in one's life. It disrupts daily life.

Cognitive-behavior therapy—A form of psychotherapy that seeks to modify behavior by manipulating the environment to change the patient's response.

Compulsion—A rigid behavior that is repeated over and over each day.

Obsession—A recurring, distressing idea, thought, or impulse that feels "foreign" or alien to the individual.

Scrupulosity—A spiritual disorder characterized by perfectionism and obsessive fears of God's punishment. Some patients with OCD also develop religious scrupulosity.

Selective serotonin reuptake inhibitors (SSRIs)—A class of antidepressants that work by blocking the reabsorption of serotonin in brain cells, raising the level of the chemical in the brain. SSRIs include Prozac, Zoloft, Luvex, and Paxil.

Serotonin—One of three major neurotransmitters found in the brain that is related to emotion, and is linked to the development of depression and obsessive-compulsive disorder.

OCD may be related to some other conditions, such as the continual urge to pull out body hair (trichotillomania); fear of having a serious disease (hypochondriasis), or preoccupation with imagined defects in personal appearance disorder (body dysmorphic disorder). Some people with OCD also have **Tourette syndrome**, a condition featuring tics and unwanted vocalizations (such as swearing). OCD is often linked with depression and other anxiety disorders.

Causes and symptoms

The tendency to develop obsessive-compulsive disorder appears to be inherited. In the summer of 2002, researchers at the University of Michigan identified a segment of human chromosome 9p as containing genes for susceptibility to OCD. Other chromosomes that may also be linked to OCD are 19q and 6p.

There are several theories behind the cause of OCD. Some experts believe that OCD is related to a chemical imbalance within the brain that causes a communication problem between the front part of the brain (frontal lobe) and deeper parts of the brain responsible for the repetitive behavior. Research has shown that the orbital cortex located on the underside of the brain's frontal lobe is overactive in OCD patients. This may be one reason for the feeling of alarm that pushes the patient into compulsive, repetitive actions. The higher-than-average rate of concurrent eating disorders in patients diagnosed with OCD has been attributed to the fact that hyperactivity in the orbital cortex is associated with both disorders. It is possible that people with OCD experience overactivity deep within the brain that causes the cells to get "stuck," much like a jammed transmission in a car damages the gears. This could lead to the development of rigid thinking and repetitive movements common to the disorder. The fact that drugs which boost the levels of serotonin (a brain chemical linked to emotion) in the brain can reduce OCD symptoms may indicate that to some degree OCD is related to brain serotonin levels.

Recently, scientists have identified an intriguing link between childhood episodes of **strep throat** and the development of OCD. It appears that in some vulnerable children, strep antibodies attack a certain part of the brain. Antibodies are cells that the body produces to fight specific diseases. That attack results in the development of excessive washing or germ **phobias**. A phobia is a strong but irrational fear. In this instance the phobia is fear of disease germs present on commonly handled objects. These symptoms would normally disappear over time, but some children who have repeated **infections** may develop full-blown OCD. Treatment with antibiotics has resulted in lessening of the OCD symptoms in some of these children.

If one person in a family has obsessive-compulsive disorder, there is a 25% chance that another immediate family member has the condition. It also appears that stress and psychological factors may worsen symptoms, which usually begin during adolescence or early adulthood.

Some studies indicate that the nature of parent-child interactions is an important factor in the development of OCD. Observers have often remarked that parents and children in OCD families can be differentiated from members of other types of families on the basis of behavior. One Australian study described the parents of children with OCD as "...less confident in their child's ability, less rewarding of independence, and less likely to use positive problem solving."

OCD has also sometimes been linked to religion, in that the symptoms of some persons diagnosed with OCD reflect religious beliefs or practices. Christian clergy have been trained since the Middle Ages to recognize a specific spiritual problem known as scrupulosity, in which a person is troubled by excessive fears of God's punishment or fears of having sinned and offended God. A new inventory for measuring scrupulosity in devout Jews as well as Protestants and Catholics has been tested at the University of Pennsylvania and appears to be a reliable instrument for evaluating OCD symptoms that take religious forms. Scrupulosity has been traditionally treated in both Judaism and Christianity by consultation with a rabbi, priest, or pastor who is able to correct the distorted beliefs that underlie the obsessions or compulsions. In some cases the clergyperson may also use an appropriate religious ritual in treating scrupulosity.

Diagnosis

People with obsessive-compulsive disorder feel ashamed of their problem and often try to hide their symptoms. They may avoid seeking treatment. Because they can be very good at keeping their problem from friends and family, many sufferers do not get the help they need until the behaviors are deeply ingrained habits and harder to change. As a result, the condition is often misdiagnosed or underdiagnosed. All too often, it can take more than a decade between the onset of symptoms and proper diagnosis and treatment.

While scientists seem to agree that OCD is related to a disruption in serotonin levels, there is no blood test for the condition. Instead, doctors diagnose OCD after evaluating a person's symptoms and history.

Treatment

Because OCD sometimes responds to selective serotonin reuptake inhibitors (SSRI) antidepressants, herbalists believe a **botanical medicine** called **St. John's wort** (*Hypericum perforatum*) might have some beneficial effect as well. Known popularly as "Nature's Prozac," St. John's wort is prescribed by herbalists for the treatment of anxiety and depression. They believe that this herb affects brain levels of serotonin in the same way that SSRI antidepressants do. Herbalists recommend a dose of 300 mg, three times per day. In about one out of 400 people, St. John's wort (like Prozac) may initially increase the level of anxiety. Homeopathic constitutional therapy can help rebalance the patient's mental, emotional, and physical well-being, allowing the behaviors of OCD to abate over time.

Other alternative treatments for OCD are intended to lower the patient's anxiety level; some are thought to diminish the compulsions themselves. Alternative recommendations include the following:

- Bach flower remedies: White chestnut, for obsessive thoughts and repetitive thinking.
- Traditional Chinese medicine: a mixture of bupleurum and dong quai, to strengthen the spleen and regulate the liver. In Chinese medicine, obsessive-compulsive disorder is due to liver stagnation and a weak spleen.
- Aromatherapy: a mixture of lavender, rosemary, and valerian for relaxation.
- Yoga: Yogis in India developed a special technique of yogic breathing specifically for OCD. The specific yogic technique for treating OCD requires blocking the right nostril with the tip of the thumb; slow deep inspiration through the left nostril; holding the breath; and slow complete expiration through the left nostril. This is followed by a long breath-holding out period.
- Schuessler tissue salts: for OCD, 10 tablets of *Ferrum phosphorica* 30X and 10 tablets of *Kali phosphorica* 200X, twice daily.
- Massage therapy: with special emphasis on loosening the muscles in the neck, back, and shoulders.

Cognitive-behavioral therapy (CBT) teaches patients how to confront their fears and obsessive thoughts by making the effort to endure or wait out the activities that usually cause anxiety without compulsively performing the calming rituals. Eventually their anxiety decreases. People who are able to alter their thought patterns in this way can lessen their preoccupation with the compulsive rituals. At the same time, the patient is encouraged to refocus attention elsewhere, such as on a hobby.

Allopathic treatment

Obsessive-compulsive disorder can be effectively treated by a combination of cognitive-behavioral therapy and medication that regulates the brain's serotonin levels. Drugs that are approved to treat obsessive-compulsive disorder include fluoxetine (Prozac), fluvoxamine (Luvox), paroxetine (Paxil), and sertraline (Zoloft), all SSRIs that affect the level of serotonin in the brain. Drugs should be taken for at least 12 weeks before deciding whether or not they are effective.

In a few severe cases where patients have not responded to medication or **behavioral therapy**, brain surgery may be attempted to relieve symptoms. Surgery can help up to a third of patients with the most severe form of OCD. The most common operation involves removing a section of the brain called the cingulate cortex. The serious side effects of this surgery for some patients include seizures, personality changes, and decreased ability to plan.

Expected results

Obsessive-compulsive disorder is a chronic disease that, if untreated, can last for decades, fluctuating from mild to severe and worsening with age. When treated by a combination of drugs and behavioral therapy, some patients go into complete remission. Unfortunately, not all patients have such a good response. About 20% of people cannot find relief with either drugs or behavioral therapy. Hospitalization may be required in some cases.

Resources

BOOKS

Dumont, Raeann. *The Sky is Falling: Understanding and Coping with Phobias, Panic and Obsessive Compulsive Disorders*. New York: W.W. Norton & Co., 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Anxiety." New York: Simon & Schuster, 2002.

Schwartz, Jeffrey. *Brain Lock*. New York: HarperCollins, 1996.

Schwartz, Jeffrey. *Free Yourself from Obsessive Compulsive Behavior: A Four Step Self Treatment Method to Change Your Brain Chemistry*. New York: HarperCollins, 1996.

Swedo, S.E., and H. L. Leonard. *It's Not All In Your Head.* New York: HarperCollins, 1996.

PERIODICALS

Abramowitz, J. S., J. D. Huppert, A. B. Cohen, et al. "Religious Obsessions and Compulsions in a Non

Clinical Sample: The Penn Inventory of Scrupulosity (PIOS)." *Behaviour Research and Therapy* 40 (July 2002): 825 838.

Barrett, P., A. Shortt, and L. Healy. "Do Parent and Child Behaviours Differentiate Families Whose Children Have Obsessive Compulsive Disorder from Other Clinic and Non Clinic Families?" *Journal of Child Psychology and Psychiatry* 43 (July 2002): 597 607.

Hanna, G. L., J. Veenstra Vanderweele, N. J. Cox, et al. "Genome Wide Linkage Analysis of Families with Obsessive Compulsive Disorder Ascertained through Pediatric Probands." *American Journal of Medical Genetics* 114 (July 8, 2002): 541 552.

Lin, H., C. B. Yeh, B. S. Peterson, et al. "Assessment of Symptom Exacerbations in a Longitudinal Study of Children with Tourette's Syndrome or Obsessive Compulsive Disorder." *Journal of the American Academy of Child and Adolescent Psychiatry* 41 (September 2002): 1070 1077.

Pelchat, M. L. "Of Human Bondage: Food Craving, Obsession, Compulsion, and Addiction." *Integrative Physiological and Behavioral Science* 76 (July 2002): 347 352.

Sica, C., C. Novara, and E. Sanavio. "Religiousness and Obsessive Compulsive Cognitions and Symptoms in an Italian Population." *Behaviour Research and Therapy* 40 (July 2002): 813 823.

Stein, D. J. "Obsessive Compulsive Disorder." *Lancet* 360 (August 3, 2002): 397 405.

Talan, Jamie. "A Link to Strep, Behavior: The Infection May Trigger Obsessive Compulsive Symptoms." *Newsday* (May 21, 1996): B31.

ORGANIZATIONS

American Academy of Child and Adolescent Psychiatry. 3615 Wisconsin Avenue, NW, Washington, DC 20016 3007. (202) 966 7300. Fax: (202) 966 2891. www.aacap.org.

American Psychiatric Association. 1400 K Street, NW. Washington, DC 20005. (202) 682 6220. www.psych.org.

Anxiety Disorders Association of America. 11900 Parklawn Dr., Ste. 100, Rockville, MD 20852. (301) 231 9350. http://adaa.org.

National Alliance for the Mentally Ill (NAMI). 200 N.Glebe Rd., #1015, Arlington, VA 22203 3728. (800) 950 NAMI. http://www.nami.org.

National Anxiety Foundation. 3135 Custer Dr., Lexington, KY 40517. (606) 272 7166. http://www.lexington online.com/naf.html.

National Institutes of Mental Health (NIMH). Information Resources and Inquires Branch. 5600 Fishers Lane, Rm.7C 02, MSC 8030, Bethesda, MD20892. (301) 443 4513. http://www.nimh.nih.gov.

Paula Ford-Martin
Rebecca J. Frey, PhD

OCD *see* **Obsessive-compulsive disorder**

Omega–3 fatty acids

Description

Omega-3 fatty acids are one of two groups of fatty acids—the omega-3s and the omega-6s—that are vital to human life. The omega-3 fatty acids get their name from the fact that the molecules of which they are made contain a double bond attached to the number 3 carbon atom, counting from the end of the molecule opposite the carboxyl group, the so-called omega end of the molecule. (This system of nomenclature is just the reverse of the one used by chemists.) The omega-3 fatty acids are called **essential fatty acids** (EFAs) because the body is unable to make them, but they are essential for normal growth and development. These fats must be supplied by diet. People living in industrialized western countries eat up to 30 times more omega-6 than omega-3 fatty acids, resulting in a relative deficiency of omega-3 fats. Omega-6 metabolic products (inflammatory prostaglandins, thromboxanes, and leukotrienes) are formed in excessive amounts causing allergic and inflammatory disorders

Sources of omega 3 fatty acids

- Beans, navy or kidney
- Canola oil
- Fish, fatty
  - Albacore tuna
  - Anchovies
  - Herring
  - Lake trout
  - Mackerel
  - Salmon
  - Sardines
- Flaxseed (ground) and flaxseed oil
- Hemp seed/hemp nut (ground) and hemp oil
- Olive oil
- Soybeans and soybean oil
- Tofu
- Walnuts
- Winter squash

(Illustration by Corey Light. Cengage Learning, Gale)

and making the body more prone to heart attacks, strokes, and **cancer**. Eating foods rich in omega-3 acids or taking **fish oil** supplements can restore the balance between the two fatty acids and can possibly reverse these disease processes.

General use

Heart disease and stroke

The American Heart Association (AHA) has endorsed omega-3 fatty acids as good for the heart. The omega-3 oils increase the concentrations of good **cholesterol** (high density lipoproteins, HDL) while decreasing the concentrations of bad cholesterol (low-density lipoproteins, LDL) and triglycerides. In addition, eating omega-3-rich food results in a moderate decrease in total cholesterol level. In one study of 38 women, **flaxseed** flour, which contains high amounts of omega-3 fatty acids, decreased total cholesterol level by 6.9% and LDL cholesterol by 14.7%. In addition, lipoprotein(a), which is associated with heart attacks in older women, decreased by almost 10%. Thus, omega-3 fatty acids are natural alternatives to estrogen in prevention of heart attacks in postmenopausal women.

Furthermore, omega-3 oils protect the heart by preventing **blood clots** or keeping other fats from injuring the arterial walls. They relax arteries and help to decrease constriction of arteries and thickening of blood.

Hundreds of studies have shown that **diets** rich in omega-3 fatty acids decrease risk of heart attacks, strokes, and abnormal heart rhythms. Eskimos, who eat a lot of cold-water fish, have low rates of heart attacks and strokes perhaps because they have thinner blood, high HDL to LDL cholesterol ratio, and less buildup of fatty deposits (plaques) in the arteries. A number of clinical trials have shown that regular consumption of fish or fish-oil supplements can prevent sudden deaths due to abnormal heart rhythms. In the Diet and Reinfarction Trial (DART) of 2,033 men who previously suffered a **heart attack**, men who ate two to three servings of fatty fish a week had their risk of sudden cardiac death lowered by 29% compared to those who had a low fat or high fiber diet. In the Physician's Health Study of 20,551 doctors, a 52% reduction in risk of heart attacks was observed in those who ate at least one fish meal per week compared with those who ate fish once a month or less.

Mild hypertension

Several studies have shown that eating 200 g of fatty fish or taking six to 10 capsules of fish oil daily will lower blood pressure (BP). Therefore, omega-3 can benefit patients with borderline high blood pressure. Omega-3 oils also effectively prevent **hypertension** in cardiac patients after transplantation.

Supplement for newborns and babies

Omega-3 fatty acids are essential for normal development of vision and brain function, especially in newborns and children. Very low birth weight preterm infants often have poor vision and motor skills, possibly because they receive less than one-third of the amount of omega-3 fatty acids outside the mother's womb that they would have received as a fetus. Human breast milk contains the appropriate amount of omega-3 and -6 fats and is believed best for babies. If mother's milk is unavailable, formulas with soybean oil that provide higher amounts of omega-3 fatty acids are more beneficial than those made from cow's milk. Even full-term babies benefit from the addition of essential fatty acids to cow-milk formulas. Studies have shown that babies given formulas supplemented with EFAs have better vision and score higher in skills and problem-solving tests compared to babies on formulas that do not contain additional EFAs.

Rheumatoid arthritis

Because omega-3 fatty acids inhibit the action of inflammatory prostaglandins and leukotrienes, they can help control arthritis symptoms. Significant reduction in the number of tender joints and morning stiffness, as well as an increase in grip strength, have been observed in patients taking fish oil capsules. Studies have shown that patients taking fish oil supplements for **rheumatoid arthritis** require fewer **pain** medications; some are able to discontinue their nonsteroidal anti-inflammatory treatment. Despite the beneficial effects of omega-3 fats, regular antirheumatic drugs and nonsteroidal anti-inflammatory medications most likely still are required to control this chronic condition.

Diabetes

Some studies in laboratories have indicated that omega-3 fatty acids in fish oils might prolong life in people with autoimmune disorders such as diabetes. One study looked at substituting fish oil for corn oil in diets and found a tendency to suppress immune system dysfunction and prolong life. As of 2008, more studies were required to prove the diet's benefits in humans.

Inflammatory bowel disease

High-dose fish-oil supplements have been shown to decrease abdominal cramping, **diarrhea**, and pain associated with **Crohn's disease**. In one study of 96

patients, patients who received 4.5 g of omega-3 fatty acids (15 fish oil capsules) required significantly less steroids to control symptoms. In another study of 78 Crohn's disease patients, 59% of patients who received nine fish oil capsules (2.7 g of omega-3 fatty acids) daily did not have any disease flare-ups for at least one year compared to 26% recurrence rate in patients who were not given fish oil. Omega-3 fatty acids also are effective in preventing reappearance of Crohn's disease after surgery to remove sections of diseased bowel. In a clinical trial involving 50 patients, patients who received 2.7 grams of omega-3 fats as fish oil cut their rate of disease reappearance in half compared to patients receiving placebo. However, the effectiveness of omega-3 oils varies depending on the type of omega-3 oils being used, length of use, and the patient's diet.

Asthma

Taking high dose omega-3 fatty acids can reduce inflammation of the airways and reduce **asthma** attacks. According to Donald Rudin, the author of *Omega-3 Oils*, allergic disorders such as asthma may be triggered by too much omega-6 and too little omega-3 fats in the body. Excessive amounts of omega-6 prostaglandins cause the body to produce antibodies that cause allergic reactions. Flaxseed or fish oil supplements can keep the omega-6 fats in check and decrease the inflammatory reactions associated with asthma.

Berger's disease (Immunoglobulin A (IgA) nephropathy)

Omega-3 fats may be effective in treating this autoimmune disease in which kidney function fails over time with few treatment options available. In a large, randomized study of 150 patients, those who received 3 g of omega-3 fatty acids daily for two years had significantly less reduction in renal function than those treated with placebo. Therefore, omega-3 fatty acids appear to have protective effects and may stabilize renal function in these patients.

Raynaud's disease

There have been few studies evaluating the effects of omega-3 fatty acids in treating Raynaud's disease; however, it appears that fish oil supplements may alleviate some blood clotting disorders.

Mental disorders

According to some studies, many common mental disorders, such as **depression**, **bipolar disorder** (manic-depression), attention-deficit hyperactive disorder (ADHD), **anxiety**, or **schizophrenia**, may be triggered by deficiencies of omega-3 fatty acids and/or B vitamins. The rates of depression are low in countries where people eat a lot of fish, while the rate of depression steadily rises in the United States as Americans eat increasingly more processed food and less fresh fish and vegetables containing omega-3 fats. In one study, 53% of bipolar patients on placebo (olive oil) became ill again within four months, while none of the patients who were given 9.6 g daily of omega-3 fatty acids (as fish oil) did. Supplements containing omega-3 fats also reportedly have been effective in children with ADHD precipitated by essential fatty acid deficiencies. Furthermore, a 25% decrease in schizophrenic symptoms was observed in patients receiving eicosapentanoic acid (EPA), one of the omega-3 fatty acids contained in fish oil.

A report in 2001 revealed that omega-3 fatty acids may have effects on stabilizing mood and relieving depression. As studies continued in the early 2000s, researchers found it more and more evident that omega-3 fatty acids can be effective for treating depression, though they remained uncertain about exactly how they work. A 2003 report linked depression to increased risk of sudden cardiac death.

Acquired immunodeficiency syndrome (AIDS)

In a small study of 20 **AIDS** patients, those who received fish oil supplements at dosage of 10 g of omega-3 fatty acids per day for 30 days gained more weight (2.4 kg) and significantly lowered their concentrations of tumor necrosis factor, which is believed to cause wasting in AIDS patients, compared to those who did not.

Cancer prevention

Omega-3 fatty acids inhibit tumor growth when injected into animals. Flaxseed oil, which is a plant source of omega-3 fatty acids, has been shown to prevent cancer of the breast, colon, and prostate. The **Mediterranean diet**, which is heart healthy, also can decrease risk of getting cancer. Omega-3 fats, it seems, strengthen the immune systems and inhibit the inflammation and blood circulation of the tumors.

Preparations

As of 2008, the U.S. Food and **Nutrition** Board had not issued recommended daily allowance (RDA) for omega-3 fatty acids. However, it has established adequate intake (IA) levels for some of the more common omega-3 fatty acids, including alpha linolenic acid (ALA), eicosapentaenoic acid (EPA), and

docosahexaenoic acid (DHA). Those recommendations differ according to age and sex and for women who are pregnant or lactating. For men over the age of 14, the AI for ALA (the only omega-3 fatty acid for which an AI exists) is 1.6 grams per day; for women in the same age range, the AI for ALA is 1.1 grams per day.

The best way to achieve this dietary requirement is by eating fatty fish two or three times a week and/or eating vegetables and oils containing omega-3 fatty acids. Omega-3 fatty acids can be found naturally in the oil of cold-water fish, such as mackerel, salmon, sardines, anchovies, and tuna, or as extracted oils from plants, such as flaxseed, canola (rapeseed), or soybean. If fish oil supplement is preferred, then one to two capsules a day is sufficient. Each 1 g fish oil capsule typically contains 180 mg of EPA and 120 mg of DHA. **Vitamin E** is often contained in fish oil supplements to prevent spoilage and vitamin-E deficiency, which may occur with high dose fish-oil consumption. Patients should take supplements containing omega-3 fatty acids only under professional supervision to prevent an overdose, adverse reactions, or interactions with other medications. For treatment of diseases, flaxseed oil should be the first choice because it is the richest source of omega-3 fatty acids, relatively safe, and inexpensive.

Precautions

The safest and most effective way to get omega-3 fatty acids is through diets of at least three fish meals a week. Fish oil or flaxseed oil supplements should be taken only under a physician's supervision.

Although fish oils can be helpful in relieving arthritic symptoms, patients still may need anti-inflammatory medications to adequately control the disease.

Taking any medication during **pregnancy** is not recommended. Women who are pregnant or breast-feeding should talk to their doctor before taking fish oil supplements or any other medications.

Because of their blood thinning activity, aspirin, nonsteroidal anti-inflammatory drugs (NSAIDS), warfarin, or other anti-clotting medications should be used in conjunction with fish oil supplements only after consultation with a physician.

Side effects

Consuming excessive amounts of fish oil capsules can result in excessive bleeding, gastrointestinal distress, **anemia**, or strokes.

KEY TERMS

Essential fatty acid (EFA)—A fatty acid that the body requires but cannot make. It must be obtained from the diet. EFAs include omega-6 fatty acids found in primrose and safflower oils, and omega-3 fatty acids oils found in fatty fish and flaxseed, canola, soybean, and walnuts.

Prostaglandins—A group of hormone-like molecules that exert local effects on a variety of processes including fluid balance, blood flow, and gastrointestinal function. They may be responsible for the production of some types of pain and inflammation.

Interactions

Because of its blood-thinning activity, fish oil supplements may interact with aspirin, nonsteroidal anti-inflammatory drugs (NSAIDS), warfarin, or other anti-clotting medications to cause excessive bleeding.

Resources

BOOKS

Harris, Robert P. *Omega 3 Fatty Acids*. New York: Novinka Books, 2006.

Maisch, B., and R. Oelze, eds. *Cardiovascular Benefits of Omega 3 Polyunsaturated Fatty Acids*. Amsterdam: IOS Press, 2007.

Wexler, Barbara. *Fish Oil, Omega 3 and Essential Fatty Acids*. Chapmanville, WV: Woodland Press, 2007.

PERIODICALS

Freeman, M. P., et al. "Omega 3 Fatty Acids: Evidence Basis for Treatment and Future Research in Psychia try." *Journal of Clinical Psychiatry* (December 2006): 1954 1967.

Harris, William S. "Omega 3 Fatty Acids and Cardiovas cular Disease: A Case for Omega 3 Index as a New Risk Factor." *Pharmacological Research* (March 2007): 217 213.

MacLean, Catherine H, et al. "Effects of Omega 3 Fatty Acids on Cancer Risk: A Systematic Review." *Journal of the American Medical Association* (January 25, 2006): 403 415.

Opthof, T., and H. M. den Ruijter. "Omega 3 Polyunsatu rated Fatty Acids (PUFAs or Fish Oils) and Atrial Fibrillation." *British Journal of Pharmacology* (December 2006): 258 260.

Surette, Marc E. "The Science behind Dietary Omega 3 Fatty Acids." *Canadian Medical Association Journal* (January 15, 2008): 177 180.

OTHER

"Essential Fatty Acids." Linus Pauling Institute, December 7, 2005. http://lpi.oregonstate.edu/infocenter/other nuts/omega3fa/. (February 19, 2008).

"Fish and Omega 3 Fatty Acids." American Heart Association. http://www.americanheart.org/presenter.jhtml?identifier 4632. (February 19, 2008).

"Omega 3 Fatty Acids." University of Maryland Medical Center, May 1, 20077. http://www.umm.edu/altmed/articles/omega 3 000316.htm. (February 19, 2008).

"Omega 3 Fatty Acids, Fish Oil, Alpha linolenic Acid." MayoClinic.com, August 1, 2005. http://www.mayoclinic.com/health/fish oil/NS_patient fishoil. (February 19, 2008).

"Omega 3 Fatty Acids, Fish Oil, Alpha linolenic Acid." MedlinePlus, November 1, 2006. http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient fishoil.html. (February 19, 2008).

ORGANIZATIONS

American Association of Naturopathic Physicians (AANP), 4435 Wisconsin Ave. NW, Suite 403, Washington, DC, 20016, (866) 538 2267, http://www.naturopathic.org.

DHA/EPA Omega 3 Institute, 150 Research Lane, Rm. 100, University of Guelph Research Park, Guelph, ON, Canada, N1G 4T2, http://www.dhaomega3.org/.

Teresa G. Odle
David Edward Newton, Ed.D.

Omega-6 fatty acids

Description

Omega-6 fatty acids are one of two groups of **essential fatty acids** (EFAs) that are required in human **nutrition**. The other EFA is the omega-3 fatty acid group. The omega-6 fatty acids get their name from the fact that the molecules of which they are made contain a double bond attached to the number 6 carbon atom, counting from the end of the molecule opposite the carboxyl group, the so-called omega end of the molecule. (This system of nomenclature is just the reverse of the one used by chemists.) Omega-6 fatty acids include **linoleic acid** and its derivatives. Chemically, linoleic acid is *cis*, *cis*-9,12-octadecadienoic acid. The term *essential* means that these fatty acids must be consumed in the diet because humans cannot manufacture them from other dietary fats or nutrients, nor can they be stored in the body. They must be consumed daily to meet the body's requirements. They are macronutrients, required in amounts of grams per day (compared to micronutrients such as vitamins, which are required in milligrams per day). EFAs provide energy, are components of nerve cells and cellular membranes, and are converted to hormone-like substances known as prostaglandins.

Sources of Omega 6-Fatty Acids

- Baked goods
- Brazil nuts
- Cereals
- Corn oil
- Cottonseed oil
- Eggs
- Hemp oil
- Meats from grass-fed animals
- Pecans
- Pine nuts
- Pumpkin oil
- Safflower oil
- Sesame oil
- Soybean oil
- Sunflower oil
- Sunflower seeds
- Wheat germ oil
- Whole grains

(Illustration by GGS Information Services. Cengage Learning, Gale)

In the body, prostaglandins and EFAs are necessary for normal physiology, including the following:

- producing steroids and synthesizing hormones
- regulating pressure in the eye, joints, and blood vessels
- mediating immune response
- regulating bodily secretions and their viscosity
- dilating or constricting blood vessels
- regulating collateral circulation
- directing endocrine hormones to their target cells
- regulating smooth muscles and autonomic reflexes
- being primary constituents of cell membranes
- regulating the rate of cell division
- maintaining the fluidity and rigidity of cellular membranes
- regulating the inflow and out-flux of substances into and out of cells
- transporting oxygen from red blood cells to the tissues
- maintaining proper kidney function and fluid balance
- keeping saturated fats mobile in the blood stream
- preventing blood cells from clumping together (conglomeration, which is the cause of atherosclerotic plaque and blood clots which can cause a stroke)
- mediating the release of inflammatory substances from cells that may trigger allergic conditions

- regulating nerve transmission and communication
- being the primary energy source for the heart muscle

Clinical trials have shown that EFAs protect against such conditions as **heart disease**; **cancer**; autoimmune diseases, including **rheumatoid arthritis** and **multiple sclerosis**; skin diseases, including **acne**, atopic **eczema**, and **psoriasis**; and may protect against **stroke**. The prevalence of heart disease in populations has been shown to be inversely proportional to the relative concentration of linoleic acid in the diet.

Both linoleic acid and its derivatives are obtained from plant and animal sources. Plant sources include unprocessed, unheated vegetable oils such as corn, sunflower seed, safflower, soy, sesame, and cottonseed oils. They are also found in plant materials such as evening primrose, black currant seeds, and gooseberry oils as well as in raw nuts and seeds, legumes, and leafy greens. Animal sources of omega-6 fatty acids (although in smaller amounts than in plants) are lean meats, organ meats, and breast milk.

Linoleic acid is an 18-carbon long polyunsaturated fatty acid containing two double bonds. Its first double bond occurs at the sixth carbon from the omega end, classifying it as omega-6 oil. As linoleic acid is absorbed and metabolized in the human body, it is converted into a derivative fatty acid, gamma linoleic acid (GLA), which is converted into dihomo-gamma linoleic acid (DGLA) and arachidonic acid (AA). The DGLA and AA are then converted into two types of prostaglandins by adding two carbon molecules and removing hydrogen molecules. There are three families of prostaglandins, PGE1, PGE2, and PGE3. DGLA is converted to PGE1, while AA is converted into PGE2. PGE3 is made by the conversion of **omega-3 fatty acids**. Both PGE1 and PGE3, anti-inflammatory agents, protect against coronary disease by keeping blood platelets slippery and flowing, thus preventing blood clotting. PGE2 has inflammatory effects and increases platelet stickiness and blood clotting. All three forms of prostaglandin must be present to ensure a functioning clotting system. There must be enough PGE2 to ensure healthy clotting, but enough PGE1 and PGE3 to protect against too much clotting, which can lead to hardening of the arteries, **heart attack**, and stroke. Likewise, PGE1 appears to act as a diuretic, whereas PGE2 aids in the retention of water and salts in the kidneys. PGE2 also is required for healthy brain and synapse functioning. The three types of prostaglandins serve as a system of checks and balances within the body.

However, if AA and its derivative, PGE2, are overproduced or imbalanced with PGE1 and PGE3, they can cause illness or disease. The over-consumption of land-based meats and the under-consumption of cold-water fish and unprocessed oils can lead to an over-production of inflammation-producing PGE2 and an under-production of anti-inflammatory agents PGE1 and PGE3. A healthy diet includes omega-6 fatty acids in a balance with omega-3 fatty acids. An optimal ratio is four parts omega-6 to one part omega-3. Ratios of healthy populations range from 2.5:1 in Inuit **diets** to 6:1 in other traditional diets.

Daily consumption of omega-6 fatty acids by many people may be excessive, due to the presence of omega-6 fatty acids in common cooking vegetable oils and processed foods. The ratio of omega-6 to omega-3 fatty acid consumption can reach 20:1. Achieve a more desirable ratio requires eliminating sources of omega-6 fatty acids, especially those hidden in processed foods, and increasing the amount of omega-3 fatty acids consumed through **fish oil** or **flaxseed** supplements. In addition, converting omega-6 fatty acids present in oils (such as corn, safflower, or soybean) to GLA requires that the oils be unprocessed and unheated and in the natural form (*cis* form). When oils undergo processing (heating and/or hydrogenation) to prolong shelf life or to form a solid at room temperature (e.g., shortening and margarine), the fatty acid structure is changed to the *trans* form, and the conversion process of omega-6 fatty acids to GLA may be inhibited.

General use

Most people receive sufficient amounts of omega-6 fatty acids in their diet. Deficiencies are rare and limited to people with severe malabsorption, short bowel syndrome, or extremely low-fat diets. For those who are unable to convert LA to GLA, dietary supplements containing GLA can be taken to increase the production of prostaglandins. Evening primrose, black currant, and **borage oil** all contain GLA. For individuals with diabetes, GLA supplementation can improve nerve function and help prevent diabetic nerve disease. Long-term exclusive or excessive use of flaxseed oil, which contains large amounts of omega-3 fatty acids, can result in omega-6 fatty acid deficiency and require the addition of oils containing omega-6 fatty acids to the diet.

Preparations

Omega-6 fatty acids may be consumed either as linoleic acid in oils that contain high levels of linoleic acid or in the converted form, GLA, in dietary supplements. Oils high in linoleic acid include soybean, peanut, corn, sunflower seed, cottonseed, soy, sesame,

KEY TERMS

Age-related macular degeneration (ARMD)—Degeneration of the macula (the central part of the retina where the rods and cones are most dense) that leads to loss of central vision in people over 60.

Atopic eczema—Inflammation of the skin caused by allergic reaction.

Multiple sclerosis (MS)—A progressive, autoimmune disease of the central nervous system characterized by damage to the myelin sheath that covers nerves. In most types, the disease, which causes progressive paralysis, is marked by periods of exacerbation and remission.

Omega-6 fatty acid—A fatty acid with its first double bond at the sixth carbon in its carbon chain.

and safflower. There is no official recommended daily dose for omega-6 fatty acids. The Food and Nutrition Board of the U.S. Department of Agriculture has, however, established recommended daily intakes of linoleic acid based on age and sex. Recommendations for pregnant and lactating women are also available. For males over the age of 19, the recommendation is for 17 grams per day; for females over the age of 19, the recommended intake is 11–12 grams per day, depending on age. Younger children, pregnant women, and women who are lactating generally need somewhat less linoleic acid than these levels.

For GLA supplementation, primrose oil, borage oil, and **black currant seed oil** are available in capsule form.

Precautions

Stress, alcohol consumption, and prescription medicines can interfere with the conversion of linoleic acid to its derivatives. Therefore, those with such conditions may benefit from the use of GLA supplementation to improve the production of prostaglandins. In addition, the use of unprocessed, unheated omega-6 oils in the cis form is recommended for improving prostaglandin production.

Side effects

Overconsumption of omega-6 oils in relation to consumption of omega-3 oils may lead to an overproduction of inflammation-producing prostaglandins (PGE2s) and a scarcity of anti-inflammatory prostaglandins (PGE1s and PGE2s), which may lead to a variety of health problems.

Linoleic acid appears to have at least one negative effect on the human body. It appears to increase a person's risk of developing age-related **macular degeneration** (ARMD), a disease of the eye that causes progressive loss of vision and eventual blindness.

Interactions

Nutrients essential for the use of omega-6 fatty acids in the body include **magnesium**, **selenium**, **zinc**, and vitamins A, carotene, B_3, B_6, C, and E.

Resources

BOOKS

Wexler, Barbara. *Fish Oil, Omega 3 and Essential Fatty Acids*. Chapmanville, WV: Woodland Press, 2007.

PERIODICALS

Conklin, S. M., et al. "High Omega 6 and Low Omega 3 Fatty Acids Are Associated with Depressive Symptoms and Neuroticism." *Psychosomatic Medicine* (November 2007): 932 934.

Kiecolt Glaser J. K,, et al. "Depressive Symptoms, Omega 6; Omega 3 Fatty Acids, and Inflammation in Older Adults." *Psychosomatic Medicine* (April 2007): 217 214.

Lauretani, F., et al. "Omega 6 and Omega 3 Fatty Acids Predict Accelerated Decline of Peripheral Nerve Func tion in Older Persons." *European Journal of Neurology* (September 2007): 801 808.

Rashid, S., et al. "Topical Omega 3 and Omega 6 Fatty Acids for Treatment of Dry Eye." *Archives of Ophthal mology* (February 2008): 219 225.

Simopoulos, A. P. "Evolutionary Aspects of Diet, the Omega 6/Omega 3 Ratio and Genetic Variation: Nutritional Implications for Chronic Diseases." *Bio medicine and Pharmacotherapy* (August 2006): 502 507.

Judith Sims
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Onion *see* **Allium cepa**

Ophiopogon

Description

Ophiopogon is a perennial herbaceous plant that is native to the Orient. Under the name *mai men dong*, its tuberous root is a highly prized and indispensable part of Chinese herbal medicine. In addition, this

Ophiopogon. *(© Organica / Alamy)*

plant's graceful, grass-like leaves and tiny bell-shaped flowers have made it a popular landscaping ground cover. It is commonly known in the Western world as lily-turf or *Liriope spicata*, and is a member of the lily, or Liliaceae, family.

The tufted mounds that ophiopogon forms are usually about 1 ft (30cm) in height and diameter. On closer examination, the individual leaves of the plant resemble straps 0.25 in (0.6 cm) to almost 2 in (5 cm) in width and up to 16 in long (40.6 cm), depending upon the species. Ophiopogon leaves are evergreen and have a leathery appearance. *Ophiopogon japonicus* , the species most used in Oriental herbal medicine, has leaves with serrated edges. Subspecies of ophiopogon include several with a great variety of ornamental leaves, ranging from all-green to green with white, cream-colored or golden edges. The more decorative ophiopogon plants, such as *Liriope muscari* (blue lily-turf) or Christmas tree lily-turf, have larger **lavender**, blue-violet, or white bell-shaped flowers in clusters growing from upward-reaching spikes 4–6 in (approximately 10–15 cm) high. The flowers appear in mid-summer, and are followed by shining blackberry-like seeds that remain throughout the winter.

Ophiopogon grows best in warm climates, but is remarkably adaptable. There are species of this plant that grow and thrive in either full sun or full shade. Ophiopogon is able to tolerate a very wide variety of adverse conditions, including extreme heat, soil that is dry even to the point of drought, or high humidity. There are both erect and creeping types of ophiopogon. *Liriope spicata*, also known as *Ophiopogon japonicus*, is a creeping variety with fast-spreading, slender tuberous roots that can prove to be quite invasive. It forms a rhizome with smaller fibrous roots growing outward; the tuber itself has a bittersweet taste. *Ophiopogon japonicus* is also better able to tolerate cold than other varieties. All types of ophiopogon are propagated by division.

General use

Ophiopogon japonicus has long been used in Oriental herbal medicine. The earliest reference to its use is in the *Shennong Bencao Jing*, or *Herbal Classic of the Divine Plowman*. The oldest known edition of this classic was printed around A.D. 300. Ophiopogon is thought to be effective in clearing away what Chinese medical practitioners call "heat in the heart" and irritability. Ophiopogon is an antiseptic that is particularly useful in the healing of mouth sores. Its sedative qualities provide relief for **insomnia**, heart palpitations, **anxiety**, and restlessness. It is similar to the many chemical sedatives used in Western medicine in that it reduces muscle spasm.

Ophiopogon also moistens the mucous membranes of the body by stimulating the production of mucosal fluids. Moisturizing of the lungs reduces coughing. In the intestines, increasing the level of moisture improves elimination. Because of these qualities, ophiopogon is used in formulas to treat **constipation**, dry throat, and chronic dry bronchitis. Because ophiopogon has been shown to lower blood sugar and regenerates necessary cells in the pancreatic isles of Langerhans, it is also considered useful in treating the fluid imbalance caused by diabetes, as evidenced by excessive thirst and urination.

According to the United States Department of Agriculture phytochemical database developed at the Beltsville Agricultural Research Center in Maryland, the following varieties of ophiopogon all have medicinal uses:

- *Ophiopogon japonicus* is the species of this plant most commonly used in Oriental herbal medicine. It is useful in treating intestinal, kidney, and liver problems. It has been found to stimulate the production of milk in nursing mothers and to reduce inflammation. It has cough suppressing properties, and is used in treating nearly all lung-related illnesses, including bronchitis, whooping cough, tuberculosis, hemoptysis (coughing up blood), sore throat, laryngitis , and cough. A chemical present in the plant has shown effectiveness in the treatment of lung tumors. It is also used to treat fever, constipation, and stomach problems.
- *Ophiopogon ohwii* is used for its cough suppressant qualities. It is also an expectorant, a cardiac tonic, and an anti-inflammatory agent.

KEY TERMS

Aphrodisiac—A substance thought to stimulate erotic desire and enhance sexual performance. Aphrodisiacs are named for Aphrodite, the ancient Greek goddess of love.

Cardiac tonic—Any of a diverse group of remedies intended to relieve heart symptoms. Most tonics contain herbal extracts, vitamins, and minerals.

Diuretic—A group of medications that increase the amount of urine produced and relieve excess fluid buildup in body tissues. Diuretics may be used in treating high blood pressure, lung disease, premenstrual syndrome, and other conditions.

Galactogogue—A substance or medication that increases the flow of breast milk in nursing mothers.

Isles of Langerhans—Cellular masses of tissue in a space within the pancreas that secrete insulin.

Rhizome—The fleshy underground horizontal root of certain plants. Valerian preparations are made from dried rhizomes as well as from roots of the valerian plant.

Tuber—The thick, fleshy, underground stem of a plant.

- *Ophiopogon pendulus* has diuretic properties that are useful in reducing fluid retention in the body caused by either heart or kidney disease.
- *Ophiopogon spicatus* is considered an aphrodisiac, a treatment for digestive disturbance, and a galactogogue, or stimulator of lactation in nursing mothers.

Preparations

The slender, tuberous roots of ophiopogon are dug in summer, and the smaller, more fibrous roots are cut away. The rhizomes are dried in the sun, then pulverized and stored in a cool place in an airtight container. The usual daily dosage in Chinese herbal medicine is 4–10 g, when the plant is used in an infusion or decoction.

Precautions

It is important to remember that Chinese herbal medicine is based upon individual prescriptions developed for each patient and his or her unique symptoms. Chinese herbs should not be taken either individually or in combination formulas unless a practitioner of Chinese herbal medicine has been consulted.

It should also be remembered that coughing is a normal and helpful bodily reaction to irritation of the airway or lungs. It is designed to expel such harmful substances as excess phlegm or irritants from the lungs. **Cough** suppression can actually prevent or postpone recovery. It is persistent coughing that needs treatment. Moreover, a cough is merely a symptom of some other bodily illness, as are digestive problems. Therefore, ophiopogon preparations should not be taken for an extended period of time, and then only for dry, ticklish coughs. These preparations should only be used for temporary relief of symptoms. If the patient is bringing up a lot of phlegm, ophiopogon will make the cough worse. A physician should be consulted for persistent cough or gastrointestinal problems.

Side effects

Ophiopogon does not appear to produce serious side effects when used as directed.

Resources

BOOKS

Molony, David, and Ming Ming Pan Molony. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: Berkley Publish ing, 1999.

Phillips, Ellen, and C. Colston Burrell. *Rodale's Illustrated Encyclopedia of Perennials*. Emmaus, PA: Rodale Press, Inc., 1993.

OTHER

Michigan State University Extension Service. "*Ophiopogon Japonicus* Dwarf Mondo Grass." http://www.msuo phiopogon.htm.

Joan Schonbeck

Opuntia *see* **Prickly pear cactus**

Oral herpes *see* **Cold sores**

Oregano essential oil

Description

Oregano (*origanum vulgare*)is a member of the Labiatae family (commonly referred to as the mint family). Its name is from the Greek word oreganos, which loosely translated means "joy of the mountains."

Native to Mediterranean regions, such as Greece and Crete, oregano is a perennial plant with an aromatic scent. With flowers that bloom from July to September, the plant is generally 2.5ft (75 cm) high

Oregano and oregano essential oil. *(© Arco Images / Alamy)*

and 2–3 ft (60–90 cm) wide. Its hairy, oval-shaped leaves are approximately 1.5 in (3.75 cm) in diameter and grow opposite of one another.

Oregano essential oil is produced from the oregano plant through the process of steam distillation. There are a variety of species referred to as oregano, but only a few qualify as high grade and are suitable for making oregano essential oil.

Oregano essential oil contains the following components:

- carvacrol (share 40–70%)
- gamma-terpinene (8–10%)
- p-cymene (5–10%)
- alpha-pinene
- myrcene
- thymol
- flavonoids
- caffeic acid derivatives

It should be noted that the *Physicians' Desk Reference for Herbal Medicines, Second Edition* also points out that there are various chemotypes with differing essential oil composition of thymol, linalool + terpinene-4-ol, linalool, caryophyllene + germacren D, or germacren D as chief components. However, those **strains**, especially ones high in thymol, are not suitable for preparing oregano essential oil intended for internal consumption. Some of these **essential oils** are toxic to the liver and kidney in very small quantities. However prudent, short term, topical use of these variants may be safe.

General use

Historically, Greek physicians used oregano essential oils for **wounds**, headaches, and venomous **bites** and even hemlock poisoning. It wasn't long before its medicinal benefits were used to treat lung conditions, **bronchitis**, sinusitis, and cold symptoms including **cough**. During the seventeenth century, it was heralded throughout Great Britain as an effective remedy for head colds. Used by physicians to induce **menstruation** as early as the nineteenth century, the benefits of using oregano essential oil have captured the interest of modern-day researchers.

Today, oregano essential oil has antiviral, antibacterial, antifungal, antiparasitic, and antiseptic properties. For external use, oregano essential oil is valued as a strong analgesic and antirheumatic agent. The diluted oil (usually 5 drops essential oil to 25 drops of carrier oil, like jojoba) can even be rubbed on a **toothache** to relieve **pain**. The oil is also believed to reduce the discomfort associated with insect bites. Its powerful antimicrobial properties are said to assist in the prevention of **infections** and to treat skin fungi such as **athlete's foot**. It has also been used to eliminate lice infestations and intestinal **worms**.

Oregano as a culinary spice became popular in the United States after World War II when the soldiers returned from Italy having developed a taste for pizza spiced with oregano. The problem is that medicinally speaking not all oregano is created equal. Growing conditions (soil, climate, rainfall, altitude) and harvesting and processing can produce variations in constituents and effects.

Having penned over ten books, Dr. Cass Ingram who is considered an expert on oregano essential oil, further explains the seriousness of mislabeled oregano oil in his book *The Cure is in the Cupboard*. He states that although many companies list products such as wild oregano or oil of oregano in their catalogues, "the problem is that the commercially available oil is almost exclusively **thyme** oil or marjoram oil," neither of which possesses the same medicinal properties as true oregano essential oil. Furthermore, Ingram states that thyme oil is usually made from a non-oregano plant, such as *Thymus capitus* from Spain, and even though it comes from an edible herb, thyme oil may be toxic. James A. Duke, Ph.D., a leading authority on healing herbs, agrees that thyme oil can be toxic; using it can lead to serious side effects and, in some cases, even cause death.

Therefore, it is critical when using oregano essential oil to be sure that its primary component is carvacrol and not thymol. As Ingram states, "true oregano

grows only under specific soil and climate conditions and cannot be reproduced in your backyard." Oregano essential oil should be made only from high-grade oregano that grows wild in the mountains of the Mediterranean. Ingram provides seven key factors to consider when determining if the oil has been derived from a high-grade oregano plant. He suggests that it should be: 1) a wild spice, not farm-raised, 2) from a proven edible species of oregano, 3) a species high in carvacrol, 4) a type used in modern research at prestigious institutions such as Georgetown University, 5) extracted in a natural process (steam distilled), 6) free of all chemical residues, and 7) relatively low in thymol (less than 5%).

Provided that the oregano essential oil being used is authentic and high grade, there is a great deal of scientific evidence to support its medicinal properties. Indeed, several studies have shown that oregano essential oil can inhibit or destroy many strains of bacteria, fungi, and parasites.

One ambiguous study, published in the *Journal of Applied Microbiology* in 1999, compared 52 plant oils and extracts. Oregano essential oil was found to have significant antibacterial action against a wide number of bacteria including E coli, Staph, Salmonella enterica, and Klebsiella pneumonie, which is a **pneumonia** that frequently occurs in people with a weakened immune system. The following year, the *Journal of Applied Microbiology* published a study by Scottish researchers that showed oregano essential oil to be effective against 25 different bacteria. Other studies, such as the one done by researchers at the University of Tennessee in 2001, also showed oregano essential oil to have powerful antibacterial properties.

Research published in the *International Journal of Food Microbiology* in 1988 found oil of oregano to be an excellent antifungal, completely inhibiting the growth of the nine fungi tested. Since that time, numerous research studies have been published that repeatedly show the ability of oregano essential oil to kill yeast, including Candida albicans. In 2002, oregano essential oil was put to the test in an interesting study by researchers in Yugoslavia and the results were published in *Nahrung*. Among the 13 fungi tested were **food poisoning**, plant, animal, and human pathogenic species. Oregano essential oil high in carvacrol possessed the best and broadest antifungal properties.

A small clinical trial published in 2000 examined the effects of oregano oil in adults with intestinal parasites. Of the 14 adult participants, 11 tested positive for the intestinal parasite, Blastocystis hominis, which is known to cause **diarrhea**, anal **itching**, and weight loss. The 11 test-positive participants took 600 mg of emulsified oregano essential oil daily for six weeks. Eight were completely free of the parasite and the remaining three participants had a reduction in parasitic presence and symptoms.

Preparations

Oregano essential oil should never be used undiluted. Always dilute it in a suitable carrier oil, such as olive oil, almond oil, or v-6 mixing oil. As with any product used for medicinal purposes, it is important to read and follow the label instructions and warnings.

A skin patch test should be conducted prior to using oregano essential oil for the first time. To do this, place a small amount of diluted essential oil on the inside of your elbow and apply a bandage. Wait 24 hours to see if there is any negative reaction, such as redness or irritation, before proceeding with more extensive use

Because oregano essential oil is concentrated, a little bit goes a long way. At first, it may be wise to start out cautiously by using only 1 drop of oregano essential oil to 3 parts olive oil and massage into the affected area once or twice a day.

To topically treat **fungal infections** on the skin and nails, Dr. Jennifer Brett, a naturopathic physician and chair of the **botanical medicine** department at the University of Bridgeport College of **Naturopathic Medicine** in Connecticut suggests the following: Dilute 1 teaspoon oregano essential oil in 2 teaspoons olive oil and apply with a cotton swab to the affected area up to three times a day.

To treat bacterial and fungal infections in other parts of the body, 1 drop of oil may be placed in an 8-ounce glass of water or juice once or twice a day. One drop may also be placed under the tongue twice a day, but it should be mixed with 1 teaspoon of honey, maple syrup, or olive oil.

For use in the bath, mix 1 to 3 drops of diluted oregano essential oil with body gel or shampoo and add it to the bath water. As an antiseptic, the diluted oil can be used in cloths to wipe down kitchen and bathroom countertops.

Precautions

Do not use oregano essential oil, either topically or internally, while pregnant.

Nursing mothers should avoid applying the oil to their nipples, because it can be difficult to wash off and may be ingested inadvertently by their infants. During the weaning process, nursing mothers wishing to use a

breast massage oil that contains oregano essential oil as a method to reduce milk production should do so with caution and be sure that all the oil is removed before breastfeeding. Because of safety issues regarding breast milk and infant care, nursing mothers should always obtain the approval of an obstetrician and/or pediatrician before using oregano essential oil either topically or internally.

Topically, oregano essential oil may be irritating to the skin, especially mucous membranes, and can cause burning. Therefore, it should always be suitably diluted, and according to Tisserand and Balacs, never applied topically to mucous membranes in concentrations greater than 1%. They also caution that people with damaged or very sensitive skin as well as children less than two years of age should not use the oil.

Special care should be taken when using oregano essential oil internally, because many of the commercially available products are erroneously labeled and are not made from high grade oregano. In fact, many contain dangerous levels of thymol. Some experts caution that oregano essential oil should never be taken internally, while others suggest that it is safe for internal use provided that it is suitably diluted and its source and contents are verified; it must be extracted from high grade oregano and meet seven strict requirements.

Internal use (swallowed or as a rectal suppository) should be highly restricted (ie, a few drops only of the pure essential oil per dose, and limiting duration of use to a few days to weeks) This is because essential oils represent highly concentrated extracts through distillation compared to the whole crude plant (essential oils have 100's of times more essential oil per drop due to purification, than does fresh or dried oregano herb) And although therapeutic in small, short term doses, these oils are toxic to liver, kidneys and the nervous system if taken in excess.

Always be sure to use true oregano essential oil (containing less than 5% thymol) and not thymol oil, which should never be taken internally and used topically only with extreme caution after being diluted in a suitable carrier oil.

People with any medical condition should use oregano essential oil only after consulting with a physician.

Side effects

The use of oregano essential oil can cause skin irritation, redness, and burning. If any of these negative side effects occur, discontinue use immediately.

When used either topically or internally to treat thrush, it has the potential to decrease a nursing mother's milk supply.

In low doses over a short period of time, oregano essential oil is considered generally safe. However, high doses may be toxic to the liver.

Interactions

In general, essential oils tend to be photosensitive. To avoid this interaction, stay away from direct sunlight or sun beds after applying oregano essential oil to prevent skin burn.

Do not apply oregano essential oil after perspiring; the combination of the oil and sweat could cause irritation.

Resources

BOOKS

Barnes J., L. A. Anderson, and J. D. Phillipson. *Herbal Medicines: A guide for Healthcare Professionals, second edition*. Pharmaceutical Press, 2002.

Brinker, F. *Herb Contraindications and Drug Interactions, second edition*. Eclectic Medical Publishers, 1998.

Duke, J. A. *Handbook of Medicinal Herbs*. CRC Press, 2001.

Fleming, T. (ed.). *Physicians' Desk Reference for Herbal Medicines*. Medical Economics Company, Inc., 2000.

Ingram, C. *The Cure is in the Cupboard*. Knowledge House, 1997.

Keville, K. *Herbs: An Illustrated Encyclopedia. A Complete Culinary, Cosmetic, Medicinal, and Ornamental Guide*. Friedman/Fairfax Publishers, 1999.

Rosengarten, F. *The Book of Spices*. Jove Books, 1973.

Tisserand, R. *Essential Oil Safety*. Churchill Livingston, 1995.

PERIODICALS

Dorman H. J., S. G. Deans. "Antimicrobial agents from plants: antibacterial activity of plant volatile oils." *Journal of Applied Microbiology* (February, 2000): 308 316.

Elgayyar M., F. A. Draughon, D. A. Golden, J. R. Mount. "Antimicrobial activity of essential oils from plants against selected pathogenic and saprophytic microor ganisms." *Journal of Food Protection* (July, 2001): 1019 1024.

Force, M., W. S. Sparks, R. A. Ronzio. "Inhibition of enteric parasites by emulsified oil of oregano in vivo." *Phytotherapy Research* (May 2000): 213 214.

Hammer, K. A., C. F. Carson, T. V. Riley. "Antimicrobial activity of essential oils and other plant extracts." *Journal of Applied Microbiology* (June, 1999): 985 990.

Sokovic M., O. Tzakou, D. Pitarokili, M. Couladis. "Anti fungal activities of selected aromatic plants growing wild in Greece." *Nahrung* (October, 2002): 317 320.

Lee Ann Paradise

Organic food

Definition

Organic foods are not specific foods, but are any foods that are grown and handled after harvesting in a particular way. In the United States, organic foods are crops that are raised without using synthetic pesticides, synthetic fertilizers, or sewage sludge fertilizer, and they have not been altered by genetic engineering. Organic animal products come from animals that have been fed 100% organic feed and raised without the use of growth hormones or antibiotics in an environment where they have access to the outdoors. Standards for organic foods vary from country to country. The requirements in Canada and Western Europe are similar to those in the United States. Many developing countries have no standards for certifying food as "organic."

Purpose

The organic food movement has the following goals:

- improve human health by decreasing the level of chemical toxins in food
- decrease the level of agricultural chemicals in the environment, especially in groundwater
- promote sustainable agriculture
- promote biodiversity
- promote genetic diversity among plants and animals by rejecting genetically modified organisms (GMOs)
- provide fresh, healthy, safe food at competitive prices

Pesticides in fruits and vegetables

Highest level	Lowest level
Peaches	Onions
Apples	Avocados
Sweet bell peppers	Corn, sweet, frozen
Celery	Pineapples
Nectarines	Mango
Strawberries	Peas, sweet, frozen
Cherries	Kiwi
Pears	Bananas
Grapes, imported	Cabbage
Spinach	Broccoli
Lettuce	Papaya
Potatoes	Blueberries

SOURCE: Developed by the Environmental Working Group

(Illustration by GGS Information Services. Cengage Learning, Gale)

KEY TERMS

Biodiversity—The presence of many different species of plants and animals within a limited geographical region.

Pathogen—An organism that causes a disease.

Toxin—A general term for something that harms or poisons the body.

Description

Organic farming is the oldest method of farming. Before the 1940s, what is today called organic farming was the standard method of raising crops and animals. World War II accelerated research into new chemicals that could be used either in fighting the war or as replacements for resources that were in short supply because of their usefulness to the military. After the war ended, many of the new technological discoveries were applied to civilian uses and synthetic fertilizers, new insecticides, and herbicides became available. Fertilizers increased the yield per acre and pesticides encouraged the development of single-crop megafarms, resulting in the consolidation of agricultural land and the decline of the family farm.

Organic farming, although only a tiny part of American agriculture, originally offered a niche market for smaller, family-style farms. In the early 1980s this method of food production began to gain popularity, especially in California, Oregon, and Washington. The first commercial organic crops were vegetables that were usually sold locally at farmers' markets and health food stores.

By the late 1980s interest in organic food had reached a level of public awareness high enough that the United States Congress took action and passed the Organic Food Production Act of 1990. This act established the National Organic Standards Board (NOSB) under the United States Department of Agriculture (USDA). NOSB has developed regulations and enforcement procedures for the growing and handling of all agricultural products that are labeled "organic." These regulations went into effect on October 21, 2002.

Since the 1990s, the market for organic food has expanded from primarily fruits and vegetables to eggs, dairy products, meat, poultry, and commercially processed frozen and canned foods. In 2000, for the first time, more organic food was purchased in mainstream supermarkets than in specialty food outlets. By 2005, every state had some farmland that was certified

organic, and some supermarket chains had begun selling their own brand-name organic foods. The demand for organic food is expected to continue to grow rapidly through at least 2010.

Organic certification is voluntary and applies to anyone who sells more than $5,000 worth of organic produce annually. (This exempts most small farmers who sell organic produce from their own farm stands). If a product carries the USDA Organic Seal indicating that it is "certified organic" it must meet the following conditions:

- The product must be raised or produced under an Organic Systems Plan that demonstrates and documents that the food meets the standards for growing, harvesting, transporting, processing, and selling an organic product.
- The producer and/or processor are subject to audits and evaluations by agents certified to enforce organic standards.
- The grower must have distinct boundaries between organic crops and non-organic crops to prevent accidental contamination with forbidden substances through wind drift or water runoff.
- No forbidden substances can have been applied to the land organic food is raised on for three years prior to organic certification.
- Seed should be organic, when available, and never genetically altered through bioengineering.
- Good soil, crop, and animal management practices must be followed to prevent contamination of groundwater, contamination of the product by living pathogens, heavy metals, or forbidden chemicals, and to reduce soil erosion and environmental pollution.

To meet these requirements, organic farmers use natural fertilizers such as composted manure to add nutrients to the soil. They control pests by crop rotation and interplanting. Interplanting is growing several different species of plants in an alternating pattern in the same field to slow the spread of disease. Pest control is also achieved by using natural insect predators, traps, and physical barriers. If these methods do not control pests, organic farmers may apply certain non-synthetic pesticides made from substances that occur naturally in plants. Weed control is achieved by mulching, hand or mechanical weeding, the use of cover crops, and selective burning.

Animals products that are USDA certified organic must come from animals that are fed only organic feed, are not given growth hormones, antibiotics, or other drugs for the purpose of preventing disease, and have access to the outdoors. This last requirement is rather vague, as regulations set neither a minimum amount of time the animal must spend outdoors nor any minimums concerning the amount of outdoor space available per animal.

Selecting organic food

The USDA allows three label statements to help consumers determine if a food is organic.

- Labels stating "100% organic" indicate that all of the ingredients in the product are certified organic. These items have the USDA Organic Seal on the label.
- Labels stating "organic" indicate that at least 95% of the ingredients are certified organic. These items also carry the USDA Organic Seal on the label.
- Labels stating "made with organic ingredients" indicate that at least 70% of the ingredients are certified organic. These items are not permitted to have the USDA Organic Seal on the label.
- Items that contain fewer than 70% organic ingredients are not permitted to use either the word "organic" or the USDA Organic Seal on the label.

Consumers may be bewildered by other words on food labels such as "natural" or "grass-fed" that may be confused with organic. Natural and organic are not interchangeable. "Natural" foods are minimally processed foods but, they are not necessarily grown or raised under the strict conditions of organic foods. "Grass-fed" indicates that the livestock were fed natural forage ("grass"), but not necessarily in open pasture or for their entire lives.

Debate continues about the exact requirements to label animal products "cage-free," "free-range," or "open pasture." Cage-free simply means the animals were not kept caged, but does not necessarily mean that they were raised outdoors or allowed to roam freely. There is no certification process for the designation "cage-free." Animals can spend as little as five minutes per day outdoors and still be considered "free-range." Animal rights organizations are working to clarify these designations and improve the conditions under which all animals, are raised.

Organic food and health

Certified organic food requires more labor to produce, which generally makes it more expensive than non-certified food. Some consumers buy organic food primarily because the way it is raised benefits the environment. Others believe absolutely in the health benefits of organic food. A larger group of consumers are uncertain if organic food offers enough health benefits to justify the additional cost.

Discussions of the health benefits of organic food can become quite heated and emotional. Advocates of buying organic foods firmly believe that they are preserving their health by preventing their bodies from becoming receptacles for poisonous chemicals that can cause **cancer**, **asthma**, and other chronic diseases. Non-organic food buyers take the position that the level pesticide and fertilizer residue in non-organic food is small and harmless. Neither side is likely to change the other's view. However, below are some conclusions from studies done comparing organic and non-organic foods.

- The food supply in the United States, whether organic or non-organic, is extremely safe.
- Fresh organic and non-organic produce are equally likely to become contaminated with pathogens such as *E. coli* that cause health concerns.
- Many, but not all, chemical contaminants can be removed from non-organic food by peeling or thorough washing in cool running water.
- Organic foods are not 100% pesticide and chemical free. However, their chemical load appears to be lower than that of non-organic foods.
- The nutrient value of identical organic and non-organic foods is the same.
- The long-term effect on humans of trace amounts of hormones, antibiotics, and drugs found in milk, meat, and other non-organic animal products is unclear.
- The long-term effect of genetically modified foods on both humans and the environment cannot yet be known.

Precautions

Individuals should be informed about food labeling requirements and read food labels carefully so that they can make informed decisions about their purchases.

Interactions

Organic food does not interact with drugs or other foods in a way that is different from non-organic foods.

Complications

No complications are expected from eating organic food.

Parental concerns

Chemicals found in foods may have a greater effect on the growth and development of younger children than older ones. Young children are rapidly growing while still developing their nervous system, immune system, and other organs. Chemicals may have a greater effect on these developing tissues than on adult tissues.

Resources

BOOKS

Fromartz, Samuel. *Organic, Inc.: Natural Foods and How They Grew*. Orlando, FL: Harcourt, 2006.

Goodman, Myra, with Linday Holland, and Pamela McKinstry, Pamela. *Food to Live By: The Earthbound Farm Organic Cookbook* New York: Workman Pub., 2006.

Lipson, Elaine.*The Organic Foods Sourcebook*.Chicago, IL: Contemporary Books, 2001.

Meyerowitz, Steve. *The Organic Food Guide: How to Shop Smarter and Eat Healthier* Guilford, CT: Globe Pequot Press, 2004.

OTHER

Barrett, Stephen. "'Organic' Foods: Certification Does Not Protect Consumers." Quackwatch, July 17, 2006. http://www.quackwatch.org/01Quackery Related Topics/organic.html.

Mayo Clinic Staff. "Organic Foods: Are They Safer? More Nutritious?" MayoClinic.com, December 26, 2006. http://www.mayoclinic.com/health/organic food/NU00255.

National Organic Program. "Organic Food Standards &Labels: The Facts." United States Department of Agriculture, Agricultural Marketing Service, January 2007. http://www.ams.usda.gov/nop/Consumers/brochure.html

Nemours Foundation. "Organic and Other Environmentally Friendly Foods." March 2007. http://kidshealth.org/teen/food_fitness/nutrition/organics.html.

"Organic Foods in Relation to Nutrition and Health Key Facts." Medical News Today. July 11, 2004. http://www.medicalnewstoday.com/medicalnews.php?newsid 10587

Organic Trade Association. "Questions and Answers About Organic." 2003. http://www.ota.com/organic/faq.html

Pames, Robin B. "How Organic Food Works." How Stuff Works, undated, accessed April 26, 2007. http://home.howstuffworks.com/organic food.htm

ORGANIZATIONS

National Organic Program, USDA AMS TM NOP, ROOM 4008 s. Bldg, Ag Stop 0268, 1400 Independence Avenue, S.W., Room 1180, Washington, DC, 20250, (202)720 3252, http://www.ams.usda.gov/nop.

Organic Trade Association, PO Box 547, Greenfield, MA, 01302, (413) 774 7511, (413) 774 6432, http://www.ota.com.

Helen M. Davidson

Oriental Ginseng, *Panax ginseng see* **Ginseng, Korean**

Ornish diet

Definition

The Ornish diet was developed by Dean Ornish, M.D. Ornish was the first physician to demonstrate that **heart disease** can be reversed by natural methods, including specific dietary and lifestyle changes.

Origins

Dean Ornish, who was born in 1953, was a professor of clinical medicine at the University of California, San Francisco, and a practicing physician as of 2008. He received his Bachelor of Arts degree from the University of Texas, Austin, then attended Baylor College of Medicine and Harvard Medical School. He received further medical training at Massachusetts General Hospital. He is the founder and president of the Preventive Medicine Research Institute located in Sausalito, California.

While Ornish was a medical student he became interested in heart disease. In 1978 he began doing research on patients with coronary artery disease (a common form of heart disease). He created a diet that was very low in fat and completely vegetarian and studied its effects on the symptoms experienced by these patients. The patients also learned a variety of **stress** reduction techniques. He discovered that for many patients this diet caused a significant lessening of their symptoms. This was the beginning of his research on the effects of low fat, low or no-meat **diets** on weight loss, health, and heart disease.

It took Dr. Ornish several published studies before conventional medicine accepted his position that simple and inexpensive treatments, including diet, **exercise**, and stress reduction, could reverse heart disease. In a study begun in 1980, Ornish studied 48 people with severe heart disease. Half of them were assigned to a control group and were treated by conventional methods, while the other half participated for three weeks in Ornish's program of an ultra-low fat diet, **yoga**, **meditation**, social support groups, and no cigarettes. The diet that Ornish designed was similar to the regimen developed in the 1970s by Nathan Pritikin to combat heart disease, which continued to be used as of 2008 in several clinics. Both diets emphasize foods that are very low in fat and yet filling, including high-fiber grains and legumes (beans and peas).

Over the course of the study, Ornish's group experienced improvement in symptoms and significant drops in **cholesterol** and blood pressure. Dr. Ornish published the results in the prestigious *Journal of the American Medical Association*, and his study generated controversy. To convince his critics, Dr. Ornish set up a long-term controlled study. After one year, patients treated with Dr. Ornish's methods showed convincing results: 82% of them had significantly less blockage in their heart arteries and there was a drop of 91% in reported chest **pain**. After that study was published in the British medical journal *Lancet*, Dr. Ornish became internationally famous, and the Ornish diet was adopted by many heart disease patients.

Benefits

Because the Ornish diet includes almost only plant products, it is high in substances thought to promote health such as **antioxidants** and fiber, as well as low in substances that are harmful to the health such as fat and cholesterol. Following the diet's recommendation of light exercise can also be very beneficial. Walking 20 or 30 minutes a day instead of being completely sedentary has significant health benefits and may even reduce by half the chance of early death.

Although the Ornish diet is effective at causing weight loss and improved overall health, the most researched and discussed benefit of the program is the prevention and even reversal of heart disease. Dr. Ornish and colleagues have done extensive research showing that following a very strict, completely vegetarian form of his diet cannot only prevent heart disease from occurring or getting more severe, but it can actually cause a reverse of artery constriction allowing blood to flow to the heart better. Dr. Ornish also believes his diet may be effective at preventing or reversing other forms of disease such as **prostate cancer**.

Description

Heart disease develops when arteries that supply the heart with oxygen become narrowed due to the buildup of plaque on their walls. Plaque deposits are caused by cholesterol, a type of fat found in animal products and also made by the body from saturated fats in the diet. The narrowing of arteries is called **atherosclerosis**, a condition that develops over many years. When the coronary (heart) arteries become too blocked to supply the heart with enough oxygen, a **heart attack** occurs.

The first principle of the Ornish diet is to eliminate cholesterol, so all foods containing cholesterol and saturated fats are removed from the diet. Saturated fats are found in meat, dairy products, oils, nuts, seed, and avocados, which are all forbidden by the Ornish diet. Furthermore, the level of fat in the diet is reduced to only 10% of the total calories. This level is much lower

than the diet recommended by the American Heart Association, which recommends up to 30% of calories from fat. The typical American diet consists of up to 50% fat. The Ornish diet is vegetarian, since cholesterol-containing meats are eliminated. The diet allows the use of egg whites and nonfat dairy products; technically it can be classified as a lacto-ovo-vegetarian diet.

Another feature of the Ornish diet is the ratios assigned to fat, protein, and carbohydrates, respectively. The typical American diet is 45% fat, 25% protein, and 30% carbohydrates, with nearly 500 mg of cholesterol per day. The Ornish diet is 10% fat, 20% protein, and 70% carbohydrates. The Ornish diet consists mainly of complex carbohydrates, commonly called starches. Complex carbohydrates are present in fruits, vegetables, grains, and beans. Simple carbohydrates include sugar, honey, and alcohol, which tend to be "empty calories," because they contain lots of calories but little fiber or nutrients. The Ornish diet restricts but does not eliminate simple carbohydrates. The Ornish diet also emphasizes high-fiber foods, which includes most complex carbohydrates. High-fiber diets have been shown to reduce cholesterol and have other beneficial effects.

The Ornish diet is slightly lower in protein than the American average, and lower protein intake has been shown by research to have potential health benefits for Americans. For those worried about the lack of protein in a vegetarian diet, the Ornish program teaches ways to ensure an adequate supply of complete proteins in the diet. Proteins are said to be complete when the body can fully utilize them. They can be obtained by combining grains with legumes (beans) or grains with nonfat dairy products. For instance, complete proteins in the Ornish diet are obtained by combining rice and beans, tofu and rice, pasta and beans, baked beans and wheat bread, or oatmeal with nonfat yogurt over the course of a day. Egg whites are another source of protein on the Ornish diet.

Another principle of the Ornish diet is that people are allowed to eat as much food as they wish, as long as the 10%-of-calories-from-fat rule is maintained, and as long as only approved foods are eaten. By allowing people to eat as much as they like, the Ornish diet reduces the risk of binge eating, to which many dieters resort when forced to restrict calories. Many diets have been shown to fail when calories are restricted.

To summarize, the Ornish diet excludes cholesterol and saturated fat, excluding all animal products (except egg whites and nonfat dairy products), nuts, seeds, avocados, chocolate, olives, and coconuts. Oils are eliminated except a small amount of canola oil for cooking, and oil that supplies omega-3 **essential fatty acids**. The Ornish diet also prohibits **caffeine** but allows a moderate intake of alcohol, sugar, and salt.

It should be noted that Ornish himself states that his diet alone is not sufficient for reversing heart disease but is only one part of an overall program that includes exercise, yoga, meditation, stress reduction, and lifestyle changes. In fact, Ornish calls some of his work "opening the heart" therapies because patients are encouraged to confront emotional aspects of their healing as well as physical concerns such as diet and high cholesterol.

KEY TERMS

Atherosclerosis—A disease process whereby plaques of fatty substances are deposited inside arteries, reducing the inside diameter of the vessels and eventually causing damage to the tissues located beyond the site of the blockage.

Cholesterol—A steroid fat found in animal foods that is also produced in the human body from saturated fat. Cholesterol is used to form cell membranes and process hormones and vitamin D. High cholesterol levels contribute to the development of atherosclerosis.

Complete protein—A protein food that has all the essential amino acids the body requires to digest it.

Essential fatty acids—Fats that are essential to the diet because the body cannot make them. Omega-3 and omega-6 are the two major categories of essential fatty acids.

Plaque—A deposit, usually of fatty material, on the inside wall of a blood vessel. Also refers to a small, round demyelinated area that develops in the brain and spinal cord of an individual with multiple sclerosis.

Saturated fat—Fat that is usually solid at room temperature, found mainly in meat and dairy products but also in vegetable sources such as some nuts, seeds, and avocados.

Preparations

Anyone thinking of beginning a new diet should consult their physician. Requirements of calories, fat, and nutrients can differ significantly from person to person, depending on gender, age, weight, and many other factors such as the presence of any diseases or conditions. Pregnant or breastfeeding women should be especially cautious because deficiencies of vitamins or minerals can have a significant negative impact on a baby.

DEAN ORNISH (1953-)

Dr. Dean Ornish was born on July 16, 1953, in Dallas, TX. He attended Rice University and University of Texas at Austin, where he received his B.A. in 1975. He went on to graduate from Baylor College of Medicine in 1980 and completed his internship and residency at Massachusetts General Hospital and Harvard Medical School.

In 1989, Ornish began issuing data showing that the atherosclerotic patients he had been treating without drugs or invasive surgery had reduced the overall blockages in their arteries. That attention became international in 1990 with the issuance of the physician's best selling book, *Dr. Dean Ornish's Program for Reversing Heart Disease: The Only System Scientifically Proven to Reverse Heart Disease without Drugs or Surgery.*

Ornish provides readers with information to help them make the comprehensive lifestyle changes he advocates. Among the alterations Ornish recommends is the incorporation of stress management techniques such as meditation, imagery, breathing, and yoga exercises into their lives. Ornish also offers suggestions for healthier methods of coping with the emotional pain he believes everyone experiences in one form or another.

Although Ornish's lifestyle recommendations are similar to those advocated by most cardiologists, his prescription for health is much stricter. However, his research patients, all seriously ill at one time, have reduced their arterial blockages without the aid of pharmaceuticals or invasive surgical techniques.

Founder and president of the Preventive Medicine Research Institute of the University of California at San Francisco, Ornish believes there is a link between the causes of depression and heart disease and that bypasses and angioplasty only treat the symptoms, not the causes, of heart disease. Furthermore, he believes that having deeply intimate, loving relationships can be invaluable in preventing and treating heart disease.

Patients with heart disease should be especially careful when beginning a diet. Although Dr. Ornish has published data about how his diet may be able to prevent or reverse heart disease, everyone reacts differently and no major dietary changes should be made without consulting a physician. The Ornish diet is not a replacement for cholesterol-lowering drugs or any other medications prescribed by a doctor and is not a replacement for medically recommended procedures. It is important to discuss all possible options with a physician and make all decisions based on professional recommendations.

Ornish states that one emphasis of his program is increasing the awareness of eating habits and the ingredients of food products. Those beginning the Ornish diet can prepare by becoming thoroughly familiar with the Ornish list of recommended and prohibited foods and by learning to read food labels and count calories. Another preparation dieters can make is determining their ideal weight for their particular height and body type. Daily calorie and fat allowances can then be derived from this ideal weight. Ornish has authored or co-authored several books that provide hundreds of recipes consistent with the diet.

Precautions

The Ornish diet is not a substitute for medical care of cardiovascular disease. Furthermore, the Ornish diet is designed to be used in conjunction with a holistic health program that includes exercise, yoga, meditation, lifestyle changes, and stress reduction. As with any diet program, research continued as of 2008 on its effectiveness. Critics of the program maintain that Dr. Ornish has not produced sufficient clinical research to support his claims; they also assert that a diet high in carbohydrates drives up insulin levels, increasing the risk of diseases such as diabetes. A 2003 study comparing low-fat diets to low-carbohydrate diets reported that obese patients lost more weight on the low-carbohydrate diet compared to a fat and calorie-restricted diet. They also appeared to have lower triglyceride levels and improved insulin sensitivity.

The Ornish diet is very low in fat and limits meat and animal product intake to little or none. Many important vitamins and minerals such as **zinc** and vitamin B-12 are acquired from these sources in a normal diet. Without these sources there is a significant possibility of deficiency. Also, because of the very low fat allowance of the diet there is some concern that people on this diet may not get enough **vitamin E**, which is found mainly in nuts and oil. These are too high in fat to be eaten regularly while on this diet. Dr. Ornish often recommends taking supplements while following his diet, and taking a complete multivitamin may help reduce the risk of a deficiency. Multivitamins and supplements, however, have their own risks, especially for pregnant or breast-feeding women and individuals with medical issues such as renal disease.

Resources

BOOKS

Ornish, Dean. *Dr. Dean Ornish's Program for Reversing Heart Disease*. New York: Random House, 2009.

Ornish, Dean. *The Spectrum: A Scientifically Proven Pro gram to Feel Better, Live Longer, Lose Weight, and Gain Health*. New York: Ballantine Books, 2007.

PERIODICALS

Byrnes, Stephen. "Keeping Up with Nutritional Research." *Townsend Letter for Doctors and Patients* (July 2003): 119.

Dansinger, Michael L., et al. "Comparison of the Atkins, Ornish, Weight Watchers, and Zone Diets for Weight Loss and Heart Disease Risk Reduction." *Journal of the American Medical Association* 293 (January 5, 2005): 43 53.

Koertge, Jenny, et al. "Improvement in Medical Risk Fac tors and Quality of Life in Women and Men with Cor onary Artery Disease in the Multicenter Lifestyle Demonstration Project." *American Journal of Cardiol ogy* (June 1, 2003): 1316 1322.

"A Low carbohydrate as Compared with a Low fat Diet in Severe Obesity." *Journal of the American Academy of Physicians Assistants* (August 2003): 10 11.

OTHER

Ornish, Dean. "Dean Ornish, M.D., Lifestyle Program." *WebMD*.http://www.webmd.com/content/pages/9/3068_9408.htm (April 23, 2008).

ORGANIZATIONS

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.

Douglas Dupler
Teresa G. Odle
Helen Davidson

Ornithosis *see* **Psittacosis**

Ortho-bionomy

Definition

Ortho-bionomy is a form of therapeutic bodywork, based on the principle that gentle and non-invasive body alignment has a positive influence on physical and emotional disorders.

Origins

Ortho-bionomy was developed in the 1970s by Dr. Arthur Lincoln Pauls, a British osteopathic physician who was also an accomplished martial artist. Pauls was influenced by the principles of **osteopathy** that state that the function of the body is related to its physical (skeletal) alignment; that proper circulation of the blood and lymph is crucial to health; and that the body contains built-in mechanisms that can be triggered to correct imbalances and diseases. Influenced also by Eastern philosophy, Dr. Pauls searched for a system of healing that was gentle, non-invasive, and that worked with the body's inherent wisdom, rather than using forceful methods to manipulate problems involving posture.

Dr. Pauls was guided toward his system of bodywork in the 1960s, when an American osteopath named Lawrence Jones published a paper on a phenomenon he called "Spontaneous Release Through Positioning." Jones claimed that **muscle spasms** and painful injuries can be treated by the gentle repositioning of the part of the body that was painful. For instance, if a person injures a knee, the muscles and tendons around that area tighten, sometimes to the point of **pain** and spasm. The tightening protects the knee from further injury. When the injury begins to heal, the muscles and tendons around the area retain the memory of the injury, and have changed in structure. This change affects the bones, joints, and overall alignment of the body. By gentle and comfortable repositioning of the area into its proper alignment, a therapist can prompt the muscles to self-correct, releasing tension and trauma while re-educating the body's memory of the injury, and speeding the healing process.

Dr. Pauls built upon this concept when developing Ortho-bionomy. Influenced by Eastern **martial arts**, Pauls built his idea on the premise that the physical body and the emotions are deeply connected. Pauls developed "Phased Reflex Techniques," which is based on the body healing itself in phases. In effect, there is a gradual release of the emotions and traumas that occur after physical injuries. Pauls also believed that reflex actions in the muscles play a key role in healing injuries, and that by utilizing knowledge of these reflexes the therapist can gently and effectively boost the body's ability to self-correct. These reflexes are contained in the proprioceptive nerves (nerves that are present in the muscles and tendons that provide feedback on the body's movement and alignment). These nerves are influenced by emotions, and they affect the movement of the body. Healing begins by re-educating these nerves toward correct alignment and movement. Emotions held inside are released. Pauls developed a detailed system of bodywork techniques based on these principles. For instance, he found that the greater the stored trauma around an

KEY TERMS

Osteopathy—System of health care that emphasizes the musculoskeletal system.

Reiki—Form of therapeutic bodywork that strives to heal the body's energy field.

injury, the longer the therapist must reposition the area to provide a full release of healing potential.

Dr. Pauls termed his system Ortho-bionomy, which means, "the correct application of the laws of life." In the mid-1970s, he began teaching his system in the United States and Europe.

Benefits

Ortho-bionomy is used to alleviate chronic pain associated with injuries, muscle and joint problems, and arthritis; reduce **stress**; increase circulation; enhance **relaxation**; and improve problems of posture or structural alignment. Its gentle technique is recommended for acute pain and rehabilitative injuries. Ortho-bionomy is incorporated into other healing treatments. For example, massage therapists may use this technique to relieve knotted muscles. Some of the techniques may be used to relieve cramps, back pain, sore muscles, and headaches.

Ortho-bionomy is safe for newborns, the elderly, and those in post-operative conditions. Athletes and dancers may improve performances with the therapy by increased balance and flexibility.

Description

A session with an Ortho-bionomy therapist is similar to other therapeutic massage sessions. The patient remains clothed. Emphasis is placed on comfort, and on a trusting and open relationship between patient and therapist. Open communication from the patient provides feedback and assists in the discovery and release of emotional issues. The therapist may use a range of hands-on techniques, including light touch, smooth movements, gentle pressure on reflex points, finding and working with points of tension and pain, gentle prolonged body-positioning for release, and re-education exercises. Therapeutic movements are done slowly and gently, so that they do not create additional stresses. Some therapists may employ non-physical touch, to work upon the energy field of the body, similar to the touch used in **reiki**. Generally, a series of treatments is recommended, as Ortho-bionomy is based on the idea that healing occurs in gradual phases. The goal of treatment is to ultimately increase the patient's awareness on the physical and emotional levels and—through this awareness—to promote re-education and elimination of unhealthy patterns.

Preparations

No special preparation is needed prior to Ortho-bionomy treatments.

Precautions

Consumers may check with a practitioner to determine the level of Ortho-bionomy training he or she has completed.

Side effects

There are no reported side effects of Ortho-bionomy. The therapy is gentle, painless, and non-invasive.

Research & general acceptance

Ortho-bionomy is done in countries around the world, indicating that it has grown in popularity since the early work of Dr. Pauls.

Training and certification

Ortho-bionomy is taught and practiced worldwide. Some **massage therapy** schools offer Ortho-bionomy as a specialty course in conjunction with general massage therapy. Ortho-bionomy is also done by other health practitioners including naturopathic and osteopathic physicians.

The Society of Ortho-bionomy International has developed two training programs for professionals, a basic practitioner program and a senior practitioner program. Both offer theoretical coursework and supervised hands-on training. Students choose individual advisors during their training. The Society's Web site has links to Ortho-bionomy practitioners in a number of states, as well as countries such as Australia and New Zealand.

Resources

BOOKS

Kain, Kathy L. *Ortho Bionomy: A Practical Manual*. Berkeley, CA: North Atlantic, 1997.

Schultz, Louis R., Rosemary Feitis, and Diana Salles. *The Endless Web: Fascial Anatomy and Physical Reality*. Berkeley, CA: North Atlantic, 1996.

PERIODICALS

Tornick, Annie Woods. "Ortho Bionomy: Dancing in the Still Point." *Massage Magazine* (March/April 2003): 114. http://www.massagemag.com.

ORGANIZATIONS

Society for Ortho Bionomy International. 5875 North Lincoln Avenue, Suite 225. Chicago, IL 60659. (800) 743 4890. http://www.ortho bionomy.org. Publishes *Ortho Bionomy News*.

Douglas Dupler

KEY TERMS

Pellagra—A condition caused by a dietary deficiency of niacin, one of the B vitamins. The patient will have dementia, diarrhea and dermatitis.

Titration—Gradually adjusting dosage of a supplement until the desired result is obtained, but no unwanted side effects appear.

Orthomolecular medicine

Definition

Orthomolecular medicine is the prevention and treatment of disease by administering nutritional supplements. The patient's state of health, external or environmental factors and quality of diet are taken into account. The architect of orthomolecular medicine, Nobel Prize laureate Linus Pauling, coined the term in 1968. The aim of orthomolecular medicine is not merely to eliminate disease, but to aim for "optimum health."

Origins

Linus Carl Pauling was born in 1901 in Portland, Oregon. He published his first scientific paper at the age of 22. In 1925, he graduated summa cum laude from the California Institute of Technology with a Ph.D. in chemistry. He was to remain at this institute for the next 38 years.

Though by no means the first to investigate the properties of the nutrients contained in foods, or the first to consider the medical application of nutritional supplements, his contribution to our understanding of how nutrients work in our bodies and how supplements can affect our health, has not been matched, either before or since. It was not until 1966, after a long and distinguished career, that he changed direction in response to a letter from Irwin Stone and began to research the properties of micronutrients.

In 1970, Pauling published *Vitamin C and the Common Cold* , which established **vitamin C** as a favorite and effective remedy for colds and flu. In 1973, he founded the Institute of Orthomolecular Medicine, a non-profit research organization, with Arthur B. Robinson and Keene Dimick. The institute later became the Linus Pauling Institute of Science and Medicine. In the years that followed, Pauling published many research papers and books detailing his findings in the field of orthomolecular medicine until his death in 1994.

As a result of Pauling's research, orthomolecular medicine has become a specialized branch of alternative medicine, and its realm of application has widened to include not only **cancer** and other diseases, but many mental illnesses, including schizophrenia.

Benefits

In summarizing their philosophy, practitioners of orthomolecular medicine cite Hippocrates's watchword which was "First, do no harm." With their policy of rectifying **nutrition** first and then administering supplements in treating disease, they feel that they already have an advantage over allopathic methods such as chemotherapy, drug therapy, surgery and radiotherapy, which orthomolecular practitioners believe have potentially disastrous effects on the human organism. Despite the fact that when taken in "mega-doses" nutritional supplements have been known to cause harm, they can have a significantly lower potential for toxicity than allopathic drugs.

Orthomolecular practitioners recommend that patients improve their lifestyle and eating habits to consolidate benefits felt from the supplements themselves. Many of their "discoveries" have now become more or less common knowledge, for example the fact that a combination of vitamin C and **zinc** can speed the departure of a virus—particularly a cold—by many days.

Orthomolecular medicine can be of benefit to anyone for a wide range of illnesses and symptoms.

Some illnesses which have been treated with orthomolecular medicine are:

- depression, anxiety, and schizophrenia
- Raynaud's disease, heart problems, and therosclerosis
- digestive disorders, irritable bowel syndrome, Crohn's disease, diverticulitis, obeisity, and endometriosis
- chronic fatigue syndrome
- heavy metal toxicity and radiation sickness
- osteoarthritis and rheumatoid arthritis

- infertility and other reproductive disorders
- high blood pressure
- asthma and other respiratory problems
- eczema and other skin disorders
- candidiasis
- cancer, AIDS, and other immune system problems
- neural tube defects in the fetus.

Description

The basic concept of orthomolecular medicine is that according to their genetic makeup, and other factors such as environment, stress levels, and levels of nutrition, individuals will have nutritional needs that are peculiar to themselves alone; no two people will be alike in this respect. Consequently, what will cause illness for one person, will produce good health in another.

Many degenerative diseases and even mental abnormalities are quite possibly the result of biochemical imbalances. Linus Pauling's research demonstrated that all illness and disease can be treated to some extent with nutritional supplements, such as vitamins, **amino acids**, trace minerals, electrolytes, and fatty acids.

Theoretically, fresh food that is of high quality should provide all the nutrients necessary for good health. However, the depletion of nutrients in soil result from over-use of pesticides and artificial fertilizers and intensive farming practices also means a gradual decline in the levels of nutrients in produce. Orthomolecular practitioners, therefore, recommend that laboratory tests should be conducted to assess nutritional status so that possible areas of insufficiency may be addressed with the use of supplements.

Orthomolecular psychiatric therapy

This is the treatment of diseases of the mind by providing optimum nutrients, thus enhancing the "chemistry of the brain." It has been found to be very effective in the treatment of mental illness, even schizophrenia.

For those in the allopathic medical profession who are sceptical, practitioners remind them that when nicotinic acid was introduced, it cured hundreds of thousands of pellagra patients of psychoses in addition to the physical symptoms of this disease. Vitamin C has been used successfully to treat some mental symptoms, in particular **depression**.

Many other micronutrients have been found to influence brain function, among them:

- thiamine
- pyridoxone
- folic acid
- tryptophan
- L(+)-glutamic acid
- cyanocobalamin

Preparations

Nutritional supplements are a growing business and can be obtained almost anywhere, even in the supermarket. It is advisable to obtain supplements from an establishment that specializes in this area, and to ensure that products are fresh and potent.

A reputable health store will have staff on hand to advise customers about what is suitable for them and how supplements should be taken.

Precautions

If taken incorrectly nutritional supplements can have a detrimental effect on the health. Some supplements can produce adverse effects when taken in combination with certain medications. Certain supplements also cause unwanted effects during **pregnancy**. Instructions should always be followed, and if in doubt, a nutritionally-oriented practitioner or a physician should be consulted. The U.S. Food and Drug Administration (FDA) has drawn up maximum and minimum recommended doses for the guidance of the public. However, orthomolecular practitioners point out that these levels are intended for normal healthy individuals and sometimes doses far in excess of the RDA (recommended daily allowance) are required to bring a sick person back to health.

In early 2002, the U.S. Pharmacopeial (USP) Convention announced that it would launch a voluntary dietary supplement verification program. Manufacturers of supplements can supply the USP with documentation that shows they have a quality standard system in place to address label accuracy, safety and efficacy of products. The USP then arranges for a quality audit to verify that good quality and safety practices are in place.

Patient should not try to prescribe their own supplements, but should instead consult a qualified practitioner for safer and more beneficial results. It should be noted that blood tests do not always give an accurate picture of nutritional status and most orthomolecular practitioners recommend titration of doses to suit the patient.

Side effects

Orthomolecular medicine, while generally harmless, can be dangerous if safe doses of nutritional

supplements are not observed. Some supplements, notably the oil-based ones such as vitamins A, D, and E, can build up and cause undesirable consequences. Too much vitamin A, for example can cause very dry skin, among other things. Vitamin D can cause calcification of soft tissue if taken in excessive amounts, and all these items can cause liver damage if taken in excess.

Research and general acceptance

Since the beginning of this century, both nutrition and its "offshoot," orthomolecular medicine, have been extensively researched. Both the United States and British governments have special departments which determine safe doses of all supplements.

Orthomolecular medicine is possibly the branch of alternative therapies that has been the subject of most scientific research, and has certainly been validated by that research. Therefore, it is the one branch of alternative medicine that it is very difficult for allopathic medicine to call into question.

Linus Pauling was undoubtedly one of the most distinguished scientists of the twentieth century, and left over 400,000 research papers and other scientific documents to record his findings. Orthomolecular medicine research is based strongly on such other scientific fields as biochemistry, physiology, immunology, endocrinology, pharmacology, and toxicology.

Training and certification

Among those qualified to advise on treatment with nutritional supplements are board certified physicians, licensed nutritionists, and naturopaths. Although specialists in orthomolecular medicine tend to be highly qualified, it is advisable to check the credentials of any therapist or physician before consultation.

Resources

PERIODICALS

Levy, Sandra. "Watch for New Seals of Approval on Diet ary Supplements." *Drug Topics*146 (January 7, 2002): 29.

"Tips for the Savvy Supplement User." *FDA Consumer*35, no. 2 (March April, 2002): 17 25.

ORGANIZATIONS

American Holistic Medicine Association. http://www.holisticmedicine.org/index.html.

American Holistic Health Association. Dept. R P.O. Box 17400 Anaheim, CA 92817 7400. (714) 779 6152. ahha@healthy.net. http://www.healthy.net/pan/chg/ahha/rosen.html.

Center for Food Safety and Applied Nutrition, U.S. Department of Health and Human Services. 5100 Paint Branch Parkway, College Park, MD 20740 (888) SAFEFOOD. http://www.cfsan.fda.gov.

The Huxley Institute for Biosocial Research. American Academy of Orthomolecular Medicine. 900 North Federal Highway, Boca Raton, FL 33432 (800) 847 3802.

The Linus Pauling Institute. http://osu.orst.edu/dept/lpi/resagenda/timeline.html.

OTHER

"Holistic medicine." http://www.holisticmed.com/whatis.html.

National Center for Complementary and Alternative Med icine. http://nccam.nih.gov.

Orthomolecular medicine online. http://www.orthomed.org/.

Patricia Skinner
Teresa G. Odle

Osha

Description

Osha, whose botanical name is *Ligusticum porteri*, is a plant native to the western United States and Mexico. A member of the Umbelliferae family, osha has been used for centuries by Native Americans and Mexicans as a treatment for sore throats, fevers, and **influenza**. The plant belongs to the same family as **parsley** and dill, and it has the same long thin hollow stalk with large divided leaves. These leaves can reach heights of 2 ft (0.6 m). Osha's seeds and flowers are at the top of the plant and spread out in the form of an umbrella, whence its Latin family name. Osha flowers are white and the seeds have a sweet celery-like smell, as does the entire plant. The root is very hairy, brown on the outside and yellow on the inside. The plant has several other names: chuchupate, Indian parsley, Porter's lovage, mountain lovage, Colorado **cough** root. A plant related to osha, *Ligusticum wallichii*, is used in **traditional Chinese medicine**; most laboratory studies of osha have used this Chinese species.

General use

Osha root is a powerful antiviral and antibacterial agent, used for bronchial **infections** and sore throats. Taking a tincture or decoction of osha root, or chewing directly on the root, causes perspiration and enhances the body's immune function. Although osha has a bitter taste, its root has a numbing effect that soothes sore throats. Since it is also an expectorant, it is very useful for coughs and pharyngitis, and can also be used for very early stages of **tonsillitis**.

KEY TERMS

Decoction—An herbal extract produced by mixing an herb in cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. The decoction is then strained and drank hot or cold. Decoctions are usually chosen over infusion when the botanical or herb in question is a root, seed, or berry.

Expectorant—A drug that promotes the discharge of mucus from respiratory system.

Infusion—Introduction of a substance directly into a vein or tissue by gravity flow.

Tincture—A solution of alcohol and water containing plant matter. One available tincture of osha is 70% alcohol.

Osha root tea helps with gastrointestinal discomfort, in particular **indigestion** and stomach upset associated with **vomiting**. It can be used to increase appetite. Both osha root tincture and tea can be used topically on **cuts** and scrapes, as osha also has strong antibacterial qualities. Michael Moore, a contemporary American herbalist associated with the Southwest School of Herbal Medicine, states that osha can be used for head colds with dry cough; certain stages of pharyngitis; early stages of tonsillitis; coughs; influenza with persistent coughing; dry, hot fevers; and acute brochial **pneumonia**. Osha can be given together with **echinacea** for leukocytosis.

Preparations

Osha is available as whole or powdered dried roots. Dried osha root can be chewed directly. Michael Moore suggests taking a "walnut-sized root" every three to four hours. A cold infusion of osha, two to six ounces, can be taken as needed. Other products that contain osha come in different concentrations and should be mixed or diluted according to label instructions. If osha is used in tincture form, 20–60 drops can be taken up to five times a day. One part osha to two parts honey works well as a cough syrup, and is more appealing to children, who often dislike the plant's bitter taste.

Precautions

The most important precaution to take with osha is correct identification. The plant is often confused with hemlock parsley, which it closely resembles. Osha is also sometimes mistaken for poison hemlock, which can be fatal to humans if ingested. Osha has also been detected in the milk of lactating mothers, and should not be used by women who are pregnant or nursing.

Side effects

There are no known side effects with using osha other than allergy or hypersensitivity to it or to its plant family. High doses of osha taken over extended periods of time, however, may cause kidney or liver toxicity.

Interactions

No known adverse reactions have been reported with osha.

Resources

BOOKS

Moore, Michael. *Herbal Materia Medica*. Southwest School of Herbal Medicine, n.d.

Moore, Michael. *Herb/Medicine Contraindications*. South west School of Herbal Medicine, 1995.

Moore, Michael. *Medicinal Plants of the Mountain West*. Santa Fe, NM: Museum of New Mexico Press, 1979.

Moore, Michael. *Specific Indications for Herbs in General Use*. Southwest School of Herbal Medicine, 1994.

Katherine Y. Kim

Osteoarthritis

Definition

Osteoarthritis (OA), which is also known as osteoarthrosis or degenerative joint disease (DJD), is a progressive disorder of the joints caused by gradual loss of cartilage and resulting in the development of bony spurs and cysts at the margins of the joints. The name osteoarthritis comes from three Greek words meaning bone, joint, and inflammation.

Description

OA is one of the most common causes of disability due to limitations of joint movement, particularly in people over 50. It is estimated that 2% of the United States population under the age of 45 suffers from osteoarthritis; this figure rises to 30% of persons between 45 and 64, and 63–85% in those over 65. About 90% of the American population will have some features of OA in their weight-bearing joints by age 40. Men tend to develop OA at earlier ages than women.

Osteoarthritis of the hand of a 78 year old woman. *(© Scott Camazine / Alamy)*

OA typically develops gradually over a period of years. Patients with OA may have joint **pain** on only one side of the body. It primarily affects the knees, hands, hips, feet, and spine.

Causes and symptoms

Osteoarthritis results from deterioration or loss of the cartilage that acts as a protective cushion between bones, particularly in weight-bearing joints such as the knees and hips. As the cartilage is worn away, the bone rubbing against bone forms spurs, areas of abnormal hardening, and fluid-filled pockets in the marrow known as subchondral cysts. As the disorder progresses, pain results from deformation of the bones and fluid accumulation in the joints. The pain is relieved by rest and made worse by moving the joint or placing weight on it. In early OA, the pain is minor and may take the form of mild stiffness in the morning. In the later stages of OA, chronic inflammation develops. The patient may experience pain even when the joint is not being used; and he or she may suffer permanent loss of the normal range of motion in that joint.

Until the late 1980s, OA was regarded as an inevitable part of **aging**, caused by simple "wear and tear" on the joints. This view has been replaced by recent research into cartilage formation. OA is now considered to be the end result of several different factors contributing to cartilage damage, and is classified as either primary or secondary.

Primary osteoarthritis

Primary OA results from abnormal stresses on weight-bearing joints or normal stresses operating on weakened joints. Primary OA most frequently affects the finger joints, the hips and knees, the cervical and lumbar spine, and the big toe. The enlargements of the finger joints that occur in OA are referred to as Heberden's and Bouchard's nodes. Some gene mutations appear to be associated with OA. **Obesity** also increases the pressure on the weight-bearing joints of the body. Finally, as the body ages, there is a reduction in the ability of cartilage to repair itself. In addition to these factors, some researchers have theorized that

Osteoarthritis

Risk Factors
- Age-related
- Overuse of joints
- Excessive weight

Physical Effects
- Affects joints
- Bony spurs
- Enlarged or malformed joints

Treatment Options
- Weight Management
- Non-steroidal anti-inflammatory drugs

Pain Management
- Support groups
- Exercise
- Joint splitting
- Physical therapy
- Passive exercise
- Joint replacement
- Heat and cold
- Message therapy
- Acupuncture
- Psychological approaches (relaxation, visualization)
- Tai Chi
- Low stress yoga

(Illustration by Corey Light. Cengage Learning, Gale)

primary OA may be triggered by enzyme disturbances, bone disease, or liver dysfunction.

Secondary osteoarthritis

Secondary OA results from chronic or sudden injury to a joint. It can occur in any joint. Secondary OA is associated with the following factors:

- trauma, including sports injuries
- repetitive stress injuries associated with certain occupations (like the performing arts, construction or assembly line work, computer keyboard operation, etc.)
- repeated episodes of gout or septic arthritis
- poor posture or bone alignment caused by developmental abnormalities
- metabolic disorders

Colored x ray of the knee showing osteoarthritis. *(Phanie / Photo Researchers, Inc.)*

Diagnosis

History and physical examination

The two most important diagnostic clues in the patient's history are the pattern of joint involvement and the presence or absence of **fever**, rash, or other symptoms outside the joints. As part of the physical examination, the doctor will touch and move the patient's joint to evaluate swelling, limitations on the range of motion, pain on movement, and crepitus (a cracking or grinding sound heard during joint movement).

Diagnostic imaging

There is no laboratory test that is specific for osteoarthritis. Treatment is usually based on the results of diagnostic imaging. In patients with OA, x rays may indicate narrowed joint spaces, abnormal density of the bone, and the presence of subchondral cysts or **bone spurs**. The patient's symptoms, however, do not always correlate with x-ray findings. Magnetic resonance imaging (MRI) and computed tomography scans (CTscans) can be used to determine more precisely the location and extent of cartilage damage.

KEY TERMS

Bouchard's nodes—Swelling of the middle joint of the finger.

Cartilage—A tough, elastic connective tissue found in the joints, outer ear, nose, larynx, and other parts of the body.

Heberden's nodes—Swelling or deformation of the finger joints closest to the fingertips.

Subchondral cysts—Fluid-filled sacs that form inside the marrow at the ends of bones as part of the development of OA.

Treatment

Diet

Food intolerance can be a contributing factor in OA, although this is more significant in **rheumatoid arthritis**. Dietary suggestions that may be helpful for people with OA include emphasizing high-fiber, complex-carbohydrate foods, while minimizing fats. Plants in the Solanaceae family, such as tomatoes, peppers, eggplant, and potatoes, should be avoided, as should refined and processed foods. Citrus fruits should also be avoided, as they may promote swelling. Foods that are high in **bioflavonoids** (berries as well as red, orange, and purple fruits and vegetables) should be eaten often. Black cherry juice (2 glasses twice per day) has been found to be particularly effective for partial pain relief.

Nutritional supplements

In the past several years, a combination of **glucosamine** and **chondroitin** sulfate has been proposed as a dietary supplement that helps the body maintain and repair cartilage. Studies conducted in Europe have shown the effectiveness of this treatment but effects may not be evident until a month after initiating this treatment. These substances are nontoxic and do not require prescriptions. Other supplements that may be helpful in the treatment of OA include the antioxidant vitamins and minerals (vitamins A, C, E, **selenium**, and **zinc**) and the B vitamins, especially vitamins B_6 and B_5.

Naturopathy

Naturopathic treatment for OA includes **hydrotherapy**, **diathermy** (deep-heat therapy), nutritional supplements, and botanical preparations, including **yucca**, **devil's claw** (*Harpagophytum procumbens*), and **hawthorn** (*Crataegus laevigata*) berries.

Electromagnetic field therapy is believed to increase blood flow and oxygen exchange to enhance the body's natural healing processes. This treatment is not suggested for use over an open wound or in combination with transdermal drug delivery patches, or by those who are pregnant or have insulin pumps or pacemakers. Magnets may be worn within a shoe insole, anklet, bracelet, or back support.

Traditional Chinese medicine

Practitioners of **Traditional Chinese medicine** treat arthritis with suction cups, massage, **moxibustion** (warming an area of skin by burning a herbal wick a slight distance above the skin), the application of herbal poultices, and internal doses of Chinese herbal formulas.

Daily **acupressure** can also provide relief for stiff, achy joints. Massage of the achy joints with a blend of aromatic oils, especially **rosemary** and **chamomile** is beneficial. Periods of imagery are another suggested treatment—for 10-20 minutes twice daily—where the joint pain is pictured as transformed into a liquid that trickles from the body into the nearest body of water and eventually into the ocean waves.

Physical therapy

Patients with OA are encouraged to **exercise** as a way of keeping joint cartilage lubricated. Exercises that increase balance, flexibility, and range of motion are recommended for OA patients. These may include walking, swimming and other water exercises, **yoga** and other stretching exercises, or isometric exercises. Physical therapy may also include massage, moist hot packs, or soaking in a hot tub.

Allopathic treatment

Treatment of OA patients is tailored to the needs of each individual. Patients vary widely in the location of the joints involved, the rate of progression, the severity of symptoms, the degree of disability, and responses to specific forms of treatment. Most treatment programs include several forms of therapy.

Patient education and psychotherapy

Patient education is an important part of OA treatment because of the highly individual nature of the disorder and its potential impacts on the patient's life. Patients who are depressed because of changes in employment or recreation usually benefit from counseling. The patient's family should be involved in discussions of coping, household reorganization, and other aspects of the patient's disease and treatment regimen.

Medications

Patients with mild OA may be treated only with pain relievers such as acetaminophen (Tylenol) or propoxyphene (Darvon). Most patients with OA, however, are given nonsteroidal anti-inflammatory drugs, or NSAIDs. These include compounds such as ibuprofen (Motrin, Advil), ketoprofen (Orudis), and flurbiprofen (Ansaid). The NSAIDs have the advantage of relieving inflammation as well as pain. They also have potentially dangerous side effects, including stomach ulcers, sensitivity to sun exposure, kidney disturbances, and nervousness or **depression**.

Some OA patients are treated with corticosteroids injected directly into the joints to reduce inflammation and slow the development of Heberden's nodes. Injections should not be regarded as a first-choice treatment and should be given only two or three times a year. A series of hyaluronic acid injections into the affected joint may help to lubricate and protect cartilage.

Surgery

Surgical treatment of osteoarthritis may include the replacement of a damaged joint with an artificial part or appliance; surgical fusion of spinal bones; scraping or removal of damaged bone from the joint; or the removal of a piece of bone in order to realign the bone.

Protective measures

Depending on the location of the affected joint, patients with OA may be advised to use neck braces or collars, crutches, canes, hip braces, knee supports, bed boards, or elevated chair and toilet seats. They are also advised to avoid unnecessary knee bending, stair climbing, or lifting of heavy objects.

New treatments

Since 1997, several new methods of treatment for OA have been investigated. Although they are still being developed and tested, they appear to hold promise. They include:

- Disease-modifying drugs. These compounds may be useful in assisting the body to form new cartilage or improve its repair of existing cartilage.
- Gene therapy.
- Cartilage transplantation. This technique is presently used in Sweden.

Resources

BOOKS

"Bone, Joint, and Rheumatic Disorders: Osteoarthritis." In *The Merck Manual of Geriatrics,* edited by William B. Abrams, et al. Rahway, NJ: Merck Research Laboratories, 1995.

Hellman, David B. "Arthritis & Musculoskeletal Disorders." In *Current Medical Diagnosis & Treatment 1998,* edited by Lawrence M. Tierney, Jr., et al. Stamford, CT: Appleton & Lange, 1998.

"Musculoskeletal and Connective Tissue Disorders: Osteoarthritis (OA)." In *The Merck Manual of Diagnosis and Therapy,* edited by Robert Berkow, et al. Rahway, NJ: Merck Research Laboratories, 1992.

Neustadt, David H. "Osteoarthritis." In *Conn's Current Therapy,* edited by Robert E. Rakel. Philadelphia: W. B. Saunders Company, 1998.

"Osteoarthritis." In *Professional Guide to Diseases,* edited by Stanley Loeb, et al. Springhouse, PA: Springhouse Corporation, 1991.

Theodosakis, Jason, et al. *The Arthritis Cure*. New York: St. Martin's, 1997.

Kathleen D. Wright

Osteopathy

Definition

Osteopathy is a "whole person" philosophy of medicine, where doctors of osteopathic medicine (DOs) endorse an approach that treats the entire person, rather than a specific complaint. Attention is given to prevention, wellness, and helping the body to heal itself. Because the body is viewed as a single organism or unit, special focus is given to understanding body mechanics and the interrelationship of the body's organs and systems. A particular emphasis is placed on the musculoskeletal system. DOs may utilize physical manipulation of muscles and bones in conjunction with, or as an alternative to, conventional treatments, drug therapies, and surgery to provide complete health care.

Origins

Dr. Andrew Still developed the osteopathic approach to medicine. Still, whose father was a Methodist minister and physician, was himself a medical doctor who served as a Union surgeon during the Civil War. After the war, personal tragedy struck the Still household when three of his children died from spinal **meningitis**. This event angered and disillusioned him. He became dissatisfied with the state of medical knowledge and treatments available at that time. Consequently, he began an intense study of the human body to find underlying causes and cures for ailments.

Upper spine examination. *(Paul Rapson / Photo Researchers, Inc.)*

Still gave great attention to anatomy. He recognized the importance of the musculoskeletal system, the body's ability for self-healing, and focused on prevention and the concept of "wellness." In an era when drug treatment was frequently dangerous and overused, and surgery often fatal, Still was able to develop alternative treatments. For example, by manipulating the ribs and spine, Still provided treatments for **pneumonia**. He gave attention to the lymphatic system (which filters foreign matter and removes excess fluids, proteins, and waste products from the tissues and transports them to the blood to be circulated and eliminated) and manipulating the fascia (connective tissue that is tough, but thin and elastic; it forms an uninterrupted three-dimensional network from head to foot, sheathing every muscle, bone, nerve, gland, organ, and blood vessel), allowing him to address a range of other ailments.

Still's sons learned his philosophies and techniques, but demand overwhelmed their ability to supply care. In 1892, Still founded the first college of osteopathic medicine, the American School of Osteopathy, in Kirksville, Missouri. When he died in 1917, there were more than 5,000 practicing osteopaths in the United States. Today, osteopaths are the fastest growing segment of the total population of physicians and surgeons in the United States. In 2002, there were more than 49,000 doctors of osteopathy. Osteopathy has spread outside of the United States and is now practiced in countries throughout the world.

Benefits

The osteopathic focus on prevention and wellness may help individuals to avoid illness by teaching healthy behaviors and encouraging health-promoting lifestyle changes. In addition to conventional treatments, drugs, and surgeries, DOs may offer manipulative therapies not available from their allopathic counterparts (MDs). Many people seek care from an osteopath for back or neck pains, joint pains, or injuries. However, DOs may use manipulative therapies to treat a variety of ailments and conditions including arthritis, **allergies**, **asthma**, **dizziness**, **carpal tunnel syndrome**, menstrual **pain**, migraine headaches, **sciatica**, sinusitis, **tinnitus** (ringing in the ears), and problems in the jaw joints. Manipulative therapies may be incorporated into the treatment plan to speed recovery from various conditions, such as **heart attack** or disc surgery, and to address pediatric concerns, such as otitis media (**ear infection**) and birth traumas. Various manipulative therapies may also be appropriate in alleviating discomforts associated with **pregnancy**, for example, back pain or digestive problems. Some osteopaths even feel that regular osteopathic treatments may help minimize the effects of **aging** on the spine and joints. Also, as noted by the American Osteopathic Association (AOA), the field of sports medicine has found particular benefit in osteopathic practitioners because of their emphasis on "the musculoskeletal system, manipulation, diet, **exercise**, and fitness. Many professional sports team physicians, Olympic physicians, and personal sports medicine physicians are DOs."

Description

Osteopathic medicine considers the human body to be a complex unit of interrelated parts, a unified organism. Organs and systems do not function independently and should not be treated as such. A disturbance in one part of the body affects the entire body. Illness is also impacted by many variables, such as emotions, **stress**, lifestyle, and environment. Therefore, illness must be addressed by taking a whole

Elderly woman receiving osteopathy treatment. *(© Sally and Richard Greenhill / Alamy)*

person approach to treatment. Because the body is seen as self-regulating and self-healing, the osteopath gives special attention to illness prevention and helping the body maintain or re-establish wellness.

The nervous and circulatory systems play crucial roles in maintaining the functioning of the body's organs and systems; negative body-wide effects may occur when these two major systems are not functioning optimally. Relieving blocked blood flow or nerve impulses will help the body to heal itself by promoting blood flow through affected tissues. The blood supply will be better able to deliver vital nutrients and boost the immune system, the nerve supply to the area will be improved, and systemic balance can be restored.

The musculoskeletal system is key in this effort to achieve and maintain systemic balance and health. The musculoskeletal system is comprised of the bones, tendons, muscles, tissues, nerves, and spinal column. As the body's largest system, it encompasses over 60% of body mass and can suffer mechanical disorders or amplify illness processes anywhere in the body. Therefore, structural evaluation and attention to the musculoskeletal system is central to osteopathy.

In addition to conventional care such as drug therapies and surgery, osteopaths may use a variety of manipulative procedures to help the body systems function at peak levels. These techniques are commonly referred to as Osteopathic Manipulative Treatment (OMT). OMT is a form of noninvasive, "hands-on" care used for prevention, diagnosis, and treatment to reduce pain and restore motion, as well as help the body heal itself. OMT may be used to facilitate the movement of body fluids and normal tissue functioning, and release painful joints or dysfunctional areas. These therapies take different forms depending on patient needs.

In addition to easing the pain of physical disorders, OMT appears to be helpful in some psychiatric conditions as well. A recent study performed at the College of Osteopathic Medicine in Downers Grove, IL, found that OMT as an adjunct to **psychotherapy** alleviated the symptoms of **depression** in women, as measured by the Zung Depression Scale, a standard diagnostic instrument.

Manipulative procedures may be categorized and discussed in a variety of ways. According to the

American Association of Colleges of Osteopathic Medicine, the following groupings encompass some of the most commonly used procedures. Descriptions are compiled from the American Academy of Osteopathy, Leon Chaitow, N.D., DO, and others.

- Articulatory techniques. Procedures that move joints through their range of motion (articulating the joints) may be used to restore normal functioning.
- Counterstrain. This type of therapy is used to alleviate trigger points localized areas of hyperirritability in the muscles). The procedure involves first finding a body position that relieves the patient's pain. Through a process in which the patient and practitioner repeatedly use coordinated techniques of pushing (or compression), relaxing, and changing position, the trigger point is eased.
- Cranial treatment. Cranial treatments focus on the craniosacral system which consists of the brain, spinal cord, cerebrospinal fluid, dura (the membrane covering the brain and spinal cord), cranial bones, and the sacrum (triangular bone comprised of five fused vertebrae, and forming posterior section of the pelvis). Craniosacral release is a gentle technique that focuses on normalizing imbalances in the natural rhythms of this system. A light touch is used to detect and release restrictions in the system and encourage the body's own healing processes. Craniosacral therapies arose from the work of Dr. William Sutherland, a DO who developed and explored the concept that the bones of the skull allowed movement and could be manipulated to improve the system's rhythmic movements. Some DOs choose to specialize in cranial osteopathy. Craniosacral therapy is also practiced by a wide variety of health care professionals. As listed by the Upledger Institute, these practitioners include MDs, chiropractors, doctors of Oriental medicine, naturopaths, nurses, psychiatric specialists, psychologists, dentists, physical therapists, occupational therapists, acupuncturists, massage therapists, and other professional bodyworkers.
- Myofascial release treatment. Various direct or indirect treatments are applied to release fascia tissues.
- Lymphatic techniques. These techniques focus on improving lymphatic circulation, improving the ability of the lymphatic system to do its job of waste removal.
- Soft tissue techniques. Applied to tissue other than bone, these techniques use varying pressure and may stretch, roll, or knead, resulting in the relaxation or release of tissues.
- Thrust techniques. A quick, sharp thrust (which is often described as high velocity/low amplitude) to the area requiring treatment is used to force a correction, restoring normal joint function and movement. This is similar to chiropractic adjustment.

Precautions

DOs use the full range of conventional diagnostic techniques, drug therapies, treatments, and surgical interventions available to MDs. If deemed appropriate by the DO, OMT may be employed in addition to these conventional diagnoses, and treatments or may serve as an alternative to drug therapies. During the course of treatment, manipulative therapies may be interrupted or stopped if complications occur—for example, a rise in blood pressure. In some situations, the osteopath may determine that no further benefit will be gained from continuing manipulative treatment. Manipulation should not be applied in several medical conditions. As listed by Chris Belshaw, these conditions are mainly "acute **infections**; **fractures**; bone disease; **cancer**; gross structural deformities; such severe general medical conditions as gross high blood pressure or heart attack; vascular disease, for example, thrombosis; neurological conditions with nerve damage; spinal cord damage; and severe prolapse of an intervertebral disc." Additionally, as in any area of medicine, there is the possibility of mistaken diagnosis. Patients should always discuss all medical conditions, treatments, questions, and concerns with their physicians.

Side effects

Some patients, as noted by Belshaw, may experience mild headaches following neck treatments or discomfort after back manipulation. Some flushing and bruising may appear on those with sensitive skin. These reactions may last for several hours. Such symptoms may recur as treatment continues. Symptoms may return if treatment is stopped too soon.

Research and general acceptance

Research has shown the benefits of osteopathic care in a range of ailments and through improved recovery times. In addition to many of the conditions discussed above, the American Osteopathic Healthcare Association reports ongoing research on patient recovery times, length of hospital stays, chronic pain, **chlamydia** infection in women, reduction of deep vein thrombosis, and fall prevention for the elderly. Osteopathic colleges have increased their attention to biomedical research opportunities for students and those who desire to pursue research careers. The AOA Board of Research encourages and supports development of

ANDREW TAYLOR STILL (1828–1917)

(Betmann/CORBIS. Reproduced by permission.)

Andrew Taylor Still, the father of osteopathy, was born on August 6, 1828, in Virginia to Abram and Martha Still. Growing up on the frontier lands of Tennessee and Missouri provided the impetus for his first studies of the musculoskeletal system. Skinning squirrels and deer, Still became familiar with the relationship between bones, muscles, nerves, and veins long before he picked up an anatomy book. He later studied medicine under his doctor preacher father and served as a Union surgeon during the Civil War.

Following the war, his distrust of traditional medicine grew when three of his children died of cerebrospinal meningitis. Still decided that the medications of his day were useless and that there had to be another way.

Still studied the attributes of good health so he could understand disease. He saw the body as a complex machine that, when working properly, stayed free of disease. He turned to a drugless, manipulative therapy believing disease was caused by a failure of the human machinery to carry the fluids necessary to maintain health. He called his holistic approach osteopathy for the Greek words *osteon,* meaning bone, and *pathos,* to suffer.

Still gained a following working as an itinerant healer, and in October 1892, he opened the American School of Osteopathy in Kirksville, Missouri. Still welcomed women even as other medical schools denied them access.

As of 2000, there were 16 osteopathic medicine colleges in the United States and 35,000 practicing doctors of osteopathy. The Kirksville College of Osteopathic Medicine remains open.

scientific research in the osteopathic medical profession. The AOA has also conducted several campaigns to educate the public on osteopathy. In 2000, the AOA started a Women's Health Initiative, a three-year campaign to promote women's healthcare among osteopathic physicians and the public.

Training and certification

Training and certification for DOs exceed those of chiropractors and physical therapists, two groups to which their manipulative techniques are sometimes compared. **Chiropractic** training focuses on spinal manipulation only. Chiropractors typically have fewer years and types of required postgraduate training, and are more limited legally in their practice. DOs also have training and licensing well beyond that of physical therapists.

Osteopathic physicians, like their allopathic physician counterparts, are complete physicians. This means they are trained and licensed to prescribe medication and perform surgery, and qualified to render complete healthcare. DOs are fully licensed in all 50 states and the District of Columbia, to serve in the military medical corps, Veterans Administration, and Public Health Service, and are recognized by the American Medical Association as physicians. They hold the same practice rights as MDs, have passed the same or similar state licensing examinations, and practice in fully accredited hospitals. DOs can practice in all branches of medicine and surgery, and can specialize in any area, but the majority are primary care physicians.

As of spring 2002, the AOA lists 20 AOA-accredited colleges of osteopathic medicine. Training for DOs and MDs parallel in many ways. Osteopathic colleges, like medical schools, offer a basic, comprehensive four-year medical education. Added to this curriculum are the osteopathic philosophies and a holistic care emphasis on prevention and community care. In addition to stressing the interrelatedness of body organs and systems, students of osteopathy are taught to consider the whole person, including lifestyle, emotional factors, and environmental factors. Training also focuses on the musculoskeletal system

and manual medicine. Manipulative therapies are taught for prevention, diagnosis, and treatment, and the osteopathic principle of helping the body toward good health.

After graduation from the four-year curriculum, DOs complete a one-year rotating internship, followed by several years in a residency program, if a specialty is desired. The areas covered during the internship period ensure that each DO is first trained as a primary care physician. Over half of all DOs are primary care physicians. Conversely, MDs are more likely to be specialists.

After the formal education process, the AOA requires members to earn continuing medical education (CME) credits every three years. To further enhance postgraduate medical education, the AOA has implemented the concept of Osteopathic Postdoctoral Training Institutions (OPTIs), which reflect the osteopathic emphasis on community care. These OPTIs are community-based consortia that include at least one hospital and college of osteopathic medicine. The intention of these is to promote institutional collaboration and enhance training opportunities that reflect the settings in which many osteopaths will practice. In early 2002, a new Osteopathic Research Center opened at the University of North Texas Health Science Center in Fort Worth. The new Research Center is the result of collaboration among the American Colleges of Osteopathic Medicine, the American Osteopathic Foundation, and the American Osteopathic Association.

Many aspects of traditional osteopathic philosophy, such as advice about diet and **smoking**, have entered mainstream medicine to the point that the lines between DOs and MDs are blurring. In addition, the dedication of osteopaths to **holistic medicine** and primary care has been a great benefit to rural areas of the United States that are often underserved by mainstream practitioners.

Resources

PERIODICALS

"Osteopathic Manipulative Treatment May Benefit Patients." *Health & Medicine Week* (October 8, 2001).

Patrick, Stephanie. "Fort Worth Chosen for Osteopathic Center." *Dallas Business Journal* 25 (October 26, 2001): 10.

Shepard, Scott. "Health Philosophies on Common Ground." *Cincinnati Business Courier* 18 (November 9, 2001): 38.

ORGANIZATIONS

American Association of Colleges of Osteopathic Medicine. 5550 Friendship Blvd., Suite 310, Chevy Chase, MD 20815 7231. (301) 968 4100. http://www.aacom.org.

American Osteopathic Association. 142 E. Ontario Chicago, IL 6061. (800) 621 1773. info@aoa net.org. http://www.aoa net.org.

The Upledger Institute, Inc. 11211 Prosperity Farms Road, D 325, Palm Beach Gardens, FL 33410 3487. Educational services: (800) 233 5880. Administration: (561) 622 4334. Fax: (561) 622& 4771. upledger@upledger.com. http://www.upledger.com.

OTHER

HealthWorld Online. "Osteopathy." [cited October 2002]. http://www.healthy.net/CLINIC/therapy/Osteo/Index.asp.

The Osteopathic Homepage. http://www.osteohome.com.

Kathy Stolley
Rebecca J. Frey, PhD

Osteoporosis

Definition

The word osteoporosis literally means porous bones. It occurs when bones lose an excessive amount of their protein and mineral content, particularly **calcium**. Over time, bone mass and, therefore, bone strength are decreased. As a result, the bones become fragile and break easily. Even a sneeze or a sudden movement may be enough to break a bone in someone with severe osteoporosis.

Description

Osteoporosis is a serious public health problem. Some 10 million people in the United States have osteoporosis and another 34 million have low bone mass, placing them at risk for osteoporosis. The disease is responsible for 1.5 million **fractures** (broken bones) annually. These fractures, which are often the first sign of the disease, can affect any bone, but the most common locations are the hip, spine, and wrist. Breaks in the hip and spine are of special concern because they almost always require hospitalization and major surgery and may lead to other serious consequences, including permanent disability and even death.

To understand osteoporosis, it is helpful to understand the basics of bone formation. Bone is living tissue that is constantly being renewed in a two-stage process (resorption and formation) that occurs throughout life. In the resorption stage, old bone is broken down and removed by cells called osteoclasts. In the formation stage, cells called osteoblasts build new bone to replace the old. During childhood

U.S. and FAO/WHO recommended amounts of calcium and vitamin D

Calcium

Age	Recommended dietary allowance, U.S.	FAO/WHO recommendations
Children 1-3 yrs.	500 (mg/day)	500 (mg/day)
Children 4-6 yrs.		600 (mg/day)
Children 4-8 yrs.	800 (mg/day)	
Children 7-9 yrs.		700 (mg/day)
Children 9-13 yrs.	900 (mg/day)	
Children 10-18 yrs.		1,300 (mg/day)
Adolescents 14-18 yrs.	1,300 (mg/day)	
Adults 19-50 yrs.	1,000 (mg/day)	
Adults 19-65 yrs.		1,000 (mg/day)
Adults > 50 yrs.	1,200 (mg/day)	
Adults ≥ 65 yrs.		1,300 (mg/day)
Postmenopausal women		1,300 (mg/day)

Vitamin D

Age	Adequate intake, U.S.		FAO/WHO recommendations	
Up to 50 yrs.	200 IU/day	5 mcg/day	200 IU/day	5 mcg/day
Adults 51-65 yrs.			400 IU/day	10 mcg/day
Adults 51-70 yrs.	400 IU/day	10 mcg/day		
Adults ≥ 65 yrs.			600 IU/day	15 mcg/day
Adults ≥ 71 yrs.	600 IU/day	15 mcg/day		

FAO/WHO = Food and Agriculture Organization and World Health Organization
IU = International Unit
mcg = microgram
mg = milligram

(Illustration by Corey Light. Cengage Learning, Gale)

and early adulthood, more bone is produced than removed, reaching its maximum mass and strength by the mid-30s. After that, bone is lost at a faster pace than it is formed, so the amount of bone in the skeleton begins to slowly decline. Most cases of osteoporosis occur as an acceleration of this normal **aging** process, which is referred to as primary osteoporosis. The condition can also be caused by other disease processes or prolonged use of certain medications that result in bone loss; if so, it is called secondary osteoporosis.

Osteoporosis occurs most often in older people, especially in women after **menopause**. It affects nearly half of all adults, men and women, over the age of 75. Women, however, are five times more likely than men to develop the disease. They have smaller, thinner bones than men to begin with, and they lose bone mass more rapidly after menopause (usually around age 50), when they stop producing a bone-protecting hormone called estrogen. In the five to seven years following menopause, women can lose about 20% of their bone mass. By age 65 or 70, though, men and women lose bone mass at the same rate.

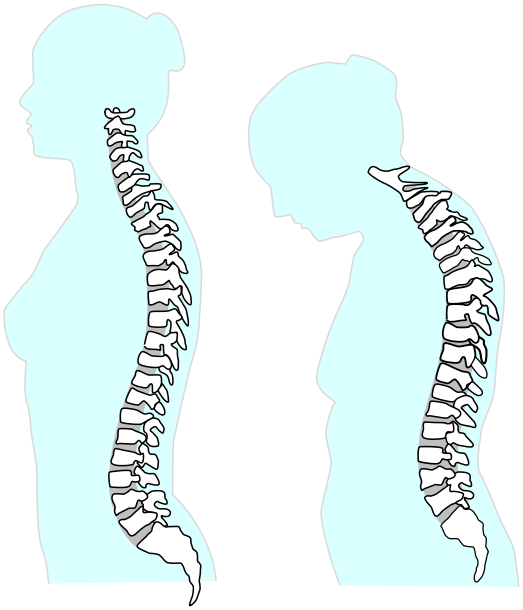
As an increasing number of men live longer, health professionals are increasingly aware that osteoporosis is an important health issue for men as well. In fact, men account for about 20% of all spinal fractures and up to 30% of all hip fractures due to osteoporosis.

Causes and symptoms

A number of factors increase the risk of developing osteoporosis. They include:

- Age. Osteoporosis is more likely as people grow older and their bones lose strength.
- Sex. Women are more likely to have osteoporosis because they start out with less bone. They also lose bone tissue more rapidly as they age. While women commonly lose 30 to 50% of their bone mass over their lifetimes, men lose only 20 to 33% of theirs.

Osteoporosis in the vertebrae



SOURCE: National Women's Health Center, U.S. Department of Health and Human Services

Osteoporosis is most common in the hips, wrist, and vertebrae (spine). The vertebrae are most important because these bones support the body to stand and sit upright. The vertebrae on the left is normal and the vertebrae on the right has been affected by osteoporosis. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

- Race. Caucasian and Asian women are most at risk for the disease, but African American and Hispanic women can get it too.
- Body type. Women with small bones or thin frames are more liable to develop osteoporosis.
- Early menopause. Women who begin menopause early because of heredity, surgery, or lots of physical exercise may lose large amounts of bone tissue early in life. Such conditions as anorexia and bulimia may also lead to early menopause and osteoporosis.
- Lifestyle. People who smoke or drink too much or do not get enough exercise have an increased chance of getting osteoporosis.
- Medications. Certain prescription medications may speed up the loss of bone. These drugs include methotrexate, cimetidine, corticosteroids, and heparin.
- Diet. Adults who do not get enough calcium or protein may be more likely to have osteoporosis. People who constantly diet are more prone to the disease.

Osteoporosis is often called the silent disease because bone loss occurs without symptoms. People often do not know they have the disease until a bone breaks, frequently in a minor fall that would not typically cause a fracture. A common occurrence is compression fractures of the spine. These can happen even after a seemingly normal activity, such as bending or twisting to pick up a light object. The fractures can cause severe back **pain**, but sometimes they go unnoticed. Either way, the vertebrae collapse on themselves, and the person actually loses height. The hunchback appearance of many elderly women, sometimes called dowager's hump or widow's hump, is due to the effect of osteoporosis on the vertebrae.

Diagnosis

Certain types of doctors may have more training and experience than others in diagnosing and treating people with osteoporosis. These include a geriatrician, who specializes in treating the aged; an endocrinologist, who specializes in treating diseases of the body's endocrine system (glands and hormones); and an orthopedic surgeon, who treats fractures, such as those caused by osteoporosis.

Before making a diagnosis of osteoporosis, the doctor usually takes a complete medical history, conducts a physical examination, and orders x rays, as well as blood and urine tests, to rule out other diseases that cause loss of bone mass. The doctor may also recommend a bone density test, which is the only way to know for certain if osteoporosis is present. It can also show how far the disease has progressed.

Several diagnostic tools are available to measure the density of a bone. The ordinary x ray is one, though it is the least accurate for early detection of osteoporosis because it does not reveal bone loss until the disease is advanced and most of the damage has already been done. Two other tools that are more likely to catch osteoporosis at an early stage are computed tomography (CT) scans and machines called densitometers, which are designed specifically to measure bone density.

The CT scan, which takes a large number of x rays of the same spot from different angles, is an accurate test but uses higher levels of radiation than other methods. The most accurate and advanced of the densitometers uses a technique called DEXA (dual energy x ray absorptiometry). With the DEXA scan, a double x-ray beam takes pictures of the spine, hip, or entire body. It takes about 20 minutes, is painless, and exposes the patient to only a small amount of radiation—about 1/50 that of a chest x ray.

Medicare covers a test that measures bone resorption, an important measure for tracking a patient's response to osteoporosis therapy. The relatively inexpensive test measures a baseline amount then compares amounts from later tests to track progress. The test consists of simple urine collection.

People should talk to their doctors about their risk factors for osteoporosis and if and when to have a bone density test. Ideally, women should have bone density measured at menopause and periodically afterward, depending on the condition of their bones. Men should be tested starting at age 65. Men and women with additional risk factors, such as those who take certain medications, may need to be tested earlier.

Treatment

Alternative treatments for osteoporosis focus on maintaining or building strong bones. They include nutritional and herbal therapies and **homeopathy**.

Nutritional therapy

A healthful diet low in fats and animal products and containing whole grains, fresh fruits and vegetables, and calcium-rich foods (such as dairy products, dark-green leafy vegetables, sardines, salmon, and almonds), along with nutritional supplements (such as calcium, **magnesium**, and **vitamin D**) are important components of nutritional approaches to treating this disease.

Women should also eat more soy products such as tofu, soy burgers, other soy-based products, or miso. Soy beans contain a substance called isoflavones which have estrogen-like activity. Isoflavones may help to increase bone density, alleviate **hot flashes** and other menopausal symptoms, lower the risk of **cancer**, and even reduce the risk of heart attacks. Natural hormone therapy, such as the use of soy products, is a safer alternative to synthetic estrogenic hormones, which may increase the risk of **breast cancer**.

In addition, women should avoid foods that may accelerate bone loss. They should avoid having too much salt in their diet, not only because salt raises the blood pressure but also because it may contribute to osteoporosis. They should also cut down on coffee, caffeinated sodas, and alcohol. High consumption of these beverages, studies have shown, are associated with accelerated drop in bone density and increase risk of bone fracture in old age. Caffeinated sodas are especially bad for the bones because in addition to containing **caffeine**, they have high amounts of phosphoric acid. Phosphoric acid increases bone resorption, thus decreasing bone density.

Herbal supplements

Herbal supplements for osteoporosis emphasize such calcium-containing plants as **horsetail** (*Equisetum arvense*), oat straw (*Avena sativa*), **alfalfa** (*Medicago sativa*), **licorice** (*Glycyrrhiza glabra*), **marsh mallow** (*Althaea officinalis*), and sourdock (*Rumex crispus*). There are, however, few data from clinical trials to support the use of these herbs.

Homeopathy

Homeopathic remedies for osteoporosis focus on treatments believed to help the body absorb calcium. These remedies may include such substances as *Calcarea carbonica* (calcium carbonate) or *Silica* (flint). Again, there are few data other than isolated case reports regarding the effectiveness of these remedies.

Allopathic treatments

There are a number of good treatments for primary osteoporosis, most of them medications. For people with secondary osteoporosis, treatment may focus on curing the underlying disease.

Drugs

For most women who have gone through menopause, the best treatment for osteoporosis is hormone replacement therapy (HRT), also called estrogen replacement therapy. In addition to alleviating hot flashes, synthetic estrogens protect women against **heart disease** and they help to relieve and prevent osteoporosis. HRT increases a woman's supply of estrogen, which helps build new bone while preventing further bone loss.

The Women's Health Initiative (WHI), a large 15-year government-funded research study, concluded in a 2006 report that the drug Prempro (estrogen combined with progestin), which is used in hormone therapy, is associated with a modest increase in the risk of breast cancer, **stroke**, and **heart attack**. The WHI also demonstrated that in patients who had a hysterectomy, estrogen therapy alone was associated with an increase in the risk of stroke, but not of breast cancer or cardiovascular (heart) disease. A large study from the National Cancer Institute indicated that long-term use of estrogen therapy may be associated with an increased risk of **ovarian cancer**. Estrogen therapy is approved for treatment of menopausal symptoms but should be prescribed for the shortest period of time possible. When used solely for the prevention of postmenopausal osteoporosis, any estrogen/hormone therapy regimen should only be considered for women at significant risk of osteoporosis, and non-estrogen medications should

be carefully considered first. The women in the WHI were participating in a follow-up phase of the study that was anticipated to last until 2010.

For people who cannot or decide not to take estrogen/hormone therapy, other medications can be good choices. These include a class of drugs called bisphosphonates, such as alendronate (Fosamax), risedronate (Actonel), and ibandronate (Boniva). Another bisphosphonate, zoledronic acid (Reclast), is approved to treat postmenopausal osteoporosis. Alendronate and another drug, calcitonin (Miacalein, Fortical), both stop bone loss, help build bone, and decrease fracture risk by as much as 50%. Both drugs attach to bone that has been targeted by bone-eating osteoclasts. They protect the bone from these cells. Osteoclasts help the body break down old bone tissue. Calcitonin is a hormone that has been used as an injection for many years. A subsequent version was on the market as a nasal spray in 2008. Side effects of these drugs are minimal, but calcitonin builds bone by only 1.5% a year. Fosamax has proven safe in very large multi-year studies and is as of 2008 indicated for treatment of osteoporosis in most men. Boniva is a pill that is taken once a month.

Another drug approved by the FDA to treat and prevent osteoporosis is raloxifene (Evista). It is from a class of drugs called estrogen agonists/antagonists, commonly called selective estrogen receptor modulators. Raloxifene appears to prevent bone loss in the spine, hips, and total body. It has been shown to benefit bone mass and turnover and can decrease the risk of vertebral fractures. Also approved for postmenopausal women and men with osteoporosis who have a high risk for fracture, is teriparatide (Forteo), an injectable form of human parathyroid hormone. Unlike other osteoporosis drugs, teriparatide works by stimulating new bone formation in the spine and hips.

Medications under study in the late 2000s include other biphosphonates that slow bone breakdown (such as alendronate), **sodium** fluoride, and vitamin D metabolites.

Surgery

Unfortunately, much of the treatment for osteoporosis is for fractures that result from advanced stages of the disease. For complicated fractures, such as broken hips, hospitalization and a surgical procedure are required. In hip replacement surgery, the broken hip is removed and replaced with a new hip made of plastic or a combination of metal and plastic. Despite often-successful surgeries, a large percentage of those who survive are unable to return to their previous level of activity, and many end up moving from self-care to a supervised living situation or nursing home. That is why prevention, getting early treatment, and taking steps to reduce bone loss are vital.

Expected results

There is no cure for osteoporosis, but it can be controlled. Most people who have osteoporosis fare well once they get treatment. The medicines available build bone, protect against bone loss, and halt the progress of this disease.

Prevention

Building strong bones, especially before the age of 35, and maintaining a healthy lifestyle are the best ways of preventing osteoporosis. To build as much bone mass as early as possible in life and to help slow the rate of bone loss later in life, individuals should do the following:

- Get calcium in foods: Experts recommend 500 to 1,300 milligrams (mg) of calcium per day for children, 1,300 mg for adolescents, 1,000 mg for ages 19 to 50, and 1,200 mg for people 51 and older. The dosage for pregnant or lactating women ages 14 to 18 is 1,300 mg daily and 1,000 mg for age 19 and older. Foods are the best source for this important mineral. Milk, cheese, and yogurt have the highest amounts. Other foods that are high in calcium are green leafy vegetables, tofu, shellfish, Brazil nuts, sardines, and almonds.
- Take calcium supplements: Many people, especially those who do not like or cannot eat dairy foods, do not get enough calcium in their diets and may need to take a calcium supplement. Supplements should be taken with meals and accompanied by six to eight glasses of water a day.
- Get vitamin D: Vitamin D helps the body absorb calcium. People can get vitamin D from sunshine with a quick (15–20 minute) walk each day or from foods such as liver, fish oil, and vitamin D fortified milk. During the winter months it may be necessary to take supplements. Four hundred mg daily is usually the recommended amount.
- Avoid smoking and alcohol: Smoking reduces bone mass, as does heavy drinking. To reduce risk, individuals ought not to smoke, and ought to limit alcoholic drinks to no more than two per day. An alcoholic drink is 1.5 oz of hard liquor, 12 oz of beer, or 5 oz of wine.
- Exercise regularly: Exercising regularly builds and strengthens bones. Weight-bearing exercises, in which bones and muscles work against gravity, are best.

KEY TERMS

Alendronate—A non-hormonal drug used to treat osteoporosis in postmenopausal women.

Anticonvulsants—Drugs used to prevent convulsions or seizures. They often are prescribed in the treatment of epilepsy.

Biphosphonates—Compounds (such as alendronate) that slow bone loss and increase bone density.

Calcitonin—A naturally occurring hormone made by the thyroid gland that can be used as a drug to treat osteoporosis and Paget's disease of the bone.

Estrogen—Female hormone produced mainly by the ovaries and released by the follicles as they mature. Responsible for female sexual characteristics, estrogen stimulates and triggers a response from at least 300 tissues. After menopause, the production of the hormone gradually decreases and eventually stops.

Glucocorticoids—A general class of adrenal cortical hormones that are mainly active in protecting against stress and in protein and carbohydrate metabolism. They are widely used in medicine as anti-inflammatories and immunosuppresives.

Osteoblasts—Cells in the body that build new bone tissue.

Osteoclasts—Cells that break down and remove old bone tissue.

Selective estrogen receptor modulator—A hormonal preparation that offers the beneficial effects of hormone replacement therapy (HRT) without the increased risk of breast and uterine cancer associated with HRT.

These include aerobics, dancing, jogging, stair climbing, tennis, walking, and lifting weights. People who have osteoporosis may want to attempt gentle exercise, such as walking, rather than jogging or fast-paced aerobics, which increase the chance of falling. Individuals ought to exercise three to four times per week for 20 to 30 minutes each time.

Resources

BOOKS

Bissinger, Margie. *Osteoporosis: An Exercise Guide*. Parsippany, NJ: Workfit Consultants, 2008.

Gueldner, Sarah H., et al. *Osteoporosis: Clinical Guidelines for Prevention, Diagnosis, and Management*. New York: Springer, 2007.

Nelson, Miriam E., and Sarah Wernick. *Strong Women, Strong Bones*.New York: Perigee Trade, 2006.

Pirello, Robert, and Bernardo A. Merizalde. *B.O.N.E.S.: Beating Osteoporosis Naturally, Easily, Sensibly*.Philadelphia: Xlibris, 2006.

PERIODICALS

Arnst, Catherine. "Bones of Contention: Drugmakers Are Stoking Fears of Fracture Among Middle Aged Women. But Experts Say the Risk Is Low." *Business Week* (February 11, 2008): 34.

Bates, Betsy. "Higher Vitamin D Doses Will Be Stressed in Fracture Guides." *Skin & Allergy News* (February 2008): 58.

Belt Marchesi, June. "Osteoporosis in Men." *Clinical Reference Systems* (May 31, 2007): N/A.

Dean, Angela. "Get with the Strength: Complementary Therapies to Prevent & Treat Osteoporosis." *Pharmacy News* (November 22, 2007): 17.

Duck, Julie, and Carl T. Amodio. "Bone Health and Osteoporosis: Make No Bones About These Important Minerals." *Chiropractic Products* (January 2008): 26(2).

Hudson, Tori. "Phytoestrogen Intake Prevents Bone Loss." *Townsend Letter: The Examiner of Alternative Medicine* (February/March 2008): 141.

ORGANIZATIONS

Arthritis Foundation, PO Box 7669, Atlanta, GA, 30357 0669, (800) 283 7800, http://www.arthritis.org.

National Osteoporosis Foundation, 1232 Twenty second St. NW, Washington, DC, 20036 4603, (800) 223 9994, http://www.nof.org.

Osteoporosis Canada, 1090 Don Mills Rd., Suite 301, Toronto, ON, M3C 3R6, Canada, (800) 463 6842, http://www.osteoporosis.ca.

Mai Tran
Ken R. Wells

Otitis media *see* **Ear infection**

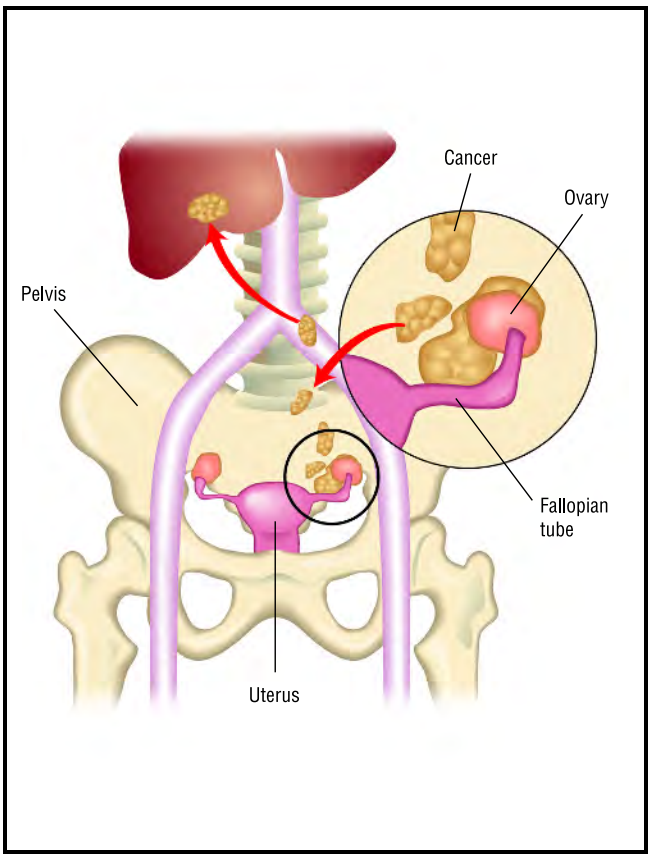
Ovarian cancer

Definition

Ovarian **cancer** is a disease in which the cells in the ovaries become abnormal, start to grow uncontrollably, and form tumors. Ninety percent of all ovarian cancers develop in the cells that line the surface of the ovaries and are called epithelial cell tumors.

Description

The ovaries are a pair of almond-shaped organs that lie in the pelvis on either side of the uterus. The fallopian tubes connect the ovaries to the uterus. The



A close-up of a cancerous growth on the ovary. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

ovaries produce and release usually one egg each month during the menstrual cycle. Along with the adrenal gland, the ovaries also produce the female hormones estrogen and progesterone, which regulate and maintain the secondary female sexual characteristics.

Ovarian cancer is the fifth most common cancer among women in the United States. It accounts for 4% of all cancers in women. However, the death rate due to this cancer is higher than that of any other cancer among women. About 1 in 70 women in the United States was anticipated to develop ovarian cancer, and 1 in 100 was anticipated to die from it. The National Cancer Institute (NCI) estimated that 21,650 new cases of ovarian cancer would be diagnosed in the United States in 2008, and that 15,520 women would die from the disease.

Ovarian cancer can develop at any age, but more than half the cases occur among women who are 65 years old or older. The incidence of the disease is highest among Native American women, followed by Caucasian, Vietnamese, Hispanic, and Hawaiian women. Only 50% of the women who are diagnosed with ovarian cancer survive five years after initial diagnosis. This low survival rate is because at the time of initial diagnosis, the cancer is usually in an advanced stage. It is difficult to diagnose ovarian cancer early because often there are no warning symptoms, and the disease spreads relatively quickly. In addition, the ovaries are situated deep in the pelvis and small tumors cannot be detected easily during a routine physical examination.

Causes and symptoms

The actual cause of ovarian cancer is not known, but several factors are known to increase a woman's chances of developing the disease. These are called risk factors. The major risk factors for cancer in general are tobacco, alcohol, diet, sexual and reproductive behavior, infectious agents, family history, occupation, environment, and pollution. There are several risk factors particularly associated with ovarian cancer.

- Age. The incidence of the disease increases with age. Half of all cases are diagnosed after age 65.
- Race. The incidence of the disease is highest among Native American women and lowest among Korean and Chinese women.
- High-fat diet. When Asian women move to the more affluent Western countries and adopt a diet that is rich in fat, the incidence of ovarian cancer among them rises. Furthermore, ovarian cancer is highest in those countries with the highest consumption of dairy foods (Switzerland, Denmark, and Sweden) and lowest in those countries with the lowest dairy intake (Japan, South Korea, Singapore). Ovarian cancer is also linked to high socioeconomic status in women.
- Family history. Women who have even one close relative with the disease have a threefold increase in risk. In addition, if a woman has had breast cancer, she is at an increased risk for ovarian cancer.
- Early menstruation/late menopause. Menstruating early (before age 12) and experiencing menopause late seem to put women at a higher risk for ovarian cancer. It is believed that the longer a woman ovulates, the higher her risk of ovarian cancer (some researchers think exposure to estrogen during the monthly cycles is the cause). Since ovulation occurs only during the childbearing years, the longer she menstruates, the greater her risk. Pregnancy gives a break from ovulation and exposure to estrogen for nine months. Hence, multiple pregnancies actually appear to reduce the risk of ovarian cancer. Similarly, since oral contraceptives suppress ovulation and reduce exposure to estrogen, women who take birth control pills have a lower incidence of the disease.

- Fertility drugs. One study has shown that prolonged use of certain fertility drugs, such as clomiphene citrate, may increase a woman's risk of developing ovarian tumors.
- Talcum powder. Some studies have suggested that the use of talcum powder in the genital area may double a woman's risk of getting the cancer. The incidence of ovarian cancer is higher than normal among female workers exposed to asbestos. Since talc contains particles of asbestos, some researchers believe that is what accounts for the increased risk.

Ovarian cancer has no specific signs or symptoms in the early stages of the disease. There may be some vague, nonspecific symptoms that are often ignored. However, if any of the symptoms persist, it is essential to have them evaluated by a doctor immediately. Only a doctor can determine whether the symptoms are an indication of early ovarian cancer; however, the presence of two or more of the following symptoms is reason for concern. The patient may experience:

- pain or swelling in the abdomen
- bloating, and a general feeling of abdominal discomfort
- constipation, nausea, or vomiting
- loss of appetite, fatigue
- unexplained weight gain (generally due to an accumulation of fluid in the abdomen)
- vaginal bleeding in postmenopausal women.

Diagnosis

Patients with ovarian cancer were once thought to exhibit no symptoms in the early stage of the disease. But newer studies have shown that certain symptoms are more common in women with early stage ovarian cancer. These symptoms include bloating, pelvic or abdominal **pain**, difficulty eating or feeling full early, and urinary problems, such as frequency or urgency, according to the National Comprehensive Cancer Network. If ovarian cancer is suspected, the doctor typically begins the diagnosis by taking a complete medical history to assess all the risk factors. A thorough pelvic examination is conducted. Blood tests to determine the level of a particular blood protein, CA125, may be ordered. This protein is usually elevated in women with ovarian cancer. However, it is not a definitive test because the levels may also rise in other gynecologic conditions, such as **endometriosis** and ectopic **pregnancy**. Researchers have found another biological marker, a protein called prostasin that appears to be specific to ovarian cancer. While prostasin should not be used as the only blood test for ovarian cancer, assessment of prostasin levels together with CA125 levels improves the likelihood of early detection. Ultrasound is almost always used to check the size of the ovaries. Standard imaging techniques such as computed tomography scans (CT scans) and magnetic resonance imaging (MRI) may be used to determine the condition of the ovaries and if the disease has spread to other parts of the body. Ultrasonography, which uses ultrasound waves to produce images of the ovaries, is also used to diagnose ovarian cancer.

A noninvasive technique for early detection of ovarian cancer involves a genetically altered virus. Researchers at the University of Alabama engineered a **common cold** virus to infect ovarian cancer cells with a green fluorescent protein that reveals the cancer cells. The technique can also be used to monitor the effectiveness of therapy.

Other tests for the early detection of ovarian cancer were undergoing development as of 2008. One of the most promising is a blood test for asymptomatic early-stage ovarian cancer. The test, developed by researchers at Yale University, has shown a 99% accuracy rate in early trials. Further testing was underway as of early 2008, and if approved by the U.S. Food and Drug Administration (FDA), the test could be available in late 2008 or early 2009.

In order to determine if the tumor is benign or cancerous, surgery is necessary. If the tumor appears to be small from the imaging tests, then a procedure known as laparoscopy may be used. A tiny incision is made in the abdomen and a slender, hollow, lighted instrument is inserted through it. This device lets the doctor view the ovary more closely and to obtain a piece of tissue for microscopic examination. If the tumor appears large, a laparotomy is performed under general anesthesia. This procedure combines both diagnosis and treatment for ovarian cancer because the tumor is often completely removed at this time. A piece of the tissue that is removed will be examined under a microscope to determine whether the tumor was benign or malignant.

Surgery confirms the diagnosis, but ovarian cancer is often strongly suspected before surgery based on symptoms and ultrasound. The goal of surgery is to completely remove the cancer, but often this is not possible.

Diagnosis in alternative treatment uses mainstream diagnostic techniques and supplements them with thorough physical and psychological examinations. Considerations such as lifestyle, relationships, and emotional and psychological histories are used to complete an overall portrait of a patient's health in order to develop holistic strategies for healing.

Treatment

There are many alternative treatments available to help with ovarian cancer. Alternative treatments can be used in conjunction with, or separate from, surgery, chemotherapy, and radiation therapy. When used with conventional treatment, alternative treatments have been shown to decrease pain and side effects, aid in the recovery process, and improve the quality of life of cancer patients.

Alternative treatment of cancer is complicated, and there are many choices in therapies and alternative practitioners. Consumers should consult as many trained healthcare practitioners as possible when choosing alternative therapies. If consumers are willing to ask questions and thoroughly research their options, they can increase their chances of getting the best possible alternative support for the difficult task of treating cancer.

Alternative medicine generally views cancer as a holistic problem. That is, cancer represents a problem with the body's overall health and immunity. As such, treatment is holistic as well, striving to strengthen and heal the physical, mental, and emotional aspects of patients. Alternative cancer treatments may emphasize different basic approaches, which include traditional medicines, mind/body approaches, physical approaches, nutritional and dietary approaches, integrated approaches, and experimental programs.

Traditional medicines

Traditional Chinese medicine uses **acupuncture**, **acupressure** massage, herbal remedies, and movement therapies such as t'ai chi and **qigong** to treat cancer. Traditional Chinese herbal remedies have already contributed a significant number of anticancer drugs, and studies have shown their anticancer properties. Acupuncture has been shown to reduce some tumors, significantly reduce pain, and support and improve immune system activity.

Ayurvedic medicine uses **detoxification**, herbal remedies, massage, **exercise**, **yoga**, breathing techniques, and **meditation** as part of its cancer treatment. *Panchakarma* is an extensive detoxification and strengthening program that is recommended for cancer patients and those undergoing chemotherapy and radiation. **Panchakarma** uses **fasting**, special vegetarian **diets**, enemas, massage, herbal medicines, and other techniques to rid the body of excess toxins (believed to contribute to chronic diseases such as cancer) and to strengthen the immune system. Some Ayurvedic herbs may also have significant anticancer properties.

Naturopathy and **homeopathy** are traditional Western healing systems using herbal medicines and other techniques to strengthen the immune system and reduce the pain of cancer treatment. **Western herbalism** is also beginning to compile studies of many herbs that have potential anticancer and immune strengthening properties (such as **mistletoe**).

Mind/body approaches

Mind/body treatments seek to help patients with the mental and spiritual challenges posed by cancer and to mobilize the body's own defenses and immune system. Some of these therapies include **psychotherapy**, support groups, **guided imagery**, visualization techniques, meditation, **biofeedback**, hypnosis, breathing techniques, and yoga. Mind/body approaches work with the idea that the mind and emotions can profoundly influence the health of the body. These techniques help patients manage the **stress** and **anxiety** that accompany cancer. Mind/body techniques have also been shown to stimulate the immune system and to reduce the pain of symptoms and conventional treatments.

Physical approaches

Physical approaches to cancer include exercise; massage therapies; movement therapies, including yoga, t'ai chi, and qigong; breathing techniques; and **relaxation** techniques. These therapies strive to increase immune system response, promote relaxation and stress reduction, and reduce side effects (such as pain, **nausea**, **vomiting**, weakness, and physical immobility) of conventional treatments.

Nutritional and dietary approaches

Cancer patients have heightened needs for diets free of toxic chemicals and full of cancer-fighting nutrients. Diet and **nutrition** may improve both a cancer patient's chances for recovery and the patient's quality of life during treatment. In laboratory studies, vitamins such as A, C, and E, as well as compounds such as isothiocyanates and dithiolthiones found in broccoli, cauliflower, and cabbage, and beta-carotene found in carrots, tomatoes, and salad greens, have been shown to protect against cancer. The minerals **selenium** and **zinc** are also important nutrients in the ovarian cancer diet. Omega-3 **essential fatty acids** such as **flaxseed** oil or **evening primrose oil** are recommended as well.

Dietary approaches for ovarian cancer include **vegetarianism**, the raw food diet, and macrobiotics. Cancer diets generally emphasize raw and fresh fruits,

vegetables, whole grains, beans, and peas. These diets also restrict or eliminate intake of fat, meat, dairy products, sugar, hydrogenated oils, processed foods, and foods with additives and artificial ingredients. **Caffeine** and alcohol are generally prohibited, and overeating is strongly discouraged.

Many herbs have been shown to have anticancer, immune enhancing, and symptom reducing properties. Some of the herbs used for ovarian problems include burdock, **mullein**, **yarrow**, vitex, **dandelion**, **black cohosh**, St. John's wort, red **raspberry**, nettles, and **Siberian ginseng**. Chinese herbs include **astragalus**, **ginger**, **dong quai**, cinnamon, rehmannia root, and scrophularia root. Patients should consult a competent herbalist or naturopathic doctor for individualized herbal support for ovarian cancer.

At least five plant extracts and 69 compounds isolated from plants have been shown to have antitumor activity against ovarian cancers. Recent additions to the list include triterpenes isolated from *Manihot esculenta*, a plant found in the Suriname rain forest, and from *Ligulariopsis shichuana*, a plant used in traditional Chinese medicine to bring down inflammation. **Green tea** consumption also improved the survival rate of women with epithelial ovarian cancer, a Chinese study reported in 2007. Green tea is high in polyphenols, which studies have shown to have powerful antioxidant and antitumor properties.

Integrated approaches

Keith Block, a conventional doctor and oncologist (cancer specialist), integrates many alternative practices into his cancer treatment center affiliated with the Chicago Medical School. His program seeks to provide individualized cancer treatment using both conventional therapies while integrating alternative healing techniques. Block advocates a special diet (based on vegetarianism and macrobiotics), exercise, psychological support, and herbal and nutritional supplements. Block's program has received acclaim for both treatment success and satisfaction of patients.

Experimental programs

Antineoplaston therapy was developed by Stanislaw Burzynski, a Polish doctor, who began practicing in Houston, Texas. Burzynski has isolated a chemical, deficient in those with cancer that he believes stops cancer growth, and his treatment has shown some promise.

Joseph Gold, the director of the Syracuse Cancer Research Institute, discovered that the chemical hydrazine sulfate has many positive effects in cancer patients, including stopping weight loss, shrinking tumors, and increasing survival rates.

The Livingston therapy was developed by the late Virginia Livingston, an American doctor. She asserted that cancer is caused by certain bacteria that she claimed are present in all tumors. She advocated a detoxification program and special diet that emphasized raw or lightly cooked, primarily vegetarian foods, with special vitamin and nutritional supplements.

The **Gerson therapy** has been the best known nutritional therapy for cancer. It is available in two clinics in California and Mexico. It consists of a basic vegetarian diet low in salt and fat, with high dosages of particular nutrients using raw fruit and vegetable juices. The Gerson therapy also requires patients to drink raw calf's liver juice, believed to aid the liver, and advocates frequent coffee enemas (thought to help the body evacuate toxins). There is no scientific evidence that supports the effectiveness of Gerson therapy.

Allopathic treatment

The cornerstone of allopathic treatment for ovarian cancer is surgery. The goal is to remove as much of the cancer as possible. Chemotherapy, which involves the use of powerful anticancer drugs to kill the cancer cells, is usually administered after the surgery to destroy any remaining cancer. As of 2008 some drugs to treat ovarian cancer were in the clinical trial stage, including monoclonal antibody treatment for advanced ovarian cancer. Radiation therapy is not routinely used for ovarian cancer.

The type of surgery depends on the extent of the disease. In most procedures, the ovaries, uterus, and fallopian tubes are completely removed. In rare cases, if the cancer is not very aggressive and the woman is young and has not had children, a more conservative approach may be adopted. Only one ovary may be removed, and, if possible, the fallopian tubes and the uterus may be left intact. Occasionally, in addition to the female reproductive organs, the appendix may also be removed. The liver and the intestine will be examined for signs of cancer and may be biopsied. Ovarian cancer spreads contiguously, which means that it moves to the organs that are next to it. In some cases, extensive surgery may be needed to remove as much of the cancer as possible.

If the patient's cancer is advanced, she may be treated with radiation therapy, chemotherapy, or both. Chemotherapy may be either systemic or intraperitoneal (IP), which means that the drugs are injected into the abdomen. The most common drug used is paclitaxel (Taxol), combined with either cisplatin or

carboplatin. Cancers that do not respond to these combinations may be treated with topotecan (Hycamtin) or with a combination of paclitaxel and epirubicin (Ellence).

One drug treatment for ovarian cancer under development in 2008, enzastaurin, was undergoing clinical trial in combination with two existing drugs, docetaxel and prednisone, in several European countries. The clinical trials were expected to be completed in January 2010. The drug is also being tested in Europe to treat breast and colorectal cancers.

Expected results

Most often ovarian cancer is not diagnosed until it is in an advanced stage, making it the most deadly of the female reproductive cancers. More than 50% of the women who are diagnosed with the disease die within five years. If ovarian cancer is diagnosed while it is still localized to the ovary, more than 90% of the patients will survive five years or more. However, only 24% of all cancers are found at this early stage.

There are no clinical studies that show alternative medicine can cure cancer, but many treatments have been shown to help improve symptoms, control the pain and side effects of conventional treatments, speed healing, and increase the quality of life for cancer patients. Alternative therapies may be strongest as preventative measures, before major problems such as cancer occur in the body, and as supportive measures, used with allopathic medicine.

Prevention

There are ways to reduce one's risks of developing ovarian cancer. As of 2008, genetic tests were available that could help to determine whether a woman who has a family history of breast, endometrial, or ovarian cancer has inherited the mutated gene that predisposes her to these cancers. (However, this mutation affects only a few women.) If the woman tests positive for the mutation, then she may opt to have her ovaries removed (a procedure called an oophorectomy). Allopathic medicine often recommends removing the ovaries as prevention even when a clear genetic component is not found, and this procedure is called a prophylactic oophorectomy.

Having one or more children, preferably having the first before age 30, and breast-feeding may decrease a woman's risk of developing the disease. High-risk women are advised to undergo periodic screening with transvaginal ultrasound or a blood test for CA125 protein. The American Cancer Society recommends annual pelvic examinations for all women after age 40, in order to increase the chances of early detection of ovarian cancer.

Alternative medicine stresses preventative measures that avoid removing the ovaries, unless a clear genetic risk has been established. Some studies have shown that removal of the ovaries does not necessarily reduce the risk of cancer, and does not necessarily increase longevity rates in women.

Having sound physical and mental health can significantly reduce the chances of getting cancer of any type. The following guidelines are generally recommended by doctors, nutritionists, and alternative practitioners for cancer prevention and recovery.

- Do not smoke.
- Do not drink alcohol excessively.
- Exercise regularly, at least 20 minutes per day. It is better to exercise outdoors in the fresh air.
- Avoid exposure to radiation. This includes avoiding unnecessary x rays, not residing near sources of natural or man-made radiation, and avoiding occupational exposure to radiation.
- Avoid exposure to harmful chemicals, in food, the home, and the workplace.
- Maintain proper body weight and avoid obesity.
- Protect the skin from overexposure to sunlight. People should avoid direct exposure to sunlight between 11 a.m. and 3 p.m., and take other necessary precautions against sunburn.
- Eat a healthy diet. People should become educated on and practice dietary principles that reduce the risk of cancer. These principles include eating plenty of raw and fresh fruits, vegetables, beans, and whole grains. People should consume organically grown foods when possible, minimize overeating, reduced the intake of meat and dairy products, increase fiber, avoid processed and artificial foods. They should also avoid canned foods, including soft drinks; avoid sugar and refined starch products, such as white flour; reduce the intake of fat; avoid hydrogenated vegetable oils such as margarine and shortening; and drink filtered or spring water. A study of nearly 50,000 women, called the Women's Health Initiative, reported in 2008 that women who reduced their fat intake for at least four years had a 40% reduced risk of ovarian cancer compared to women who did not reduce their dietary intake of fat.
- Strive to maintain sound mental and emotional health. It is helpful to learn a technique such as yoga, t'ai chi, or meditation to reduce stress and promote relaxation. People should maintain healthy relationships and social support systems.

KEY TERMS

Computed tomography (CT) scan—A series of x rays that are put together by a computer in order to form detailed pictures of areas inside the body.

Ectopic pregnancy—A pregnancy that develops outside of the uterus, such as in the fallopian tube. Ectopic pregnancies often cause severe pain in the lower abdomen and are potentially life-threatening because of the massive blood loss that may occur as the developing embryo/fetus ruptures and damages the tissues in which it has implanted.

Endometriosis—A condition in which the tissue that normally lines the uterus (endometrium) grows in other areas of the body, causing pain, irregular bleeding, and frequently, infertility.

Magnetic resonance imaging (MRI)—An imaging technique that uses a large circular magnet and radio waves to generate signals from atoms in the body. These signals are used to construct detailed images of internal body structures and organs, including the brain.

Monoclonal antibody—A protein substance that is produced in the laboratory from a single clone of a B-cell, the type of cell of the immune system that makes antibodies. Monoclonal antibodies are used in cancer treatment.

Paclitaxel—A drug derived from the common yew tree (*Taxus baccata*) that is the mainstay of chemotherapy for ovarian cancer.

Prostasin—A blood protein that appears to be a reliable early indicator of ovarian cancer.

Transvaginal ultrasound—A technique for imaging the ovaries using sound waves generated by a probe inserted into the vagina. This diagnostic imaging procedure serves as the baseline for a hysterosonographic examination.

Resources

BOOKS

Alschuler, Lise N., and Karolyn A. Gazella. *Alternative Medicine Magazine's Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing*. San Francisco: Celestial Arts, 2007.

Dizon, Don S. *100 Questions & Answers About Ovarian Cancer*, 2nd ed. Sudbury, MA: Jones and Bartlett, 2006.

Sheen, Barbara. *Diseases and Disorders Ovarian Cancer*. Farmington Hills, MI: Lucent Books, 2005.

PERIODICALS

Hudson, Tori. "Green Tea Enhances Survival of Ovarian Cancer Patients." *Townsend Letter: The Examiner of Alternative Medicine* (August/September 2007): 161(2).

Jenkins, Rebecca. "New Hope for Early Ovarian Cancer Detection." *Australian Doctor* (February 22, 2008): 3.

Parch, Lorie A. "Silent No More: At Last There's Consensus About Symptoms that Could Allow Ovarian Cancer to be Detected at an Earlier, More Treatable Stage." *Town & Country* (November 2007): 146.

Pedersen, Amanda. "Higher Levels of HE4 May Be Sign of Ovarian Cancer, Study Reveals." *Diagnostics & Imaging Week* (December 20, 2007): 3.

Wendling, Patrice. "Serial Screening Combo May Flag Early Ovarian Cancer." *Internal Medicine News* (September 1, 2007): 25.

ORGANIZATIONS

American Cancer Society, 250 Williams St., Atlanta, GA, 30303, (800) 227 2345, http://www.cancer.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

British Association for Cancer Research, Institute of Cancer Research, McElwain Laboratories, Cotswold Road, Sutton, SM2 5NG, Great Britain, (44) 020 8722 4208, http://www.bacr.org.uk.

Canadian Cancer Society, 10 Alcorn Ave., Suite 200, Toronto, ON, M4V 3B1, Canada, (416) 961 7223, http://www.cancer.ca.

Women's Cancer Resource Center, 5741 Telegraph Ave., Oakland, CA, 94609, (888) 421 7900, http://www.wcrc.org.

Douglas Dupler
Ken R. Wells

Ovarian cysts

Definition

Ovarian cysts are fluid-filled sacs that form inside or on the surface of the ovaries, which are the female reproductive organs that lie in the lower abdomen. Ovarian cysts appear and disappear regularly as part of the normal menstrual cycle. The cysts can, however, become a medical problem if they remain in the ovaries, enlarge, and cause **pain** or other symptoms.

Description

Ovarian cysts develop as a normal part of a healthy menstrual cycle; mature ovaries very often have cysts in them. The cysts that appear during the regular activity of the ovaries are called functional cysts. There are two types of functional cysts, known as follicular cysts and luteal cysts respectively.

Ovarian cyst (on the left). *(VEM / Photo Researchers, Inc.)*

KEY TERMS

Antiandrogen—A substance that blocks the action of androgens, the hormones responsible for male characteristics.

Dermoid tumor—A skin-like benign growth that may appear on the ovary and resemble a cyst.

Ectopic pregnancy—A pregnancy that develops outside of the mother's uterus, such as in the fallopian tube. Ectopic pregnancies often cause severe pain in the lower abdomen and are potentially life-threatening because of the massive blood loss that may occur as the developing embryo/fetus ruptures and damages the tissues in which it has implanted.

Functional cyst—A benign cyst that forms on the ovary and resolves on its own without treatment.

Hirsutism—An abnormal growth of hair on the face and other parts of the body caused by an excess of androgens. Also known as hypertrichosis.

McCune-Albright syndrome (MCAS)—A genetic syndrome characterized in girls by the development of ovarian cysts and puberty before the age of 8, together with abnormalities of bone structure and skin pigmentation.

Mittelschmerz—A German word for the pain that some women experience at ovulation.

Ovulation—The monthly process by which an ovarian follicle ruptures releasing a mature egg cell.

Polycystic ovarian syndrome (PCOS)—A condition in which the eggs are not released from the ovaries and instead form multiple cysts.

In the ovaries, immature eggs are stored in the follicles, which are tiny tube-like membranes. When **menstruation** begins in the early teens, women have nearly 400,000 follicles that store and produce eggs in the ovaries. During each menstrual cycle, an egg matures inside one of the follicles, and the follicle sac fills up with a liquid (*liquor folliculi*) that nourishes the growing egg. This swollen follicle is a follicular cyst. When the egg is released into the fallopian tube during ovulation, the follicle opens or ruptures and the fluid drains away. Sometimes there is pain associated with ovulation, known as *Mittelschmerz*, which is a German word that means middle pain. *Mittelschmerz* may last from a few minutes to several days. A small amount of bleeding may also accompany the normal release of an egg from the follicle.

After ovulation, another functional cyst forms on the ovary where the egg was released. This cyst is called the *corpus luteum*, or luteal cyst. The luteal cyst has the function of secreting progesterone, an important female hormone that regulates the reproductive cycle. If no **pregnancy** occurs, the luteal cyst should disappear with the continuation of the menstrual cycle.

Abnormalities in the menstrual cycle may cause cysts to remain and grow irregularly. Sometimes the follicles stay filled with liquid after the egg is released, or the egg does not get released in the proper way and the follicle continues to grow. These follicular cysts can reach 2 in (5 cm) or more in diameter, and may cause pain and pressure. They may rupture completely. Luteal cysts can also become abnormal. These cysts can grow quite large, to 3 in (8 cm)or more in diameter, and can cause sharp pain in the abdomen. Luteal cysts are often misdiagnosed as ectopic (tubal) pregnancies, particularly when they break open and cause bleeding and severe pain. Sometimes a cyst can bleed; it is then known as a *corpus hemorrhagicum*, meaning a body that bleeds. Bleeding often occurs when the cyst naturally breaks and begins to go away. When bleeding lasts for longer than several days and a large cyst remains, surgical intervention is sometimes called for. Surgery on the ovaries is usually performed through an instrument called a laparoscope. A laparoscope is a small device with a tiny camera.

Other types of cysts and growths may occur on the ovaries as well. Neoplastic (new growth) cysts may appear, which are benign (noncancerous) growths. These cysts occur when cells of the ovaries not related to ovulation begin to grow abnormally. Dermoid tumors are a type of benign growth that may occur on the ovaries and resemble cysts. Abnormal cysts may contain fluid or blood, and may be inside the ovary or next to it under the surface. Other cysts can be solid or contain cellular debris. All abnormal cysts require close watch by a doctor.

There is also a condition known as **polycystic ovary syndrome** (PCOS), in which the eggs and follicles are not released from the ovaries and instead form multiple cysts. **Obesity** is linked to this condition, as 50% of women with PCOS are also obese. Hormonal imbalances play a major role in this condition, including high levels of the hormone androgen and low levels of progesterone, the female hormone necessary for egg release. High levels of insulin, the hormone that regulates blood sugar, are often found in women with PCOS. PCOS is also characterized by irregular menstrual periods, **infertility**, and hirsutism (excessive hair growth on the body and face). Although PCOS was formerly thought to be an adult-onset condition, more recent research indicates that it begins in childhood, possibly even during fetal development.

In adolescent girls, ovarian cysts may be associated with a genetic disorder known as McCune-Albright syndrome, which is characterized by abnormal bone growth, discoloration of the skin, and early onset of puberty. The ovarian cysts are responsible for the early sexual maturation.

Causes and symptoms

The causes of nonfunctional ovarian cysts are not yet fully understood. Many factors are believed to play a role in the development of cysts, including a woman's general state of health, weight, diet, personal history, and lifestyle. The mind/body connection may also be a factor with cysts, as **stress** and **anxiety** may be prominent factors. Some alternative practitioners and psychotherapists believe that unexpressed creativity and repressed emotions like guilt and anger may be linked to problems in the ovaries. For PCOS, obesity, hormonal imbalances and high blood insulin levels are closely linked to the condition. For example, women with PCOS are five to ten times more likely to develop type 2 (adult-onset) diabetes than women in the general population.

PCOS is also known to run in families, which suggests that genetic factors contribute to its development. The specific gene or genes responsible for PCOS have not yet been identified; however, several groups of researchers in different countries have been investigating genetic variations associated with increased risk of type 2 diabetes in order to determine whether the same genetic variations may be involved in PCOS.

McCune-Albright syndrome is known to be associated with mutations in the GNAS1 gene. The mutation is sporadic, which means that it occurs during the child's development in the womb and that the syndrome is not inherited.

Some cysts can be asymptomatic (without symptoms), while others can cause swelling, aching, sharp pain, and bleeding. Pain from cysts may last from a few minutes to a few days. Other symptoms of cysts include late or missed periods, feelings of pressure or weight in the lower abdomen, and **constipation** and problems urinating due to internal pressure from cysts. Ruptured cysts can cause intense pain, and produce symptoms resembling those of appendicitis, infection or ectopic pregnancy. Medical attention should be sought at once for the following symptoms:

- sudden sharp pain in the lower abdomen
- persistent pain on the right side of the abdomen accompanied by sickness, fever, or vomiting
- abdominal pain along with vaginal discharge, fever, or swelling
- intermittant bursts of pain in the lower abdomen during intercourse, bowel movements, or exercise

Diagnosis

The majority of ovarian cysts in adults are found during routine pelvic examinations performed by doctors or gynecologists (specialists in women's sexual organs and health issues). An ultrasound test can be given to identify the location, size and probable type of cyst. Cysts less than 1.6 in (4 cm) in diameter are considered normal in premenopausal women. Doctors examine cysts closely to make certain they are not fibroid tumors or **cancer**. The cysts may be watched for a few months to allow them to go away or shrink on their own. For abnormal, painful or bleeding cysts, a biopsy may be performed. A biopsy is a procedure in which a small amount of tissue is surgically removed and examined to determine the exact type of growth. In alternative treatment, practitioners will closely consider lifestyle, diet, and emotional and psychological profiles in order to identify all the factors that may be playing a role in the development of cysts.

Ovarian cysts can be diagnosed in female fetuses by transabdominal ultrasound during the mother's pregnancy.

Treatment

Alternative treatment strives to reduce the possible causes and symptoms of cysts. Consumers should search for practitioners who have experience treating women's problems in general and ovarian cysts in particular. Because cysts may have many possible causes, ranging from hormone imbalances to emotional stress,

a holistic approach to healing should include measures to balance and improve physical, emotional, and mental health. Preventive and supportive measures include dietary and nutritional changes, herbal supplementation, hot/cold compresses, daily **exercise**, and stress management through mind/body techniques. Treatments for existing cysts include such traditional healing systems as **traditional Chinese medicine**, Ayurveda, **homeopathy**, and **naturopathic medicine**.

Diet and nutrition

Dietary guidelines for treatment and prevention of cysts include:

- Eliminating caffeine and alcohol.
- Reducing intake of sugars, including honey and maple syrup, and refined starches such as white flour products.
- Increasing use of foods rich in vitamin A and carotenoids; good choices include carrots, tomatoes, and salad greens.
- Eating foods high in B vitamins such as whole grains.
- Including a dietary source of iodine such as seaweed for thyroid support.

Nutritional supplements include:

- Omega-3 essential fatty acids, such as flaxseed oil or evening primrose oil to promote hormonal balance. Essential fatty acids are also found in fatty fish like salmon and trout.
- Vitamins A, C, and E, and the minerals zinc and selenium. Zinc and selenium should be taken at different times. A good multivitamin and mineral supplement is also recommended.

Herbal therapies

Herbs that promote hormonal balance, steady blood sugar levels, and immune system strengthening are generally recommended. Herbs used to treat cysts include burdock, **mullein**, **yarrow**, vitex, **dandelion**, **black cohosh**, **St. John's wort**, red **raspberry**, nettles and **Siberian ginseng**. Chinese herbs include **astragalus**, **ginger**, **dong quai**, cinnamon, rehmannia root, and scrophularia root, although the specific formula that is given is tailored to the symptoms of the specific patient. A competent herbalist or naturopathic doctor should be consulted for herbal treatment of ovarian cysts.

Compresses

Compresses can be used to stimulate circulation and healing in the ovaries. A hot water bottle covered with a towel soaked in castor and **essential oils** can be applied to the lower abdomen near the ovaries. **Lavender**, **rosemary**, and **chamomile** are recommended essential oils. A hot compress can also be made by heating in a warm oven a cloth soaked in castor and essential oils, which is then applied to the lower abdomen. Bags of ice covered with towels can be used alternately as cold treatments to increase local circulation.

Exercise and bodywork

Daily exercise for twenty minutes or more is recommended. Exercising outdoors in plenty of sunlight may help regulate hormones. **Yoga** includes exercises specifically designed to increase circulation and healing in the lower abdomen, and is an excellent stress-reduction technique as well.

Mind/body therapies

Mind/body therapies seek to heal the emotional and psychological components that may be contributing to cyst formation. Stress reduction can be achieved through yoga, **meditation**, **t'ai chi**, breathing techniques, progressive **relaxation**, and others. Visualization techniques, yoga, and **qigong** may help stimulate healing in the internal organs. Some practitioners have theorized that problems in the ovaries may be linked to certain emotional states. For instance, the ovaries are the organs that create life, and blocked creativity in women may contribute to their dysfunction. Furthermore, the ovaries are the specific female organs, and some healers have proposed that women who suffer abuse, low self-esteem, guilt and anger may be susceptible to ovarian problems. **Psychotherapy**, support groups, and other mind/body therapies seek to help women uncover and confront emotional issues.

Other systems

Traditional Chinese medicine utilizes **acupuncture**, **acupressure**, dietary and herbal remedies for ovarian cysts. **Ayurvedic medicine** uses herbal remedies, diet, exercise, yoga, massage, and **detoxification**. Homeopathic practitioners prescribe the remedies *Apis* for cysts on the right ovary and *Colocynthis* for cysts on the left ovary, as well as other remedies for hormone and immune system balance. Naturopathy tends to view ovarian cysts as associated with blood sugar problems, and uses herbal, dietary and other natural remedies to balance hormone and insulin levels.

Allopathic treatment

The treatment of ovarian cysts may vary according to the type of cyst and the patient's symptoms. Some cysts can be drained of fluid with the use of a fine

needle, although this treatment has been shown to be no more effective in eliminating cysts than leaving them alone. Many cysts, particularly small ones, can be watched closely for several months to determine if they will go away on their own. Ultrasound is used to view cysts. A laparoscopy is a surgical procedure that may be used to correct bleeding cysts and other cyst conditions without removing the ovary, and allows doctors to view the ovaries. Doctors advise surgical removal for cysts that are larger than 4 in (10 cm) and for complex cysts. Complex cysts are solid or have additional growths inside them.

Most uncomplicated ovarian cysts in female infants resolve on their own shortly after delivery. Complicated cysts are treated by laparoscopy or laparotomy after the baby is born.

McCune-Albright syndrome is treated with testolactone (Teslac), an anti-estrogen drug that corrects the hormonal imbalance caused by the ovarian cysts.

Long-term management of PCOS has been complicated in the past by lack of a clear understanding of the causes of the disorder. Most commonly, hormonal therapy has been recommended, including estrogen and progesterone and such other hormone-regulating drugs as ganirelix (Antagon). Birth control pills have also been prescribed by doctors to regulate the menstrual cycle and to shrink functional cysts. In severe and painful cases, the ovaries have been removed by surgery.

More recent studies have shown that increasing sensitivity to insulin in women with PCOS leads to improvement in both the hormonal and metabolic symptoms of the disorder. This sensitivity is increased by either weight loss and exercise programs or by medications. Metformin (Glucophage), a drug originally developed to treat type 2 diabetes, has been shown to be effective in reducing the symptoms of hyperandrogenism as well as **insulin resistance** in women with PCOS.

Another strategy that is being tried with PCOS is administration of flutamide (Eulexin), a drug normally used to treat **prostate cancer** in men. Preliminary results indicate that the antiandrogenic effects of flutamide benefit patients with PCOS by increasing blood flow to the uterus and ovaries.

A surgical procedure known as ovarian wedge resection appears to improve fertility in women with PCOS who have not responded to drug treatments. In an ovarian wedge resection, the surgeon removes a portion of the polycystic ovary in order to induce ovulation.

Expected results

Neither type of functional ovarian cyst, follicular or luteal, has been shown to progress to cancer. When cysts do not go away on their own, they often can be removed without harming the ovaries. Some women have opted to live with large cysts instead of surgery without negative consequences. The chances for cysts recurring can vary. Some women never have cysts, others get them once or occasionally, while others see them appear and disappear almost constantly. Likewise, ovarian cysts can be painful and bothersome for some women, while other women experience no symptoms.

Resources

BOOKS

Blum, Jeanne. *Woman Heal Thyself: An Ancient Healing System for Contemporary Women*. New York: Tuttle, 1995.

Hobbs, Christopher, and Kathi Keville. *Women's Herbs, Women's Health*. Loveland, CO: Interweave Press, 1998.

Morgan, Peggy, and the Editors of Prevention Magazine. *The Female Body: An Owner's Manual*. Emmaus, PA: Rodale, 1996.

Northrup, Christiane, M.D. *Women's Bodies, Women's Wisdom*. New York: Bantam, 1994.

"Pelvic Pain." Section 18, Chapter 237 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

"Physical Conditions in Adolescence." Section 19, Chapter 275 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

"Pregnancy Complicated by Disease: Disorders Requiring Surgery." Section 18, Chapter 251 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Ajossa, S., S. Guerriero, A. M. Paoletti, et al. "The Antiandrogenic Effect of Flutamide Improves Uterine Perfusion in Women with Polycystic Ovary Syndrome." *Fertility and Sterility* 77 (June 2002): 1136–1140.

de Sanctis, C., R. Lala, P. Matarazzo, et al. "Pubertal Development in Patients with McCune Albright Syndrome or Pseudohypoparathyroidism." *Journal of Pediatric Endocrinology and Metabolism* 16 (March 2003) (Suppl. 2): 293–296.

Ehrmann, D. A., P. E. Schwarz, M. Hara, et al. "Relationship of Calpain 10 Genotype to Phenotypic Features of Polycystic Ovary Syndrome." *Journal of Clinical Endocrinology and Metabolism* 87 (April 2002): 1669–1673.

Elkind Hirsch, K. E., B. W. Webster, C. P. Brown, and M. W. Vernon. "Concurrent Ganirelix and Follitropin Beta Therapy is an Effective and Safe Regimen for Ovulation Induction in Women with Polycystic Ovary

Syndrome." *Fertility and Sterility* 79 (March 2003): 603 607.
Franks, S. "Adult Polycystic Ovary Syndrome Begins in Childhood." *Best Practice and Research: Clinical Endocrinology and Metabolism* 16 (June 2002): 263 272.
Kazerooni, T., and M. Dehghan Kooshkghazi. "Effects of Metformin Therapy on Hyperandrogenism in Women with Polycystic Ovarian Syndrome." *Gynecological Endocrinology* 17 (February 2003): 51 56.
Legro, R. S. "Polycystic Ovary Syndrome. Long Term Sequelae and Management." *Minerva ginecologica* 54 (April 2002): 97 114.
Marx, T. L., and A. E. Mehta. "Polycystic Ovary Syndrome: Pathogenesis and Treatment Over the Short and Long Term." *Cleveland Clinic Journal of Medicine* 70 (Janu ary 2003): 31 33, 36 41, 45.
Mittermayer, C., W. Blaicher, D. Grassauer, et al. "Fetal Ovarian Cysts: Development and Neonatal Outcome." *Ultraschall in der Medizin* 24 (February 2003): 21 26.
Ovalle, F., and R. Azziz. "Insulin Resistance, Polycystic Ovary Syndrome, and Type 2 Diabetes Mellitus." *Fer tility and Sterility* 77 (June 2002): 1095 1105.
Vankova, M., J. Vrbikova, M. Hill, et al. "Association of Insulin Gene VNTR Polymorphism with Polycystic Ovary Syndrome." *Annual of the New York Academy of Sciences* 967 (June 2002): 558 565.
Yildirim, M., V. Noyan, M. Bulent Tiras, et al. "Ovarian Wedge Resection by Minilaparatomy in Infertile Patients with Polycystic Ovarian Syndrome: A New Technique." *European Journal of Obstetrics, Gynecology, and Reproductive Biology* 107 (March 26, 2003): 85 87.

ORGANIZATIONS

American College of Obstetricians and Gynecologists (ACOG). 409 12th Street, SW, P. O. Box 96920, Washington, DC 20090 6920. http://www.acog.org.
The Health Resource. 209 Katherine Drive. Conway, AR 72032. (501) 329 5272.
Herb Research Foundation. 1007 Pearl Street, Suite 200. Boulder, CO 80302.
Polycystic Ovarian Syndrome Association. P. O. Box 80517, Portland, OR 97280. (877) 775 PCOS. www.pco support.org.

Douglas Dupler
Rebecca J. Frey, PhD

Overweight *see* **Obesity**

Oxygen/ozone therapy

Definition

Oxygen/ozone therapy is a term that describes a number of different practices in which oxygen, ozone, or hydrogen peroxide are administered via **gas** or water to kill disease microorganisms, improve cellular function, and promote the healing of damaged tissues. The rationale behind bio-oxidative therapies, as they are sometimes known, is the notion that as long as the body's needs for **antioxidants** are met, the use of certain oxidative substances will stimulate the movement of oxygen atoms from the bloodstream to the cells. With higher levels of oxygen in the tissues, bacteria and viruses are killed along with defective tissue cells. Healthy cells survive and multiply more rapidly. The result is a stronger immune system. The use of oxygen and/or ozone for therapeutic treatment is sometimes called hyperbaric, meaning high-pressure therapy.

These men are receiving oxygen treatments at an oxygen bar. *(Jeff Greenberg / Alamy)*

Ozone itself is an allotrope (form) of oxygen, O_3, produced when ultraviolet light or an electric spark passes through air or oxygen. It is a toxic gas that creates free radicals, the opposite of what antioxidant vitamins do. Oxidation, however, is good when it occurs in harmful foreign organisms that have invaded the body. Ozone inactivates many disease bacteria and viruses.

Origins

The various forms of oxygen and ozone therapy have been in use since the late nineteenth century. The earliest recorded use of oxygen to treat a patient was by French surgeon J. A. Fontaine. who built a mobile operating device for the treatment in 1879. **Cancer** researchers first began using hyperbaric oxygen in the 1950s. The term hyperbaric means that the oxygen is given under pressure higher than normal air pressure. Recently, oxygen therapy has also been touted as a quick purification treatment for mass-market consumers. Oxygen bars can be found in airports and large cities, and provide pure oxygen in 20-minute

sessions for less than $20. While proponents claim that breathing oxygen will purify the body, most medical doctors do not agree. What is more, oxygen can be harmful to people with severe lung diseases, and these people should never self-treat with oxygen.

Ozone has been used since 1856 to disinfect operating rooms in European hospitals and since 1860 to purify the water supplies of several large German cities. Ozone was not, however, used to treat patients until 1915, when the German doctor Albert Wolff began to use it to treat skin diseases with the gas. During World War I, the German Army used ozone to treat **wounds** and anaerobic **infections**. In the 1950s, several German physicians used ozone to treat cancer alongside mainstream therapeutic methods. According to some estimates, in the 2000s there were more than 15,000 ozone practitioners in Europe, although the number was much smaller in the United States. The European figure includes medical doctors as well as naturopaths and homeopaths.

Hydrogen peroxide is familiar to most people as an over-the-counter preparation that is easily available at supermarkets as well as pharmacies; it is used as an antiseptic for cleansing minor **cuts** and scrapes. It was first used as an intravenous infusion in 1920 by a British physician in India, T. H. Oliver, to treat a group of 25 Indian patients who were critically ill with **pneumonia**. Oliver's patients had a mortality rate of 48%, compared to the standard mortality rate of 80% for the disease. In the 1920s, an American physician William Koch experimented with hydrogen peroxide as a treatment for cancer. He left the United States after a legal battle with the Food and Drug Administration (FDA). In the early 1960s, researchers at Baylor University studied the effects of hydrogen peroxide in removing plaque from the arteries as well as its usefulness in treating cancer, but their findings were largely ignored.

Benefits

Oxygen and ozone therapies are thought to benefit patients in the following ways:

- Stimulating white blood cell production
- Killing viruses (ozone and hydrogen peroxide)
- Improving the delivery of oxygen from the blood stream to the tissues of the body
- Speeding up the breakdown of petrochemicals
- Increasing the production of interferon and tumor necrosis factor, thus helping the body to fight infections and cancers
- Increasing the efficiency of antioxidant enzymes
- Increasing the flexibility and efficiency of the membranes of red blood cells
- Speeding up the citric acid cycle, which in turn stimulates the body's basic metabolism

Description

Oxygen, ozone, and hydrogen peroxide are used therapeutically in a variety of different ways.

Hyperbaric oxygen therapy (HBO)

Hyperbaric oxygen therapy (HBO) involves putting the patient in a pressurized chamber in which he or she breathes pure oxygen for a period of 90 minutes to two hours. HBO may also be administered by using a tight-fitting mask, similar to the masks used for anesthesia. A nasal catheter may be used for small children.

Ozone therapy

Ozone therapy may be administered in a variety of ways:

- Intramuscular injection: A mixture of oxygen and ozone is injected into the muscles of the buttocks.
- Rectal insufflation: A mixture of oxygen and ozone is introduced into the rectum and absorbed through the intestines.
- Autohemotherapy: Between 10–15 mL of the patient's blood is removed, treated with a mixture of oxygen and ozone and reinjected into the patient.
- Intra-articular injection: Ozone-treated water is injected into the patient's joints to treat arthritis, rheumatism, and other joint diseases.
- Ozonated water: Ozone is bubbled through water that is used to clean wounds, burns, and skin infections, or to treat the mouth after dental surgery.
- Ozonated oil: Ozone is bubbled through olive or safflower oil, forming a cream that is used to treat fungal infections, insect bites, acne, and skin problems.
- Ozone bagging: Ozone and oxygen are pumped into an airtight bag that surrounds the area to be treated, allowing the body tissues to absorb the mixture.

Hydrogen peroxide

Hydrogen peroxide may be administered intravenously in a 0.03% solution. It is infused slowly into the patient's vein over a period of one to three hours. Treatments are given about once a week for chronic illness but may be given daily for such acute illnesses as pneumonia or **influenza**. A course of intravenous hydrogen peroxide therapy may range from one to 20 treatments, depending on the patient's condition

and the type of illness being treated. Injections of 0.03% hydrogen peroxide have also been used to treat rheumatoid and **osteoarthritis**. The solution is injected directly into the inflamed joint.

Hydrogen peroxide is also used externally to treat stiff joints, **psoriasis**, and **fungal infections**. The patient soaks for a minimum of 20 minutes in a tub of warm water to which 1 pint of 35% food-grade hydrogen peroxide (a preparation used by the food industry as a disinfectant) has been added.

Preparations

Oxygen is usually delivered to the patient as a gas; ozone as a gas mixed with oxygen or bubbled through oil or water; and hydrogen peroxide as an 0.03% solution for intravenous injection or a 35% solution for external **hydrotherapy**.

Precautions

Patients interested in oxygen/ozone therapies must consult with a physician before receiving treatment. Hyperbaric oxygen treatment should not be given to patients with untreated pneumothorax, a condition in which air or gas is present in the cavity surrounding the lungs. Patients with a history of pneumothorax, chest surgery, **emphysema**, middle ear surgery, uncontrolled high fevers, upper respiratory infections, seizures, or disorders of the red blood cells are not suitable candidates for oxygen/ozone therapy. In addition, patients should be aware that oxygen should not be used near open flames since it greatly increases the rate of combustion.

Side effects

Typical side effects of oxygen or ozone therapy can include elevated blood pressure and ear pressure similar to that experienced while flying. Side effects may also include **headache**, numbness in the fingers, temporary changes in the lens of the eye, and seizures.

Research and general acceptance

Oxygen/ozone therapies are far more widely accepted in Europe than in the United States. In the 2000s, the most intensive research in these therapies was being conducted in the former Soviet Union and in Cuba. In the United States, the work of the Baylor researchers was not followed up. The National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health sponsored four studies at the University of Pennsylvania on the use of hyperbaric oxygen in the treatment of four medical conditions.

KEY TERMS

Autohemotherapy—A form of ozone therapy in which a small quantity of the patient's blood is withdrawn, treated with a mixture of ozone and oxygen, and reinfused into the patient.

Hydrogen peroxide—A colorless, unstable compound of hydrogen and oxygen (H_2O_2). An aqueous solution of hydrogen peroxide is used as an antiseptic and bleaching agent.

Hyperbaric oxygen therapy (HBO)—A form of oxygen therapy in which the patient breathes oxygen in a pressurized chamber.

Ozone—A form of oxygen with three atoms in its molecule (O_3), produced by an electric spark or ultraviolet light passing through air or oxygen. Ozone is used therapeutically as a disinfectant and oxidative agent.

European research in ozone therapy has included studies in the oxygenation of resting muscles, the treatment of vascular disorders, and the relief of **pain** from herniated lumbar disks. Relatively little research on topics such as these was being conducted in the United States as of 2008.

Training and certification

In Europe, ozone therapies may be administered by licensed naturopaths and homeopaths as well as by medical doctors. In the United States and Canada, oxygen and ozone treatments are administered only by medical doctors.

Resources

BOOKS

Altman, Nathaniel. *The Oxygen Prescription: The Miracle of Oxidative Therapies*. Rochester, VT: Healing Arts Press, 2007.

Harch, Paul G., and Virginia McCullough. *The Oxygen Revolution: Hyperbaric Oxygen Therapy, The Ground breaking New Treatment for Stroke, Alzheimer's, Par kinson's, Arthritis, Autism, Learning Disabilities and More*. Long Island City, NY: Hatherleigh Press, 2007.

Neuman, Tom S., and Stephen R. Thom. *Physiology and Medicine of Hyperbaric Oxygen Therapy*. St. Louis, MO: Saunders Elsevier, 2008.

PERIODICALS

Buettner, M. F., and D. Wolkenhauer. "Hyperbaric Oxygen Therapy in the Treatment of Open Fractures and Crush Injuries." *Emergency Medical Clinics of North America* (February 2007): 177 188.

Rockswold, S. B., G. L. Rockswold, and A. Defillo. "Hyperbaric Oxygen in Traumatic Brain Injury." *Neurological Research* (March 2007): 162 172.

Singhal, A. B. "A Review of Oxygen Therapy in Ischemic Stroke." *Neurological Research* (March 2007): 173 183.

Smerz, R. W. "Hyperbaric Oxygen Therapy: Caveat Doctor!" *Hawaii Medical Journal* (April 2005): 102 103.

OTHER

Neumeister, Michael. "Hyperbaric Oxygen Therapy." emedicine.com, July 21, 2005. http://www.emedicine.com/plastic/topic526.htm (February 19, 2008).

ORGANIZATIONS

American College of Hyperbaric Medicine, 9875 S. Franklin Dr., Suite 300, Franklin, WI, 53132, (414) 858 2240, http://www.hyperbaricmedicine.org/.

NIH National Center for Complementary and Alternative Medicine (NCCAM), NCCAM Clearinghouse. PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://nccam.nih.gov.

Amy Cooper
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

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Pain

Definition

Pain is an unpleasant feeling that is conveyed to the brain by sensory neurons. The discomfort signals actual or potential injury in the body. However, pain is more than a sensation or the physical awareness of pain; it also includes perception, the subjective interpretation of the discomfort. Perception gives information on the pain's location, intensity, and something about its nature. The various conscious and unconscious responses to both sensations and perception, including the emotional response, add further definition to the overall concept of pain.

Description

Pain arises from any number of situations. Injury is a major cause, but pain may also arise from a wide variety of illnesses. It may accompany a psychological condition, such as **depression**, or may even occur in the absence of a recognizable trigger.

Acute pain

Acute pain often results from ordinary tissue damage, such as a skin burn or broken bone. Acute pain can also be associated with headaches or **muscle cramps**. This type of pain usually goes away as the injury heals or the cause of the pain (stimulus) is removed.

To understand acute pain, it is necessary to understand the nerves that support it. Nerve cells, or neurons, perform many functions in the body. Although their general purpose, providing an interface between the brain and the body, remains constant, their capabilities vary widely. Certain types of neurons are capable of transmitting a pain signal to the brain.

As a group, these pain-sensing neurons are called nociceptors, and virtually every surface and organ of the body is wired with them. The central part of these cells is located in the spine, and they send threadlike projections to every part of the body. Nociceptors are classified according to the stimulus that prompts them to transmit a pain signal. Thermoreceptive nociceptors are stimulated by temperatures that are potentially tissue damaging. Mechanoreceptive nociceptors respond to a pressure stimulus that may cause injury. Polymodal nociceptors are the most sensitive and can respond to temperature and pressure. Polymodal nociceptors also respond to chemicals released by the cells in the area where the pain originates.

Nerve cell endings, or receptors, are at the front end of pain sensation. A stimulus at this part of the nociceptor unleashes a cascade of neurotransmitters (chemicals that transmit information within the nervous system) in the spine. Each neurotransmitter has a purpose. For example, substance P relays the pain message to nerves leading to the spinal cord and brain. These neurotransmitters may also stimulate nerves leading back to the site of the injury. This response prompts cells in the injured area to release chemicals that trigger an immune response and influence the intensity and duration of the pain.

Chronic and abnormal pain

Chronic pain refers to pain that persists after an acute injury heals, **cancer** pain, pain related to a persistent or degenerative disease, and long-term pain from an unidentifiable cause. It is estimated that one in three people in the United States experiences chronic pain at some point in their lives. Of these people, approximately 50 million are either partially or completely disabled.

Chronic pain may be caused by the body's response to acute pain. In the presence of continued stimulation of nociceptors, changes occur within the nervous system. Changes at the molecular level are dramatic and may include alterations in genetic transcription of neurotransmitters and receptors. These changes may also occur in the absence of an identifiable cause; one of the

frustrating aspects of chronic pain is that the stimulus may be unknown. For example, the stimulus cannot be identified in as many as 85% of individuals suffering lower back pain.

Other types of abnormal pain include allodynia, hyperalgesia, and phantom limb pain. These types of pain often arise from some damage to the nervous system (neuropathic). Allodynia refers to a feeling of pain in response to a normally harmless stimulus. For example, some individuals who have suffered nerve damage as a result of viral infection experience unbearable pain from just the light weight of their clothing. Hyperalgesia is somewhat related to allodynia in that the response to a painful stimulus is extreme. In this case, a mild pain stimulus, such as a pin prick, causes a maximum pain response. Phantom limb pain occurs after a limb is amputated; although an individual may be missing the limb, the nervous system continues to perceive pain originating from the area.

Causes and symptoms

Pain is the most common symptom of injury and disease, and descriptions can range in intensity from a mere ache to unbearable agony. Nociceptors have the ability to convey information to the brain that indicates the location, nature, and intensity of the pain. For example, stepping on a nail sends an information-packed message to the brain: The foot has experienced a puncture wound that hurts a lot.

Pain perception also varies depending on the location of the pain. The kinds of stimuli that cause a pain response on the skin include pricking, cutting, crushing, burning, and freezing. These same stimuli would not generate much of a response in the intestine. Intestinal pain arises from stimuli such as swelling, inflammation, and distension.

Diagnosis

Pain is considered in conjunction with other symptoms and individual experiences. An observable injury, such as a broken bone, may be a clear indicator of the type of pain a person is suffering. Determining the specific cause of internal pain is more difficult. Other symptoms, such as **fever** or **nausea**, help narrow the possibilities. In some cases, such as lower back pain, a specific cause may not be identifiable. Diagnosis of the disease causing a specific pain is further complicated by the fact that pain can be referred to (felt at) a skin site that does not seem to be connected to the site of the pain's origin. For example, pain arising from fluid accumulating at the base of the lung may be felt in the shoulder.

Since pain is a subjective sensation, it may be very difficult to communicate its exact quality and intensity to other people. There are no diagnostic tests designed to determine the quality or intensity of an individual's pain. Therefore, a medical examination includes a lot of questions about where the pain is located, its intensity, and its nature. Questions seek to reveal what increases or relieves the pain, how long it has lasted, and whether there are any variations in it. An individual may be asked to use a pain scale to describe the pain. One such scale assigns a number to the pain intensity. For example, 0 may indicate no pain, and 10 may indicate the worst pain the person could imagine. Scales are modified for infants and children to accommodate their level of comprehension. Among the most painful non-trauma experiences are **childbirth** and **kidney stones**.

Treatment

Both physical and psychological aspects of pain can be dealt with through alternative treatment. Some of the most popular treatment options include herbal therapies, nutritional therapies, **homeopathy**, **acupressure** and **acupuncture**, massage, **chiropractic**, **guided imagery**, and **relaxation** techniques, such as **yoga**, hypnosis, and **meditation**. **Hydrotherapy** can also be beneficial for pain relief. A 2006 study reported that patients who received complimentary or alternative medical therapies before and after open heart surgery experienced less pain and tension during recovery than patients who received standard pain treatment. The therapies included music, massage, and guided imagery. The study of 104 men and women was conducted by the Minneapolis Heart Institute at Abbott Northwestern Hospital in Minneapolis.

Herbal therapies

Mild natural painkillers are used as herbal remedies for pain. They should only be used for mild to moderate chronic pain. However, unlike prescription drugs, they are not addictive and do not dull the senses. In addition, they can help heal the nervous system as well as relieve pain. The following herbal remedies have been known to provide pain relief:

- Capsaicin: found naturally in cayenne pepper. Its cream or gel form may be able to relieve some arthritic pain.
- Bromelain: reduce inflammation.
- Curcumin: reduces inflammation.
- Kava kava: helps relax the body.
- Pine-bark and grape-seed extracts: reduces inflammation.

- Pain-relief tea: is composed of white willow bark, chamomile, skullcap, valerian root, and licorice root. This herbal preparation may be effective in relieving normal aches and pain. However, persons with high blood pressure or those allergic to aspirin should avoid using this preparation.

Nutritional therapy

Diet and **nutrition** can play important roles in controlling chronic pain. Patients with chronic pain sometimes find relief just by eating healthy foods and by adding nutritional supplements with pain-killing properties. A diet high in fiber and complex carbohydrates is recommended. Because inflammation is often caused by allergic reactions, patients should eliminate allergic foods from their **diets**. They should also avoid foods high in fats or margarine, red meat, dairy products, shellfish, alcohol, and coffee. In addition, they may consider taking one of the following nutritional supplements: **flaxseed** oil, **bromelain**, **calcium** taken with **magnesium**, **vitamin C** taken with **bioflavonoids**, and **glucosamine**. Glucosamine sulfate is one of the best natural remedies available for arthritic pain, although studies show mixed results. Several studies have shown that it effectively reduces pain and improves joint movement in 80% of arthritic patients. It works by healing and regenerating new connective tissues damaged by the inflammatory process. It may also increase the level of endorphins, the body's natural painkillers, and reduces inflammation in most arthritic patients.

Researchers also have reported what thousands of people with arthritis have known for a long time—that cod liver oil eases the pain of arthritis. Several studies report that the **omega-3 fatty acids** in cod liver oil break down joint cartilage, slowing destruction of the joints and easing pain. This has been good news for arthritis sufferers who cannot tolerate the prescription drugs available for arthritis treatment. However, the Glucosamine/Chondroitin Arthritis Intervention Trial reported in 2006 that glucosamine and **chondroitin** did not reduce effectively pain in people with **osteoarthritis** of the knee. Nearly 1,600 patients with osteoarthritis of the knee took part in the study conducted at 16 centers across the United States. Not all of the news from the study was bad for the two-supplement combination. Study participants who reported moderate to severe pain, as opposed to mild pain, 79% reported significant pain reduction when taking glucosamine and chondroitin supplementation. The study lasted for six months and a majority of the participants said they suffered from mild osteoarthritis of the knee.

Homeopathy

Depending on a patient's specific condition, a homeopathic physician may prescribe one of the following medications for pain management:

- Arnica: for treatment of acute pain after an injury.
- Hypericum: for treatment of pain in nerves, fingers, or toes after injury or surgery.
- Ledum: for treatment of pain associated with black-and-blue bruises and puncture wounds.

In 2006, Miralus Healthcare began aggressively marketing its homeopathic **headache** formula HeadOn, which is applied topically to the forehead. In its now-famous television commercial, which many viewers deemed as annoying, an announcer quickly repeats three times the slogan, "HeadOn, apply directly to the forehead." It is not a coincidence that the ads are careful not to say that the product is for headache pain or can relieve headache pain. Making unsubstantiated medical claims is a violation of federal law. HeadOn is composed almost entirely of wax, with trace amounts of **potassium** bichromate (a chemical) and white bryony (a botanical) as active ingredients. As of early 2008, it came in six formulas: migraine relief, tension headache relief, headache relief, p.m. pain relief/sleep aid, sinus headache relief, and extra strength headache relief. The products cost about $8 to $10 and are primarily sold at discount pharmacies (Walgreens, CVS) and discount department store chains (Wal-Mart, Kmart). An article published in the September 2007 issue of *Consumer Reports* stated that HeadOn may "possibly" work "if users believe it will work." The article also stated that Miralus claimed clinical studies have been conducted on the product but refused to provide the magazine with details or copies of the studies. As of March 2008, there were no clinical studies posted on the Miralus Website (http://www.miralus.com). In 2006, the National Advertising Division (NAD) of the Council of Better Business Bureaus requested Miralus discontinue its ad claims regarding the performance and efficacy (effectiveness) of HeadOn due to insufficient evidence. In a written reply to NAD, Miralus disagreed with the conclusion but said it would consider the recommendation in developing future advertising. It did not provide NAD with any clinical studies of HeadOn. Miralus makes a number of other topical pain relief medications, including three formulations of RenewIn for joint care and ActivOn for arthritis pain. RenewIn and ActivOn retail for $12 to $15. As with HeadOn, Miralus does not claim RenewIn relieves pain, only that it provides "joint comfort."

Acupuncture

Acupuncture involves inserting needles at various points on the skin. These needles direct chi (life force) to organs or functions of the body. This therapy possibly works by triggering the release of endorphins, therefore dulling the perception of pain. Acupuncture can effectively reduce most chronic pain. However, it may require up to 10 sessions before results are noticeable. A 2002 study showed that acupuncture worked well for chronic **neck pain** and range of motion but that its long-term effects were limited. It is important that patients request disposable needles to prevent transmission of **AIDS**, **hepatitis**, and other infectious diseases.

Acupressure

There are some acupressure techniques that patients can train themselves to do to help relieve pain. Using thumbs or fingers to apply pressure at appropriate acupressure points in the body, a person can release muscular tension in the head, neck, or shoulder; calm the nervous system; and relieve painful symptoms. Like acupuncture, acupressure probably works by releasing endorphins.

Massage

Massage involves using physical manipulation techniques to make various parts of the body, such as muscles, connective tissues, and vertebrae, work together and function properly. This form of therapy may effectively reduce **stress** and physical pain.

Chiropractic

Chiropractors treat patients by manipulating joints and the spine. It is believed that pain, especially back pain, is caused by misalignment of the spine. This form of treatment is most effective in patients with persistent back pain and neck problems. It is also effective in some patients with acute, uncomplicated **low back pain**.

Relaxation therapy

Relaxation techniques include meditation, yoga, music, guided imagery, **biofeedback**, and **hypnotherapy**. When practiced regularly, these techniques have been shown to relax muscles and reduce tension and stress-related pain.

Lifestyle changes

Lifestyles can be changed to include a healthier diet and regular **exercise**. Regular exercise, aside from relieving stress, has been shown to increase endorphins.

Hydrotherapy

This form of therapy uses hot and cold compresses, whirlpools, saunas, and alternating cold/warm showers or body wraps to reduce the soreness of aching joints, inflamed muscles, chronic muscle **strains**, and backache. Some of these treatments can be done at home.

Allopathic treatment

There are many drugs aimed at preventing or treating pain. Nonopioid analgesics, narcotic analgesics, corticosteroids, anticonvulsant drugs, and tricyclic antidepressants work by blocking the production, release, or uptake of neurotransmitters. Nonopioid analgesics are used for treatment of minor pain. They include common over-the-counter medications such as aspirin, acetaminophen (Tylenol), and ibuprofen (Advil). Narcotic analgesics such as codeine, morphine, and methadone are used for more severe pain, such as cancer pain. These medications are available with a doctor's prescription. Initially developed to treat seizures and depression, some anticonvulsants and antidepressants also have pain-killing applications. Finally, corticosteroid injections directly into or near the nerve that is transmitting the pain signal are reserved for intractable (unrelenting) pain that is not treatable by other medications.

Drugs are not always effective in controlling pain. Surgical methods are used as a last resort if drugs and local anesthetics fail. Electrode implants are the least destructive surgical procedure. However, this method may not completely control pain and is not used frequently. Other surgical techniques involve destroying or severing the nerve, but the use of this technique is limited by side effects, including unpleasant numbness.

Expected results

Successful pain treatment is highly dependent on successful resolution of the pain's cause. Acute pain stops when an injury heals or when an underlying problem is treated successfully. Chronic pain and abnormal pain are more difficult to treat, and finding a successful resolution may take more time. Some pain is intractable and requires extreme measures for relief.

Prevention

Pain is generally preventable only to the degree that the cause of the pain is preventable; diseases and injuries are often unavoidable. However, increased pain, pain from surgery and other medical procedures, and continuing pain are preventable through drug treatments and alternative therapies.

KEY TERMS

Neuron—The fundamental nerve cell of the nervous system.

Neurotransmitters—Chemicals within the nervous system that transmit information from or between nerve cells.

Nociceptor—A nerve cell that is capable of sensing pain and transmitting a pain signal.

Referred pain—Pain that is experienced in one part of the body but originates in another organ or area. The pain is referred because the nerves that supply the damaged organ enter the spine in the same segment as the nerves that supply the area where the pain is felt.

Stimulus—Anything capable of eliciting a response in an organism or a part of that organism.

For many years, experts thought that arthritis patients should not exercise because it would damage their joints. However, a 2002 report stated that regular low-impact exercise such as water aerobics or riding a stationary bicycle can actually help arthritic patients prevent pain.

Resources

BOOKS

Berger, Phyllis. *The Journey to Pain Relief: A Hands On Guide to Breakthroughs in Pain Treatment*. Alameda, CA: Hunter House, 2007.

Lewandowski, Michael J. *The Chronic Pain Care Workbook: A Self Treatment Approach to Pain Relief Using the Behavioral Assessment of Pain Questionnaire*. Oakland, CA: New Harbinger, 2006.

Phillips, Maggie. *Reversing Chronic Pain: A 10 Point All Natural Plan for Lasting Relief*. Berkeley, CA: North Atlantic Books, 2007.

Sadler, Jan. *Pain Relief Without Drugs: A Self Help Guide for Chronic Pain and Trauma*. Rochester, VT: Healing Arts Press, 2007.

PERIODICALS

Archer, Shirley. "New Guidelines for Back Pain Including Yoga." *IDEA Fitness Journal* (January 2008): 89.

Archer, Shirley. "Qigong Helps Neck Pain." *IDEA Fitness Journal* (February 2008): 90.

Barrow, Karen. "The Right Pressure: Rolfing Eases Chronic Pain and Stress by Loosening the Connective Between Muscles and Bones." *Natural Health* (February 2008): 90(2).

Jackson, Emily, et al. "Does Therapeutic Touch Help Reduce Pain and Anxiety in Patients with Cancer?" *Clinical Journal of Oncology Nursing* (February 2008): 113(8).

Menard, Martha Brown, and Cynthia Piltch. "Massage Soothes Chronic Pain." *Massage Therapy Journal* (Spring 2008): 153(3).

ORGANIZATIONS

American Chronic Pain Association, PO Box 850, Rocklin, CA, 95677 0850, (800) 533 3231, http://www.theacpa.org.

American Pain Society, 4700 W. Lake Ave., Glenview, IL, 60025, (847) 375 4715, http://www.ampainsoc.org/.

Canadian Pain Society.701 Rossland Road East, Suite 373, Whitby, ON, L1N 9K3, Canada, (905) 668 9545, http://www.canadianpainsociety.ca.

Mai Tran
Ken R. Wells

Painful bladder syndrome *see* **Interstitial cystitis**

Paleolithic diet

Definition

The Paleolithic, or caveman, diet is a reversion to the foods eaten by humans prior to the advents of civilization, agriculture, and technology. Before those developments, the human diet during the Stone Age is thought to have consisted largely of lean red meat and vegetation. Modern-day adherents to Paleolithic **diets** add vigorous physical activity to mimic the Stone Age's hunter-gatherer lifestyle. In some cases, modern-day "Paleos" actually adopt such a lifestyle, hunting their own food in the natural environment.

Origins

The Paleolithic Period of human development, characterized by the use of chipped, stone tools, began about 2.5 million years ago. Whenever possible, Paleolithic peoples consumed large amounts of animal meat and offal, deriving 45-65% of their energy from animals. Among those aboriginal, hunter-gatherer societies in Australia, Africa, and South America that survived into the twentieth century, the rates of **cancer**, **rheumatoid arthritis**, **obesity**, diabetes, **osteoporosis**, **heart disease**, and other conditions were remarkably low until they switched to modern diets. In most other cultures, this switch to modern diets happened about 10,000 years ago, when it was discovered that many inedible plants could be

rendered suitable for human consumption by cooking. This resulted in the introduction of grains, beans, and potatoes as foods, and later followed by sugar, milk, and milk products.

Benefits

Many nutritionists and scientists believe a Paleolithic diet and lifestyle might be an effective weapon against the adverse effects of modern affluence, reducing risk of heart disease, cancer, obesity, rheumatoid arthritis, and other conditions. Since this was the diet practiced during much of human evolution, advocates argue, it is the food that humans were designed to eat. Additionally, these advocates endorse the idea that milk (after weaning) and grains were never intended for human consumption.

Description

There is really no single Paleolithic diet. Hunter-gatherer cultures in different parts of the world ate widely differing diets, due to the availability in each locality. Stone Age diets also varied significantly depending on the season. Generally, however, such diets included much lean red meat from game, as well as eggs, fish, fruit, nuts, and vegetables. Excluded from most Paleolithic diets were grains (e.g., breads, pasta, cereals, corn), milk, refined sugars, beans, soy beans, or lentils. For twenty-first century adherents to Caveman diets, potatoes and peanuts are also forbidden. These diets are high in high-quality protein, fiber, vitamins, minerals, **iron**, mono-unsaturated fats, omega-3 fats, phytochemicals, and **antioxidants**. They are low in salt, saturated fats, enzyme inhibitors such as protease or amylase inhibitors, exorphins, and glycoalkaloids.

Precautions

Concerns have been expressed about the environmental effects of millions of people switching to diets heavy in red meats, requiring many agricultural operations to switch from growing crops to raising livestock. Sensitive wild areas could be ravaged in the search for insufficient quantities of Paleolithic foods. The global food supply is widely thought to be incapable of supporting widespread adoption of this diet. It is also believed that Stone Age peoples had access to a broader range of wild foods than are currently available, and modern-day "Paleos" should monitor their consumption to ensure a balanced diet. Some nutritionists caution against total dietary exclusion of milk and milk products, arguing that low-fat dairy products can be useful to maintain sufficient levels of **calcium**.

KEY TERMS

Offal—Waste parts of an animal that are usually discarded.

Side effects

A balanced Paleolithic diet is thought to be generally free of harmful side effects, although anyone excluding milk and dairy products should be careful to maintain sufficient dietary levels of calcium to avoid problems such as osteoporosis, osteomalacia, rickets, and tetany.

Research and general acceptance

Many aspects of the Paleolithic diet have proven health benefits. There is absolutely no question that people who get plenty of **exercise** and eat lots of fruits and vegetables and avoid saturated fats tend to be healthier. Some experts are dubious, however, as to whether the benefits of the caveman diet extend into old age. They argue that diseases such as cancer, heart disease, and arthritis are found less frequently in hunter-gatherer societies because few members of those societies survive to an age at which those conditions become problems.

Training and certification

There is no organization dedicated specifically to training and certification of Paleolithic diet advisors, although a substantial number of scientists, physicians, and nutritionists are interested in the subject and can provide advice.

Resources

BOOKS

Audette, Raymond V. and Troy Gilchrist. *NeanderThin: Eat Like a Caveman to Achieve a Lean, Strong, Healthy Body*. New York: St. Martin's Press, 1999.

David Helwig

Palming *see* **Bates method**

Panax quinquefolius see **Ginseng, American**

Panchakarma

Definition

Panchakarma is the purification therapy used in **Ayurvedic medicine**. The word panchakarma means five actions, and refers to five procedures intended to intensively cleanse and restore balance to the body, mind, and emotions. Ayurvedic physicians use Panchakarma as a treatment for a wide variety of health conditions and as a preventative measure.

Origins

Ayurvedic medicine is the oldest healing system in the world, originating in the ancient civilizations of India some 3,000–5000 years ago. Ayurveda means knowledge of life in Sanskrit. Panchakarma is based on central concepts of Ayurveda, which state that disease is caused by the build-up of toxic substances in the body, and by imbalances in the body and mind.

Today, Ayurvedic medicine is used by millions of people, including at least half of the population of India. Ayurveda has become an increasingly accepted alternative medical treatment in America during the last couple of decades, aided by the efforts of Deepak Chopra, a conventionally trained M.D. who has written bestselling books based in part on Ayurvedic principles. Several Ayurvedic institutes and health clinics in America now perform panchakarma and conduct studies of its healing effects. A study in 2004 estimated that about three-quarters of a million Americans had used Ayurveda at least once, and 154,000 people had used it within the previous 12 months.

The ideas behind panchakarma have influenced other alternative treatments: Environmental medicine studies how the accumulation of environmental substances in the body may cause disease, and **detoxification** therapy relies upon cleansing the body as its central treatment.

Benefits

Panchakarma is used in Ayurvedic medicine to treat almost all diseases, particularly those that are chronic, metabolic, or stress-related in origin. Practitioners have used panchakarma to treat **allergies**, **asthma**, arthritis, **cancer**, **chronic fatigue syndrome**, **colitis**, high **cholesterol**, **depression**, diabetes, digestive disorders, **heart disease**, **hypertension**, immune problems, **infections**, inflammation, **insomnia**, nervous disorders, **obesity**, skin problems, and ulcers. Practitioners may use panchakarma alongside intensive conventional treatments, including chemotherapy and surgery, as a way to support healing and recovery. Panchakarma is limited in treating traumatic injuries, acute **pain**, and conditions requiring immediate surgery or invasive procedures.

Description

The first step of any Ayurvedic treatment is a thorough examination and diagnosis by an Ayurvedic practitioner, who determines the type and extent of panchakarma treatment required. According to Ayurvedic theory, physical and emotional traits are classified as three doshas—vata, kapha, and pitta. Each individual has all three doshas with one predominating. If an imbalance occurs, diseases or conditions appear. Panchakarma rebalances the doshas, bringing them back to equilibrium and returning the individual to good health. The physician may prescribe herbal remedies, and recommend that dietary and lifestyle changes be enacted before, during and after panchakarma.

Ayurvedic doctors believe that disease generally starts in the digestive tract. Poor **diets**, bad health habits, and other causes can lead to impaired digestion, and cause a toxic substance called *ama* to accumulate in the body. Ama interferes with normal functioning and the flow of energy, creating imbalances and disease. One goal of panchakarma is to cleanse the body of excess ama, and to restore the body's digestive power (*agni*).

A key part of panchakarma is *Shamana*, which is a collection of supportive therapies that include the preparation and post-therapy measures. The main treatment is called *shodhana* and refers to panchakarma's five main cleansing and elimination procedures. During preparation for panchakarma, oil therapy (termed *snehana* in Ayurveda) is the first treatment. Patients are given oil massages—*abhyanga* is full body massage and *shirodhaya* is forehead massage. They are fed dietary oils to lubricate the digestive tract, and are sometimes administered oil enemas. For stress-related and mental conditions, a special oil massage is given during which oil is steadily poured onto the patient's forehead. Practitioners may give oil therapy for up to a week before beginning the main treatment. Another preparation is sweating therapy (*swedana*). This employs saunas, steam rooms, heated clothing, herbal poultices, and **exercise**.

The five main methods of panchakarma are:

- therapeutic vomiting (*vamana*)
- purgation (*virechana*), which is the evacuation of the bowels
- medicated enema therapy (*niruha basti*)

- oil enema therapy (*anuvasana basti*)
- nasal cleansing (*nasya*).

Depending on an individual's health problem, one or more of these methods are used to cleanse the body and promote healing. Other Ayurvedic therapies may be used in conjunction with these methods.

Vamana uses herbal solutions or salt water to induce **vomiting**. This treatment is used for skin problems, asthma, diabetes, chronic sinus or lung infections, **epilepsy**, heart disease, and digestive disorders. Niruha basti uses special herbal solutions in a means to treat such conditions as skin diseases, liver problems, abdominal tumors, parasites, and chronic fevers. For therapeutic enemas, medicinal oils and herbal solutions are used to cleanse the lower bowels. Niruha and anuvasana basti are used to treat conditions such as **constipation**, arthritis, nervous disorders, colitis, headaches, muscle weakness, and lower back pain. During nasya, medicated oils or powders are administered into the nostrils to cleanse the sinuses. This therapy is used to treat conditions of the head, including mental disorders, headaches, and problems of the ear, nose, and throat.

After cleansing methods are performed, patients go through an important aftercare stage called *paschata karma*. Patients are advised to rest and avoid certain activities. In addition, they often receive attention from nurses and doctors. Psychological care and counseling may be part of the healing program, as panchakarma strives to cleanse the patient of emotional problems in addition to physical ones. Patients are also counseled about preventative practices. Dietary changes are carefully planned, and lifestyle considerations are examined and recommended. Exercise programs, such as **yoga**, and stress-management techniques, including **meditation**, may be introduced to patients during or after panchakarma, and herbal remedies may be prescribed as well.

Panchakarma treatment can vary in length from a couple of days to several weeks. Some clinics offer in-patient services, during which patients have medical supervision and are intensively treated around the clock with dietary therapy, exercise, yoga, meditation, massage, and other therapies. Most clinics offer out-patient services, during which panchakarma treatments may take two or more hours per day until completed. Some clinics provide housing arrangements for visiting patients.

Panchakarma treatment from Ayurvedic clinics typically cost $200–$400 per day, not including initial physician fees and herbal prescriptions. In addition, clinics with in-patient services are more expensive, and the costs vary with services. Insurance coverage of panchakarma varies, depending on the policy and whether the practitioner is a licensed physician.

KEY TERMS

Agni—Ayurvedic term for strength of digestion.

Meditation—A practice of concentrated focus upon a sound, object, visualization, the breath, movement, or attention itself in order to increase awareness of the present moment, reduce stress, promote relaxation, and enhance personal and spiritual growth.

Yoga—A method of joining the individual self with the divine, universal spirit, or cosmic consciousness. Physical and mental exercises are designed to help achieve this goal, also called self-transcendence or enlightenment. On the physical level, yoga postures, called asanas, are designed to tone, strengthen, and align the body. On the mental level, yoga uses breathing techniques (pranayama) and meditation (dyana) to quiet, clarify, and discipline the mind.

Preparations

Patients should be thoroughly diagnosed and cared for by a qualified Ayurvedic practitioner. Patients should seek panchakarma treatment from reputable clinics with adequate staff and facilities.

Precautions

Certain panchakarma methods are not appropriate for specific health problems, and some should not be performed on children, pregnant women, and the elderly. Panchakarma treatments should only be administered by qualified and experienced practitioners.

Individuals should note that some Ayurvedic herbal products have been linked with unsafe levels of toxins. A 2004 study that appeared in *JAMA (the Journal of the American Medical Association)* cautioned that some Ayurvedic herbal medicine products may contain potentially harmful levels of heavy metals, including lead, mercury, and/or arsenic. Also in 2004, the Centers for Disease Control received a dozen reports of **lead poisoning** that was associated with the use of Ayurvedic products.

In addition, the National Center for Complementary and Alternative Medicine cautions that possible interactions may occur between certain Ayurvedic herbal products and other medications. For example,

it notes that the extract of an Ayurvedic herb called **guggul** may enhance the activity of aspirin and possibly promote bleeding problems.

Side effects

During panchakarma, **fatigue**, malaise, headaches, congestion, general illness, and an increase in symptoms may occur as side effects. Also, because panchakarma seeks to release stored emotional problems from the patient, some people can experience mental disturbances and depression during treatment.

Research and general acceptance

The majority of the research surrounding Ayurveda has been conducted at research institutions in India, and its findings have mainly been published in Indian and European scientific journals. Much of the research in America is being supported by the Maharishi Ayur-Ved organization, which studies the Ayurvedic products it sells and its clinical practices, including panchakarma. Various studies have reported that panchakarma and/or Ayurvedic treatments have been successful in treating and in some cases, curing chronic illnesses such as asthma, **bronchitis**, hypertension, and diabetes. Other studies have shown that panchakarma can lower cholesterol and improve digestive disorders, and that Ayurvedic remedies can successfully treat diabetes, **acne**, and allergies. Proponents also claim that Ayurvedic treatments, including panchakarma, have been used successfully to support the healing process of patients undergoing chemotherapy.

As of 2007, however, the National Center for Complementary and Alternative Medicine cautions that most clinical trials of Ayurvedic approaches have been small, had problems with research designs, lacked appropriate control groups, or had other issues that affected how meaningful the results were.

Training and certification

In America, there is no standardized program for the certification of Ayurvedic practitioners. Many practitioners have primary degrees, either as MDs, homeopaths, or naturopathic physicians, with additional training in Ayurveda. Some institutions that provide training in Ayurvedic medicine include the following.

- The American Institute of Vedic Studies offers a program of Ayurvedic study.
- The Ayurvedic Institute offers training through classes and seminars, and performs panchakarma treatment. Its founder was Dr. Vasant Lad, one of the leading Ayurvedic practitioners in India and later America.
- Bastyr University of Natural Health Sciences offers training in Ayurvedic medicine.
- The Center for Mind-Body Medicine offers health services and professional training programs in Ayurveda. Dr. Deepak Chopra was one of its founders.
- The Rocky Mountain Institute of Yoga and Ayurveda offers a Panchakarma Practitioners Certification program that includes courses on Ayurvedic massage.

Resources

BOOKS

Godagama, Shantha. *Handbook of Ayurveda*. Berkeley: North Atlantic Books, 2004.

Krishan, Shubhra. *Essential Ayurveda: What It Is and What It Can Do for You*. Rockport, Novato, CA: New World Library, 2003.

Lad, Vasant. *Textbook of Ayurveda*. Albuquerque: Ayurve dic Press, 2001.

PERIODICALS

Saper, Robert B., Stefanos N. Kales, Janet Paquin, Michael J. Burns, David M. Eisenberg, Roger B. Davis, and Russell S. Phillips. "Heavy Metal Content of Ayurvedic Herbal Medicine Products" *JAMA*. Vol. 292, no. 23 (December 15, 2004): 2868 2873.

ORGANIZATIONS

American Institute of Vedic Studies. P.O. Box 8357, Santa Fe, NM 87504. (505) 983 9385. http://www.vedanet.com/ (accessed February 21, 2008).

Ayurvedic and Naturopathic Medical Clinic. 2115 112th Ave NE, Bellevue, WA 98004. (425) 453 8022. http://www.ayurvedicscience.com/ (accessed February 21, 2008).

The Ayurvedic Institute. 11311 Menaul Blvd., Albuquerque, NM 87192.(505) 291 9698. http://www.ayurveda.com/ (accessed February 21, 2008).

Bastyr University. 14500 Juanita Dr. NE, Seattle, WA 98103. (206) 834 4100. http://www.bastyr.edu/ (accessed February 21, 2008).

Center for Mind Body Medicine. 5225 Connecticut Ave, NW, Suite 414_Washington, DC 20015. (202) 966 7338. http://www.cmbm.org/ (accessed February 21, 2008).

Rocky Mountain Institute of Yoga and Ayurveda. P.O. Box 1091, Boulder, CO 80306. (303) 499 2910. http://www.rmiya.org/index.php/ (accessed February 21, 2008).

OTHER

Ayurveda Holistic Community. http://www.ayurvedahc.com (accessed February 21, 2008).

The Ayurvedic Institute. http://www.ayurveda.com (accessed February 21, 2008).

National Institute of Ayurvedic Medicine. http://www.niam.com (accessed February 21, 2008).

"What is Ayurvedic Medicine?" National Center for Alternative and Complementary Medicine, National Institutes of Health. http://nccam.nih.gov/health/ayurveda/ (accessed February 20, 2008).

Douglas Dupler
Leslie Mertz, Ph.D.

Pancreatic enzymes *see* **Digestive enzymes**

Pancreatitis

Definition

Pancreatitis is an inflammation of the pancreas, an organ that is important in digestion. Pancreatitis can be acute, beginning suddenly, usually with the patient recovering fully; or chronic, progressing slowly with permanent injury to the pancreas.

Description

The pancreas is located in the midline of the back of the abdomen, closely associated with the liver, stomach, and duodenum, the first part of the small intestine. The pancreas is considered a gland. A gland is an organ whose primary function is to produce chemicals that pass either into the main blood circulation (called an endocrine function), or pass into another organ (called an exocrine function). The pancreas is unusual because it has both endocrine and exocrine functions. Its endocrine function produces three hormones. Two of these hormones, insulin and glucagon, are central to the processing of sugars in the diet (carbohydrate metabolism or breakdown). The third hormone produced by the endocrine cells of the pancreas affects gastrointestinal functioning. This hormone is called vasoactive intestinal polypeptide (VIP). The pancreas's exocrine function produces a variety of **digestive enzymes** (trypsin, **chymotrypsin**, **lipase**, and amylase, among others). These enzymes are passed into the duodenum through a channel called the pancreatic duct. In the duodenum, the enzymes begin the process of breaking down a variety of food components, including, proteins, fats, and starches.

Acute pancreatitis occurs when the pancreas suddenly becomes inflamed but improves. Patients usually recover fully from the disease, and in almost 90% of cases, the symptoms disappear within about a week after treatment. The pancreas returns to its normal structure and functioning after healing from the illness. After an attack of acute pancreatitis, the tissue and cells of the pancreas typically return to normal. With chronic pancreatitis, damage to the pancreas occurs slowly over time. Symptoms may be persistent or sporadic, but the condition does not disappear and the pancreas is permanently impaired. Pancreatic tissue is damaged, and the tissue and cells function poorly.

Causes and symptoms

There are a number of causes of acute pancreatitis. The most common, however, are gallbladder disease and **alcoholism**. These two diseases are responsible for more than 80% of all hospitalizations for acute pancreatitis. Other factors in the development of pancreatitis include:

- certain drugs
- infections
- structural problems of the pancreatic duct and bile ducts (channels leading from the gallbladder to the duodenum)
- injury to the abdomen resulting in injury to the pancreas (including injuries occurring during surgery)
- abnormally high levels of circulating fats in the bloodstream
- malfunction of the parathyroid gland, with high blood levels of calcium
- complications from kidney transplants
- a hereditary tendency toward pancreatitis (recent advances in gene mapping have led to the discovery that a mutation in the gene responsible for cystic fibrosis is associated with a greatly increased risk of pancreatitis)

Pancreatitis caused by drugs accounts for about 5% of all cases. Some drugs that are definitely related to pancreatitis include:

- azathioprine, 6–mercaptopurine (Imuran)
- dideoxyinosine (Videx)
- estrogens (birth control pills)
- furosemide (Lasix)
- pentamidine (NebuPent)
- sulfonamides (Urobak, Azulfidine)
- tetracycline
- thiazide diuretics (Diuril, Enduron)
- valproic acid (Depakote)

Some drugs that are probably related to pancreatitis include:

- acetaminophen (Tylenol)
- angiotensin–converting enzyme (ACE) inhibitors (Capoten, Vasotec)
- erythromycin

KEY TERMS

Abscess—A localized collection of pus in the skin or other body tissue caused by infection.

Acute—Refers to a disease or symptom that has a sudden onset and lasts a relatively short period of time.

Autodigestion—A process in which pancreatic enzymes are activated prematurely and begin to digest the pancreas itself.

Chronic—Refers to a disease or condition that progresses slowly but persists or recurs over time.

Diabetes—A disease characterized by an inability to process sugars in the diet, due to a decrease in or total absence of insulin production.

Duodenum—The first of the three segments of the small intestine. The duodenum is about 10 in (25 cm) long and connects the stomach and the jejunum.

Endocrine—Refers to glands that secrete hormones circulated in the bloodstream or lymphatic system.

Enzyme—A protein that catalyzes a biochemical reaction without changing its own structure or function.

Exocrine—Refers to a system of organs that produces chemicals that go through a duct (or tube) to reach other organs or body surfaces whose functioning they affect.

Glands—Collections of tissue that produce chemicals needed for chemical reactions elsewhere in the body.

Necrosis—Localized tissue death due to disease or injury, such as a lack of oxygen supply to the tissues.

Pseudocyst—A fluid-filled space that may arise in the setting of pancreatitis.

Ranson's signs—A set of 11 signs used to evaluate the severity of a case of pancreatitis.

- methyldopa (Aldomet)
- metronidazole (Flagyl, Protostat)
- nitrofurantoin (Furadantin, Furan)
- nonsteroidal anti–inflammatory drugs (NSAIDs) (Aleve, Naprosyn, Motrin)
- salicylates (aspirin)

All of these causes of pancreatitis seem to have a similar mechanism in common. Under normal circumstances, many of the extremely potent enzymes produced by the pancreas are not active until they enter the duodenum, in which contact with certain other chemicals allows them to function. In pancreatitis, these enzymes become prematurely activated and actually begin their digestive functions within the pancreas. The pancreas, in essence, begins to digest itself. This process is known as autodigestion. A cycle of inflammation begins, including swelling and loss of function. Digestion of the blood vessels in the pancreas results in bleeding. Other active pancreatic chemicals cause the blood vessels to become leaky, and fluid begins to leak out of the normal circulation into the abdominal cavity. The activated enzymes also gain access to the bloodstream through the eroded blood vessels, and begin circulating throughout the body.

Pain is a major symptom of pancreatitis. The pain is usually quite intense and steady, located in the upper right hand corner of the abdomen, and often described as "piercing" or "boring." This pain is also often felt all the way through to the patient's back. The patient's breathing may become quite shallow because deeper breathing tends to cause more pain. Patients usually find some relief of pain by sitting up and bending forward; this postural relief is characteristic of pancreatic pain. **Nausea** and **vomiting**, and abdominal swelling are all common, as well. A patient will often have a slight **fever**, with an increased heart rate and low blood pressure.

Classic signs of shock may appear in more severely ill patients. Shock is a very serious syndrome that occurs when the volume (quantity) of fluid in the blood is very low. In shock, a patient's arms and legs become extremely cold, the blood pressure drops dangerously low, the heart rate is quite fast, and the patient may begin to experience changes in mental status.

In very severe cases of pancreatitis (called necrotizing pancreatitis) the pancreatic tissue begins to die and bleeding increases. Due to the bleeding into the abdomen, two distinctive signs may be noted in patients with necrotizing pancreatitis. Turner's sign is a reddish purple or greenish brown color in the flank area (the area between the ribs and the hip bone). Cullen's sign is the appearance of a bluish color around the navel.

Some of the complications of pancreatitis are due to shock. When shock occurs, all of the body's major organs are deprived of blood and the oxygen it carries, resulting in damage. Kidney, respiratory, and heart failure are serious risks of shock. The pancreatic enzymes that have begun circulating throughout the body (as well as various poisons created by the abnormal digestion of the pancreas by those enzymes) have severe effects on the major body systems. Any number of complications can occur, including damage to the

heart, lungs, kidneys, lining of the gastrointestinal tract, liver, eyes, bones, and skin. As the pancreatic enzymes work on blood vessels surrounding the pancreas, and even blood vessels located at a distance, the risk of **blood clots** increases. These blood clots complicate the situation by blocking blood flow in the vessels. When blood flow is blocked, the supply of oxygen is decreased to various organs and the organ can be damaged.

The pancreas may develop additional problems, even after the pancreatitis decreases. When the entire organ becomes swollen and suffers extensive cell death (pancreatic necrosis), the pancreas becomes extremely susceptible to serious infection. A local collection of pus (called a pancreatic **abscess**) may develop several weeks after the illness subsides, and may result in increased fever and a return of pain. Another late complication of pancreatitis, occurring several weeks after the illness begins, is called a pancreatic pseudocyst. This occurs when dead pancreatic tissue, blood, white blood cells, enzymes, and fluid that has leaked from the circulatory system accumulates. In an attempt to enclose and organize this abnormal accumulation, a kind of wall forms from the dead tissue and the growing scar tissue in the area. Pseudocysts cause additional abdominal pain by putting pressure on and displacing pancreatic tissue, resulting in more pancreatic damage. Pseudocysts also press on other nearby structures in the gastrointestinal tract, causing more disruption of function. Pseudocysts are life-threatening when they become infected (abscess) and rupture. Simple rupture of a pseudocyst causes death 14% of the time. Rupture complicated by bleeding causes death 60% of the time.

As the pancreatic tissue is increasingly destroyed in chronic pancreatitis, many digestive functions become disturbed. The quantity of hormones and enzymes normally produced by the pancreas begins to seriously decrease. Decreases in the production of enzymes result in the inability to appropriately digest food. Fat digestion, in particular, is impaired. A patient's stools become greasy as fats are passed out of the body. The inability to digest and use proteins results in smaller muscles (wasting) and weakness. The inability to digest and use the nutrients in food leads to malnutrition and a generally weakened condition. As the disease progresses, permanent injury to the pancreas can lead to diabetes.

Diagnosis

Diagnosis of pancreatitis can be made very early in the disease by noting high levels of pancreatic enzymes circulating in the blood (amylase and lipase). Later in the disease, and in chronic pancreatitis, these enzyme levels will no longer be elevated. Because of this fact, and because increased amylase and lipase can also occur in other diseases, the discovery of such elevations are helpful but not mandatory in the diagnosis of pancreatitis. Other abnormalities in the blood may also point to pancreatitis, including increased white blood cells (occurring with inflammation and/or infection), changes due to dehydration from fluid loss, and abnormalities in the blood concentration of **calcium**, **magnesium**, **sodium**, **potassium**, bicarbonate, and sugars.

X rays or ultrasound examination of the abdomen may reveal **gallstones**, perhaps responsible for blocking the pancreatic duct. The gastrointestinal tract will show signs of inactivity (ileus) due to the presence of pancreatitis. Chest x rays may reveal abnormalities due to air trapping from shallow breathing, or due to lung complications from the circulating pancreatic enzyme irritants. Computed tomography scans (CT scans) of the abdomen may reveal the inflammation and fluid accumulation of pancreatitis, and may also be useful when complications like an abscess or a pseudocyst are suspected.

In the case of chronic pancreatitis, a number of blood tests will reveal the loss of pancreatic function that occurs over time. Blood sugar (glucose) levels will rise, eventually reaching the levels present in diabetes. The levels of various pancreatic enzymes will fall, as the organ is increasingly destroyed and replaced by nonfunctioning scar tissue. Calcification of the pancreas can also be seen on x rays. Endoscopic retrograde cholangiopancreatography (ERCP) may be used to diagnose chronic pancreatitis in severe cases. In this procedure, the doctor uses a medical instrument fitted with a fiber-optic camera to inspect the pancreas. A magnified image of the area is shown on a television screen viewed by the doctor. Many endoscopes also allow the doctor to retrieve a small sample (biopsy) of pancreatic tissue to examine under a microscope. A contrast product may also be used for radiographic examination of the area.

Treatment

Pancreatitis is a serious condition that requires medical diagnosis and treatment. Alternative therapies should be used only to complement conventional treatment.

Nutritional therapy

Before taking nutritional supplements, patients should consult their doctors to make sure these

supplements do not interfere with their overall treatment program. The following nutritional changes are recommended to help support pancreatic function and relieve pancreatitis symptoms:

- Follow a diabetic diet and avoid alcohol consumption.
- Limit intake of hydrogenated/saturated fats, sugar, and highly processed foods.
- Increase intake of yellow and orange fruits and dark-green vegetables, which are good sources of beta-carotene, whole foods, vitamin C, and other antioxidants.
- Take high-potency multivitamin/mineral supplements.
- Use chromium (300 mcg daily) supplements to help control blood sugar level and enhance insulin effectiveness.
- Take lipotrophic agents(which increase bile flow to and from the liver), such as vitamin B_6, vitamin B_{12}, folic acid, choline, betaine, and methionine.
- Take pancreatic enzymes at mealtime.

Other therapies

Other alternative treatments such as **acupuncture** or **relaxation** techniques can help patients cope with painful symptoms associated with pancreatitis. Reduce **stress** by **meditation**, **yoga**, **t'ai chi**, or other relaxation techniques. Stress can stimulate pancreatitis attacks.

Allopathic treatment

Treatment of acute pancreatitis involves quickly and sufficiently replacing lost fluids by giving the patient new fluids through a needle inserted in a vein (intravenous or IV fluids). Pain is treated with a variety of medications. In order to decrease pancreatic function (and decrease the discharge of more potentially harmful enzymes into the bloodstream), the patient is not allowed to eat. A thin, flexible tube (nasogastric tube) may be inserted through the patient's nose and down into his or her stomach. Oxygen may need to be administered by nasal prongs or by a mask.

Complications, such as **infections** that often occur in cases of necrotizing pancreatitis, abscesses, and pseudocysts, will require antibiotics administered intravenously. Severe necrotizing pancreatitis may require surgery to remove part of the dying pancreas. A pancreatic abscess can be drained by a needle inserted through the abdomen and into the collection of pus (percutaneous needle aspiration) or surgically removed, if necessary. Pancreatic pseudocysts may shrink on their own (in 25–40% of cases) or may continue to expand, requiring needle aspiration or surgery. When diagnostic exams reveal the presence of gallstones, surgery may be necessary for their removal.

Because chronic pancreatitis often includes repeated flares of acute pancreatitis, the same kinds of basic treatment are necessary. Patients receive IV replacement fluids, receive pain medication, and are monitored for complications. Treatment of chronic pancreatitis caused by alcohol consumption requires that the patient stop drinking alcohol entirely. As chronic pancreatitis continues and insulin levels drop, a patient may require insulin injections in order to be able to process sugars in his or her diet. Pancreatic enzymes can be replaced with oral medicines, and patients sometimes have to take as many as eight pills with each meal. Drugs can be used to reduce the pain, but when narcotics are used for pain relief, there is danger of the patient becoming addicted.

Expected results

A number of systems have been developed to help determine the prognosis of an individual with pancreatitis. A very basic evaluation of a patient will allow some prediction to be made based on the presence of dying pancreatic tissue (necrosis) and bleeding. When necrosis and bleeding are present, as many as 50% of patients may die.

More elaborate systems have been created to help determine the prognosis of patients with pancreatitis. Ranson's signs, the most commonly used system, identifies 11 different signs that can be used to determine the severity of the disease. The first five categories are evaluated when the patient is admitted to the hospital:

- age over 55 years
- blood sugar level over 200 mg/Dl
- serum lactic dehydrogenase over 350 IU/L (increased with increased breakdown of blood, as would occur with internal bleeding, and with heart or liver damage)
- AST over 250 μ (a measure of liver function, as well as a gauge of damage to the heart, muscle, brain, and kidney)
- white blood count over 16,000 μL

The next six of Ranson's signs are reviewed 48 hours after admission to the hospital. These are:

- greater than 10% decrease in hematocrit (a measure of red blood cell volume)
- increase in BUN (blood urea nitrogen, an indicator of kidney function) greater than 5 mg/dL
- blood calcium less than 8 mg/dL

- PaO_2 (a measure of oxygen in the blood) less than 60 mm Hg
- base deficit greater than 4 mEg/L (a measure of change in the normal acidity of the blood)
- fluid sequestration greater than 6 L (an estimation of the quantity of fluid that has leaked out of the blood circulation and into other body spaces).

Once a doctor determines how many of Ranson's signs are present and gives the patient a score, the doctor can better predict the risk of death. The more signs present, the greater the chance of death. A patient with less than three positive Ranson's signs has a less than 5% chance of dying. A patient with three to four positive Ranson's signs has a 15–20% chance of dying.

The results of a CT scan can also be used to predict the severity of pancreatitis. Slight swelling of the pancreas indicates mild illness. Significant swelling, especially with evidence of destruction of the pancreas and/or fluid buildup in the abdominal cavity, indicates more severe illness. With severe illness, there is a worse prognosis.

Surgical treatment of pancreatitis is frequently followed by complications because of the leakage of pancreatic enzymes from the remaining portion of the organ. A team of French surgeons has reported that treating patients with somatostatin-14, a hormone that inhibits pancreatic secretion as well as pancreatic blood flow, appears to be effective in lowering the rate of complications from pancreatic surgery. In spite of recent advances in surgical technique, however, the mortality rate following surgery for pancreatitis is still 3%–10%.

Prevention

Alcoholism is essentially the only preventable cause of pancreatitis. Patients with chronic pancreatitis must stop drinking alcohol entirely. The drugs that cause or may cause pancreatitis should also be avoided.

Resources

BOOKS

Greenberger, Norton J., Phillip P. Toskes, and Kurt J. Isselbacher. "Acute and Chronic Pancreatitis." In *Harrison's Principles of Internal Medicine,* edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

"Pancreatitis." In *Alternative Medicine: The Definitive Guide*. Tiburon, CA: Future Medicine Publishing, Inc., 1999.

"Pancreatitis." In *Reader's Digest Guide to Medical Cures & Treatments*. Canada: The Reader's Digest Association, Inc., 1997.

PERIODICALS

Amann, Stephen, et al. "Pancreatitis: Diagnostic and Ther apeutic Interventions." *Patient Care* 31, no. 11 (June 15, 1997): 200+.

Goulliat, C., J. F. Gigot. "Pancreatic Surgical Complications The Case for Prophylaxis." *Gut* 49 (December 2001): 32 39.

Le Marechal, C., O. Raguenes, I. Quere, et al. "Screening of Pancreatic Secretory Trypsin Inhibitor (PSTI) Muta tions in Chronic Pancreatitis by DHPLC." *American Journal of Human Genetics* 69 (October 2001): 623.

Meissner, Judith E. "Caring for Patients with Pancreatitis." *Nursing* 27, no. 10 (October 1997): 50+.

"Mutations in the PSTI Gene Associated with Pancreatitis." *Gene Therapy Weekly* (December 27, 2001): 19.

Schlapman, Nancy. "Spotting Acute Pancreatitis." *RN* 64 (November 2001): 54.

ORGANIZATION

National Digestive Diseases Information Clearinghouse. 2 Information Way, Bethesda, MD 20892 3570. http:// www.niddk.nih.gov.

Mai Tran
Rebecca J. Frey, PhD

Panic disorder

Definition

A panic attack is a sudden, intense experience of fear coupled with an overwhelming feeling of danger, accompanied by physical symptoms of **anxiety**, such as a pounding heart, sweating, and rapid breathing. A person with panic disorder may experience repeated panic attacks (at least several a month) and feel severe anxiety about having another attack.

Description

Each year, panic disorder affects one in every 63 Americans. While many people experience moments of anxiety, panic attacks are sudden and unprovoked, having little to do with real danger.

Panic disorder is a chronic, debilitating condition that can have a devastating impact on a person's family, work, and social life. Typically, the first attack strikes without warning. A person might be walking down the street, driving a car, or riding an escalator when suddenly panic strikes. Pounding heart, sweating palms, and an overwhelming feeling of impending doom are common features. While the attack may last only seconds or minutes, the experience can be profoundly disturbing. A person who has had one panic

KEY TERMS

Agoraphobia—Abnormal anxiety regarding public places or situations from which the person may wish to flee or in which he or she would be helpless in the event of a panic attack.

Aromatherapy—The therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological well-being.

Benzodiazepines—A class of drugs that have a hypnotic and sedative action, used mainly as tranquilizers to control symptoms of anxiety or panic.

Cognitive-behavioral therapy—A type of psychotherapy in which people learn to recognize and change negative and self-defeating patterns of thinking and behavior.

Selective serotonin reuptake inhibitors (SSRIs)—A class of antidepressants that work by blocking the reabsorption of serotonin in the brain, thus raising the levels of serotonin. SSRIs include fluoxetine (Prozac), sertraline (Zoloft), and paroxetine (Paxil)

Tricyclic antidepressants—A class of antidepressants named for their three-ring structure that increase the levels of serotonin and other brain chemicals. They are used to treat depression and anxiety disorders, but have more side effects than the newer class of antidepressants called SSRIs.

attack typically worries that another one may occur at any time.

As the fear of future panic attacks deepens, the person begins to avoid situations in which panic occurred in the past. In severe cases of panic disorder, the victim refuses to leave the house for fear of having a panic attack. This fear of being in exposed places is often called agoraphobia.

People with untreated panic disorder may have problems getting to work or staying on the job. As the person's world narrows, untreated panic disorder can lead to **depression**, **substance abuse**, and in rare instances, suicide.

Causes and symptoms

Scientists aren't sure what causes panic disorder, but they know that a tendency to develop the condition can be inherited. In 2001, a team of geneticists pinpointed an abnormal duplication (known as DUP25) of a segment of human chromosome 15q as implicated in panic disorder. In addition to genetic factors, some experts think that people with panic disorder may have a hypersensitive nervous system that unnecessarily responds to nonexistent threats. Research suggests that people with panic disorder may not be able to make proper use of their body's normal stress-reducing chemicals. And in some cases, panic disorder develops as a drug intolerance reaction to medications given to reduce high blood pressure.

People with panic disorder usually have their first panic attack in their 20s. Four or more of the following symptoms during panic attacks would indicate panic disorder if no medical, drug-related, neurologic, or other psychiatric disorder is found:

- pounding, skipping, or palpitating heartbeat
- shortness of breath or the sensation of smothering
- dizziness or lightheadedness
- nausea or stomach problems
- chest pains or pressure
- choking sensation or a "lump in the throat"
- chills or hot flashes
- sweating
- fear of dying
- feelings of unreality or being detached
- tingling or numbness
- shaking and trembling
- fear of losing control

A panic attack is often accompanied by the urge to escape, together with a feeling of impending doom. Others are convinced they are about to have a **heart attack**, suffocate, lose control, or "go crazy." Once people experience one panic attack, they tend to worry so much about having another attack that they avoid the place or situation associated with the original episode.

Diagnosis

Because its physical symptoms are easily confused with other conditions, panic disorder often goes undiagnosed. A thorough physical examination is needed to rule out a medical condition. Because the physical symptoms are so pronounced and frightening, panic attacks can be mistaken for a heart problem. Some people experiencing a panic attack go to an emergency room and endure batteries of tests until a diagnosis is made.

Once a medical condition is ruled out, a mental health professional is the best person to diagnose panic and panic disorder, taking into account not just the actual episodes, but how the patient feels about the attacks, and how they affect everyday life.

Treatment

One approach used in several medical centers focuses on teaching patients how to accept their fear instead of dreading it. In this method, the therapist repeatedly stimulates a person's body sensations (such as a pounding heartbeat) that can trigger fear. Eventually, the patient gets used to these sensations and learns not to be afraid of them. Patients who respond report almost complete absence of panic attacks.

Neurolinguistic programming and hypnotherapy can also be beneficial in treating panic attacks, since these techniques can help bring an awareness of the root cause of the attacks to the conscious mind.

Herbs known as *adaptogens* may also be prescribed by an herbalist or holistic healthcare provider to treat anxiety related to panic disorder. These herbs are thought to promote adaptability to **stress**, and include Siberian ginseng (*Eleutherococcus senticosus*), ginseng (*Panax ginseng*), wild yam (*Dioscorea villosa*), borage (*Borago officinalis*), licorice (*Glycyrrhiza glabra*), chamomile (*Chamaemelum nobile*), **milk thistle** (*Silybum marianum*), and nettles (*Urtica dioica*). Herbal preparations of **skullcap** (*Scutellaria lateriafolia*), **lemon balm** (*Melissa officinalis*), **passionflower** (*Passiflora incarnata*), and oats (*Avena sativa*) may also be recommended to ease the symptoms of panic disorder. Nutritional supplementation with B vitamins, magnesium, and antioxidant vitamins are also useful for relieving anxiety.

Chinese medicine regards anxiety as a disruption of *qi*, or energy flow, inside the patient's body. The practitioner of Chinese medicine chooses **acupuncture** and/or herbal therapy to rebalance the entire system. In acupuncture, the kidney meridian is associated with fear and may be out of balance. Reishi (*Ganoderma lucidum*), or ling-zhi is a medicinal mushroom prescribed in TCM to reduce anxiety and **insomnia**. It is available in extract form, but because reishi can interact with other prescription drugs and is not recommended in patients with certain medical conditions, individuals should consult their healthcare practitioner before taking the remedy. Other TCM herbal remedies for panic disorder include the **cordyceps** mushroom (also known as caterpillar fungus.) There are several herbal formulas, depending on the pattern of imbalance in an individual.

Meditation and mindfulness training can be beneficial to patients with **phobias** and panic disorder. **Hydrotherapy**, massage therapy, and **aromatherapy** are useful to some anxious patients because they can promote general **relaxation** of the nervous system. Popular aromatherapy prescriptions for anxiety relief include **essential oils** of lavender, ylang-ylang, and **chamomile**. Relaxation training, which is sometimes called anxiety management training, includes breathing exercises and similar techniques intended to help the patient prevent hyperventilation and relieve the muscle tension associated with the fight-or-flight reaction of anxiety. **Yoga**, aikido, **t'ai chi**, and dance therapy help patients work with the physical, as well as the emotional, tensions that either promote anxiety or are created by the anxiety.

Finally, patients can make certain lifestyle changes to help keep panic at bay, such as eliminating **caffeine** and alcohol, cocaine, amphetamines, and **marijuana**.

There are also homeopathic remedies that may be helpful by seeing a trained homeopathic practitioner.

It is important for patients who are using alternative treaments for panic disorder alongside allopathic medications or treatments to keep their health care provider informed about any herbal remedies they may be taking that could interact with prescription medications. A study done in 2001 found that Americans are more likely to seek alternative treatment for anxiety disorders than standard allopathic therapies, and that the percentage of alternative therapy users was the same in both sexes. In addition, the percentage was not affected by age, race, education, income, place of residence, marital status, or employment.

Allopathic treatment

Most patients with panic disorder respond best to a combination of cognitive-behavioral therapy and medication. Cognitive-behavioral therapy usually runs from 12–15 sessions. It teaches patients:

- How to identify and alter thought patterns so as not to misconstrue bodily sensations, events, or situations as catastrophic.
- How to prepare for the situations and physical symptoms that trigger a panic attack.
- How to identify and change unrealistic self-talk (such as "I'm going to die!") that can worsen a panic attack.
- How to calm down and learn breathing exercises to counteract the physical symptoms of panic.
- How to gradually confront the frightening situation step by step until it becomes less terrifying.
- How to "desensitize" themselves to their own physical sensations, such as rapid heart rate.

At the same time, many people find that medications can help reduce or prevent panic attacks by changing the way certain chemicals interact in the brain. People with panic disorder usually notice whether or not the drug is effective within two months, but most people take medication for at least six months to a year.

Several kinds of drugs can reduce or prevent panic attacks, including:

- Selective serotonin reuptake inhibitor (SSRI) antipressants like paroxetine (Paxil) or fluoxetine (Prozac), some approved specifically for the treatment of panic.
- Tricyclic antidepressants such as clomipramine (Anafranil).
- Benzodiazepines such as alprazolam (Xanax) and clonazepam (Klonopin).
- A combination of sertraline, another SSRI, with clonazepam has been reported as especially effective in treating panic disorder.

Expected results

While there may be occasional periods of improvement, the episodes of panic rarely disappear on their own. Fortunately, panic disorder responds very well to treatment; panic attacks decrease in up to 90% of people after six to eight weeks of a combination of cognitive-behavioral therapy and medication.

Unfortunately, many people with panic disorder never get the help they need. If untreated, panic disorder can last for years and may become so severe that a normal life is impossible. Many people who struggle with untreated panic disorder and try to hide their symptoms end up losing their friends, family, and jobs.

Prevention

There is no way to prevent the initial onset of panic attacks. Antidepressant drugs or benzodiazepines can prevent future panic attacks, especially when combined with cognitive-behavioral therapy. There is some suggestion that avoiding stimulants (including caffeine, alcohol, or over-the-counter cold medicines) may help prevent attacks as well.

Resources

BOOKS

Bloomfield, Harold H. *Healing Anxiety with Herbs.* New York: Harper Collins, 1998.

Sheehan, Elaine. *Anxiety, Phobias and Panic Attacks: Your Questions Answered.* New York: Element, 1996.

Wilson, Robert R. *Don't Panic: Taking Control of Anxiety Attacks.* New York: HarperCollins, 1996.

PERIODICALS

"Alternative Treatment of Anxiety and Depression." *Harvard Mental Health Letter* 18 (October 2001): np.

Boschert, Sherry. "Drug Intolerance, Mood Disorders Linked in HT (Panic Attacks, Anxiety, Depression)." *Internal Medicine News* 34 (November 2001): 30.

Goddard, Andrew W. "Early Administration of Clonazepam with Sertraline for Panic Disorder." *Journal of the American Medical Association* 286 (October 24, 2001): 1955.

Gratacos, M., M. Nadal, R. Martin Santos, et al. "Polymorphic Genomic Mutation on Human Chromosome 15 and Susceptibility to Anxiety Disorders (Panic Disorder and Social Phobia)." *American Journal of Human Genetics* 69 (October 2001): 177.

Katerndahl, David A. "Panic Attacks and Panic Disorder." *Journal of Family Practice* 43 (September 1996): 275 283.

ORGANIZATIONS

Anxiety Disorders Association of America. 11900 Parklawn Dr., Ste. 100, Rockville, MD 20852. (301) 231 9350.

Anxiety Network Homepage. http://www.anxietynetwork.com.

National Institute of Mental Health, Anxiety Disorders Education Program. Rm 15C 05, 5600 Fishers Lane, Rockville, MD 20857. (800) 64 PANIC. www.nimh.nih.gov/anxiety.

Paula Ford-Martin
Rebecca J. Frey, PhD

Pantothenic acid

Description

Pantothenic acid, also known as vitamin B_5, is a member of the water-soluble B vitamin family. Every living organism needs pantothenic acid to survive. Humans do not make this vitamin and must obtain it from the food they eat. It is an essential ingredient of two substances, coenzyme A and acyl carrier protein, which are needed to metabolize carbohydrates and fats. The same coenzymes play a part in production of certain hormones, **vitamin D**, red blood cells, and the neurotransmitter acetylcholine. Pantothenic acid is necessary for proper growth and development. Studies of Mexican infants whose **diets** are deficient in micronutrients have shown that those who receive dietary supplements containing pantothenic acid do not show the growth retardation that appears in control groups.

General use

Pantothenic acid was discovered in 1936 and soon afterward was recognized as a vitamin essential to growth. Pantothenic acid is found in all living things. Its name is derived from the Greek word "pantos," which means "everywhere."

Pantothenic acid joins with another molecule to form coenzyme A (CoA). Coenzymes are small molecules that regulate enzyme reactions. CoA is involved in many essential metabolic reactions that produce energy and synthesize new molecules. Without pantothenic

Recommended dietary allowance of pantothenic acid

Age	mg/day
Children 0-6 mos.	1.7
Children 7-12 mos.	1.8
Children 1-3 yrs.	2
Children 4-8 yrs.	3
Children 9-13 yrs.	4
Children 14-18 yrs.	5
Adults ≥ 19 yrs.	5
Pregnant women	6
Breastfeeding women	7

Foods that contain pantothenic acid

	mg
Liver, beef, cooked, 3.5 oz.	5.3
Salmon, baked, 3.5 oz.	1.4
Yogurt, 8 oz.	1.35
Chicken, dark meat, cooked, 3.5 oz.	1.3
Chicken, light meat, cooked, 3.5 oz.	1.0
Milk, nonfat, 1 cup	0.80
Corn, cooked, 1/2 cup	0.72
Sweet potato, cooked, 1/2 cup	0.68
Lentils, cooked, 1/2 cup	0.64
Egg, 1 large, cooked	0.61
Broccoli, steamed, 1/2 cup	0.40
Tuna, canned, 3 oz.	0.18
Bread, whole wheat, 1 slice	0.16

mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

acid, there would be no CoA, and life would cease. Some of the activities that require CoA, and thus indirectly pantothenic acid, include:

- converting fats, carbohydrates, and proteins from food into energy that the body can use
- synthesizing heme, the molecule in red blood cells that picks up oxygen in the lung and carries it throughout the body
- synthesizing essential fatty acids, cholesterol, and steroid hormones needed to build new cells
- synthesizing acetylcholine, a neurotransmitter that carries electrical impulses between nerve cells
- stimulating chemical reactions in the liver that help rid the body of certain drugs and toxins (poisons).

The United States Institute of Medicine (IOM) of the National Academy of Sciences has developed values called Dietary Reference Intakes (DRIs) for vitamins and minerals. The DRIs consist of three sets of numbers. The Recommended Dietary Allowance (RDA) defines the average daily amount of the nutrient needed to meet the health needs of 97–98% of the population. The Adequate Intake (AI) is an estimate set when there is not enough information to determine an RDA. The Tolerable Upper Intake Level (UL) is the average maximum amount that can be taken daily without risking negative side effects. The DRIs are calculated for children, adult men, adult women, pregnant women, and breastfeeding women.

The IOM has not set RDA values for pantothenic acid because of incomplete scientific information. Instead, it has set AI levels for all age groups. AI levels for pantothenic acid are measured by weight (milligrams or mg). No UL levels have been set for this vitamin because large doses of pantothenic acid do not appear to cause any side effects.

The following are the daily AIs of pantothenic acid for healthy individuals:

- children birth–6 months: 1.7 mg
- children 7–12 months: 1.8 mg
- children 1–3 years: 2 mg
- children 4–8 years: 3 mg
- children 9–13 years: 4 mg
- children 14–18 years: 5 mg
- adults age 19 and older: 5 mg
- pregnant women: 6 mg
- breastfeeding women: 7 mg

Pantothenic acid and pantethine are both available as supplements, and do appear to function somewhat differently. Pantethine can be used to lower serum **cholesterol** and triglycerides. It is more expensive and less effective than using **niacin** (vitamin B_3) for the same purpose, but does not have the potential side effects that niacin does. Generally a dose of 300 mg taken three times a day is recommended for this purpose. Pantethine may be a good cholesterol-lowering alternative for people with diabetes, who cannot take niacin due to the potential side effects on blood sugar regulation. Taking supplements of pantothenic acid does not affect cholesterol, as in this form it is immediately converted into coenzymes.

One very small study indicated that large daily doses of pantothenic acid (2 g of **calcium** pantothenate) were helpful to relieve symptoms of **rheumatoid arthritis**. Consult a healthcare provider regarding use of supplements for this purpose.

Panthenol is a derivative of pantothenic acid and is frequently an ingredient of shampoos and other hair care products. Experiments with rats have shown that a deficiency of pantothenic acid can cause hair to turn gray and fall out. Neither oral nor topical use of any

form of pantothenic acid has been shown to prevent or treat gray hair or balding in humans. Some skin care products contain another form of pantothenic acid, called panthoderm, which may be helpful in treatment of minor skin injuries.

Other claims for pantothenic acid that remain unproven are that it improves immune function, decreases **allergies**, and acts as an anti-aging substance.

Preparations

Natural sources

Pantothenic acid is found small quantities in a wide variety of foods. Good sources include liver, kidney, fish, shellfish, egg yolk, broccoli, lentils, and mushrooms. Pantothenic acid is unstable. Much of it is lost during cooking, canning, freezing, and processing. Frozen meats and processed grains, for example, can lose up to half their pantothenic acid content.

The following list gives the approximate pantothenic acid content of some common foods.

- liver, beef, cooked, 3.5 ounces: 5.3 mg
- chicken, dark meat, cooked 3.5 ounces: 1.3 mg
- chicken, light meat, cooked 3.5 ounces: 1.0 mg
- salmon, baked, 3.5 ounces: 1.4 mg
- tuna, canned, 3 ounces: .18 mg
- egg, 1 large, cooked: .61 mg
- milk, nonfat, 1 cup: .80 mg
- yogurt, 8 ounces: 1.35 mg
- broccoli, steamed, 1/2 cup: .40 mg
- sweet potato, cooked 1/2 cup: .68 mg
- lentils, cooked, 1/2 cup: .64 mg
- corn, cooked 1/2 cup: .72
- bread, whole wheat, 1 slice: .16 mg

In order to get the most value out of the pantothenic acid contained in natural sources, use fresh foods whenever possible. Cook with minimal amounts of water since the water-soluble vitamin content may be leached out. Frozen foods lose some of their water-soluble vitamin content as they thaw. Processing can also destroy a significant amount of the vitamin content of foods. Pantothenic acid is fairly heat-stable, and is not broken down by cooking although it is destroyed by extremes of pH as may be created by adding such things as baking soda or vinegar.

Supplemental sources

Oral supplements of both pantothenic acid and pantethine are available. The latter is quite expensive, and less stable than other types. Calcium pantothenate is one form of pantothenic acid made for oral use. Dexpanthenol is formulated for topical, intramuscular, or intravenous use. It is generally recommended that the B-vitamin family be taken in balanced amounts. Taking an excessive amount of an individual B-vitamin may have a detrimental effect on the absorption of others. As with all supplements, pantothenic acid should be stored in a cool, dry place, away from direct sunlight, and out of the reach of children. A dose of up to 500 mg is often recommended.

Deficiency

Pantothenic acid deficiency is so rare that it has only been seen in humans in severely malnourished prisoners of war in Asia after World War II and in research volunteers who were given a pantothenic-free diet. The main symptoms these groups experienced were burning, tingling, and numbness in the feet and **fatigue**. These symptoms disappeared when pantothenic acid was added to their diet.

It is possible for individuals to have low levels of pathothenic acid in conjunction with other B vitamins under certain conditions. This category may include people with severe nutritional deficiencies; and those with conditions affecting absorption, such as sprue or removal of portions of the gastrointestinal tract. People who chronically abuse alcohol or other drugs, and those under excessive amounts of **stress** including debilitating illnesses or recovery from **burns** or surgery are also at higher risk of general vitamin deficiency. The elderly are more susceptible both to poor nutritional status and decreased vitamin absorption. Use of tobacco is also detrimental to B vitamin absorption. Athletes who have a strenuous, daily physical regimen and people with physically active occupations may require larger than average amounts of pantothenic acid.

Precautions

People with hemophilia should not use dexpanthenol as it may prolong bleeding time. Anyone with a known or suspected obstruction of the gastrointestinal tract should also not use this product.

Side effects

Taken in very large doses, pantothenic acid may cause **diarrhea**. Topical use of dexpanthenol may cause a skin reaction.

Interactions

Using oral contraceptives may mildly increase the body's need for pantothenic acid. The effects of the

KEY TERMS

Coenzyme—A substance needed by enzymes to produce many of the reactions in energy and protein metabolism in the body.

Hyperreflexia—Reflexes that are abnormally brisk.

Neurotransmitter—A chemical messenger that transmits an impulse from one nerve cell to the next.

medication levodopa may be decreased by supplemental pantothenic acid. This problem is not seen with combination carbidopa and levodopa products. These medications are often used to treat symptoms of **Parkinson's disease**. Anyone taking medication for this condition should consult a health care provider before taking nutritional supplements.

Resources

BOOKS

Berkson, Burt and Arthur J. Berkson. *Basic Health Publi cations User's Guide to the B complex Vitamins*. Laguna Beach, CA: Basic Health Publications, 2006.

Bratman, Steven, and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. Emmaus, PA: Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. Arizona: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Compre hensive Database*. California: Therapeutic Research Faculty, 1999.

Lieberman, Shari and Nancy Bruning. *The Real Vitamin and Mineral Book: The Definitive Guide to Designing Your Personal Supplement Program*, 4th ed. New York: Avery, 2007.

Pressman, Alan H. and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*, 3rd ed. Indianapolis, IN: Alpha Books, 2007.

PERIODICALS

Rivera, Juan A., Teresita Gonzalez Cossio, Mario Flores, et al. "Multiple Micronutrient Supplementation Increases the Growth of Mexican Infants." *American Journal of Clinical Nutrition* 74 (November 2001): 657.

ORGANIZATIONS

Linus Pauling Institute, Oregon State University, 571 Weniger Hall, Corvallis, OR, 97331 6512, (541) 717 5075, (541) 737 5077, http://lpi.oregonstate.edu.

Judith Turner
Rebecca J. Frey, PhD
Helen Davidson

Parasitic infections

Definition

Parasites are organisms that live inside humans or other organisms who act as hosts. They are dependent on their hosts because they are unable to produce food or energy for themselves. Parasites are harmful to humans because they consume needed food, eat away body tissues and cells, and eliminate toxic waste, which makes people sick.

Because of sanitary living conditions in the United States, parasites do not cause widespread life-threatening **infections**. In other parts of the world, however, parasitic infections are epidemic. They kill and disable millions of people every year. Parasitic infection cases in the United States in the 2000s were on the rise, however, due to increased travel to and from underdeveloped countries. In addition, parasitic infections can cause severe infections in **AIDS** patients and other patients with weakened immune systems.

Because parasites can live inside the human body for years without making their presence known, they are more common than one might think. According to one study, approximately half of all Americans have at least one form of parasite. Their presence causes a variety of chronic diseases and conditions such as chronic **fatigue**, weakness, low energy levels, skin **rashes**, **pain**, **constipation**, and frequent colds and **influenza**.

Description

There are two types of parasites: large and small. Large parasites such as intestinal **worms** are easily seen with the naked eye. These are roundworms, flukes, and tapeworms. They usually lay their eggs on the intestinal walls. As they hatch, the young larvae feed on the food in the intestinal tract. Then they grow, reproduce, and start the cycle all over again. They sometimes dig through the digestive tract to get into the bloodstream, muscles, and other organs where they cause even more havoc. These types of parasites often cause malnutrition and **anemia** because they tend to rob the body of essential nutrients.

Small parasites—mostly protozoa and amoebae—are so tiny that they can only be seen with a microscope. These tiny parasites are even more dangerous to the body than the large ones. Although they usually stay in the intestines, they can migrate virtually anywhere in the body: into the bloodstream, muscles, and even vital organs such as the brain, the lungs, or the liver, where they do substantial damage.

Because parasites are everywhere, it is not difficult to become infected. People can become infested through the following ways:

- being bitten by insects
- walking barefoot
- eating raw or undercooked pork, beef, or fish
- eating contaminated raw fruits and vegetables
- eating foods prepared by infected handlers
- drinking contaminated water
- having contact with infected persons (including sexual contact, kissing, sharing drinks, shaking hands, or sharing toys)
- inhaling dust that contains parasitic eggs or cysts
- playing with or picking up pet litter contaminated with parasitic eggs or cysts

In 2002, the Centers for Disease Control (CDC) announced the first documented cases of transplant patients contracting a dangerous parasitic disease from infection with T. cruzi from organs harvested from a Central American donor. The infection caused Chagas disease, causing two of the three donor recipients to die. The CDC identified two additional cases of Chagas diseased in transplant patients. In one case, reported in 2006, the patient received a heart transplant in 2005 and showed symptoms of Chagas in January 2006. The patient was treated medically and recovered. However, he died several months later due to organ rejection. It was found that his donor lived in the United States but had traveled to a portion of Mexico infected with T. cruzi. Another case of Chagas disease was reported in February 2006, one month following a heart transplant. The patient's symptoms disappeared following treatment. He died several months later as a result of cardiac arrest. These represent the fourth and fifth reported cases of Chagas disease caused by T. cruzi. The fact that they occurred in Los Angeles prompted the CDC to encourage physicians in the area to suspect T. cruzi in transplant and transfusion patients, if appropriate symptoms are present.

Causes and symptoms

Risk factors for getting parasitic infections include:

- an immune system weakened by disease or long-term exposure to toxic chemicals or environmental pollution
- prolonged antibiotic use
- alcohol and/or drug abuse
- smoking
- emotional and/or physical stress
- diet high in fat and sugar and low in fiber
- food allergies
- malabsorption syndrome
- obesity

Causes

There are more than 100 types of human parasites. The following describe some of the most common species in the United States.

ARTHROPODS (INSECTS). In the United States, because of high sanitary standards and a temperate climate, parasitic insects do not flourish. Common bugs such as ticks, mites, fleas, lice, and bedbugs may cause intense **itching** in affected areas. They are a nuisance but generally not a major health risk. One exception is the deer tick, which is associated with the debilitating **Lyme disease**. Other parasites, spread by mosquitoes, cause more serious diseases such as western and eastern equine encephalitis, **malaria**, Dengue **fever**, and yellow fever.

INTESTINAL PARASITES. Some of the most common intestinal parasites are:

- Pinworms. This is the most common parasitic infection in the United States. The worm resides in the colon, yet it lays eggs outside the body, usually near the anus, a process that causes severe itching. The disease can be transmitted from one individual to another through dirty hands, clothing, bedclothes, and toys.
- Tapeworms. The two most common tapeworms are *Taenia solium* (pork tapeworm) and *Taenia saginata* (beef tapeworm). *Taenia solium* infestation is caused by eating undercooked pork while *Taenia saginata* (pork tapeworm) infestation is associated with consuming raw beef. Adult tapeworms may become quite big, some as long as 20 feet (6.1 m). Of the two, pork tapeworm is the more harmful. It often causes anemia and weight loss. More seriously, when adult pork tapeworm eggs, excreted in human feces, are ingested by other people (which can happen with poor hygiene and sanitation), the parasitic life cycle that occurs in pigs and cattle takes place in the human host. Once in the human digestive system, the tapeworm eggs, called proglottids, develop into an embryonic form of the parasite called onchospheres that burrow through the intestinal wall and into the bloodstream. From there they migrate into the muscles, eyes, and the brain, a condition called cysticercosis. Cysts in the brain often cause epileptic seizures.
- Protozoa (one-celled organisms) such as *Giardia lamblia, Entamoeba histolytica,* or *Cryptosporidium*. These organisms are some of the most common and infectious parasites in the world. They can be transmitted through contaminated food and water. They can also

be spread from one person to another. Protozoa may spread throughout the body, causing abscesses in the lungs, liver, heart, and brain. Cramps, watery diarrhea, abdominal pain, and serious weight loss are common symptoms of Giardia infection. *Entamoeba histolytica* can cause dysentery, a severe form of intestinal infection, as well as liver and lung damage. Cryptosporidia can cause severe diarrhea in AIDS or cancer patients who have weakened immune systems.

According to the Centers for Disease Control and Prevention (CDC), cases of *Cryptospordium* in the United States increased from 3,505 in 2003 to 8,269 cases in 2005. The largest portion of the increase was related to an outbreak in New York that was traced to use of a recreational water fountain. In 2003, 425 cases were linked to unpasteurized apple cider produced from contaminated apples.

CNS PARASITIC INFECTIONS. *Toxoplasma gondii* is the most common parasite that invades the central nervous system (CNS). Humans become infected with this organism by eating raw or undercooked meat or by handling infected cat litter, which can contain eggs. Pregnant women who are infected may miscarry or deliver stillborn babies. Infected babies are born with congenital toxoplasmosis and have symptoms that include eye inflammation, blindness, **jaundice**, seizures, abnormally small or large heads, and mental retardation. In people with weakened immune systems, such as AIDS patients, toxoplasmosis can affect the whole body, causing inflammation, convulsions, trembling, **headache**, confusion, paralysis in half of the body, or coma.

Symptoms

Parasitic infections are difficult to diagnose because many patients exhibit only vague symptoms or no symptoms at all. The following symptoms, however, may indicate parasitic infections:

- Diarrhea with foul-smelling stool that becomes worse in the later part of the day.
- Sudden changes in bowel habits (e.g. constipation that changes to soft and watery stool).
- Constant rumbling and gurgling in the stomach area unrelated to hunger or eating.
- Heartburn or chest pain.
- Flu-like symptoms such as coughing, fever, and nasal congestion.
- Nonspecific food allergies.
- Itching around the nose, ears, and anus, especially at night.
- Losing weight with constant hunger.

Other symptoms of parasitic infections include anemia, blood in the stool, bloating, **diarrhea**, **gas**, loss of appetite, intestinal obstruction, **nausea**, **vomiting**, sore mouth and gums, excessive nose picking, grinding teeth at night, chronic fatigue, headaches, muscle aches and pains, shortness of breath, skin rashes, **depression**, and **memory loss**.

Diagnosis

The following tests may be used to help doctors diagnose parasitic infections:

- *Ova and parasite (O & P) test*. Three to six stool samples are collected every one or two days to look for eggs and parasites.
- *Cellophane tape* (applied to the anal area). Ova (eggs) that stick to the tape prove pinworm infestation.
- *Endoscopy*. This procedure is used to obtain samples from the duodenum (the upper part of the small intestine), which are then analyzed for the presence of parasites.
- *Urine sample* and vaginal swab to detect *Trichomonas*, a parasite that causes vaginitis.
- *Blood tests*. High levels of eosinophils (a type of white blood cell) indicate infections. Antibodies against the parasites may also be detected. A study released in 2008 found that blood testing is often necessary to obtain a specific diagnosis. An increase in eosinophils, in particular, is associated with parasitic infections.
- *X ray, MRI, and CT scans*. X rays detect lesions in internal organs. Computed axial tomography (CT) scans and magnetic resonance imaging (MRI) are used to diagnose CNS parasitic infections.

Infected patients who are treated with anti-parasitic drugs or herbal remedies should be retested twice at the end of the treatment program; the two tests should be given one month apart.

Treatment

Alternative therapies for parasitic infections reduce parasitic infections by improving **nutrition** and strengthening the immune system through herbal therapy and **Ayurvedic medicine**. Some herbal remedies are directly anti-parasitic and actually eliminate the organisms that cause disease. Patients taking allopathic anti-parasitic remedies should consult their doctor before using any of these herbs. Care should be taken before giving them to children as they easily overdose.

Nutritional therapy

The following dietary changes may help prevent or treat parasitic infections:

- Eating a well-balanced diet with lots of fiber, vegetables, fruits, whole grains, nuts, and seeds. Fiber helps eliminate worms from the intestines; good nutrition improves immune function and protects the body against parasitic invasion.
- Limiting dairy foods, sugar, and fat. Parasites thrive on these foods.
- Avoiding raw or undercooked fish, pork, or beef.
- Take daily multivitamin/mineral supplements to prevent malnutrition and improve immune function.
- Supplementing the diet with probiotics such as *Lactobacillus acidophilus, Bifidobacteria*, and other beneficial intestinal bacteria that cultivate normal intestinal flora and suppress the spreading of parasites.

Herbal therapy

Herbal treatment should be given in combination with supportive dietary treatment and continued until the worms are completely eradicated. The following herbs are helpful in treating parasitic infestations:

- *Melaleuca alternifolia* (tea tree) oil. First discovered by Australian aborigines, tea tree oil has many uses, including treating intestinal parasites, lice, and ticks.
- *Artemisia annua* (wormwood herb) and citrus seed extract. These can be used together to help eliminate intestinal parasites such as *Giardia lamblia*.
- *Berberine-containing herbs*. Berberine is an antimicrobial alkaloid that can prevent parasites from attaching to the intestinal walls of human hosts. One study found that berberine was as effective against amoebal *Giardia lamblia* as metronidazole, the standard treatment. Herbs that contain berberine include goldenseal *(Hydrastis canadensis)*, barberry *(Berberis vulgaris)*, Oregon grape *(Berberis aquifolium)*, and goldthread *(Coptis chinensis)*.

Ayurvedic medicine

Momordica charantia (**bitter melon**) is a very safe remedy for pinworm infection. The melon is a vegetable shaped like a cucumber with a bitter taste. It can be found in most Oriental markets. It should be sliced thinly and eaten raw with other vegetables to reduce its bitter taste. Daily consumption of one to two bitter melons for seven to 10 days can eliminate pinworm infection. Patients may want to repeat the regimen after several months to prevent reinfection. Chinese herbal combinations also help treat parasitic infections by supporting the gastrointestinal system, stimulating immune response, and killing parasites.

Allopathic treatment

Insect infestations

Infestations with lice, ticks, fleas, or bedbugs can be controlled by insecticides and attention to hygiene and household or environmental contact.

Intestinal parasites

Treatment for intestinal parasites usually involves anti-parasitic drugs. Depending on the severity of the condition and the species involved, treatment may include one (or more) of the following drugs: albendazole, furazolidone, iodoquinol, mebendazole, metronidazole, niclosamide, paromomycin, pyrantel pamoate, pyrimethamine, quinacrine, sulfadiazine, or thiabendazole. Nitrazoxinide was approved in 2002 for treatment of *Cryptosporidium* in children ages 1 to 11 years. In 2004, the drug was approved for people older than age 11, including adults. The approval of this drug may have led to a rise in the number of reported cases.

To prevent reinfection and transmission of disease, thorough cleaning of hands, clothes, sheets, and toys is recommended. Treatments should involve all members of the family and repeated treatments may be necessary.

CNS parasitic infections

Babies or AIDS patients with toxoplasmosis are often given spiramycin or sulfadiazine plus pyrimethamine. Treatment may be continued indefinitely for AIDS patients to prevent recurrence.

Expected results

Though parasitic infections are difficult to diagnose, complete recovery from infestation can be achieved with appropriate herbal therapy or anti-parasitic drugs. Because reinfestation is common, multiple treatments may be necessary.

Prevention

The following measures can help prevent parasitic infections:

- Washing hands before eating and after using the restroom.
- Wearing gloves when gardening or working with soil or sand because soil can be contaminated with eggs or cysts of parasites.

KEY TERMS

Contaminated—Unclean or infected by contact with or the addition of something.

Eosinophil—A type of white blood cell that increases in number in response to certain medical conditions, such as allergy or parasitic infection.

Infest—To be parasitic in a host.

Intestines—Also called the bowels and divided into the large and small intestine. They extend from the stomach to the anus, where waste products exit the body. The small intestine is about 20 ft (6.1 m) long and the large intestine, about 5 ft (1.5 m) long.

Protozoa—Single-celled microorganisms belonging to the subkingdom Protozoa that are more complex than bacteria. About 30 protozoa cause diseases in humans.

- For pregnant women, avoiding handling of cat litter.
- Not allowing children to be licked by pets; not allowing children to kiss pets that are not dewormed regularly.
- Washing fresh vegetables carefully. Many people get *Entamoeba histolytica* by eating contaminated raw fruit and vegetables.
- Avoiding eating raw meat, which may contain *Giardia lamblia*.
- Wearing long-sleeved shirts, long pants, and boots when walking in the woods. In addition, spraying insect repellent on clothing to prevent tick bites.

Resources

PERIODICALS

"Chagas Disease after Organ Transplantation Los Angeles, California, 2006." *MMWR Weekly*. 55, no. 29 (July 28, 2006): 798 800.

Page, Kathleen R., and Jonathan Zenilman. "Eosinophilia in a Patient from South America." *Journal of the American Medical Association* 299, no. 4 (January 30, 2008): 437 444.

OTHER

"General Information: Diagnosis of Parasitic Diseases." *Division of Parasitic Diseases: Public Information*. http://www.cdc.gov/ncidod/dpd/public/geninfo_diagnosis_diseases.htm. (February 28, 2008).

"Parasitic Infections." *The Merck Manual of Diagnosis and Therapy*. http://www.merck.com/pubs/mmanual/section13/chapter161/161a.htm. (February 28, 2008).

ORGANIZATIONS

AIDS Treatment Data Network, The NETWORK, 611 Broadway, Suite 613, New York, NY, 10012, (212) 260 8868, (800)734 7104, http://www.atdn.org/.

Centers for Disease Control and Prevention (CDC), International Traveler's Hotline: (404)332 4559, http://www.cdc.gov/travel/.

Mai Tran
Teresa G. Odle, PhD
Rhonda Cloos, RN

Parkinson's disease

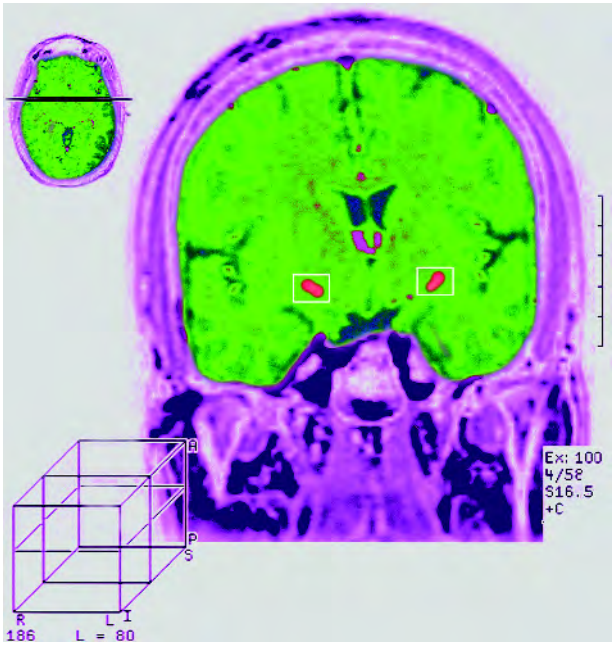
Definition

Parkinson's disease (PD) is a motor system disorder caused by the chronic, progressive degeneration of neurons (nerve cells) in regions of the brain that control movement. PD causes a decline in the initiation, speed, and smoothness of movement. Over time it may come to affect many bodily functions.

Description

Parkinson's Disease (PD) was first described in 1817 by James Parkinson. It affects more than one million people in the United States, including some 500,000 people who have yet to be diagnosed. About 50,000 new cases are diagnosed each year. The average age of PD onset is 60. Symptoms of PD are seen in as many as 15% of those between the ages 65 and 74 and almost 30% of those between the ages of 75 and 84. Only 5 to 10% of PD cases occur before the age of 50. Young-onset PD occurs in those under age 40. A parent or sibling with PD increases one's risk of developing the disease.

PD results from the degeneration and death of neurons in the substantia nigra, movement control centers on each side of the brain. These cells secrete dopamine, a neurotransmitter that attaches to receptors on cell surfaces in another part of the brain—the corpus striatum—that controls muscle action. When dopamine levels fall, the neurons of the corpus striatum begin to misfire. It is estimated that dopamine-producing cells begin dying about 13 years before PD symptoms become evident. The symptoms of PD begin when about 60% of the dopamine-producing cells have died.



MRI image of Parkinson's Disease. *(James Cavallini / Photo Researchers, Inc.)*

Causes and symptoms

Causes

Although the cause of Parkinson's Disease (PD) is unknown, it appears to result from a combination of environmental and hereditary factors as well as oxidative damage and **aging**. Factors for PD may include:

- herbicide and pesticide exposure
- an as-yet-unidentified toxin or virus
- cellular damage from oxidation by free-radicals (atoms or molecules with an unpaired electron)
- loss of dopamine-secreting cells with age, particularly with accelerated aging
- fewer dopamine-secreting cells at birth

Symptoms

Early symptoms of PD often are quite subtle, developing on one or both sides of the body. The primary symptoms of PD are:

- tremors (shaking) while at rest. The classic PD tremor is the rubbing of the thumb and forefinger at a frequency of about three rubs per second. Tremors may spread to the hands, arms, legs, feet, jaw, and face. The tremors increase with stress. However, many people with PD do not experience tremors.
- slow movement (bradykinesia) or freezing during movement (akinesia).
- stiffness or rigidity of the limbs and trunk
- poor balance leading to frequent falls

Other early symptoms of PD include:

- short, shuffling steps
- stooped posture
- masking (reduction) of facial expression and infrequent blinking
- slow or rapid, soft, monotonic (without inflection) speech
- other speech changes
- insomnia, restlessness, and nightmares
- depression
- emotional changes, including fear, irritability, and insecurity
- incontinence
- constipation
- small, illegible handwriting
- frequent, dramatic swings in mobility and moods

Later-stage PD symptoms may include:

- frozen muscles that prevent the initiation of movement
- oily or very dry skin
- sweating
- digestive tract shutdown causing difficulties in swallowing, digesting, and elimination
- auditory and/or visual hallucinations
- progressive deterioration of intellectual function
- dementia, affecting 30 to 40% of those with late-stage PD
- loss of contact with reality (psychosis)

Medications for PD can also cause some of these symptoms.

Diagnosis

There is no definitive test for PD. Diagnosis is based on a careful medical history and complete neurological examination.

In addition to PD, anything that damages the substantia nigra can cause Parkinson's-like symptoms, called parkinsonism. Possible causes of parkinsonism include:

- infection
- nausea
- trauma
- stroke
- exposure to manganese or other toxins
- medications for psychiatric disorders, such as haloperidol (Haldol) or chlorpromazine (thorazine)

- a chemical called MPTP, present as an impurity in some illegal drugs
- epilepsy
- Alzheimer's disease
- other neurodegenerative diseases that sometimes are referred to as Parkinson's plus or parkinsonism plus syndromes

Brain scans, blood tests, lumbar puncture, or x rays may be used to rule out causes of parkinsonism other than PD.

Treatment

There is no cure for Parkinson's disease. In a study released in 2007, gene therapy showed promise. Study participants were given either low, medium, or high doses of a gene involved in the production of dopamine. The gene was injected directly into the brain cells of the participants. Three months following the injection, researchers found improvements that were similar to those previously seen after surgical intervention, such as deep brain stimulation. No side effects were noted; however, scientists believe that more research is needed.

Many factors can help relieve PD symptoms, at least temporarily:

- maintaining general health
- regular, moderate, muscle-building exercise
- frequent rest
- smaller, more frequent, meals to accommodate gastrointestinal slowdowns
- physical, occupational, and/or speech therapies
- encouragement and emotional support

Fatigue, **anxiety**, and **depression** can aggravate PD symptoms significantly.

Therapies that may relieve muscle tightness in PD include:

- acupuncture
- massage
- yoga
- Feldenkrais
- t'ai chi
- qigong
- meditation

A physical therapist can design an appropriate **exercise** program and suggest strategies and techniques for improving balance and stimulating movement during slowdowns or freezing.

Supplementation therapies for PD include:

- amino acids
- essential fatty acids, including omega-3 and omega-6 fatty acids, fish oil, and flax oil
- antioxidants, including carotenoids (dark green and orange fruits and vegetables) and other bioflavonoids (antioxidants derived from foods)
- vitamins A, B, C, and E
- selenium and zinc
- calcium and magnesium
- coenzyme Q_{10} (CoQ_{10}).

For more than 4,000 years, practitioners of Ayurveda—traditional Indian medicine—have prescribed mucuna seeds (*Mucuna pruriens*) to treat Parkinson's disease. Mucuna contains a natural form of levodopa.

Allopathic treatment

Drugs

The pharmacological treatment of Parkinson's disease is very complex. Although many drugs may relieve at least some symptoms of PD, their effectiveness varies with the patient and the progression of the disease. Side effects may preclude the use of the most effective dose or require another drug to counteract them.

A study released in 2007 found that a blood pressure medication known as israpidine forced the neurons of mice to use dopamine in a more youthful manner of generating electrical impulses. Researchers hoped that further investigation would show a link to slowing the progression of PD.

LEVODOPA. Levodopa (L-dopa, L-3,4-dihydroxyphenylalanine) has been the standard treatment for PD since the 1960s and remains one of the best drugs for treating symptoms, particularly tremors and movement problems. Levodopa (Laradopa) is a naturally occurring derivative of dopamine that is converted into dopamine in the brain. However, unlike dopamine, levodopa can reach the brain from the bloodstream. Levodopa treatment may begin at the onset of PD symptoms or when the symptoms begin to interfere with daily life. At least 75% of patients are helped to some degree by levodopa, and the drug enables many people with PD to live relatively normal lives for a number of years. Levodopa normally is prescribed only in combination with other drugs.

Side effects of levodopa include:

- nausea and vomiting
- low blood pressure, particularly when standing up, resulting in dizziness and fainting
- dyskinesias (abnormal movements, including twisting and tics) in at least 50% of patients
- agitation
- hallucinations

These effects usually lessen after several weeks on levodopa.

After five or more years on levodopa, many patients develop the following:

- motor fluctuations, including "peak-dose" dyskinesias when the drug is at its highest level in the brain
- on-off phenomena—significant changes in response as the drug levels fluctuate
- unpredictable responses to the drug

The levodopa dosage is usually increased when these changes occur. However, dyskinesias may increase with increasing dosages.

Levodopa is an amino acid that is absorbed from the digestive system by the same transporters that carry **amino acids** from dietary proteins. Therefore some healthcare practitioners may limit or redistribute protein intake to improve levodopa adsorption into the bloodstream.

ENZYME INHIBITORS. Since levodopa and dopamine are amino acids, they can be broken down by the same enzyme systems that break down other amino acids. Therefore, the two most commonly prescribed forms of levodopa are an amino-acid-decarboxylase (AADC) inhibitor: carbidopa (in Sinemet) or benzaseride (in Madopar). These drugs enable more levodopa to enter the brain and may reduce some side effects. Controlled-release formulations (Sinemet CR) can prolong the interval between doses. Carbidopa also prevents vitamin B_6 (pyridoxin) from interfering with levodopa.

Catechol-O-methyltransferase (COMT) also breaks down levodopa. The COMT inhibitor entacapone (Comtan) prolongs the effects of levodopa and may moderate its fluctuations. Stalevo contains levodopa, carbidopa, and entacapone. Although the COMT inhibitor tolcapone (Tasmar) reduces the average required dosage of levodopa by 25%, as of 2008 it was no longer commonly used because of severe side effects and possible liver damage and failure.

Selegiline (deprenyl) inhibits monoamine oxidase B (MAO-B), which metabolizes dopamine in the brain. Selegiline can delay levodopa treatment for an average of nine months and also is used in combination with levodopa (Eldepryl) in early-stage PD. Common side effects include dyskinesias, **dry mouth**, and mood swings.

DOPAMINE AGONISTS. Dopamine agonists (DAs) are drugs that activate dopamine receptors, mimicking the effects of dopamine. In younger adults with early-stage PD, DAs appear to be more effective than levodopa. More often, DAs are used in conjunction with Sinemet to prolong the action of levodopa and reduce levodopa-induced dyskinesias. Although they are expensive, DAs may postpone or prevent the need for expensive neurosurgery at later stages of PD.

DAs include the following:

- bromocriptine (Parlodel)
- pergolide (Permax)
- pramipexole (Mirapex)
- ropinirole (Requip)

Side effects of DAs are similar to those of levodopa, including drowsiness and confusion. DAs may cause dyskinesias in at least 50% of patients. Pergolide has been associated with a type of **heart disease**.

ANTICHOLINERGIC DRUGS. The neurotransmitters dopamine and acetylcholine balance one another's effects in the brain. Anticholinergics help maintain this balance when dopamine levels fall. Although they may control tremors in early-stage PD, their side effects—including dry mouth, urine retention, severe **constipation**, blurred vision, confusion, **memory loss**, and hallucinations—are usually too severe for older patients or those with **dementia**. Anticholinergics rarely work for very long. Trihexyphenidyl (Artane) and benztropine (Cogentin) are the most common anticholinergics for PD.

OTHER DRUGS. Other common PD medications include:

- Diphenhydramine (Benadryl), an antihistamine, and antidepressants such as amitryptiline (Elavil), have similar effects as anticholinergics and may be appropriate for older patients.
- Amantadine (Symmetrel) is an antiviral drug used in later-stage PD, particularly to treat tremors and levodopa-induced dyskinesias. Its effects include increased dopamine release and blocking of glutamate, an amino acid that destroys neurons. Side effects include swollen ankles and purple mottling of the skin.
- Clozapine (Clozaril) is particularly effective for psychiatric symptoms of late-stage PD, including psychosis and hallucinations.

Although drug therapies can relieve most symptoms of early-stage PD, as the disease advances, drug responses begin to fluctuate and their overall effectiveness decreases.

Surgery

Surgery may be used to help manage severe or debilitating PD symptoms when drug treatments fail.

Pallidotomy uses an electrical current to destroy a small amount of brain tissue in the globus pallidus,

KEY TERMS

Acetylcholine—A major neurotransmitter that balances the effects of dopamine in the brain.

Akinesia—Inability to move.

Allopathic—The practice of medicine that combats disease with remedies that produce effects different from those produced by the disease.

Amino acid decarboxylate (AADC) inhibitors—Drugs, such as carbidopa and benserazide, that block the enzyme AADC, which breaks down levodopa in the blood.

Antioxidants—Nutrients in food that help maintain health by slowing the destructive aging process of cell molecules and improving immune responses.

Ayurveda—India's traditional health system.

Bioflavonoids—A group of chemical compounds naturally found in certain fruits, vegetables, teas, wines, nuts, seeds, and roots. Not considered vitamins, they function nutritionally as antioxidants to prevent cell destruction.

Bradykinesia—Slow movement.

Catechol-O-methyltransferase (COMT) inhibitors—Drugs, such as entacapone and tolcapone, that block COMT, an enzyme that breaks down levodopa in the blood.

Corpus striatum—Regions on each side of the brain that transmit signals for movement in response to dopamine from the substantia nigra.

Dopamine—A brain neurotransmitter that sends signals that help to control movement.

Dopamine agonist (DA)—A drug that binds to dopamine receptors on cell surfaces and mimics the effects of dopamine.

Dyskinesia—An abnormal involuntary movement or tic.

Feldenkrais—An educational method dedicated to improved movement and enhanced functioning originated by Moshe Feldenkrais (1904 1984), an engineer, physicist, and Judo expert.

Globus pallidus—Areas on each side of the brain that transmit signals controlling movement.

Levodopa—A naturally occurring amino acid that is converted to dopamine in the brain; the primary treatment for Parkinson's disease.

Monoamine oxidase (MAO-B) inhibitors—Drugs such as selegiline that inhibit the enzyme MAO-B that breaks down dopamine in the brain.

Neurotransmitter—A chemical that helps to transmit signals between two nerves or between a nerve and a muscle.

Pallidotomy—Surgery that destroys a small amount of tissue in the globus pallidus, which is over-stimulated by the corpus striatum in PD. The surgery can improve tremors, rigidity, and bradykinesia.

Parkinsonism—A disease or condition with symptoms similar to those of Parkinson's disease.

Substantia nigra—Movement control centers of the brain containing dopamine-producing cells.

T'ai chi—An ancient Chinese martial art consisting of slow, rhythmic movements to relieve stress, anxiety, and depression, and provide cardiovascular, respiratory, and pain relief benefits. Qigong is a form of T'ai chi.

Thalamotomy—Surgery that destroys a small amount of tissue in the thalamus to control PD tremors.

Thalamus—An important relay center for sensory signals in the cerebral cortex of the brain.

which is over-stimulated by the corpus striatum in PD. Pallidotomy may relieve tremors and slow, rigid movements, and decrease dyskinesia caused by drug therapy, by interfering with the neural pathway between the globus pallidus and the thalamus (a major transmission center in the brain). The benefits often do not last and the surgery may cause slurred speech, disabling weakness, and vision problems, particularly with a double pallidotomy (surgery on both sides of the brain).

Thalamotomy reduces hand and arm tremors by destroying small amounts of tissue in the thalamus. Because a double thalamotomy leaves patients extremely weak and with slurred speech, it usually is performed on only one side of the brain, relieving tremors on the opposite side of the body.

With deep brain stimulation (DBS), a device similar to a heart pacemaker sends signals to fine electrodes implanted in the subthalamic nuclei or the globus pallidus (Activa Therapy). The electrical pulses appear to interrupt signals from the thalamus that are involved in tremors. DBS restores a balance between excitatory (tending to excite) and inhibitory (interfering or retarding) signals in brain signal transmission centers, thereby

decreasing or abolishing dyskinesias without slowing normal movement. Patients use a magnetic device to adjust stimulation in one or both halves of the brain, as the response dictates. DBS usually results in a significant improvement in some motor symptoms, including tremors and peak-dose dyskinesias and improves motor function and mobility. It also enables patients to take higher doses of levodopa. The best candidates for DBS are persons who have been afflicted with PD for 10 to 20 years and who have wearing-off motor fluctuations, periods of extreme slowness in movement, and twisting motions caused by medications. Risks may be as minor as drowsiness or **headache** or as serious as hemorrhage, **stroke**, or infection.

The implantation of fetal cells to replace the dopamine-producing cells of the substantia nigra appears to benefit only patients under age 60. It can have serious side effects and about 15% of patients later develop severe dyskinesia due to dopamine-overproduction.

The use of stem cells derived from embryos discarded by **infertility** clinics is a potentially useful treatment for PD. However, it remains morally and ethically controversial, and as of 2008, the treatment was linked to law-making decisions and opinions.

Prognosis

There is no way to predict the course of PD. Many people live active, productive lives for 12 to 15 years. However, in others the disease progresses rapidly. Regardless of treatment, PD symptoms worsen with time and become less responsive to drug therapy. Most people with PD experience some additional problem every year. A small number of patients eventually become completely incapacitated. Although PD is not fatal, its effects can lead to fatal accidents or illnesses.

Prevention

There are no clear risk factors or preventions for PD. Central body **obesity** may increase the risk. Some studies have found that coffee drinking or hormone replacement therapy (HRT) in postmenopausal women may decrease the risk of PD. However, heavy coffee drinking in combination with HRT appears to increase the risk of Parkinson's disease.

Resources

BOOKS

Christensen, Jackie Hunt. *The First Year Parkinson's Disease: An Essential Guide for the Newly Diagnosed*. New York: Marlowe, 2005.

Ford, Blair. *Deep Brain Stimulation for Parkinson's Disease*. New York: Parkinson's Disease Foundation, 2005.

Weiner, William J. *Parkinson's Disease: A Complete Guide for Patients and Families (A Johns Hopkins Press Health Book)*. Baltimore, MD: Johns Hopkins University Press, 2007.

PERIODICALS

Bean, Bruce P. "Neurophysiology: Stressful Pacemaking." *Nature* 60, no. 447 (June 28, 2007): 1059 1060.

OTHER

Gardner, Amanda. "First Gene Therapy Trial Effective Against Parkinson's." *Healthfinder.gov* (2007). http://www.healthfinder.gov/news/newsstory.asp?docID 605764. (February 18, 2008).

ORGANIZATIONS

American Parkinson Disease Association, Inc, 1250 Hylan Blvd., Suite 4B, Staten Island, NY, 10305, (800) 223 2732, http://www.apdaparkinson.com.

Michael J. Fox Foundation for Parkinson's Research, Grand Central Station, PO Box 4777, New York, NY, 10163, (800) 708 7644, http://www.michaeljfox.org.

National Parkinson Foundation, 1501 NW Ninth Ave./Bob Hope Rd., Miami, FL, 33136 1494, (800) 327 4545, http://www.parkinson.org.

Parkinson Alliance, PO Box 308, Kingston, NJ, 08528 0308, (800) 579 8440, http://www.parkinsonalliance.net.

Parkinson's Action Network, 1000 Vermont Ave. NW, Washington, DC, 20005, (800) 850 4725 , (202) 842 4101, http://parkinsonsaction.org.

Parkinson's Disease Foundation, 710 West 168th Street, New York, NY, 10032 9982, (800) 457 6676 , (212) 923 4778, http://www.parkinsons foundation.org.

Paula Ford-Martin
Margaret Alic, PhD
Rhonda Cloos, RN

Parotitis *see* **Mumps**

Parrot fever *see* **Psittacosis**

Parsley

Description

Parsley (*Petroselinum crispum* and *P. sativum*) is a member of the Apiaceae family of plants. Relatives of this common culinary herb include the garden vegetables carrot, parsnip, and celery. Parsley belongs to the same family as poison hemlock (*Conium maculatum L.*), a deadly narcotic herb. Parsley is native to the Mediterranean area but is now naturalized and cultivated throughout the world. Nicolas Culpeper, the seventeenth-century English herbalist and astrologer, placed parsley under the dominion of the planet Mercury. Common names for

Fresh parsley. *(Photo by Kelly Quin. Reproduced by permission.)*

this herb include parsley breakstone, garden parsley, rock parsley, persely, and petersylinge. A variety known as Hamburg parsley (*P. crispum, "Tuberosum"*), first cultivated in Holland, has a root as much as six times as large as garden parsley.

In ancient times parsley was dedicated to Persephone, the wife of Hades and goddess of the underworld. Parsley is slow to germinate. Folk legend explains this characteristic with the myth that parsley must first visit Hades seven times before it may freely germinate and flourish on the earth. It was also believed that the herb would flourish only in gardens where a strong woman presides over the household. Parsley was used as a ceremonial herb in ancient Greek and Roman cultures. The herb was sprinkled on corpses to cover the stench, and planted on the graves of loved ones. Roman gladiators ate parsley before facing foes in the arena. Victorious Greek athletes were crowned with parsley. In the Middle Ages this lovely herb was known as merry parsley and was credited with lethal powers. It was believed that one could bring certain death to an adversary by pulling a parsley root from the earth while calling out the enemy's name.

Parsley is a self-seeding biennial that thrives in rich, moist soil in full sun or partial shade. It grows from a single spindle-shaped taproot producing smooth, many-branched and juicy stems. The bright green leaves are feather-like in appearance, tri-pinnate and finely divided. Some varieties are flat-leafed, others are more compact and curly. Diminutive five-petaled flowers are yellow-green and borne in dense, flat-topped clusters. They bloom in midsummer. The gray-brown seeds are tiny, ribbed and ovate (egg-shaped). Parsley can grow as much as 3 ft (1 m) tall in its second year as the flower-bearing stems become nearly leafless and reach for the sun.

General use

Parsley's taproot, leaves, and seeds are used medicinally. The leaf is used extensively as a culinary herb and garnish. Parsley's volatile oil, particularly the oil from the seed, contains the chemicals apiole, also known as parsley camphor, and myristicin in varying quantities depending on the variety of parsley. These constituents are diuretic, and also act as uterine stimulants. The diuretic effect of parsley appears to be related to increased retention of **potassium** in the small intestine.

Internal uses

In folk tradition, parsley has been used to promote **menstruation**, facilitate **childbirth**, and increase female libido. Its emmenagogic properties can bring on delayed menstruation. Parsley juice also inhibits the secretion of histamine; it is useful in treating **hives** and relieving other allergy symptoms. A decoction of parsley root can help eliminate bloating and reduce weight by eliminating excess water gain. Parsley has also been used traditionally as a liver tonic and as a means of breaking up **kidney stones**. The German Commission E, an advisory panel on herbal medicines, has approved parsley for use in the prevention and treatment of kidney stones. The saponin content of parsley may help relieve coughs. Parsley root is laxative and its carminative action can relieve flatulence and **colic**. Parsley is rich in vitamins and minerals, including A and C, as well as **calcium**, thiamin, **riboflavin**, **niacin**, **zinc**, potassium, and **iron**. The **boron** and fluorine in parsley give strength to the bones. Parsley's high chlorophyll content makes this beneficial herb a natural as a tasty breath freshener.

More recently, the natural deodorizing activity of parsley has been put to use by the food industry. More particularly, parsley can be added to processed foods containing onions or **garlic** in order to minimize the odors associated with these vegetables.

External uses

The freshly gathered leaves of parsley have been used as a poultice to relieve breast tenderness in lactating women. Parsley poultices may also soothe tired, irritated eyes, and speed the healing of **bruises**. The juice will relieve the itch and sting of insect **bites**, and serves well as a mosquito repellent. A juice-soaked gauze pad can be applied to relieve **earache** or **toothache**, or used as a face wash to lighten freckles. The

KEY TERMS

Abortifacient—An agent that induces abortion.

Biennial—A plant that takes two years to complete its life cycle. It produces fruit and flowers only in the second year.

Carminative—A substance or preparation that relieves digestive gas.

Diuretic—A medication or substance that increases urine output.

Emmenagogue—A type of medication that brings on or increases a woman's menstrual flow.

Infusion—The most potent type of extraction of a herb into water. Infusions are steeped for a longer period of time than teas.

Photosensitivity—An abnormal reaction to light exposure caused by a disorder or resulting from the use of certain drugs.

Pinnate—Having leaflets arranged on each side of a common stalk. Parsley has a tripinnate leaf.

Saponin—A compound found in parsley, soapwort, and other plants, that forms a stable foam when added to water. Saponin is used commercially in beverages.

Tincture—An alcoholic solution of a chemical or drug.

powdered seeds, sprinkled on the hair and massaged into the scalp for three days, are a folk remedy said to stimulate hair growth. Parsley has also been used as a hair rinse in efforts to eradicate head lice.

Preparations

The root and seed of parsley should be harvested in the fall from plants in the second year of growth. The leaves can be harvested throughout the growing season. It is important not to confuse wild parsley with the herb *Aethusa cynapium*, also known as "fool's parsley." It would be a toxic mistake.

After harvesting, remove parsley leaves from the stems and place them in a single layer on a drying tray out of direct sunlight in an airy room. When the herb is thoroughly dry, store it in tightly sealed, clearly labeled dark glass containers.

Decoction: Many of parsley's medicinal properties are concentrated in the root and are best extracted by decoction. Add about 1 tsp of thinly-sliced fresh or dried parsley root to 8 oz of cold water in a glass or ceramic pot. Bring to a boil; reduce heat and simmer for about ten minutes and infuse for an additional ten minutes. Drink up to three cups daily.

Infusion: Place 2 oz of fresh parsley leaves or root in a warmed glass container. Bring 2.5 cups of fresh nonchlorinated water to the boiling point and add it to the herbs. Cover and infuse the tea for about ten minutes, then strain. Drink the herb after the infusion cools. The prepared tea can be kept for about two days in the refrigerator. Parsley tea may be enjoyed by the cupful up to three times a day.

Tincture: Combine 4 oz of finely-cut fresh or powdered dry herb with 1 pt of brandy, gin, or vodka in a glass container. There should be enough alcohol to cover the plant parts and have a 50/50 ratio of alcohol to water. Place the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped dark glass bottle. A standard dose is 1/2–1 tsp of the tincture up to three times a day

Juice: Large amounts of organic fresh parsley are needed for juicing. An electric home juicer or food processor may be used. Squeeze any pulp through a sieve to extract all the juice. Prepare parsley juice fresh as needed, and store in clearly labeled glass containers. Keep refrigerated.

Precautions

A chemical found in the oil-rich seeds of parsley has abortifacient properties. For this reason, women should not use parsley during **pregnancy** or lactation. Parsley irritates the epithelial tissues of the kidney, increasing blood flow and filtration rate; therefore persons with kidney disease should not take this herb internally without consultation with a qualified herbalist or physician. According to the *PDR for Herbal Medicine*, the daily dose of parsley in medicinal preparations is 2.1 oz (6 g). Parsley's volatile oil is toxic in high doses, and overdose can lead to poisonings.

Side effects

Parsley contains furocoumarins—compounds that can cause photosensitivity in fair-skinned persons exposed to sunlight after "intensive skin contact" with the freshly harvested herb. Parsley may also cause allergy in sensitive persons.

Interactions

No interactions have been reported between parsley and standard allopathic medications.

Resources

BOOKS

Coon, Nelson. *An American Herbal: Using Plants For Healing*. Emmaus, PA: Rodale Press, 1979.

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Foster, Steven, and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston and New York: Houghton Mifflin Company, 1990.

Hoffmann, David. *The New Holistic Herbal,* 2nd ed. Boston: Element, 1986.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Tyler, Varro E., Ph.D. *Herbs of Choice*. New York: Phar maceutical Products Press, The Haworth Press, Inc., 1994.

Weiss, Gaea, and Shandor Weiss. *Growing & Using the Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Kreydiyyeh, S. I., and J. Usta. "Diuretic Effect and Mecha nism of Action of Parsley." *Journal of Ethnopharma cology* 79 (March 2002): 353 357.

Negishi, O., T. Negishi, and T. Ozawa. "Effects of Food Materials on Removal of Allium specific Volatile Sul fur Compounds." *Journal of Agriculture and Food Chemistry* 50 (June 19, 2002): 3856 3861.

ORGANIZATIONS

United States Department of Agriculture. Washington, DC 20250. www.usda.gov.

Clare Hanrahan
Rebecca J. Frey, PhD

Partridge berry *see* **Squawvine**

Pasque flower *see* **Pulsatilla**

Passionflower

Description

Passionflower (*Passiflora incarnata*) is a creeping perennial vine with white, purple-tinged flowers and orange berries that grows to a height of up to 30 ft (9 m). First used by Native Americans and the Aztecs of Mexico as a sedative, passionflower has been a popular folk remedy for centuries in Europe and North America. Other names for passionflower include maypop, granadilla, passion vine, and apricot vine. The herb, which is generally used today to alleviate **anxiety** and **insomnia**, received its curious name from the Spanish conquistadors who overran Mexico and Peru in the sixteenth century. In the flowers of the vine, they saw various symbols of the Passion of Christ, which in Christian tradition refers to the period of time between the Last Supper and Christ's death. In the Spaniard's elaborate analogy, the corona in the center of the flower was thought to resemble the crown of thorns worn by Jesus during the crucifixion. The flower's tendrils symbolized whips, the five stamens represented Christ's **wounds**, the total number of petals corresponded to the 10 faithful apostles (Peter and Judas did not make the cut), and so on.

While there are over 400 species belonging to the genus *Passiflora*, the variety used for medicinal purposes is called *incarnata*, which can be translated "embodied." The plant is obtained primarily from the southern United States, India, and the West Indies, though passionflower also grows in Mexico as well as Central and South America. Only the parts of the plant that grow above the ground are used as a drug, in fresh and dried form.

Some investigations of passionflower have been conducted in humans; in addition, animal and other studies suggest that the herb has sedative, anxiolytic, and antispasmodic properties. The German Commission E, considered an authoritative source of information on alternative remedies, reported that passionflower appears to reduce restlessness in animals. In a 1988 study involving rats that was published in a German journal of pharmacology, passionflower was shown to prolong sleep, reduce motor activity, and protect the rodents from convulsions. Despite findings such as these, researchers have been unable to identify the herb's active ingredients. Attention has focused on flavonoids (medicinal passionflower contains up to 2.5% of these chemicals); maltol; and harmala alkaloids such as harman, harmine, harmaline, and harmalol. (The Germans attempted to use harmine as a truth serum during World War II because of the chemical's reputation for inducing a euphoria-like state.) Some researchers speculate that it is the interaction, or synergy, of several chemicals in passionflower that is responsible for the herb's therapeutic effects.

General use

Although it has not been approved by the Food and Drug Administration (FDA), passionflower is mainly used in the United States and Europe to relieve anxiety, restlessness, and insomnia. It is also recommended for the relief of **nausea** caused by nervousness or anxiety. The herb appears to work, at least in part, by mildly depressing the central nervous system and preventing **muscle spasms**. In its capacity as a sedative and sleep aid, passionflower has been endorsed by

Passionflower blossom. *(©PlantaPhile, Germany. Reproduced by permission.)*

several important European research organizations. For over 15 years, passionflower has been approved by Commission E for the treatment of nervous unrest. The European Scientific Cooperative on Phytotherapy has approved the herb for use in people who experience tension, restlessness, and insomnia associated with irritability. Passionflower is listed in many national pharmacopoeiae as a drug plant.

Passionflower is often used in combination with other sedative plants. In the United Kingdom, it is an ingredient in several dozen over-the-counter (OTC) sedatives. In Germany, the herb is used as an ingredient in sedative preparations that also include **valerian** and **lemon balm**. The standardized sedative tea formula approved by Commission E contains 30% passionflower, 40% valerian root, and 30% lemon balm. Passionflower is also used in Germany in a special sedative tea for children. The ingredients of this tea typically include 30% passionflower, 30% lemon balm, 30% **lavender** flower, and 10% **St. John's wort**. In combination with **hawthorn**, passionflower is also used to alleviate digestive spasms associated with **gastritis** and **colitis**.

In the past, passionflower was approved by the FDA as an ingredient in OTC sleep aids and sedative products. This approval was revoked in 1978 during a review by the agency, but not because the reviewers found passionflower to be unsafe or ineffective. Drug manufacturers were responsible for submitting information about the safety and effectiveness of OTC medications under review by the FDA. No companies submitted data for passionflower, so the herb was denied approval because it had no sponsors.

Throughout its history, passionflower has been used to treat a variety of medical problems in addition to those mentioned above. These include **epilepsy**, **diarrhea**, **neuralgia**, **asthma**, **whooping cough**, seizures, painful **menstruation**, and **hemorrhoids** (when used externally). Some herbalists also recommend passionflower as a treatment for **Parkinson's disease**, based on their belief that the harmine and harmaline in the herb may help to counteract the effects of the disorder. As of 2000, these additional uses for passionflower are considered speculative.

In 2002, a team of American researchers published a report finding that passionflower shows

KEY TERMS

Antigen—Any substance that can stimulate the production of antibodies and combine with them.

Antispasmodic—A medication with the ability to prevent or relieve convulsions or muscle spasms.

Anxiolytic—A medication that alleviates anxiety.

Neuralgia—Sharp pain along the course of a nerve.

Sedative—A substance given to calm or soothe.

promise as a chemopreventive for **cancer**. The scientists found that passionflower extract inhibits an early antigen of Epstein-Barr virus, which suggests that it may also inhibit the growth of cancerous tumors.

Preparations

Recommended dosages of passionflower generally range from 4–8 g of herb a day. While it is typically used in preparations containing other sedative ingredients, it may also be used alone. Passionflower tea can be prepared by steeping 1 teaspoonful of the herb in 150 ml of simmering water. The mixture should be strained after about 10 minutes. Dosage is usually two or three cups of tea a day, taken during the day and a half-hour before going to bed. The liquid extract preparation is usually taken three times a day in doses of 0.5–1.0 ml. Dosage for the tincture is 0.5–2.0 ml three times a day. Tablets containing passionflower are available in the United Kingdom. Persons who use a combination product containing passionflower should follow the package directions for use.

Precautions

Passionflower is not known to be harmful when taken in recommended dosages, though there are some precautions to consider. The herb contains two potentially dangerous alkaloids called harman and harmaline. In large amounts, these chemicals may stimulate the tissue of the uterus. However, most authorities believe that the amounts of harman and harmaline contained in medicinal passionflower are too small to have an adverse effect when the herb is used in normal amounts. Caution should also be exercised when combining passionflower with certain medications (see below).

While self-care measures such as passionflower may be effective in relieving anxiety or insomnia, these problems may be a symptom of a more serious psychological disorder that requires consultation with a mental health professional. Nighttime sleep aids should not be used for longer than two weeks without seeking medical advice. Due to lack of sufficient medical study, passionflower should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

Side effects

When taken in recommended dosages, passionflower has not been associated with any significant or bothersome side effects.

Interactions

Passionflower has the potential to interact adversely with certain medications. The harman and harmaline in passionflower may increase the effects of prescription antidepressants called monoamine oxidase inhibitors (MAOIs), which are generally used to treat **depression**, panic attacks, and eating disorders. Passionflower may also increase the effects of OTC sedatives as well as those sold by prescription.

Resources

BOOKS

Gruenwald, Joerg. *PDR for Herbal Medicines*. New Jersey: Medical Economics, 1998.

Newall, Carol A. *Herbal Medicines: A Guide for Health Care Professionals*. London: Pharmaceutical Products Press, 1996.

Sifton, David W. *PDR Family Guide to Natural Medicines and Healing Therapies*. New York: Three Rivers Press, 1999.

Tyler, Varro E. *Herbs of Choice*. New York: Pharmaceutical Products Press, 1994.

PERIODICALS

Kapadia, G. J., M. A. Azuine, H. Tokuda, et al. "Inhibitory Effect of Herbal Remedies on 12 o Tetradecanoylphorbol 13 Acetate Promoted Epstein Barr Virus Early Antigen Activation." *Pharmacological Research* 45 (March 2002): 213 222.

ORGANIZATIONS

American Botanical Council. P.O. Box 144345. Austin, TX 78714 4345. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl Street. Suite 200. Boulder, CO 80302. http://www.herbs.org.

OTHER

Discovery Health. http://www.discoveryhealth.com.

OnHealth. http://www.onhealth.com.

Greg Annussek
Rebecca J. Frey, PhD

Past life therapy

Definition

Past life therapy is a therapy in which an individual is regressed to past lives in order to heal and resolve ailments and situations from the current life.

KEY TERMS

Regression therapy—Traveling back and reliving emotions experience through prior lives while meditating.

Origins

Past life therapy is based on the ancient belief of reincarnation. The foundation of Hindu philosophy, reincarnation dates back thousands of years. It is the notion that the soul is eternal and incarnates again and again, retaining all the knowledge of events that occur during each lifetime.

Karma is an important component of reincarnation. It is a Sanskrit word meaning action. The basis of karma is that every action has a reaction: cause and effect. Each lifetime is lived in order to resolve unwholesome actions in previous lifetimes. The circumstances of each life are determined by the growth and progress achieved in a past life. According to this theory, a person's actions in one lifetime determine the conditions, situations, relationships, environment, and opportunities of the next life.

The actions carried out in one lifetime are often carried through to the next life. For instance, someone who committed a murder in a previous life may encounter a lifetime in which he will have to deal with anger and violence. Although "past lives" began as a religious concept, since the 1960s it has been used in the therapeutic community to help people reframe current issues in their lives that are blocking their health and well-being. Whether or not there are past-life experiences and memories is debatable and ultimately unprovable. They may be metaphors of the mind. Even so, they can serve as useful processes for bringing understanding and resolution to present conflicts.

Benefits

Past life therapy is reported to have a myriad of benefits. Memories revealed from a past life allow individuals to alter their perspectives on their current lives. This therapy helps people to understand who they are, learn how past life events have affected present life circumstances, and to offer insight into hidden conflicts so that repeating patterns may be stopped.

Awareness created through regression therapy allows mental, physical, and emotional release. Patients may let go of deep-seated emotions, fears, and guilt that often result in the relief of such problems as chronic **pain**, **alcoholism**, jealousy, arthritis, claustrophobia, agoraphobia, migraine headaches, weight problems, **insomnia**, obsessive/compulsive behaviors, chemical dependencies, **depression**, and sexual dysfunctions. The release of fear and other painful emotions strengthens will and self-esteem and fosters forgiveness towards others and towards the self.

Throughout their lives individuals may have felt negativity towards certain persons or places. They may be averse to particular foods, be prone to illness or disease, or have recurring dreams. This may be the result of a past life connection. By becoming aware of the roots of these conditions the negativity is released and healing often occurs.

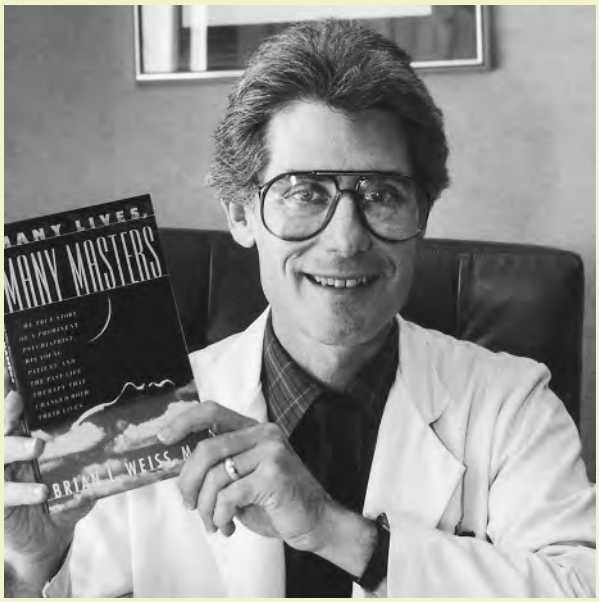
Description

Past lives may be accessed through regression therapy, hypnosis, **guided imagery**, dreams, craniosacral therapy and other types of bodywork, spontaneous regressions, automatic writing, **meditation**, or contact with one's higher self. Dealing with one's higher self is achieved through meditation and hypnosis and is based on the belief that the soul retains information of past lives and uses this to set the destiny of the current life. Contacting the higher self is said to help change one's destiny. The therapy is usually performed on an individual basis.

Past life therapy is usually undertaken to reach the source of problems or conflicts in the current life. The purpose of a regression session is to release guilt, fears, and other emotions tied to past events in order to make appropriate decisions in the present lifetime and gain an understanding of present relationships.

One common method of exploring past lives is through hypnosis. During a hypnotic regression, the patient is relaxed into a light trance state in which he or she is often completely aware of the surroundings. In order to achieve this state, the therapist may lead the patient through a guided fantasy. The patient may begin to intuit an awareness of a scene or see moving pictures as in a movie or on television. The patient may see or hear words describing a scene and feel emotions relating to that scene. The therapist acts as a coach, encouraging the patient to explain what she is seeing and feeling until the scene has stopped.

BRIAN WEISS (1944-)



(AP/Wide World Photos. Reproduced by permission.)

Brian L. Weiss graduated from Columbia University and Yale Medical School, where he received his degree in medicine with a specialty in psychiatry. He is Chairman Emeritus of Psychiatry at the Mount Sinai Medical Center in Miami and a former professor of psychiatry at the Uni versity of Miami School of Medicine. He is an advocate of the clinical applications of regression or past life therapy in treating phobias, addictions, depression, and psychoso matic disorders. Weiss uses hypnosis to access patients' memories of their childhood and past lives. His interest began when a woman he had hypnotized said she had communicated with his dead infant son through spirits called the Masters. The woman claimed to have lived at least 86 previous lives.

He conducts lectures around the world and is a fre quent guest on radio and television talk shows. Weiss is author of several books, including *Many Lives, Many Mas ters* (1988), *Through Time Into Healing* (1993), *Only Love is Real: A Story of Soulmates Reunited* (1995), and *Mes sages from the Masters* (2000). He is founder of the Weiss Institute and maintains a practice at 6701 SW 72nd St, Miami, FL.

In the past life regression, the patient may recognize people from her current life. According to the karmic theory, souls who are closely related in one life will meet in another. Often people who bond together in this lifetime, such as family, lovers, or friends, have also been together in previous lives. The significance of meeting again is to resolve karmic issues from other lives in order to promote growth and healing.

Past lives generally are not experienced in a sequential fashion. This is due to the karmic understanding that past lives are revealed at a time when the individual will benefit most by the lesson learned through the review.

Research and general acceptance

Much research has been conducted on past life therapy. One of the proponents of the past life movement, Dr. Brian Weiss, has written several books detailing the experiences he has encountered while performing past life regressions.

Dr. Ian Stevenson, professor of psychiatry at the University of Virginia, has conducted research on children who consciously recall their past lives. One of his cases involved a girl from India named Shanti Devi. When she was very young, Shanti began to talk about a husband and children. She gave the address of her "former" home and the identity of her husband. When she was nine, Shanti was taken to the house, where she retrieved some jewelry she had buried in the garden in her former life.

Past life therapy is not generally accepted by most Western medical practitioners. Although the idea of discovering past lives through hypnosis became popularized in the 1970s, it is now under criticism by modern psychologists. Many contend that patients under hypnosis are directed to remember past lives by the suggestions of hypnotherapists, and subsequently fabricate false memories of past lives.

Training and certification

Past life therapy may be performed by trained psychologists, persons trained in **hypnotherapy** or regression techniques, or psychics or mediums. The techniques used for past life regressions are the same techniques used for age regression therapy.

Resources

BOOKS

Andrews, Ted. *How to Uncover Your Past Lives*. Minnesota: Llewellyn Publications, 1997.

Avery, Jeanne. *Past Lives, Present Loves*. Signet, 1999.

Eason, Cassandra. *Discover Your Past Lives*. England: Foulsham, 1996.

ORGANIZATIONS

Association for Past Life Research and Therapies, Inc. , P.O. Box 20151 Riverside, CA 92516. http://www.pastlifehealing.com/.

Jennifer Wurges

Pau d'arco

Description

Pau d'arco (pronounced pow-darko) is a large tree that grows in the Amazon rain forest and in tropical areas of South America. The botanical names for the species most commonly used are *Tabebuia heptaphylla* and *Tabebuia impetiginosa*. The tree is called taheebo or lapacho in South America. The inner bark of pau d'arco is used as an herbal medicine, most notably in the treatment of **cancer** and **infections**.

The pau d'arco tree grows up to 150 ft (45 m) tall and 10 ft (3 m) in diameter, and is prized for its lumber. The wood is extremely hard, and makes fine furniture. The tree produces large purple flowers, making it popular for landscaping and decoration. The bark of the tree has been used medicinally by native South American peoples for centuries. Rainforest medicine men scrape the inner bark and brew a tea from it. The tea has been used to treat conditions as varied as **malaria**, infections, **fever**, arthritis, skin problems, **syphilis**, **AIDS**, and cancer. Pau d'arco has long been a common herbal remedy for Europeans who moved to South America as well, and is sometimes drunk there as a refreshing tea. The tea has a cool, bitter flavor.

Pau d'arco became known to the mainstream medical community during the 1960s. At that time, a doctor named Theodore Meyer learned of the herb from a rainforest tribe, and used it to treat patients suffering from **leukemia** (cancer of the blood). He reported that the herb completely cured five cases of advanced cancer. Then, a hospital in South America used a tea made from the herb to treat cancer patients, and reported that pau d'arco reduced **pain** and cured tumors in some patients. These stories made it to the press, and pau d'arco was touted around the world as a miracle cancer cure.

Pau d'arco caught the attention of American researchers and drug companies, and scientific studies on it were performed. Scientists isolated an active chemical found in the bark, and termed it lapachol. Several studies showed that lapachol was effective against cancerous tumors in rats, giving it promise as a cancer cure. In 1974, however, the National Cancer Institute concluded that the amounts of lapachol required for beneficial effects against cancer in humans would result in toxic side effects, and stopped researching pau d'arco as a cancer treatment.

The inner bark of pau d'arco is used as an herbal medicine, most notably in the treatment of cancer and infections. *(Genevieve Vallee / Alamy)*

Although research in general did not support the huge claims made for pau d'arco, it continued to generate stories of miraculous cancer cures and other successes treating infections and chronic conditions. Some researchers have theorized that other ingredients in the bark besides lapachol may have therapeutic effects; and it has been shown that the use of the whole herb does not create the side effects that extracted lapachol causes. Researchers have isolated over 20 active chemicals in pau d'arco. Research, mainly on laboratory animals, has shown pau d'arco

KEY TERMS

Candidiasis—A common infection caused by a yeast called *Candida albicans*.

Lapachol—The name given to the active ingredient in pau d'arco, which appears to have some anti-cancer properties.

to have anti-microbial and anti-viral properties, helping to destroy bacteria, fungi, parasites and viruses by increasing the supply of oxygen to cells. It has demonstrated effectiveness against yeast infections, malaria, **tuberculosis**, strep, and dysentery. Pau d'arco has also been shown to influence the activity of the immune system. In small dosages, it increases immune system activity and in large doses suppresses some immune responses such as inflammation. Its anti-inflammatory actions have given pau d'arco promise as a remedy for **allergies**, arthritis, skin problems, ulcers and other inflammatory conditions.

General use

Pau d'arco is used frequently in the herbal treatment of cancer and infections, including candidiasis and other yeast infections. Pau d'arco is also used for allergies, arthritis, diabetes, flu, lupus, parasites, skin diseases, and ulcers.

Preparations

Pau d'arco is available in health food stores in capsules, tinctures, and as dried bark. The recommended dosage is 1-2 capsules or 1-2 droppersful of tincture taken one to four times per day, depending on the condition and patient.

Tea can be made from the bark by adding 1 tbsp of bark for every 3 cups of water. The tea should be boiled for 20 minutes or longer in a non-aluminum pot. One cup of tea can be taken three or four times daily for acute conditions. One-half cup three or four times daily is recommended for other conditions.

Precautions

Pregnant and lactating women should not use pau d'arco, as its effects during **pregnancy** have not been sufficiently researched. Pau d'arco has been shown to have blood-thinning actions in some people, and may cause **anemia** (shortage of red blood cells) when used over long periods. For this reason, pau d'arco should not be used before surgery or by patients with anemia or bleeding problems.

Another precaution consumers should take is assuring that the product they purchase is produced by a reputable manufacturer. Pau d'arco is a valuable resource in South America, and there has been a history of fraudulent products being exported. Some of these products have caused uncomfortable side effects that do not occur with real pau d'arco. In Canada in 1987, a chemical analysis of 12 commercial products revealed that only one contained the active ingredient lapachol, and that was in minute amounts. Some manufacturers have begun to offer products with standardized quantities of active ingredients to assure quality. The pau d'arco imported from Argentina is generally considered to be the highest quality bark.

Side effects

Possible side effects from ingesting too much pau d'arco include **nausea**, **vomiting**, **diarrhea**, **dizziness**, and stomach cramps. Long-term usage has been reported to cause anemia.

Interactions

Pau d'arco products should be avoided by those taking anticoagulant (blood thinning) medication.

Resources

BOOKS

Jones, Kenneth. *Pau d'Arco: Immune Power From the Rain Forest*. Rochester, VT: Healing Arts Press, 1995.

Taylor, Leslie. *Herbal Secrets of the Rainforest*. Rocklin, CA: Prima, 1998.

PERIODICALS

HerbalGram (a quarterly journal of the American Botanical Council and Herb Research Foundation). P.O. Box 144345, Austin, TX 78714 4345. (800) 373 7105.

Douglas Dupler

Pediculosis *see* **Lice infestation**

Pelvic inflammatory disease

Definition

Pelvic inflammatory disease (PID) is a term used to describe any infection in the lower female reproductive tract that spreads upward to the upper female

Pelvic inflammatory disease (PID) risk factors

Age: the rate of infection in women drops as they get older. Risk is highest for sexually active women under 25 years of age.

Ethnicity: the rate of infection is higher in nonwhite groups.

Socioeconomic status: the rate of infection is higher in women of lower socioeconomic status.

IUD: the rate of infection is higher with the use of IUDs, and frequent douching.

Barrier contraception: consistent use of barrier contraceptives protects against PID, although they may not protect against other STDs, such as HPV.

Lifestyle: the rate of infection is higher in women who abuse drugs and alcohol, have had intercourse for the first time at an early age, and have had a higher number of sexual partners.

STDs: the rate of infection is higher in women who have had sexually transmitted diseases.

(Illustration by Corey Light. Cengage Learning, Gale)

reproductive tract. The lower female genital tract consists of the vagina and the cervix. The upper female genital tract consists of the body of the uterus, the fallopian or uterine tubes, and the ovaries.

Description

PID is the most common and the most serious consequence of infection with sexually transmitted diseases (STD) in women. Over one million cases of PID are diagnosed annually in the United States, and it is the most common cause for hospitalization of reproductive-age women. Sexually active women aged 15–25 are at highest risk for developing PID. The disease can also occur, although less frequently, in women having monogamous sexual relationships. The most serious consequences of PID are increased risk of infertility and ectopic **pregnancy**.

To understand PID, it is helpful to understand the basics of inflammation. Inflammation is the body's response to disease-causing (pathogenic) microorganisms. The affected body part may swell due to accumulation of fluid in the tissue or may become reddened due to an excessive accumulation of blood. A discharge (pus) may be produced that consists of white blood cells and dead tissue. Following inflammation, scar tissue may form by the proliferation of scar-forming cells (fibrosis). Adhesions of fibrous tissue form and cause organs or parts of organs to stick together.

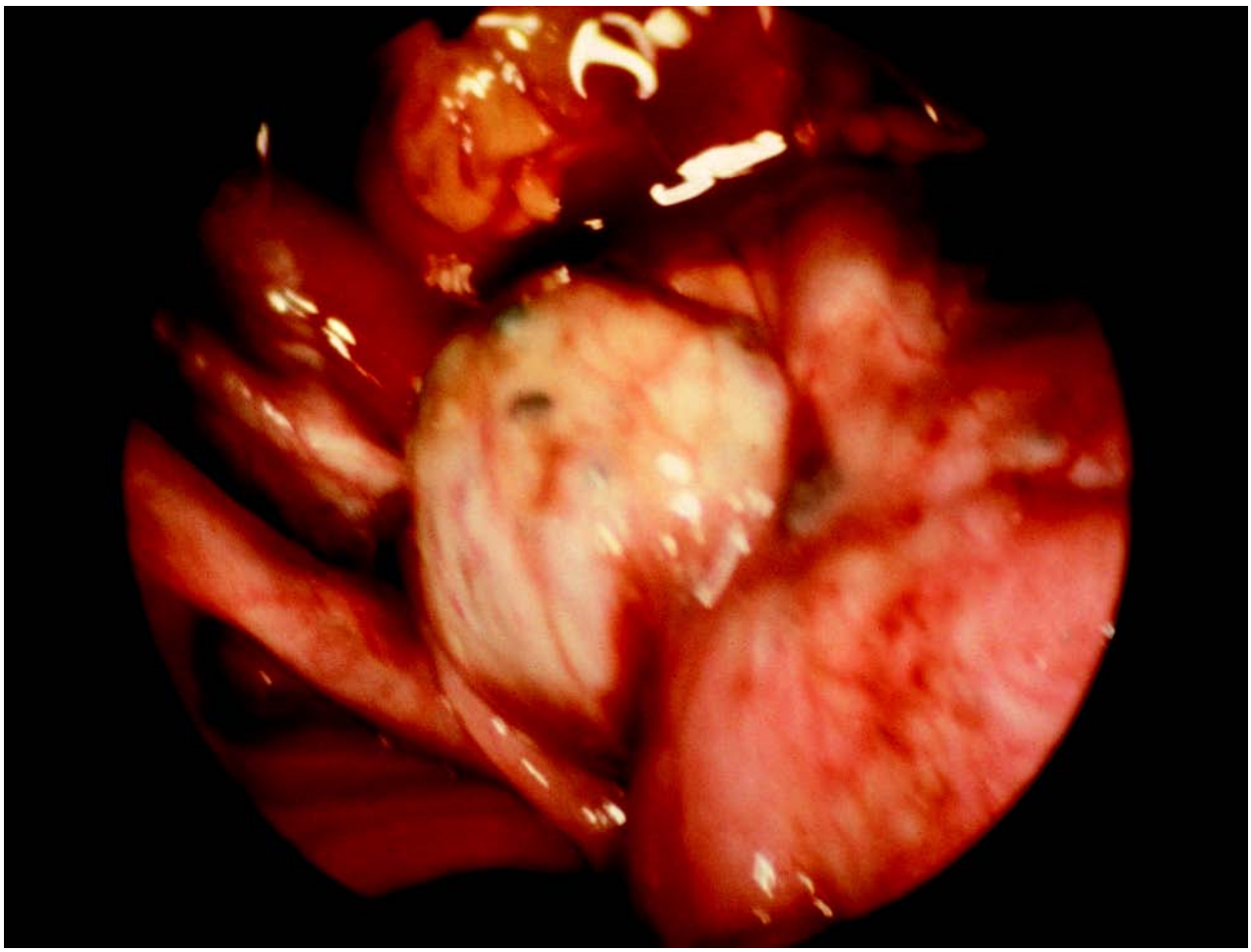
PID may be used synonymously with the following terms:

- salpingitis (inflammation of the fallopian tubes)
- endometritis (inflammation of the inside lining of the body of the uterus)
- tubo-ovarian abscesses (abscesses in the tubes and ovaries)
- pelvic peritonitis (inflammation inside of the abdominal cavity surrounding the female reproductive organs)

Causes and symptoms

A number of factors affect the risk of developing PID. They include:

- Age. The incidence of PID is very high in younger women and decreases as a woman ages.
- Race. The incidence of PID is 8–10 times higher in nonwhites than in whites.
- Socioeconomic status. The higher incidence of PID in women of lower socioeconomic status is due in part to a woman's lack of education and awareness of health and disease, and due in part to barriers to her accessibility to medical care.
- Use and method of contraception. Induced abortion, use of an IUD, nonuse of such barrier contraceptives as condoms, and frequent douching are all associated with a higher risk of developing PID.
- Lifestyle. Such high-risk behaviors as drug and alcohol abuse; early age at first intercourse; a high number of sexual partners; and smoking all are associated with a higher risk of developing PID.



Laparoscopic view of pelvic inflammatory disease. *(Custom Medical Stock Photo. Reproduced by permission.)*

- Specific sexual practices. Intercourse during the menses and frequent intercourse may offer more opportunities for the admission of pathogenic organisms to the inside of the uterus.
- The presence of a sexually transmitted disease. Sixty to seventy-five percent of PID cases are associated with STDs. A prior episode of PID increases the chances of developing subsequent infections.

The two major organisms that cause STDs are *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. The main symptom of *N. gonorrheae* infection (**gonorrhea**) is a vaginal discharge of mucus and pus. Sometimes bacteria from the colon normally in the vaginal cavity may travel upward to infect the upper female genital organs, facilitated by the infection with gonorrhea. **Infections** with *C. trachomatis* and other nongonoccal organisms are more likely to have mild or no symptoms.

Although PID is unusual in women who are not sexually active, disease organisms other than the gonococcus and *C. trachomatis* can occasionally gain entrance to the upper female reproductive tract and cause PID. Cases have been reported from Canada, Norway, and South America of PID caused by pinworms, pneumococci, and *Entamoeba histolytica*, a pathogenic amoeba.

Normally the cervix produces mucus that acts as a barrier to prevent disease-causing microorganisms, called pathogens, from entering the uterus and moving upward to the tubes and ovaries. This barrier may be breached in two ways. A sexually transmitted pathogen, usually a single organism, invades the lining cells, alters them, and gains entry. Another way for organisms to gain entry happens when trauma or alteration to the cervix occurs. **Childbirth**, spontaneous or induced abortion, or use of an intrauterine contraceptive device (IUD) are all conditions that may alter or weaken the normal lining cells, making them susceptible to infection, usually by several organisms.

KEY TERMS

Adhesion—The joining or sticking together of parts of an organ that are not normally joined together.

C-reactive protein (CRP)—A protein present in blood serum in various abnormal states, like inflammation.

Ectopic—Located away from normal position; ectopic pregnancy results in the attachment and growth of the fertilized egg outside of the uterus, a life-threatening condition.

Endometriosis—The presence and growth of functioning endometrial tissue in places other than the uterus; often results in severe pain and infertility.

Erythrocyte sedimentation rate (ESR)—The rate at which red blood cells settle out in a tube of unclotted blood, expressed in millimeters per hour; elevated sedimentation rates indicate the presence of inflammation.

Fibrosis—The formation of fibrous, or scar, tissue which may follow inflammation and destruction of normal tissue.

Hysterectomy—Surgical removal of the uterus.

Laparoscope—A thin flexible tube with a light on the end which is used to examine the inside of the abdomen; the tube is inserted into the abdomen by way of a small incision just below the navel.

Ligase chain reaction—A laboratory technique for detecting sexually transmitted disease organisms in urine by rapidly copying and recopying the organism's DNA, thus making the presence of infection easier to detect.

During **menstruation**, the cervix widens and may allow pathogens entry into the uterine cavity.

Recent evidence suggests that bacterial vaginosis (BV), a bacterial infection of the vagina, may be associated with PID. BV results from the imbalance of normal organisms in the vagina— by douching, for example. While the balance is altered, conditions then favor the overgrowth of anaerobic bacteria that thrive in the absence of free oxygen. A copious discharge is usually present. Should some trauma occur in the presence of anaerobic bacteria, such as menses, abortion, intercourse, or childbirth, these organisms may gain entrance to the upper genital organs.

The most common symptom of PID is pelvic pain. However, many women with PID have symptoms so mild that they may be unaware that they are infected.

In acute salpingitis, a common form of PID, swelling of the fallopian tubes may cause tenderness on physical examination. Fever may be present. Abscesses may develop in the tubes, ovaries, or in the surrounding pelvic cavity. Infectious discharge may leak into the peritoneal cavity and cause peritonitis; or abscesses may rupture, causing a life-threatening surgical emergency.

Chronic salpingitis may follow an acute attack. Subsequent to inflammation, scarring and resulting adhesions may result in chronic **pain** and irregular menses. Due to blockage of the tubes by scar tissue, women with chronic salpingitis suffer a high risk of having an ectopic pregnancy. An ectopic pregnancy develops when a fertilized ovum is unable to travel down the fallopian tube to the uterus and implants itself in the tube, on the ovary, or in the peritoneal cavity. This condition can also be a life-threatening surgical emergency.

IUDs

The use of intrauterine devices, or IUDs, has been strongly associated with the development of PID. Bacteria may be introduced to the uterine cavity while the IUD is being inserted or may travel up the tail of the IUD from the cervix into the uterus. Surrounding uterine tissue may show areas of inflammation, increasing its susceptibility to pathogens.

Some researchers, however, maintain that the connection between IUDs and PID has been exaggerated and that further research is necessary.

Susceptibility to STDs

Susceptibility to STDs involves many factors, some of which are not known. The ability of the organism to produce disease and the circumstances that place the organism in the right place at a time when a trauma or alteration to the lining cells has occurred are factors. The woman's own immune response also helps to determine whether infection occurs.

Diagnosis

If PID is suspected, the physician will take a complete medical history and perform an internal pelvic examination. Other diseases that may cause pelvic pain, such as appendicitis and **endometriosis**, must be ruled out. If pelvic examination reveals tenderness or pain in that region, or tenderness on movement of the cervix, these are good physical signs that PID is present.

Specific diagnosis of PID is difficult to make because the upper pelvic organs are hard to reach for samplings. The physician may take samples directly

from the cervix to identify the organisms that may be responsible for infection. Two blood tests may help to establish the existence of an inflammatory process. A positive C-reactive protein (CRP) and an elevated erythrocyte sedimentation rate (ESR) indicate the presence of inflammation. The physician may take fluid from the cavity surrounding the ovaries called the *cul de sac*; this fluid may be examined directly for bacteria or may be used for culture. Diagnosis of PID may also be done using a laparoscope, but laparoscopy is expensive, and it is an invasive procedure that carries some risk for the patient.

A newer diagnostic technique that has dramatically improved the accuracy of laboratory testing for PID and other STDs is the ligase chain reaction (LCR) technique. The LCR technique detects DNA from *N. gonorrhoeae* and *C. trachomatis* in a patient's urine sample. LCR technology is less invasive as well as more accurate.

Treatment

Alternative therapy should be complementary to antibiotic therapy. Because of the potentially serious nature of this disease, a patient should first consult an allopathic physician to start antibiotic treatment for infections. Traditional medicine is better equipped to quickly eradicate the infection, while alternative treatments can help the body fight the disease and relieve painful symptoms associated with PID. Some of the alternative treatments include **diets**, nutritional supplements, herbal remedies, **homeopathy**, **acupressure**, and **acupuncture**.

General recommendations

- Bed rest. Patients need to rest and reduce physical activity to help the body recuperate faster.
- Avoid sexual activity. Both patient and her partner should be treated for PID infections. They should also avoid sexual activity until their infections are completely eradicated.
- Healthy diet. Diet should include a variety of fresh fruits and vegetables. These foods contain high amount of phytonutrients and essential vitamins that help keep the body strong and stimulate the immune system to fight infections.

Nutritional supplements

The following nutritional supplements may be helpful:

- Daily vitamin and mineral supplements. These supplements can ensure that the body receives all the essential nutrients for normal body function. They also help keep the body strong to fight diseases including PID.
- Vitamin C. High-dose vitamin C (1–2 g) boost the immune function and help the body fight infection better.

Herbal treatment

The following herbal remedies may be helpful:

- Castor oil packs. Patients can make warm packs by pouring castor oil on a clean piece of cloth wrapped in layers and warming it before placing on the lower part of their abdomen for up to 20 minutes. It is recommended that patients repeat this therapy every day for up to seven days.
- *Echinacea* spp., goldenseals and *Calendula officinalis*. These herbs are believed to have antimicrobial activity and may be taken to augment the action of prescribed antibiotics.
- Grapefruit seed extract. This herb has been used to fight a variety of infections including bacterial, viral, fungal, parasitic, and worm infections.
- Blue cohosh (*Caulophyllum thalictroides*) and false unicorn root (*Chamaelirium luteum*). These remedies are recommended as tonics for the general well-being of the female genital tract.

Homeopathy

A homeopathic practitioner may prescribe a patient-specific remedy to help reduce some of the symptoms associated with PID. Herbs that are used in PID patients include **Apis** mellifica, **Arsenicum album**, **Belladonna**, Colocynthis, Magnesia phosphorica, and Mercurius vivus.

Acupressure

Acupressure (applying pressure on specific pressure points) can increase blood flow to the pelvic region, reduce pain, and promote general health.

Acupuncture

Acupuncture involves inserting needles at various points on the skin of the body. These needles are like antennae that direct qi (life force) to organs or functions of the body. This treatment may help with pain and also strengthen immunity. It is important that patients request disposable needles to prevent transmission of **AIDS**, hepatitis, and other infectious diseases.

Allopathic treatment

If acute salpingitis is suspected, treatment with antibiotics should begin immediately. The patient is usually treated with at least two broad-spectrum antibiotics that can kill both *N. gonorrhoeae* and *C. trachomatis* plus other types of bacteria that may have the potential to cause infection. Hospitalization may be required to ensure compliance. Treatment for chronic PID may involve hysterectomy. Early treatment of suspected PID is essential because some **strains** of *N. gonorrhoeae* are showing increasing resistance to standard antibiotics as of 2002.

If a woman is diagnosed with PID, she should see that her sexual partner is also treated to prevent the possibility of reinfection.

Expected results

PID can be cured if the initial infection is treated immediately. If infection is not recognized, as frequently happens, the process of tissue destruction and scarring that results from inflammation of the tubes results in irreversible changes in the tube structure that cannot be restored to normal. Subsequent bouts of PID increase a woman's risk of complications. Thirty to forty percent of female **infertility** cases are due to acute salpingitis.

With modern antibiotic therapy, death from PID is almost nonexistent. In rare instances, death may occur from the rupture of tubo-ovarian abscesses and the resulting infection in the abdominal cavity. One recent study has linked infertility, a consequence of PID, with a higher risk of **ovarian cancer**.

Prevention

The prevention of PID is a direct result of the prevention and prompt recognition and treatment of STDs or of any suspected infection involving the female genital tract. The main symptom of infection is an abnormal discharge. To distinguish an abnormal discharge from the mild fluctuations of normal discharge associated with the menstrual cycle takes vigilance and self-awareness. Sexually active women must be able to detect symptoms of lower genital tract disease. Frank dialogue regarding sexual history, risks for PID, and treatment options is necessary with a physician. Also, open discussions with sexual partners regarding symptoms and possible infection is imperative.

Lifestyle changes should focus on preventing the transfer of organisms when the body's delicate lining cells are unprotected or compromised. Barrier contraceptives, such as condoms, diaphragms, and cervical caps, should be used. Women in monogamous relationships should use barrier contraceptives during menses and take their physician's advice regarding intercourse following abortion, childbirth, or biopsy procedures.

Resources

BOOKS

Buhner, Stephen Harrod. *Herbal Antibiotics: Natural Alter natives for Treatment of Drug Resistant Bacteria*. Pow nal, VT: Schoolhouse Road, 1999.

Kurman, Robert J., ed. *Blaustein's Pathology of the Female Genital Tract*. New York: Springer Verlag, 1994.

Landers, D.V., and R. L. Sweet, eds. *Pelvic Inflammatory Disease*. New York: Springer, 1997.

The PDR Family Guide to Natural Medicine and Herbal Therapies: The Most Comprehensive Book of Its Kind. New York, NY: Three Rivers Press, 1999.

Zand, Janet, Allan N. Spreen and James B. LaValle. "Pelvic Inflammatory Disease." In *Smart Medicine for Health ier Living: A Practical A to Z Reference to Natural and Conventional Treatments for Adults*. Garden City Park, NY: Avery Publishing Group,1999: 467 469.

PERIODICALS

Bucher, A., and F. Muller. "Spectrum of Abdominal and Pelvic Infections Caused by Pneumococci in Previously Healthy Adult Women." *European Journal of Clinical Microbiology and Infectious Diseases* 21 (June 2002): 474 477.

Calore, E. E., N. M. Calore, and M. J. Cavaliere. "Salpin gitis Due to *Entamoeba histolytica*." *Brazilian Journal of Infectious Diseases* 6 (April 2002): 97 99.

Centers for Disease Control and Prevention. "Sexually Transmitted Diseases Treatment Guidelines 2002." *Morbidity and Mortality Weekly Report* 51 (May 10, 2002)(RR 6): 1 78.

Espey, E., and T. Ogburn. "Perpetuating Negative Attitudes About the Intrauterine Device: Textbooks Lag Behind the Evidence." *Contraception* 65 (June 2002): 389 395.

Kissin, D. M., S. Holman, H. L. Minkoff, et al. "Epidemi ology and Natural History of Ligase Chain Reaction Detected Chlamydial and Gonococcal Infections." *Sexually Transmitted Infections* 78 (June 2002): 208 209.

Tandan, T., et al. "Pelvic Inflammatory Disease Associated with *Enterobius vermicularis*." *Archives of Diseases of Childhood* 86 (June 2002): 439 440.

ORGANIZATIONS

American College of Obstetricians and Gynecologists (ACOG). 409 12th St., S.W., PO Box 96920, Washing ton, D.C. 20090 6920. www.acog.org.

Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. www.cdc.gov.

Mai Tran
Rebecca J. Frey, PhD

Pennyroyal

Description

Pennyroyal (*Hedeoma pulegioides*), known as American pennyroyal, and *Mentha pulegium*, known as English or European pennyroyal, are both members of the Lamiaceae or mint family. These two beneficial herbs, though classified in different genera, have similar chemical constituents and medicinal properties.

American pennyroyal is also known as mock pennyroyal, mosquito plant, fleabane, tickweed, stinking balm, and hedeoma. This aromatic American native thrives in limestone-rich soil, in fields, and in sunny patches of open woodlands throughout North America. American pennyroyal was used extensively by Native Americans to treat a variety of ailments from **headache** and stomach distress to **itching**, watery eyes, and fevers. For external use, the leaves were crushed and applied to the skin to repel mosquitoes and other insects. American pennyroyal came to be called squawmint and squaw balm because of its traditional use by native women to promote menstrual flow. Women in some Native American tribes reportedly drank hot pennyroyal tea regularly as a method of contraception. Pennyroyal was listed as a medicinal drug in official publications from 1831–1931. It was included in the *U.S. Pharmacopoeia* as an abortifacient (an agent that induces abortion) until 1931.

Pennyroyal. *(© dk / Alamy)*

American pennyroyal is an annual mint with small, oval leaves arranged opposite each other on a square stem. Leaves are entire and may be sparsely-toothed or smooth on the margins. The erect stems grow to 1 ft (31 cm) high from a many-branched root system. The tiny blue-violet flowers grow in whorls from the leaf axils on the top half of the stems. The fragrant herb blossoms in midsummer. The entire plant exudes a strong, acrid aroma and has a mint flavor. The scent is offensive to fleas, chiggers, mosquitoes, and other irritating insects.

European pennyroyal, also known as English pennyroyal, is a perennial mint native to Europe and Asia. The herb has naturalized throughout North America since its introduction to the continent by early European colonists. European pennyroyal was mentioned in Greek literature as early as 421 B.C. in the plays of Aristophanes where it was noted for its use as an abortifacient. In the first century A.D. the herbalist and physician Pliny wrote of pennyroyal's action to repel fleas. The specific name for the herb is from the Latin word *pulex*, meaning flea. European pennyroyal thrives in moist areas along stream banks, around ponds, in irrigated fields, and in boggy grasslands. This growing habit is reflected in some of European pennyroyal's other common names, including run-by-the-ground, lurk-in-the-ditch, and pudding grass.

European pennyroyal can be distinguished from the American native pennyroyal not only by its preferred habitat, but also, with careful observation, by its appearance. European or English pennyroyal hugs the ground where it grows, with only the flower stalk rising to a height of about 1 ft (31 cm). The oval leaves are opposite along the square stem, but are smaller than those of the American pennyroyal, measuring about 0.5 in (1.3 cm) long. The tiny, tubular blossoms each have four stamens in the European herb, and bear only two stamens in the American native.

General use

Pennyroyal has been used traditionally as a stimulating tea to relieve digestive disorders, gall bladder disorders, **gout**, **nausea**, and nervous conditions. Pennyroyal leaf, prepared as a hot infusion, will promote perspiration. Some herbalists suggest the additional treatment of a hot footbath while drinking the herbal infusion as a remedy at the onset of colds and flu. Pennyroyal may relieve headache, bring down **fever**, and quiet coughs. It has also been used to treat **bronchitis** and sinusitis. As a carminative (gas-reliever),

KEY TERMS

Abortifacient—A drug or other substance that causes abortion.

Emmenagogue—A herbal remedy or medication that brings on a woman's menstrual period.

Hepatotoxic—Poisonous to the liver.

Pulegone—The toxic chemical found in pennyroyal oil.

pennyroyal is considered an effective remedy for flatulence, a virtue it shares with other mints. The herbal infusion has also been used traditionally to treat suppressed **menstruation**.

By far the most controversial and dangerous use of pennyroyal is as an abortifacient. Its emmenagogic properties stimulate uterine contraction and promote menstrual flow. The essential oil has been used for centuries to induce abortion. This use of the essential oil of pennyroyal is extremely risky, and has sometimes been lethal to both the mother and the fetus. The U.S. Food and Drug Administration reported on a 1998 fatal case of pennyroyal overdose in a self-induced abortion. Both pennyroyals contain as much as 85% of the toxic phytochemical pulegone in the essential oil.

Pennyroyal is also considered potentially dangerous because of its hepatotoxicity, or ability to harm the liver. Of four cases of pennyroyal poisoning reported in San Francisco in 1996, one patient died from liver damage. As of late 2001, researchers are studying the pathways of pulegone metabolism in the human body in order to determine the degree of toxicity more precisely.

The best use for this potent herb is an external application as an insect repellent to deter mosquitoes, fleas, chiggers, and other pests. It is also soothing as a skin wash to relieve itching and rash. Pet collars, woven from the freshly gathered stems and leaves, will deter fleas, and bunches of the herb, hanging to dry, will also keep pests at bay. Many commercial products contain the oil of pennyroyal in insect-repellent preparations. Other chemical constituents in pennyroyal include tannins, such as rosmaric acid, and flavonoids, including diosmin and **hesperidin**.

Preparations

The essential oil of pennyroyal and the fresh or dried leaves and stems are medicinally active. Gather fresh leaves in the summer, on a dry and sunny day when the herb is in blossom. Hang bundles of the herb to dry in a light, airy room out of direct sunlight. When the herb is thoroughly dry, strip the leaves from the stems and store in tightly sealed, clearly labeled, dark-glass containers.

Infusion: Place 2 oz of fresh, or 1 oz of dried, pennyroyal leaves in a warmed glass container. Bring 2.5 cups of fresh, nonchlorinated water to a boil and add it to the herbs. Do not boil the tea. Cover and infuse the tea for about 10 minutes. Strain. The prepared tea will store for about two days in the refrigerator. This infusion may be used externally as a soothing skin wash. According to some herbalists, pennyroyal leaf infusion may also be safely consumed as a medicinal tea, taking up to two cups throughout the day. Others, however, including the *PDR For Herbal Medicines*, recommend that pennyroyal not be ingested due to its hepatotoxicity. Other non-toxic herbs, such as **peppermint** (*Mentha piperita*) and **spearmint** (*Mentha spicata*) may be used to remedy many of the same conditions that pennyroyal treats without the toxic risk.

Precautions

Pregnant women should never ingest pennyroyal, particularly the oil, nor should they apply the oil externally as it may be absorbed through the skin. Pennyroyal essential oil contains as much as 85% of the ketone pulegone, an extremely toxic phytochemical. Overdose of the essential oil has been reported to cause severe liver damage, coma, and death. Quantities as small as 0.5 tsp of the essential oil have caused extremely toxic reactions. The effective abortifacient dosage is dangerously close to the lethal dose. Women have died when attempting to induce abortion by ingesting pennyroyal oil. American pennyroyal contains twice as much of the toxic volatile oil as European pennyroyal. The *PDR For Herbal Medicines* recommends that the drug not be used because of its hepatotoxicity, although with proper dosage and administration of the foliage drug, poisoning is not likely.

Side effects

Contact dermatitis is possible when using crushed leaf or the undiluted oil extract on the skin to repel insects.

Interactions

None reported.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Foster, Steven, and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston New York: Houghton Mifflin Company, 1990.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics Company, 1998.

Tyler, Varro E. *The Honest Herbal*. New York: Pharma ceutical Products Press, 1993.

Weiss, Gaea, and Shandor Weiss. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Anderson, Ilene B., Walter H. Mullen, et al. "Pennyroyal Toxicity: Measurement of Toxic Metabolite Levels in Two Cases and Review of the Literature." *Annals of Internal Medicine* 124 (April 1996): 726 734.

Chen, L. J., et al. "Metabolism of (R) (+) pulegone in F344 Rats." *Drug Metabolism and Disposal* 29 (December 2001): 1567 77.

U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Office of Special Nutri tionals. *FDA/CFSAN Report, October 20, 1998*.

OTHER

"Herbal Abortifacients." *Westside Crisis Pregnancy Center*. [cited January 2033]. http://w cpc.org/abortion/herbal.html.

"Pennyroyal." *Viable Herbal Solutions*. [cited January 2003]. http://www.viable herbal.com/herbdesc3/1pennyro.htm.

Clare Hanrahan
Rebecca J. Frey, PhD

Peony *see* **White peony root**

Peppermint

Description

Peppermint (*Mentha piperita*) is an aromatic perennial plant that grows to a height of about 3 ft (1 m). It has light purple flowers and green leaves with serrated edges. Peppermint belongs to the Lamiaceae family and grows throughout North America, Asia, and Europe. There are more than 25 species of true mint grown throughout the world.

The plant is harvested when the oil content is highest. When ready for harvest, it is always collected in the morning, before noon sun reduces the leaf essential oil content. This generally takes place shortly before the plant blooms, which occurs in the summer (July through August) or during dry, sunny weather. The United States is responsible for producing 75% of the world's supply of peppermint.

History

Peppermint is a natural hybrid of water mint (*Mentha aquatica*) and **spearmint** (*Mentha spicata*) and was first cultivated in England in the late seventeenth century. The herb has been used as a remedy for **indigestion** since Ancient Egyptian times. In fact, dried peppermint leaves were found in Egyptian pyramids dating back to 1000 B.C. The ancient Greeks and Romans valued it as a stomach soother. During the eighteenth century, peppermint became popular in Western Europe as a folk remedy for **nausea**, **vomiting**, **morning sickness**, respiratory **infections**, and menstrual disorders. Peppermint was first listed in the *London Pharmacopoeia in 1721*. In modern times it appears in the *British Herbal Pharmacopoeia* as a remedy for intestinal **colic**, **gas**, colds, morning sickness, and **menstruation pain**.

Properties

Peppermint is a cooling, relaxing herb that contains properties that help ease inflamed tissues, calm **muscle spasms** or cramps, and inhibit bacteria and microorganisms. It also has pain-relieving and infection-preventing qualities.

The medicinal parts of peppermint are derived from the whole plant, and include a volatile oil, flavonoids, phenolic acids, and triterpenes. The plant is primarily cultivated for its oil, which is extracted from the leaves of the flowering plant.

The essential oil contains the principal active ingredients of the plant: menthol, menthone, and menthyl acetate. Menthyl acetate is responsible for peppermint's minty aroma and flavor. Menthol, peppermint's main active ingredient, is found in the leaves and flowering tops of the plant. It provides the cool sensation of the herb.

The menthol content of peppermint oil determines the quality of its essential oil. This varies depending upon climate, habitat, and where the peppermint is grown. For instance, American peppermint oil contains 50–78% menthol, while English peppermint oil has a menthol content of 60–70%. Japanese peppermint oil contains 85% menthol. Peppermint and its oils help with intestinal function.

Peppermint also contains vitamins A and C, **magnesium**, **potassium**, **inositol**, **niacin**, **copper**, **iodine**, silicon, **iron**, and **sulfur**.

Peppermint. *(© Arco Images / Alamy)*

General use

Peppermint is one of the most popular flavoring agents. Many products contain peppermint, including chewing gum, mints and candies, ice cream and other sweets, tobacco, toothpaste, mouthwash, **cough** drops, teas, alcoholic liqueurs, and digestive aids. It is also used to scent soaps, perfumes, detergents, lipsticks and other cosmetics, and is an ingredient in many over-the-counter medications. Therapeutically, peppermint is used to treat many ailments of the skin, circulatory system, respiratory system, digestive system, immune system, and nervous system.

Peppermint and headaches

Peppermint's pain-relieving effects on headaches have been known for many years. The first documented report to link peppermint and **headache** relief was published in 1879. A more recent study took place in Germany in 1996. In this double-blind study, researchers found that an ethanol solution containing 10% peppermint oil was as effective in relieving headache pain as 1,000 mg of acetaminophen. In another study, 32 people with headaches massaged peppermint oil on their temples. The results showed that the peppermint oil significantly relieved their pain.

When applied to the skin, peppermint reduces sensitivity and relieves pain. Rubbed on the temples, across the forehead, and behind the neck, peppermint oil helps to ease digestive-related headaches and migraines by generating a cooling effect on the skin and relaxing cranial muscles.

Peppermint as a digestive aid

Peppermint is employed in the treatment of various digestive ailments, such as **irritable bowel syndrome**, **Crohn's disease**, **diverticulitis**, liver and gallbladder complaints, loss of appetite, spastic colon, **diarrhea**, gas, bloating, colic, cramps, and **heartburn**. The infused herb tea of peppermint or a few drops of its essential oil stimulate the flow of digestive juices and the production

Peppermint. *((c) Photo Researchers, Inc. Reproduced by permission.)*

of bile, a substance that helps to digest fats. This eases indigestion, relieves gas, reduces colon spasms, and eases **motion sickness** and nausea. When peppermint is taken after a meal, its effects will reduce gas and help the digestion of food by reducing the amount of time the food is in the stomach. This is one reason after-dinner mints are so popular.

The compounds of the essential oil have antispasmodic properties that reduce spasms of the colon and intestinal tract and relax the stomach muscles. Peppermint has a soothing effect on the lining and muscles of the colon, which helps to relieve diarrhea and spastic colon.

Menthol acts to stimulate the stomach lining. Its cooling properties soothe the stomach and ease stomach pain. Peppermint oil is popular in the treatment of motion and sea sickness and nausea associated with **pregnancy**. It acts as an anesthetic to the stomach wall and eases vomiting and nausea. An account on the effects of peppermint on nausea appeared in the September 1997 issue of the *Journal of Advanced Nursing*, in which gynecological patients were given peppermint oil to counter post-operative nausea. The patients reported less nausea and required fewer drugs to treat the nausea.

A German health commission, German Commission E, has endorsed peppermint tea as a treatment for indigestion. Clinical trials in Denmark and Britain in the 1990s confirmed peppermint's actions as a therapeutic treatment for irritable bowel syndrome. In 1996, a German study was performed to research the therapeutic benefits of peppermint essential oil on irritable bowel syndrome. Subjects with irritable bowel syndrome were given enteric-coated capsules containing peppermint and caraway oils. Results showed that the pain symptoms, which ranged from moderate to severe, improved in 89.5% of the group.

Peppermint and respiratory ailments

Peppermint is an expectorant and decongestant. It is used to help treat many respiratory ailments including **asthma**, **bronchitis**, sinusitis, and coughs.

Peppermint is an element of many cough preparations, not only for its pleasant flavor, but also

KEY TERMS

Essential oil—A concentrated oil that has been distilled from a plant.

Expectorant—A substance that acts to promote coughing and clear mucus from the lungs and respiratory tract.

Perennial—A plant that blooms every year.

Tincture—The concentrated solution of an herbal extract, usually made with alcohol.

because it contains compounds that help ease coughs. Constituents of peppermint increase the production of saliva, causing frequent swallowing and suppressing the cough reflex.

German Commission E has officially recognized peppermint's ability to reduce inflammation of nasal passageways. When menthol vapors are inhaled, nasal passageways are opened to provide temporary relief of nasal and sinus congestion.

Peppermint essential oil is an ingredient in many commercial chest and cold rubs. These are popularly rubbed onto the chest to ease congestion.

A tea made from the leaves can stimulate the immune system and relieve the congestion of colds, flus, and upper respiratory infections.

Other conditions

Peppermint is an effective relaxant and can be helpful in treating nervous **insomnia**, **stress**, **anxiety**, and restlessness.

Many over-the-counter balms and liniments contain peppermint essential oil. These are applied externally to relieve muscle pain, arthritis, **itching**, and **fungal infections**.

Peppermint induces sweating and can help bring down fevers. It is said that it contains **antioxidants** that help prevent **cancer** and **heart disease**. The essential oil is a powerful antiseptic and is useful in treating bad breath and sore throats. It is also beneficial in preventing tooth decay and **gum disease**.

A plant with potent antiviral properties, peppermint can help fight viruses that cause ailments such as **influenza**, herpes, yeast infections, and **mumps**. Peppermint is also used as an **earache** remedy, to dissolve **gallstones**, to ease muscle tightness, and to ease menstrual cramps.

A 2002 report announced that peppermint also helped participants in a study run faster, do more pushups, and show greater grip strength than those who were not exposed to peppermint scent. Although researchers concluded the effect may have been psychological, a result of peppermint's effect on mood and increased motivation, it still resulted in measurable performance improvement.

Preparations

Peppermint is available as a tincture, tea, essential oil, oil capsules, and tablets. The fresh and dried leaves may be purchased in bulk.

Tablets and capsules are often coated so the oil's therapeutic properties are released in the intestine and not in the stomach. These enteric-coated pills are used in the treatment of irritable bowel syndrome, diverticulitis, and other chronic digestive ailments. Peppermint oil capsules are effective in treating lower intestinal disorders:

- Irritable bowel syndrome: 1–2 capsules three times daily between meals.
- Gallstones: 1–2 capsules three times daily between meals.

Peppermint tea

Peppermint tea may be used to relieve migraine headaches, minor colds, digestive ailments, and morning sickness, as well as many other conditions. Taken after a meal, the tea acts to settle the stomach and improve digestion. To prepare the tea, pour one cup of boiling water over 1–2 tsp of dried peppermint leaves, cover, and steep for 10 minutes. Strain the mixture before drinking.

DOSAGE. For relief of migraine pressure, drink 1–2 cups of cool tea daily.

For digestive disorders, drink one cup of tea with meals.

For cough relief, drink 3–4 cups of cool tea throughout the day, taking frequent sips (every 15–30 minutes).

For morning sickness, women may drink a tea that has been diluted.

Aromatherapy and peppermint

The essential oil of peppermint is a pale yellow or greenish liquid that is made by distilling the flowering herb. When inhaled, the oil can reduce **fever**, relieve nausea and vomiting, improve digestion, and soothe the respiratory system. Various studies have been

performed on the oil's ability to improve the sense of taste and smell and improve concentration and mental acuity when inhaled.

The oil blends well with other **essential oils** such as benzoin, **rosemary**, **lavender**, marjoram, lemon, **eucalyptus**, and other mints. Essential oils are available at many health food stores or through a qualified aromatherapist.

Peppermint essential oil can be used in several ways: inhaled, rubbed on **reflexology** points on the bottom of the feet, diffused into the air, or as a therapeutic bath. Below are some applications for the use of peppermint essential oil:

- Steam inhalation for congestion relief: A few drops of the essential oil of peppermint are placed in a large bowl of hot water. The person should cover his or her head with a towel, lean over the bowl, and inhale the steam.
- Motion sickness: A few drops of essential oil should be places on a tissue and inhaled.
- Headaches: A few drops can be placed on a cool, wet towel and used as a compress on the forehead. Or, massaged into the neck, back, temples, and/or forehead.
- Digestion: Several drops of diluted oil massaged on the stomach or the pure oil rubbed onto the bottoms of the feet.
- Breath freshener: Several drops placed on the tongue.
- Therapeutic bath: Several drops of diluted oil placed into a tepid bath to relieve stomach complaints, nasal congestion, headache, or menstrual cramps. If essential oil is not available, a bath can be made by adding to the water a cloth bag filled with several handfuls of dried or fresh peppermint leaves.

As with any essential oil, caution should be taken when using it. Essential oils are highly concentrated and should be diluted with a vegetable oil prior to external use to prevent adverse reactions, as some people are allergic to peppermint or its essential oil. The oil may cause a skin reaction if the dosage is excessive. Avoid contact with the eyes.

Precautions

Extreme caution should be used when administering to children under five years of age as the menthol can cause a choking reaction in young children.

Peppermint oil should not be applied to the faces of infants or small children.

The essential oil of peppermint should not be ingested unless under professional supervision.

Pure menthol or pure peppermint should not be ingested. Pure peppermint may cause an irregular heartbeat. Pure menthol is poisonous and fatal in doses as small as 1 tsp.

Pregnant women with a history of miscarriage should use peppermint with caution. Large amounts of peppermint may trigger a miscarriage. Additional caution should be practiced by women who are breast-feeding their infants.

Side effects

If the essential oil is not used properly it can cause **dermatitis** and other allergic reactions.

Rare reactions to enteric-coated capsules may occur. These reactions include skin rash, heartburn, slow heart rate, and muscle tremors.

Large internal doses of peppermint essential oil may result in kidney damage.

Interactions

Peppermint should not be used in conjunction with homeopathic treatment.

Resources

BOOKS

Foster, Steven, and Varro E. Tyler, Ph.D. *Tyler's Honest Herbal*. The Haworth Herbal Press, 1999.

PERIODICALS

Moxey, Beth."A Peppermint Twist: New Research Shows that a Whiff of Peppermint May Improve Your Run ning (Health and Fitness)."*Runner's World* (January 2002): 21.

"Peppermint Oil and Tea Best for Nose and Stomach, Not Lungs."*Environmental Nutrition* (January 1997):7.

Siegel Maier, Karyn. "Peppermint: More Than Just Another Pretty Flavor."*Better Nutrition* (February 1998): 24.

Jennifer Wurges
Teresa G. Odle

Periodontal disease *see* **Gum disease**

Peripheral neuropathy

Description

Peripheral neuropathy, sometimes called peripheral neuritis, is damage to the nerves that connect peripheral (outlying) portions of the body (especially the hands,

arms, legs, and feet) to the central nervous system. It may involve only one peripheral nerve (mononeuropathy) or several nerves (polyneuropathy).

Description

Similar to electrical wiring in a house, the body has a highly complex network of nerves made up of bundles of neurons, axons, and dendrites. This network originates in the brain and extends down through the spinal cord. These nerves branch off at junctures along this pathway to connect each portion of the body to the brain and spinal cord, the central nervous system. Nerves relay necessary information to and from every area, notifying the brain of sensations and external conditions. The brain, in turn, sends messages back to those areas. With peripheral neuropathy, damage has occurred to the nerves that connect peripheral portions of the body, and the patient feels **pain** or numbness.

Peripheral neuropathy is not usually considered a disease. It is more often thought of as a symptom of other diseases or conditions, or results from damage caused by the introduction of toxic substances. There are an estimated two million Americans who suffer from peripheral neuropathy. It becomes more common as people age, and the majority of its victims are 65 years old or older.

Causes and symptoms

The symptoms of peripheral neuropathy depend upon which type of nerve fiber is affected. Sensory nerve fiber damage is more likely to generate various sensations, while motor nerve fiber is more apt to result in weakening and wasting of muscle tissue in the affected area. It is a condition that develops quite gradually, usually over a period of months or even years. A tingling, prickly sensation in the toes and/or feet is commonly the first sign that is noticed, or there may be numbness in this area. Typically this feeling progresses to the lower legs, fingers, hands, arms, and then the trunk of the body in severe cases. As the situation worsens, the tingling sensation feels more like burning or severe discomfort followed by sharp, almost electric shock-like jabs of pain. These sensations may begin in the toes and feet, and then progress to other affected areas. Later symptoms often include increasing muscle weakness, poor coordination, numbness, and lack of feeling. **Urinary incontinence**, **diarrhea**, **constipation**, **impotence**, and postural hypotension (dramatic drops in blood pressure when a person stands) causing **dizziness** or dangerous falls are other potential negative effects, especially in the elderly.

KEY TERMS

Axons—The conducting fiber of a nerve cell. Axons vary from a fraction of an inch to several feet in length.

Carpal tunnel syndrome—Numbness, tingling, and pain in the thumb, index, and middle fingers that worsens at night. The condition may affect one or both hands and is sometimes accompanied by weakness in the thumb(s). The condition results from pressure on the median nerve where it passes into the hand via a gap (the carpal tunnel).

Charcot-Marie-Tooth syndrome (CMT)—The most common form of inherited peripheral neuropathy.

Dendrites—Branching projections that grow out of a nerve cell.

Intubation—The process of passing an endotracheal tube (breathing tube) into the trachea (windpipe).

Lupus—A chronic disease that causes inflammation of connective tissue. The more common type, discoid lupus erythematosus (DLE), affects exposed areas of the skin. The more serious and potentially fatal form, systemic lupus erythematosus (SLE), affects many systems of the body, including the joints and the kidneys.

Neurons—Nerve cells.

Rheumatoid arthritis—A type of joint inflammation where the joints of fingers, wrists, toes, and other joints in the body become painful, swollen, stiff, and in severe cases, deformed. The disease usually takes the form of recurring, moderate attacks.

Peripheral nerves are extended and delicate, easily damaged by a variety of things. Diabetes, **alcoholism**, diseases of the autoimmune system such as rheumatoid arthritis and lupus, and exposure to health damaging substances can cause peripheral neuropathy. Chronic liver and kidney disease, thyroid gland imbalances, bacterial or viral **infections**, and **cancer** can also cause the damage. Many of the strong anticancer drugs used and certain vitamin deficiencies can also lead to this condition. Repetitive mechanical actions that put pressure on a particular nerve, like the wrist in carpal-tunnel syndrome, or even inherited abnormalities in the body can cause peripheral neuropathy. However, in many cases no one single reason for this condition can be found.

Guillain-Barre syndrome, also called acute polyneuritis or ascending paralysis, is the only form of peripheral neuropathy that develops differently. It is a rare and very serious form that is believed to be caused by an autoimmune reaction to infection. Its primary difference from other types of peripheral neuropathy is the terrific rapidity of its onset.

A few rare forms of peripheral neuropathy are inherited. The best known inherited peripheral neuropathy is called Charcot-Marie-Tooth syndrome, or CMT. More than 20 different genes and loci on human chromosomes are now known to be associated with CMT.

Diagnosis

Because peripheral neuropathy can be caused by a variety of factors, outcomes vary depending upon the reason for the nerve damage. Some causes, such as vitamin or metabolic deficiencies, can be reversed if caught early; other causes may not be reversible. Because of these factors, early diagnosis is very important. A neurologist (a doctor who specializes in the nervous system) can diagnose the disorder, try to determine the cause, and assess the extent of the damage. Sensations of pain, temperature, and touch in various parts of the body are tested by observing the person's ability to respond to a stimulus. If areas of either hypersensitivity or loss of sensation are found, the boundaries of that feeling are mapped by further testing.

An electromyogram (EMG) tests the electrical activity occurring in muscles and can be used in the diagnostic process. X rays, blood tests, and muscle biopsies are common tests used in determining the cause of peripheral neuropathy. For example, blood tests that show elevated blood sugar would indicate diabetes, or elevated liver function tests or thyroid levels could indicate liver or thyroid disease.

Treatment

Treating the underlying cause of the peripheral neuropathy is the key to reversing this condition. For example, diabetics who closely follow their diabetic diet and keep their blood sugar in good control stand the best chance of recovering. Nutritional deficiencies often related to alcoholism may indicate that the person needs to stop drinking and requires vitamin supplements. Changes in lifestyle or treatment of the disease condition causing the neuropathy is a highly important facet of reversing, arresting, or simply reducing the symptoms of this uncomfortable condition.

Several simple self-care actions can also relieve symptoms. They include:

- That shoes and stockings should never be tight, but rather loose cotton socks and shoes with good support and padding should be worn. Good foot care includes daily or twice daily foot soaks in tepid to cool water for 15 minutes followed by application of a moistening cream.
- Keeping heavy bed covers off of feet at night either by turning back the covers or using a bed cradle.
- Improving circulation and stimulating regeneration of nerves by frequently massaging the affected areas and walking as much as possible. Hydrotherapy with whirlpool baths may also be used to improve circulation.
- Reducing the intake of caffeine and nicotine, both of which may increase pain.
- Lowering the stress level as much as possible, including taking steps to treat the depression and/or insomnia that often accompany peripheral neuropathy. This may include relaxation therapies or herbal remedies.

Herbal remedies used for peripheral neuropathy include gingko, **St. John's wort**, vervain, oats, and gotu kola. Nutritional supplements that may provide relief and are thought to help repair nerve fibers include supplemental **carnitine**, gamma-linolenic acid, alpha-lipoic acid, **magnesium**, **chromium**, **choline**, **inositol**, vitamins B_6 and B_{12}, **niacin**, **thiamine**, **biotin**, and **folic acid**. Additional therapies thought to provide relief include **detoxification** and **fasting**, used to cleanse the system and eliminate poisons that may cause nerve damage.

Control of symptoms is a significant part of the treatment. Pain relief is usually the highest priority. Bodywork such as massage and movement therapies like **t'ai chi** and **qigong** may provide relief. **Acupuncture** can also be used to promote general health and provide some symptomatic relief. **Meditation** or **yoga** may help with **relaxation** and pain control.

Another alternative approach to peripheral neuropathy is the **Feldenkrais** method, which works on improving the patient's sense of balance, and thus helps to prevent falls.

Allopathic treatment

It may take months for the symptoms to subside. Milder pain can be treated with over-the-counter pain medications, including Tylenol or aspirin, while more severe episodes of pain may require pain relievers such as nonsteroidal anti-inflammatory drugs (NSAIDs) like ibuprofen or naproxen, or narcotics such as codeine,

Demerol, or morphine. Sometimes tricyclic antidepressants such as Elavil, Tofranil, or Norpramin are used both for pain relief and the depression that may accompany chronic pain. Anticonvulsant medications such as Tegretol, Neurontin, or Dilantin are effective against electric-like, jabbing pain. Less frequently used drugs include heart and blood pressure drugs such as Mexitil and clonidine, which may alleviate burning sensations.

The acute onset and potentially serious symptoms that can develop in Guillain-Barre syndrome, including nerve and muscle damage affecting swallowing and breathing, make this the type of peripheral neuropathy most likely to require in-patient hospital treatment. The person suffering from this syndrome must be carefully monitored, may require intubation in order to breathe, and may even have blood plasma removed in order to reduce the number of antibodies in the blood.

Expected results

Full recovery from peripheral neuropathy is possible if the nerves are not damaged beyond repair. The outcome is dependent upon the extent of damage. Research is now being conducted that may lead to the manufacture of substances similar to the naturally produced chemicals in the body that stimulate repair of small nerve fibers.

The majority of people suffering from Guillain-Barre syndrome recover completely, often without even receiving medical treatment, but some will develop residual, permanent weakness in the affected area or have further episodes.

Prevention

The best way to prevent peripheral neuropathy is to treat the underlying disease or eliminate the toxic substance that may cause the symptoms.

Resources

BOOKS

Thomas, Clayton L., ed. *Taber's Cyclopedic Medical Dictionary*. F. A. Davis Co., 1997.

PERIODICALS

Kauffman, T. "Balance Falls Assessment: Low Tech to High Tech, Peripheral Neuropathy, and Alternative Considerations." *The Gerontologist* (October 15, 2001): 264.

Palau, F., A. Cuesta, L. Pedrola, et al. "Mutations in the Ganglioside Induced Differentiation Associated Protein 1 (GDAP1) Gene Cause Axonal Charcot Marie Tooth Disease." *American Journal of Human Genetics* 69 (October 2001): 196.

ORGANIZATIONS

MayoClinic.com. http://www.mayoclinic.com.

Joan Schonbeck
Rebecca J. Frey, PhD

Periwinkle

Description

An herbal remedy with a rich history in folk medicine, periwinkle is the common name for a pair of perennial flowering shrubs belonging to the dogbane (Apocynaceae) family. The herb has been used for centuries to treat a variety of ailments and was a favorite ingredient of magical charms in the Middle Ages. The purple-flowered plant was called sorcerer's violet by superstitious Europeans and was renowned for its

Periwinkle flower. *(©PlantaPhile, Germany. Reproduced by permission.)*

power to dispel evil spirits. There are two main varieties: lesser periwinkle (*Vinca minor*), which is also called common periwinkle, and greater periwinkle (*Vinca major*). Lesser periwinkle originated in Spain, France, and other areas of Europe but can now be found growing in many parts of the world, while greater periwinkle is native to southern Europe. While not widely recommended for medicinal purposes today, periwinkle is sometimes used to improve brain circulation and alleviate heavy menstrual periods. Only the aboveground parts of the plant are used as a drug.

It is important to distinguish lesser and greater periwinkle from a close relative called Madagascar periwinkle. The Latin name for this herb is *Catharanthus roseus*, but it was formerly classified as *Vinca rosea*, and is still called by that name in some of the herbal literature. Another member of the dogbane family, this plant originated on the island of Madagascar but now grows in the southern United States and many other temperate regions of the world. Madagascar periwinkle has been used for centuries to treat a variety of medical problems, from diabetes and eye **infections** to sore throats and tumors. Modern research has indicated that Madagascar periwinkle contains dozens of alkaloids, some of which may have the ability to lower blood sugar levels and stop bleeding. Two of these alkaloids, vincristine and vinblastine, are recognized by Western medicine as potent anticancer agents. (A shaman in Madagascar who used the plants to treat tumors and **cancer** gave Western scientists the lead.) They are used to make important prescription drugs. Madagascar periwinkle is not widely recommended as a dietary supplement because some of the alkaloids in the plant can cause serious and potentially dangerous side effects.

General use

While not approved by the Food and Drug Administration (FDA), periwinkle has been reported to have a number of beneficial effects. Unfortunately, there is scarcely any scientific evidence to support these claims. Both forms of the herb have been used as an astringent for centuries and may be useful in alleviating excessive bleeding during **menstruation**, according to some herbalists. Lesser periwinkle is generally recommended for improving circulation, particularly in the brain. Greater periwinkle has been used to combat nervousness or **anxiety** and help reduce high blood pressure. Periwinkle is also reputed to be effective in treating diabetes, perhaps by stimulating the pancreas.

While they do not recommend periwinkle for a wide variety of ailments, some practitioners of alternative medicine claim that the herb is useful in treating certain conditions. Periwinkle has been used as an effective astringent that can be used orally or topically. It is mainly used to treat excessive menstrual bleeding but may also be a helpful choice in cases of **colitis**, **diarrhea**, bleeding gums, **nosebleeds**, sore throats, and mouth ulcers.

Perhaps the most intriguing dietary supplement derived from periwinkle is vinpocetine, which is made from an alkaloid chemical in lesser periwinkle called vincamine. While vinpocetine is not what most people would consider a natural remedy, since it is produced via chemical manipulation in the laboratory, it is sold in the United States as a dietary supplement. Several studies of vinpocetine suggest that it may improve brain function and memory, particularly in people affected by diseases that decrease mental capacity such as **Alzheimer's disease** or **dementia**. In a double-blind, placebo-controlled trial published in the *Journal of the American Geriatrics Society* in 1987, vinpocetine appeared to improve the condition of several dozen elderly patients who suffered from mental impairment due to **aging**. Researchers found that the 42 patients who took vinpocetine for three months performed better on several tests of mental functioning than those in the placebo group. In the study, no significant side effects were associated with vinpocetine.

Exactly how vinpocetine works is unknown. According to one theory, vinpocetine may protect

KEY TERMS

Alkaloid—Any of a large class of bitter-tasting alkaline ring compounds that contain nitrogen and are common in plants. In addition to the alkaloids in periwinkle, nicotine, caffeine, morphine, and quinine belong to this class of compounds.

Astringent—An agent that helps to contract tissue and prevent the secretion of internal body fluids such as blood or mucus. Astringents are typically used to treat external wounds or to prevent bleeding from the nose or throat.

Diabetes—A disease in which the body either cannot produce adequate amounts of insulin or properly metabolize the hormone.

Pancreas—An organ behind the stomach that produces digestive enzymes and hormones such as insulin.

Placebo—A sugar pill or inactive agent often used in the control group of a medical study.

brain cells from damage caused by oxygen deprivation. The apparent effectiveness of vinpocetine, which is made partly from a chemical contained in lesser periwinkle, may help to explain the herb's traditional reputation as a brain booster. It is important to remember, however, that periwinkle itself has not been proven to have the same effects as vinpocetine.

Preparations

The optimum daily dosage of periwinkle has not been established with any certainty. Readers who wish to use this herb should follow the package directions for proper usage or consult a doctor experienced in the use of alternative remedies.

The dosage of vinpocetine is generally 30 mg a day, divided into three equal doses. Taking vinpocetine with food may enhance its effectiveness by increasing the amount of drug absorbed.

Precautions

Periwinkle is not known to be harmful when taken in recommended dosages, though it is important to remember that the long-term effects of taking the herb (in any amount) have not been investigated. Periwinkle should not be used by people with low blood pressure or **constipation**. Due to lack of sufficient medical study, periwinkle should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

Taking too much periwinkle can cause a potentially dangerous drop in blood pressure (symptoms include **dizziness** and fainting). In case of overdose, seek emergency care.

Vinpocetine should not be combined with certain medications or dietary supplements (see below).

Side effects

Periwinkle may cause flushing and gastrointestinal problems.

When taken in recommended dosages, vinpocetine is not associated with any bothersome or significant side effects.

Interactions

Periwinkle is not known to interact adversely with any drugs or dietary supplements. Periwinkle may be combined with cranesbill and agrimony. It may also be used in conjunction with beth root for menstrual problems.

Vinpocetine should not be combined with agents that thin the blood, except under medical supervision. These include drugs such as warfarin (Coumadin) and aspirin as well as dietary supplements like ginkgo, **vitamin E** in high dosages, and **garlic**.

Resources

BOOKS

Crellin, John K. and Jane Philpott. *A Reference Guide to Medicinal Plants: Herbal Medicine Past and Present*. Durham, NC: Duke University Press, 1997.

ORGANIZATIONS

American Botanical Council. PO Box 144345. Austin, TX 78714 4345.

OTHER

Discovery Health. http://www.discoveryhealth.com.

Greg Annussek

Pertussis *see* **Whooping cough**

Pet therapy

Definition

Animal-assisted therapy (AAT), also known as pet therapy, utilizes trained animals and handlers to achieve specific physical, social, cognitive, and emotional goals with patients.

Origins

The enjoyment of animals as companions dates back many centuries, perhaps even to prehistoric times. The first known therapeutic use of animals started in Gheel, Belgium in the ninth century. In this town, learning to care for farm animals has long been an important part of an assisted living program designed for people with disabilities.

Some of the earliest uses of animal-assisted healing in the United States were for psychiatric patients. The presence of the therapy animals produced a beneficial effect on both children and adults with mental health issues. It is only in the last few decades that AAT has been more formally applied in a variety of therapeutic settings, including schools and prisons, as well as hospitals, hospices, nursing homes, and outpatient care programs.

Pet therapy used to engage senior woman in an assisted living facility. *(© Mira / Alamy)*

KEY TERMS

Endorphins—A group of chemicals resembling opiates that are released in the body in response to trauma or stress. Endorphins react with opiate receptors in the brain to reduce pain sensations.

Benefits

Studies have shown that physical contact with a pet can lower high blood pressure, and improve survival rates for **heart attack** victims. There is also evidence that petting an animal can cause endorphins to be released. Endorphins are chemicals in the body that suppress the **pain** response. These are benefits that can be enjoyed from pet ownership, as well as from visiting therapeutic animals.

Many skills can be learned or improved with the assistance of a therapy animal. Patient rehabilitation can be encouraged by such activities as walking or running with a dog, or throwing objects for the animal to retrieve. Fine motor skills may be developed by petting, grooming, or feeding the animal. Patient communication is encouraged by the response of the animal to either verbal or physical commands. Activities such as writing or talking about the therapy animals or past pets also develop cognitive skills and communication. Creative inclusion of an animal in the life or therapy of a patient can make a major difference in the patient's comfort, progress, and recovery.

Description

The way in which AAT is undertaken depends on the needs and abilities of the individual patient. Dogs are the most common visiting therapy animals, but cats, horses, birds, rabbits, and other domestic pets can be used as long as they are appropriately screened and trained.

For patients who are confined, small animals can be brought to the bed if the patient is willing and is not allergic to the animal. A therapeutic plan may include a simple interaction aimed at improving communication and small motor skills, or a demonstration with educational content to engage the patient cognitively.

If the patient is able to walk or move around, more options are available. Patients can walk small animals outside, or learn how to care for farm animals. Both of these activities develop confidence and motor abilities. Horseback riding has recently gained great therapeutic popularity. It offers an opportunity to work on balance, trunk control, and other skills. Many patients who walk with difficulty, or not at all, get great emotional benefit from interacting with and controlling a large animal.

One advantage of having volunteers provide this service is that cost and insurance are not at issue.

Precautions

AAT does not involve just any pet interacting with a patient. Standards for the training of the volunteers and their animals are crucial in order to promote a safe, positive experience for the patient. Trained volunteers will understand how to work with other medical professionals to set goals for the patient and keep records of progress. Animals that have been appropriately trained are well socialized to people, other animals, and medical equipment. They are not distracted by the food and odors that may be present in the therapy environment and will not chew inappropriate objects or mark territory.

Animals participating in AAT should be covered by some form of liability insurance.

Research and general acceptance

The research evidence supporting the efficacy of AAT is slim, although the anecdotal support is vast. Although it may not be given much credence by medical personnel as a therapy with the potential to assist the progress of the patients, some institutions do at least allow it as something that will uplift the patients or distract them from their discomforts.

Training and certification

AAT is carried out by volunteers who are trained to provide therapy along with their animals. There are a growing number of groups that will provide screening and certification. These include Delta Society, Therapy Dogs Inc., Therapy Dogs International, and St. John Ambulance Therapy Dogs in Canada. Each program has somewhat different qualifications. The Pet Partners Program sponsored by Delta is exemplary. Animals receive a veterinary screening, an aptitude test to evaluate socialization, and a skills test of training and behavior. The owner also receives training hours and agrees to a code of ethics in order to join Pet Partners.

Resources

BOOKS

Burch, Mary. *Volunteering With Your Pet*. New York: Howell Book House, 1996.

ORGANIZATIONS

Delta Society. http://www.deltasociety.org/.

Judith Turner

Pharyngitis *see* **Sore throat**

Phlebitis

Definition

Thrombophlebitis is the inflammation of a vein, with **blood clots** forming inside the vein at the site of inflammation. Thrombophlebitis is also known as phlebitis, phlebothrombosis, and venous thrombosis.

Description

There are two aspects of thrombophlebitis, inflammation of a vein and blood clot formation. If the inflammation component is minor, the disease is usually called venous thrombosis or phlebothrombosis. Thrombophlebitis can occur in both deep veins and superficial veins, but most often occurs in the superficial veins of the extremities (legs and arms). Most cases occur in the legs. When thrombophlebitis occurs in a superficial vein, one that is near the surface of the skin and is visible to the eye, the disease is called superficial thrombophlebitis. Any form of injury to a blood vessel can result in thrombophlebitis. In the case of superficial thrombophlebitis, the blood clot usually attaches firmly to the wall of the affected blood vein. Since superficial veins do not have muscles that massage the veins and help the blood to circulate, blood clots in superficial veins tend to remain where they form and seldom break loose. When thrombophlebitis occurs in a deep vein, a vein that runs deep within muscle tissue, it is called deep venous thrombosis. Deep venous thrombosis presents the threat of producing blood clots that will break loose to form emboli. Emboli are clumps of cells that are carried by the circulation to other tissues where they can lodge and block the blood supply. Emboli typically come to rest in the lungs and cause tissue damage that can sometimes be serious or fatal.

Causes and symptoms

The main symptoms of phlebitis are tenderness and **pain** in the area of the affected vein. Redness and/or swelling may also be seen. In the case of deep venous thrombosis, there is more swelling than is caused by superficial thrombophlebitis, and the patient may experience muscle stiffness in the affected area. There are many causes of thrombophlebitis. The main causes can be grouped into three categories: injury to veins, increased blood clotting, and blood stasis. When blood veins are damaged, collagen in the vein wall is exposed. Platelets respond to collagen by initiating the clotting process. Damage to a vein can occur as a consequence of in-dwelling catheters, trauma, infection, Buerger's disease, or the injection of irritating substances. Increased tendency of the blood to clot can be caused by malignant tumors, genetic disorders, high-fat **diets**, and oral contraceptives. Stasis, in which the blood clots due to decreased blood flow in an area, can happen following surgery, as a consequence of **varicose veins**, as a complication of postpartum states, and following prolonged bed rest. In the case of prolonged bed rest, blood clots form because of inactivity, allowing blood to move sluggishly and stagnate (collect) in the veins. Stasis can lead to blood clots. These clots (also called emboli) are sometimes released when the patient stands up and

KEY TERMS

Emboli, embolus—Emboli is the plural form of embolus. Embolus refers to any mass of air, blood clot, or foreign body that travels through the bloodstream and is capable of lodging in smaller blood vessels where it can obstruct the blood flow to that vessel.

Embolism—The obstruction of a blood vessel by a blot clot.

Phlebitis—Inflammation of a vein.

Stasis—Stagnation in the flow of blood or any body fluid.

Thrombus—A blood clot that forms within a blood vessel or the heart.

resumes activity. Emboli can present a problem if they lodge in vital organs. In the case of postpartum patients, a **fever** developing four to 10 days after delivery may indicate thrombophlebitis. It is also known that thrombophlebitis in some patients involves hereditary factors, including mutations of genes that control the amount of clotting factors in the blood.

Questions have been raised in recent years as to whether frequent long-distance air travel increases the risk of thrombophlebitis in airline pilots and passengers. As of 2001, studies of the effects of long-distance flights on blood circulation in human test subjects have yielded conflicting results.

Diagnosis

In superficial thrombophlebitis, the location of the clot can sometimes be seen by the unaided eye. Blood clots are hard and can usually be detected by a physician using palpation (massage). Deep venous thrombosis requires specialized diagnostic instruments to detect the blood clot. Among the instruments a physician may use are ultrasound and x ray, coupled with dye injection (venogram).

Treatment

While patients have to rely on conventional medicine to resolve major blood clots in the veins, alternative therapies help prevent future blood clots and bring relief from pain due to superficial thrombophlebitis.

Physical therapy

Physical therapy helps prevent blood clots in patients who are temporary bed-ridden after a major surgery or accidents. Physical therapists help patients **exercise** their arms and legs while they are restricted in bed, use massage to stimulate muscles, and encourage them to regain their mobility as soon as possible.

Nutritional therapy

The following dietary changes may help prevent phlebitis and further vein damage:

- Limit fat intake. Saturated and hydrogenated fats are associated with increased risk of thrombosis and poor blood circulation.
- Eat a heart-healthy, high-fiber diet with emphasis on fruits, vegetables, grains, beans, nuts and seeds, and fish.
- Eat lots of garlic, ginger, onions, and hot pepper. These spices have blood-thinning activity and prevent clot formation.
- Increase consumption of cherries, blueberries, and blackberries. They contain chemicals called proanthocyanidins and anthocyanidins that help improve vein function and keep veins healthy.
- Take nutritional supplements. Supplements that help prevent blood clots and keep veins healthy include B-complex vitamins, especially folic acid (2,500 mg/day), vitamin B_6 (25 mg/day) and vitamin B_{12} (2 mcg/day); vitamin C (500 - 3,000 mg/day) and vitamin E (800 - 1,200 IU).

Herbal therapy

Several herbs help keep veins healthy and strong and/or prevent blood clots. They include:

- Butcher's broom (*Ruscus aculeatus*)
- Gingko biloba
- Gotu Kola (*Centella asiatica*)
- Horse chestnut (*Aesculus hippocastanum*)
- Bromelain (a natural enzyme found in pineapple that inhibits clot formation, therefore preventing thrombophlebitis)

Allopathic treatment

Superficial thrombophlebitis usually resolves without treatment. Application of heat or anti-inflammatory drugs (aspirin or ibuprofen) can help relieve the pain. It can take from several days to several weeks for the clot to resolve and the symptoms to completely disappear. Rarely, anticoagulant drugs may be administered.

Deep venous thrombosis is a serious condition. To prevent pulmonary embolism, anticoagulant drugs are given and the patient's limbs are elevated. The primary objective in treating deep venous thrombosis (DVT) is prevention of a pulmonary embolism. The

patient usually is hospitalized during initial treatment. The prescribed anticoagulant drugs limit the ability of blood clots to grow and new clots to form. Sometimes, a drug that dissolves blood clots is administered. Recent advances in drug treatment of DVT include the use of low molecular weight heparin (LMWH), which is safer for use in pregnant women and also allows more patients with DVT to be treated on an outpatient basis.

Surgery may be used to treat DVT if the affected vein is likely to present a long term threat of producing blood clots that will release emboli. The affected veins are either removed or tied off to prevent the release of the blood clots. Tying off superficial blood veins is an outpatient procedure that can be performed with local anesthesia. The patient is capable of immediately resuming normal activities.

Expected results

Superficial thrombophlebitis seldom progresses to a serious medical complication, although non-lethal embolisms may be produced. Deep venous thrombosis may lead to embolism, especially pulmonary embolism. This is a serious consequence of deep venous thrombosis, and is sometimes fatal.

Prevention

To prevent phlebitis, people should eat a high-fiber, heart-healthy diet and engage in regular physical exercises such as walking, bicycling, or running. If temporarily bedridden, they should stretch their arms and legs frequently and try to become mobile as soon as possible.

Resources

BOOKS

Alexander, R.W., R. C. Schlant, and V. Fuster, eds. *The Heart,* 9th edition. New York: McGraw Hill, 1998.

Berkow, Robert, ed. *Merck Manual of Medical Information*. Whitehouse Station, NJ: Merck Research Laboratories, 1997.

Larsen, D.E., ed. *Mayo Clinic Family Health Book* New York: William Morrow and Company, Inc., 1996.

Murray, Michael T., and Joseph Pizzorno. "Varicose Veins." In *Encyclopedia of Natural Medicine, revised 2nd ed.* Rocklin, CA: Prima Publishing, 1998.

"Phlebitis." In *Prevention's Healing with Vitamins: The Most Effective Vitamin and Mineral Treatment for Everyday Health Problems and Serious Disease From Allergies and Arthritis to Water Retention and Wrinkles*. Emmaus, PA: Rodale Press, Inc., 1996.

"Phlebitis/Venous Thrombosis." In *Reader's Digest Guide to Medical Cures & Treatments: A Complete A to Z Sourcebook of Medical Treatments, Alternative Options, and Home Remedies*. Canada: Reader's Digest Association, Inc., 1996.

PERIODICALS

Egermayer, Paul. "The 'economy class syndrome': Problems with the assessment of risk factors for venous thromboembolism." *Chest* 120 (October 2001): 1047 1048.

Evans, A. D. B., and R. V. Johnston. "Venous Thromboembolic Disease in Pilots." *Lancet* 358 (November 17, 2001): 1734.

Ulutin, T. A., J. Altinisik, H. O. Ates, et al. "Screening of Factor V Leiden (G1691A), Prothrombin G20210A and Protein C Mutations in Thrombosis Patients." *American Journal of Human Genetics* 69 (October 2001): 430.

Zoler, Mitchel L., and Winnie Anne Imperio. "Drug Update: Outpatient Treatment of Deep Vein Thrombosis." *Internal Medicine News* 34 (December 1, 2001): 24.

Mai Tran
Rebecca J. Frey, PhD

Phobias

Definition

A phobia is an intense but unrealistic fear that can interfere with the ability to socialize, work, or go about everyday life, brought on by an object, event or situation.

Description

Just about everyone is afraid of something—an upcoming job interview or being alone outside after dark. But about 18% of all Americans are tormented by irrational fears that interfere with their daily lives. They aren't crazy—they know full well their fears are unreasonable—but they can't control the fear. These people suffer from phobias.

Phobias belong to a large group of mental problems known as **anxiety** disorders that include **obsessive-compulsive disorder** (OCD), **panic disorder**, and **post-traumatic stress disorder**. Phobias themselves can be divided into three specific types:

- specific phobias
- social phobia
- agoraphobia

Specific phobias

As its name suggests, a specific phobia is the fear of a particular situation or object, including anything

KEY TERMS

Agoraphobia—A phobia characterized by intense fear of open or public places with no way to leave or escape easily if panic develops.

Benzodiazepine—A class of drugs that have a hypnotic and sedative action, used mainly as tranquilizers to control symptoms of anxiety.

Beta blockers—A group of drugs usually prescribed to treat heart conditions, but are also used to reduce the physical symptoms of anxiety and phobias, such as sweating and palpitations.

Monoamine oxidase inhibitors (MAO inhibitors)—A class of antidepressants used to treat social phobia.

Neuroimaging—The use of x ray studies and magnetic resonance imaging (MRIs) to detect abnormalities or trace pathways of nerve activity in the central nervous system.

Selective serotonin reuptake inhibitors (SSRIs)—A class of antidepressants that work by blocking the reabsorption of serotonin in the brain, raising the levels of serotonin. SSRIs include Prozac, Zoloft, and Paxil.

Serotonin—One of three major types of neurotransmitters found in the brain that is linked to emotions.

Specific phobia—An intense but irrational fear of a specific place, object, or animal. Common specific phobias include fear of spiders, snakes, or dogs; fear of flying or highway driving; fear of blood; and fear of elevators and other closed spaces.

from airplane travel to dentists. Found in one out of every 10 Americans, specific phobias seem to run in families and are roughly twice as likely to appear in women. If the person doesn't often encounter the feared object, the phobia doesn't cause much harm. However, if the feared object or situation is common, it can seriously disrupt everyday life. Common examples of specific phobias, which can begin at any age, include fear of snakes, flying, dogs, escalators, elevators, high places, disease, or open spaces.

Social phobia

People with social phobia have deep fears of being watched or judged by others and being embarrassed in public. This may extend to a general fear of social situations—or be more specific, such as a fear of giving speeches or of performing (stage fright). More rarely, people with social phobia may have trouble using a public restroom, eating in a restaurant, or signing their name in front of others.

Social phobia is not the same as shyness. Shy people may feel uncomfortable with others, but they don't experience severe anxiety, they don't worry excessively about social situations beforehand, and they don't avoid events that make them feel self-conscious. On the other hand, people with social phobia may not be shy—they may feel perfectly comfortable with people except in specific situations. Social phobias may be only mildly irritating, or they may significantly interfere with daily life. It is not unusual for people with social phobia to turn down job offers or avoid relationships because of their fears.

Agoraphobia

Agoraphobia is the intense fear of feeling trapped and having a panic attack in a public place. It usually begins between ages 15 and 35, and affects three times as many women as men—about 3% of the population.

An episode of spontaneous panic is usually the initial trigger for the development of agoraphobia. After an initial panic attack, the person becomes afraid of experiencing a second one. Sufferers literally fear the fear, and worry incessantly about when and where the next attack may occur. As they begin to avoid the places or situations in which the panic attack occurred, their fear generalizes. Eventually the person completely avoids public places. In severe cases, people with agoraphobia can no longer leave their homes for fear of experiencing a panic attack.

Causes and symptoms

Experts don't really know why phobias develop, although research suggests they may arise from a complex interaction between heredity and environment. Some hypersensitive people have unique chemical reactions in the brain that cause them to respond much more strongly to **stress**. These people also may be especially sensitive to **caffeine**, which triggers certain brain chemical responses.

Advances in neuroimaging have also led researchers to identify certain parts of the brain and specific neural pathways that are associated with phobias. One part of the brain that is currently being studied is the amygdala, an almond-shaped body of nerve cells involved in normal fear conditioning. Another area of the brain that appears to be linked to phobias is the posterior cerebellum.

While experts believe the tendency to develop phobias runs in families and may be hereditary, a specific stressful event usually triggers the development of a specific phobia or agoraphobia. For example, someone predisposed to develop phobias who experiences severe turbulence during a flight might go on to develop a phobia about flying.

Social phobia typically appears in childhood or adolescence, sometimes following an upsetting or humiliating experience. Certain vulnerable children who have had unpleasant social experiences (such as being rejected) or who have poor social skills may develop social phobias. The condition also may be related to low self-esteem, unassertive personality, and feelings of inferiority.

A person with agoraphobia may have a panic attack at any time for no apparent reason. While the attack may last only a minute or so, the person remembers the feelings of panic so strongly that the possibility of another attack becomes terrifying. For this reason, people with agoraphobia avoid places where they might not be able to escape if a panic attack occurs.

While the specific trigger may differ, the symptoms of different phobias are remarkably similar (e.g., feelings of terror and impending doom, rapid heartbeat and breathing, sweaty palms, and other features of a panic attack). Patients may experience severe anxiety symptoms in anticipating a phobic trigger. For example, someone who is afraid to fly may begin having episodes of pounding heart and sweating palms at the mere thought of getting on a plane in two weeks.

Diagnosis

A mental health professional can diagnose phobias after a detailed interview and discussion of both mental and physical symptoms. Social phobia is often associated with other anxiety disorders, **depression**, or **substance abuse**.

Treatment

People who have a specific phobia that is easy to avoid (such as snakes) and that doesn't interfere with their lives may not need to seek treatment. In all types of phobias, symptoms may be eased by lifestyle changes, such as:

- eliminating caffeine
- cutting down on alcohol
- eating a good diet
- getting plenty of exercise
- reducing stress

Meditation and mindfulness training can be beneficial to patients with phobias and panic disorder. **Hydrotherapy**, **massage therapy**, and **aromatherapy** are useful to some anxious patients because they can promote general **relaxation** of the nervous system. Relaxation training, which is sometimes called anxiety management training, includes breathing exercises and similar techniques intended to help the patient prevent hyperventilation and relieve the muscle tension associated with the fight-or-flight reaction of anxiety. **Yoga**, aikido, **t'ai chi**, and **dance therapy** help patients work with the physical, as well as the emotional, tensions that either promote or are created by anxiety.

Herbs known as adaptogens may be prescribed to treat the anxiety related to phobias. These herbs are thought to promote adaptability to stress, and include **Siberian ginseng** (*Eleutherococcus senticosus*), and ginseng (*Panax ginseng*). Adrenal modulators such as **licorice** (*Glycyrrhiza glabra*) and borage (*Borago officinalis*), nervine herbs such as **chamomile** (*Chamaemelum nobile*) and **skullcap** (*Scutellaria lateriafolia*), and antioxidal herbs like **milk thistle** (*Silybum marianum*) are also beneficial. Tonics of skullcap and oats (*Avena sativa*) may also be recommended to ease anxiety.

Allopathic treatment

When phobias interfere with a person's daily life, a combination of **psychotherapy** and medication can be quite effective. Medication can block the feelings of panic, and when combined with cognitive-behavioral therapy, can be quite effective in reducing specific phobias and agoraphobia.

Cognitive-behavioral therapy adds a cognitive approach to more traditional **behavioral therapy**. It teaches patients how to change their thoughts, behavior, and attitudes, while providing techniques to lessen anxiety, such as deep breathing, muscle relaxation, and refocusing.

One cognitive-behavioral therapy is desensitization (also known as exposure therapy), in which people are gradually exposed to the frightening object or event until they become used to it and their physical symptoms decrease. For example, someone who is afraid of snakes might first be shown a photo of a snake. Once the person can look at a photo without anxiety, he might then be shown a video of a snake. Each step is repeated until the symptoms of fear (such as pounding heart and sweating palms) disappear. Eventually, the person might reach the point where he can actually

touch a live snake. Three-fourths of patients are significantly improved with this type of treatment.

Another more dramatic cognitive-behavioral approach is called flooding, which exposes the person immediately to the feared object or situation. The person remains in the situation until the anxiety lessens.

Several drugs are used to treat specific phobias by controlling symptoms and helping to prevent panic attacks. These include anti-anxiety drugs (benzodiazepines) such as alprazolam (Xanax) or diazepam (Valium). Blood pressure medications called beta blockers, such as propranolol (Inderal) and atenolol (Tenormin), appear to work well in the treatment of circumscribed social phobia, when anxiety gets in the way of performance, such as public speaking. These drugs reduce overstimulation, thereby controlling the physical symptoms of anxiety.

In addition, some antidepressants may be effective when used together with cognitive-behavioral therapy. These include the monoamine oxidase inhibitors (MAO inhibitors) phenelzine (Nardil) and tranylcypromine (Parnate), as well as selective serotonin reuptake inhibitors (SSRIs) like fluoxetine (Prozac), paroxetine (Paxil), sertraline (Zoloft), and fluvoxamine (Luvox).

A medication that shows promise as a treatment for social phobia is valproic acid (Depakene or Depakote), which is usually prescribed to treat seizures or to prevent migraine headaches. Researchers conducting a twelve-week trial with 17 patients found that about half the patients experienced a significant improvement in their social anxiety symptoms while taking the medication. Further studies are underway.

Treating agoraphobia is more difficult than other phobias because there are often so many fears involved, such as open spaces, traffic, elevators, and escalators. Treatment includes cognitive-behavioral therapy with antidepressants or anti-anxiety drugs. Paxil and Zoloft are used to treat panic disorders with or without agoraphobia.

Expected results

Phobias are among the most treatable mental health problems; depending on the severity of the condition and the type of phobia, most properly treated patients can go on to lead normal lives. Research suggests that once a person overcomes the phobia, the problem may not return for many years—if at all.

Untreated phobias are another matter. Only about 20% of specific phobias will go away without treatment, and agoraphobia will get worse with time if untreated. Social phobias tend to be chronic, and without treatment, will not likely go away. Moreover, untreated phobias can lead to other problems, including depression, **alcoholism**, and feelings of shame and low self-esteem.

A group of researchers in Boston reported in 2003 that phobic anxiety appears to be a risk factor for **Parkinson's disease** (PD) in males, although it is not yet known whether phobias cause PD or simply share an underlying biological cause.

While most specific phobias appear in childhood and subsequently fade away, those that remain in adulthood often need to be treated. Unfortunately, most people never get the help they need; only about 25% of people with phobias ever seek help to deal with their condition.

Prevention

There is no known way to prevent the development of phobias. Medication and cognitive-behavioral therapy may help prevent the recurrence of symptoms once they have been diagnosed. Early detection and treatments may decrease severity.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition, text revision. Washington, DC: American Psychiatric Association, 2000.

Bloomfield, Harold H. *Healing Anxiety with Herbs*. New York: Harper Collins, 1998.

Peurifoy, Reneau Z. *Anxiety, Phobias and Panic: A Step by Step Program for Regaining Control of Your Life*. New York: Warner Books, 1996.

"Phobic Disorders. " Section 15, Chapter 187 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Schneier, Franklin, and Lawrence Welkowitz. *The Hidden Face of Shyness: Understanding and Overcoming Social Anxiety*. New York: Avon Books, 1996.

Stern, Richard. *Mastering Phobias: Cases, Causes and Cures*. New York: Penguin USA, 1996.

PERIODICALS

Kinrys, G., M. H. Pollack, N. M. Simon, et al. "Valproic Acid for the Treatment of Social Anxiety Disorder." *International Clinical Psychopharmacology* 18 (May 2003): 169 172.

Modica, Peter. "Social phobia may run in the family." *American Journal of Psychiatry* 155 (1998): 90 97.

Ploghaus, A., L. Becerra, C. Borras, and D. Borsook. "Neural Circuitry Underlying Pain Modulation:

Expectation, Hypnosis, Placebo." *Trends in Cognitive Science* 7 (May 2003): 197 200.
Rauch, S. L., L. M. Shin, and C. I. Wright. "Neuroimaging Studies of Amygdala Function in Anxiety Disorders." *Annals of the New York Academy of Sciences* 985 (April 2003): 389 410.
Weisskopf, M. G., H. Chen, M. A. Schwarzschild, et al. "Prospective Study of Phobic Anxiety and Risk of Parkinson's Disease." *Movement Disorders* 18 (June 2003): 646 651.

ORGANIZATIONS

Agoraphobics Building Independent Lives. 1418 Lorraine Ave., Richmond, VA 23227.
Agoraphobics In Motion. 605 W. 11 Mile Rd., Royal Oak, MI 48067.
American Psychiatric Association (APA). 1400 K Street, NW, Washington, DC 20005. (888) 357 7924. http://www.psych.org.
Anxiety Disorders Association of America. 11900 Parklawn Dr., Ste. 100, Rockville, MD 20852. (301) 231 9350.
National Anxiety Foundation. 3135 Custer Dr., Lexington, KY 40517. (606) 272 7166. http://www.lexington online.com/naf.html.
National Institute of Mental Health (NIMH) Office of Communications. 6001 Executive Boulevard, Room 8184, MSC 9663, Bethesda, MD 20892 9663. (866) 615 NIMH or (301) 443 4513. http://www.nimh.nih.gov.

OTHER

Anxiety Network Homepage. http://www.anxietynetwork.com.
National Institute of Mental Health (NIMH). *Anxiety Disorders*. NIH Publication No. 02 3879. Bethesda, MD: NIMH, 2002.

Paula Ford-Martin
Rebecca J. Frey, PhD

Phosphorus

Description

Phosphorus (chemical symbol P) is a chemical element discovered by the German alchemist Hennig Brand in 1669. It plays an essential part in multiple biochemical reactions for both plants and animals and is essential to all life. Phosphorus is found in living things and in soil and rock, mostly as chemical compounds known as phosphates. Rock and soil phosphorus are mined extensively throughout the world, but especially in the People's Republic of China and the United States.

Elemental phosphorus exists in a number of allotropic forms, primarily white, red, and black phosphorus. Allotropes are forms of an element with differing physical and chemical properties. White (also called yellow or common) phosphorus is a wax-like substance formed by heating phosphorus until it vaporizes and the condensate solidifies. One of this form's characteristics has given the English language the adjective *phosphorescent*, from white phosphorus's tendency to glow in the dark when exposed to air.

White phosphorus is highly toxic, causes **burns** if it comes in contact with skin, and is so combustible that it has to be stored underwater for safety. Red phosphorus is a rust-colored powder created by heating white phosphorus and exposing it to sunlight. It is not as combustible as the white form. Black phosphorus is made by heating white phosphorus under extremely high pressure until it resembles graphite.

In plants, phosphorus is necessary for photosynthesis to take place. In the human body, phosphorus works in tandem with another element, **calcium**, in much the same way that two other electrolyte components, **sodium** and **potassium**, do. Though phosphorus is found in every cell of the human body and accounts for 1% of the body's total weight, its primary function is working in conjunction with calcium to form teeth and bones.

Eighty-five percent of the phosphorus found in the body is located in these structures. In a delicately balanced chemical reaction, parathyroid hormone (PTH), alcitonin, and 25-dihydroxy **vitamin D** regulate the absorption of both calcium and phosphorus from the intestinal tract, thus making it available for the production of bones and teeth. If an excessive amount of phosphorus is absorbed, the phosphorus combines with all available calcium and prevents the calcium's efficient use in making and maintaining bones and teeth.

PTH balances the proportions of calcium and phosphorus in the body by increasing the release of calcium and phosphate from bone and the loss of phosphorus via the kidneys while limiting the excretion of calcium. PTH also increases the activity of the 25-Dihydroxy v25-Dihydroxy vitamin D, which, in contrast, increases the absorption of both phosphorus and calcium from the intestinal tract.

General use

Compounds of phosphorus are used to make fertilizers, detergents, and water softeners. They are also used in the manufacture of steel, plastics, insecticides, medical drugs, and animal feeds. Phosphorus is used in the manufacture of safety matches and pesticides, including rat poison.

Phosphorus found in the blood stream and in soft tissue has a highly significant role to play in a variety of body functions. Working with vitamin B, phosphorus is involved in the metabolism of fats and carbohydrates, in both the repair of damaged cells and tissues and the routine maintenance of healthy ones. Phosphorus is necessary for the regularity of the heartbeat and aids in the contraction of all other muscles throughout the body. Phosphorus is needed for the functioning of the kidneys and plays a part in the conduction of impulses along the network that makes up the nervous system.

Preparations

According to the American Dietetic Association, phosphorus intake in the United States is generally above what is needed and in the 1990s and 2000s actually increased. Therefore, under normal circumstances with normal food intake, there is seldom if ever a need to supplement intake of phosphorus. Persons suffering from eating disorders such as anorexia and bulimia can be deficient in phosphorus intake as well as other nutrients. As the best source of phosphorus is in protein foods such as meat, eggs, and milk products. Some vegetarians may also need to evaluate their intake of this element. Excess consumption of processed foods, inadequate intake of whole foods, and fertilizers and pesticides are some of the causes for excess phosphorus.

Beside high-protein foods, phosphorus is also found in decreasing quantities in wholegrain breads and cereals, especially unprocessed ones, and in minute amounts in fruits and vegetables. The phosphorus present in wholegrain breads and cereals, however, exists as a substance called *phytin*. Phytin combines with calcium to create a salt that the human body is incapable of absorbing, thus making grains that are unprocessed and not enriched a negligible source of phosphorus. But both commercially prepared cereals and breads may provide this element as they are frequently enriched with it. Phosphates can also be taken by mouth as a tablet.

Precautions

White phosphorus is poisonous. Red phosphorus is not. As noted, white phosphorus is a highly toxic, flammable substance capable of burning the skin on contact, and of igniting at room temperature. It should be handled with extreme care. Accidental phosphorus poisoning can happen from both fertilizers and pesticides. Humans rarely come into contact with elemental phosphorus, so these precautions apply primarily to

KEY TERMS

Anorexia nervosa—A serious and sometimes fatal eating disorder characterized by intense fear of being fat and severe weight loss. It primarily affects teenage and young adult females. Sufferers have a distorted body image wherein they see themselves as fat even when they are at normal weight or even emaciated.

Bulimia—An eating disorder characterized by bouts of gross overeating usually followed by self-induced vomiting.

Calcitonin—A hormone produced by the thyroid gland that controls the calcium level in the blood by slowing the rate that calcium is lost from bone.

Deciliter—A fluid measurement that is equal to one-tenth of a liter, or 100 cubic centimeters (27 fluid drams or teaspoonfuls).

Diabetic ketoacidosis—A potentially serious condition in which ketones become present in the blood stream because of the metabolism of fats *burned* in lieu of carbohydrates that would normally be used, which occurs because there is insufficient insulin available to cause carbohydrates to be used as fuel.

Electrolyte—Substances that split into ions, or electrically charged particles, within the body to regulate many important bodily processes. Examples of electrolytes are sodium, potassium, hydrogen, magnesium, calcium, bicarbonate, phosphates, and chlorides.

Multiple endocrine neoplasia—Tumor formation characterized by a progressive, abnormal multiplication of cells that are not necessarily malignant in any of the glands that secrete chemicals directly into the blood stream, such as the thyroid gland, adrenal glands, or ovaries.

Osteomalacia—Softening, weakening, and removal of the minerals from bone in adults caused by vitamin D deficiency.

Osteoporosis—Loss of formative protein tissue from bone, causing it to become brittle and easily fractured; considered a normal part of aging, but with hormonal causes that make it much more common in women than men.

Sarcoidosis—A rare disease of unknown cause as of 2008 that occurs mostly in young adults. Inflammation occurs in the lymph nodes and other tissues throughout the body, usually including the lungs, liver, skin, and eyes.

workers in the phosphorus industry. Phosphates sometimes are leached into water systems through sewage and can drastically alter the chemical makeup of lakes and rivers. In sufficient quantities, they can lead to the death of nearly all forms of aquatic life.

A normal blood serum level of phosphorus is 2.4–4.1 mg per deciliter of blood. An abnormal serum phosphorus level should be evaluated by a physician.

Phosphorus levels higher than normal can indicate a diet that includes an excessive phosphorus intake, inadequate intake of calcium, or lack of PTH (parathyroid hormone) in the system. It can be related to bone metastasis associated with **cancer**, liver or kidney disease, or *sarcoidosis*.

Serum phosphorus levels that are below normal can be related to insufficient phosphorus or vitamin D in one's diet leading to rickets in children and osteomalacia in adults. Disorders of the parathyroid gland, causing it to secrete excessive quantities of PTH, or of the pancreas, causing it to secrete too much insulin, also affect blood levels of phosphorus. Diabetic ketoacidosis or too much calcium are other possible causes. Multiple endocrine neoplasia (MEN) is yet another condition that often is associated with lower than normal levels of phosphorus.

Side effects

Phosphorus preparations taken to supplement low phosphorus levels in the body can cause **diarrhea**.

Interactions

Antacids can decrease the absorption of phosphorus. Laxatives and enemas that contain the chemical compound sodium phosphate and excessive intake of vitamin D can increase phosphorus levels in the body. Administration of intravenous glucose solutions will cause phosphorus to combine with the glucose that is being absorbed by the cells.

Resources

BOOKS

Berdanier, Carolyn D., and Janos Zempleni. *Advanced Nutrition: Macronutrients, Micronutrients, and Metab olism*. Boca Raton, FL: CRC Press, 2008.

Panel on Macronutrients. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Choles terol, Protein, and Amino Acids (Macronutrients)*. Washington, DC: National Academies Press, 2005.

Shils, Maurice E., et al., eds. *Modern Nutrition in Health and Disease,* 10th ed. Philadelphia: Lippincott Williams & Wilkins, 2005.

PERIODICALS

Karp, H., et al. "Acute Effects of Different Phosphorus Sources on Calcium and Bone Metabolism in Young Women: A Whole Foods Approach." *Calcified Tissue International* (April 2007): 251 258.

Rigo, Jacques, et al. "Enteral Calcium, Phosphate and Vitamin D Requirements and Bone Mineralization in Preterm Infants." *Acta Pædiatrica* (July 2007): 969 974.

OTHER

"Phosphorus." Linus Pauling Institute, August 2007. http://lpi.oregonstate.edu/infocenter/minerals/phosphorus/. (February 19, 2008).

"Nutrition Fact Sheet: Phosphorus." Northwesternutrition, July 2007. http://www.feinberg.northwestern.edu/nutrition/factsheets/phosphorus.html. (February 19, 2008).

Joan Schonbeck
David Edward Newton, Ed.D.

Phytolacca

Definition

Phytolacca is a genus of plants belonging to the family Phytolaccaceae, commonly known as the pokeweeds. That common name is also used for members of the genus Phytolacca. Some well known members of the genus include "P. americana", native to North America; "P. dioica" (South America); "P. decadra" (North America); "P. heteropetala" (Mexico); "P. icosandra (South America); and "P. octandra(New Zealand). Members of the Phytolacca genus are also known by a number of common names, including American nightshade, **cancer** root, cocum, inkberry, ombú, pigeon berry, poke, pokebush, pokeberry, pokeroot, polk salad, polk sallet, red ink plant, red nightshade, red weed, scoke, and shang–lu .

Description

Pokeweed is a perennial plant that adjusts readily to a variety of growing conditions. It prefers open areas, such as recently cleared spaces, open meadows, or pastureland. It is anchored by large, fleshy, bulbous root that sends out a single erect stem each year that may grow to a height of 10 feet (3 meters). One of the most robust examples of the plants grows on the South American pampas, where it attains the height and appears of a small tree. The stem is green at first, but turns red or purple later in the season as flowers appear. Leaves are alternate, pointed, and crinkly. White flowers, which form at the terminus of

pendulous stems, eventually change into round deep purple berries filled with a beautiful purple juice. American botanist Edmond Preston first noted in 1884 that leaves of the pokeweed emit a faint and continuous fluorescent light in the dark at the end of its growing season in fall.

Pokeweed contains a number of organic compounds toxic to mammals, including phytolaccine (an alkaloid), phytolaccatoxin (a resin), and phytolaccigenin (a saponin). Alkaloids are nitrogen–containing organic compounds with physiological effects on animals. Saponins are glycosides, sugar–like substances. Resins are semi–solid materials commonly produced by plants. Most animals avoid pokeweed, apparently because of its noxious taste. Small children are sometimes attracted to the colorful berries and may become ill if they eat the plant. The toxins in pokeweed act as an emetic, producing **nausea** and **vomiting** within a few hours of being ingested. Without treatment, symptoms because worse and may include convulsions, spasms, paralysis of the respiratory system, and death. Interestingly, birds appear to be immune to the toxic effects of the pokeweed plant. Scientists hypothesize that the plant seeds, which contain toxins, pass through a bird's digestive system unchanged, thus avoiding any harmful effects on the animals. This hypothesis helps explain the fact that pokeweed plants often grow in isolated areas where no parent plant has been able to drop seeds. The volunteer plants in such cases arise out of seeds that have passed through a bird's digestive system.

Uses

Physicians and public health authorities have long advised against the human consumption of phytolacca, pointing out the serious risk of poisoning. Nonetheless, pokeweed products have had a long history as foods and herbal remedies. In the American south, for example, the plant is often prepared by boiling it three times over (to remove toxic components) and then served as poke salad, pokeberry juice, or in combination with other juices and jellies.

The plant's appeal, in spite of its toxic risks, lies in a number of supposed therapeutic uses to which it can be put. It is taken either orally, as a tonic or infusion, or topically, by rubbing on the skin or other injured or diseased area. Proponents of it say that pokeweed is

- alterative (gradually improving one's overall health)
- anodyne (relieving pain and discomfort)
- anti–inflammatory
- cathartic (capable of relieving constipation)
- emetic (capable of inducing nausea and vomiting)
- expectorant (an agent that stimulates the expulsion of mucus from the lungs and throat)
- hypnotic (capable of inducing sleep)
- narcotic (capable of inducing deep sleep or unconsciousness)
- purgative (stimulating movement of the bowels)

Some specific conditions for which phytolacca has been recommended include **bronchitis**, catarrh (inflammation of the mucous membranes), chronic **eczema**, diphtheria, dysentery, glandular **fever**, immune disorders, **influenza**, **mumps**, **psoriasis**, rheumatism, **sore throat**, **sprains**, swollen glands, tender nipples and sore breasts, tinea capitis (**fungal infections** of the scalp), **tonsillitis**, and ulcers of the leg. On its website review of the medicinal uses of phytolacca in 2008, the Memorial Sloan–Kettering Cancer Center concluded that "[n]o study supports the use of pokeweed for any proposed claim."

In spite of that general observation, some researchers believe that phytolacca or one or more of its components may be effective in treating certain diseases, especially cancer and viral **infections**, such as autoimmundeficiency syndrome (**AIDS**). Since the late 1990s, for example, researchers have been exploring the use of pokeweed antiviral protein (PAP) as treatment for certain types of cancers and viral infections. The compound has been effective in killing viruses and cancer cells in vitro and in experimental animals. At this point, however, there is not enough evidence to assess the safety and efficacy of PAP for use with humans. Research also continues on the use of another product obtained from phytolacca called PAPF–s as an antifungal agent. So far, laboratory results are promising, but no human studies have been completed.

Side Effects

Some homeopathic practitioners claim that there are no side effects associated with the use of phytolacca preparations. Medical sources, however, report that a number of adverse effects have been reported during the use of the product. These effects include chest **pain**, difficulty in breathing, **hives**, itchy or swollen skin, nausea, vomiting, stomach cramps, **diarrhea**, muscular weakness, hypotension, and irregular heart beat. As indicated above, the product is also toxic if taken in sufficient amounts.

Interactions

Relatively little research has been conducted on possible interactions of phytolacca with drugs and other herbs. Some hypothesized interactions are the following:

KEY TERMS

Alkaloid—A nitrogen containing plant product that has pharmacological effects on animals.

Alterative—Having the tendency to improve one's general health gradually over time.

Anodyne—A substance that reduces pain and discomfort

Cathartic—Capable of reducing or relieving constipation.

Emetic—Having a tendency to induce nausea and vomiting

Expectorant—A substance that loosens phlegm in the lungs and throat, leading to its expulsion by coughing and spitting

Hypnotic—Capable of inducing sleep.

Narcotic—Capable of inducing deep sleep or unconsciousness.

Purgative—Having a tendency to stimulate movement of the bowels.

Resin—A gummy, semi solid material produced by many kinds of plants.

Saponin—Soapy like substances found in many plants with a chemical structure related to that of the simple sugar glucose.

- an increase in the action of anticoagulants
- inhibition, in general, of the action of drugs because of the increase in transit time through the gastrointestinal system
- an increase in the action of antidepressants
- a reduction in the efficacy of phytolacca with the use of chlorophenylalanine, cyproheptadine HCl, and phenobarbital
- an increase in the antibiotic activity of echinacea
- a reduction in pokeroot's efficacy if milk is used in tea concoctions

Resources

BOOKS

Bensky, Dan, Steven Clavey, and Erich Stoger. *Chinese Herbal Medicine: Materia Medica, 3rd edition*. Vista, Calif.: Eastland Press, 2004.

Gruenwald, Joerg. *PDR for Herbal Medicines*. London: Thomson PDR, 2004.

PERIODICALS

Park, Sand Wok, et al. "Isolation and Characterization of a Novel Ribosome inactivating Protein from Root Cultures of Pokeweed and Its Mechanism of Secretion from Roots." *Plant Physiology* (September 2002): 164 178.

Zhao, Y., et al. "A Pokeweed Antiviral Protein Gene in Roots of Phytolacca Americana." *Acta Virologica* (October 2004): 131 132.

OTHER

Alternative Nature Online Herbal. "Pokeweed." http://www.altnature.com/gallery/pokeweed.htm (February 27, 2008).

Henriette's Herbal Homepage. "Phytolacca." http://www.henriettesherbal.com/eclectic/kings/phytolacca.html (February 27, 2008).

Plants for a Future. "Phytolacca americana L. Pokeweed" http://www.pfaf.org/database/plants.php?Phytolacca+americana (February 27, 2008).

David Edward Newton, Ed.D.

PID *see* **Pelvic inflammatory disease**

Pilates

Definition

Pilates or Physical Mind method, is a series of non-impact exercises designed by Joseph Pilates to develop strength, flexibility, balance, and inner awareness.

Origins

Joseph Pilates (pronounced pie-LAH-tes), the founder of the Pilates method (also simply referred to as "the method") was born in Germany in 1880. As a frail child with rickets, **asthma**, and **rheumatic fever**, he was determined to become stronger. He dedicated himself to building both his body and his mind through practices which included **yoga**, zen, and ancient Roman and Greek exercises. His conditioning regime worked and he became an accomplished gymnast, skier, boxer, and diver.

While interned in England during World War I for being a German citizen, Pilates became a nurse. During this time, he designed a unique system of hooking springs and straps to a hospital bed in order to help his disabled and immobilized patients regain strength and movement. It was through these experiments that he recognized the importance of training the core abdominal and back muscles to stabilize the torso and allow the entire body to move freely. This experimentation provided the foundation for his style of conditioning and the specialized **exercise** equipment associated with the Pilates method.

KEY TERMS

Yoga—A system of physical, mental, and breathing exercises developed in India.

Zen—A form of meditation that emphasizes direct experience.

Pilates emigrated to the United States in 1926 after the German government invited him to use his conditioning methods to train the army. That same year he opened the first Pilates studio in New York City. Over the years, dancers, actors, and athletes flocked to his studio to heal, condition, and align their bodies.

Joseph Pilates died at age 87 in a fire at his studio. Although his strength enabled him to escape the flames by hanging from the rafters for over an hour, he died from smoke inhalation. He believed that ideal fitness is "the attainment and maintenance of a uniformly developed body with a sound mind fully capable of naturally, easily, and satisfactorily preforming our many and varied daily tasks with spontaneous zest and pleasure."

Benefits

Pilates is a form of strength and flexibility training that can be done by someone at any level of fitness. The exercises can also be adapted for people who have limited movement or who use wheel chairs. It is an engaging exercise program that people want to do. Pilates promotes a feeling of physical and mental well-being and also develops inner physical awareness. Since this method strengthens and lengthens the muscles without creating bulk, it is particularly beneficial for dancers and actors. Pilates is also helpful in preventing and rehabilitating from injuries, improving posture, and increasing flexibility, circulation, and balance. Pregnant women who do these exercises can develop body alignment, improve concentration, and develop body shape and tone after **pregnancy**. According to Joseph Pilates, "You will feel better in 10 sessions, look better in 20 sessions and have a completely new body in 30 sessions."

Although Pilates is often associated with dancers, athletes, and younger people in general who are interested in improving their physical strength and flexibility, a simplified version of some Pilates exercises is also being used as of 2003 to lower the risk of hospital-related deconditioning in older adults. A Canadian study of hospitalized patients over the age of 70 found that those who were given a set of Pilates exercises that could be performed in bed recovered more rapidly than a control group given a set of passive range-of-motion exercises.

Description

During the initial meeting, an instructor will analyze the client's posture and movement and design a specific training program. Once the program has been created, the sessions usually follow a basic pattern. A session generally begins with mat work and passive and active stretching. In passive stretching, the instructor moves and presses the client's body to stretch and elongate the muscles. During the active stretching period, the client preforms the stretches while the instructor watches their form and breathing. These exercises warm up the muscles in preparation for the machine work. The machines help the client to maintain the correct positioning required for each exercise.

There are over 500 exercises that were developed by Joseph Pilates. "Classical" exercises, according to the Pilates Studio in New York involve several principles. These include concentration, centering, flowing movement, and breath. Some instructors teach only the classical exercises originally taught by Joseph Pilates. Others design new exercises that are variations upon these classical forms in order to make the exercises more accessible for a specific person.

There are two primary exercise machines used for Pilates, the Universal Reformer and the Cadillac, and several smaller pieces of equipment. The Reformer resembles a single bed frame and is equipped with a carriage that slides back and forth and adjustable springs that are used to regulate tension and resistance. Cables, bars, straps, and pulleys allow the exercises to be done from a variety of positions. Instructors usually work with their clients on the machines for 20-45 minutes. During this time, they are observing and giving feedback about alignment, breathing, and precision of movement. The exercises are done slowly and carefully so that the movements are smooth and flowing. This requires focused concentration and muscle control. The session ends with light stretching and a cool-down period.

Once the basics are learned from an instructor, from either one-on-one lessons or in a class, it is possible to train at home using videos. Exercise equipment for use at home is also available and many exercises can be performed on a mat.

A private session costs between $45–$75, depending on the part of the country one is in. This method is not specifically covered by insurance although it may be covered when the instructor is a licensed physical therapist.

Precautions

The Pilates method is not a substitute for good physical therapy, although it has been increasingly used and recommended by physical therapists since the mid-1980s. People with chronic injuries are advised to see a physician.

Research and general acceptance

As of early 2004, several physical therapists and gerontologists have done research studies on the Pilates method, although much more work needs to be done in this area. The appeal of the Pilates method to a wide population, coupled with a new interest in it on the part of rehabilitation therapists, suggests that further studies may soon be underway. Dancers and actors originally embraced the Pilates method as a form of strength training that did not create muscle bulk. Professional and amateur athletes also use these exercises to prevent reinjury. Sedentary people find Pilates to be a gentle, non-impact approach to conditioning. Pilates equipment and classes can be found in hospitals, health clubs, spas, and gyms.

Training and certification

There are two main centers for training and certification. The Pilates Studio in New York City certifies teachers in the "classical" exercises of "The Pilates Method." The teacher training program of The Pilates Studio involves seminar training and 600 apprenticeship hours. Perspective teachers need a strong background in Pilates. There is an extensive application and examination process. Classes are available throughout the United States and in 20 international locations.

The PhysicalMind Institute in Santa Fe, New Mexico, offers a 275-hour basic certification program in "The Method." Prerequisites include a 15-hour course, knowledge of functional anatomy, and 10 hours of private sessions. After completing an apprenticeship, students must pass a written and practical final exam. Advanced training is also offered. Students at this center receive training in the original exercises of Joseph Pilates, as well as the concepts of body mechanics. Understanding the concepts behind the exercises enables teachers to create appropriate variations for their clients. Classes are available throughout the United States and Canada.

Resources

BOOKS

Knaster, Mirka. *Discovering the Body's Wisdom*. New York: Bantam Books, 1996.

Pilates, Joseph H., et al. *The Complete Writings of Joseph Pilates: Return to Life Through Contrology and Your Health*. New York: Bantam Doubleday, 2000.

Robinson, Lynne, et al. *Body Control: Using the Techniques Developed by Joseph Pilates*. Trans Atlantic Publica tions, 1998.

Siler, Brooke. *The Pilates Body: The Ultimate At Home Guide to Strengthening, Lengthening and Toning Your Body Without Machines*. New York: Bantam Doubleday, 2000.

PERIODICALS

Anderson, Brent D. "Pushing for Pilates." *Rehab Manage ment* 14 (June July 2001): 23 25.

Argo, Carol. "The Pilates Method for a Balanced Body." *American Fitness* (March/April 1999):52 54.

Blum, C. L. "Chiropractic and Pilates Therapy for the Treatment of Adult Scoliosis." *Journal of Manipulative and Physiological Therapeutics* 25 (May 2002): E3.

Chang, Yahlin. "Grace Under Pressure." *Newsweek* (Feb ruary 28, 2000).

Coleman Brown, L., and V. Haley Kanigel. "Movement with Meaning." *Rehab Management* 16 (July 2003): 28 32.

Mallery, L. H., E. A. MacDonald, C. L. Hubley Kozey, et al. "The Feasibility of Performing Resistance Exercise with Acutely Ill Hospitalized Older Adults." *BMC Geriatrics* 3 (October 7, 2003): 3.

ORGANIZATIONS

PhysicalMind Institute. 1807 Second Street, Suite 15/16, Santa Fe, New Mexico 87505. (505) 988 1990 or (800) 505 1990. Fax: (505) 988 2837. themethod@trail.com. http:\\www.the method.com.

The Pilates Studio. 2121 Broadway, Suite 201, New York, New York, 10023 1786. (800)474 5283 or (888) 474 5283 or (212)875 0189. Fax: (212) 769 2368. http:\\ www.pilates studio.com.

Linda Chrisman
Rebecca J. Frey, PhD

Piles *see* **Hemorrhoids**

Pinched nerve

Definition

A pinched nerve is caused by some anatomical structure putting pressure on a nerve and impairing its function. This problem may occur in many different

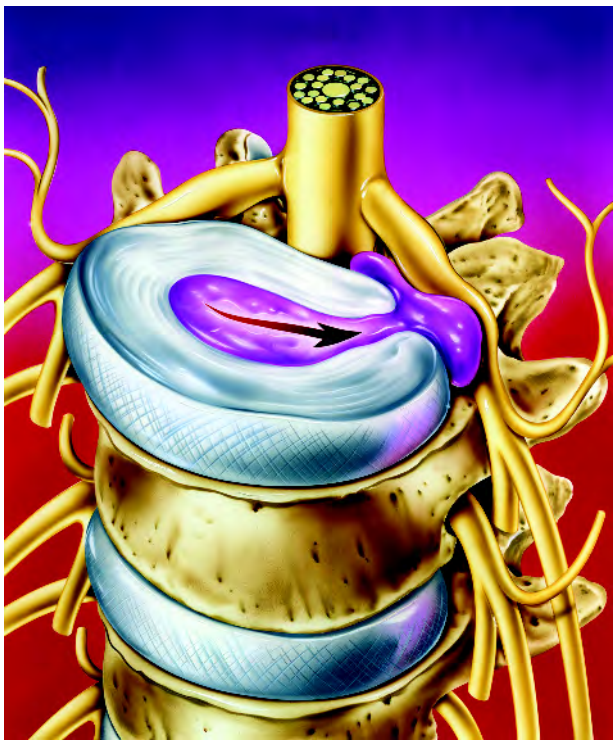


Illustration of an intervertebral disc that has ruptured, leading to the internal jelly-like material putting pressure on a nerve. *(John Bavosi / Photo Researchers, Inc.)*

areas of the body. The most common places are those in which a nerve must travel through a small space. Examples include the region where the nerve roots exit the spine called the intervertebral foramen, and the carpal tunnel at the wrist, where a nerve must travel through a tunnel created by the wrist bones and ligaments.

Description

A pinched nerve may go by several different names. It may be called nerve compression, entrapment, or impingement. Many problems involving pinched nerves will be called syndromes. Examples include **carpal tunnel syndrome**, thoracic outlet syndrome, and piriformis syndrome. If the nerve is pinched right near its root where it attaches to the spinal cord it is often called a radiculopathy.

The nerves that exit the spine and go down the upper limb and lower limb are gathered together in groups. Each group of nerves is called a plexus. In the neck region the nerves that leave the neck and go down the upper arm make up the brachial plexus. In the low back region, the nerves that go down the leg may come from the lumbar plexus or the sacral plexus. If a nerve is pinched where it is part of a plexus, it may be called a plexopathy. If the nerve is pinched farther along its length after it has left the plexus it is called a neuropathy.

A nerve is responsible for carrying two different types of signals. It carries sensory information, such as sensations of heat, pressure, texture, **pain**, or body position back to the spinal cord where that information will eventually be transmitted directly to the brain. These sensory signals that travel through the nerves are called afferent signals. A nerve also carries motor signals from the brain and spinal cord that tell the muscles when and how much to contract in order to create movement in the body. These motor signals that go from the brain and spinal cord out to the muscles are called efferent signals. When a nerve is pinched it may cause dysfunction with either the sensory (afferent) or motor (efferent) signals.

Causes and symptoms

A pinched nerve may occur from a direct blow. Most people are familiar with this sensation when they bang their elbow on a hard surface and get a sharp pain or prickling sensation down the arm. The symptoms of this kind of pinched nerve are usually very short-lived and are not a significant problem unless the force of the impact was severe.

What is much more common is the sensation of small amounts of pressure on the nerve from such adjacent structures as bones, muscles, tendons, and ligaments. This pressure most often occurs when the nerve has to travel through a small space between these structures. The nerve may get compressed with a small amount of pressure for a long period of time. It is the long time period of pressure on the nerve that causes the most damage. In many cases these long periods of pressure are related to the person's job. Occupations in which a person must hold the wrist, forearm or shoulder in one position for long periods of time and/or perform repetitive movements have a high rate of workers with pinched nerve syndromes. Dental hygienists, keyboard instrumentalists, violinists, data entry workers, assembly line and construction workers, and professional athletes are examples of workers at risk for pinched nerve syndromes.

When pressure is placed on the nerve a person may feel a variety of different symptoms. Paresthesia (the sensation of pins and needles) is often felt first. The sensations of paresthesia are usually felt anywhere along the nerve from the site of compression toward the far end of the extremity. Symptoms may also go from the site of compression toward the spinal cord, but it is not as common. In addition to paresthesia sensations, a person with a pinched nerve may also feel sharp, shooting pain, or pain that feels like an

KEY TERMS

Afferent—Sensory signals that go from the sensory cells at the periphery of the body back to the brain and spinal cord.

Chiropractic—A method of treatment based on adjustment or manipulation of the segments of the spinal column.

Cupping—A procedure in traditional Chinese medicine in which heated air is trapped underneath a specially shaped glass cup that is placed over the skin and then rubbed along the skin. The heated air trapped in the cup creates a suction effect on the skin. Sometimes cups are used with a vacuum pump instead of heating.

Efferent—Motor signals that go from brain and spinal cord out to the muscles of the body.

Neuropathy—Compression of a peripheral nerve somewhere along its length.

Paresthesia—The sensation of pins and needles or tingling that is often the result of nerve compression.

Plexopathy—Compression of a nerve where it is part of a bundle of nerves called a plexus.

Radiculopathy—Compression of a nerve root at the point where it exits the spinal cord.

Transcutaneous electrical nerve stimulation (TENS)—A form of treatment for chronic pain in which a self-operated portable device is used to send electrical impulses through electrodes placed on the skin over the affected area. The pain is relieved because the electrical impulses interrupt the transmission of pain signals traveling along the nerve.

electrical shock going down the extremity. All of these symptoms are from impairment of the afferent (sensory) nerve signal transmission. The sensation is not necessarily near the area where the pressure is occurring.

Motor (efferent) signals can also be impaired from nerve compression. This will most likely show up as muscle weakness or problems with coordination. For example, people with carpal tunnel syndrome will frequently report losing grip strength. This is because the nerve has been compressed and signals are not getting through to the muscles of the hand that produce the grip.

Diagnosis

Most pinched nerve conditions can be diagnosed with physical examination. The practitioner will take a thorough history, including an occupational history, and investigate the nature of the signs and symptoms to see if they indicate the likelihood of nerve compression. A number of physical examination tests may also be performed to see if nerve compression is aggravated with specific movements or pressure in certain areas. In addition to physical examination and information from the patient's history, nerve conduction tests may be run to see if the nerves are transmitting signals at the proper rate. If a nerve compression problem exists, there will be a slowing in the velocity of signal transmission in that nerve and it will likely be detected by the nerve conduction velocity test.

As of 2003, diagnostic imaging is being increasingly used to aid in the diagnosis of nerve entrapment and compression syndromes. Recent refinements in ultrasound and magnetic resonance imaging (MRI) provide doctors with detailed pictures of the anatomy of peripheral nerves and the changes that take place in them with compression syndromes.

Treatment

Alternative therapy practitioners who specialize in such manual therapy methods as **chiropractic**, **osteopathy**, or **massage therapy** will look closely at the mechanical factors in the region of pain to identify what is pinching the nerve. If it is determined that the nerve is being compressed by some structure like a muscle that is pressing on the nerve, then therapy will be aimed at reducing tightness in that muscle so that it no longer presses on the nerve. This will generally be done through a variety of soft tissue therapy methods. In some instances there are other postural or mechanical distortions that may lead to nerve compression, and those will be addressed through manual therapy or various movement retraining methods.

Treatment will also focus on changing mechanical factors that may have led to nerve compression. For example, in carpal tunnel syndrome it is often some repetitive use activity that has led to the problem. If that activity can be altered so there is not an accumulation of **stress** on the soft tissues, it is likely that the symptoms of the nerve compression will be resolved. However, nerve compression symptoms may be slow to fully resolve even after the primary cause of the compression has been addressed.

Acupuncture can be quite helpful in treating pinched nerves since it has been shown to be a very effective method for producing pain relief. The primary goals of an acupuncture treatment will be both to reduce pain sensations and to get proper energy moving along the pathways that have been impaired.

Needles will be inserted in areas that will help encourage proper neurological flow through the involved area. Acupuncture with electrical stimulation of the needles may also be used for treating pinched nerves.

In addition to acupuncture, other approaches from **traditional Chinese medicine** may be used. Both topical and oral herbal preparations may be used to help restore proper function and address any underlying causes of the pinched nerve symptoms. **Cupping** may be used to help free soft tissue restrictions that may be compressing the nerve structures in the area.

Allopathic treatment

Traditional allopathic treatment for pinched nerves will also focus on the site of nerve compression and try to manage the symptoms first through conservative therapy. Oral medications may be given to relieve pain or reduce any inflammation that may be contributing to the nerve compression. Physical therapy may be used to help address any mechanical factors that may be contributing to the nerve compression. Physical therapy approaches are likely to include stretching, joint mobilization, soft tissue treatments, or such other modalities as ultrasound to address the causative factors of the nerve compression. Splinting is an additional conservative approach to nerve compression syndromes.

Depending on where the nerve compression is located, surgical treatment may sometimes be necessary. Surgery is often performed for such common nerve compression problems as carpal tunnel syndrome and thoracic outlet syndrome. Most of these surgical procedures will be aimed at relieving pressure on the affected nerve.

Some newer allopathic treatments that are used to relieve the pain of pinched nerve syndromes include low-level laser therapy (LLLT) and transcutaneous electrical nerve stimulation (TENS). In LLLT, a continuous-wave red-beam laser is aimed at acupuncture points on the affected area. In TENS, the affected nerve is stimulated with high-frequency electrical signals, which disrupt the transmission of pain impulses along the nerve so that the pain is no longer felt. Both these approaches give good results in treating pinched nerve syndromes, as they are noninvasive and painless.

In some cases in which the pinched nerve is related to the patient's job, a change of occupation may be necessary.

Expected results

Most problems with pinched nerves will be resolved as soon the pressure on them is released. If the symptoms have been present for a long time, the relief of the condition may not be immediate. The longer the pressure has been applied, the longer it is likely to take for the symptoms to be resolved.

Prevention

Most pinched nerve conditions can be avoided with proper body mechanics. Repetitive motions of the upper extremity are notorious for causing pinched nerves in several places, and it is wise to make sure a person is conditioned for the level of activity he or she is engaging in so as to prevent this from occurring. The individual should also be careful of activities that might put pressure on nerves for long periods. For example, nerves can be compressed in the shoulder region from the wearing of heavy backpacks or handbags for long periods.

Resources

BOOKS

Beinfield, H. *Between Heaven & Earth: A guide to Chinese Medicine* New York: Ballantine, 1991.

Butler, D. *Mobilisation of the Nervous System*. London: Churchill Livingstone, 1999.

Dawson, D., M. Hallet, and A. Wilbourn. *Entrapment Neuropathies*. Philadelphia: Lippincott Raven, 1999.

Hammer, W. *Functional Soft Tissue Examination and Treatment by Manual Methods, Second Ed.* Gaithers burg, MD: Aspen, 1999.

Maciocia, G. *Foundations of Chinese Medicine*. London: Churchill Livingstone, 1989.

Stux, G. *Basics of Acupuncture*. New York: Springer Verlag, 1991.

PERIODICALS

Anton, D., J. Rosecrance, L. Merlino, and T. Cook. "Prev alence of Musculoskeletal Symptoms and Carpal Tun nel Syndrome Among Dental Hygienists." *American Journal of Industrial Medicine* 42 (September 2002): 248 257.

Becker, J., D. B. Nora, I. Gomes, et al. "An Evaluation of Gender, Obesity, Age and Diabetes Mellitus as Risk Factors for Carpal Tunnel Syndrome." *Clinical Neuro physiology* 113 (September 2002): 1429 1434.

Gerritsen, A. A., H. C. de Vet, R. J. Scholten, et al. "Splinting vs Surgery in the Treatment of Carpal Tun nel Syndrome: A Randomized Controlled Trial." *Jour nal of the American Medical Association* 288 (September 11, 2002): 1245 1251.

Naeser, M. A., K. A. Hahn, B. E. Lieberman, and K. F. Branco. "Carpal Tunnel Syndrome Pain Treated with Low Level Laser and Microamperes Transcutaneous Electric Nerve Stimulation: A Controlled Study."

Archives of Physical Medicine and Rehabilitation 83 (July 2002): 978 988.
Nathan, P. A., K. D. Meadows, and J. A. Istvan. "Predictors of Carpal Tunnel Syndrome: An 11 Year Study of Industrial Workers." *Journal of Hand Surgery* 27 (July 2002): 644 651.
Roquelaure, Y., J. Mariel, S. Fanello, et al. "Active Epide miological Surveillance of Musculoskeletal Disorders in a Shoe Factory." *Occupational and Environmental Medicine* 59 (July 2002): 452 458.
Spratt, J. D., A. J. Stanley, A. J. Grainger, et al. "The Role of Diagnostic Radiology in Compressive and Entrapment Neuropathies." *European Radiology* 12 (September 2002): 2352 2364.
Werner, R. A., and M. Andary. "Carpal Tunnel Syndrome: Pathophysiology and Clinical Neurophysiology." *Clin ical Neurophysiology* 113 (September 2002): 1373 1381.

ORGANIZATIONS

American Academy of Medical Acupuncture (AAMA). 4929 Wilshire Blvd., Suite 428, Los Angeles, CA 90010. (323) 937 5514. www.medicalacupuncture.org.
American College of Occupational and Environmental Medicine (ACOEM). 1114 North Arlington Heights Road, Arlington Heights, IL 60004. (847) 818 1800. www.acoem.org.
American Physical Therapy Association (APTA). 1111 North Fairfax Street, Alexandria, VA 22314. (703)684 APTA or (800) 999 2782. www.apta.org.
Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH). (800) 35 NIOSH. Fax: (513) 533 8573. www.cdc.gov/niosh.

Whitney Lowe
Rebecca J. Frey, PhD

Pine bark extract is a new nutritional supplement used for its antioxidant properties, which are believed to be effective for a wide range of healing and preventative purposes. *(© Andrew Darrington / Alamy)*

Pine bark extract

Description

Pine bark extract is made from the bark of a European coastal pine tree called the Landes or maritime pine, whose scientific name is *Pinus maritima*. The maritime pine is a member of the Pineaceae family. Pine bark extract is a new nutritional supplement used for its antioxidant properties, which are believed to be effective for a wide range of healing and preventative purposes. Pine bark extract has been patented by a French researcher under the name Pycnogenol (pronounced pick-nah-jen-all).

Pine bark extract has a 450-year-old legend surrounding it. There is a written account of an event that happened in 1534, when a French ship led by explorer Jacques Cartier became stranded in ice near Quebec, Canada. Cartier's crew became severely sick from scurvy, which used to be a fatal disease caused by a lack of **vitamin C** in the diet. Cartier's crew was saved when a Quebec Indian instructed them to drink a brew made from pine bark and needles. Four centuries later, a French researcher named Jacques Masquelier discovered the reason for the effectiveness of this remedy. A substance found in pine bark acts as an antioxidant in the body, and greatly increases the effectiveness of the vitamin C found in the pine needles.

During the 1950s, Masquelier had heard the story of Cartier when he was in Canada performing research. He was investigating a group of substances called flavonols, which he originally found in peanut skins. Flavonols and **bioflavonoids** are substances in fruits and vegetables that give them their color. Masquelier found that these substances have beneficial

KEY TERMS

Antioxidant—A substance or compound that prevents free radical or oxidative damage. Pine bark extract contains powerful antioxidants called OPCs.

Atherosclerosis—Hardening of the arteries.

Bioflavonoids—Water-soluble plant pigments that have a wide variety of effects on the human body.

Cholesterol—A steroid fat found in animal foods that is also produced in the body for several important functions. Excess cholesterol intake is linked to many diseases.

effects in the body, particularly in improving circulation and repairing tissue. He later found that an abundant source of these substances was the bark of pine trees that grew on the coasts of southern France. Pine bark was also the most efficient source of the substance, because it took only warm water and pressure to extract the substance from trees that were considered a waste product. Masquelier called his pine bark extract Pycnogenol, and continued his research on pine bark extract and bioflavonoids for decades. In 1987, the United States awarded him a patent. Only Masquelier's pine bark extract can legally claim to have antioxidant properties.

Antioxidants play a key role of repairing and protecting cells in the body. They help protect against free radicals, which are damaging byproducts of metabolism and exposure to environmental pollutants. Free radical damage is believed to contribute to **aging**, as well as too severe conditions including **heart disease** and **cancer**. Common antioxidants are vitamins A, C, E, and the mineral **selenium**. Researchers have termed the group of antioxidants found in pine bark extract oligomeric proanthocyanidins, or OPCs for short. OPCs (also referred to as PCOs) are some of the most powerful antioxidants available.

OPCs are found in many common foods. In fact, OPCs are at the center of what has been called the French paradox. The French paradox has to do with the fact that the French eat as much **cholesterol** as Americans, yet have a significantly reduced incidence of heart disease. Researchers have theorized that one reason for this paradox is the French consumption of red wine with meals. Red wine is rich in bioflavonoids, including OPCs, which have been shown to protect blood vessels from cholesterol. Another OPC supplement on the market besides pine bark extract is **grape seed extract**, which is the cheapest and most widely used source of OPCs.

Much research has been conducted on OPCs and on pine bark extract. In France, pine bark extract and OPCs have been rigorously tested for safety and effectiveness, and pine bark extract is a registered drug. Pine bark extract has been shown to contain a powerful antioxidant that helps protect cells from free radical damage and increases the effectiveness of vitamin C. Pine bark extract has been shown to help lower cholesterol, and to decrease the risk and severity of **atherosclerosis**, or damage to the arteries. It has been demonstrated to help strengthen and repair tissues made of collagen, a protein that builds blood vessels, skin, and connective tissue. The OPCs in pine bark extract have also been shown to help reduce swelling and inflammation in the body.

General use

Pine bark extract is used to reduce the risk and severity of heart disease, strokes, high cholesterol, and circulation problems. It is used in the nutritional treatment of **varicose veins** and **edema**, which is swelling in the body due to fluid retention and leakage of blood vessels. Arthritis and inflammation have also been improved in studies using pine bark extract, as well as the uncomfortable symptoms of PMS and **menopause**. The OPCs in pine bark extract are recommended for various eye conditions that are caused by blood vessel damage, such as diabetic **retinopathy** and **macular degeneration**. Pine bark extract is recommended to improve the health and smoothness of the skin, including damage caused by overexposure to sunlight. Pine bark extract is a supplement used for anti-aging and preventive care as well.

Preparations

Pine bark extract is available in health food stores as powder and capsules. For prevention and general health, a daily dosage of 50 mg (1–2 capsules) is recommended. For treatment of health conditions, the dosage may be increased to 300 mg or more, depending on the advice of a physician and the specific condition. Pine bark extract can be taken either with or between meals.

Precautions

While pine bark extract is used in the nutritional treatment of many conditions, it is not meant to replace proper medical supervision.

Side effects

Pine bark extract has been extensively tested for safety, and no dangerous side effects have been observed with its use.

Interactions

The effectiveness of pine bark extract may be increased with the use of other antioxidants, including vitamins A, C, E, and the mineral selenium. **Diets** rich in foods that contain antioxidants and bioflavonoids, such as fresh fruits and vegetables, may also contribute to its effectiveness.

Resources

BOOKS

Kilham, Chris. *OPC: The Miracle Antioxidant*. New Can aan, CT: Keats, 1997.

Passwater, Richard, PhD. *The New Superantioxidant Plus*. New Canaan, CT: Keats, 1992.

Douglas Dupler

KEY TERMS

Adjuvant—A substance or medication used together with a vaccine or other drug to assist the effect of the main ingredient.

Antiemetic—A medication or preparation given to stop vomiting.

Chi—The Chinese name for "life force."

Decoction—An extract of a herb obtained by boiling the herb in water or alcohol.

Expectorant—A drug given to help bring up mucus or phlegm from the respiratory tract.

Goiter—Swelling of the thyroid gland caused by under or over production of thyroxine.

Materia medica—The branch of medical science concerned with the study of drugs or herbs.

Rhizome—A horizontal underground stem that sends up shoots from its upper surface.

Scrofula—Tuberculosis of the lymphatic glands.

Pinellia

Description

Pinellia (*Araceae pinellia ternatae*) is a member of the Aroid family. Originating from China and Japan, it is a small plant that is popular for ornamental use and known in Asia as "green dragon." Pinellia is a small plant, growing only to a height of 6–12 in (15–30 cm) high. It has black shiny stems, and glossy arrowhead-shaped leaves that are highlighted by a silver stripe along the veins. It produces purple tongue-like flowers in late summer.

General use

Athough not widely used in Western herbal medicine, pinellia is particularly useful for chest complaints. It relieves coughs and **cuts** through mucus, being especially good for sinus congestion and nasal discharge. It is also recommended for **asthma**, emphysema, and any form of **wheezing**, which makes it valuable as not many herbs are suited to the treatment of these particular ailments. It is more widely used in Oriental medicine than in Western natural therapies, however, and it is often an ingredient of herbal mixtures in both Western and Chinese herbal medicine.

Pinellia in Chinese herbalism

Known as "ban xia" or "wu bing shao" to the Chinese, Pinellia is widely used in a variety of combinations in Chinese herbal medicine. They consider that its properties are "pungent, warm, and toxic," and it is considered a treatment for the areas of the Chinese concepts of Spleen, Stomach, and Lung. Remedies are generally prepared from the roots and stems of the plant and are used to treat digestive and respiratory problems.

Pinellia is most useful for chest complaints, in which it is used in conjunction with **magnolia** bark or perilla leaf—both common ingredients of Chinese remedies. It is especially useful when dealing with phlegm and congestion, which are both cold in nature. Pinellia is also used in combination with other herbal ingredients for the treatment of **nausea** and **vomiting**. It is considered an antiemetic (nausea suppressant). Depending on the patient's body type, it may be used with fresh **ginger**, bamboo shavings, loquat leaf, perilla stem, or amomum fruit. It may also be used with ginseng or jujube.

Chinese herbalists also recommend pinellia for the treatment of swollen glands, and certain cases of goiter, for which it is used in conjunction with seaweed and fritillary bulb. It is recommended for sinus problems in which there is **pain** and a feeling of fullness across the sinus area.

Pinellia is also used for coughing and asthma. In addition, the Chinese use it for the treatment of scrofula and subcutaneous cysts.

Pinellia also appears to have antidepressant effects. It is the primary ingredient in Banxia Houpu decoction, a traditional Chinese formula that has been used for centuries to treat **depression**. A recent chemical analysis of this decoction showed that its antidepressant activity is close to that of fluoxetine (Prozac).

A new use for pinellia is its role as an adjuvant (substance given to assist the effectiveness of a vaccine or medication) to a nasal vaccine for **influenza**. Researchers isolated a compound called pinellic acid from pinellia, and found that an oral preparation of it measurably increased the effectiveness of a nasal vaccine against influenza without any harmful side effects.

Preparations

The parts of the plant used, particularly in Chinese herbalism, are generally the rhizomes, or tubers. These should be dug during late summer, early autumn. The bark and fibrous roots are then removed and the rhizomes should be dried in sunlight. The raw herbs are toxic and must be prepared bydrying them and then frying them in ginger and vinegar to make them usable. The preparation is called *fa ba xia* and is available in health food stores.

Dosage may be in the form of readily prepared pills, again especially in the case of Chinese herbalism, or in the form of a syrup, in which case the recommended dosage should be followed. The dried rhizome may be taken in doses of 5–10 grams.

Precautions

Pinellia is best used as an expectorant for congestive chest conditions. Another remedy should be used for dry coughs accompanied by chills, due to its drying and warming properties. Pinellia should not be used by pregnant women, those suffering from blood disorders, particularly if there is bleeding, **fever** or conditions which cause heat in the body. Pinellia is used to treat **morning sickness**, but only under the strict supervision of an experienced herbalist.

A general precaution to observe when using any Chinese patent medicine is to purchase only well-known brands recommended by a practitioner of **traditional Chinese medicine**. Cases have been reported of incorrect labeling, contamination with heavy metals, and substitution of Western pharmaceuticals for the Chinese ingredients. Any of these occurrences can present a serious health hazard.

Side effects

Pinellia is registered as a toxic herb in the United States and should be used with caution. The Chinese Materia Medica also acknowledges that it has toxic potential. Never use the herb in its raw form or exceed the recommended doses of herbal mixtures containing pinellia.

Pinellia has been reported to trigger asthmatic attacks in people who have been sensitized to it.

Interactions

Pinellia should not be taken in conjunction with aconite, as it may increase the toxic properties of this substance.

Resources

BOOKS

Reid, Daniel. *Chinese Herbal Medicine*. Boston, MA: Shambhala, 1996.

PERIODICALS

Lee, S. K., H. K. Cho, S. H. Cho, et al. "Occupational Asthma and Rhinitis Caused by Multiple Herbal Agents in a Pharmacist." *Annals of Allergy, Asthma and Immunology* 86 (April 2001): 469 474.

Luo, L., J. Nong Wang, L. D. Kong, et al. "Antidepressant Effects of Banxia Houpu Decoction, a Traditional Chinese Medicinal Empirical Formula." *Journal of Ethnopharmacology* 73 (November 2000): 277 281.

Nagai, T., H. Kiyohara, K. Munakata, et al. "Pinellic Acid from the Tuber of *Pinellia ternata Breitenbach* as an Effective Oral Adjuvant for Nasal Influenza Vaccine." *International Immunopharmacology* 2 (July 2002): 1183 193.

ORGANIZATIONS

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. www.aaom.org.

Institute of Traditional Medicine. 2017 SE Hawthorne Blvd., Portland, OR 97214. (503) 233 4907. www.itmonline.org.

OTHER

"A Healing Place." www.healingplace.com/formulas/pinellia.html.

"Herbal Medicine" In: Holistic Online.com. www.holisticonline.com/w_herbal_medicine.html.

Patricia Skinner
Rebecca J. Frey, PhD

Pink eye *see* **Conjunctivitis**

Piper methysticum see **Kava kava**

Pityriasis rosea

Definition

Pityriasis rosea is a skin disease of uncertain origin characterized by lesions bordered by collar-like areas that tend to peel off in tiny scales. Pityriasis comes from the Greek word for bran, *pityron*, because the flakes of skin shed from the lesions resemble small pieces of wheat bran. Rosea comes from a Latin word that means "rose-colored" or "pink."

Description

Pityriasis rosea is a common benign skin disease, or exanthem, that was first described by a French physician named Camille Gibert in 1860. It is classified as a papulosquamous disorder, which means that its lesions are marked by small raised areas (papules) as well as scaly areas. Pityriasis rosea begins in 60%–90% of patients with a pinkish-brown or salmon-colored herald patch—sometimes called a mother patch—on the chest, back, or neck. The herald patch is a small spot when it first appears, but enlarges over a period of several days to form a circular or oval-shaped area between 3/4-in and 2-1/2 in in diameter. The herald patch develops a scaly border known as a collarette, and is often misdiagnosed in its early stages as **eczema** or ringworm.

The herald patch is followed within 5–10 days by a series of similar but smaller oval-shaped patches that appear on the patient's chest, back, and legs, although the general eruption may appear as rapidly as a few hours after the herald patch or as long as three months later. The general rash lasts for about six weeks. The smaller patches range between 1/8 in and 1/2 in in diameter, and are sometimes described as resembling cigarette paper. Lesions on the trunk and abdomen are commonly distributed along the midline of the body in a pattern resembling the outline of a Christmas tree. The lesions of the general eruption are found most commonly on the chest, back, and upper arms, but are sometimes limited to such smaller areas of the body as the armpits, groin, palms of the hands, or feet. Between 9% and 16% of patients develop ulcers or plaques inside the mouth. It is relatively unusual, however, for patches to appear on the face. A small minority of patients may have the herald patch as the only sign of pityriasis rosea.

Pityriasis rosea is a common skin disorder, accounting for 3% of visits to dermatologists in the United States and Canada. The overall prevalence of the disease in the general North American population is thought to be about 0.13% in males and 0.14% in females. It is rare in infants and the elderly; most cases are diagnosed in persons between the ages of 10 and 35. Pityriasis rosea tends to cluster in families, which is one reason why some researchers have been investigating various viruses as possible causes; however, it is not known to spread by casual contact. The disease affects all races and ethnic groups equally.

Pityriasis rosea may occur at any time of year but is most common in temperate climates in the spring and fall.

KEY TERMS

Collarette—The slightly raised area of scaly skin that forms at the borders of the herald patch and later lesions of pityriasis rosea.

Exanthem—A skin eruption or rash. The term is also used for diseases that have skin rashes as a prominent feature (e.g., measles). Pityriasis rosea is an example of an exanthem.

Herald patch—The initial skin eruption of pityriasis rosea, usually on the back or chest, that occurs a week or two before the main outbreak. It is sometimes called the mother patch.

Papule—A small solid raised area of skin, no more than 1 cm in diameter. The skin lesions associated with pityriasis rosea may include papules as well as scales or flakes of skin.

Prodromal—Referring to warning symptoms that occur before the onset of a disease or disorder.

Pruritus—The medical term for itching. Pruritus is a common symptom of pityriasis rosea.

Topical—Referring to medications applied to the skin or exterior of the body.

Causes and symptoms

Causes

The cause of pityriasis rosea is debated as of early 2004. Various researchers have reported isolating a mycoplasma (a type of gram-negative bacterium), a picornavirus, and human herpesviruses 6 and 7 from skin samples of patients diagnosed with the disease, but these findings are not yet considered definitive. Certain medications, including diphtheria vaccines, barbiturates, gold, bismuth compounds, captopril (Capoten), metronidazole (Flagyl), isotretinoin (Accutane), clonidine (Catapres), omeprazole (Prilosec), penicillamine (Cuprimine or Depen), and terbinafine (Lamisil) have been reported to cause skin **rashes** that resemble the lesions of pityriasis rosea. High levels of emotional **stress** appear to increase the severity of the skin lesions in some patients.

Symptoms

The most common symptom associated with the lesions of pityriasis rosea is pruritus or **itching**, which affects about 75% of patients, with 25% reporting severe itching. Many patients find that athletic activity or hot weather makes the itching worse. In addition to pruritus, some patients have prodromal symptoms, which are warning symptoms that occur before the herald patch appears. Prodromal symptoms of pityriasis rosea may include **fever**, loss of appetite, **nausea**, **headache**, joint pains, and swelling of the lymph nodes. Lymph node swelling is more common among African Americans diagnosed with the disease than among Caucasian or Asian Americans.

Diagnosis

The diagnosis of pityriasis rosea is usually made through taking a patient history—with particular attention to prescription medications—and a skin biopsy ordered by a dermatologist. Although there is no blood test for pityriasis rosea itself, most primary care physicians will order a rapid plasma reagin (RPR) or Venereal Disease Research Laboratory (VDRL) blood test to screen for **syphilis**. The reason for this precaution is that the lesions of pityriasis rosea resemble the skin rash associated with secondary syphilis. The skin biopsy is done to distinguish between pityriasis rosea and such other skin diseases as lichen planus, **psoriasis**, ringworm, **Kaposi's sarcoma**, and seborrheic **dermatitis**.

Treatment

Pityriasis rosea is a self-limiting disease, which means that it goes away on its own even without alternative or allopathic treatment. Both mainstream physicians and naturopaths, however, recommend adding a cup of oatmeal or baking soda to a tub of warm (not hot) water to minimize itching. In addition, patients whose lesions increase in size or number due to emotional stress may be helped by **hydrotherapy**, **aromatherapy**, **meditation**, or other therapies intended to reduce stress. **Massage therapy**, however, is contraindicated because the disease usually affects large areas of skin.

Homeopathic practitioners suggest the following remedies for pityriasis rosea, to be taken in 6C potency four times daily for 7 days:

- *Arsenicum*. Recommended for patients whose rash is accompanied by anxiety, restlessness, and thirst.
- *Radium bromide*. For patients whose lesions are fiery red in color, burning, and painful.
- *Natrum muriaticum*. For patients whose lesions have a red appearance under thin white scales, or whose pruritus is made worse by warmth or exercise.

In addition, a homeopathic remedy known as *Urtica urens* is available in cream or ointment form for direct application to affected areas.

Allopathic treatment

Allopathic treatment of pityriasis rosea is directed toward symptom relief, as the cause of the disease is still uncertain. To relieve the itching, the doctor may prescribe calamine lotion, **zinc** oxide ointment, oral antihistamine medications, or topical ointments containing corticosteroids or a combination of phenol and 25% menthol. Some physicians prescribe creams containing pramoxine, a local anesthetic. Steroid medications taken by mouth are not recommended unless the pruritus is extremely severe; although these drugs relieve itching, they may also prolong the course of the disease or make the lesions worse.

Some patients are benefited by exposure to sunlight or by treatment with ultraviolet light; however, there is some risk that the skin lesions will develop hyperpigmentation (become darker than the surrounding skin) after ultraviolet treatment. Hyperpigmentation is most likely to occur in African American patients.

There is no need to keep children with pityriasis rosea from attending school, as the disease is not considered contagious.

Expected results

The prognosis for patients with pityriasis rosea is excellent. The disease does not cause long-term health problems, is not dangerous even during **pregnancy**, and usually clears completely in 6–8 weeks. A few patients have lesions that last as long as 3–4 months, but fewer than 3% of patients experience recurrences.

Prevention

As the cause of pityriasis rosea is still debated as of 2004, there are no known preventive measures.

Resources

BOOKS

"Pityriasis Rosea." Section 10, Chapter 117 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

PERIODICALS

Allen, Robert A. MD, and Robert A. Schwartz, MD, MPH. "Pityriasis Rosea." *eMedicine*, 11 November 2002. http://www.emedicine.com/derm/topic335.htm.

Scott, L. A., and M. S. Stone. "Viral Exanthems." *Dermatology Online Journal* 9 (August 2003): 4.

Stulberg, J. L., and J. Wolfrey. "Pityriasis Rosea." *American Family Physician* 69 (January 1, 2004): 87 91.

Watanabe, T., T. Kawamura, S. E. Jacob, et al. "Pityriasis Rosea Is Associated with Systemic Active Infection with Both Human Herpesvirus 7 and Human Herpesvirus 6." *Journal of Investigative Dermatology* 119 (October 2002): 793 797.

ORGANIZATIONS

American Academy of Dermatology. P. O. Box 4014, Schaumburg, IL 60168 4014. (847) 330 0230. Fax: (847) 330 0050. http://www.aad.org.

OTHER

American Academy of Dermatology (AAD). *Pityriasis Rosea*. Schaumburg, IL: AAD, 2003.

Rebecca Frey, PhD

Placebo effect

Definition

A placebo effect occurs when a treatment or medication with no therapeutic value (a placebo) is administered to a patient and the patient's symptoms improve. The patient believes and expects that the treatment is going to work; therefore, it does. The placebo effect is also a factor to some degree in clinically effective therapies and explains why some patients respond better than do others to treatment despite similar symptoms and illnesses.

Origins

The word placebo is from the Latin "I shall please." Throughout most of medical history, the placebo effect was the principal treatment physicians offered their patients; for example, reassurance, attention, and belief in treatment would mobilize patients' internal powers to fight their illnesses. This effect is apparent in indigenous cultures using shamanistic healing, which places healing power in objects and rituals. In fact, placebos are sometimes called sham treatments.

Placebos were used throughout the nineteenth century in blind assessments of medical treatments. These blind assessments were created to test controversial medical treatments of the time (e.g., mesmerism and **homeopathy**) and involved using a blindfold on or withholding information from patients so they were unaware of the exact nature of the treatment being studied. For example, in blind assessments of homeopathy conducted in 1834 in France, homeopathic remedies were replaced with an inert placebo substance without the patient's knowledge. These blind assessments were the forerunners to modern double-blind randomized controlled trials used in drug development and in the study of other therapeutic techniques.

According to some medical historians, from the early 1800s through as late as World War II, placebos (usually in the form of sugar pills or saline injections) were regularly prescribed for up to 80% of patients. Doctors used placebos to appease patients when no effective treatment for their symptoms was available or prescribed placebos to patients they perceived as difficult.

The first documented American clinical study using placebos was conducted in the late 1920s. In 1937 scientists at Cornell University Medical School published a study on an **angina** drug that used placebo and blind assessment techniques. They found that the patients who were given a placebo instead of the angina drug experienced an improvement of symptoms. This was the first published account in the United States that discussed the possible therapeutic value of the placebo effect.

Benefits

The placebo effect is usually positive by its nature because it indicates that a patient believes in the therapy and that the therapy has some sort of a beneficial effect. The placebo effect has been documented in a wide variety of diseases and disorders. Certain conditions such as headaches, arthritis, and **hot flashes** are especially responsive to placebos, as are some individuals.

Description

Every available medical treatment is subject to the placebo effect. If patients believe the therapy will benefit them, it usually will to some degree. Even if the placebo does not improve the symptoms directly, the peace of mind patients may feel after taking a treatment they believe will help them is often enough to encourage a sense of improved well-being. For this reason, controlled, scientific studies are so crucial to determining the actual clinical efficacy of medications and therapies.

The person prescribing the placebo treatment may also have an impact on the effect it has on the patient. For example, the doctor's enthusiasm about a new

treatment may heighten its placebo effect for the patient. In addition, if a healthcare provider is perceived as a trusted, well-respected figure by the patient, the patient may experience benefits from any treatments the provider prescribes.

Placebos are often used in scientific trials of new medications and treatments to determine their efficacy. A randomly selected group of study subjects known as the control group is given placebo medication (usually a sugar or water-based substance) or treatment while the rest of the subjects are administered the actual therapy. The patients do not know which group they are in during the study, and the researchers and study authors do not know which subjects are in which group (hence the term double-blind). This system helps researchers to determine if new treatments work because they are clinically effective or because the subjects believe they will work.

Some authorities have estimated that the average placebo effect is 33%, though it can range lower and higher. Therefore, to demonstrate that a treatment, procedure, or medication is effective, a trial has to show that it does significantly better than the placebo given to a control group. For example, a study of single-remedy homeopathy was conducted with a group of 487 patients with an influenza-like syndrome. Patients treated with a single, non-individualized remedy were 70% more likely to have recovered within 48 hours than those receiving the placebo. Mathematical analysis allows a researcher to determine whether this effect is statistically significant or not.

Preparations

Placebos have therapeutic value only if the patient believes they will work. If the healthcare provider elicits trust and respect and engenders comfort, the patient is likely to find the prescribed treatments beneficial, whether they are clinically effective or unproven.

The use of a placebo in scientific studies requires informed consent of the entire population of subjects. The study subjects must know that they have a 50/50 chance of receiving a placebo treatment instead of the treatment under investigation.

Precautions

Using placebos with patients presents ethical issues if the healthcare provider knows there is no therapeutic value to the treatment and other available treatments could possibly benefit the patient. For patients with progressive or life-threatening illnesses, taking a medication or therapy with no clinical value other than its placebo effect can be harmful if it causes them to ignore proven treatments that could improve their condition.

Some clinical trials of surgical procedures require the placebo or control subjects to undergo what is essentially unnecessary surgery, involving incisions and other invasive procedures while the final therapeutic portion of the procedure is withheld (the placebo). Although as of 2008 this is standard scientific procedure recommended by the U.S. Food and Drug Administration (FDA) for the approval of new medical procedures and devices, it is also commonly accepted knowledge that unnecessary surgery is never beneficial to a patient and can result in serious complications such as infection, hemorrhaging, and possible death.

Side effects

The placebo effect can have a negative influence also, a nocebo. If a placebo is given that patients believe to be harmful to their health in some way, the patients may develop symptoms appropriate to this belief. A toxic or negative placebo suggests the great degree to which attitudes and expectations can affect one's state of health or course of an illness. People who believe they have been cursed or are the victim of voodoo have been known to die.

Research and general acceptance

The placebo effect is a well-known phenomenon in the scientific community, and clinical trials and other scientific studies are built around it. Ethical concerns can arise when there is a risk that patients are not getting the potentially life-saving treatments they need. In some cases, the placebo effect is enough to compensate for this lack. For example, a study published in the *Archives of General Psychiatry* found that in 45 controlled trials of antidepressants, subjects in the control group experienced a significant positive therapeutic effect with the placebo only. In cases of treatments involving potentially fatal diseases such as **cancer** and **AIDS**, the ethical implications of placebo use may not be as clear-cut.

Surgical placebo procedures, which are a relatively new type of clinical study, are not as universally accepted as placebo drug trials. A heated debate in the medical community concerns the value of such studies. However, the use of placebo surgery for controlled clinical trials is endorsed by the National Institutes of Health, the medical research arm of the U.S. Department of Health and Human Services.

KEY TERMS

Double-blind randomized controlled trial—A study that uses two groups of subjects. One group (the experimental group) receives the treatment being tested, while the other group (the control group) receives a placebo. Double-blind means that neither the subjects nor the researchers know which subjects are in which group.

Homeopathy—A practice of medicine based on the theory that certain substances that produce a specific symptom will cure those same symptoms if administered in small, extremely diluted doses.

Resources

BOOKS

Jopling, David. *Talking Cures and Placebo Effects*. New York: Oxford University Press, 2008.

Kradin, Richard. *The Placebo Response and the Power of Unconscious Healing*. New York: Routledge Press, 2008.

Thompson, W. Grant. *The Placebo Effect and Health: Combining Science and Compassionate Care*. Amherst, NY: Prometheus Books, 2005.

PERIODICALS

Hrobjartsson, Asbjorn, and Peter C. Gotzsche. "Is the Pla cebo Powerless? Update of a Systematic Review with 52 New Randomized Trials Comparing Placebo with No Treatment." *Journal of Internal Medicine* (April 2005): 91 100.

Hunter, Philip. "A Question of Faith. Exploiting the Placebo Effect Depends on Both the Susceptibility of the Patient to Suggestion and the Ability of the Doctor to Instill Trust." *EMBO Reports* (February 2007): 125 128.

Paterson, Charlotte, and Paul Dieppe. "Characteristic and Incidental (Placebo) Effects in Complex Interventions such as Acupuncture." *BMJ* (May 21, 2005): 1202 1205.

Sartorius, Norman. "Praised Be Placebo, May Its Glory Shine." *Croatian Medical Journal* (February 2006): 189 190.

Paula Ford-Martin
David Edward Newton, Ed.D.

Plantain

Description

Plantain, *Plantago major*, was considered to be one of the nine sacred herbs by the ancient Saxon people, and has been celebrated in Anglo-Saxon poetry as the "mother of herbs." There are more than 200 species of plantain and nearly as many recorded uses for this humble herb. Plantain is native to northern and central Asia and Europe. Early colonists brought plantain to North America as one of their favored healing remedies. Native Americans called this persistent herb "white man's foot" as it is often found growing along well-trodden foot paths. The Latin generic name means "sole of the foot." The indigenous Americas adopted many of the traditional European uses for this beneficial herb. They also used the plant to draw out the poison of rattlesnake bite, to soothe rheumatic **pain**, as a poultice to treat battle **wounds**, and as an eyewash. They used the fresh young leaves and seeds in their diet.

Plantains. *(© foodfolio / Alamy)*

Plantain is a member of the Plantaginaceae family. Some of the familiar species, naturalized throughout North America, are: *Plantago major*, commonly known as common plantain, dooryard plantain, broad-leaved plantain, greater plantain, round-leafed plantain, way bread, devil's shoestring, bird seed, snakeweed, and white man's foot; *Plantago media L.*, known as hoary plantain; and *Plantago lanceolata L.*,

also known as English plantain, lance-leaf plantain, buckhorn, chimney-sweeps, headsman, ribgrass, ribwort, ripplegrass, hen plant, snake plantain, fire weed, and soldier's herb. Two species of plantain, valued medicinally primarily for the seed, are *Plantago psyllium L.* and *Plantago indica*, also known as flea seed and plantago. The dried, ripe seeds of these species, generally called **psyllium**, is high in mucilage and is widely used as a bulk-forming laxative.

Plantain is a hardy and prolific perennial found in fields, lawns, roadsides, footpaths, and marginal areas throughout the temperate regions of the world. It thrives even in poor, compacted soil. The sturdy leaves and flower stalks grow in a basal rosette directly from the mass of light-brown rootlets. Depending on the species, the leaves are broadly ovate or narrow and lance-like. The dark-green leaves have distinct, parallel ribs along their length and are slightly bitter to the taste. The yellow-green stamens and the rust-colored sepals of the tiny flowers encircle the wand-like spikes at the end of each stalk. Plantain's flower spikes resemble tiny cattail spikes. The yellow-green stamens are more prominent in *P. lanceolata L.*, encircling the flower spike like a delicate wreath. The tapered flower spikes in this species are longer than those of *P. major* stretching up well beyond the height of the basal leaves. Plantain flowers from June through September. Blossoms are followed by flea-size, light-brown seeds. The plant may reach to 2 ft (0.6 m) in height, and self-seeds freely.

General use

The leaves and seeds of plantain are most often used medicinally. The fresh leaves, crushed and applied to wounds, sores, insect **bites**, bee and wasp **stings**, **eczema**, and sunburn are healing to tissue because of the high allantoin content. Plantain is an ancient remedy used widely for relieving coughs, **bronchitis** , **tuberculosis**, **sore throat**, **laryngitis**, urinary **infections**, and digestive problems. The infusion has been used as a blood purifying tonic, a mild expectorant, and a diuretic. The juice from crushed leaves may also stem the flow of blood from **cuts**, and soothe the itch of poison ivy or the sting of **nettle** (*Urtica dioica*). The root of the herb has been used to relieve **toothache**. The juice may relieve **earache**. A decoction of plantain has been used in douche preparations to relieve leucorrhea, and the juice or infusion can ease the pain of ulcers and inflammation of the intestines. All plantains contain high amounts of mucilage and tannin, and have similar medicinal properties. Plantain is high in minerals and vitamins C and K.

KEY TERMS

Astringent—Any preparation or medication that causes the soft tissues of the body to contract or tighten.

Demulcent—A soothing substance or medicine, often containing mucilage, used to calm irritated mucous membranes.

Diuretic—A herbal preparation or medication given to increase urinary output.

Expectorant—A drug given to help bring up mucus or phlegm from the respiratory tract.

Mucilage—A gummy or gel-like substance present in plants.

Plantain is used throughout the world. It is an effective treatment for chronic **colitis**, acute **gastritis**, enteritis, and enterocolitis according to the Russian Ministry of Health. The German Commission E, an advisory panel on herbal medicines for that country, lists plantain as a safe and effective herb with demulcent, astringent and antibacterial properties. A poultice (salve prepared from the leaf) or an infusion used as a skin wash, have been shown to reduce pain, **itching**, and bleeding from **hemorrhoids**. Studies in Italy and Russia have confirmed plantain's usefulness as a weight-loss remedy. In Chinese medicine plantain is considered a remedy for male **impotence**. The species *P. major* and *P. lanceolata* contain mucilage, the iridoid glycosides cubin and catapol, flavonoids, tannins, and **silica**.

Plantain seeds, particularly those of the species *P. psyllium* and *P. ovata* soaked in water and ingested, are widely used as a gentle and safe bulk laxative and antidiarrheal. Plantago seeds from these two species are listed in *The United States Pharmacopoeia XXII* as an official laxative herb. Psyllium is found in numerous commercial laxative preparations. Psyllium seed has also been proven beneficial in reducing high levels of blood **cholesterol**. Psyllium seeds contain a high mucilage content in addition to other phytochemicals including monoterpene alkaloids, glycosides, sugars, triterpenes, fixed oil, fatty acids, and tannins. The entire plant may be used with an alum mordant to dye wool a bronze-gold color. A newer use of plantain starch is in the manufacture of pharmaceuticals; like corn starch, plantain starch can be used as an inert ingredient to mix with drugs in order to form tablets containing consistent measured doses of the drugs.

Preparations

Harvest plantain leaves throughout the spring and summer, before the herb is in full blossom. Fresh young leaves may be eaten in salads or cooked as a potherb. The juice of fresh, bruised leaves has an antibacterial effect. However this property is lost when the herb is infused with boiling water. Harvest seeds when they can be easily removed from the flower spikes. Dry the leaves quickly to avoid discoloration and store in clearly labeled, dark glass containers.

Leaf infusion: Place 2–4 tbsp of fresh plantain leaf, half if dried, in a warmed glass container. Bring 2-1/2 c of fresh, non-chlorinated water to the boiling point, add it to the herbs. Cover. Steep five to seven minutes. No need to decoct plantain leaves. Drink warm or cold throughout the day, up to three cups per day. The prepared tea will store for about two days in the refrigerator in a sealed jar.

Tincture: Combine 4 oz of finely-cut, fresh plantain leaf, or 2 oz dry, powdered herb with one pint of brandy, gin, or vodka, in a glass container. Cover and store the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped, clearly labeled, dark glass bottle. A standard dose is 10–30 drops of the tincture in water, up to three times a day.

Precautions

Pregnant women should not use plantain, particularly the laxative psyllium preparations. Nursing mothers should consult a qualified herbalist before using psyllium or treating young children with the herb. Avoid inhaling psyllium seed powder as it may induce **asthma** attacks. Ingesting seeds without first soaking them in water may cause gastrointestinal problems. It is critical to drink large amounts of water when using psyllium, as the seeds absorb water in the intestine.

Persons who are interested in using herbal preparations as dietary supplements or to treat minor health conditions should note that the United States Food and Drug Administration (FDA) does not subject herbal preparations to the same set of regulations applied to prescription drugs. It is up to the manufacturer to make sure that a dietary supplement is safe before it is marketed. The FDA's role is that of post-marketing surveillance. Since the mid-1990s, there have been reports of herbal products that were mislabeled. In 1997, a young woman with a heart condition purchased a product that was labeled as "plantain" and experienced an abnormally rapid heartbeat. It turned out that the product was contaminated with **digitalis**, a powerful heart stimulant derived from **foxglove**. It is best to purchase herbs or herbal preparations only from established and reliable manufacturers. Questions about the safety of a specific product or reports of adverse reactions to a herbal product should be sent to the FDA's Center for Food Safety and Applied **Nutrition**, listed under Resources below.

Side effects

Psyllium seed and plantain may cause allergic reactions in sensitive persons.

Interactions

Plantain has been reported to decrease the absorption of digoxin (a heart medication) and lithium from the intestine. Its **Vitamin K** content may interfere with blood-thinning medications (anticoagulants). Plantain should not be taken together with prescription diuretics as it increases the risk of **potassium** loss from the bloodstream (hypokalemia). Persons taking any of these prescription medications should consult a physician before taking plantain as a dietary supplement.

Resources

BOOKS

Culpeper, Nicholas. *Culpeper's Complete Herbal & English Physician*. IL: Meyerbooks, 1990.

Duke, James A., Ph.D. *The Green Pharmacy*. PA: Rodale Press, 1997.

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. Lynn Sonberg Book Associ ates, 1996.

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Western Herbal Medicine. New York: Simon & Schuster, 2002.

Tyler, Varro E., Ph.D. *Herbs of Choice, The Therapeutic Use of Phytomedicinals*. New York: Pharmaceutical Prod ucts Press, 1994.

PERIODICALS

Alebiowu, G., and O. A. Itiola. "Compressional Character istics of Native and Pregelatinized Forms of Sorghum, Plantain, and Corn Starches and the Mechanical Prop erties of Their Tablets." *Drug Development and Indus trial Pharmacy* 28 (July 2002): 663 672.

ORGANIZATIONS

American Botanical Council. 6200 Manor Road, Austin, TX 78714 4345. (512) 926 4900. www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. www.herbs.org.

United States Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition. 5100 Paint Branch Parkway, College Park, MD 20740. (888) SAFEFOOD. www.cfsan.fda.gov.

Clare Hanrahan
Rebecca J. Frey, PhD

Pleurisy

Definition

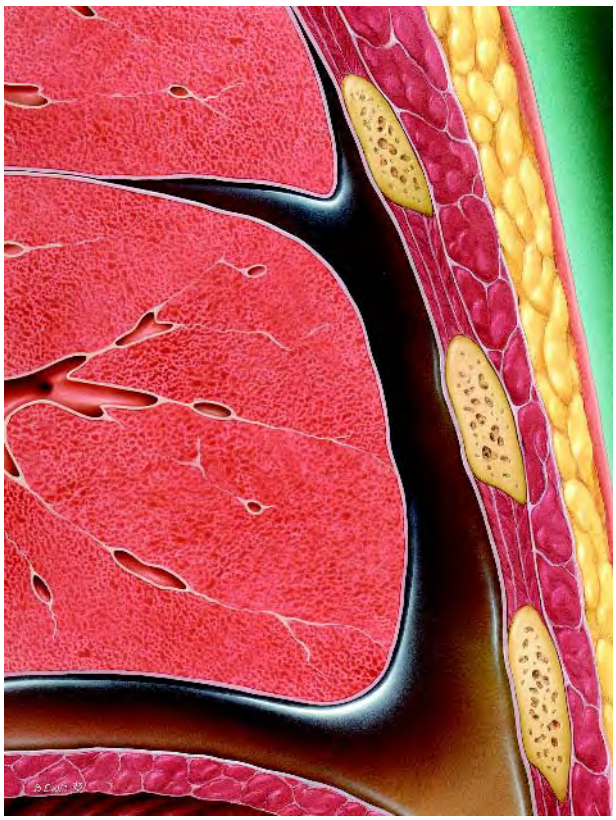
Pleurisy is an inflammation of the membrane that surrounds and protects the lungs (the pleura). Inflammation occurs when an infection or damaging agent irritates the pleural surface. Sharp chest pains are the primary symptom of pleurisy.

Description

Pleurisy, also called pleuritis, is a condition that generally stems from an existing respiratory infection, disease, or injury. In people who have otherwise good health, respiratory **infections** or **pneumonia** are the main causes of pleurisy. This condition used to be more common, but with the advent of antibiotics and modern disease therapies, pleurisy has become less prevalent.

The pleura is a double-layered structure made up of an inner membrane, which surrounds the lungs, and an outer membrane, which lines the chest cavity. The pleural membranes are very thin, close together, and have a fluid coating in the narrow space between them. This liquid acts as a lubricant, so that when the lungs inflate and deflate during breathing, the pleural surfaces can easily glide over one another.

Pleurisy occurs when the pleural surfaces rub against one another, due to irritation and inflammation. Infection within the pleural space is the most common irritant, although the abnormal presence of air, blood, or cells can also initiate pleurisy. These disturbances all act to displace the normal pleural fluid, which forces the membranes to rub, rather than glide, against one another. This rubbing irritates nerve endings in the outer membrane and causes **pain**.



Pleural effusion, the oozing of fluid from the blood or lymph into a pleural cavity, the space between the two layers of the pleura. *(Brian Evans / Photo Researchers, Inc.)*

Pleurisy also causes a chest noise that ranges from a faint squeak to a loud creak. This characteristic sound is called a "friction rub."

Pleurisy cases are classified either as having pleural effusion or as being "dry." Pleural effusion is more common and refers to an accumulation of fluid within the pleural space; dry pleurisy is inflammation without fluid build-up. Less pain occurs with pleural effusion because the fluid forces the membrane surfaces apart. However, pleural effusion causes additional complications because it places pressure on the lungs. This leads to respiratory distress and possible lung collapse.

Causes and symptoms

A variety of conditions can give rise to pleurisy. The following represent the most common sources of pleural inflammation:

- infections, including pneumonia, tuberculosis, and other bacterial or viral respiratory infections
- immune disorders, including systemic lupus erythematosus, rheumatoid arthritis, and sarcoidosis

KEY TERMS

Effusion—The accumulation of fluid within a cavity, such as the pleural space.

Empyema—An infection that causes pus to accumulate in the pleural space which may cause a tear in the pleural membrane and allow the infection to spread to other areas in the body.

Inflammation—An accumulation of fluid and cells within tissue that is often caused by infection and the resultant immune response.

Pneumonia—A condition caused by bacterial or viral infection that is characterized by inflammation of the lungs and fluid within the air passages.

Referred pain—The presence of pain in an area other than where it originates. In some pleurisy cases, referred pain occurs in the neck, shoulder, or abdomen.

- diseases, including cancer, pancreatitis, liver cirrhosis, and heart or kidney failure
- injury, from a rib fracture, collapsed lung, esophagus rupture, blood clot, or material such as asbestos
- drug reactions, from certain drugs used to treat tuberculosis (isoniazid), cancer (methotrexate, procarbazine), or the immune disorders mentioned above (hydralazine, procainamide, phenytoin, quinidine).

The hallmark symptom of pleurisy is sudden, intense chest pain that is usually located over the area of inflammation. Although the pain can be constant, it is usually most severe when the lungs move during breathing, coughing, **sneezing**, or even talking. The pain is usually described as shooting or stabbing, but in minor cases it resembles a mild cramp. When pleurisy occurs in certain locations, such as near the diaphragm, the pain may be felt in other areas such as the neck, shoulder, or abdomen (referred pain). Another indication of pleurisy is that holding one's breath or exerting pressure against the chest causes pain relief.

Pleurisy is also characterized by certain respiratory symptoms. In response to the pain, pleurisy patients commonly have a rapid, shallow breathing pattern. Pleural effusion can also cause shortness of breath, as excess fluid makes expanding the lungs difficult. If severe breathing difficulties persist, patients may experience a blue-colored complexion (cyanosis).

Diagnosis

The distinctive pain of pleurisy is normally the first clue physicians use for diagnosis. Doctors usually feel the chest to find the site of inflammation. A stethoscope is used to listen for abnormal chest sounds (such as the friction rub) as the patient breathes. Sometimes, a friction rub is masked by the presence of pleural effusion and further examination is needed for an accurate diagnosis.

To diagnose the illness that is causing pleurisy, doctors must evaluate the patient's history, additional symptoms, and laboratory test results. A chest x ray may also be taken to look for signs of accumulated fluid and other abnormalities. Computed tomography (CT) scan and ultrasound scans are more powerful diagnostic tools used to visualize the chest cavity.

The most helpful information in diagnosing the cause of pleurisy is a fluid analysis. Once the doctor knows the precise location of fluid accumulation, a sample is removed using a procedure called thoracentesis. In this technique, a fine needle is inserted into the chest to reach the pleural space and extract fluid. Several laboratory tests are performed to analyze the chemical components of the fluid and determine whether bacteria or viruses are present. Pleurisy associated with **rheumatoid arthritis** produces a distinctive pattern of tissue cells in the pleural fluid. Cancerous growths also shed cells into the tissue fluid. While most cases of pleurisy associated with **cancer** are secondary developments from a primary tumor, in some instances the pleurisy is the first indication of a malignancy.

In certain instances a biopsy of the pleura may be needed for microscopic analysis. A sample of pleural tissue can be obtained several ways: with a biopsy needle, by making a small incision in the chest wall, or by using a thoracoscope (a video-assisted instrument for viewing the pleural space and collecting samples).

Treatment

Alternative treatments can be used in conjunction with conventional treatment to help heal pleurisy. **Acupuncture** and botanical medicines are alternative approaches for alleviating pleural pain and breathing problems.

Herbal remedies

Poultices (crushed herbs applied directly to the skin) of respiratory herbs can assist in the healing process. An herbal remedy commonly recommended is pleurisy root (*Asclepias tuberosa*), so named because

of its use by early American settlers who learned of this medicinal plant from Native Americans. Pleurisy root helps to ease pain, inflammation, and breathing difficulties brought on by pleurisy. This herb is often used in conjunction with **mullein** (*Verbascum thapsus*) or elecampane (*Inula helenium*), which serve as expectorants to clear excess mucus from the lungs. Other respiratory herbs that are used in the treatment of pleurisy include **boneset** (*Eupatorium perfoliatum*), **catnip** (*Nepata cataria*), and **feverfew** (*Chrysanthemum parthenium*).

Herbs thought to combat infection, such as **echinacea** (*Echinacea* species), are also included in herbal pleurisy remedies. Antiviral herbs, such as *Lomatium dissectum* and *Ligusticum porteri*, can be used if the pleurisy is of viral origin.

Chinese medicine

Traditional Chinese treatments are chosen based upon the specific symptoms of the patient. The treatment principles are to harmonize the collaterals, regulate the qi, and possibly to treat stagnation of phlegm and blood. Acupuncture, ear acupuncture, and herbal remedies are used to treat chest pains. The herb **ephedra** (*Ephedra sinica*) opens air passages and alleviates respiratory difficulties in pleurisy patients. One pill of Xue Fu Zhu Yu Wan (Blood Mansion Eliminating Stasis Pill) can be taken twice daily to treat stabbing chest pain. The basic herbal formula, to which additional herbs are added for specific symptoms, is:

- Chuan Lian Zi (*Fructus meliae toosendan*), 10 g
- Jiang Xiang (*Ligum dalbergiae odoriferae*), 3 g
- Jie Geng (*Radix platycodi*), 5 g
- Xiang Fu (*Rhizoma cyperi*), 10 g
- Xuan Fu Hua (*Flos inulae*), 6 g
- Yan Hu Suo (*Rhizoma corydalis*), 10 g
- Yu Jin (*Tuber curcumae*), 10 g
- Zhi Ke (*Fructus aurantii*) 5 g

Other remedies

Other alternative remedies for pleurisy include:

- Aromatherapy. Essential oils can be effective when used as massage oils or inhaled with steaming water. Rosemary relieves pain. Peppermint relieves pain and decreases inflammation. Eucalyptus eliminates infection.
- Diet. Dietary recommendations include eating fresh fruits and vegetables, and adequate protein. The patient should ingest omega–3 fatty acids, which are fats with anti-inflammatory activity found in salmon, mackerel, herring, and flaxseed oil.
- Homeopathy. Homeopathic treatment, chosen by a trained practitioner based on the pattern of symptoms experienced by the patient, can be effective in resolving pleurisy.
- Hydrotherapy. Contrast hydrotherapy applied to the chest and back, along with compresses (cloths soaked in an herbal solution), can assist in the healing process.
- Supplements. Taking certain nutritional supplements, especially large doses of vitamin C, may also provide health benefits to persons with pleurisy.

Allopathic treatment

The pain of pleurisy is usually treated with analgesic and anti-inflammatory drugs, such as acetaminophen, ibuprofen, and indomethacin. Sometimes, a painful **cough** will be controlled with codeine-based cough syrups. However, as the pain eases, a person with pleurisy should try to breathe deeply and cough to clear congestion, otherwise pneumonia may occur.

The treatment used to cure pleurisy is determined by the underlying cause. Pleurisy from a bacterial infection is treated with antibiotics. Specific therapies designed for more chronic illnesses can often cause pleurisy to subside. In some cases, excess fluid must be removed by thoracentesis or a chest tube. If left untreated, a more serious infection, called empyema, may develop.

Expected results

Prompt diagnosis, followed by appropriate treatment, ensures a good recovery for most pleurisy patients. Generally speaking, the prognosis for pleurisy is linked to the seriousness of its cause.

Prevention

Preventing pleurisy is often a matter of providing early medical attention to conditions that can cause pleural inflammation. Maintaining a healthy lifestyle and avoiding exposure to harmful substances (for example, asbestos) are more general preventative measures.

Resources

BOOKS

The Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine Publish ing, 1999.

Light, Richard W. "Disorders of the Pleura, Mediastinum, and Diaphragm." In *Harrison's Principles of Internal Medicine*. 14th ed., edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Light, Richard W. *Pleural Diseases*. Baltimore, MD: Wil liams and Wilkins, 1995.
Stauffer, John L. "Lung: Pleural Diseases." In *Current Medical Diagnosis and Treatment 1998*. edited by Law rence M. Tierney, Jr., et al. Stamford, CT: Appleton and Lange, 1998.
Ying, Zhou Zhong, and Jin Hui De. "Chest Pain." *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Brechot, J. M., T. Molina, and P. Jacoulet. "Secondary Tumoral Pleurisy." [Article in French] *Presse Med* 31 (March 30, 2002): 556 561.
Chow, C. W., and S. C. Chang. "Pleuritis as a Presenting Manifestation of Rheumatoid Arthritis: Diagnostic Clues in Pleural Fluid Cytology." *American Journal of Medical Science* 323 (March 2002): 158 161.

ORGANIZATIONS

American Lung Association. 1740 Broadway, New York, NY 10019 4374. (800) 586 4872. http://www.lungusa.org.
National Heart, Lung, and Blood Institute. Information Center. PO Box 30105, Bethesda, MD 20824 0105. (301) 496 4236. http://www.nhlbi.nih.gov.

Belinda Rowland
Rebecca J. Frey, PhD

PMS *see* **Premenstrual syndrome**

Pneumonia

Definition

Pneumonia is an infection of the lung that can be caused by nearly any class of organism known to cause human **infections**. These include bacteria, amoebae, viruses, fungi, and parasites.

Description

Anatomy of the lung

To better understand pneumonia, it is important to understand the basic anatomic features of the respiratory system. The human respiratory system begins at the nose and mouth, where air is breathed in (inspired) and out (expired). The air tube extending from the nose is called the nasopharynx. The tube carrying air breathed in through the mouth is called the oropharynx. The nasopharynx and the oropharynx merge into the larynx. The oropharynx also carries swallowed substances, including food, water, and salivary secretion that must pass into the esophagus and then into the stomach. The larynx is protected by a trap door called the epiglottis, which prevents substances that have been swallowed, as well as substances that have been regurgitated (thrown up), from heading down into the larynx toward the lungs.

A useful method of picturing the respiratory system is to imagine an upside-down tree. The larynx flows into the trachea, which is the tree trunk, and thus the broadest part of the respiratory tree. The trachea divides into two tree limbs, the right and left bronchi. Each one of these branches off into multiple smaller bronchi, which course through the tissue of the lung. Each bronchus divides into tubes of smaller and smaller diameter, finally ending in the terminal bronchioles. The air sacs of the lung, in which oxygen-carbon dioxide exchange actually takes place, are clustered at the ends of the bronchioles like the leaves of a tree. They are called alveoli.

The tissue of the lung that serves only a supportive role for the bronchi, bronchioles, and alveoli is called the lung parenchyma.

Function of the respiratory system

The main function of the respiratory system is to provide oxygen, the most important energy source, for the body's cells. Inspired air (the air taken in when a person breathes) contains oxygen and travels down the respiratory tree to the alveoli. The oxygen moves out of the alveoli and is sent into circulation throughout the body as part of the red blood cells. The oxygen in the inspired air is exchanged within the alveoli for the waste product of human metabolism, carbon dioxide. The air people breathe out contains carbon dioxide. This **gas** leaves the alveoli during expiration. To restate this exchange of gases simply, humans breathe in oxygen, and they breathe out carbon dioxide.

Respiratory system defenses

The healthy human lung is sterile. There are normally no resident bacteria or viruses (unlike the upper respiratory system and parts of the gastrointestinal system, where bacteria dwell even in a healthy state). There are multiple safeguards along the path of the respiratory system. These are designed to keep serious, pathogenic organisms from invading and leading to infection.

The first line of defense includes the hair in the nostrils, which serves as a filter for larger particles. The epiglottis is a trap door of sorts, designed to prevent food and other swallowed substances from entering the larynx and then trachea. **Sneezing** and coughing, both provoked by the presence of irritants within the

respiratory system, help to clear such irritants from the respiratory tract.

Mucus produced by the respiratory system also serves to trap dust and infectious organisms. Tiny hair-like projections (cilia) from cells lining the respiratory tract beat constantly. They move debris trapped by mucus upwards and out of the respiratory tract. This mechanism of protection is referred to as the mucociliary escalator.

Cells lining the respiratory tract produce several types of immune substances that protect against various organisms. Other cells (called macrophages) along the respiratory tract actually ingest and kill invading organisms.

The organisms that cause pneumonia, then, are usually carefully kept from entering the lungs by these host defenses. However, when an individual encounters a large number of organisms at once, the usual defenses may be overwhelmed. Infection may happen either by inhaling contaminated air droplets or by aspiration of organisms inhabiting the upper airways.

Demographics

In the United States, pneumonia, in combination with **influenza**, is the eighth most common disease leading to death. An estimated 2.3 million Americans develop pneumonia each year, and about 58,500 die from it, according to 2004 statistics published by the Centers for Disease Control and Prevention (CDC). In developing countries, pneumonia ties with **diarrhea** as the most common cause of death.

Pneumonia is the most common fatal infection acquired by already hospitalized patients. Even in nonfatal cases, pneumonia is a significant economic burden on the healthcare system. One study estimates that people in the U.S. workforce who develop pneumonia cost employers five times as much in health care as the average worker.

Causes and symptoms

Causes

The list of organisms that can cause pneumonia is very large and includes nearly every class of infectious organism: viruses, bacteria, bacteria-like organisms, fungi, and parasites (including certain **worms**). Different organisms are more frequently encountered by different age groups. Further, other characteristics of individuals may place them at greater risk for infection by particular types of organisms:

- Viruses cause the majority of pneumonia cases in young children (especially respiratory syncytial virus, parainfluenza and influenza viruses, and adenovirus).
- Adults are more frequently infected with bacteria (such as *Streptococcus pneumoniae, Haemophilus influenzae,* and *Staphylococcus aureus*).
- Pneumonia in older children and young adults is often caused by the bacteria-like *Mycoplasma pneumoniae* (the cause of what is often referred to as "walking" pneumonia).
- *Pneumocystis carinii* is an extremely important cause of pneumonia in patients with immune problems, such as patients being treated for cancer with chemotherapy or patients with AIDS. Classically considered a parasite, it appears to be more related to fungi.
- People who have reason to come into contact with bird droppings, such as poultry workers, are at risk for pneumonia caused by the organism *Chlamydia psittaci.*
- A very large, serious outbreak of pneumonia occurred in 1976, when many people attending an American Legion convention were infected by a previously unknown organism. Subsequently named *Legionella pneumophila,* it causes what is was later called "Legionnaire's disease." The organism was traced to air conditioning units in the convention's hotel.

CONDITIONS PREDISPOSING TO PNEUMONIA. In addition to exposure to sufficient quantities of causative organisms, certain conditions may make an individual more likely to become ill with pneumonia. Certainly, the lack of normal anatomical structure could result in an increased risk of pneumonia. For example, there are certain inherited defects of cilia which result in less effective protection. Cigarette smoke, inhaled directly by a smoker or secondhand by an innocent bystander, interferes significantly with ciliary function, as well as inhibiting macrophage function.

Stroke, seizures, alcohol, and various drugs interfere with the function of the epiglottis. A weak epiglottis leads to a leaky seal on the trap door, with possible contamination by swallowed substances and/or regurgitated stomach contents. Alcohol and drugs also interfere with the normal **cough** reflex. This interference further decreases the chance of clearing unwanted debris from the respiratory tract.

Viruses may interfere with ciliary function, allowing themselves or other microorganism invaders (such as bacteria) access to the lower respiratory tract. One of the most important viruses is HIV (Human Immunodeficiency Virus), the causative virus in **AIDS** (acquired immunodeficiency syndrome). Between the 1980s and early 2000s this virus resulted in a huge

increase in the incidence of pneumonia. Because AIDS results in a general decreased effectiveness of many aspects of the host's immune system, a person with AIDS is susceptible to all kinds of pneumonia, which includes some previously rare parasitic types that would be unable to cause illness in an individual with a normal immune system.

The elderly have an increased risk of developing pneumonia due to a less effective mucociliary escalator, as well as immune system changes that occur naturally with the **aging** process.

Various chronic conditions predispose a person to infection with pneumonia. These include **asthma**, cystic fibrosis, and neuromuscular diseases that may interfere with the seal of the epiglottis. Esophageal disorders may result in stomach contents passing upwards into the esophagus, which increases the risk of aspiration into the lungs of those stomach contents with their resident bacteria. Diabetes, **sickle cell anemia**, lymphoma, **leukemia**, and **emphysema** also predispose a person to pneumonia.

Genetic factors appear to be involved in susceptibility to pneumonia. Certain changes in DNA appear to affect some patients' risk of developing such complications of pneumonia as septic shock.

Pneumonia is also one of the most frequent infectious complications of all types of surgery. Many drugs used during and after surgery may increase the risk of aspiration, impair the cough reflex, and cause patients to underfill their lungs with air. **Pain** after surgery also discourages patients from breathing deeply enough and from coughing effectively.

Radiation treatment for **breast cancer** increases the risk of pneumonia in some patients by weakening lung tissue.

In addition, the use of mechanical ventilators to assist patients in breathing after surgery increases their risk of developing pneumonia. This condition, now referred to as ventilator-associated pneumonia, has a mortality exceeding 50%.

Symptoms

Pneumonia is suspected in any patient who has **fever**, cough, chest pain, shortness of breath, and increased respirations (number of breaths per minute). Fever with a shaking chill is even more suspicious. Many patients cough up clumps of sputum, commonly known as spit. These secretions are produced in the alveoli during an infection or other inflammatory condition. They may appear streaked with pus or blood. Severe pneumonia results in the signs of oxygen deprivation, which includes blue appearance of the nail beds or lips (cyanosis).

The invading organism causes symptoms, in part, by provoking an overly strong immune response in the lungs. In other words, the immune system that should help fight off infections, kicks into such high gear, that it damages the lung tissue and makes it more susceptible to infection. The small blood vessels in the lungs (capillaries) become leaky, and protein-rich fluid seeps into the alveoli, which results in less functional area for oxygen-carbon dioxide exchange. The patient becomes relatively oxygen deprived, while retaining potentially damaging carbon dioxide. The patient breathes faster and faster, in an effort to bring in more oxygen and blow off more carbon dioxide.

Mucus production is increased, and the leaky capillaries may tinge the mucus with blood. Mucus plugs actually further decrease the efficiency of gas exchange in the lung. The alveoli fill further with fluid and debris from the large number of white blood cells being produced to fight the infection.

Consolidation, a feature of bacterial pneumonia, occurs when the alveoli, which are normally hollow air spaces within the lung, instead become solid, due to quantities of fluid and debris.

Viral pneumonia and mycoplasma pneumonia do not result in consolidation. These types of pneumonia primarily infect the walls of the alveoli and the parenchyma of the lung.

Severe acute respiratory syndrome (SARS)

Severe acute respiratory syndrome (SARS) is a contagious and potentially fatal disease that first appeared in the form of a multi-country outbreak in early February 2003 in Asia, North America, and Europe. The CDC later worked with the World Health Organization (WHO) to investigate the cause(s) of SARS and to develop guidelines for infection control. SARS was described as an atypical pneumonia of unknown etiology and the disease agent was identified as a previously unknown coronavirus.

Early symptoms of SARS include a high fever with **chills**, **headache**, **muscle cramps**, and weakness. This early phase is followed by respiratory symptoms, usually a dry cough and painful or difficult breathing. About 10 to 20% of patients require mechanical ventilation due to insufficient blood oxygen levels. The median incubation period of SARS is four to five days. The primary mode of transmission is direct mucus membrane (eyes, nose, and mouth) contact with infectious respiratory droplets. If the patient is isolated and receives prompt treatment within the first five days

after the onset of symptoms, the risk of infecting other people is greatly reduced, particularly if the SARS-designated care facility adheres to strict airborne precautions, according to the WHO. Treatments include antibiotics known to be effective against bacterial pneumonia; ribavirin and other antiviral drugs; and steroids. The mortality of SARS is estimated at 7 to 9%.

Diagnosis

For the most part, diagnosis of pneumonia is based on the patient's report of symptoms, combined with examination of the chest. Listening with a stethoscope reveals abnormal sounds, and tapping on the patient's back (which should yield a resonant sound due to air filling the alveoli) may instead yield a dull thump if the alveoli are filled with fluid and debris.

Laboratory diagnosis can be made of some types of bacterial pneumonia by staining sputum with special chemicals and looking at it under a microscope. Identification of the specific type of bacteria may require culturing the sputum (using the sputum sample to grow greater numbers of the bacteria in a lab dish.).

X-ray examination of the chest may reveal certain abnormal changes associated with pneumonia. Localized shadows obscuring areas of the lung may indicate a bacterial pneumonia, while streaky or patchy appearing changes in the x-ray picture may indicate viral or mycoplasma pneumonia. These changes on x ray, however, are known to lag behind the patient's actual symptoms.

Treatment

Pneumonia is a potentially serious condition that requires prompt medical attention. Patients should contact their doctors for immediate diagnosis and treatment. Alternative treatment such as nutritional support, however, can help alleviate some of the symptoms associated with pneumonia and boost the body's immune function.

Diet and nutrition

The following nutritional changes are recommended:

- Avoid all potentially allergenic foods and determine allergenic foods with an elimination diet.
- Reduce intake of sugar and processed foods.
- Get plenty of rest.
- Get plenty of fluids to prevent dehydration and help loosen phlegm.
- Consume nutritional supplements such as vitamins C, bioflavonoids, vitamin A, beta-carotene, and zinc.

Herbal treatment

Over-the-counter herbal preparations such as glycerol guaiacolate can help clear the lungs of phlegm and speed up the recovery process. Antimicrobial herbs, such as **goldenseal** (*Hydrastis canadenis*) and Chinese herbs, which stimulate the immune system, may be taken for treatment.

Other treatment

Other treatments include **yoga**, help with breathing, movement, and **relaxation**. Also recommended are **meditation** and the use of **guided imagery**. Individuals can contact local practitioners to enroll in such therapies.

Allopathic treatment

Prior to the discovery of penicillin antibiotics, bacterial pneumonia was almost always fatal. In the late 2000s, antibiotics, especially given early in the course of the disease, are very effective against bacterial causes of pneumonia. Erythromycin and tetracycline improve recovery time for symptoms of mycoplasma pneumonia. They do not, however, eradicate the organisms. Amantadine and acyclovir may be helpful against certain types of viral pneumonia.

Another antibiotic linezolid (Zyvox) was being used to treat penicillin-resistant organisms that cause pneumonia in the late 2000s. Linezolid is the first of a line of antibiotics known as oxazolidinones. Another drug known as ertapenem (Invanz) was reported to be effective in treating bacterial pneumonia.

Expected results

Rate of recovery varies according to the type of organism causing the infection. Recovery following pneumonia with *Mycoplasma pneumoniae* is nearly 100%. *Staphylococcus pneumoniae* has a death rate of 30 to 40%. Similarly, infections with a number of gram negative bacteria (such as those in the gastrointestinal tract which can cause infection following aspiration) have a high death rate of 25 to 50%. *Streptococcus pneumoniae,* the most common organism causing pneumonia, produces a death rate of about 5%. More complications occur in very young or very old individuals who have multiple areas of the lung infected simultaneously. Individuals with other chronic illnesses (including **cirrhosis** of the liver, congestive heart failure, individuals without a functioning spleen, and individuals who have other diseases that

KEY TERMS

Alveoli—The little air sacs clustered at the ends of the bronchioles, in which oxygen-carbon dioxide exchange takes place.

Aspiration—An action during which solids or liquids that should be swallowed into the stomach are instead breathed into the respiratory system.

Cilia—Hair-like projections from certain types of cells.

Consolidation—A condition in which lung tissue becomes firm and solid rather than elastic and air-filled because it has accumulated fluids and tissue debris.

Coronavirus—One of a family of RNA-containing viruses known to cause severe respiratory illnesses. In March 2003, a previously unknown coronavirus was identified as the causative agent of severe acute respiratory syndrome (SARS).

Cyanosis—A bluish tinge to the skin that can occur when the blood oxygen level drops too low.

Parenchyma—The supportive tissue surrounding a particular structure. An example is that tissue that surrounds and supports the actually functional lung tissue.

Sputum—Material produced within the alveoli in response to an infectious or inflammatory process.

result in a weakened immune system) experience complications. Patients with immune disorders, various types of **cancer**, transplant patients, and AIDS patients also experience complications.

Prevention

Because many types of bacterial pneumonia occur in patients who are first infected with the influenza virus, yearly vaccination against influenza can decrease the risk of pneumonia for the elderly and people with chronic diseases such as asthma, cystic fibrosis, diabetes, kidney disease, and cancer.

Maintaining a healthy diet that includes whole foods and **vitamin C** and B-complex vitamins aids in prevention. Also helpful in terms of both good health and prevention of pneumonia is developing a regular **exercise** regimen, as well as reducing **stress**.

A specific vaccine against *Streptococcus pneumoniae* is very protective and should also be administered to patients with chronic illnesses.

Patients who have decreased immune resistance are at higher risk for infection with *Pneumocystis carinii*. They are frequently put on a regular drug regimen of Trimethoprim sulfa and/or inhaled pentamidine to avoid Pneumocystis pneumonia.

Resources

BOOKS

Mandell, Gerald L., John E. Bennett, and Raphael Dolin. "Clinical Evaluation and Therapy for Pneumonia." In *Principles and Practice of Infectious Diseases,* 6th ed. Philadelphia: Churchill Livingstone/Elsevier, 2005.

Pizzorno, Joseph E., Michael T. Murray, and Herb Joiner Bey. "Bronchitis and Pneumonia." In *The Clinician's Handbook of Natural Medicine,* 2nd ed. Philadelphia: Churchill Livingstone/Elsevier, 2007.

PERIODICALS

Minino, A. M., Melonie P. Heron, Sherry L. Murphy, and Kenneth D. Kochanek. "Deaths: Final Data for 2004." *National Vital Statistics Reports*, National Centers for Health Statistics, Centers for Disease Control and Pre vention, 55, no. 19 (August 21, 2007): 1 120.

Ruffell, A., and L. Adamcova. "Ventilator Associated Pneumonia: Prevention Is Better than Cure." *Nursing in Critical Care* 13, no. 1 (January/February 2008): 44 53.

ORGANIZATIONS

American Lung Association, 61 Broadway, 6th Floor, New York, NY, 10006, (800) 548 8252, (212) 315 8700, http://www.lungusa.org.

Centers for Disease Control and Prevention, 1600 Clifton Rd., NE, Atlanta, GA, 30333, (800) 311 3435, (404) 498 1515, http://www.cdc.gov.

Global Alliance Against Chronic Respiratory Diseases (GARD), World Health Organization, Department of Chronic Diseases and Health Promotion, 20, Avenue Appia, CH 1211 27, Geneva, Switzerland, http://www.who.int/respiratory/gard/en/.

National Heart, Lung, and Blood Institute Information Center, PO Box 30105, Bethesda, MD, 20824 0105, (301) 592 8573, http://www.nhlbi.nih.gov.

Mai Tran
Rebecca J. Frey, PhD
Angela M. Costello

Poison ivy and poison oak *see* **Contact dermatitis**

Poison oak (plant) *see* **Rhus toxicodendron**

Pokeweeds *see* **Phytolacca**

Polarity therapy

Definition

Polarity therapy is a holistic, energy-based system that includes bodywork, diet, **exercise**, and lifestyle counseling for the purpose of restoring and maintaining proper energy flows throughout the body. The underlying concept of polarity therapy is that all energy within the human body is based in electromagnetic force and that disease results from improperly dissipated energy.

Origins

Austrian-American chiropractor, osteopath, and naturopath Randolph Stone (1888–1981) developed polarity therapy as an integration of Eastern and Western principles and techniques of healing. Stone discovered the ancient principles of the Ayurvedic philosophy in the course of his travels during a sojourn in India. On a life-long quest to learn the fundamentals of human vitality, he also studied **reflexology** and **traditional Chinese medicine**.

Stone became committed to the principles of **Ayurvedic medicine**, which he interpreted in conjunction with his scientific and medical knowledge to define polarity therapy. According to the philosophy of Ayurved, which is based in a set of principles called the tridosha—the energy of the human body is centered in five organs or regions (the brain; the cardiopulmonary [heart and lungs] region, the diaphragm, the smaller intestine, and the larger intestine). One of five airs or energy forms controls each respective region: prana in the brain, vyana in the heart and lungs, udana in the diaphragm, samana in the smaller intestine, and apana in the larger intestine. The five airs control all directional motion in the body, with each air in command of a different type of movement. Stone established further that the prana, centered in the brain, ultimately controlled the combined forces of the body. Any impediment or restriction to the flow of prana in turn affects the health of the entire body. The prana force is nurtured through the flow of food and air into the body as well as through our interactions with other living beings and through the intake of the five sensory organs.

Stone devoted much of his life to defining an elaborately detailed cause and effect relationship between the human anatomy and illness, based in the energy flow of the prana. He further attributed electromagnetic energy as the basis of the energy forces. He used the medical symbol of the Caduceus to define the patterns of the flow and described the energy movement in detail in charts of the human body. Polarity therapy is based in charted energy flows. The primary energy pattern is defined in a spiral motion that radiates from the umbilicus and defines the original energy flow of the fetus in the womb.

Benefits

Polarity therapy unblocks and recharges the flow of life energy and realigns unbalanced energy as a means of eliminating disease. Patients learn to release tension by addressing the source of the **stress** and by maintaining a healthy demeanor accordingly.

This treatment may be effective to promote health and healing to anyone willing to embrace the appropriate lifestyle. Polarity therapy is reportedly effective for anyone who has been exposed to toxic poisons. Likewise HIV-positive individuals may find comfort in polarity therapy. Additionally this is an appropriate therapy for relieving general stress, back **pain**, stomach cramps, and other recurring maladies and conditions.

Description

After determining the exact source of a patient's energy imbalance, the therapist begins the first of a series of bodywork sessions designed to rechannel and release the patient's misdirected prana. This therapy, akin to massage, is based in energetic pressure and involves circulating motions. In performing the regimen, the therapist pays strict attention to the pressure exerted at each location—even to which finger is used to apply pressure at any given point of the patient's anatomy. This technique, which comprises the central regimen or focal point of polarity therapy is very gentle and is unique to polarity therapy. It typically involves subtle rocking movements and cranial holds to stimulate body energy. Although firm, deep pushing touches are employed in conjunction with the massage technique, the polarity therapist never exerts a particularly forceful contact.

To support the bodywork, the therapist often prescribes a diet for the patient, to encourage cleansing and eliminate waste. The precepts of polarity therapy take into consideration specific interactions between different foods and the human energy fields.

Likewise, a series of exercises is frequently prescribed. These exercises, called polarity **yoga** include squats, stretches, rhythmic movements, deep breathing, and expression of sounds. They can be both energizing

KEY TERMS

Apana—life sustaining energy centered in the larger intestine; the fifth of the five airs of Ayurvedic philosophy; the life force governing expulsion activity.

Ayurveda—(Sanskrit, *Ayur,* life, and *veda,* knowledge) is translated as "knowledge of life" or "science of longevity." It became established as the traditional Hindu system of medicine.

Caduceus— the ancient and universal symbol of medicine consisting of the winged staff of Mercury and two intertwining serpents.

Prana—life sustaining energy centered in the human brain; the first of the five airs of Ayurvedic philosophy; the life force governing inspiration and the conscious intellect.

Primary energy pattern—a spiral motion that radiates from the umbilicus; the energy pattern associated with a child in the womb.

QV—quantum vacuum, a theory coined by physicists, which defines the interactions of energy that combine to form reality.

Reflexology—Belief that reflex areas in the feet correspond to every part of the body, including organs and glands, and that stimulating the correct reflex area can affect the body part.

Samana—life sustaining energy of the smaller intestine; the fourth of the five airs of Ayurvedic philosophy; the life force governing side-to-side motion.

Tridosha—the combination of three basic principles of energy, or biological humor, that comprise life, according to Ayurvedic philosophy.

Udana—life sustaining energy of the diaphragm, the third of the five airs of Ayurvedic philosophy, the life force governing upward motion.

Vyana—life sustaining energy of the heart and lungs; the second of the five airs of Ayurvedic philosophy; the life force governing circular motion.

and relaxing. Counseling may be included whenever appropriate as a part of a patient's highly individual therapy regimen to promote balance.

Preparations

Therapists take a comprehensive case history from every patient prior to beginning treatment. This preliminary verbal examination often monopolizes the first therapy session. Depending upon circumstances a therapist might have a need to assess the patient's physical structural balance through observation and physical examination.

Precautions

Polarity therapy is safe for virtually anyone, even the elderly and the most frail patients, because of the intrinsic gentleness of the **massage therapy**.

Side effects

Highly emotional releases of energy (laughter, tears, or a combination of both) are associated with this therapy.

Research and general acceptance

This is a complementary therapy of holistic, spiritually based treatment, which may be used in conjunction with a medical approach. Polarity therapy is practiced worldwide, but the majority of practitioners are based in the United States. Modern physicists employ concepts similar to Stone's basic theories of polarity in defining the quantum vacuum (QV) as a foundation of all reality. Still, by 2000, this holistic regimen had not achieved the widespread acceptance anticipated by Stone before his death in 1981.

When St. Paul Fire and Marine insurers offered a liability insurance package to therapy providers, the company recognized polarity therapy as an alternative medical treatment along with **acupuncture**, **biofeedback**, **homeopathy**, reflexology, and others.

Training and certification

The American Polarity Therapy Association (APTA) sanctions two levels of training. The Associate Polarity Practitioner (APP) is the preliminary level, based on a minimum level of excellence in this field. Registered Polarity Practitioner (RPP) is bestowed upon the graduates of an approved training curriculum. Post-graduate and specialty training is available in a variety of fields, and APTA certifies practitioners accordingly.

RANDOLF STONE (1890-1981)

Randolf Stone was born Rudolph Bautsch in 1890 in Austria. He immigrated with his family to the United States in 1898. As he grew, Stone started studying many medical practices and soon was experienced in the healing arts of naturopathy, osteopathy, and chiropractic. He changed his name to Randolf Stone in the 1920s.

Stone's quest for knowledge continued to grow. He soon turned to the study of physics, including quantum physics and the study of energy fields, in search of a more effective healing art. In pursuit of greater knowledge in these areas, he traveled throughout the United States. Additionally he returned to Europe and traveled to India to investigate the esoteric arts of different cultures.

Through his travels, Stone grew to believe in energy fields that surround people. When these fields are weak or disrupted, it results in sickness and disease. Stone developed polarity therapy. This is the manipulation of these human energy fields through nutrition, touch, and environmental factors. Stone based his theories of polarity therapy extensively on the precepts that he learned throughout the course of his travels, most fundamentally on the Ayurveda system of five energies that he learned in India. He also drew from his knowledge of chiropractic, naturopathy, and osteopathy medical treatments.

In 1947, Stone published his first book, *Energy,* discussing his views on the energy fields. He followed up this work with six other books, all expanding on polarity therapy. His writing, *The Physical Anatomy of Man,* became the foundation for all healing arts in the United States.

Resources

BOOKS

Stone, Randolph. *Polarity Therapy The Complete Collected Works.* Reno, CRCS Publications, 1986.

PERIODICALS

Modern Medicine (August 1, 1999): 15.

ORGANIZATIONS

American Polarity Therapy Association. P.O. Box 19858, Boulder Colorado 80308. (303) 545 2080. Fax: (303) 545 2161.

Trans Hyperboreau Institute of Science. P.O. Box 2344 Sausalito, California 94966. (415) 331 0230. (800) 485 8095. Fax: (415) 331 0231.

OTHER

Young, Phil. "Prana." http://www.eclipse.co.uk/masterworks/Polarity/PolarityArticles.htm. (16 June 2000).

Gloria Cooksey

Polycystic ovary syndrome

Definition

Polycystic Ovary Syndrome (PCOS) is a collection of hormonal and metabolic imbalances marked by virilization, anovulation and polycystic ovaries.

Description

The condition known as PCOS was first defined by Drs. Stein and Leventhal in 1935, who observed that female patients with multiple **ovarian cysts** often had other distinct physical symptoms including excessive male-pattern hair growth, menstrual cycle disturbances leading to **infertility**, and **obesity**. In 2004, the American Society of Reproductive Medicine and European Society of Human Reproduction and Embryology redefined diagnostic criteria to include two out of three of the following: anovulation, hyperandrogenism, and polycystic ovaries.

Demographics

PCOS is the most common hormonal disorder of premenopausal women, affecting 5-7% of women of childbearing age. Symptoms typically begin to occur shortly after the onset of menses, however the syndrome may remain undiagnosed until later in life. There can be many different clinical presentations that fall under the category of PCOS. It has been suggested that PCOS may actually have several subcategories based on the variety of symptoms. The most common symptoms are excessive hair growth, menstrual irregularities and obesity. It is estimated that 95% of women with this collection of symptoms have PCOS.

Causes and Symptoms

The cause of PCOS is not fully understood. Several different mechanisms have been identified as contributing to PCOS: dysfunction of the central nervous system, ovarian disorders, and **insulin resistance**. Additionally, there appears to be a genetic component.

The central nervous system regulates autonomic processes of the body, and is in communication with

the endocrine system via the hypothalamus. The hypothalamus is responsible for regulating aspects of the autonomic nervous system and communicating with the pituitary gland via neuroendocrine agents. The hypothalamic hormone regulating reproduction, Gonadotropin-releasing hormone (GnRH), influences the pituitary gland to secrete follicle-stimulating hormone (FSH) and leutinizing hormone (LH). In PCOS, GnRH secretion is disrupted, resulting in elevated LH. The effect of LH on the ovary is to increase androgen production.

Alteration of ovarian function is another component of PCOS. Typically, there is a failure of the follicle to fully mature and ovulate. As a result, the ovaries may be quite enlarged by multiple unreleased follicles, now fluid-filled follicular cysts. Androgen production by the ovaries is enhanced, including testosterone and dehydroepiandrosterone (**DHEA**).

Metabolic alterations involving insulin likely play a role in PCOS. Between 40-80% of women with PCOS experience some degree of insulin resistance or dysglycemia, and about 40% will go on to develop Type II diabetes. Insulin resistance is the decreased sensitivity of insulin receptors of skeletal muscle. Decreased sensitivity to insulin leads to a need for more insulin to be released, resulting in chronically elevated levels of both insulin and glucose. Dysglycemia is certainly present in the general population and is not unique to PCOS, but there is a correlation between the two for many women. It has been proposed that the insulin resistance of PCOS is qualitatively different from that which occurs independently, and involves a problem with the signaling pathway of insulin. Insulin interferes with ovulation and the normal menstrual cycle.

In addition to the local effects of excess insulin, there are many systemic effects. About 40-60% of women with anovulatory menstrual cycles and PCOS are obese. The weight distribution tends to be abdominal, with an increased waist-to-hip ratio. This abdominal obesity is known to contribute to elevated risk of diabetes, **hypertension**, hyperlipidemia, and cardiovascular disease. Obesity further contributes to the abnormal hormone profile in women with PCOS by promoting estrogen conversion in adipose tissue.

Obesity is also linked with a decrease in sex-hormone-binding globulin (SHBG), a transport protein that binds to and carries estrogen and testosterone, which in their unbound form are metabolically active. The effect of estrogen on the ovary is to stimulate androgen production and increase ovarian receptors to LH, amplifying the androgen effect. Elevated testosterone produced by the ovary and unbound from SHBG is responsible for the symptoms of virilization that often occur with PCOS. These symptoms include excess hair growth, loss of hair from the head, and **acne**.

Testosterone is normally produced in small amounts by the ovaries and adrenal glands, as are weaker androgens **androstenedione**, dehydroepiandrosterone (DHEA) and dehydroepiandrosterone sulfate (DHEA-S). These can be converted to the highly active hormone dihydroxytestosterone (DHT) by the enzyme 5-a-reductase. Testosterone acts on receptors on hair follicles to promote hair growth, also known as hirsutism, on the chest, back, abdomen and face.

Hirsutism doesn't necessarily correlate with testosterone levels measured in the blood, as androgens may be elevated enough to cause hair growth and still be within normal limits on testing. The number of androgen receptors in the hair follicle determines the degree of hirsutism, and this has great genetic and ethnic variation.

Other skin changes may occur as part of the polycystic ovary syndrome. Acne is a fairly common symptom and presents as a result of an increase in circulating androgens. Skin discoloration at the neck and under the breasts, called *acanthosis nigricans*, is a unique symptom that is caused by elevated insulin. Skin tags, thickening of the skin (*hyperkeratosis*) and **infections** of hair follicles called *hydradenitis suppurativa* are also caused by hyperinsulinemia and may occur in PCOS.

Diagnosis

PCOS is considered a diagnosis of exclusion, made after a full workup to rule out other endocrine disorders. The first part of evaluation is a clinical assessment of medical history, family history and a physical examination. Signs and symptoms looked for on the physical exam include:

- hair loss on head
- facial hair growth: cheeks, chin, upper lip, sideburns
- acne
- thyroid enlargement
- skin discoloration
- skin tags
- body hair on chest, back, abdomen, between umbilicus and pubic area, thighs
- enlarged or tender ovaries
- weight, body mass index (BMI), waist-hip ratio

Next, the physician will order laboratory evaluation and ultrasound of the pelvis. A diagnosis of PCOS

can be made if the patient has clinical symptoms, laboratory abnormalities or multiple cysts on ultrasound. Often a woman will have all of these, but all two of the three must be present to make a diagnosis.

There are numerous laboratory tests that may be helpful for the diagnosis and management of PCOS. Many of these tests evaluate hormone levels:

- thyroid-stimulating hormone (TSH)
- prolactin
- LH and FSH
- testosterone, androstenedione, DHEA
- estrogen
- SHBG

Further tests to evaluate glucose regulation are indicated and include **fasting** glucose, insulin, and hemoglobin A1C (HgbA1C). HgbA1C measures glycosylated hemoglobin, a marker of the effects of prolonged elevated glucose. A glucose tolerance test (GTT) could also be performed, in which a series of serum samples are drawn after the patient consumes a standardized bolus of glucose. Fasting glucose and HgbA1C may be used to monitor treatment of insulin resistance.

Women with PCOS are at increased risk of cardiovascular disease, a problem associated with dysglycemia. Additional screening tests may be ordered:

- Lipid panel - includes total cholesterol, high-density and low-density lipoproteins (HDL and LDL), and triglycerides
- Homocysteine - a predictor of coronary, cerebral and peripheral vascular disease associated with vitamin B12 or folate deficiency
- C-Reactive protein (CRP) - a marker of inflammation and an independent risk factor for cardiovascular disease

Treatment

Conventional treatment for PCOS typically centers around drug therapy for dysglycemia. The most widely used drug is metformin (Glucophage), a non-sulfonylurea which increases cell receptor response to insulin, decreases intestinal absorption of glucose, and decreases production of glucose by the liver. Several studies have evidenced that metformin both decreases hyperinsulinemia and promotes ovulation in women with anovulatory cycles. It may also help with weight loss in overweight patients with PCOS.

Another pharmaceutical strategy for treating PCOS is suppressing ovarian function with oral contraceptive pills (OCPs). Treatment with OCPs will often initiate regular menses in women with **amenorrhea** or oligomenorrhea. The birth control pill decreases androgen levels, regulates menses and protects against uterine hyperplasia. However, there is conflicting evidence regarding the effect of OCPs on metabolic issues, some studies suggesting that oral contraceptive use promotes dysglycemia and leads to frank diabetes. Another obvious disadvantage of the oral contraceptive pill in PCOS is the problem of infertility.

Conventional treatment with PCOS seeking fertility is often metformin, clomifene, or a combination of the two. Clomifene (Clomid) acts on the ovaries to induce ovulation, and increases the rate of ovulation with use of metformin alone from 46% to 76%.

Women struggling with the often disruptive symptoms of PCOS may be seeking treatment for the virilizing effects of testosterone. One such treatment is spironolactone, a diuretic drug with antiandrogenic effects.

Nutrition/dietetic concerns

Of primary importance are lifestyle factors that can be modified to improve overall health and manage hyperinsulinemia. A high fiber diet rich in complex carbohydrates such as whole grains and vegetables, and avoidant of refined carbohydrates like pasta, breads, pastries and sweets, is crucial for glucose regulation. Developing dietary habits of eating small, frequent meals and snacks will help regulate glucose and insulin. Lean proteins consumed with every meal and snack make for slow-burning sources of fuel. Lastly, decreasing overall calorie consumption may be part of a holistic nutritional plan if weight loss is a goal of treatment. In overweight women, a loss of 10% body weight will reduce insulin resistance and often the weight loss alone can restore ovulation.

Regular **exercise** also reduces insulin resistance and promotes weight loss. Exercising five to seven days per week for thirty minutes is optimal. Walking or other movement after meals is another way to utilize excess circulating glucose, as active skeletal muscle is not dependent on insulin for its uptake.

Therapy

There are many complementary and alternative treatments for PCOS, often using similar strategies as pharmaceutical therapy to address insulin resistance, anovulation, infertility and hyperandrogenism. The goals of natural remedies for PCOS are to:

- increase insulin sensitivity, lower blood glucose and insulin levels
- induce ovulation and restore fertility

KEY TERMS

Adipose—Fat tissue, which can act as an endocrine organ by converting androgens to estrogen via the enzyme aromatase.

Adrenal glands—Composed of an outer cortex and inner medulla, the adrenal glands sit above both kidneys. The adrenal cortex produces several hormones including cortisol, DHEA, estrogen and progesterone, and aldosterone.

Amenorrhea—The absence of menses in women of childbearing age in the absence of pregnancy.

Androgen—Precursors to male hormones testosterone and androsterone.

Dysglycemia—Disrupted glucose regulation resulting in periods of hypoglycemia, hyperglycemia, elevated insulin and insulin resistance.

Hirsutism— Male-pattern growth of increased coarse hair in females.

Insulin—A protein produced by the pancreas, insulin regulates glucose uptake for use by cells.

Oligomenorrhea—Irregular, infrequent menses.

Virilization—Male sexual characteristics such as deepening voice, male-pattern hair growth and balding in women.

- lower estrogen and adrogens by increasing SHBG
- inhibit 5-alpha reductase to reduce conversion of androgens to dihydrotestosterone

Several nutrients are important cofactors needed for glucose metabolism. **Chromium**, often referred to as "glucose-tolerance factor," has been shown in several studies to lower blood glucose, insulin and Hgb A1C. Additionally, the botanical agents **fenugreek**, momordica, **gymnema** and cinnamon are used for lowering glucose and insulin.

The hyperandrogenism of PCOS can be improved by increasing SHBG and by inhibiting 5-a-reductase from converting androgens to dihydrotestosterone. **Saw palmetto** has traditionally been used in men with benign prostatic hypertrophy (BPH), and is anti-androgenic through its inhibition of 5-a-reductase. **Green tea**, soy and flax seeds have been found to increase SHBG, also acting to inhibit testosterone activity.

Menstrual irregularities including amenorrhea and anovulation often improve with management of insulin. Further treatments for hormone regulation include **acupuncture** and **botanical medicine**. Acupuncture has been shown to improve fertility when used in conjunction with conventional therapies. Western botanicals that may be helpful in PCOS include **black cohosh**, which may decrease elevated levels of LH.

Prognosis

The hormonal and metabolic imbalances of PCOS can usually be well managed with diet, exercise and medical or natural therapies.

Prevention

Because PCOS has an unclear etiology and includes a genetic component, it is difficult to determine how to prevent its onset. Maintaining a healthy weight and eating a nutritious diet low in refined carbohydrates are crucial in managing PCOS, and may help prevent some symptoms from developing.

Resources

BOOKS

Gordon J., Speroff L. *Handbook for Clinical Gynecologic Endocrinology and Infertility*. Lippincott. 2002.

Thatcher, S. *Polycystic Ovary Syndrome: The Hidden Epi demic*.Perspectives Press. 2000.

PERIODICALS

Diamante Kandarakis E, JP Baillargeon, MJ Iuorno, DJ Jakubowicz, JE Nestler. A Modern Medical Quandary: Polycystic Ovary Syndrome, Insulin Resistance, and Oral Contraceptive Pills. *Journal of Clinical Endocri nology and Metabolism*. 2003. 88(5):1927 1932.

Dunaif A et al. Insulin Resistance and the Polycystic Ovary Syndrome: Mechanism and Implications for Patho genesis. *Endocrine Reviews*.1997. 18(6):774 800.

Eagelson CA, AB Bellows, M Hu, MB Gingrich, JC Mar shall. Obese Patients with Polycystic Ovary Syndrome: Evidence that Metformin Does Not Restore Sensitivity of the Gonadotropin Releasing Hormone Pulse Gen erator to Inhibition by Ovarian Steroids. *Journal of Clinical Endocrinology and Metabolism*. 2003. 88(11):5158 5162.

Ehrmann DA, MK Cavaghan, J Imperial, J Sturgis, RL Rosenfeld, KS Polonsky. Effects of Metformin on Insulin Secretion, Insulin Action and Ovarian Steroi dogenesis in Women with Polycystic Ovary Syndrome. *Journal of Clinical Endocrinology and Metabolism*. 1997. 82(2):524 530.

Fagelman E, FC Lowe. Saw Palmetto Berry as a Tretment for BPH. *Reviews in Urology*. 2001 Summer 3(3):134 8.

Fleming R, ZE Hopkinson, MA Wallace, IA Greer, N Sat tar. Ovarian Function and Metabolic Factors in Women with Oligomenorrhea Treated with Metformin in a Randomized Double Blind Placebo Controlled Trial. *Journal of Clinical Endocrinology and Metabo lism*. 2002. 87(2):569 574.

Godsland IF, C Walton, C Felton, A Proudler, A Patel, V Wynn. Insulin Resistance, Secretion and Metabolism in Users of Oral Contraceptives. *Journal of Clinical Endocrinology and Metabolism*. 1992. 72(1):64.

Korythowski MT, M Mokan, MH Horwitz, SL Berga, Metabolic Effects of Oral Contraceptives in Women with PCOS. *Journal Clinical Endocrinology and Metab olism*. 1995. 80(11):3327.

Martin J, ZQ Wang, XH Zhang, D Wachtel, J volaufova, DE Matthews, WT Cefalu. Chromium Picolinate Sup plementation Attenuates Body Weight Gain and Increases Insulin Sensitivity in Subjects with Type 2 Diabetes. *Diabetes Care*. 2006 August 29(8):1826 32.

Persaud SJ, H Al Majed, A Raman, PM Jones. *Gymnema sylvestre* Stimulates Insulin Release In Vitro by Increased Membrane Permeability. *Journal of Endocri nology*. 1999. (63):207 212.

Rotterdam ESHRE/ASRM Sponsored PCOS Consensus Workshop Group. Revised 2003 Consensus on Diag nostic Criteria and Long Term Health Risks. *Fertility and Sterility*. 2004. 81:19 25.

Diana Christoff Quinn, ND

Polygonum *see* **Fo ti**

Postpartum depression

Definition

Postpartum **depression** is a mood disorder that begins after **childbirth** and usually lasts at least six weeks.

Description

Postpartum depression, or PPD, affects approximately 15% of all childbearing women. The onset of postpartum depression tends to be gradual and may persist for many months or develop into a second bout following a subsequent **pregnancy**. Mild to moderate cases are sometimes unrecognized by women themselves. Many women feel ashamed and may conceal their difficulties. This is a serious problem that disrupts women's lives and can have effects on the baby, other children, partners, and other relationships. Levels of depression for fathers can also increase significantly.

Postpartum depression is often divided into two types: early onset and late onset. Early-onset PPD most often seems like the "blues," a mild brief experience during the first days or weeks after birth. During the first week after the birth, up to 80% of mothers experience the "baby blues." This period is usually a time of extra sensitivity; symptoms include tearfulness, irritability, **anxiety**, and mood changes, which tend to peak between three to five days after childbirth. The symptoms normally disappear within two weeks without requiring specific treatment apart from understanding, support, skills, and practice. In short, some depression, **fatigue**, and anxiety may fall within the "normal" range of reactions to giving birth.

Late-onset PPD appears several weeks after birth. It involves slowly growing feelings of sadness, depression, lack of energy, chronic fatigue, inability to sleep, change in appetite, significant weight loss or gain, and difficulty caring for the baby.

Causes and symptoms

Experts cannot always say what causes postpartum depression. Most likely, it is caused by a combination of factors that vary from person to person. Some researchers think that women are vulnerable to depression at all major turning points in their reproductive cycle, childbirth being only one of these markers. Factors before the baby's birth that are associated with a higher risk of PPD include severe **vomiting** (hyperemesis), premature labor contractions, and psychiatric disorders in the mother. In addition, new mothers commonly experience some degree of depression during the first weeks after birth. Pregnancy and birth are accompanied by sudden hormonal changes that affect emotions. Additionally, the 24-hour responsibility for a newborn infant represents a major psychological and lifestyle adjustment for most mothers, even after the first child. These physical and emotional stresses are usually accompanied by inadequate rest until the baby's routine stabilizes, so fatigue and depression are not unusual.

In addition to hormonal changes and disrupted sleep, certain cultural expectations appear to place women from those cultures at increased risk of postpartum depression. For example, women who bear daughters in societies with a strong preference for sons (such as Communist China) are at increased risk of postpartum depression. In other cultures, a strained relationship with the husband's family is a risk factor. In Western countries, domestic violence is associated with a higher rate of PPD.

Experiences of PPD vary considerably but usually include several symptoms.

Feelings:

- persistent low mood
- inadequacy, failure, hopelessness, helplessness

- exhaustion, emptiness, sadness, tearfulness
- guilt, shame, worthlessness
- confusion, anxiety, and panic
- fear for the baby and of the baby
- fear of being alone or going out

Behaviors:

- lack of interest or pleasure in usual activities
- insomnia or excessive sleep, nightmares
- not eating or overeating
- decreased energy and motivation
- withdrawal from social contact
- poor self-care
- inability to cope with routine tasks

Thoughts:

- inability to think clearly and make decisions
- lack of concentration and poor memory
- running away from everything
- fear of being rejected by the partner
- worry about harm or death to partner or baby
- ideas about suicide

Some symptoms may not indicate a severe problem. However, persistent low mood or loss of interest or pleasure in activities, along with four other symptoms occurring together for a period of at least two weeks, indicate clinical depression and require adequate treatment.

There are several important risk factors for postpartum depression, including the following:

- stress
- lack of sleep
- poor nutrition
- lack of support from one's partner, family, or friends
- family history of depression
- labor/delivery complications for mother or baby
- premature or postmature delivery
- problems with the baby's health
- separation of mother and baby
- a difficult baby (temperament, feeding, sleeping problems)
- pre-existing neurosis or psychosis

Diagnosis

Diagnosis of postpartum depression can be made through a clinical interview with the patient to assess symptoms.

Treatment

Postpartum depression can be effectively alleviated through counseling and support groups, so that the mother does not feel she is alone in her feelings. **Acupuncture**, **traditional Chinese medicine**, **yoga**, **meditation**, and herbs can all help the mother suffering from postpartum depression return to a state of balance.

Recommended herbal remedies to ease depressive episodes may include **damiana** (*Turnera diffusa*), ginseng (*Panax ginseng*), lady's slipper (*Cypripedium calceolus*), **lavender** (*Lavandula angustifolia*), oats (*Avena sativa*), **rosemary** (*Rosmarinus officinalis*), **skullcap** (*Scutellaria laterifolia*), St. John's wort (*Hypericum perforatum*), and vervain (*Verbena officinalis*). Women who are breastfeeding or are suffering from a chronic medical condition should consult a healthcare professional before taking any herbal remedies.

Some strategies that may help new mothers cope with the **stress** of becoming a parent include:

- Valuing her role as a mother and trusting her own judgment.
- Making each day as simple as possible.
- Avoiding extra pressures or unnecessary tasks.
- Trying to involve her partner more in the care of the baby from the beginning.
- Discussing with her partner how both can share the household chores and responsibilities.
- Scheduling frequent outings, such as walks and short visits with friends.
- Sharing her feelings with her partner or a friend who is a good listener.
- Talking with other mothers to help keep problems in perspective.
- Trying to sleep or rest when the baby is sleeping.
- Taking care of her health and well being.

Allopathic treatment

Several treatment options exist, including medication, **psychotherapy**, counseling, and group treatment and support strategies, depending on the woman's needs. One effective treatment combines antidepressant medication and psychotherapy. These types of medication are often effective when used for three to four weeks. Any medication use must be carefully considered if the woman is breastfeeding, but with some medications, continuing breastfeeding is safe. There are many classes of antidepression medications. Two of the most commonly prescribed for PPD are selective serotonin reuptake inhibitors (SSRIs) such as citalopram (Celexa),

KEY TERMS

Hyperemesis—Severe vomiting during pregnancy. Hyperemesis appears to increase a woman's risk of postpartum depression.

Postpartum—Following childbirth.

escitalopram (Lexapro), fluoxetine (Prozac), paroxetine (Paxil, Pexeva), and sertraline (Zoloft), and tricyclids, such as amitriptyline (Elavil), desipramine (Norpramin), imipramine (Tofranil), and nortriptyline (Aventyl, Pamelor). Nevertheless, medication alone is never sufficient and should always be accompanied by counseling or other support services. Also, many women with postpartum depression feel isolated. It is important for these women to know that they are not alone in their feelings. There are various postpartum depression support groups available in local communities, often sponsored by non-profit organizations or hospitals. Also, support information is available by calling the PPD helpline. Women can find a local support group by calling the Kristin Brooks Hope Center helpline at (800) 442-4673. For women who have thoughts of suicide, it is imperative to immediately call the toll-free 24-hour suicide hotline at (800) 784-2433.

Expected results

When a woman has supportive friends and family, mild postpartum depression usually disappears quickly. If depression becomes severe, a mother cannot care for herself and the baby, and in rare cases, hospitalization may be necessary. However, medication, counseling, and support from others usually work to cure even severe depression in three to six months.

Prevention

Exercise, including yoga, can help enhance a new mother's emotional wellbeing. New mothers should also try to cultivate good sleeping habits and learn to rest when they feel physically or emotionally tired. It is important for a woman to learn to recognize her own warning signs of fatigue and respond to them by taking a break.

Resources

BOOKS

Poulin, Sandra. *The Mother to Mother Postpartum Depression Support Book*. New York: Berkley Trade, 2006.

Shields, Brooke. *Down Came the Rain: My Journey Through Postpartum Depression*. New York: Hyperion Books, 2006.

Venis, Joyce A., and Suzanne McCloskey. *Postpartum Depression Demystified: An Essential Guide for Understanding the Most Common Complication After Childbirth*. New York: Marlowe, 2007.

PERIODICALS

Gaby, Alan R. "Fish Oil for Postpartum Depression." *Townsend Letter: The Examiner of Alternative Medicine* (October 2006): 40.

Hung, Chich Hsiu. "The Hung Postpartum Stress Scale." *Journal of Nursing Scholarship* (Spring 2007): 71(4).

Klotter, Jule. "Exercise and Postpartum Depression." *Townsend Letter: The Examiner of Alternative Medicine* (October 2007): 42(2).

McGinnis, Marianne. "Baby Blues? Get Help Early." *Prevention* (January 2006): 107.

Ramashwar, S. "In China, Women Who Give Birth to Girls Face an Increased Risk of Postpartum Depression." *International Family Planning Perspectives* (December 2007): 191(2).

ORGANIZATIONS

Kristin Brooks Hope Center, 615 Seventh St. NE, Washington, DC, 20002, (202) 536 3200, (800) 442 4673, http:www//hopeline.com.

National Institute of Mental Health, 6001 Executive Blvd., Room 8184, MSC 9663, Bethesda, MD, 20892, (866) 615 6464, http://www.nimh.nih.gov.

Postpartum Support International, PO Box 60931, Santa Barbara, CA, 93160, (805) 967 7636, (800) 944 4773, http://www.postpartum.net.

Paula Ford-Martin
Ken R. Wells

Post-traumatic stress disorder

Definition

Post-traumatic **stress** disorder (PTSD) is a debilitating psychological condition trigged by a traumatic event, such as rape, war, a terrorist act, sudden or violent death of a loved one, natural disaster, or catastrophic accident. It is marked by recurring memories or thoughts of the event, "blunting" of emotions, increased arousal, and sometimes severe personality changes.

Description

Officially termed post-traumatic stress disorder since 1980, descriptions of post-traumatic stress were

Common characteristics that increase the risk of developing PTSD

Female

Middle-aged (40 to 60 years old)

No experience coping with traumatic events

Ethnic minority

Lower socioeconomic status

Children in the home

Having family members with PTSD

Pre-existing psychiatric condition

Primary exposure to the trauma

Living in traumatized community

Lacking a good support system (close family and friends)

(Illustration by Corey Light. Cengage Learning, Gale)

documented as early as the Civil War and in nineteenth century train crash victims. In the period between World War I and II, a condition known as "shell shock" or "battle fatigue" was recognized. Initially, it was thought that shrapnel entered the brain during battle explosions and caused small brain hemorrhages. When symptoms occurred in war veterans who had not been exposed to explosions, it was then often viewed as a character flaw.

In the 1970s, during and after the Vietnam War, post-traumatic stress received more serious research and documentation. In 1989, the National Center for Post-traumatic Stress Disorder was established in the U.S. Department of Veterans Affairs. Another benchmark was its addition to the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) published by the American Psychiatric Association. In the past 20 years, those who have been diagnosed with PTSD have been rape victims, victims of violent crimes, and survivors of natural disasters, terrorist attacks, and random shootings in schools and the workplace.

Although people of all ages, cultures, and socioeconomic backgrounds can develop PTSD if exposed to a life-threatening event, statistics gathered from past events indicate that the risk of PTSD increases in order of the following factors:

- female gender
- middle-aged (40 to 60 years old)
- little or no experience coping with traumatic events
- ethnic minority
- lower socioeconomic status
- children in the home
- women with spouses exhibiting PTSD symptoms
- pre-existing psychiatric conditions
- primary exposure to the event including injury, life-threatening situation, and loss
- living in a traumatized community

For example, over a third of the survivors of the 1995 Murrah Federal Building bombing in Oklahoma City developed PTSD and over half showed signs of **anxiety**, **depression**, and alcohol abuse. More than a year later, Oklahomans in general had an increased use of alcohol and tobacco products, as well as PTSD symptoms.

Children are also susceptible to PTSD and their risk is increased exponentially as their exposure to the event increases. Children experiencing abuse, the death of a parent, or those located in a community suffering a traumatic event can develop PTSD. Two years after the Oklahoma City bombing, 16% of children in a 100-mile radius of Oklahoma City with no direct exposure to the bombing had increased symptoms of PTSD. Weak parental response to the event, having a parent suffering from PTSD, and increased exposure to the event via the media all increase the possibility of the child developing PTSD symptoms.

Causes and symptoms

Specific causes for the onset of post-traumatic stress disorder are not clearly defined, although experts suspect it may be influenced both by the severity of the event, by the person's personality and genetic make-up, and by whether or not the event was expected. First response emergency personnel and those directly involved in the event or families who have lost loved ones in the event are most like to experience PTSD.

People exposed to mass destruction or death, toxic contamination, the sudden or violent death of a loved one, or the loss of home or community, are also at high risk for PTSD. Victims of human-caused trauma have a higher incidence of PTSD than those of natural disasters. Among rape and Holocaust survivors, the rate of PTSD is 50%.

A sampling of the types of traumatic events and the percentage of those exposed to them who develop PTSD includes:

- natural disaster, 4–5%
- mass shooting, 28%
- plane crash into hotel, 29%
- bombing, 34%

For men, events most likely to trigger PTSD are rape, combat exposure, childhood neglect, and childhood physical abuse. For women, these events are rape, sexual molestation, physical attack, threat with a weapon, and childhood physical abuse.

A related condition, Acute Stress Disorder (ASD), which occurs two days to four weeks after a traumatic event, is thought to be an indicator of the occurrence of PTSD. This is especially true if the following factors are present:

- lack of emotional and social support
- the presence of other stressors such as fatigue, cold, hunger, fear, uncertainty, and loss
- continued difficulties at the scene of the event
- lack of information about the event
- lack of self-determination
- treatment given in an authoritarian or impersonal manner
- lack of follow-up

PTSD symptoms are distinct and prolonged stress reactions that naturally occur during a highly stressful event. Common symptoms are:

- hyperalertness
- fear and anxiety
- nightmares and flashbacks
- sight, sound, and smell recollection
- avoidance of recall situations
- anger and irritability
- guilt
- depression
- increased substance abuse
- negative world view
- decreased sexual activity

Symptoms usually begin within three months of the trauma, although sometimes PTSD does not develop until years after the initial trauma occurred. Once the symptoms begin, they may fade away again within six months. Others suffer with the symptoms for far longer and in some cases, the problem may become chronic.

Among the most troubling symptoms of PTSD are flashbacks, which can be triggered by sounds, smells, feelings, or images. During a flashback, the person relives the traumatic event and may completely lose touch with reality, suffering through the trauma for minutes or hours at a time, believing that the traumatizing event is actually happening all over again.

Research conducted in the late 20th century suggests that PTSD sufferers undergo neurological and physiological changes stemming from altered brain activity. A decrease in size of the hippocampus (one of two seahorse-shaped parts of the brain generally believed by scientists to pay an essential role in formation of new memories) may affect the processing and integration of memory while abnormal activation of the amygdala (almond-shaped parts of the brain believed to have strong connections to mental and physical reactions) may be tied to fear response. This altered brain activity can lead to hyper-arousal of the sympathetic nervous system, increased sensitivity of the startle reflex, and sleep abnormalities.

The hormone levels of PTSD patients may also show abnormalities: for example, high levels of thyroid, epinephrine, and natural opiates coupled with low levels of cortisol. Blunted, or depressed, responses to a trauma may be the result of the body's increased production of opiates (narcotic-like hormones that induce mental lethargy), which masks the emotional **pain**.

People with post traumatic stress disorder are also like to suffer from other psychiatric disorders. Eighty-eight percent of men and 79% of women with PTSD meet the diagnostic criteria for other disorders. Physical ailments such as headaches, gastrointestinal ailments, immune system weaknesses, **dizziness**, chest pain, and general body discomfort are also common in PTSD sufferers.

Diagnosis

Consultation with a mental health professional for diagnosis and a plan of treatment is always advised. Many of the responses to trauma, such as shock, terror, irritability, blame, guilt, grief, sadness, emotional numbing, and feelings of helplessness, are natural reactions. For most people, resilience is an overriding factor and trauma effects diminish within six to sixteen months. It is when these responses continue or become debilitating that PTSD is often diagnosed.The third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) outlined three forms of the disorder:

- Acute: onset within six months of the event and lasting less than six months
- Chronic: symptoms lasting six months or more
- Delayed: onset at least six months after the event

As outlined in DSM-IV, the exposure to a traumatic stressor means that an individual experienced, witnessed or was confronted by an event or events involving death or threat of death, serious injury or the threat of bodily harm to oneself or others. The individual's response must involve intense fear, helplessness, or horror. A two-pronged approach to evaluation is considered the best way to make a valid diagnosis because it can gauge under-reporting or over-reporting of symptoms. The two primary forms are structured interviews and self-report questionnaires. Spouses, partners and other family members may be interviewed. Because the evaluation may involve subtle reminders of the trauma in order to gauge a patient's reactions, individuals should ask for a full description of the evaluation process beforehand. Asking what results can be expected from the evaluation is also advised.

A number of structured interview forms have been devised to facilitate the diagnosis of post traumatic stress disorder:

- The Clinician Administered PTSD Scale (CAPS) developed by the National Center for PTSD
- The Structured Clinical Interview for DSM (SCID)
- Anxiety Disorders Interview Schedule-Revised (ADIS)
- PTSD-Interview
- Structured Interview for PTSD (SI-PTSD)
- PTSD Symptom Scale Interview (PSS-I)

Self-reporting checklists provide scores to represent the level of stress experienced. Some of the most commonly used checklists are:

- The PTSD Checklist (PCL), which has one list for civilians and one for military personnel and veterans
- Impact of Event Scale-Revised (IES-R)
- Keane PTSD Scale of the MMPI-2
- The Mississippi Scale for Combat Related PTSD and the Mississippi Scale for Civilians
- The Post Traumatic Diagnostic Scale (PDS)
- The Penn Inventory for Post-Traumatic Stress
- Los Angeles Symptom Checklist (LASC)

Treatment

A definitive treatment does not yet exist for PTSD nor is there a known cure. However, a number of therapies such as cognitive-behavior therapy, group therapy, and exposure therapy are showing promise. Cognitive-behavioral therapy focuses on changing specific actions and thoughts with the help of **relaxation** training and breathing techniques. In exposure therapy, the person relives the traumatic event repeatedly in a controlled environment and then works through the trauma.

A treatment technique known as eye movement desensitization and reprocessing (EMDR) has been employed with some success to treat PTSD. EMDR involves desensitizing the patient to his or her traumatic memories by associating a series of eye movements with both negative and positive events and emotions. The specific eye movements associated with the negative memories are thought to help the brain process the event and come to terms with the trauma. EDMR should only be performed by a healthcare practitioner, usually a clinical psychologist, certified in the technique.

Relaxation training, which is sometimes called anxiety management training, includes breathing exercises and similar techniques intended to help the patient prevent hyperventilation and relieve the muscle tension associated with the fight-or-flight reaction of anxiety. **Yoga**, aikido, t'ai chi, and **dance therapy** help patients work with the physical as well as the emotional tensions that either promote anxiety or are created by the anxiety.

Other alternative or complementary therapies are based on physiological and/or energetic understanding of how the trauma is imprinted in the body. These therapies affect a release of stored emotions and resolution of them by working with the body rather than merely talking through the experience. One example of such a therapy is Somatic Experiencing (SE), developed by Dr. Peter Levine. SE is a short-term, biological, body-oriented approach to PTSD or other trauma. This approach heals by emphasizing physiological and emotional responses, without re-traumatizing the person, without placing the person on medication, and without the long hours of conventional therapy.

When used in conjunction with therapies that address the underlying cause of PTSD, relaxation therapies such as **hydrotherapy**, **massage therapy**, and **aromatherapy** are useful to some patients in easing PTSD symptoms. **Essential oils** of lavender, chamomile, neroli, sweet marjoram, and ylang-ylang are commonly recommended by aromatherapists for stress relief and anxietyreduction.

Research into the prevention of PTSD is also undergoing intensive research. The National Mental Health Association provides RAPID grants that allow

researchers to visit disaster scenes to study acute effects and the effectiveness of early intervention. Rapid disaster relief and positive community response appear to be key. Not identifying individual survivors as "victims" also seems to help. Debriefing survivors as quickly as possible after the event can stem the development of PTSD symptoms.

Allopathic treatment

As of mid-2004, allopathic (medical practice that combats disease with remedies to produce effects different from those produced by the disease) treatment consists of a combination of medication along with supportive and cognitive-behavioral therapies. Effective medications include anxiety-reducing medications and antidepressants, especially the selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine (Prozac) and sertraline (Zoloft). In 2001, the U.S. Food and Drug Administration (FDA) approved Zoloft as a long-term treatment for PTSD. In a controlled study, Zoloft was effective in safely improving symptoms of PTSD over a period of 28 weeks and reducing the risk of relapse. Sleep problems can be lessened by brief treatment with an anti-anxiety drug such as a benzodiazepine like alprazolam (Xanax). However, long-tem use of these drugs can lead to disturbing side effects, such as increased anger. The new research into the biological changes manifested in PTSD patients is leading to additional research on drugs used to monitor hormone levels and brain activity.

Expected results

With appropriate medication, emotional support, and counseling, most people show significant improvement. Behavior therapies can help reduce negative thought patterns and self talk. The patient typically moves back and forth through three recovery phases:

- Phase One, Safety: the elimination and/or management of dangerous behaviors and/or relationships. Becoming less fearful of thoughts, feelings, and dissociative (separated from the main stream of consciousness) episodes
- Phase Two: resolution of traumatic memory processing. Developing a narrative account of the trauma without becoming re-traumatized
- Phase Three: personality re-integration and rehabilitation

Successful treatment depends in part on whether or not the trauma was unexpected, the severity of the trauma, if the trauma was chronic (such as for victims of sexual abuse), and the person's inherent personality and genetic makeup. However, prolonged exposure to severe trauma such as experienced by victims of prolonged physical or sexual abuse and survivors of the Holocaust may cause permanent psychological scars.

Resources

BOOKS

Knaster, Mirka. *Discovering the Body's Wisdom: A Guide to Exploring Bodyways*. New York: Bantam Books, 1996.

Shapiro, Francine, Ph.D., and Margot Silk Forrest. *The Breakthrough Therapy for Overcoming Anxiety, Stress, and Trauma*. New York: Basic Books, 1997.

PERIODICALS

DiGiovanni, C. "Domestic Terrorism with Chemical or Biological Agents: Psychiatric Aspects." *American Journal of Psychiatry* (1999): 15001505.

Kessler, R., et al. "Post traumatic Stress Disorder in the National Comorbidity Survey." *Archives of General Psychiatry* (1996): 10481060.

North, C., S. Nixon, S. Hariat, S. Mallonee et al. "Psychi atric Disorders Among Survivors of the Oklahoma City Bombing." *Journal of the American Medical Association* (1999): 755762.

Pfefferbaum, B., R. Gurwitch, N. McDonald et al. "Post traumatic Stress Among Children After the Death of a Friend or Acquaintance in a Terrorist Bombing." *Psychiatric Services* (2000): 386388.

"Sertraline HCI Approved for Long Term Use." *Women's Health Weekly* (September 20, 2001).

Sloan, M. "Response to Media Coverage of Terrorism." *Journal of Conflict Resolution* (2000): 508522.

Smith, D, E., Christiansen, R. Vincent, and N. Hann. "Population Effects of the Bombing of Oklahoma City." *Journal of Oklahoma State Medical Association* (1999): 193198.

ORGANIZATIONS

American Psychiatric Association. 1000 Wilson Blvd., Ste. 1825, Arlington, VA 22209 3901. (703) 907 7300. http://www.psych.org.

Anxiety Disorders Association of America. 8730 Georgia Ave., Ste. 600, Silver Spring, MD 20910. (240) 485 1001. http://www.adaa.org.

Freedom From Fear. 308 Seaview Ave., Staten Island, NY 10305. (718) 351 1717. http://www.freedomfrom fear.com.

International Society for Traumatic Stress Studies, 60 Revere Dr., Ste. 500, Northbrook, IL 60062. (847) 480 9028. http://www.istss.org.

National Anxiety Foundation. 3135 Custer Dr., Lexington, KY 40517. (606) 272 7166. http://www.lexington on line.com.

National Institute of Mental Health. 6001 Executive Blvd, Rm. 8184, MSC 9663, Bethesda, MD 20892. (866) 615 6464. http://www.nimh.nih.org.

National Mental Health Association. 2001 N. Beauregard St., 12th floor, Alexandria, VA 22311. (800) 969 NMHA. http://www.nmha.org.

OTHER

"Effects of Traumatic Stress in a Disaster Situation." *National Center for PTSD*. [cited May 2, 2004]. http://www.ncptsd.org/facts/disasters/fs_effects_disaster.htmlgt;.

"How is PTSD Measured?" National Center for PTSD. [cited May 2, 2004]. http://www.ncptsd.org/facts/treatment/ fs/lay/assess.htmlgt;.

Mary McNulty

Potassium

Description

Potassium is one of the electrolytes essential to the smooth running of the human body; in fact, just about all bodily functions depend on it to some extent. It is also one of the most abundant minerals in the body, constituting 70% of the positive ions inside cells; the rest are a mixture of **sodium**, **magnesium**, **calcium**, **arginine**, and others. Potassium is distributed to the cells by a process of passive diffusion and is regulated by an enzyme called adenosinetriphosphatase together with the level of sodium concentration inside the cell. Potassium and sodium are antagonistic, which means that an imbalance of one will automatically cause an imbalance of the other; normally potassium should predominate inside the cell.

General use

Potassium is necessary for normal cell respiration. A deficiency can cause decreased levels of oxygen, which will reduce the efficiency of cell function. Adequate supplies of potassium are also required to regulate heartbeat, facilitate normal muscle contraction, regulate the transfer of nutrients to cells, and regulate kidney function and stomach juice secretion, among other functions. One of the most important uses of potassium in the body is in the process of nerve transmission, as it is a cofactor catalyst for the activation of several enzyme systems, but since only minute amounts are required for these processes, deficiency in this respect is unlikely.

Potassium is thought to be therapeutically useful in many ways, including assisting in the treatment of **alcoholism** and **acne**, alleviating **allergies**, promoting the healing of **burns**, and preventing high blood pressure. It can also help with such problems as congestive heart failure, **chronic fatigue syndrome**, or **kidney stones**. People suffering from any of the above conditions should consider increasing their intake of potassium after talking to a professional.

Symptoms of potassium deficiency

A deficiency of potassium in the blood is referred to as hypokalemia and manifests itself in many ways. Among the most serious symptoms are arthritis, high blood pressure, **heart disease**, **stroke**, **cancer**, and even **infertility**, as potassium constitutes a vital element of seminal fluid.

Potassium deficiency will increase acid levels in the body, lowering the natural pH, which will have far reaching effects. Lack of potassium can also aggravate problems caused by lack of protein. If potassium levels are down, the liver cannot operate normally, particularly regarding transformation of glucose to glycogen. A healthy liver should have about twice as much potassium as sodium.

Potassium deficiency can cause problems with the formation of connective tissue and can render normally strong body tissue vulnerable to all kinds of problems. The collagen of a healthy person is approximately as strong as steel, and the strength of bone tissue can be likened to that of cast **iron**. Lack of potassium may create a susceptibility to **fractures**, skin lesions that do not heal, or other connective tissue problems. So important is potassium for the protection of collagen that many natural health gurus claim that along with other vital nutrients, it constitutes an essential element of protection against premature **aging**. In the 1920s, German physician Max Gerson became the first person ever to cure lupus lesions with a diet entirely raw fruit and vegetables designed to reduce abnormally high sodium levels and raise potassium levels to normal.

Potassium is essential to the efficient processing of foods in the body; without it they cannot be broken down into the proper compounds. This condition can lead to rheumatism, and is one reason why adequate potassium prevents rheumatism.

Potassium requirements

In the past potassium was more plentiful in the diet than salt, but gradually, the situation has been reversed. The widespread lack of potassium in modern **diets** is largely due to modern processing and high levels of salt added to most processed foods. Cooking and processing remove potassium, and added salt further robs the body of vital potassium. This departure from traditional cooking of fresh homegrown fruit and vegetables is likely the cause of many health problems faced by modern society.

Who needs potassium supplements?

Those who may need to take potassium supplements include women who take oral contraceptives, abusers of alcohol or drugs, smokers, athletes, workers whose job involves physical exertion, patients who have had their gastrointestinal tract surgically removed, anyone suffering from any degree of malabsorption syndrome, and vegetarians. People who have eating disorders, especially bulimia and anorexia, are particularly at risk of damage due to low potassium levels. Also, individuals who have been ill, anyone who has undergone surgery, and those who are taking cortisone or **digitalis** preparations, and those suffering from high levels of **stress** will probably have low potassium levels.

The U.S. Food and Drug Administration (FDA) has established a Daily Reference Value (recommended daily intake) of potassium as 3,500 mg. The actual average daily intake of potassium for Americans ranges significantly from a low of about 1,200 mg/day to as high as 4,000 mg/day. However, in general, nutritionists recommend reducing salt intake and ensuring adequate supply by increasing the amount of fresh fruit and vegetables in the diet.

If individuals feel that they may be suffering from a potassium deficiency but would like to make sure before taking supplements, there are a variety of laboratory tests that can be conducted. These include serum-potassium determinations (although these may be unreliable unless levels are very low), serum creatinine, electrocardiograms, serum-pH determinations, whole blood, sublingual cell smears, and red blood cell potassium level determinations.

Preparations

The best sources of potassium are fresh natural foods. Supplements may have side effects and large doses must be taken to approach the levels of potassium that can be obtained from food; the average tablet contains about 90 mg, for example, and a medium banana contains 500 mg. Vegetables containing the highest levels of potassium are generally those containing the lowest levels of starch. Seaweed has amazingly high potassium content, containing roughly ten times as much as leafy vegetables, but it also contains a large amount of mineral salt. Green coconut milk is another good source of potassium.

Plentiful sources of potassium

There is a great variety of natural foods that are an excellent source of potassium. These include avocados; bananas; chard; citrus fruits; juices such as grapefruit, tomato, and orange; dried lentils; green leafy vegetables; milk; molasses; nuts such as almonds, brazils, cashews, peanuts, pecans, and walnuts; parsnips; dried peaches; potatoes; raisins; sardines; spinach; and wholegrain cereals.

Cooking

Boiling food in water is a sure way to lose the potassium in it, unless it is to make soup. Baking and broiling are ways in which food can be cooked while at the same time preserving the potassium content; indeed, these methods preserve all the nutrients apart from **vitamin C** and some of the B vitamins, which are destroyed by heat. Broiling also oxidizes **essential fatty acids**. Stir-frying is also a good way of preserving nutrients. It is important to vary the intake of potassium rich foods in order to ensure adequate intake of other nutrients and to avoid the possibility of toxicity, as some vegetables contain elements that are toxic if they are eaten in large amounts (oxalic acid in rhubarb, for example). It is important to note that freezing also depletes potassium levels in foods.

RECIPE FOR POTASSIUM BROTH. Many variations of potassium broth can be found, and most natural health practitioners recommend one version or another, but the main constituents are the following vegetables, generally any vegetable of choice can be added to this base.

Ingredients

- 2 lb potatoes
- 1 lb carrots
- 1/2 lb peas
- bones for stock, or a vegetable bouillon cube
- 4 oz cracked wheat or pearl barley

First, in a stainless steel pan, boil the stock bones, if they are used. After about one hour, add the remaining ingredients and continue to simmer in plenty of water for about another hour. It is preferable to use the potatoes and carrots well scrubbed, but with their skins on, as this retains valuable nutrients. Keep any unused soup in the refrigerator.

Potassium supplements

Potassium supplements come in either tablet or liquid form, and anything over 390 mg requires a prescription in the United States. Enteric-coated tablets have been known to cause ulcers, as they do not dissolve until they reach the intestines and may prove too concentrated for the undefended intestinal wall. To be on the safe side, supplements should be taken with a glass of juice. Slow-release enteric-coated

supplements are available, which decrease the danger of ulcers. Potassium gluconate is the ideal supplement, as it more closely resembles the potassium found in plants. Small divided doses should be taken, as opposed to one large dose, when treating a potassium deficiency. Athletic drinks are an electrolyte replacement and as such contain potassium. Potassium supplements should be kept in a cool, dry place, out of direct light. They should not be frozen and should not be kept in the bathroom medicine cabinet as heat and moisture may reduce their effectiveness.

Precautions

In general, the multitude of nutrients that humans require in order to stay healthy are synergistic, which means they are interdependent. If one is depleted, it is highly likely others will be deficient. Many nutrients, for example, require the presence of either calcium or vitamin C for efficient use by the body, and if individuals have a deficiency of any of the B vitamins, they almost certainly will have a deficiency in the B vitamins in general, as these occur together in nature. Given the factor of synergy, it is very unwise to take large amounts of any one nutrient without making sure that the full spectrum of nutrients is plentifully available for the body to use, which can best be achieved by making sure that a large proportion of the daily diet consists of raw fruit and vegetables, whole grains, and unroasted nuts.

Of all the essential nutrients that are commonly taken as supplements, potassium is perhaps the most dangerous. Only 14 grams of potassium can cause death under certain circumstances, particularly when intake is low at other times. When potassium intake is restricted, somehow the mechanism for utilizing it is altered, so that large amounts cannot be processed.

Just the right amount of potassium is essential. Too much or too little can cause **muscle spasms and cramps** if a calcium deficiency also exists. Thus, it is important to ensure adequate intake of calcium and **vitamin D**, which will promote the uptake of calcium in the body.

Many sufferers of degenerative diseases such as **tuberculosis**, cancer, and arthritis, suffer from high serum potassium levels. This is not because they have too much serum, but because the disease affects body functions in such a way that it throws off this valuable nutrient instead of using it. In such cases, natural sources of potassium, such as fresh fruit or vegetable juice, can be more effective than supplements.

Potassium and heart disease

Potassium has been recommended for the treatment of heart disease since the 1930s, but some heart disease that is due to malnutrition does not respond to potassium. Indeed, because of the impaired ability of the body to take up potassium, it can be dangerous. Most heart disease patients of the Western world, however, can benefit from an increase in potassium levels.

Potassium and arthritis

Some individuals who begin to eat a well-balanced selection of fresh vegetables and fruits and eliminate a large proportion of processed, denatured foods begin to feel amazingly well very quickly, as the potassium/sodium balance in the body is restored. Tiredness and other symptoms, such as arthritis, are soon replaced with renewed energy and vigor, and the body is able to replenish itself and finds new strength. However, potassium is only partially successful at treating **osteoarthritis**.

Side effects

Those who are taking potassium-sparing diuretics, such as spironolactone, triamterene, or amiloride should not take potassium supplements. Anyone allergic to potassium supplements or those who have kidney disease should not take them either. Those suffering from Addison's disease, heart disease, intestinal blockage, stomach ulcers, those using medication for heart disease, or taking diuretics, or who are above the age of 55, should consult a doctor before taking potassium supplements. There are no contradictions for pregnant or breast feeding women, although they should not take mega-doses.

ECG and kidney function tests can be affected by potassium supplementation. A doctor should be informed if one is taking potassium supplements. However, supplementation will not affect blood tests, unless they are to measure serum-potassium levels.

Symptoms of potassium overdose

Overdose symptoms of potassium include listlessness, mental confusion, tingling of limbs, weakness, pallid complexion, low blood pressure, and an irregular or fast heartbeat. These symptoms can progress to a drop in blood pressure, convulsion, coma, and eventually cardiac arrest, and can also be triggered by any kind of shock to the system. If any of the above symptoms occur, or in cases of bloody stool (may appear black and tarry), or difficulty in breathing or **nausea**, medical help should be sought immediately.

KEY TERMS

Catalyst—A substance that increases the rate of a chemical reaction without undergoing change itself.

Collagen—Connective tissue fiber.

Electrolyte—An ionic substance that conducts an electrical current in solution and may be essential to normal bodily function.

Malabsorption—The inability of the digestive tract to absorb all the nutrients from food due to some malfunction or disability.

Mega-doses—Very high doses of vitamins intended to treat a variety of ailments, as recommended by orthomolecular practitioners.

Passive diffusion—A process whereby a liquid migrates from a solution of lower concentration to a solution of higher concentration, making the latter more dilute.

Positive ions—Ionic particles having a positive electrical charge.

Serum—Clear, fluid part of the blood.

High serum-potassium is the major problem with shock and is the major cause of death in cases of shock or injury. This is a life-threatening situation, and self treatment is not appropriate.

If such an emergency occurs and medical help is not available, a glass of water containing half a teaspoon of salt, a quarter of a teaspoon of bicarbonate soda and a little honey will help. Potassium supplements should be taken with extreme care in cases of dehydration, as this can be fatal. Adequate liquids, particularly juice, should always accompany the supplement.

Interactions

Care should be taken when taking potassium supplements in conjunction with diuretics. A practitioner should be consulted. A doctor should be informed when a patient is taking potassium supplements. In addition, the following are known to react with potassium:

- Amilorid: causes a dangerous rise in blood potassium
- Atropine: increases the possibility of intestinal ulcers, which may be caused by potassium supplements
- Belladonna: increases possibility of intestinal ulcers
- Calcium: increases likelihood of heartbeat irregularities
- Captopril: increases likelihood of potassium overdose
- Digitalis preparations: may cause irregular heartbeat
- Enalapril: increases chance of overdose
- Laxatives: may decrease effectiveness of potassium (due to the fact that they leach potassium from the body)
- Spironolactone: increases blood potassium
- Triamterene: increases blood potassium
- Vitamin B_{12}: slow release supplements may decrease the absorption of vitamin B_{12}, increasing requirements

Resources

BOOKS

Duyff, Roberta Larson. *American Dietetic Association Complete Food and Nutrition Guide,* 3rd ed. New York: Wiley, 2006.

Haas, Elson M., and Buck Levin. *Staying Healthy with Nutrition*. Berkeley, CA: Celestial Arts, 2006.

Hark, Lisa, and Darwin Deen. *Nutrition for Life*. Harlow, Essex, UK: DK Adult, 2005.

PERIODICALS

Ferrara, L. A., et al. "Fast Food Versus Slow Food and Hypertension Control." *Current Hypertension Reviews* (February 2008): 30 35.

Geleijnse, Johanna M., et al. "Sodium and Potassium Intake and Risk of Cardiovascular Events and All cause Mortality: The Rotterdam Study." *European Journal of Epidemiology* (November 2007): 763 770.

Lin, Shih Hua, and Mitchell Halperin. "Hypokalemia: A Practical Approach to Diagnosis and Its Genetic Basis." *Current Medicinal Chemistry* (June 2007): 1551 1565.

Schaefer, Timothy J., and Robert W. Wolford. "Disorders of Potassium." *Emergency Medical Clinics of North America* (August 2005): 723 747.

OTHER

"Potassium in Diet." *New York Times,* Health Guide, March 2, 2007. http://health.nytimes.com/health/guides/nutrition/potassium in diet/overview.html. (February 20, 2008).

Patricia Skinner
David Edward Newton, Ed.D.

Pranic healing

Definition

Pranic healing encompasses a broad array of therapeutic approaches, both ancient and modern, based on the notion that illnesses of body or mind involve an imbalance and/or blockage in the flow of vital life energy. In ancient India, this energy was known as

prana, as it still is in the contemporary practice of yoga and **Ayurvedic medicine**. Traditional Chinese medicine uses the term *qi* to describe this vital energy. Pranic healing seeks, by widely varying means, to strengthen and equalize the pranic flow. And, as the number of alternative therapies has mushroomed during the last several decades, the concept of prana/qi has become almost a common denominator among approaches that may otherwise seem wildly diverse.

Origins

The belief in a fundamental life force flowing through the human body (and, by extension, through all living things) is an ancient one, common to many healing systems worldwide. More recently, many Western therapies have incorporated a similar concept.

Prana

The concept of prana evolved thousands of years ago in India, apparently in connection with esoteric religious practices. A central concept in both yoga and Ayurveda (an ancient healing system), it is discussed in the earliest written sources for these disciplines—the *Yoga Sutras* of Patanjali and the ancient Hindu scriptures known as *vedas*.

Qi

As with prana, the origins of the concept of qi are lost in the distant past. **Acupuncture**, which uses needles inserted at specific points to stimulate the flow of qi, has been practiced extensively in China for thousands of years. Archaeologists have unearthed stone acupuncture needles dated to around 3000 B.C. The *Nei Jing* (or *Classic of Internal Medicine*), the oldest known text that discusses the theoretical basis of traditional Chinese medicine, is believed to have been written roughly 2,000 years ago. In addition to acupuncture, one type of Chinese massage is known as qi healing or healing with external qi.

Benefits

Because it is a general conceptual approach rather than a specific healing modality, pranic healing cannot be said to provide a specific list of benefits; although pranayama, or yogic breathing, is said to directly benefit the respiratory system. Some practitioners might argue that dealing with imbalances at such a fundamental level, rather than treating symptoms at a superficial level, benefits the patient by getting to the root of the problem and avoiding the risk of merely masking it by treating symptoms. Pranic healing also makes a good fit with the concept of wellness, as opposed to the mere absence of disease, that underlies many alternative therapies.

KEY TERMS

Kundalini—In yoga, energy that resides at the base of the spine and can be channeled upward for spiritual awakening.

Prana—The Indian word for vital life force or energy.

Pranayama—The yogic discipline of controlling the breath. It is sometimes used to refer to a form of yoga that emphasizes breathing exercises.

Qi—The Chinese word for life energy.

Description

The diverse array of therapies loosely described as pranic healing may be grouped under several subheads, depending on both their origins and the nature of the healing techniques they employ.

Traditional healing systems

Both Ayurveda and **traditional Chinese medicine** are ancient medicinal systems that view health and disease in terms of blockage and flow of vital energy. Both use various diagnostic techniques, herbs/diet, and other treatments (notably acupuncture, therapeutic **exercise**, and massage, in the case of TCM) to stimulate and balance energy flow.

Pranayama

Practitioners of pranayama, or yogic breathing, believe that prana is moving when the human breath, which is a manifestation of universal prana, is flowing freely. When the body's energy is blocked, this stagnation can lead to illness and disease. Because Ayurvedic medicine considers prana a kind of nutrient that one can take in through the breath, breathing exercises play an important role in health promotion in Ayurveda. Pranayama soothes the nervous system, induces **relaxation**, regulates respiration, and balances the hemispheres of the brain. The major technique of pranayama is alternate nostril breathing.

Bodywork

Over the last century or so, more especially in recent decades, a number of alternative therapies have emerged that manipulate the body and/or noninvasively stimulate specific points to promote wellness,

achieve healing, and strengthen the vital force. Among the many such modalities are reflexology, **polarity therapy**, breema, and **reiki**.

Nonphysical approaches

The many different schools of meditation generally involve some combination of breathing, chanting, special postures, and mental exercises to produce enhanced or altered states of being. The focus of different **meditation** techniques can range from simple relaxation to mainstream religious devotion to esoteric spiritual evolution.

Exercise systems

Various ancient systems—including **yoga**, qigong and t'ai chi—represent a blending of exercise, therapeutic benefits, and spiritual path. To the extent that these disciplines are viewed as healing modalities, they can be said to represent forms of pranic healing. Qigong, for example, literally means "energy cultivation." In each case, specific postures and/or movements—practiced daily, often in combination with breathing exercises—are said to encourage optimal energy flow.

Preparations

Preparations for the various types of pranic healing range from wearing comfortable non-binding clothing for bodywork to fasting and spiritual preparation for certain forms of meditation. Students of yoga are advised not to eat a full meal for two to three hours prior to a yoga class because some of the postures are uncomfortable on a full stomach.

Precautions

Despite the widespread adoption of the concept of prana by contemporary alternative therapies, it is not accepted in Western scientific circles. Although controlled studies have confirmed specific therapeutic benefits for both yoga and acupuncture—which, in different ways, are based on the idea of pranic healing—there is as yet no generally accepted scientific evidence for the theories that underlie these systems. Because so many different techniques and practitioners are said to employ some form of pranic healing, it can be difficult even to determine what, exactly, is meant by their respective uses of this terminology. And there is always the risk that a focus on maximizing pranic flow might interfere with more mainstream attempts to address tangible physiological problems.

Given the variety of practices and techniques that can be classified under pranic healing, persons who are interested in a specific form should find out beforehand what level of physical exercise is involved (if any) and what belief system (if any) underlies the practice. Some forms of bodywork may be too strenuous for people with heart disease, fragile bones, or other major health problems. In addition, some forms of pranic healing may produce physical or psychological phenomena that can startle those not expecting them. For example, a type of yoga known as kundalini yoga works with energy stored at the base of the spine that is activated by exercises. Some people who have experienced the movement of kundalini energy found it unsettling because they had not been prepared for it. It may be helpful to seek out an experienced guide or mentor who has practiced a specific form of pranic healing long enough to be aware of possible reactions.

Side effects

The side effects of pranic healing can range from headaches and muscular soreness or stiffness after bodywork sessions to edginess or nervousness resulting from energies released by meditation. These side effects are usually mild and disappear after further practice.

Research and general acceptance

Some forms of pranic healing, including yoga, Ayurveda, and traditional Chinese medicine, have been intensively studied. The Office of Alternative Medicine of the National Institutes of Health (NIH) funds research into various forms of pranic healing, including mind/body interventions. The NIH's National Center for Complementary and Alternative Medicine (NCCAM) maintains a clearinghouse of information about alternative therapies and clinical trials of their effectiveness.

Training and certification

The training and certification of practitioners of prana healing ranges from the equivalent of medical school and government licensing for practitioners of traditional Chinese medicine to various forms of certification conferred by other professions or groups. **Breema** and reiki have formal degrees or certification programs. The Shalem Institute in Washington, DC, has a program for training spiritual directors in the mainstream Christian churches. There are various yoga institutes in the United States that provide courses of instruction for teachers of yoga.

Resources

BOOKS

Cassileth, Barrie R. *The Alternative Medicine Handbook*. New York: W.W. Norton & Company, 1998.

Gach, Michael Reed, with Carolyn Marco. *Acu Yoga: Self Help Techniques to Relieve Tension*. Tokyo and New York: Japan Publications, Inc., 1998.
Stein, Diane. *Essential Reiki: A Complete Guide to an Ancient Healing Art,* Chapter VI, "Opening the Kun dalini." Freedom, CA: The Crossing Press, Inc., 1995.
Svoboda, Robert, and Arnie Lade. *Tao and Dharma: Chi nese Medicine and Ayurveda*. Twin Lakes, WI: Lotus Press, 1995.
Woodham, Anne, and Dr. David Peters. *DK Encyclopedia of Healing Therapies*. New York: DK Publishing, 1997.

ORGANIZATIONS

American Foundation of Traditional Chinese Medicine (AFTCM). 505 Beach Street. San Francisco, CA 94133. (415) 776 0502. Fax: (415) 392 7003. aftcm@earthlink.net.
National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse. P. O. Box 8218. Silver Spring, MD 20907 8218. TTY/TDY: (888) 644 6226.
Shalem Institute for Spiritual Formation. Mount Saint Alban. Washington, DC 20016.

Peter Gregutt

Praniyama *see* **Breath therapy**

Prayer and spirituality

Definition

Prayer is an act of communication with God or the Absolute. The spiritual beliefs of the person praying influence how the Absolute is perceived. For some, the Absolute is known as the Great Goddess. Others experience the Absolute as God, Allah, the Tao, the Universal Mind, Brahma, the Void, or a myriad of other forms. Spiritual, or faith, healing is the relief of illness through some type of religious belief system held by the sick person or by someone praying for them.

Origins

Prayer in one form or another is a spiritual practice found in nearly every culture. The use of prayer for healing is a vital principle of Christianity, Judaism, and Islam. Even in a non-theistic religion such as Buddhism, prayer is important in healing. In the traditional medicine of Mexico, **curanderismo**, health is perceived as a gift from God. Disease is seen as a punishment for sins and God's help is necessary for a cure. Patients may pray or make a spiritual pilgrimage as part of their medical treatment.

Spiritual healing in the West dates back to Biblical times, when some of the Hebrew prophets and Jesus used the power of prayer to heal the sick and injured. In the Jewish and Christian religions, praying for healing and medical miracles has been common for 3,000 years. The Christian tradition of faith healing formally developed out of a first-century prayer ritual for healing. Among contemporary Christians belonging to liturgical churches (Roman Catholics, Eastern Orthodox, Episcopalians, and Lutherans), spiritual healing is related to the sacraments of the Eucharist and anointing the sick, especially in churches, shrines, or sites where miracles have taken place. In the United States, numerous spiritual healing or faith healing groups and movements have appeared since the early 1800s, such as the Emmanuel movement and the John Alexander Dowie movement.

Christian Science, a movement that grew out of the Association formed by Mary Baker Eddy in 1876, holds faith healing at the core of its principles. Christian Scientists believe that death and illness are illusions. Eddy claimed that the end result of knowledge gained through Christian Science is the power to heal. Eddy's beliefs stemmed from her claims that she was cured of various illnesses in 1862 through massage, positive reinforcement, and mental healing. In 1875, she published *Science and Health*, the founding text of Christian Science.

People have always prayed, especially when sick or facing death. Still, despite the scientific evidence pointing to the effectiveness of prayer, it is not generally accepted as a treatment method by the Western medical community. Hippocrates, the father of modern medicine, believed that the mind and body were separate, and this point of view is the foundation of modern Western medicine.

Beginning in the seventeenth century, with the philosophy of René Descartes, the West has increasingly focused on a material view of the world. In medicine this has meant that an almost exclusive concentration on the physical aspects of disease. The contribution of emotions, thoughts, relationships, and spirituality to disease and health were either ignored or discounted. Only since the 1960s has there been an increase in interest about the effectiveness of prayer, **meditation**, and other mind-body approaches to health and healing.

Benefits

Perhaps the two most obvious benefits of faith healing is that the cost is minimal or zero, and that it involves no medications or medical devices. The medical, scientific, and religious communities almost unanimously agree that the human mind has a tremendous amount of

untapped potential, including the power to heal physical and emotional ailments. A person's faith has a strong influence over his or her sense of well-being, ability to fight disease, and desire to get well, according to many researchers.

Prayer and other spiritual approaches can be particularly beneficial for people with stress-related disorders. Dr. Herbert Benson reports that meditative prayer can ease **anxiety**, mild **depression**, **substance abuse**, ulcers, **pain**, **nausea**, tension and migraine headaches, **infertility**, **premenstrual syndrome** (PMS), **insomnia**, and high blood pressure.

Prayer also plays an important role in helping people cope with difficult circumstances such as chronic illness and death. Prayer offers new meaning, purpose, hope, and a sense of guidance or control. These perceptions may help instill a fighting spirit, which has been reported to be an important factor in healing. Prayer can enrich the quality of one's life and also bring a feeling of peace and acceptance at the time of death. In addition, being part of a religious community can benefit patients by counteracting the social isolation that many sick people experience. Visits from friends or their spiritual leader are reminders that they are still part of a faith community and the larger human community.

More recently, researchers have recognized that prayer and spiritual practice are often related to people's connections with other creatures. Although the strength of the bond between humans and animals was first discussed in the context of people's grieving for dead pets, the human-animal connection and its role in spirituality is now being studied in its own right.

Description

Spiritual healing can involve a person praying alone by themselves for healing, one person praying for the healing of another person, or a group of persons praying for an ill person. It can involve formal ritual and the administration of the sacraments. Many Roman Catholic, Episcopal, and Lutheran congregations in the United States hold special Eucharists for healing; people can come for their own healing or in behalf of someone else.

Another common type of prayer is meditative prayer, which involves quieting the mind and focusing on an object, sound, movement, visualization, or simply the breath. Eastern types of meditative prayer may involve the repetition of a sound or phrase (mantra) or repeating the name of the Divine (japa). In India, there is a tradition of sacred temple dance as a form of meditative prayer. Western types of meditative prayer may focus on quieting the mind and opening the heart to listen to God, often repeating prayer-like mantras. Dr. Herbert Benson has studied the effects of meditative prayer and found many significant health benefits.

Many healers also use prayer as a form of spiritual healing. Healing utilizing prayer can be done at a distance or through the laying on of hands. Spiritual healing is often not distinguished from psychic and energy healing, although some researchers do make a distinction. A spiritual healer is primarily concerned with a way of being, while other types of healers are concerned with the sick person's body and try to heal the physical symptoms of the disease. A spiritual healer allows an infinite consciousness, intelligence, and love (known as God, or nonlocal mind) to express itself through the healer. Other types of healers direct their energy outward and concentrate on replenishing or changing the energy flow of the patient. Energy healers do this by using their hands or fingers. Examples of subtle energy healing include **reiki**, **therapeutic touch**, **qigong**, and **pranic healing**. Psychic healers are able to relieve symptoms from a distance with their minds.

Preparations

People can pray at any time at any place. There is no advance preparation needed. However, most of the major religious traditions have developed certain patterns or practices associated with prayer, such as the use of rosaries, prayer books, or prayer shawls, that are meaningful to members of those traditions and help them to focus their attention when they pray. There are many clergy and spiritual leaders in the major faith traditions in the United States who can explain the various practices associated with prayer and why they can be helpful preparation for praying.

Precautions

Prayer and spirituality are not a substitute for other medical care. It is a complementary practice. Patients with serious illnesses should not choose prayer over other medical therapies and delay seeking necessary treatment.

There is also potential for harm in prayer and spiritual practices. Studies have shown that the growth of microorganisms can be retarded or inhibited depending upon the intention of the healer. There is also evidence of negative prayer in many different cultures.

Side effects

There are no known side effects of positive prayer, although negative energy focused on an individual has been shown to produce negative results.

Research and general acceptance

A 1996 Gallup poll showed that nine out of 10 Americans pray and 75% pray every day. The most common prayers were for family well-being (98%), prayers of thanks (94%), prayers for strength or guidance (92%), and prayers for forgiveness (92%). Eighty-two percent of Americans prayed for health and healing. Prayer is one of the most common complementary practices to standard medical treatment.

As of 1993, one American researcher had compiled a list of over 130 English-language clinical studies that have documented the effectiveness of faith and prayer in healing. For example, a 1987 study at the University of California Medical School in San Francisco involving 393 patients with heart problems were divided into two groups. One group had people pray for them at a distance (intercessory prayer), and the other group did not. The prayed-for group had fewer deaths, medical interventions, and complications than the control (not prayed-for) group. Dr. Larry Dossey, who was co-chair of the Panel on Mind/Body Interventions in the Office of Alternative Medicine at the National Institutes of Health in 2000, has written several books on laboratory studies of prayer and the historical reluctance of the mainstream scientific community to examine the connections between prayer and healing.

A number of studies, also at Duke University, have shown that the combination of active involvement in a religious community and frequent prayer has powerful effects on blood pressure and **smoking**.

Over the past three decades approximately 200 studies have examined the ability of prayer to affect human beings, animals, plants, and even microorganisms. Evidence so far shows that there is no one best way to pray.

Acceptance of prayer and spiritual healing among medical professionals varies. Some feel quite strongly that medicine and spiritual practice should not be mixed and that doctors and nurses should refer patients to religious professionals for spiritual needs. Surveys have shown, however, that as of 2002 a majority (about 76%) of physicians and nurses in the United States feel comfortable praying with patients if asked to do so, and 96% would discuss spiritual or religious matters with patients confronting a life-threatening illness or end-of-life issues.

Some researchers have attempted in recent years to develop scales for measuring spiritual experiences, in order to have some basis for comparing findings from different studies. Two such measures are the Daily Spiritual Experience Scale (DSES), a 16-item questionnaire; and the Ironson-Woods Spirituality-Religion (SR) Index, which measures four factors—faith in God, sense of peace, religious behavior, and compassionate view of others. The Ironson-Woods Index has been used to study the effects of spirituality and religious practice on the long-term survival of **AIDS** patients.

Training and certification

Clergy and pastoral counselors in the mainstream religious bodies in the United States receive extensive training in the spiritual and mental health needs of patients. The American Association of Pastoral Counselors (AAPC) is a professional organization that certifies Christian clergy who have undergone advanced training in **psychotherapy** as well as theology. The AAPC supports about 100 counseling centers across the United States as well as certifying clergy who serve in hospital chaplaincies or mental health clinics. The corresponding certification body for Jewish rabbis and pastoral counselors is the National Association of Jewish Chaplains.

Spiritual healers in less structured traditions may be certified through a school of energy healing, recognized within a particular religious group for their healing aptitude, or initiated into healing by another means. Native American healers have formed the Indigenous Traditional Healing Council to provide certification for healers as well as to protect the integrity of Native American healing rituals. Many other healers develop their healing gifts on their own. Any caring person can develop a certain amount of healing ability through meditation, prayer, study with other experienced healers, and practice. There are many self-help books on prayer and meditation, but personal guidance is usually helpful to learn the subtleties of any approach to healing. Churches and other religious centers usually offer spiritual direction through prayer, meditation, or study.

Resources

BOOKS

Benor, Daniel J. "Spiritual Healing." *Essentials of Complementary and Alternative Medicine*. Edited by Wayne Jonas and Jeffrey Levin. New York, NY: Lippincott Williams & Wilkins, 1999.

Benson, Herbert, M.D. *Timeless Healing: The Power and Biology of Belief*. New York, NY: Fireside, 1997.

Dossey, Larry, M.D. *Healing Words: The Power of Prayer and the Practice of Medicine*. New York, NY: Harper Collins, 1993.

Koenig, H.G., and M. McConnell. *The Healing Power of Faith*. New York, NY: Simon & Schuster, 1999.

Koenig, Harold G. "Spiritual Healing." *Clinician's Com plete Reference to Complementary and Alternative Medicine*. Edited by Donald Novey. St. Louis, Mis souri: Mosby, 2000.

Targ, Russel, and Jane Katra. *Miracles of Mind: Exploring Nonlocal Consciousness and Spiritual Healing*. Novato, CA: New World Library, 1998.

PERIODICALS

Ironson, G., G. F. Solomon, E. G. Balbin, et al. "The Iron son Woods Spirituality/Religiousness Index Is Associ ated with Long Survival, Health Behaviors, Less Distress, and Low Cortisol in People with HIV/AIDS." *Annals of Behavioral Medicine* 24 (Winter 2002): 34 48.

Lawrence, R. J. "The Witches' Brew of Spirituality and Medicine." *Annals of Behavioral Medicine* 24 (Winter 2002): 74 76.

Lliff, S. A. "An Additional "R": Remembering the Ani mals." *Institute for Laboratory Animal Research Journal* 43 (2002): 38 47.

Siegel, B., A. J. Tenenbaum, A. Jamanka, et al. "Faculty and Resident Attitudes About Spirituality and Religion in the Provision of Pediatric Health Care." *Ambulatory Pediatrics* 2 (January February 2002): 5 10.

Tricycle: The Buddhist Review (Spring 2000): 66 81.

Underwood, L. G., and J. A. Teresi. "The Daily Spiritual Experience Scale: Development, Theoretical Descrip tion, Reliability, Exploratory Factor Analysis, and Preliminary Construct Validity Using Health Related Data." *Annals of Behavioral Medicine* 24 (Winter 2002): 22 33.

ORGANIZATIONS

American Association of Pastoral Counselors. 9504 A Lee Highway, Fairfax, VA 22031 2303. (703)385 6967. www.aapc.org. info@aapc.org.

Indigenous Traditional Healing Council. P. O. Box 646, Tempe, AZ 85280. (602) 209 4759.www.azitlan.org/ sweatlodge/council/htm..

National Association of Jewish Chaplains. 901 Route 10, Whippany, NJ 07981 1156. (973) 736 9193.www. najc.org.

Linda Chrisman
Ken R. Wells
Rebecca J. Frey, PhD

Pregnancy

Definition

Pregnancy is the period from conception to birth. After an egg is fertilized by a sperm and implanted in the lining of the uterus, it develops into an embryo, and later into a fetus. Pregnancy usually lasts 40 weeks, beginning from the first day of the woman's last menstrual period. The condition is divided into trimesters, each lasting three months.

Recommended weight gain for pregnant women

If you are:	You should gain:
Underweight	About 27 to 40 pounds
Normal weight	About 25 to 35 pounds
Overweight	About 15 to 25 pounds
Obese	About 15 pounds or less

SOURCE: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services

General weight-gain recommendations for women who are expecting only one baby. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

Description

Pregnancy is a state in which a woman carries a fertilized egg inside her body as it develops into a fetus and prepares to be born.

First month

At the end of the first month, the embryo is about 1/3 in long (.85 cm), and its head, trunk, and the beginnings of arms and legs have started to develop. The embryo gets nutrients and eliminates waste through the umbilical cord and placenta. By the end of the first month, the liver and digestive system begin to develop, and the heart starts to beat.

Second month

In this month, the heart starts to pump and the nervous system (including the brain and spinal cord) begins to develop. The 1 in (2.5 cm) long fetus has a complete cartilage skeleton, which is replaced by bone cells by month's end. Arms, legs, and all of the major organs begin to appear. Facial features begin to form.

Third month

By now, the fetus has grown to 4 in (10 cm) and weighs a little more than 1 oz (28 g). Now the major blood vessels and the roof of the mouth are almost completed. The face starts to take on a more recognizably human appearance. Fingers and toes appear. All the major organs are forming; the kidneys are now functional, and the four chambers of the heart are complete.

Fourth month

The fetus begins to kick and swallow, although most women still cannot feel fetal movement at this time. Now 4 oz (112 g) in weight, the fetus can hear and urinate and has established sleep-wake cycles. All organs are now fully formed, although they continue to grow for the next five months. The fetus has skin, eyebrows, and hair.

Fifth month

Now weighing up to 1 lb (454 g) and measuring 8 to 12 in (20–30 cm), the fetus experiences rapid growth as its internal organs continue to grow. At this point, the mother may feel fetal movement, and she can hear the heartbeat with a stethoscope.

Sixth month

Even though its lungs are not fully developed, some fetuses born during this month can survive with intensive care. Weighing 1 to 1.5 lbs (454–681 g), the fetus is red, wrinkly, and covered all over its body with fine hair. The fetus grows very rapidly during this month as its organs continue to develop.

Seventh month

There is a better chance that a fetus born during this month will survive. The fetus continues to grow rapidly and may weigh as much as 3 lbs (1.3 kg). Now the fetus can suck its thumb and look around its watery environment with open eyes.

Eighth month

Growth slows as the fetus begins to take up most of the space inside the uterus. Now weighing between 4 and 5 lbs (1.8–2.3 kg) and measuring 16 to 18 in (40–45 cm) in length, the fetus may at this time prepare for delivery next month by moving into the head-down position.

Ninth month

Adding 0.5 lb (227 g) each week as the due date approaches, the fetus drops lower into the mother's abdomen and prepares for the onset of labor, which may begin any time between the 37th and 42nd week of pregnancy. Most healthy babies weigh 6 to 9 lbs (2.7–4 kg) at birth and will be about 20 in (50 cm) long.

Causes and symptoms

Pregnancy is caused by a sperm fertilizing an egg. The first sign of pregnancy is usually a missed menstrual period, although some women bleed in the beginning. A woman's breasts swell and may become tender as the mammary glands prepare for eventual breastfeeding. Nipples begin to enlarge and the veins over the surface of the breasts become more noticeable.

Nausea and **vomiting** are common symptoms during the first three months of pregnancy. Since these symptoms are usually worse in the morning, this condition is known as **morning sickness**. Many women also feel extremely tired during the early weeks or pregnancy. Frequent urination is common, and there may be a creamy white discharge from the vagina. Some women crave certain foods, and an extreme sensitivity to odors may worsen the nausea. Maternal weight begins to increase.

In the second trimester (13–28 weeks) a woman begins to look noticeably pregnant and the enlarged uterus is easy to feel. The nipples get bigger and darker, the skin of Caucasians may darken, and some women may feel flushed and warm. Appetite may increase. By the twenty-second week, most women have felt the fetus move. During the second trimester, nausea and vomiting often diminish or disappear, and the pregnant woman often feels better and more energetic than in early pregnancy. Heart rate increases as does the volume of blood in the body.

By the third trimester (29–40 weeks), many women begin to experience a range of symptoms. Stretch marks (striae) may develop on the abdomen, breasts and thighs, and a dark line may appear from the navel to pubic hair. A thin fluid may be expressed from the nipples. Many women feel hot, sweat easily, and often find it hard to get comfortable. Kicks from an active fetus may cause sharp pains, and lower backaches are common. More rest is needed as the woman copes with the added **stress** of extra weight. Braxton Hicks contractions may get stronger.

At about the thirty-sixth week in a first pregnancy (later in repeat pregnancies), the fetus's head drops down low into the pelvis. This shift may relieve pressure on the upper abdomen and the lungs, allowing a woman to breathe more easily. The fetus's new position, however, places more pressure on the bladder.

The average woman gains 28 lb (12.7 kg) during pregnancy, 70% of it during the last 20 weeks. An average healthy full-term baby at birth weighs 7.5 lbs (3.4 kg), and the placenta and fluid together weigh another 3 lbs (1.3 kg). The remaining weight that a woman gains during pregnancy is mostly due to water retention and fat stores.

In addition to the typical symptoms of pregnancy, some women experience other problems that may be

annoying but usually disappear after delivery. **Constipation** may develop as a result of food passing more slowly through the intestine. **Hemorrhoids** and **heartburn** are fairly common during late pregnancy. Gums may become more sensitive and bleed more easily. Eyes may dry out, making contact lenses feel painful. Pica (a craving to eat substances other than food) may occur. Swollen ankles and **varicose veins** may be a problem in the second half of pregnancy, and chloasma (light brown spots) may appear on the face.

While the preceding symptoms are considered normal, there are some symptoms that may indicate more dangerous underlying problems. A pregnant woman experiencing any of the following should contact her doctor immediately:

- abdominal pain
- rupture of the amniotic sac or leaking of fluid from the vagina
- bleeding from the vagina
- no fetal movement for 24 hours (after the fifth month)
- continuous headaches
- marked sudden swelling of eyelids, hands, or face during the last three months
- dim or blurry vision during the last three months
- persistent vomiting

Diagnosis

Many women first discover they are pregnant after a positive home pregnancy test. Pregnancy urine tests check for the presence of human chorionic gonadotropin (hCG), which is produced by a placenta. Home tests can detect pregnancy as early as the first day of the missed menstrual period.

Home pregnancy tests are more than 97% accurate if the result is positive, and about 80% accurate if the result is negative. If the result is negative and there is no menstrual period within another week, the pregnancy test should be repeated. While home pregnancy tests are reliable, they are less accurate than a pregnancy test evaluated by a laboratory. For this reason, a woman may want to have a second pregnancy test conducted at her doctor's office to be sure of the accuracy of the result.

Blood tests to determine pregnancy are usually used only when a very early diagnosis of pregnancy is needed. This more expensive test, which also looks for hCG, can produce a result within nine to twelve days after conception.

Once pregnancy has been confirmed, there are a range of screening tests that can be done to screen for birth defects, which affect about 3% of unborn children. Two tests are recommended for all pregnant women: alpha-fetoprotein (AFP) and the triple marker test.

Other tests are recommended for women at higher risk for having a child with a birth defect. These groups include women over age 35 who have another child or a close relative with a birth defect or who have been exposed to certain drugs or high levels of radiation. Women with any of these risk factors may want to consider amniocentesis, chorionic villus sampling (CVS) or ultrasound.

Other prenatal tests

Other prenatal tests that are routinely performed include:

- pap test
- gestational diabetes screening test at 24–28 weeks
- tests for sexually transmitted diseases
- urinalysis
- blood tests for anemia or blood type
- screening for immunity to various diseases, such as German measles

Treatment

Alternative medicine offers a variety of treatments for conditions ranging from morning sickness to stretch marks. Before starting any treatment, a pregnant woman should consult with her doctor or healthcare practitioner. Note that except for **ginger**, the effectiveness of these herbs has not been proven to the satisfaction of conventional medical practitioners.

Prenatal care is vitally important for the health of the fetus. A pregnant woman should eat a balanced, nutritious diet of frequent small meals. Many physicians prescribe pregnancy vitamins, including **folic acid** and **iron** supplementation during pregnancy.

Herbal remedies

Numerous herbs are believed to remedy a range of conditions experienced by pregnant women. Many remedies can be taken as herbal teas, and packaged tea bags are sold at health food stores. The following herbs are recommended for pregnant women:

- Red raspberry leaf tea (*Rubus idaeus*) is regarded as an all-purpose remedy. It is said to be a good source of iron, to tone the uterus, protect against miscarriage,

and prevent infection, cramps, and anemia. Furthermore, red raspberry is believed to aid the birth process by stimulating contractions. The herb also is believed to prevent excessive bleeding during labor and afterwards.

- For morning sickness, several forms of ginger (*Zingiber officinale*) provide relief. A cup of ginger tea, ginger capsules, ginger ale, or ginger cookies can ease the queasiness.
- Lemon balm (*Melissa officinalis*) can be taken for nausea. It also aids digestion.
- Wild yam (*Dioscorea villosa*) and burdock root (*Arctium luppa*) are effective against morning sickness. Wild yam can be taken for pregnancy pain and cramping. The herb is taken to reduce the risk of miscarriage. Burdock root aids with water retention; it also protects against infant jaundice.
- Peppermint (*Mentha piperita*) can be taken after the first trimester to combat nausea. It helps with digestion, provides stomach relief, and serves as a body strengthener.
- Echinacea (various species) boosts the immune system to fight colds, flu, and infection.
- Chamomile (*Matricaria recutita*) provides soothing relaxation and can be used to help with sleep. It also helps with digestive problems and bowel difficulties.
- Yellow dock (*Rumex crispus*) thwarts infant jaundice. The herb helps with iron absorption.
- Bilberry (*Vaccinium myrtillus*) serves as a diuretic for bloating; it also strengthens vein and capillary support.
- Nettles (*Urtuca dioica*) and oat straw (*Avena sativa*) are sources of calcium. In addition, nettles and dandelion reportedly prevent high blood pressure and water retention. Nettles contain vitamin K and help to prevent excessive bleeding. Nettles can also be taken to avoid hemorrhoids and to enhance kidney function.
- Blue cohosh (*Caulophyllium thalictroides*) is taken during the last weeks of pregnancy to induce labor contractions and ease spasmodic pains.
- Lobelia (*Lobelia inflata*) works to relax the mother during delivery. The herb also aids with delivery of the placenta.

HERBS TO AVOID. Some herbs can cause complications to mother or fetus and should not be taken during pregnancy. Uterine contractions can be caused by **angelica** (*Angelica archangelica*, *A. atropurpurea*), lovage (*Levisticum vulgaris*), **mistletoe** (*Viscum album*), **mugwort** (*Artemesia vulgaris*), tansy (*Tanacetum vulgare*), wild ginger (*Asarum europaeum*), and **wormwood** (*Artemisia absinthium*). Other herbs to be avoided include cinchona (*Chinchona pubescens*), **eucalyptus** oil (*Eucalyptus globulus*), **juniper** (*Juniperus communis*), ma huang (**ephedra**) (*Ephedria sinica*), male fern (*Dryopteris filix-mas*), **pennyroyal** (*Mentha pulegium*), poke root (*Phytolacca americana*), rue (*Ruta graveolens*), shepherd's purse *Capsella bursa-pastoris*), and **yarrow** (*Achillea millefolium*).

Aromatherapy

Aromatherapy involves the use of **essential oils** as remedies. The application of combined oils to the skin is said to counteract stretch marks. An aromatherapist can recommend specific oil combinations.

Traditional Chinese medicine and acupuncture

In addition to using herbs for **infertility** problems, **traditional Chinese medicine** recommends herbal formulas for such problems associated with pregnancy as morning sickness, threatened miscarriage, and **postpartum depression**. One well-known formula, recommended to be taken three to six months before attempting conception, is called the Rock on Tai Mountain decoction. The formula is intended to build up both the woman's qi, or life energy, and her blood. In traditional Chinese medicine, it is thought that the mother's blood nourishes, the qi protects, and the qi in the kidneys holds the fetus.

Chinese practitioners use **acupuncture** to assist conception by clearing the stagnation of qi in the liver; to prevent miscarriage by conserving qi in the kidney; and to induce labor.

Traditional Chinese medicine recommends abstinence from intercourse during pregnancy in order to allow the placenta to develop normally and to prevent harm caused by sexual excess to the various organs and substances in the mother's body.

Hydrotherapy

Although pregnant women should avoid saunas and hot tubs, other forms of **hydrotherapy** can provide relief. To ease nausea, a warm compress is placed between the chest and abdomen 30 minutes before eating. The compress is a cloth soaked in hot water and wrung out. A foot bath can soothe swollen feet.

Homeopathy

Morning sickness can be treated by several homeopathic remedies. If a homeopathic remedy is a decimal potency, it is indicated by an "x". This indicates the number of times that one part of a remedy was

diluted in nine parts of a diluent. Distilled water is the preferred diluent.

Ipecacuanha 30x is recommended if the woman feels worse lying down, has **diarrhea**, and is salivating heavily. If morning sickness is accompanied by queasiness about eating, *Colchicum autumnale* 6x is recommended. ***Nux vomica*** 6x is the remedy when a woman vomits in the morning, but her condition improves after eating. *Phosphorus* 6x is taken when a woman vomits after drinking water. For nausea only, *Natrum phosporicum* 6x may provide relief.

Each remedy is taken every 15 minutes until the feeling of nausea lessens. However, no more than four doses should be taken in one day unless specified by a homeopath.

Flower remedies

Flower remedies are liquid concentrates made by soaking flowers in spring water. Also known as flower essences, 38 remedies were developed by homeopathic physician Edward Bach during the 1930s. Walnut, a Bach remedy for difficulty in adjusting to change, may be helpful to pregnant women. A thirty-ninth combination formula, the **rescue remedy**, is taken to relieve stress. A pregnant woman should, however, check with her doctor before beginning flower therapy. Flower essences, which contain alcohol, are taken in water and usually sipped.

Relaxation techniques

Relaxation techniques can be used to cope with such conditions as stress or morning sickness. Helpful techniques include **meditation**, deep breathing, and listening to relaxation tapes. Another useful technique is **guided imagery**. The mother does some deep breathing and then visualizes a positive image or affirmation.

Bodywork

Massaging sore areas of the body during pregnancy can reduce aches and stress. Another form of bodywork is the **Alexander technique**, developed by actor Frederick Matthias Alexander during the 1800s. An Alexander technique practitioner can show a woman how to release muscle tension, with emphasis on the neck. The technique focuses on posture and movement. It is said to reduce stress and relieve **pain** in such areas as the back.

Allopathic treatment

No medication (not even nonprescription drugs, herbal, or homeopathic remedices) should be taken except under medical supervision, since certain substances can pass from the mother through the placenta and into the developing fetus. Some drugs have been proven harmful to a fetus, but all drugs should be considered suspect and taken only with medical supervision. Drugs taken during the first three months of a pregnancy may interfere with the normal formation of the fetus's organs, leading to birth defects. Drugs taken later on in pregnancy may slow the fetus's growth rate, or they may damage specific fetal tissue (such as the developing teeth).

To have the best chance of having a healthy baby, a pregnant woman should avoid:

- smoking
- alcohol
- street drugs
- large amounts of caffeine
- artificial sweeteners.

Expected results

Pregnancy is a natural condition that usually causes little discomfort provided the woman takes care of herself and gets adequate prenatal care. **Childbirth** education classes for the woman and her partner help prepare the couple for labor and delivery.

Prevention

There are many ways to avoid pregnancy. A woman has a choice of many methods of contraception that will prevent pregnancy, including (in order of least to most effective):

- spermicide alone
- natural (rhythm) method
- diaphragm or cap alone
- condom alone
- diaphragm with spermicide
- condom with spermicide
- intrauterine device (IUD)
- contraceptive pill
- sterilization (either a man or woman)
- avoiding intercourse

KEY TERMS

Alpha-fetoprotein—A substance produced by a fetus's liver that can be found in the amniotic fluid and in the mother's blood. Abnormally high levels of this substance suggest there may be defects in the fetal neural tube, a structure that will include the brain and spinal cord when completely developed. Abnormally low levels suggest the possibility of Down syndrome.

Braxton Hicks contractions—Short, fairly painless uterine contractions during pregnancy that may be mistaken for labor pains. They allow the uterus to grow and help circulate blood through the uterine blood vessels.

Chloasma—A skin discoloration common during pregnancy, also known as the mask of pregnancy or melasma, with which blotches of pale brown skin appear on the face. The blotches may appear in the forehead, cheeks, and nose, and may merge into one dark mask. It usually fades gradually after pregnancy, but it may become permanent or recur with subsequent pregnancies.

Embryo—The result of fertilization of an egg by a sperm during the first eight weeks of development following conception. For the rest of pregnancy, the embryo is called a fetus.

Fetus—A developing unborn infant from the end of the eighth week after fertilization until birth.

Human chorionic gonadotropin (hCG)—A hormone produced by the placenta during pregnancy.

Placenta—The organ that develops in the uterus during pregnancy that links the blood supplies of the mother and fetus.

Rhythm method—The oldest method of contraception with a very high failure rate, in which partners refrain from having sex during ovulation. Ovulation is predicted on the basis of a woman's previous menstrual cycle.

Resources

BOOKS

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Dolan, Deirdre, and Alexandra Zissu. *The Complete Organic Pregnancy*. New York: Collins, 2006.

Mayo Clinic Book of Alternative Medicine: The New Approach to Using the Best of Natural Therapies and Conventional Medicine. New York: Time Inc. Home Entertainment, 2007.

Murkoff, Heidi, and Sharon Mazel. *What to Expect When You're Expecting*, 4th ed. New York: Workman, 2008.

Raffelock, Dean, and Robert Roundtree. *A Natural Guide to Pregnancy and Postpartum Health*. New York: Avery, 2002.

Romm, Aviva J. *The Natural Pregnancy Book: Herbs, Nutrition and Other Holistic Choices*. Berkeley, CA: Celestial Arts, 2003.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

Association of Women's Health, Obstetric, and Neonatal Nurses, 2000 L St. NW, Suite 740, Washington, DC, 20036, (800) 673 8499 , (202) 261 2400, Toll free in Canada (800) 245 0231, http://www.awhonn.org.

National Women's Health Network, 514 Tenth Street NW, Suite 400, Washington, DC, 20004, (202) 628 7814, http://www.nwhn.org.

Liz Swain
Tish Davidson, A.M.

Pregnancy massage

Definition

Pregnancy massage is the prenatal use of **massage therapy** to support the physiologic, structural, and emotional well-being of both mother and fetus. Various forms of massage therapy, including Swedish, deep tissue, neuromuscular, movement, and Oriental-based therapies, may be applied throughout pregnancy as well as during labor and the postpartum period.

Origins

Cultural and anthropological studies indicate that massage and movement during the childbearing experience were and continue to be a prominent part of many cultures' health care. Indian Ayurvedic medical manuals detail therapists' instructions for rubbing specially formulated oils into pregnant patients' stretched abdominal skin. Traditional sculptures depict Eskimo fathers supporting and lovingly stroking their laboring wives' backs. In certain Irish hospitals laboring women are held and touched by a doula (labor assistant) or midwife through most of their notably short, uncomplicated labors. For billions of women, over thousand of years, midwives' highly developed hands-on skills

Pregnancy massage increases blood flow, relaxes muscles, reduces water retention, and makes the skin more supple. It is particularly useful in relieving the back pain of late pregnancy. *((c) Photo Researchers, Inc. Reproduced by permission.)*

have provided loving support and eased childbearing discomforts. As massage therapy resumes its place within Western healthcare methods, pregnancy massage is becoming one of its fastest growing specialized applications.

Benefits

Profound physiologic, functional, emotional, relational, and lifestyle changes occur during gestation and labor, often creating high **stress** levels. Too much stress can negatively affect maternal and infant health, resulting in reduced uterine blood supply and higher incidence of miscarriage, prematurity, and other complications. Massage therapy can help a woman approach her due date with less **anxiety** as well as less physical discomfort. Even apart from easing specific aches, massage can act as an overall tonic and increase the expectant mother's body awareness.

KEY TERMS

Doula—A woman who assists an expectant mother with physical and emotional support during labor.

Edema—An abnormal accumulation of fluid in specific parts of the body, causing swelling of the area. Many women experience edema of the wrists and ankles during pregnancy.

Massage therapy can address the various physical challenges of pregnancy: **edema**; foot, leg, or hand discomforts; and **pain** in the lower back, pelvis, or hips. **Swedish massage** may facilitate gestation by supporting cardiac function, placental and mammary development, and increasing cellular respiration. It can also reduce edema and high blood pressure as well as contribute to sympathetic nervous system sedation. Deep tissue, trigger point, and both active and passive movements alleviate stress on weight-bearing joints, muscles, and fascial tissues to reduce neck and back pain caused by poor posture and strain on the uterine ligaments. During labor, women whose partners use basic massage strokes on their backs and legs have shorter, less complicated labors. After the baby's birth, massage therapy can gently facilitate the body's return to its pre-pregnancy state, alleviate pain, foster a renewed sense of body and self, and help maintain flexibility despite the physical stresses of infant care. For post-Caesarean mothers, specific therapeutic techniques can also reduce scar tissue formation and facilitate the healing of the incision and related soft tissue areas.

Description

When nestled with pillows or other specialty cushions into a side-lying or semi-reclining position, most women are more comfortable for the 30–60 minutes of a typical massage session. A pregnant woman can expect to enjoy many of the same techniques, draping, and professional demeanor offered all massage therapy clients. The lower back, hips, and neck benefit from sensitively applied deep tissue, neuromuscular, and **movement therapy**. Edema in the legs and arms may be relieved with the gliding and kneading strokes of Swedish or **lymphatic drainage** massage. Pregnant women should expect a thorough health and prenatal intake interview with their therapists. Cost, procedures, and insurance coverage are similar to those for other massage client populations.

Preparations

In addition to the preparations listed in the massage therapy entry, some expectant women will be asked to secure a release from their maternity healthcare provider, especially those with complications or high risk factors.

Precautions

In addition to those listed in the massage therapy entry, the following other precautions are prudent:

- The abdomen should be touched only superficially with a flat, gentle hand.
- Any pressure applied to the inner leg should also be superficial.
- Women who must be on bed rest for any complication are at higher risk of blood clots forming in their legs; therefore, most massage of the legs should be avoided.
- Massage is safest when a woman is either lying on the side or propped semi-sitting at a 45–70 degree angle rather than lying on her back or belly.
- Because there are many other specific body areas and types of techniques that must be avoided or modified according to an individual woman's health condition, advanced specialized training of the therapist and consultation with her physician or midwife are highly recommended. It is better to avoid massage if the woman has vaginal bleeding, abdominal pain, or diarrhea.

Side effects

There are no known side effects to receiving appropriate prenatal massage therapy.

Research and general acceptance

Current research on the benefits of touch is providing a contemporary basis for its reintroduction into maternity care. Scientists have found that rats restricted from cutaneous self-stimulation had poorly developed placentas and 50% less mammary gland development. Their litters were often ill, stillborn, or died shortly after birth due to poor mothering skills. Women who are nauseated and/or **vomiting** prenatally experienced a decrease in these discomforts when they applied finger pressure to a specific **acupuncture** point (**acupressure**) on their forearm several times each day. Pregnant women massaged twice weekly for five weeks experienced less anxiety, leg, and back pain. When compared with control groups who practiced **relaxation** exercises only, the women who had had massage reported better sleep and improved moods, and their labors had fewer complications, including fewer premature births. Studies show that when women receive nurturing touch during later pregnancy, they touch their babies more frequently and lovingly. During labor the presence of a doula, a woman providing physical and emotional support, including extensive touching and massage, reduces the length of labor and number of complications, interventions, medications, and Caesarean sections.

Training and certification

Some massage therapy schools include comprehensive courses in pregnancy massage therapy. More often, however, therapists receive only introductory guidance in maternity applications during their 500–1000 hours of basic training and then pursue specialization certification in pre- and perinatal massage therapy. Several nationwide programs offer such advanced training in 24–34 hour workshop programs.

Resources

BOOKS

Curties, Debra. *Breast Massage*. Moncton, New Brunswick, Canada: Curties Overzet Publications Inc., 1999.

Goldsmith, Judith. *Childbirth Wisdom*. New York: Congdon and Weed, 1984.

Klaus, Marshall H., M.D., John H. Kennell, M.D., and Phyllis H. Klaus, M.Ed. *Mothering the Mother*. New York: Addison Wesley Publishing Company, 1993.

Osborne Sheets, Carole. *Pre and Perinatal Massage Therapy: A Comprehensive Practitioners' Guide to Pregnancy, Labor, and Postpartum*. San Diego: Body Therapy Associates, 1998.

Rich, Laurie. *When Pregnancy Isn't Perfect*. New York: Dutton, 1991.

Samuels, Mike, and Nancy Samuels. *The New Well Pregnancy Book*. New York: Fireside, 1996.

Yates, John, PhD. *A Physician's Guide to Therapeutic Massage: Its Physiological Effects and Their Application to Treatment*. Vancouver, BC: Massage Therapists' Association of British Columbia, 1999.

ORGANIZATIONS

National Association of Pregnancy Massage Therapy. (888) 451 4945.

Carole Osborne-Sheets

Premenstrual syndrome

Definition

Premenstrual syndrome (PMS) refers to over 150 symptoms that occur between ovulation and the onset of **menstruation**. The symptoms include both physical

Symptoms of PMS

Physical	Emotional/behavioral
Weight gain	Moodiness/irritability
Fluid retention	Anxiety or tension
Breast tenderness	Depression
Headaches and body aches	Panic attacks
Acne	Suicidal thoughts
Hot flashes	Crying fits
Nausea	Aggressiveness
Cold sores and herpes outbreaks	Social withdrawal
Constipation or diarrhea	
Food cravings/Appetite changes	
Insomnia	
Fatigue	

(Illustration by Corey Light. Cengage Learning, Gale)

ones, such as breast tenderness, back **pain**, abdominal cramps, **headache**, and changes in appetite; behavioral symptoms such as clumsiness, poor concentration, and sleep problems; and psychological symptoms of **anxiety**, irritability, **depression**, and unrest. Severe forms of this syndrome are referred to as premenstrual dysphoric disorder (PMDD). These symptoms may be related to hormonal imbalances and emotional disorders.

Description

Between 40 and 75% of all menstruating women experience symptoms that occur before or during menstruation. PMS encompasses a wide range of symptoms, some as minor as appetite change or others so severe that they may interfere with daily life. Some women experience an increase in their sexual libido (sex drive). Only 3 to 7% of women experience the much more severe premenstrual dysphoric disorder (PMDD). These symptoms can last 4 to 10 days and can have a substantial impact on a woman.

The reason some women get severe PMS whereas others get little or none of the symptoms is not understood. PMS symptoms usually begin at puberty and last until **menopause**. Women more sensitive to hormonal change may experience PMS more than others. **Stress** also contributes and the relief of tension often lessens the other symptoms as well. Overall, however, it is difficult to predict who is most at risk for PMS.

Causes and symptoms

Because PMS is restricted to the second half of a woman's menstrual cycle, after ovulation, it is thought that hormones play a role. During a woman's monthly menstrual cycle, which lasts from 24 to 35 days, hormone levels change. The hormone estrogen gradually rises during the first half of a woman's cycle, the pre-ovulatory phase, and falls dramatically at ovulation. After ovulation, the post-ovulatory phase, progesterone levels gradually increase until menstruation occurs. Both estrogen and progesterone are secreted by the ovaries, which are responsible for producing the eggs. The main role of these hormones is to cause thickening of the lining of the uterus (endometrium).

However, estrogen and progesterone also affect other parts of the body, including the brain. In the brain and nervous system, estrogen can affect the levels of neurotransmitters, such as serotonin. Serotonin has long been known to have an effect on emotions and eating behavior. It is thought that when estrogen levels go down during the post-ovulatory phase of the menstrual cycle, decreases in serotonin levels follow. Whether these changes in estrogen, progesterone, and serotonin are responsible for the emotional aspects of PMS is not known with certainty. However, most researchers agree that the chemical transmission of signals in the brain and nervous system is in some way related to PMS. This position is supported by the fact that the times following **childbirth** and menopause are also associated with both depression and low estrogen levels.

Nutritional deficiencies, food **allergies**, and **hypoglycemia** (low blood sugar) have been linked with PMS. A diet deficient in **essential fatty acids**, **zinc**, **magnesium**, and vitamin B_6 may affect estrogen and progesterone production and their balance in the body.

Over 150 symptoms for PMS have been identified. These include physical, behavioral, and emotional aspects that range from mild to severe. The physical symptoms include bloating, headaches, food cravings, abdominal cramps, headaches, tension, **fatigue**, **acne**, muscle aches, and breast tenderness. Behavioral symptoms may include

Conceptual illustration of menstrual pain. *(© PHOTOTAKE Inc. / Alamy)*

insomnia, lack of concentration, and clumsiness. Emotional aspects include mood swings, irritability, and depression.

Diagnosis

The best way to diagnose PMS is to review a detailed diary of a woman's symptoms for several months. PMS is diagnosed by the presence of physical, psychological, and behavioral symptoms that are cyclic and occur in association with the premenstrual period of time. PMDD, which is far less common, was officially recognized as a disease in 1987. Its diagnosis depends on the presence of at least five symptoms related to mood that disappear within a few days of menstruation. These symptoms must interfere with normal functions and activities of the individual.

Treatment

There are many natural treatments for PMS and PMDD depending on the symptoms and their severity. **Hypnotherapy**, spiritual healing, **color therapy**, **reflexology**, **Ayurvedic medicine**, **traditional Chinese medicine**, **acupuncture**, **acupressure**, **aromatherapy**, herbal treatment, Naturopathic treatment, and **homeopathy** are all used to treat PMS.

Vitamins and minerals

Some women find relief with the use of vitamin and mineral supplements. Magnesium can reduce the fluid retention that causes bloating, whereas **calcium** may decrease both irritability and bloating. Magnesium and calcium also help relax smooth muscles, which may reduce cramping. Some studies indicate that calcium supplements can reduce premenstrual complaints by nearly half. **Vitamin E** reduces breast tenderness, nervous tension, fatigue, and insomnia. Vitamin B_6 decreases fluid retention, fatigue, irritability, and mood swings. Vitamin B_5 supports the adrenal glands and may help reduce fatigue.

Phytoestrogens and natural progesterone

The Mexican wild yam, *Dioscorea villosa*, contains a substance that may be converted to progesterone in the body. Because this substance is readily absorbed through the skin, it can be found as an ingredient in many skin creams. (Some products also have natural progesterone added to them.) Some herbalists believe that these products can have a progesterone-like effect on the body and decrease some of the symptoms of PMS.

The most important way to alter hormone levels may be by eating more phytoestrogens. These plant-derived compounds have an effect similar to estrogen in the body. One of the richest sources of phytoestrogens is soy products, such as tofu and soy milk. Additionally, many supplements contain **black cohosh** (*Cimicifuga racemosa*) or **dong quai** (*Angelica sinensis*), which are herbs high in phytoestrogens. **Red clover** (*Trifolium pratense*), **alfalfa** (*Medicago sativa*), **licorice** (*Glycyrrhiza glabra*), **hops** (*Humulus lupulus*), and legumes are also high in phytoestrogens. Increasing the consumption of phytoestrogens is also associated with decreased risks of **osteoporosis**, **cancer**, and **heart disease**.

Herbal treatment

Herbal treatment has been used to treat many symptoms of PMS. Herbs to alleviate cramps include **angelica** root, **cramp bark**, **kava kava**, red **raspberry**, **black haw**, and **rosemary**. Black cohosh, **peppermint**, strawberry leaf, and **valerian** root have been used to decrease mood swings. **Dandelion**, couch grass, and **hawthorn** are effective diuretic herbs used to reduce bloating and swelling. **Burdock root** and red clover are liver cleansing herbs that can be useful in eliminating excess estrogen from the system. Herbs to balance hormones include **blessed thistle**, dong quai, false unicorn root, **fennel** seed, sarsaparilla root, and squaw vine. **Feverfew** may be effective for migraine headaches.

Many herbs may be beneficial as a natural antidepressant. St. John's wort (*Hypericum perforatum*) has been shown in scientific trials to be an effective antidepressant. As with the standard antidepressants, however, it must be taken continuously and does not show an effect until used for four to six weeks. A preliminary study conducted at the University of Exeter in England indicated that St. John's wort may also be an effective treatment for the moods associated with PMS. For two menstrual cycles, each woman in the study took one 300 milligram tablet of St. John's wort daily and maintained a diary in which each woman rated her symptoms on a scale of zero to four. Of the 19 women who completed the study, symptom ratings improved by about 50%. Scores on tests of anxiety and depression also dropped significantly after the first month on St. John's wort. There are also herbs, such as **skullcap** (*Scutellaria lateriflora*) and kava kava (*Piper methysticum*), that can relieve the anxiety and irritability that often accompany depression. An advantage of these herbs is that they can be taken when symptoms occur rather than continually.

Chaste-berry tree (*Vitex agnus-castus*) in addition to helping rebalance estrogen and progesterone in the body also may relieve the anxiety and depression associated with PMS. It is also used to treat menstrual irregularities, painful menstruation, and breast pain in women with PMS. Two surveys of its effectiveness were done on 1,542 women who took a liquid extract (42 drops daily) for spans up to 16 years. The patients' doctors rated its effectiveness as very good, good, or satisfactory in 92% of cases. An article on the surveys was published in the February 2000 issue of *Let's Live* magazine.

Another natural PMS remedy is **evening primrose oil** (EPO) *Oenothera biennis*. EPO is derived from the plant's seeds and is valued for its oil-containing essential fatty acids. These include **linoleic acid** and **gamma-linoleic acid** (GLA). Women with PMS have been shown to have impaired conversion of linoleic acid to GLA. Because a deficiency of GLA might be a factor in PMS and because evening primrose oil contains significant amounts of GLA, researchers have studied EPO as a potential way to reduce PMS symptoms. In several double blind studies, EPO was found to be beneficial, whereas in other studies it was no more effective than a placebo. The studies were done in the 1980s and 1990s. Despite these conflicting results, many homeopathic health practitioners recommend EPO. The usual recommended dose is 3 to 4 grams per day. EPO seems to work best when used over several menstrual cycles and may be more helpful in women with PMS who also experience breast tenderness or **fibrocystic breast disease**.

Aromatherapy

Aromatherapy oils can be a useful adjunct treatment for PMS. **Lavender** oil reduces headaches, cramps, and painful breasts. **Chamomile** and sandalwood oils may be used to relieve stress and tension. Premenstrual fatigue may be remedied by geranium, bergamot, and rosemary oils.

Homeopathy

A number of homeopathic remedies may be applied in the treatment of PMS, depending upon the individual's symptoms. Natrum muriaticum may be the appropriate remedy when irritability, lack of self-confidence, depression, anxiety, and headaches are present. **Sepia** may be given when PMS is accompanied by stress, weepiness, and to calm nerves. Symptoms of indifference, panic attacks, anger, tension, **hair loss**, sugar cravings, and a reduced sex drive may indicate that Kali carbonicum may be the appropriate remedy.

Allopathic treatment

Allopathic treatments available include over-the-counter anti-inflammatory drugs such as ibuprofen or acetominophen, antidepressant drugs, hormone treatment, or (only in extreme cases) surgery to remove the ovaries. Anti-inflammatory drugs are useful in reducing headaches, muscle aches, and cramping. One recommendation is to begin taking the anti-inflammatory one to two days before the onset of cramps. Doing so will block the cramp-causing hormones, prostaglandins, and may prevent any **nausea**, **vomiting**, and **diarrhea** associated with PMS. Hormone treatment usually involves oral contraceptives. This treatment is used to prevent ovulation and the changes in hormones that accompany ovulation. Some studies, however, indicate that hormone treatment has little effect over placebo. In 2006, the U.S. Food and Drug Administration (FDA) approved Sarafem for the treatment of premenstrual dysphoric disorder (PMDD), a severe form of PMS. As of April 2008, it was the only prescription medication indicated for the treatment of this condition. Sarafem, however, is not a new drug. It is actually a new brand name for the antidepressant fluoxetine (Prozac), which has had some very serious allegations leveled against it. Opponents of the drug claim that it is a trigger for violent and/or suicidal behavior in certain susceptible individuals.

Antidepressants

Besides Prozac, other antidepressants prescribed for PMS include sertraline (Zoloft) and paroxetine (Paxil). They are termed selective serotonin reuptake inhibitors (SSRIs) and act by indirectly increasing the brain serotonin levels, thus stabilizing emotions. Some doctors prescribe antidepressant treatment for PMS throughout the cycle, while others direct patients to take the drug only during the latter half of the cycle. Antidepressants should be avoided by women wanting to become pregnant. Side effects of sertraline were found to include nausea, diarrhea, and decreased libido.

Expected results

The prognosis for women with both PMS and PMDD is good. Most women experience relief from symptoms when treated.

Prevention

Women who have PMS typically have very poor **diets**. Maintaining a good diet, one low in sugars, salt, fats, alcohol, and **caffeine**, and high in phytoestrogens and complex carbohydrates, may prevent some of the symptoms of PMS. Consumption of more complex carbohydrates may relieve PMS symptoms since carbohydrates drop serotonin levels as they raise insulin levels. For instance, two cups of cereal or a cup of pasta has enough carbohydrate to effectively increase serotonin levels. Carbohydrates also provide steady levels of blood sugar and act to stabilize one's mood. One recommendation is to eat 100 calories of complex carbohydrates every three hours beginning one week before menstruation. Complex carbohydrates include whole wheat bread and pasta, brown rice, and whole grain foods. Caution should be taken due to the fact that a high carbohydrate diet causes water retention, which in turn is a symptom of PMS. Also, excess caffeine consumption has been associated with breast tenderness and fibrocystic breasts. Because of the potential that PMS is caused by estrogen dominance, one might also consider steps that eliminate or reduce the consumption of xenoestrogens (estrogenic compounds from the hormones and pesticides in the food supply). A vegetarian diet or consumption of organically grown meats, eggs, fruits, vegetables, and dairy products are two ways one might reduce xenoestrogen exposure.

Women should try to **exercise** three times a week, keep in generally good health, and maintain a positive self image. Because PMS is often associated with stress, avoidance of stress or developing better means to deal with stress can be important. Chronic stress has two very important effects on the body related to PMS: it increases cortisol, a hormone produced by the adrenal glands, that keeps women going through times of stress and it increase production of prolactin. Cortisol competes for progesterone receptor sites. If it is chronically elevated, women end up with the symptoms of progesterone deficiency, even though their bodies may be producing enough for their needs. Further, cortisol can stimulate feelings of irritability, anger and rage, familiar symptoms for women with PMS. Stress reduction techniques such as **biofeedback** training, exercise, time management skills, **yoga**, and **meditation** may all be useful to women who are chronically stressed.

KEY TERMS

Antidepressant—A drug used to control depression.

Estrogen—A female hormone important in the menstrual cycle.

Neurotransmitter—A chemical messenger used to transmit an impulse from one nerve to the next.

Phytoestrogens—Compounds found in plants that can mimic the effects of estrogen in the body.

Progesterone—A female hormone important in the menstrual cycle.

Serotonin—A neurotransmitter important in regulating mood.

Resources

BOOKS

Glenville, Marilyn. *Overcoming PMS the Natural Way*. London: Piatkus Books, 2006.

Jones, Andrew. *The All Natural Cure to Your PMS*. Akron, OH: 48 Hour Books, 2007.

O'Brien, P., M. Shaun, et al. *The Premenstrual Disorders: PMS and PMDD*. New York: Informa Healthcare, 2007.

Scalis, Dagmara. *Everything Health Guide to PMS: The Essential Guide to Reducing Discomfort, Minimizing Symptoms, and Feeling Your Best*. Cincinnati, OH: Adams Media, 2007.

PERIODICALS

Crain, Esther. "The PMS Diet: What You Consume Pre period Can Control Annoying Symptoms." *Cosmopol itan* (October 2007): 224.

Graham, Janis. "Hormone Help: It's Not Just About Birth Control Anymore. New Methods Can Help Manage Heavy Periods, Killer Cramps, PMS, Even Hot Flashes." *Good Housekeeping* (June 2007): 43(4).

Guthrie, Catherine. "Herbs for Hormones: Tame PMS, Hot Flashes, and Even Hormone Related Depression with Herbs and Supplements." *Natural Health* (March 2008): 91(3).

Kane, Emily A. "Marvel at Milk Thistle's Many Uses: This Ancient Medicine Has a Range of Modern Uses. Treating Liver Disease, Resolving Skin Conditions and Alleviating PMS Symptoms Are Just a Few." *Better Nutrition* (June 2007): 24.

Parch, Lorie. "The Nine Best Herbs for Women: The Latest Research on What Really Works to Prevent PMS, Hot Flashes, Migraines, Heart Disease, and More." *Natural Health* (September 2006): 74(6).

Perkins, Melissa. "Banish PMS Forever! Cramps, Bloating, Mood Swings Yeah, Periods Can Suck. But with These Expert Tips, You Can Beat Even the Ickiest PMS Symptoms and Make It Through the Month." *Girl's Life* (February/March 2007): 50(2).

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Australian Homeopathic Association, 6 Cavan Ave., Renown Park, SA 5008, Australia, (61) 8 8346 3961, http://www.homeopathyoz.org.

European Institute of Women's Health, 33 Pearse St., Dub lin, 2, Ireland, 353 1 671 5691, http://www.eurohealth.ie.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

Office of Women's Health. U.S. Department of Health and Human Services, 200 Independence Ave. SW, Room 712E, Washington, DC, 20201, (800) 994 9662, http://www.womenshealth.gov.

Jennifer Wurges
Ken R. Wells

Prickly heat

Definition

Prickly heat is a common disorder of the sweat glands characterized by a red, **itching**, prickling rash following exposure to high environmental temperatures.

Description

Prickly heat is also known as heat rash, sweat retention syndrome, and miliaria rubra. This disorder occurs during the summer months or year-round in hot, humid climates, and is caused by blockage of the sweat glands. The skin contains two types of glands: one produces oil and the other produces sweat. The sweat glands are coil-shaped and extend deep into the skin. Blockage can occur at several different depths, producing four distinct skin rashes:

- Miliaria crystallina. This is the most superficial blockage and affects only the thin upper layer of skin, the epidermis. Sweat that cannot escape to the surface forms little blisters. A bad sunburn as it just starts to blister can look exactly like miliaria crystallina.
- Miliaria rubra. Blockage at a deeper layer causes sweat to seep into the living layers of skin, causing irritation and itching.
- Miliaria pustulosais. A complication of miliaria rubra in which the sweat is infected with pyogenic (pus-producing) bacteria and contains pus.
- Miliaria profunda. The deepest of all blockages causes dry skin and possibly goose bumps.

These four types of heat rash can cause complications because they prevent sweat from cooling the body, as normally occurs when the sweat evaporates from the skin surface. Sweating is the most important human cooling mechanism available in hot environments. If it does not work effectively, the body can rapidly become overheated, with severe and potentially fatal consequences.

Causes and symptoms

The best evidence to date suggests that bacteria form the plugs in the sweat glands. These bacteria are probably normal inhabitants of the skin, and why they suddenly interfere with the free flow of sweat is not understood.

Heat rash appears suddenly and has a hot, itching, prickling sensation. Infants are more likely to get miliaria rubra than adults. Obese persons are also more susceptible to heat rash. All the sweat retention **rashes** are also more likely to occur in hot, humid weather.

Failure to secrete sweat can cause the body to overheat. Before the patient suffers heat **stroke**, there will be a period of heat exhaustion symptoms (**dizziness**, thirst, weakness) when the body is still effectively maintaining its normal temperature. Then the patient's temperature rises, often rapidly, to 104 or 105° F (40° C) and beyond. Heat stroke is an emergency that requires immediate and rapid cooling. The best method of treatment is immersion in ice water.

Diagnosis

Prickly heat can be diagnosed and treated by a dermatologist (skin disease specialist). The symptoms of a rash and dry skin in hot weather are usually sufficient to diagnose these conditions.

KEY TERMS

Ambient—Surrounding.

Antipruritic—A type of medication applied to the skin to stop itching.

Pyogenic—Capable of generating pus. Streptococci, staphylococci, and bowel bacteria are the primary pyogenic organisms.

Syndrome—A collection of abnormalities that occur together often enough to suggest that they have a common cause.

Treatment

Naturopaths maintain that **essential fatty acids** can speed the clearing of the rash. The patient should eat fish rich in fatty acids (salmon, mackerel, or herring). Other sources include dark green leafy vegetables and **flaxseed** oil.

The homeopathic remedy for prickly heat is a dose of *apis* in 30c potency, taken when the itching or prickling sensation begins. *Apis* may be taken every 2 hours for up to 10 days.

An alkaline bath is the **hydrotherapy** treatment for prickly heat. The patient should soak for 30–60 minutes in a tub filled with lukewarm water containing 1 cup of baking soda.

Herbal treatments to relieve itching include sprinkling arrow root powder over the rash or rubbing a slice of fresh daikon radish or raw potato over the rash. A sponge bath with **ginger** will increase circulation. Fresh grated ginger is steeped in boiling-hot water, cooled, and then sponged over the rash. For widespread itching the patient can take cool baths with corn starch and/or oatmeal.

Chinese herbal medicines are used internally for widespread prickly heat or externally for small areas of rash. The medicines Zhi Yang Po Fen (Relieve Itching Powder), Jie Du Cha Ji (Resolve Toxin Smearing Liquid), and Qing Dai San Cha Ji (Natural Indigo Powder Smearing Liquid) can be applied to the rash. Fresh lotus leaf with a decoction of Jin Yin Hua (*Flos lonicerae*) can be taken as a tea. A decoction of the following herbs can be taken by mouth:

- Qing Hao (*Herba artemisiae annuae*): 5g
- Bo He (*Herba menthae*): 5 g
- Jin Yin Hua (*Flos lonicerae*): 10 g
- Dan Zhu Ye (*Herba lophatheri*): 10 g
- Lu Dou Yi (*Pericarpium phaseoli munginis*): 10 g
- Ju Hua (*Flos chrysanthemi*): 5 g
- fresh lotus leaf: one piece

Allopathic treatment

Heat rash may be treated with topical antipruritics (itch relievers) containing calamine, **aloe**, menthol, camphor, **eucalyptus** oil, and similar ingredients. Dermatologists can peel off the upper layers of skin using a special ultraviolet light. This treatment will remove the plugs and restore sweating, but is not necessary in most cases.

Expected results

With cooler temperatures, the rash disappears in a day, but the skin may not recover its ability to sweat for two weeks (the time needed to replace the top layers of skin with new growth from below).

Prevention

Because the body cannot cool itself adequately without sweating, careful monitoring for symptoms of heat exhaustion is important, especially in infants or the elderly. If the symptoms of heat exhaustion do appear, the person should move into the shade or take a cool bath or shower. Clinical studies have found that application of topical antiseptics like hexachlorophene almost completely prevented these rashes. General measures to prevent prickly heat include:

- wearing loose-fitting clothing
- removing sweat-soaked clothing
- taking a cool shower or bath after sweating
- limiting outdoor activities to the mornings and evenings during hot weather
- staying in an air-conditioned environment during hot weather.

Resources

BOOKS

Berger, Timothy G. "Skin and Appendages." In *Current Medical Diagnosis and Treatment*, edited by Lawrence M. Tierney, Jr., et al. Stamford, CT: Appleton & Lange, 1996.

"Sweat Retention Syndrome." In *Dermatology in General Medicine*, edited by Thomas B. Fitzpatrick et al. New York: McGraw Hill, 1993.

Ying, Zhou Zhong, and Jin Hui De. "Prickly Heat and Summer Dermatitis." *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Church ill Livingston, 1997.

Belinda Rowland

Prickly pear cactus

Description

A member of the Cactaceae (or cactus) family, prickly pear cactus, also known as nopal, grows in the United States, Mexico, and South America. It also flourishes in Africa, Australia, and the Mediterranean.

Although prickly pear cactus can tolerate a wide range of temperature and moisture levels, it grows best in sunny, desert-like conditions. Over a dozen species of prickly pear cactus belong to the *Opuntia* genus, but all of them have flat, fleshy, green-colored pads that look like large leaves and are oval to round in shape. With a tendency to grow quickly and at odd angles, the pads are actually the stems of the plant. It is in the pads that the moisture is stored. In general, the pads range from 4 in (10 cm) to 18 in (46 cm) in length. Larger pads have been known to grow as wide as 9 in (23 cm) or more. The height of a prickly pear cactus can vary and be anywhere from less than a foot to 7 ft (2.1 m) tall.

Prickly pear cactus. *(© Chris Howes/Wild Places Photography / Alamy)*

KEY TERMS

Genus—With regard to botany, genus refers to a plant's classification. Plants within the same genus have one or more common characteristics.

Spines—These sharp needle-like protrusions serve the plant in three important ways. Not only do they conduct water and reduce water loss, but they also protect the plant from herbivores.

Like most cactus plants, the prickly pear cactus has long, sharp spines that protrude from the pads. In addition, harder-to-see tiny spines, called glochids, can be found at the base of the more predominant spines. Disguised in fuzzy-looking patches, the glochids appear harmless. However, they come off the pad easily and once they've gotten into a person's skin, they can be difficult to remove and cause irritation for days.

The pads and fruit of the prickly pear cactus are edible. The fruit can be peeled and eaten raw. However, many experts suggest that the fruit is best when it is made into candy, jelly, juice, or wine. It is also available dried or in extract form.

From early spring to summer, the cactus blossoms and sets fruit, which line the edges of the pads. Anytime thereafter, until late fall, the fruit ripens and is ready to be picked. The fruit should be harvested only when ripe and, according to Savio, "Those that are best for eating fresh ripen from September to November." Once picked, the fruit has a brief shelf life—typically under a week.

Most often, the flowers of the prickly pear cactus are red, yellow, or purple with each flower yielding one fruit. On average, the fruit grows to be about 2.5 in (7 cm) long and is cylindrical in shape. Although the fruit's flesh can be found in many different colors, such as white, green, yellow, red, or purple, most people in the United States are familiar with the reddish-purple or dark red variety; whereas in Mexico, the white-skinned varieties are most common.

In a 1998 paper presented in Santiago, Chile, at the International Symposium on Cactus Pear and Nopalitos Processing and Uses, Armida Rodriguez-Felix and Monica A. Villegas-Ochoa reported that the chemical composition of prickly pear cactus pads is not unlike most vegetables. High in **amino acids**

(building blocks of proteins and highly bioactive, generally), prickly pear cactus is said to be high in fiber, B vitamins, **magnesium**, and **iron**. Rodriguez-Felix and Villegas-Ochoa listed the following ingredients as well:

- water
- carbohydrates
- protein
- fat
- minerals
- vitamin C
- beta carotene

General use

Prickly pear cactus has been used for healing purposes and as food for centuries. Loaded with protein and vitamins, the cactus, also known as nopal, has been used to treat diabetes, stomach problems, **cuts** and **bruises**, **sunburn**, windburn, **constipation**, and cold symptoms. Folk remedies abound, such as the one that involves heating the pads and placing them on a cold sufferer's chest to relieve congestion.

In an article published in *The Hindu,* India's national newspaper, Ms. Margarita Barney de Cruz, president of the Group to Promote Education and Sustainable Development, was quoted as having said that nopal was even used in the sixteenth to eighteenth centuries for painting churches and convents. Apparently, according to Barney de Cruz, this practice originated in rural Mexico when it was discovered that prickly pear cactus could be used to make a highly effective waterproof paint for homes.

Rural residents, especially farmers, in Mexico and elsewhere have utilized the prickly pear cactus for years as an effective way to mark property lines, as well as a protective barrier against predators, both animal and human. In central Africa, the juice from the pads has long been considered an effective mosquito repellent.

An important part of the Mexican culture for centuries, prickly pear cactus is still being used there for medicinal and nutritional purposes. In *Worldwide Gourmet,* edited by Michele Serre, prickly pear cactus reportedly is one of the most important food crops collected by the native population and is widely eaten as both a fruit and vegetable. In northern Mexico, the pads are often fed to dairy cows in order to add a unique and sweet flavor to their milk. Not only is this feed inexpensive, but also the resulting dairy product is highly prized among local consumers.

Today, prickly pear cactus is still being used as a remedy for many of the same problems it was used for in the past. For example, it is still commonly used topically to treat cuts, insect **bites**, sunburn, and windburn. Over the past three decades, some interesting studies have been conducted on the healing properties of prickly pear cactus, with a primary research focus on its effectiveness in lowering blood sugar levels. Wholehealthmd.com reported that animal studies done in the 1990s indicate that extracts of the prickly pear at doses lower than traditionally used can reduce blood sugar levels. This is promising for the possible development of easy-to-use extracts that may some day be effective for use in treating diabetes in humans. With regard to the cactus pads themselves, not the extract, some interesting studies have indicated that the cooked pads do help reduce sugar levels, thereby validating traditional medicinal usage. According to the experts at wholehealthmd.com, one theory of the mechanism of blood sugar lowering is that the high fiber from the pad's gooey pectin absorbs sugar in the body, and then enables the body to very slowly release sugar through the course of the day.

Two 1988 studies, one published in *Diabetes Care* and the other in the *Archives of Investigative Medicine,* conducted by Frat-Munari and colleagues indicated that consuming 100 to 500 grams of cooked pads was beneficial in treating humans with diabetes. Results confirmed a drop of between 8 to 31% of blood glucose readings. The Frati-Munari studies involved three groups on three separate "treatments." One group took nopal, one group took a water placebo, the third took zucchini squash. The water group experienced no change in serum glucose levels, whereas a slight increase of serum glucose concentrations was measured in the zucchini squash group. Those taking nopal displayed improvements in elevated blood sugar.

In a similar study published by the *Texas Journal of Rural Health* in 1998, Keith Rayburn, M.D., and colleagues had an interestingly different outcome. In the study by Rayburn et al, although blood sugar readings also fell after consumption, the water ingestion group showed a declining glucose concentration, whereas in the studies by Frati-Munari that was not the case. Dr. Rayburn and colleagues compared their study to two studies with similar findings (one by Chen et al conducted in 1988 and another by Gannon et al conducted in 1989) and made three important assessments. One explanation for the different findings might have to do with the water control group. It may have had a declining glucose reading because its members were allowed to drink as much water as they liked, which could have had a blood-sugar-lowering effect. Secondly, although the use of nopal in folk culture is not limited to one species, Rayburn and

colleagues did point out that the nopal used in their study differed from the nopal used in the 1988 studies by Frati-Munari and colleagues. In fact, Rayburn and his colleagues specifically stated, "We cannot rule out the possibility that *O. streptacantha* might have more activity than other species." Finally, and perhaps most importantly, Rayburn and colleagues concluded, "Despite lacking an acute hypoglycemic effect in our subjects, it is possible that nopal has other important metabolic effects, such as lowering lipids or increasing insulin sensitivity, as suggested by Frati-Munari et al [in two studies published in 1991]."

In a literature review published in 2002 by the *Journal of American Pharmacists Association,* Drs. Shapiro and Gong investigated the uses of several products and conclude that based on the evidence, several natural products in common use can lower blood glucose in patients with diabetes.

Interesting research continues to be conducted to validate or discover new ways in which prickly pear cactus can be used medicinally. For example, in a 1998 study published in *Archives of Pharmaceutical Research* by Dr. E. H. Park and colleagues, it was suggested that prickly pear cactus pads could be used to reduce inflammation and help relieve stomach problems. Some evidence also exists that prickly pear cactus could be effective in reducing **cholesterol** levels, but more research needs to be conducted.

Preparations

Gloves should be worn when the pads and fruit are removed from the cactus. Even those varieties regarded as "spineless" have glochids, so beware. To avoid getting punctured by the spines, use a long, sharp knife to cut and tongs to lift the pads and fruit away from the plant. Place the cuttings in a bowl or basket with handles. Novices should continue to wear gloves until all the spines are removed. To remove the spines, simply scrape them off with a blunt knife, while holding the pad at its base. Another way to remove the spines is to burn them off by passing the pad over an open flame, but this should be done with great care and suitable utensils such as tongs with heat resistant handles. Many experts recommend cutting off the edges or peeling them entirely. Most experts agree that the young, bright green pads are the most tender and the best ones for culinary purposes.

If the pads are small, they can be sautéed in a covered pan with some olive oil and vegetables, such as mushrooms, peppers, onions, or tomatoes. The ingredients should be simmered over low heat until the pad is very tender. Some people also prefer to add ground pepper and herbs such as cilantro, basil, or **rosemary**. The nopales can also be sautéed until cooked. The pads can also be sliced thin to resemble green beans. As Savio states, "They can be eaten raw in salads, boiled and fried like eggplant, pickled with spices, or cooked with shellfish, pork, chilies, tomatoes, eggs, coriander, **garlic**, and onions." In an article published by *Wilderness Way,* Christopher Nyerges suggests that the cut slices be boiled in water, drained, and then boiled again to reduce the sliminess. The slices can then be seasoned with butter and garlic powder prior to serving them. Once dried, the peeled and sliced pads are known as leather britches, according to Nyerges. Much like string beans, the leather britches add texture and fiber to stews and soups.

Omelets containing prickly pear cactus are common in the southwestern United States. When a young cactus pad is cooked in a skillet for use in an omelet, its bright green color will change to "a dull green-almost tan-as it cooks," Nyerges explained.

An interesting suggestion regarding "the importance of a penny" can be found in the *Worldwide Gourmet*. In an article on prickly pear cactus, the reader is encouraged "to rub a **copper** penny with baking soda and lemon, heat it on the grill until it turns red, and then put it in the water used to cook the nopal. This allows the water to reach its boiling point more quickly and also neutralizes the viscous substance found in the cactus."

Often tasting similar to watermelon, the fruit can be eaten raw and is delicious chilled. It is filled with little seeds, which account for its grainy texture. The seeds are edible, too, but some people prefer to remove them. In the Native American culture, it is customary to dry and grind the seeds for later use in flour.

According to Nyerges, making juice is simple. Just "press the peeled fruit through a colander to remove the seeds and add an equal amount of water to the sweet, pulpy mass." When chilled, it's a refreshing summer beverage.

For soft, shiny hair, cut a peeled cactus pad into10 small pieces. Put them in a blender with two cups of water. Turn the blender on low for a few seconds, just enough to get the cactus juices into the water but not so long that the mixture turns to mush. Then strain the pieces out, leaving only the juicy water. The juicy water can then be used as a hair massage, which should be thoroughly rinsed out after one minute. If the mixture is allowed to thicken, it can still be used, although it will take more time to rinse out.

For minor cuts, the juice from the pads has been used traditionally much like **aloe** vera. Savio suggests to "simply cut off a portion of a [peeled] pad, crush it,

and squeeze the juice into the cut; the sap will soothe the wound." When an equal measure of prickly pear cactus and water are mixed, the juice can be somewhat jelly-like, making it an ideal salve for windburn.

Recommended dosages vary, but most experts agree that eating 100 to 500 grams of the prickly pear cactus daily is reasonable, provided that there are no contraindications for doing so. For those that prefer juice, 2 to 4 ounces a day are suggested. If in doubt, consult with a physician or registered dietician for an individual assessment.

Precautions

Even Opuntia cacti, regarded as spineless, have glochids, so beware.

Consuming prickly pear cactus is not recommended while pregnant or breast-feeding. In addition, it has not been established whether it is safe for young children or anyone with severe liver or kidney disease to consume nopal.

In general, prickly pear cactus is considered safe in food form, which has been consumed for centuries by native peoples. However, less is known about the extract form, which should be taken only after consulting a physician.

People taking drugs for diabetes should not consume nopal without first consulting with a physician, since insulin or diabetes medication dosage may be affected.

Because water causes dried nopal to swell, oral doses of dried nopal should be taken with at least 8 ounces of water to avoid potentially dangerous blockages of the esophagus or intestines.

Side effects

Adverse side effects such as mild bloating, **diarrhea**, **headache**, and **nausea** have been reported after consuming nopal.

The experts at wholehealthmd.com caution that it is possible to be allergic to prickly pear cactus, although it isn't common. Signs of an allergic reaction are those typically associated with other food **allergies**. They include skin rash, **hives**, swelling, chest **pain**, breathing problems such as tightness in the chest or throat, and digestive symptoms such as diarrhea or constipation. If any of these reactions occur, one should contact a physician immediately.

Although rare, **contact dermatitis** has been reported from touching the nopal plant or applying it to broken skin. People with sensitive skin should consult a physician before using nopal as a topical ointment. More common is skin irritation caused by coming in contact with the plant's spines during the collection and cleaning process, which is why gloves should be worn, especially during the collection process.

Interactions

Because some studies have shown that consuming nopal may cause lower blood sugar by increasing the body's ability to absorb insulin, people taking drugs for diabetes, such as Actos, Avandia, Glyset, and Prandin, to name a few, should consult with their physician before adding nopal to their **diets**.

In order to avoid **hypoglycemia**, which is blood sugar that is too low, nopal should not be used in conjunction with other blood sugar medication and herbs such as **bitter melon**, **chromium**, **kudzu**, panax ginseng, or high amounts of **ginger** without the guidance of a health professional. Symptoms of hypoglycemia include shakiness, confusion, distorted speech, and loss of muscle control. Hypoglycemia is potentially an emergency and even deadly problem, and requires immediate intervention (offering fruit juice or professional health care management).

In theory, because dried nopal becomes gel-like when combined with water, taking it within two hours of other medications (or even after meals) could alter the way food and medications are absorbed in the body. Always consult with a physician or pharmacist before adding dried nopal (or any form of nopal) to your health care regime. Be sure to make a complete list of any other herbal product being taken, as well as any prescribed or over-the-counter medicine, so that an informed decision can be made.

Resources

PERIODICALS

Chen, Y. D., C. Y. Jeng, C. B. Hollenbeck, M. S. Wu, and G. M. Reaven. "Relationship between plasma glucose and insulin concentration, glucose production, and glucose disposal in normal subjects and patients with non insulin dependent diabetes." *Journal of Clinical Investigation*. (1988): 21 25.

Frati Munari, A. C., B. E. Gordillo, P. Altamirano, and C. R. Ariza. "Hypoglycemic effects of *Opuntia strepta cantha* Lemaire in NIDDM." *Diabetes Care*. (1988): 63 66.

Frati Munari, A. C., J. L. Q. Lazaro, P. Altamirano Busta mante, M. Banales Ham, S. Islas Andrade, and C. R. Ariza Andraca. "The effect of different doses of prickly pear cactus (*Opuntia streptacantha* Lemaire) on the glucose tolerance test in healthy individuals." *Archives of Investigative Medicine*. (1988): 143 148.

Frati Munari, A. C., B. E. Gordillo, P. Altamirano, C. R. Ariza, R. Cortes Franco, A. Chavez Negrete, and S. Islas Andrade. "Influence of nopal intake upon fasting glycemia in type 2 diabetics and healthy subjects." *Archives of Investigative Medicine*. (1991): 51 56.

Frati Munari, A. C., N. X. Diaz, P. Altamirano, C.R. Ariza, and R. Lopez Ledesma. "The effect of two sequential doses of *Opuntia streptacantha* upon glycemia." *Archives of Investigative Medicine* (1991): 431 436.

Gannon, M. C., F. Q. Nuttall, S. A. Neil, and E. R. Sea quest. "Effects of dose ingested glucose on serum metabolite and hormone responses in type 2 diabetic subjects." *Diabetes Care* (1989): 544 552.

Park, E. H., J. H. Kahng, E. A. Paek. "Studies on the pharmacological action of cactus: identification of its anti inflammatory effect." *Archives of Pharmaceutical Research*. (1998): 30 34.

Rayburn, K., R. Martinez, M. Escobedo, F. Wright, and M. Farias. "Glycemic effects of various species of nopal (*Opuntia sp.*) in type 2 diabetes mellitus." *Texas Journal of Rural Health*. (1998): 68 74.

Shapiro, K., and W. C. Gong. "Natural products used for diabetes." *Journal of American Pharmacists Associa tion*. (2002): 217 226.

OTHER

Nyerges, C. "Prickly pear cactus." *Wilderness Way* [cited June 14, 2004]. http://www.wwmag.net/pricklycactus.htm.

"Prickly pear." Wholehealthmd.com [cited June 14, 2004]. http://www.wholehealthmd.com.

"Prickly pear and barbary fig." *The Worldwide Gourmet* [cited June 14, 2004]. http://gourmet.sympatico.ca/vegetables/south/nopal.htm.

"Prickly pear cactus crop with multiple uses." *The Hindu* [cited June 14, 2004]. http://www.hindu.com.

Rodriguez Felix, A., and M. A. Villegas Ochoa. "Post harvest handling of cactus leaves (nopalitos)." Paper presented at the *International Symposium of Cactus Pear and Nopalitos Processing and Uses*. Santiago, Chile (September 24 26, 1998).

Savio, Yvonne. *Prickly pear cactus*. Brochure. Small Farm Center, University of California. July 1989 [cited June 14, 2004]. http://www.sfc.ucdavis.edu/pubs/brochures/pricklypear.html.

Lee Ann Paradise

Prince's pine

Description

Prince's pine, the evergreen shrub *Chimaphila umbellate,* is closely related to the wintergreens and is sometimes confused with striped **wintergreen** (*C. maculata*). Other names for prince's pine are pipsissewa (the most common alternate name), king's curse, ground holly, love in winter, rheumatism weed, butter weed, winter green, and pyrola umbellata.

Prince's pine grows in deep or moderate shade and requires moist, well-drained soil. It is most often found growing under conifers (pines, firs) and along mountain streams to an altitude of about 7,700 ft (2,500 m). The plant is widely distributed in the northern hemisphere and can be found in northern Europe, Siberia, Canada, Alaska, and across most of the continental United States, except for a region stretching from Florida to Texas and north through Nebraska. Prince's pine is on the endangered species list in the state of Illinois, is a threatened species in Iowa and Ohio, and is listed as vulnerable in New York. In Germany it is a protected species.

Prince's pine grows slowly, reaching a mature height of 8–10 inches (10–25 cm). The leaves, shiny dark green on top and lighter green underneath, are 2 to 3 inches (5–8 cm) long and about .5 inches (1.2 cm) wide and tapered at both ends. The leaves remain green all year. Scented light purple to cream-colored flowers develop in July and August. The leaves are used in healing. In some cultures, the yellow rhizome (root-like part) is also ground and used medicinally.

General use

Prince's pine is used as a food additive as well as a healing herb. An extract of the leaves is used to flavor root beer and candy. In Mexico, prince's pine is used to flavor an alcoholic drink made from fermented sprouted corn. The plant is also used in the perfume industry because of its pleasant scent.

Prince's pine is thought to have diuretic, astringent, antibacterial, and tonic properties. A chemical analysis of the herb shows that, among other compounds, it contains hydroquinones, which are known to have antibacterial actions, and tannins, which are known astringents.

Historically, many different Native American tribes used prince's pine to treat urinary problems and to regulate **menstruation**. The herb was also used to induce sweating and treat fevers. Some Native American tribes made a tea of the ground rhizome and used it for treating **tuberculosis** and other lung **infections**. Other traditional uses are treatment of **gonorrhea** (a sexually transmitted disease), stomach **cancer**, and rheumatism. Externally the leaves were used to treat skin diseases.

Modern herbalists mainly use prince's pine to treat urinary tract infections and as a general tonic. Prince's pine is thought to have many of the same actions as uva-ursi (*Acrtostaphylos uva-ursi*), although less intense. In 1999, a United States patent was filed

for an herbal treatment for **chronic fatigue syndrome** that has prince's pine as one of its four ingredients. Prince's pine, under the name pipsissewa, was included in the *United States Pharmacopoeia* from 1820 to 1916.

Prince's pine is also used in homeopathic medicine. Homeopathic medicine operates on the principle that "like heals like," which means that a disease can be cured by treating the person with substances that produce the same symptoms as the disease, while also working in conjunction with the homeopathic law of infinitesimals. In opposition to traditional medicine, the law of infinitesimals states that the *lower* a dose of curative, the more effective it is. To achieve a low dose, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid. In homeopathic medicine, prince's pine is used to treat disorders of the urinary tract, female reproductive system, and male prostate.

Preparations

The leaves of prince's pine are usually harvested from wild-growing plants in the summer when the plant is in flower. They are dried for future use but lose much of their fragrance when dried. Leaves are crushed or ground and prepared as a decoction, fluid extract, or syrup. Dosage varies depending on the preparation and condition being treated. Fresh leaves are often crushed and put directly on the skin to treat skin diseases, although an extract of prince's pine can also be used externally.

Precautions

No studies have been done on the safety of prince's pine, so pregnant and breastfeeding women would do well to avoid using this herb.

Side effects

No side effects from the internal use of prince's pine have been reported. Given that this herb is also used as a food additive, it is highly likely to be safe when used internally in moderate quantities. Fresh leaves placed directly on the skin can cause **blisters** in some sensitive individuals.

Interactions

No studies have been done on interactions between prince's pine and other herbs or traditional pharmaceuticals. Individuals who regularly take dietary supplements, herbs, or pharmaceutical drugs should discuss the use of prince's pine with their healthcare provider before beginning treatment.

KEY TERMS

Astringent—A substance that reduces secretions, dries and shrinks tissue, and helps control bleeding.

Decoction—A preparation made by boiling an herb, then straining the solid material out. The liquid is then taken internally as a drink.

Diuretic—A substance that removes water from the body by increasing urine production.

Resources

BOOKS

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

PERIODICALS

Moerman, D.E "An Analysis of the Food Plants and Drug Plants of Native North America." *Journal of Ethno rharmacology* 52 (1996): 1 22.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, 425 967 0737, http://www.holisticmedicine.org.

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://homeopathyusa.org.

Tish Davidson, A. M.

Pritikin diet

Definition

The Pritikin diet is a heart-healthy high-carbohydrate, low-fat, moderate-exercise lifestyle diet developed in the 1960s. It promotes eating whole grains, vegetables, and fruit instead of animal protein, eggs, processed grains, and sugar.

Origins

Nathan Pritikin, the originator of the Pritikin Diet, was diagnosed with **heart disease** at the age of 42. In the late 1950s when Pritikin was diagnosed,

about 40% of calories in the average American diet came from fats. Pritikin was given little medical guidance on how lifestyle changes might slow his heart disease. Although educated as an engineer, Pritikin worked to devise his own heart-healthy diet. He spent the next 20 years researching diet and **nutrition**, experimenting with a variety of **diets**, such as eating only meats or only lentils. He recorded the information and his reactions to the various diets along with blood and other medical tests. He finally concluded that a program combining moderate **exercise** with a diet low in fat and high in fiber was most beneficial, and credits it with reversing his own heart disease. Based on his experience, he opened the Pritikin Longevity Center in Florida in 1975. Here people could come and immerse themselves for one or more weeks in the Pritikin Eating Plan.

In 1976, he opened the Pritikin Longevity Center in Santa Barbara, California, which moved a few years later to Santa Monica, California. Pritikin detailed his program of diet and exercise in his 1979 book, *The Pritikin Program for Diet and Exercise*, which quickly became a bestseller. He and his son, Robert Pritikin, have published eight additional books on diet and exercise. Robert Pritikin took over management of the longevity center following the death of his father in 1985.

Pritikin's diet came to national attention when Pritikin and Florida cardiologist David Lehr appeared in the CBS program "60 Minutes" in 1977. The Pritikin Diet soon became the most popular diet of the 1970s. The Pritikin Program took on new credibility in 1984 when the National Institutes of Health published its landmark lipid study that said lowering **cholesterol** reduced the risk of heart disease. Since that time, many research studies have been done to evaluate the effectiveness of the Pritikin Plan, the results of which have been published in mainstream, refereed medical journals. More than 75,000 people have experience the Plan at what is now the upscale Pritikin Longevity Center & Spa at the Turnberry Isle Yacht Club in Aventura, Florida. Millions of others have bought Pritikin's books and tried the Plan.

Benefits

The consensus among health professionals is that a diet low in fat and high in fiber can help prevent a wide range of medical problems. It also provides significant health benefits to people who already have many different health conditions. Additionally, it can also be effective in weight loss and ideal weight maintenance.

Pritikin Diet emphasizes the following specific health benefits:

- lowered total cholesterol and LDL or "bad" cholesterol
- lowered blood pressure, so that people with high blood pressure may no longer need pressure-lowering drugs
- better control of insulin levels, so that people with type 2 diabetes can often control their disease through diet and without drugs
- decrease in the circulating levels of compounds that increases the risk of heart disease and blood vessel damage
- a substantially reduced risk of heart disease, hypertension, type 2 diabetes, and breast, colon, and prostate cancers.
- lifetime freedom from obesity and all of its associated health risks and lifestyle-limiting conditions

Description

The Pritikin diet is basically the opposite of another popular program, the **Atkins diet**. While the Atkins regimen is high in fat and protein and low in carbohydrates, the Pritikin program is low in fat and protein and high in whole-grain natural complex carbohydrates. Pritikin believed the reason a large number of Americans are overweight is because they do not eat enough complex carbohydrates, such as whole-grain corn, rice, and wheat.

The Pritikin diet is based on a wide variety of foods, including fruits, vegetables, beans, and low-fat dairy products. There are four levels to the Pritikin diet, each based on calories. Individuals pick the level they want based on how overweight they are, how much weight they want to lose, and how quickly they want to. In his book, "The Pritikin Permanent Weight-Loss Manual," Pritikin lists two weeks of sample menus for each level. The book also contains information on a free-form version of the diet, in which the dieter selects any food that has low calorie density.

The Pritikin Plan is based on eating a particular number of servings of each group of foods as follows:

- at least five 1/2-cup servings of whole grains such as wheat, oats, and brown rice or starchy vegetables such as potatoes, and dried beans and peas. Refined grain products (white flour, regular pasta, white rice) are limited to two servings daily, with complete elimination of refined grain products considered optimal.
- at least four 1-cup servings of raw vegetables or 1/2-cup servings of cooked vegetables. Dark green, leafy, and orange or yellow vegetables are preferred.

- at least three servings of fruit, one of which can be fruit juice.
- two servings of calcium-rich foods such as nonfat milk, nonfat yogurt or fortified and enriched soymilk.
- no more than one 3.5 ounce cooked serving of animal protein. Fish and shellfish are preferred. Lean poultry should optimally be limited to once a week and lean beef to once a month. This diet is easily adapted to vegetarians by replacing animal protein with protein from soy products, beans, or lentils.
- no more than one caffeinated drink daily. Instead drink water, low-sodium vegetable juices, grain-based coffee substitutes (e.g. Postum) or caffeine-free teas.
- no more than four alcoholic drinks per week for women and no more than seven for men, with red wine preferred over beer or distilled spirits.
- no more than seven egg whites per week
- no more than 2 ounces (about 1/4 cup) of nuts daily

Other foods such as unsaturated oils, refined sweeteners (e.g. concentrated fruit juice, corn syrup), high-sodium condiments (e.g. soy sauce), and artificial sweeteners (e.g. Splenda) are "caution" foods. They are not recommended, but if they are used, the Plan gives guidance in how to limit them to reasonable amounts. Animal fats, processed meat, dairy products not made with non-fat milk, egg yolks, salty snacks, cakes, cookies, fried foods and similar high-calorie choices are forbidden.

An important component of the Pritikin program is exercise. Pritikin encourages many types of exercise routines, but aerobic exercises like walking, jogging, swimming, and indoor machines that simulate these activities are recommended for optimum weight loss. The suggested routine should include 5-10 minutes of warm-up, 20-30 minutes of workout, and 5-10 minutes of cool-down.

Unlike the Atkins diet, the Pritikin program can be easily followed by vegetarians, including vegans.

Preparations

No advance preparation is required for the diet.

Precautions

As with any diet, overweight individuals and those with serious medical conditions such as heart disease or diabetes who are contemplating the Pritikin diet should first check with their doctor or health care practitioner. Individuals taking certain prescription drugs may find the need for these drugs will decrease and should be monitored by their physician during and following the weight loss period.

Side effects

The Pritikin diet is not believed to cause any adverse side effects.

Research and general acceptance

Unlike many diets, the Pritikin Plan has the respect of much of the medical community and has a thirty-year history of delivering on most of its health promises. Supporters of the diet point to many studies done by both Longevity Center doctors and outside investigators and published in highly respected journals such as the *Journal of the American Medical Association* and the *New England Journal of Medicine*. People do lose weight and keep it off, along with decreasing the risk of heart disease when following the plan.

Dietitians and nutritionists also like the fact that the diet teaches people how to eat well using ordinary foods rather than special pre-packaged foods. This keeps the cost of following the Plan low, especially since the Plan calls for dieters to eat only small quantities of meat. In addition, the Plan is designed to provide a balance of vitamins and minerals from food and does not rely on dietary supplements.

The biggest criticism of the Pritikin Plan is that it requires rigorous self-discipline to stay on for a lifetime. People who do well on the Pritikin Plan tend to be highly motivated and zealous about following the diet. Many healthcare professionals feel long-term success for most people is more likely to occur if the dieter follows a well-balanced but less rigorous diet.

Some nutritionists also take issue with whether the low fat component of the diet allows people to get enough beneficial fats such as **omega-3 fatty acids** and whether absorption of the fat-soluble vitamins A, D, E, and K is impaired. To date these criticisms have not been supported by research findings. However, critics were handed more ammunition by a long-term study of 49,000 American women ages 50–79 that found that a low-fat diet had no effect on the risk of developing heart disease or **cancer**. The study was published in February 2006 in the *Journal of the American Medical Association*. The findings are controversial, and go against much current medical thinking. This study will certainly stimulate additional research on low-fat diets.

Training and certification

The diet can be followed by nearly anyone and requires no special training or certification.

KEY TERMS

Carbohydrates—Neutral compounds of carbon, hydrogen, and oxygen found in sugar, starches, and cellulose.

Cholesterol—A steroid alcohol found in human cells and body fluids, implicated in the onset of heart disease.

Complex carbohydrates—A type of carbohydrate found mostly in green plants and vegetables.

Crohn's disease—A disease of the colon, characterized by diarrhea, cramps, and loss of appetite and weight.

Triglycerides— A blood fat lipid that increases the risk for heart disease.

Vegan—A strict vegetarian diet that does not allow meat or dairy products.

Resources

BOOKS

Pritikin, Nathan. *The Pritikin Permanent Weight Loss Manual*. New York: Grosset & Dunlap. 1981.

Pritikin, Nathan. *Pritikin Program for Diet and Exercise*. New York: Bantam Books. 1987.

Pritikin, Robert. *The Pritikin Principle: The Calorie Density Solution*. New York: Time Life. 2000.

Pritikin, Robert. *The New Pritikin Program: The Easy and Delicious Way to Shed Fat, Lower Your Cholesterol, and Stay Fit*. New York: Pocket Books. 1991.

Pritikin, Robert. *The Pritikin Weight Loss Breakthrough: Five Easy Steps to Outsmart Your Fat Instinct*. New York: Signet. 1999.

Scales, Mary Josephine. *Diets in a Nutshell: A Definitive Guide on Diets from A to Z*. Clifton, VA: Apex Pub lishers, 2005.

PERIODICALS

Pritikin, Robert. "Go Out and Eat Thin! 32 Slimming Tricks from the Newest Pritikin Diet Program." *Redbook* (Jan. 1990): 74.

ORGANIZATIONS

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, Illinois, 60606 6995, (800) 877 1600, http://www.eatright.org.

The Pritikin Longevity Center, 19735 Turnberry Way, Aventura, FL, 33180, (305) 935 7131, (800) 327 4914, (305) 935 7371, http://www.pritikin.com.

Ken R. Wells

Proanthocyanidin *see* **Grape seed extract**

Probiotics

Definition

Probiotics, as defined by the Food and Agricultural Organization of the United Nations (FAO), are "live microorganisms administered in adequate amounts which confer a beneficial health effect on the host." The microorganisms referred to in this definition are non-pathogenic bacteria (small, single celled organisms which do not promote or cause disease), and one yeast, *Saccharomyces*. They are considered "friendly germs," due to benefits to the colon and the immune system. The word probiotic is a compound of a Latin and a Greek word; it means "favorable to life." Probiotics is also sometimes used to refer to a form of nutritional therapy based on eating probiotic foods and dietary supplements. Although probiotic supplements have also been used with farm animals, most are produced for human consumption in the form of dairy products containing two types of microbes—lactobacilli and bifidobacteria. As with the extended use of **royal jelly**, probiotics are now also being used in face creams and similar cosmetic products.

A new category called prebiotics now also appears in the literature. Prebiotics refer mainly to certain foods, and occasionally to certain food products, that support probiotic microorganism viability, enhancing their survivability. Included among prebiotics are foods such as Jerusalem and regular artichokes, oats, leeks, onions and whole grain breads or cereals. Examples of prebiotic food products are the **Fructooligosaccharides** (fructo-oligo-saccharides, or fruit derived, digestion resistant sugars) (FOS), also in honey, and the galactooligosaccharides (galacto-oligo-saccharides), sugars in galactose-containing foods like goats milk.

Origins

Although the term probiotics is relatively recent, as are science-based investigations, the use of probiotic-containing fermented foods in many cultures of the world predates the advent of refrigeration. The applied notion of improving health by supplementing the natural microflora of the human intestines with additional bacteria taken by mouth goes back to the late nineteenth century. At that time, some physicians attributed sickness and the **aging** process to a build up of waste products (or, putrefaction) in the colon (the lower part of the large intestine that empties into the rectum), and toxic materials leaking from the colon into the bloodstream. The process of leakage—

now referred to as gut permeability or leaky gut syndrome— and the poisoning that resulted from it, were called autointoxication. The autointoxication theory assumed that dietary changes aimed at reducing toxic decomposition in the colon would be beneficial to health. Some observers knew about the use of lactic acid bacteria in sausage-making to ferment the meat and protect it from spoilage. Because these bacteria are harmless to humans, it was thought that adding them to the diet by eating fermented foods would reduce the amount of toxins produced in the colon. The Lactobacilli group of bacteria, some of which are found in yogurt, was the first identified probiotic. In the 1920s and 1930s, many doctors recommended **acidophilus** milk, which contains the lactobaccili bacterium called *Lactobacillus acidophilus,* for the treatment of **constipation** and **diarrhea**. This treatment was effective for many patients.

The next phase in the development of probiotics came in the 1950s, when medical researchers began to study *L. acidophilus* as a possible answer to some of the digestive side effects of taking antibiotics. It was known that antibiotic medications upset the natural balance of the intestinal microflora by killing of the beneficial as well as the pathogenic bacteria. The researchers thought that taking oral preparations of *L. acidophilus* might offset the side effects of the antibiotics.

One of the chief difficulties in benefiting from probiotic supplementation has been assuring survivability of the bacteria as it passes through the acidity of the stomach and the digestive processes of the small intestine and successfully colonizing in the colon. Recently, a new probiotic with exceptional survivability and colonization characteristics, as demonstrated in studies, has emerged. This probiotic, screened from many **strains** of lactobacilli and named after its co-discoverers, Sherwood Gorbach and Barry Goldin, is known as Lactobacillus GG (LGG). LGG was demonstrated effective against psuedomembranous **colitis**, an infection of the colon by *Clostridium difficile* as a result of antibiotic overkill of beneficial bacteria, and against atopic **eczema** in children due to gut permeability. LGG was demonstrated to have positive results against Candida in mice, as well. Three patents have been awarded on LGG from June 1989 to May 1995. In 1987, a Finnish dairy cooperative, Valio, Ltd., was granted a license to conduct research. About 1992, Valio released a fermented milk product with LGG called Gefilus. In 1996, a division of an American corporation was formed, called CAG Functional Foods, which markets LGG as the product Culturelle. One source reported significant benefit from the use of Culturelle when cultured in milk. Culturelle is currently available only in capsules, but a yogurt product is anticipated to be marketed soon.

Much of the research and marketing of proven probiotics is conducted outside the United States. One such research proven probiotic strain is Lactobacillus plantarum 299v. It has been particularly valuable in **irritable bowel syndrome** (IBS) and recovery from surgery. Its colonization ability was proven using biopsy.

Two proven beneficial strains marketed in the United States are *Lactobacillus reuteri,* a Swedish product proven effective against diarrhea in children due to a rotavirus (a virus transmitted from feces), available in the Stoneyfield brand of yogurt, and *Saccharomyces boulardii*, a yeast product available in capsules effective against antibiotic associated diarrhea.

Benefits

Probiotic foods and dietary supplements have been recommended as treatments for a variety of diseases and disorders, ranging from problems confined to the digestive tract to general health issues.

Intestinal complaints

To summarize, probiotic organisms, in particular the LGG strain, have been shown to be helpful in managing the following intestinal disorders:

- Pseudomembranous colitis, a potentially life-threatening inflammation of the colon caused by an overgrowth of the bacterium *Clostridium difficile* as a result of the patient's having taken antibiotics that causes profuse watery diarrhea, cramps, and low-grade fever.
- so-called "traveler's diarrhea"
- acute nonbacterial diarrhea
- rotaviral diarrhea
- irritable bowel syndrome (IBS)
- bacterial overgrowth in the small bowel by organisms such as Helicobacter pylori, implicated in gastric ulcers (studies have demonstrated benefit but not cure)

Lifestyle-related disorders

Some supporters of probiotics go beyond applications limited to treatment of intestinal disorders. In keeping with the theory of autointoxication, they maintain that probiotics are effective in treating a wide range of chronic and acute illnesses thought to result from a condition called intestinal dysbiosis, or

poor intestinal health quality due to toxic buildup, putrefaction, and leaky gut syndrome. Intestinal dysbiosis is defined as an imbalance among the various microorganisms in the digestive tract. This imbalance is attributed to a combination of Western high-protein **diets**, **stress**, environmental pollution, and allopathic medications. Putrefaction is believed to result from a low fiber diet, chronic constipation or sluggish colon, and poor food combining leading to increased gut fermentation. Leaky gut syndrome is the term used to suggest that the effect of these toxins on the intestinal cell walls is damaging to intestinal integrity, and as a result, large molecules of relatively undigested food and toxins cross the intestinal membrane into the blood stream.

Some alternative practitioners maintain that the following diseases and disorders are directly related to intestinal dysbiosis or may also be beneficially treated with probiotics:

- mental health problems
- chronic fatigue syndrome
- muscular soreness and stiffness
- autoimmune disorders, including lupus, rheumatoid arthritis, ankylosing spondylitis, enteric arthritis, and Reiter's syndrome (by immune stimulation and repair of the leaking gut)
- lactose intolerance (by increasing the presence of lactase)
- infectious diseases
- high blood pressure (research has demonstrated a systolic blood pressure decrease of 10–20 mm Hg with the use of a fermented milk product
- high cholesterol (clinical studies have not been conclusive; as one source said, "evidence is not overwhelming")
- cancer (by decreasing exposure from gene altering substances)
- menopausal problems in women (by improving the liver's ability to detoxify and eliminate hormonal metabolites)
- vaginosis (once thought to be relatively benign, now implicated in easier transmission of sexual diseases, pelvic inflammatory disease, and pregnancy-related complications, improved by reducing vaginal pH which inhibits growth of unfavorable bacteria)
- allergies and asthma (a double-blind placebo-controlled study demonstrated a 50% drop in children followed up to two years of age)
- kidney stones, by inhibiting the absorption of oxalate from the intestines

More specifically, probiotic foods and dietary supplements are claimed to counteract intestinal dysbiosis in the following ways:

- production of vitamins. Friendly bacteria are said to manufacture vitamin B_3, vitamin B_6, and folic acid.
- anti-tumor and anti-cancer activity
- suppression of pathogenic microorganisms in favor of the non-pathogenic
- relief of anxiety symptoms through indirect detoxification
- protection against radiation and other environmental toxins
- support of the immune system, by reducing immune load
- recirculation of female hormones in the bloodstream by a cleaner liver and cleaner blood, thus maintaining higher levels of estrogen in menopausal women
- maintenance of smooth bowel functioning

Description

Products

Probiotics is a nutrition-based therapy and relies primarily on the addition of foods or supplements containing friendly bacteria to the diet. Some recommended foods are ordinary grocery store items that involve fermentation in their production; these include miso, pickles, sauerkraut and fermented dairy products such as yogurt and kefir. As mentioned, other food or food products called prebiotics, such as Jerusalem artichokes and FOS, are thought to support the growth of the beneficial bacteria in the intestines. Most users and recommenders of probiotics, however, encourage the use of loose powdered, refrigerated dietary supplements of friendly bacteria or LGG capsules. Some of these products are milk-based, while others are milk-free. Probiotic dietary supplements are over-the-counter (OTC) preparations that can be easily purchased at grocery or health food stores, or from European manufacturers over the Internet. The types of bacteria most often recommended are *Lactobacillus GG*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, and, especially for children *Bifidobacterium bifidum*. Breast milk is reported to contain nutrients that support bifidobacterium growth.

Dosage and administration

Some practitioners distinguish between a therapeutic dose of probiotic products, which is given for 10 days, and a maintenance dose, which is used afterward. One source gives 2–5 level tsp (5–10 g) of powdered supplement as the daily therapeutic dose if the patient is taking *L. acidophilus* or *B. bifidum*, 1–3 tsp

(3–6 g) if the patient is using *L. bulgaricus*. The maintenance dose of *L. acidophilus* is given as 0.5 tsp (1 g) daily; of *B. bifidum*, 2 tsp (4 g) daily; of *L. bulgaricus*, 0.5 tsp (1 g) with each meal. The recommended dose of LGG capsules is once daily. A dose two or three times daily may also be used initially to overcome acute symptoms.

Patients are advised to take these supplements with spring water, but not with juice or broth. These fluids are thought to stimulate the secretion of stomach acids that will destroy the friendly bacteria.

Preparation

The fact that probiotic products include some ordinary dairy and grocery items means that most people who use them do not think of them as medications and see no need to consult a health professional. Persons who are taking prescription medications and persons with compromised immune status, however, are advised to consult their doctors before using probiotic dietary supplements. These products often influence the bulk and frequency of bowel movements, thus increasing the elimination rate of some medications and necessitating a dose adjustment.

Some practitioners of nutritional therapies recommend cleansing the lower digestive tract with an enema or colonic treatment before beginning a course of probiotic supplements. Conversely, use of probiotics may be particularly recommended following colonic therapy as it is following antibiotic therapy.

Precautions

Although the bacteria in probiotic supplements are human-friendly, some persons may have food **allergies** or a digestive tract that is sensitive to miso, other fermented foods, or the milk powder that may be in some products. Vegetarians or persons who cannot digest milk-based products may prefer probiotic supplements with a rice base.

Product reliability is a concern because probiotic dietary supplements are not regulated by the Food and Drug Administration (FDA) and because study after study demonstrates the difficulty of maintaining a live probiotic culture, in or out of the body. One study of the microorganisms in 25 dairy products and 30 powdered products found that more than one third of these products contained no living microorganisms, and only 13% of the products contained all of the bacteria types listed on the label. One practitioner suggests the following guidelines for evaluating the effectiveness of probiotic products:

- Number of viable organisms. A number lower than 1 billion organisms per gram is considered inadequate for a therapeutic dosage.
- Type of organism. Single-strain products are considered more useful than multi-strain products on the grounds that the different bacteria in multi-strain products may compete with each other.
- Processing method. Products that have been put through a centrifuge or ultra-filtration system are thought to have fewer viable bacteria.
- Additives. Products that do not have hormones or other chemicals added to stimulate the growth of the bacteria are considered more effective.
- Form. Powdered supplements are considered preferable to liquids. Encapsulated powders are second-best, except in the case of LGG capsules.
- Storage. Probiotic products that are not refrigerated are thought to lose much of their effectiveness.

Side effects

The side effects of treatment with probiotics may include a condition called excessive drainage syndrome, which includes **headache**, diarrhea, bloating, or constipation. Another commonly reported side effect is intestinal **gas**. These side effects are attributed to the cleansing of toxins from the body and may last for some days. Practitioners recommend lowering the supplement dosage to reduce the side effects, or pretreating with colonic therapy, or stool softeners and fiber as tolerated or advised by a healthcare professional.

Research and general acceptance

More studies of probiotics have been done in Europe than in the United States, which is reflected in the fact that the leading manufacturers of probiotic supplements are presently based in Europe. Some mainstream researchers in Europe as well as in the United States are skeptical of some of the claims made for probiotics. Their reasons include the following considerations:

- The studies done in support of probiotics are mostly anecdotal or heavily reliant on test-tube experimentation rather than on clinical trials in human subjects. As of 2000, relatively few strains of probiotic bacteria have been shown to have clinical value. These strains are helpful in treating milk allergy and irritable bowel syndrome in humans, and in improving resistance to a yeast called *Candida* in immunocompromised mice.
- The basic concept of probiotics is based on a misunderstanding of the role of microflora in the human digestive tract.

KEY TERMS

Autointoxication—Self-poisoning by toxic products formed within the body during intestinal digestion. This term was coined around 1885 as part of a theory that regarded intestinal function as a central aspect of health.

Colon—The part of the large intestine that lies between the cecum and the rectum, and is divided by name into three parts, the ascending, transverse and descending colon. In a healthy person, the ascending colon rises upward intra-abdominally from above the right leg toward the right hip, the transverse colon crosses over to the left hip, and the descending colon segment joins the rectum intra-abdominally, near the top of the left leg. An unhealthy colon may droop, drape, or twist, and be enlarged or otherwise irregularly shaped.

Intestinal dysbiosis—An imbalance among the various microorganisms that live in the digestive tract.

Intestinal microflora—The bacteria and other microorganisms that live in the human gastrointestinal tract.

Miso—A fermented paste made from soybeans, salt, and rice or barley, used to flavor soups and sauces in Oriental cooking.

Pseudomembranous colitis—A potentially life-threatening inflammation of the colon, caused by a toxin released by the Clostridium difficile bacterium that multiplies rapidly following antibiotic treatment.

Traveler's diarrhea—Diarrhea caused by ingesting local bacteria to which one's digestive system has not yet adapted.

- It is difficult to see how bacteria taken by mouth can survive the process of human digestion. At present, only two species of lactobacilli, *L. GG* and *L. plantarum 299v*, have been shown to be able to colonize the human gut.
- Supporters of probiotics emphasize two types of bacteria, the lactobacilli and the bifidobacteria, and virtually ignore the hundreds of other species that live in the intestines.

More clinical studies examining the effects of probiotics on specific conditions are being conducted. One such study in the making will examine the effect of probiotics on hepatic steatosis, or fatty degeneration of the liver. An inclusion criteria was biopsy diagnosis of non-alcoholic fatty liver disease. The study is expected to be completed in October 2004.

Training and certification

As of 2000, there are no training or certification programs specifically for probiotics. Most practitioners who recommend probiotics have been trained as nutritionists or naturopathic physicians.

Resources

BOOKS

Chaitow, Leon, ND, and Natasha Trenev. *Probiotics*. Northampton, UK: Thorsons, 1990.

ORGANIZATIONS

American Academy of Alternative Medicine (AAAM). 16126 E. Warren, Box 24224. Detroit, MI 48224 0224. (313) 882 0641. Fax: (313) 882 0972.

Ontario College of Naturopathic Medicine. 60 Berl Avenue. Toronto, Ontario M8Y3C7.

OTHER

Bryan, Mike. "Probiotics and Prebiotics." 1997 2004. [cited June 4, 2004]. http://www.medicinalfoodnews.com/vol02/issue7/biotic.htm.

Clarke, Jane. "Bacteria." [cited June 4, 2004]. http://www.bbc.co.uk/cgi bin/education.

"Frequently Asked Questions: Probiotics, New Zealand." 2001 [cited June 4, 2004]. http://www.probiotics.co.nz/faqsAnswrNtrn.sap?id 5.

"History of Probiotic Research." June 27, 2001 [cited June 4, 2004]. http://www.phototour.minneapolis.mn.us/candida/history.html.

"Lactobacillus GG (LGG)." July 16, 2001 [cited June 4, 2004]. http://www.phototour.minneapolis.mn.us/candida/lgg.html.

"Lactobacillus plantarum 299v (Lp299v)." March 14, 2004. [cited June 4, 2004]. http://www.phototour.minneapolis.mn.us/candida/lp299v.html.

Mercola, M.D., Joseph. "One Third of Probiotics, 'Good Bacteria' Products Like Acidophilus, Found to be Worthless." July 11, 2001 [cited June 4, 2004]. http://www.mercola.com/2001/jul/11/probiotics.htm.

Solga, M.D., Steve. "Probiotics Effect on Hepatic Steato sis." September 2003 [cited June 4, 2004]. http://www.clinicaltrials.gov/ct/show.

"Summary of Probiotic Strains." April 30, 2002 [cited June 4, 2004]. http://www.phototour.minneapolis.mn.us/candida/summary.htm

"What Are Probiotics?" USProbiotics.org. 2004 [cited June 4, 2004]. http://www.usprobiotics.org/101.

Rebecca Frey, Ph.D.
Katherine E. Nelson, N.D.

Prolotherapy

Definition

Prolotherapy is the treatment of soft-tissue damage through the use of injections. The injections lead to inflammation in the area, and the body reacts by increasing the blood supply and sending more nutrients to the area, resulting in tissue repair. The term prolotherapy is derived from the word *prolo*, short for proliferation, as the therapy is intended to proliferate tissue growth in the damaged area.

Origins

The idea behind this therapy dates back more than 2000 years to Hippocrates, who used it to treat soldiers with injured shoulders. Instead of injections Hippocrates used a hot poker, which he speared into the shoulder joint, causing inflammation and stimulating the body to repair itself. Prolotherapy using injections was derived from a treatment developed by H.I. Biegeleisen called sclerotherapy, used to treat **varicose veins**. In the 1950s, George Hackett, often called a pioneer of prolotherapy, was experimenting with and touting the benefits of the procedure.

Benefits

Prolotherapy has been used to treat chronic neck and back **pain**, joint pain from arthritis, headaches, **fibromyalgia**, sports injuries, **carpal tunnel syndrome**, and partially torn tendons, ligaments, and cartilage.

The benefit of prolotherapy is that it is a nonsurgical procedure that can be administered in a clinic, saving patients from undergoing anesthesia and surgery followed by a long recovery period. It's also cheaper than surgery. The average back or neck surgery costs about $40,000, while a single prolotherapy treatment runs anywhere from $90–$200, though patients may need several treatments. Furthermore, with prolotherapy there is no loss of mobility as there is with back surgery, when doctors fuse together the vertebrae in an effort to create stability in the spine.

Another benefit is that prolotherapy takes patients off drugs. Patients escape the cost of pain killers and their side effects.

Description

In prolotherapy, a doctor injects a sugar water or salt water-based solution into the damaged ligament or tendon at the point where it attaches to the bone. The injection produces an inflammation, which increases blood flow, swelling, and pain. The body then launches a course of repair and healing. The inflammation tricks the body into thinking another injury has occurred, so it sends in macrophages, which are cells that ingest and destroy the irritant solution. These cells clean up the area. The body then sends in fibroblasts, which are cells that help build fibrous tissue. The fibroblasts excrete collagen, a protein that makes the ligaments denser and stronger. The stronger ligaments provide more support for the joints, often alleviating the pain.

The length of treatment sessions varies and depends on the area being treated. For example, treatment of an injured elbow involves injections only in one site, whereas treatment of larger areas, like the neck and back, involves more injections. Treating an elbow may take only a few injections, whereas the back may involve up to 50 injections for one treatment. The more injections, the longer the treatment.

The treatment generally involves several sessions, usually three to six, which are separated by two or three-week intervals. Some practitioners space treatments four or six weeks apart.

Though doctors have practiced prolotherapy for more than a half-century, it is still considered an alternative treatment; therefore most insurance policies don't cover it.

Preparations

Analgesics and sedatives may be given before treatment to reduce discomfort. Many patients, however, forgo sedation because they cannot drive home

KEY TERMS

Analgesics—Referring to a class of medicines that relieves pain, including aspirin and Tylenol.

Fibroblasts—Found in connective tissue, these fat, oval cells help build fibrous tissue.

Ligaments—The rubbery band of tough tissue that connects one bone to another bone in a joint.

Macrophages—Often called the garbage collectors of the body, these cells, found in connective tissue, lymphatic tissue, and bone marrow, destroy other cells, microorganisms, and foreign matter found in the blood and tissues.

Tendons—Refers to the tough, fibrous connective tissue that connects muscles to bones.

afterward. Many doctors use topical freeze sprays, ice packs, or anaesthetic cream to reduce skin sensation.

It is recommended that patients drink plenty of water in the hours before the procedure because it helps with cell hydration.

Precautions

As with all procedures, there are risks. Patients are asked to sign a consent and waiver. Since the treatment involves inserting a needle into the body, there is a chance of puncture to arteries, nerves, or even lung tissue, depending on the area to be treated. Some patients may have allergic reactions to the substance injected.

Side effects

The most common side effects include pain during the injections and soreness and stiffness afterward. Patients are reminded not to take any anti-inflammatory drugs, such as ibuprofen, because these will impede the healing process prolotherapy aims to set in place.

Research and general acceptance

According to the Alternative Medicine Network, studies show prolotherapy relieves 92% of those treated; however, the therapy is relatively untested.

Opponents wonder how prolotherapists decide where to make their injections since areas of ligament weakening won't show up on an x ray. Others fear nervous system damage should the substance be injected too close to the nerves. Prolotherapy received a bad name in the 1950s when the *Lancet* reported three cases of paralysis and two deaths after treatment. It did not resurface for a number of years. As of 2000, there were only 400–500 U.S. doctors administering the treatment.

In the April 1997 issue of *Headache,* Dr. Irwin Abraham of Rochester, New York, reported preliminary findings of a study on prolotherapy to cure chronic headaches with **neck pain**. Of 17 patients, 11 said their symptoms were improved or relieved after treatment. At a two-year follow-up, nine reported complete relief, one had partial relief, and one's symptoms had relapsed.

Training and certification

Abraham stated in *Headache* that prolotherapy is a "safe, simple, and long-lasting treatment that any primary care physician can perform in the office setting." Doctors can learn prolotherapy through observation and instruction by a skilled prolotherapist.

The American Association of Orthopedic Medicine offers courses and workshops to train physicians and works to increase the number of physicians using the therapy.

Resources

PERIODICALS

Abraham, Irwin. "Prolotherapy for Chronic Headache." *Headache* (April 1997): 256.

Jennings, Suzanne. "The Prolotherapy Option." *Forbes* 152, no. 13 (December 1993): 248.

ORGANIZATIONS

American Association of Orthopedic Medicine. (800) 992 2062. http://www.aaomed.org.

OTHER

"Prolotherapy: The Natural Solution for Pain." *Mark T. Wheaton's Orthopedic Practice Page*. http://www.wheatons.com/Prolotherapy_CommonQuestions.htm. (June 2000).

"Prolotherapy defined." Prolotherapy.com http://www.prolotherapy.com/prolodefine.htm. (June 2000).

"The Thinking Person's Guide to Perfect Health: Sclero therapy (Prololotherapy)." *The Alternative Medicine Network*. http://www.sonic.net/ nexus/sclero.html. (June 2000).

Lisa Frick

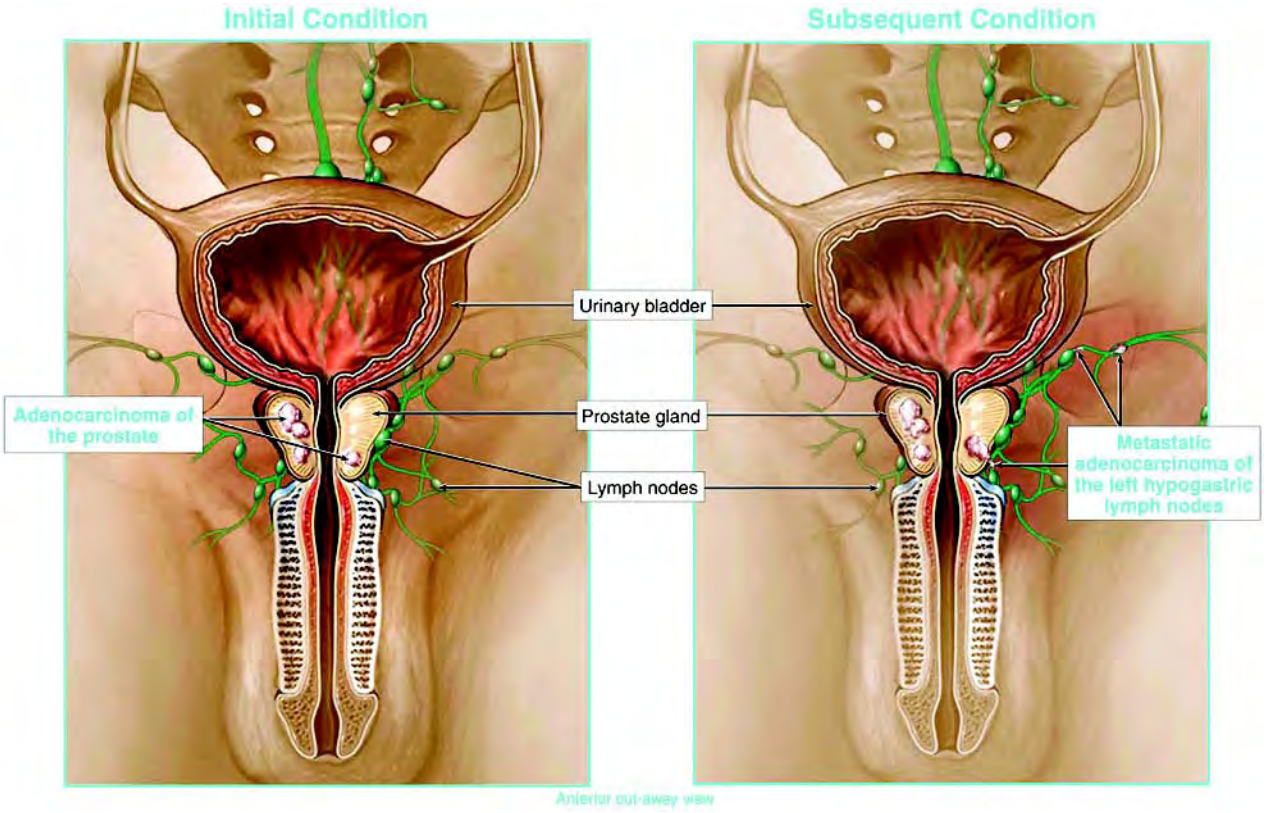
Prostate cancer

Definition

In prostate **cancer** cells of the prostate become abnormal and start to grow uncontrollably, forming tumors. Tumors that can spread to other parts of the body are called malignant tumors or cancers. Tumors incapable of spreading are said to be benign.

Description

As of 2007, prostate cancer was the most commonly diagnosed malignancy among adult males in Western countries. Although prostate cancer is often very slow growing, it can be aggressive, especially in younger men. Given its slow growing nature, many men with the disease die of other causes rather than from the cancer itself. In 2007, there were more than 218,000 new cases of prostate cancer and more than 27,000 deaths from the disease in the United States. More than 2 million men in the United States who have been diagnosed with prostate cancer at some



Progression of prostate cancer. *(© Nucleus Medical Art, Inc. / Alamy)*

point were still alive as of 2007, according to the American Cancer Society (ACS). The Canadian Cancer Society reported about 22,000 new cases of prostate cancer and 4,300 deaths in 2007. It is the number one cancer among Canadian men accounting for 27% of all cancers in males. Although prostate cancer may be very slow-growing, it is a heterogeneous disease and can be quite aggressive, especially in younger men. When the disease is slow-growing, it may often go undetected. Because it may take years for the cancer to develop, many men with the disease will probably die of other causes, rather than from the cancer itself.

Prostate cancer affects African American men twice as often as it does Caucasian men, and the mortality rate among African Americans is also two times higher. African Americans have the highest rate of prostate cancer in the world, whereas the rate in Asians is one of the lowest. However, although the rate of prostate cancer in native Japanese is low, the rate in Japanese Americans is closer to that of white American men. This pattern suggests that environmental factors and diet also play a role in prostate cancer.

The prostate, testicles, and seminal vesicles are the major male sex glands. These three glands together secrete the fluid that makes up semen. The prostate is about the size of a walnut and lies just behind the urinary bladder. A tumor in the prostate interferes with proper control of the bladder and normal sexual functions. Often, the first symptom of prostate cancer is difficulty in urinating. However, because the same symptom can be caused by a common, noncancerous condition of the prostate (benign prostatic hyperplasia), this symptom is insufficient in determining if prostate cancer is present.

As the prostate cancer grows, some of the cells break off and spread to other parts of the body through the lymph or the blood. The most common sites to which it spreads are the lymph nodes, the lungs, and various bones around the hips and the pelvic region.

Causes and symptoms

As of the late 2000s the cause of prostate cancer was not known; however, the disease is found mainly in men over the age of 55. The average age at diagnosis is 72. In fact, 80% of the prostate cancer cases occur in men over the age of 65. While only 1 in 100,000 men

gets prostate cancer under the age of 40, the frequency rises to 1,326 cases per 100,000 for men between the ages of 70 and 74. Hence, age appears to be a risk factor for prostate cancer.

Some studies have shown that a family history of prostate cancer puts a man at higher risk for developing this disease. In addition, there is some evidence that a diet high in fat increases the risk of prostate cancer. Workers in the electroplating and welding industries who are exposed to the metal cadmium and rubber industry workers appear to have a higher than average risk of getting this disease. Research has indicated that men with high plasma testosterone levels also may be at an increased risk.

Frequently, prostate cancer has no symptoms, and the disease is diagnosed when the patient goes for a routine screening examination. However, occasionally, when the tumor becomes large or the cancer has spread to the nearby tissues, the following symptoms may be seen:

- weak or interrupted flow of the urine
- frequent urination (especially at night)
- difficulty starting urination
- inability to urinate
- pain or burning sensation when urinating
- blood in the urine
- persistent pain in lower back, hips, or thighs (bone pain)
- painful ejaculation

Diagnosis

Prostate cancer is curable when detected early. However, because the early stages of prostate cancer may not have any visible symptoms, it often goes undetected until the patient goes for a routine physical examination. Diagnosis of the disease is made using some or all of the following tests.

Digital rectal examination (DRE)

In order to perform this test, the doctor puts a gloved, lubricated finger into the rectum to feel for any lumps in the prostate. The rectum lies just behind the prostate gland, and a majority of prostate tumors begin in the posterior region of the prostate. If the doctor does detect an abnormality, then more tests are ordered to confirm the diagnosis.

BLOOD TESTS. Blood tests are used to measure the amounts of certain protein markers, such as the prostate-specific antigen (PSA), found circulating in the blood. The cells lining the prostate generally make this protein and a small amount can be detected in the bloodstream. However, prostate cancers produce a lot of this protein, and it can be easily detected in the blood. Hence, when PSA is found in the blood in higher than normal amounts for the patient's particular age group, cancer may be present.

TRANSRECTAL ULTRASOUND. A small probe is placed in the rectum, and sound waves are released from the probe. These sound waves bounce off the prostate tissue and an image is created. Since normal prostate tissue and prostate tumors reflect the sound waves differently, the test can be used quite efficiently to detect tumors. Though the insertion of the probe into the rectum may be slightly uncomfortable, the procedure is generally painless and takes only 20 minutes.

PROSTATE BIOPSY. If cancer is suspected from the results of any of the above tests, the doctor removes a small piece of prostate tissue with a hollow needle. This sample is then checked under the microscope for the presence of cancerous cells. Prostate biopsy is the most definitive diagnostic tool for prostate cancer.

If cancer is detected during the microscopic examination of the prostate tissue, the pathologist grades the tumor using the Gleason system, which means the pathologist scores the tumor on a scale of 1 to 10 to indicate how aggressive the tumor is. Tumors with a lower score are less likely to grow and spread than are tumors with higher scores. The Gleason system is different from staging the cancer. When doctors stage a cancer, they give it a number that indicates whether it has spread, as well as the extent of its spread. In Stage I, the cancer is localized, whereas in the last stage, Stage IV, the cancer cells have spread to other parts of the body.

X RAYS AND IMAGING TECHNIQUES. A chest x ray may be ordered to determine whether the cancer has spread to the lungs. Imaging techniques (such as computed tomography scans and magnetic resonance imaging), in which a computer is used to generate a detailed picture of the prostate and areas nearby, may be used to get a clearer view of the internal organs. A bone scan also may be used to check whether the cancer has spread to the bone.

Treatment

The doctor and the patient decide on the treatment mode after considering many factors. Such factors include the patient's age, the stage of the tumor, his general health, and the presence of any other illnesses. In addition, the patient's personal preferences

and the risks and benefits of each treatment protocol are taken into account before any decision is made.

Various natural remedies used to treat noncancerous prostate problems can be implemented with the approval of a medical doctor along with the recommended medical care. **Prostate enlargement** is a precursor to prostate cancer, and many alternative treatments are available to alleviate benign prostate enlargement. Among these is the herb **saw palmetto**, which has shown to be highly effective in the treatment of prostate enlargement. In addition, treatments that focus on strengthening the immune system of the cancer patient can be helpful, using physiological and psychological therapies.

Lycopene, the antioxidant found in tomatoes and tomato products, has long been thought to help prevent prostate cancer. In the first clinical intervention trial of prostate cancer patients in 2001, lycopene supplementation slowed the progression of prostate cancer.

Visualization of a healthy, cancer-free body, and of cancer cells as weak and confused is believed to constitute healing imagery. Numerous studies affirm the power of a positive mental attitude in assisting conventional medical treatment to be more effective, while at the same time, minimizing undesirable side effects of chemotherapy or radiation.

Compounds contained in **maitake** mushrooms are believed to enhance the immune response and slow the growth of tumors. One study by a homeopathic physician, Abram Ber of Phoenix, Arizona, found that patients with prostate cancer treated with maitake mushroom tablets reported a decrease in the urge to urinate, along with improvement in the flow of urine.

Watchful waiting

Watchful waiting means no immediate treatment is recommended, but doctors keep the patient under careful observation. This option is generally used in older patients when the tumor is not very aggressive and the patients have other, more life-threatening illnesses. Prostate cancer in older men tends to be slow-growing. Therefore, the risk of the patient dying from prostate cancer, rather than from other causes, is relatively small.

Allopathic treatment

Surgery

For early stage prostate cancer, surgery is the best option and the most common one. Radical prostatectomy involves complete removal of the prostate. During the surgery, a sample of the lymph nodes near the prostate is removed to determine whether the cancer has spread beyond the prostate gland. Because the seminal vesicles (the glands where sperm is made) are removed along with the prostate, **infertility** is a side effect of this surgery. In order to minimize the risk of **impotence** (inability to have an erection) and incontinence (inability to control urine flow), a procedure known as nerve-sparing prostatectomy is used.

In a different surgical method, known as the transurethral resection procedure (TURP), only the cancerous portion of the prostate is removed, by using a small wire loop that is introduced into the prostate through the urethra. This technique is most often used in men who cannot have a radical prostatectomy due to age or other illness, and it is rarely recommended.

RADIATION THERAPY. Radiation therapy involves the use of high-energy x rays to kill cancer cells or to shrink tumors. It can be used instead of surgery for early stages of cancer. The radiation can either be administered from a machine outside the body (external beam radiation), or small radioactive pellets can be implanted in the prostate gland in the area surrounding the tumor.

HORMONE THERAPY. Hormone therapy is commonly used when the cancer is in an advanced stage and has spread to other parts of the body. Prostate cells need the male hormone testosterone to grow. Decreasing the levels of this hormone, or inhibiting its activity, causes the cancer to shrink. Hormone levels can be decreased in several ways. Orchiectomy is a surgical procedure that involves complete removal of the testicles, leading to a decrease in the levels of testosterone. Alternatively, drugs (such as LHRH agonists or anti-androgens) that bind to the male hormone testosterone and block its activity can be given. Another method tricks the body by administering the female hormone estrogen. When this is given, the body senses the presence of a sex hormone and stops producing testosterone. However, there are some unpleasant side effects to hormone therapy. Depending on the doses of estrogen, men may have **hot flashes** (such as those symptomatic of **menopause**), enlargement and tenderness of the breasts, erectile dysfunction (ED) or loss of sexual desire, as well as a risk of **blood clots**, heart attacks, and strokes.

CHEMOTHERAPY. Chemotherapy is the use of drugs to treat a disease. The drugs can either be taken as a pill or injected into the body through a needle that is inserted into a blood vessel. This type of treatment is called systemic treatment because the

drug enters the blood stream, travels through the whole body, and kills the cancer cells that are outside the prostate. Chemotherapy is sometimes used to treat prostate cancer that has recurred after other treatment. As of 2008, research was ongoing to find more drugs that are effective for the treatment of prostate cancer.

CRYOTHERAPY. Cryotherapy was still in the experimental stages in the United States as of early 2008. Cryosurgery destroys the cancer by freezing it and is under study as an alternative to surgery and radiation therapy. To avoid damaging healthy tissue, the doctor places a cryoprobe in direct contact with the tumor to freeze it. It is likely to be at least several years before cryotherapy is ready for general use in the United States. However, cryotherapy is in use in India as a primary treatment for localized or locally advanced prostate cancer.

Expected results

According to the American Cancer Society, the survival rate for all stages of prostate cancer combined increased from 50 to 87% between 1975 and 2005. Due to early detection and better screening methods, nearly 60% of the tumors are diagnosed while they are still confined to the prostate gland. The five-year survival rate for early stage cancers is almost 99%. Sixty three percent of the patients survive 10 years, and 51% survive 15 years after initial diagnosis.

Prevention

Because the cause of the cancer is not known, there is no definite way to prevent prostate cancer. However, the American Cancer Society recommends that all men over age 40 have an annual rectal exam and that men have an annual PSA test beginning at age 50. Those who have a higher than average risk, including African American men and men with a family history of prostate cancer, should begin annual PSA testing even earlier, starting at age 45.

Some evidence suggests that a diet high in fat increases the risk of prostate cancer. A diet high in fruits and vegetables may decrease the risk. Studies also suggest that nutrients such as soy isoflavones, **vitamin E**, **selenium**, **vitamin D**, and **carotenoids** (including lycopene, the red color agent in tomatoes and beets) may decrease prostate cancer risk. Further studies to find out whether men can reduce their risk of prostate cancer by taking certain dietary supplements were underway as of early 2008, according to the National Cancer Institute.

KEY TERMS

Anti-androgen drugs—Drugs that block the activity of the male hormone.

Benign—Not spreading, cancerous, or life-threatening.

Benign prostatic hyperplasia (BPH)—A noncancerous condition of the prostate that causes growth of the prostate tissue, thus enlarging the prostate and obstructing urination.

Biopsy—Surgical removal and microscopic examination of living tissue for diagnostic purposes.

Chemotherapy—Chemical (drug) treatment of disease; in cancer treatment, the use of synthetic drugs to destroy a tumor either by inhibiting the growth of the cancerous cells or by killing the cancer cells.

Estrogen—A female sex hormone.

Hormone therapy—In prostate cancer, treatment that involves reducing the levels of the male hormone testosterone, so that the growth of the prostate cancer cells is inhibited.

Lymph nodes—Small bean-shaped structures that are scattered along the lymphatic vessels. These nodes serve as filters and retain any bacteria or cancer cells that are traveling through the system.

Malignant—Capable of spreading, cancerous, and potentially life-threatening.

Prostatectomy—Surgical removal of the prostate gland.

Radiation therapy—Treatment using high energy radiation from x-ray machines, cobalt, radium, or other sources.

Rectum—The last 5 to 6 in (13-16 cm) of the intestine that leads to the anus.

Semen—A whitish, opaque fluid containing sperm released at ejaculation.

Seminal vesicles—The pouches above the prostate that store semen.

Testicles—Two egg-shaped glands that produce sperm and sex hormones.

Testosterone—A male sex hormone produced mainly by the testicles.

Trans-rectal ultrasound—A procedure in which a probe is placed in the rectum. High-frequency sound waves that cannot be heard by humans are sent out from the probe and reflected by the prostate. These sound waves produce a pattern of echoes which are then used by the computer to create sonograms, or pictures of areas inside the body.

Various research initiatives were underway as of early 2008 to discover new ways to treat and possibly prevent prostate cancer. Researchers were studying changes in genes that may increase the risk for developing prostate cancer. Some studies were looking at the genes of men who were diagnosed with prostate cancer at a relatively young age, such as less than 55 years old, and the genes of families who have several members with the disease. Other studies were trying to identify which genes, or combination of genes, are most likely to lead to prostate cancer. Much more work was needed, however, before scientists could say exactly how genetic changes relate to prostate cancer.

Scientists were also looking at ways to stop prostate cancer from returning in men who have already been treated for the disease. These approaches use drugs such as finasteride, flutamide, nilutamide, and LH-RH agonists that manipulate hormone levels. One study found that the combination of nilutamide and an experimental cancer vaccine was effective in reducing recurrence of prostate cancer. The experimental vaccine was designed to strengthen the body's natural defenses against prostate cancer. The experimental prostate cancer vaccine, called Provenge, was denied approval by the U.S. Food and Drug Administration (FDA) in 2007 because it failed to shrink prostate tumors during a trial in 127 men. The safety and effectiveness of a drug or vaccine are key measurements the FDA uses in approving or disapproving it. However, the study reported men who received the Provenge vaccine lived 4.5 months longer than men on conventional treatments. In 2007, an FDA advisory panel recommended approval of Provenge, finding that it was both safe and effective. In a rare move, the FDA rejected the advisory panel's approval recommendation, saying it wanted another study done. This study was expected to be completed in late 2008.

Resources

BOOKS

Ellsworth, Pamela, and Alan J. Wein. *100 Questions & Answers About Prostate Cancer*. Sudbury, MA: Jones & Bartlett Publishers, 2008.

Skarin, Arthur T., et al. *Prostate Cancer: Dana Farber Cancer Institute Handbook*. Burlington, MA: Mosby, 2007.

Torrey, E. Fuller. *Surviving Prostate Cancer: What You Need to Know to Make Informed Decisions*. New Haven, CT: Yale University Press, 2008.

PERIODICALS

Albaugh, Jeffrey, and Eileen Danaher Hacker. "Measurement of Quality of Life in Men with Prostate Cancer." *Clinical Journal of Oncology Nursing* (February 2008): 81(6).

Babbington, Gabrielle. "Prostate Cancer Study Divides Experts." *Australian Doctor* (October 19, 2007): 6.

Bivins, Vincent Michael. "After the Prostate Cancer Diagnosis: Thanks to Advanced Technology, Treatment Options Can Lead to a Better Quality of Life." *Ebony* (February 2008): 50.

Doyle Lindrud, Susan. "Prostate Cancer: A Chronic Illness." *Clinical Journal of Oncology Nursing* (December 2007): 857(5).

Faloon, William. "Lignans Protect Against Prostate Cancer." *Life Extension* (January 2008): N/A.

Katz, Aaron. "Life Saving Advances in Prostate Cancer Testing." *Life Extension* (January 2008): N/A.

Ranjan, Pratyush, et al. "High Intensity Focused Ultrasound vs. Cryotherapy as Primary Treatment for Prostate Cancer." *Indian Journal of Urology* (January/March 2008): 16.

ORGANIZATIONS

American Cancer Society, 1599 Clifton Rd. NE, Atlanta, Georgia, 30329, (800) 227 2345, http://www.cancer.org.

American Prostate Society, PO Box 870, Hanover, MD, 21076, (410) 859 7335, http://www.americanprostatesociety.com.

American Urologic Association, 1000 Corporate Blvd., Suite 410, Linthicum, MD, 21090, (866) 746 4282, http://www.auanet.org.

Canadian Cancer Society, 10 Alcorn Ave., Suite 200, Toronto, ON, M4V 3B1, Canada, (888) 939 3333, http://www.cancer.ca.

National Cancer Institute, 9000 Rockville Pike, Bethesda, MD, 20892, (800) 422 6237, http://www.cancer.gov/.

Kathleen Wright
Ken R. Wells

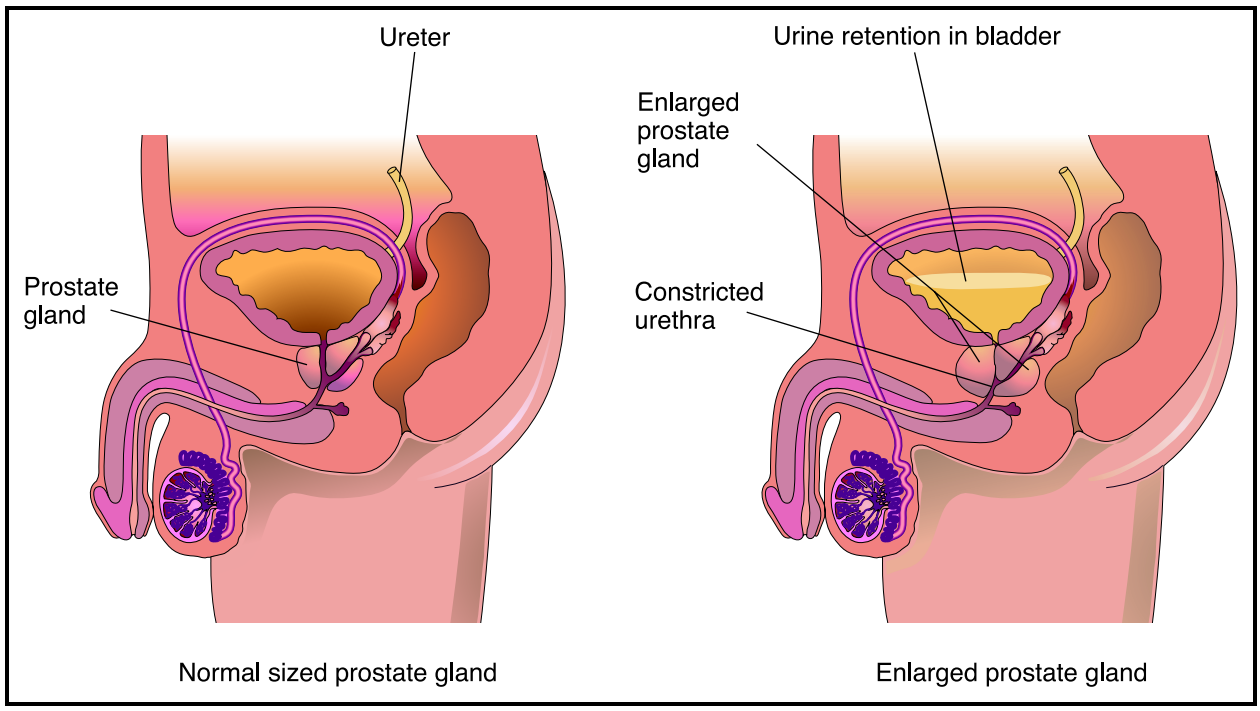
Prostate enlargement

Definition

A non-cancerous condition that affects many men past 50 years of age, enlarged prostate makes eliminating urine more difficult by narrowing the urethra, a tube running from the bladder through the prostate gland. It can effectively be treated by surgery and, in the 2000s, by certain drugs.

Description

The common term for enlarged prostate is BPH, which stands for benign (non-cancerous) prostatic hyperplasia or hypertrophy. Hyperplasia means that the prostate cells are dividing too rapidly, increasing the total number of cells and therefore the size of the organ itself. Hypertrophy simply means enlargement. BPH is often part of the **aging** process. The actual changes in the prostate may start as early as the 30s but



An enlarged prostate is a non-cancerous condition in which the narrowing of the urethra makes the elimination of urine more difficult. It most often occurs in men over age 50. *(Iustration by Electronic Illustrators Group. Cengage Learning, Gale)*

take place very gradually, so that significant enlargement and symptoms usually do not appear until after age 50. Past this age the chances of the prostate enlarging and causing urinary symptoms become progressively greater. More than 40% of men in their 70s have an enlarged prostate. Symptoms generally appear between the ages of 55 and 75. About 10% of all men eventually require treatment for BPH.

BPH has been viewed as a rare condition in blacks, but this finding may partly be due to the fact that black patients may have less access to medical care. The condition also seems to be uncommon among the Chinese and other Asian peoples, for reasons that in the 2000s are not clear.

Causes and symptoms

The cause of BPH is a mystery, but age-related changes in the levels of hormones circulating in the blood may be a factor. Whatever the cause, an enlarging prostate gradually narrows the urethra and obstructs the flow of urine. Even though the muscle in the bladder wall becomes stronger in an attempt to push urine through the smaller urethra, in time, the bladder fails to empty completely at each urination. The urine that collects in the bladder can become infected and lead to stone formation. The kidneys themselves may be damaged by infection or by urine constantly backing up.

When the enlarging prostate gland narrows the urethra, a man will have increasing trouble starting the urine stream. Because some urine remains behind in the bladder, he will have to urinate more often, perhaps two or three times at night (nocturia). The need to urinate can become very urgent and, in time, urine may seep out. Other symptoms of BPH are a weak and sometimes a split stream and general aching or **pain** in the perineum (the area between the scrotum and anus). Some men may have considerable enlargement of the prostate before even mild symptoms develop.

If a man must strain to urinate, small veins in the bladder wall and urethra may rupture, causing blood to appear in the urine. If the urinary stream becomes totally blocked, the urine collecting in the bladder may cause severe discomfort, a condition called acute urinary retention. Urine that stagnates in the bladder can easily become infected. A burning feeling during urination and **fever** are clues that infection may have developed. Finally, if urine backs up long enough it may increase pressure in the kidneys, though this rarely causes permanent kidney damage.

Diagnosis

When a man's symptoms point to BPH, the physician first performs a digital rectal examination, inserting a finger into the anus to feel whether—and how

much—the prostate is enlarged. A smooth prostate surface suggests BPH, whereas a distinct lump in the gland might mean **prostate cancer**. The next procedure is a blood test for a substance called prostate-specific antigen (PSA). Between 30–50% of men with BPH have an elevated PSA level. In fact, some studies indicate that the PSA level can be used as a predictor of a man's long-term risk of developing BPH. A high BPH level does not indicate **cancer** by any means, but other measures are needed to make sure that the prostate enlargement is benign.

An ultrasound examination of the prostate, which is entirely safe and delivers no radiation, can show whether the prostate is enlarged and may indicate if cancer is present.

If digital or ultrasound examination of the prostate raises the suspicion of cancer, most urologists recommend that a prostatic tissue biopsy be performed. This procedure is usually performed with a lance-like instrument that is inserted into the rectum. It pierces the rectal wall and, guided by the physician's finger, obtains six to eight pieces of prostatic tissue that are sent to the laboratory for microscopic examination.

A catheter placed through the urethra and into the bladder can show how much urine remains in the bladder after the patient urinates—a measure of how severe the obstruction is. Another and very simple test for obstruction is to have the man urinate into a uroflowmeter that measures the rate of urine flow. A very certain—though invasive—way of confirming obstruction from an enlarged prostate is to pass a special viewing instrument called a cystoscope into the bladder, but this is not often necessary.

It is routine to check a urine sample for an increased number of white blood cells, which may mean there is infection of the bladder or kidneys. The same sample may be cultured to show what type of bacterium is causing the infection and which antibiotics will work best. The state of the kidneys may be checked in two ways: imaging by either ultrasound or injecting a dye (the intravenous urogram, or pyelogram); or a blood test for creatinine, which collects in the blood when the kidneys cannot.

Treatment

An extract of the **saw palmetto** (*Serenoa repens* or *S. serrulata*) has been shown to stop or decrease the hyperplasia of the prostate. The herb is believed to inhibit the enzyme that converts one type of testosterone to another (significant in both prostate enlargement and prostate cancer), offering the same positive effects as the prescription drug Proscar or Propecia (finasteride) without the negative side effects. Symptoms of BPH will improve after taking the herb for one to two months but continued use is recommended.

In 2006, researchers in San Francisco reported that a year-long study of saw palmetto to treat BPH showed it was no more effective than a placebo in controlling symptoms. The study of 225 men taking 160 mg of saw palmetto twice a day concluded that there clearly was no benefit of using saw palmetto to treat BPH. The researchers said that previous studies that showed saw palmetto effective in treating BPH involved a small number of participants and had a short duration. However, researchers said their study was not conclusive and urged further research. They also noted that other health practitioners believe a higher dose of saw palmetto is needed for it to be effective.

Zinc is also effective in shrinking an enlarged prostate. A 15–30 mg zinc supplement, or inclusion of pumpkin or sunflower seeds in the daily diet, can produce the desired effect. Prevention of prostate inflammation and swelling is thought to be aided by an increase in **essential fatty acids**. One source of these fatty acids is **flaxseed** oil, available in capsule or liquid form at most health food stores.

The increase in circulation to the groin achieved by certain **yoga** poses and exercises can ease prostate problems. The knee squeeze and the seated sun poses should become a part of the daily routine. The stomach lock **exercise**, performed in a supine position, involves taking a deep breath and then breathing out slowly as the buttocks, groin, and stomach muscles are pulled in. Experts believe this exercise can both prevent prostate problems and treat flare ups; however, this exercise is not recommended for those with **hypertension**, **heart disease**, **hiatal hernia**, or ulcers.

Imagery that involves picturing the prostate shrinking to normal size and sensing an even flow of urine, practiced twice a day, can be helpful. A **reflexology** session to relax the entire body, with special attention to the prostate and endocrine reflexes in the hands and feet, may help the body heal itself.

Allopathic treatment

A class of drugs called alpha blockers relaxes the muscle tissue surrounding the bladder outlet and lining the wall of the urethra to permit urine to flow more freely. These drugs improve obstructive symptoms but do not keep the prostate from enlarging. Examples of alpha-blockers include terazosin (Hytrin), doxazosin (Cardura), prazosin (Minipress), tamsulosin (Flomax), and alfuzosin (Uroxatral). Another class of

drugs, called 5 alpha-reductase inhibitors, does shrink the prostate and may delay the need for surgery. Symptoms may not, however, improve until the drug has been used for three months or longer. One 5 alpha-reductase inhibitor, finasteride (Proscar and Propecia), has been shown to reduce the risk of developing prostate cancer by as much as 25%. Side effects occur in less than 10% of men using these drugs and include sexual problems such as a decrease in ejaculate volume, loss of sex drive, and erectile dysfunction. Another 5 alpha-reductase inhibitor is dutasteride (Avodart). Antibiotic drugs are given promptly whenever infection is diagnosed. Some medications, including antihistamines and some decongestants, can make the symptoms of BPH suddenly worse and even cause acute urinary retention and, therefore, should be avoided.

When drugs have failed to control symptoms of BPH but the physician does not believe that conventional surgery is yet needed, a procedure called transurethral needle ablation (TUNA) may be tried. The patient is given local anesthesia, and a needle is inserted into the prostate and radio frequency energy is applied to destroy the tissue that is obstructing urine flow. Another approach is microwave **hyperthermia**, using a device called the Prostatron to deliver microwave energy to the prostate through a catheter. This procedure is done at an outpatient surgery center.

For many years the standard operation for BPH has been transurethral resection (TUR) of the prostate. Under general or spinal anesthesia, a cystoscope is passed through the urethra and prostate tissue surrounding the urethra is removed using either a cutting instrument or a heated wire loop. The small pieces of prostate tissue are washed out through the scope. No incision is needed for TUR. There normally is some blood in the urine for a few days following the procedure. In a few men—less than 5% of all those having TUR—urine will continue to escape unintentionally. Other uncommon complications include a temporary rise in blood pressure with mental confusion, which is treated with salt solution. Erectile dysfunction—the inability to achieve lasting penile erections—does occur, but probably in fewer than 10% of patients. A narrowing or stricture rarely develops in the urethra, but this can be treated fairly easily.

Studies of men who undergo transurethral resection after acute urinary retention indicate that the general public remains not well informed about BPH. A majority of the men who were diagnosed with acute urinary retention said that they had had their symptoms for over a year. When asked why they did not seek treatment earlier, 35% said they were afraid of surgery, but 41% thought their symptoms were only a normal part of aging.

As of late 2007, a number of new treatments for BPH were being investigated, ranging from newly developed drugs to existing drugs used to treat other conditions. One of these new drugs, NX-1207, was undergoing clinical trials in the United States. Initial results showed the drug was extremely effective in treating BPH with minimal side effects and no sexual side effects, according to researchers at the Johns Hopkins University School of Medicine. Further studies were underway as of late 2007, and there was no estimated date when the drug might be ready to submit to the U.S. Food and Drug Administration for approval. Existing drugs that were being looked at as treatments for BPH include the anti-wrinkle drug botulinum toxin A (Botox), the over-the-counter pain relievers aspirin and ibuprofen, and the erectile dysfunction medications sildenafil (Viagra), vardenafil (Levitra), and tadalafil (Cialis).

Expected results

In several studies, 160 mg dose of saw palmetto given twice daily for 45 days achieved positive results in approximately 80% of the patients studied. That percentage increased when results were obtained after 90 days. People taking saw palmetto should use only standardized extracts that contain 85–95% fatty acids and sterols. Dosages vary depending on the type of saw palmetto used. A typical dose is 320 mg per day of standardized extract or 1–2 g per day of ground, dried, whole berries. It may take up to four weeks of use before beneficial effects are seen.

When BPH is treated by conventional TUR, there is a risk of complications but, in the great majority of men, urinary symptoms are relieved and the quality of life is much enhanced. It was anticipated that less invasive forms of surgical treatment would be increasingly used to achieve results as good as those of the standard operation.

Prevention

Whether BPH is caused by hormonal changes in aging men, there is no known way of preventing the condition as of early 2008. Once it does develop and symptoms are present that interfere seriously with the patient's life, timely medical or surgical treatment reliably prevents symptoms from getting worse. Also, if the condition is treated before the prostate has become grossly enlarged, the risk of complications is minimal. A potentially serious complication of BPH is urinary infection (and possible infection of the kidneys), which

KEY TERMS

Catheter—A rubber or plastic tube placed through the urethra into the bladder to remove excess urine when the flow of urine is cut off or to prevent urinary infection.

Creatinine—One of the waste substances normally excreted by the kidneys into the urine. When urine flow is slowed, creatinine may collect in the blood and cause toxic effects.

Hyperplasia—A condition in which cells, such as those making up the prostate gland, divide abnormally rapidly and cause the organ to become enlarged.

Hypertrophy—A term for enlargement, as in BPH (benign prostatic hypertrophy).

Urethra—The tube that conducts urine from the bladder outside the body; in male, the urethra extends from the bladder to the tip of the penis. When the urethra is narrowed by an enlarging prostate, symptoms of BPH develop.

Urinary retention—The result of progressive obstruction of the urethra by an enlarging prostate, causing urine to remain in the bladder even after urination.

can be prevented by using a catheter to drain excess urine out of the bladder so that it does not collect, stagnate, and become infected. There is no scientific evidence that diet or **nutrition** plays a direct role in the development of an enlarged prostate. However, a 2006 study reported that obese men were up to 3.5 times more likely to have an enlarged prostate than men with a normal weight.

Resources

BOOKS

Balch, Phyllis A. *Prescription for Nutritional Healing, fourth edition*. New York: Avery, 2007.

Katz, Aaron E. *Dr. Katz's Guide to Prostate Health: From Conventional to Holistic Therapies*. Topanga, CA: Freedom Press, 2005.

Moyad, Mark A., and Ian M. Thompson. *Complementary Medicine for Prostate Health*. Totowa, NJ: Humana Press, 2008.

PERIODICALS

Altshul, Sara. "Soothe His Prostate Problems." *Prevention* (January 2006): 80.

Bent, S., et al. "Saw Palmetto for Benign Prostatic Hyper plasia." *New England Journal of Medicine*(February 9, 2006): 557 566.

Cooperman, Ted. "Saw Palmetto for Benign Prostatic Hyperplasia." *Townsend Letter: The Examiner of Alternative Medicine* (June 2006): 94.

Giordano, Jill. "Prompt Diagnosis of BPH Can Prevent Complications." *American Family Physician* (May 1, 2006): 1632.

MacDougall, David S. "Obesity, Diabetes Increase BPH Risk; Enlarged Prostate More than Three Times as Likely in Obese Men than in Men with a Normal BMI." *Renal & Urology News* (July 2006): 29.

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

American Prostate Society, PO. Box 870, Hanover, MD, 21076, (410) 850 0818, http://www.americanprostatesociety.com.

American Urological Association, 1000 Corporate Blvd., Suite 410, Linthicum, MD, 21090, (866) 746 4282, http://www.auanet.org.

Canadian Urological Association, 1155 University, Suite 1155, MontrealQC, H3B 3A7, Canada, (514) 395 0376, http://www.cua.org.

Kathleen D. Wright
Ken R. Wells

Psoralea seeds

Description

Psoralea seed comes from the plant *Psoralea corylifolia*. *Psoralea corylifolia* grows in warm climates from the Middle East to China. This herb requires direct sunlight and moist, well-drained soil. In some parts of its habitat, it is considered a weed that competes with food crops. In other areas, especially in India, it is cultivated as a medicinal crop.

Psoralea corylifolia is an erect annual herb that grows to a height of about 20 to 40 inches (.6–1.2 m). It has broad, elliptical, slightly serrated leaves. The plant flowers from August to December and produces an elongated seed pod containing a single large, smooth, black seed. *Psoralea corylifolia* is a member of the bean family. Unlike some members of this family, the seeds have a bitter, unpleasant taste and are not used for food. They are, however, used extensively in healing. Occasionally the roots, leaves, and fruit (seed pod and seed) of the herb are also used medicinally.

Psoralea corylifolia is widely used in India, China, and Tibet and has more than a dozen different names. In **traditional Chinese medicine** (TCM) it is called bu gu zhi. In India some of its more common names are

bakuchi, babachi, bawchi, bukchi, bemchi, barachi, bavachi, hakuch, latakasturi, and bodi. In English, it is sometimes called Malay tea or scruf pea.

General use

Psoralea seed is commonly used both internally and externally in Ayurvedic and traditional Chinese medicine. In both systems of healing, psoralea seed is used to treat similar conditions. An essential oil, when extracted from the seed, can be taken internally or applied to the skin. Seeds also can be ground into a powder and taken internally or mixed into a paste and used externally.

Psoralea seeds are most often used in the treatment of skin diseases, especially leucoderma and vitiligo. These are conditions in which the skin loses pigmentation. White patches begin as small spots, then merge into larger patches. Although rare in the United States, the condition is thought to affect between 1% and 2% of people in India. Leucoderma is treated both with the essential oil taken internally and a paste applied to the skin. It is thought to stimulate the production of new skin pigment. Other skin diseases such as **psoriasis**, alopecia (**hair loss**), **eczema**, and a variety of inflammatory skin diseases are also treated with psoralea seed. The herb is also used to treat leprosy, scorpion sting, and snake bite.

There is some scientific basis for the use of psoralea seed in treating skin disease. The seeds contain the compound psoralen. In traditional Western medicine, a compound containing psoralen is applied to the skin, and then the skin is exposed to ultraviolet (UV) light as a treatment for psoriasis and eczema. Research has also shown that psoralea seed extract has antibiotic and antifungal properties and is effective against some types of internal parasites.

In addition to treating skin diseases, psoralea seed oil or powder is used in TCM and **Ayurvedic medicine** to treat disorders of the urinary and male reproductive system, including **bedwetting**, frequent urination, premature ejaculation, low sex drive, and **impotence**. In TCM, psoralea is considered a general yang tonic.

Occasionally other parts of the plant are used besides the seed. Chewing the root is said to help control dental caries (cavities). The leaves are used to treat **diarrhea**, and the seed pod is used as a diuretic. Other claims for this herb are that it helps prevent **osteoporosis**, has anticancer properties, and can treat **tuberculosis**. There is little scientific evidence to support these uses, although much research was being done on this herb as of 2008 in China and India.

KEY TERMS

Ayurvedic medicine—A 5,000-year old system of holistic medicine developed in India. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

Diuretic—A substance that removes water from the body by increasing urine production.

Eczema—A disease in which the skin becomes dry, red, itchy, and thickened.

Osteoporosis—A condition found in older individuals in which bones decrease in density, become fragile, and are likely to break. It can be caused by lack of vitamin D and/or calcium in the diet.

Psoriasis—A disease in which the skin develops itchy, dry, scaly red patches.

Traditional Chinese medicine (TCM)—An ancient system of medicine based on maintaining a balance in vital energy or qi that controls emotions, spiritual, and physical wellbeing. Diseases and disorders result from imbalances in qi (the life force), and treatments such as massage, exercise, acupuncture, and nutritional and herbal therapy are designed to restore balance and harmony to the body.

Yang aspects—Qualities such as warmth, activity, and light.

Preparations

The traditional method of extracting the essential oil from psoralea seed was quite complicated and involved burying the seeds in a pottery crock and then building a fire over the crock to extract the oil. As of 2008, factories in India produce a standardized essential oil from the seeds by modern extraction methods. A powder for internal use is also available in capsule form. A paste for external use can be made in the proportions of 1 part alcoholic extract of psoralea seed, 2 parts chaulmugra oil, and 2 parts lanoline.

Precautions

No studies have been done on the safety of psoralea seed, so pregnant and breastfeeding women should avoid using this herb.

Side effects

The psoralen found in psoralea seed sensitizes the skin to sunlight. In about 5% of people, psoralea seed

oil or paste applied externally causes skin irritation and blistering. Internal use of psoralea seed may cause mild stomach upset.

Interactions

No studies have been done as of 2008 on interactions between psoralea seed and other herbs or traditional pharmaceuticals. Individuals who regularly take dietary supplements, herbs, or pharmaceutical drugs should discuses the use of psoralea seed with their healthcare provider before beginning treatment.

Resources

BOOKS

Pole, Sebastian. *Ayurvedic Medicine: The Principles of Tra ditional Practice*. Oxford: UK Churchill Livingston, 2006.

Premla, M. S. *Ayurvedic Herbs: A Clinical Guide to the Healing Plants of Traditional Indian Medicine*. New York: Routledge, 2006.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoun dation.org.

American Association of Oriental Medicine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, (914) 443 4770, http://www.aaaomonline.org.

American Holistic Medical Association, PO Box 2016, Edmonds, WA, 98020, (425) 967 0737, http://www. holisticmedicine.org.

Centre for International Ethnomedicinal Education and Research (CIEER), http://www.cieer.org.

National Institute of Ayurvedic Medicine, 375 Fifth Ave., Fifth Floor, New York, NY, 10016, (212) 685 8600, http://niam.com/corp web/index.htm.

Tish Davidson, A. M.

Psoriasis

Definition

Psoriasis is a chronic, non-contagious disease characterized by inflamed hyperproliferative lesions covered with silvery-white scabs of dead skin.

Description

Psoriasis, which affects at least four million Americans, is slightly more common in women than in men. Although the disease can develop at any time, 10–15% of all cases are diagnosed in children under 10, and the average age at onset of symptoms is 28 years of age.

Hand with severe Psoriasis. *(© Medical-on-Line / Alamy)*

Psoriasis is most common in fair-skinned people and relatively rare in dark-skinned individuals, although the rate among African Americans appeared as of 2008 to be slowly rising.

Normal skin cells mature and replace dead skin every 28–30 days. Psoriasis causes skin cells to mature in less than a week. Because the body cannot shed the old skin as rapidly as new cells are rising to the surface, raised patches of dead skin develop on the arms, back, chest, elbows, legs, nails, folds between the buttocks, and scalp.

Psoriasis is considered mild if it affects less than 5% of the surface of the body, moderate if 5–30% of the skin is involved, and severe if the disease affects more than 30% of the body surface.

Types of psoriasis

Dermatologists distinguish different forms of psoriasis according to what part of the body is affected, how severe symptoms are, how long they last, and the pattern formed by the scales.

PLAQUE PSORIASIS. Plaque psoriasis (psoriasis vulgaris), the most common form of the disease, is characterized by small, red bumps that enlarge, become inflamed, and form scales. The top scales flake off easily and often, but those beneath the surface of the skin clump together. Removing these scales exposes tender skin, which bleeds and causes the plaques (inflamed patches) to grow.

Plaque psoriasis can develop on any part of the body, but most often occurs on the elbows, knees, scalp, and trunk.

SCALP PSORIASIS. At least 50 of every 100 people who have any form of psoriasis have scalp psoriasis. This form of the disease is characterized by scale-capped plaques on the surface of the skull.

NAIL PSORIASIS. The first sign of nail psoriasis is usually pitting of the fingernails or toenails. Size, shape, and depth of the marks vary, and affected nails may thicken, yellow, or crumble. The skin around an affected nail is sometimes inflamed, and the nail may peel away from the nail bed.

GUTTATE PSORIASIS. Named for the Latin word *gutta,* which means "a drop," guttate psoriasis is characterized by small, red, drop-like dots that enlarge rapidly and may be somewhat scaly. Often found on the arms, legs, and trunk and sometimes in the scalp, guttate psoriasis can clear up without treatment or disappear and resurface in the form of plaque psoriasis.

PUSTULAR PSORIASIS. Pustular psoriasis usually occurs in adults. It is characterized by blister-like lesions filled with non-infectious pus and surrounded by reddened skin. Pustular psoriasis, which can be limited to one part of the body (localized) or can be widespread, may be the first symptom of psoriasis or develop in a patient with chronic plaque psoriasis.

Generalized pustular psoriasis is also known as Von Zumbusch pustular psoriasis. Widespread, acutely painful patches of inflamed skin develop suddenly. Pustules appear within a few hours, then dry and peel within two days.

Generalized pustular psoriasis can make life-threatening demands on the heart and kidneys.

Palomar-plantar pustulosis (PPP) generally appears between the ages of 20 and 60. PPP causes large pustules to form at the base of the thumb or on the sides of the heel. In time, the pustules turn brown and peel. The disease usually becomes much less active for a while after peeling.

Acrodermatitis continua of Hallopeau is a form of PPP characterized by painful, often disabling, lesions on the fingertips or the tips of the toes. The nails may become deformed, and the disease can damage bone in the affected area.

INVERSE PSORIASIS. Inverse psoriasis occurs in the armpits and groin, under the breasts, and in other areas where skin flexes or folds. This disease is characterized by smooth, inflamed lesions and can be debilitating.

ERYTHRODERMIC PSORIASIS. Characterized by severe scaling, **itching**, and **pain** that affects most of the body, erythrodermic psoriasis disrupts the body's chemical balance and can cause severe illness. This particularly inflammatory form of psoriasis can be the first sign of the disease, but often it develops in patients with a history of plaque psoriasis.

PSORIATIC ARTHRITIS. About 10% of patients with psoriasis develop a complication called psoriatic arthritis. This type of arthritis can be slow to develop and mild, or it can develop rapidly. Symptoms of psoriatic arthritis include:

- joint discomfort, swelling, stiffness, or throbbing
- swelling in the toes and ankles
- pain in the digits, lower back, wrists, knees, and ankles
- eye inflammation

Causes and symptoms

The cause of psoriasis is unknown, but research related to the Human Genome Project was mapping the genetic component of the disease in the 2000s. In 2003, researchers at Washington University in St. Louis announced that three genes on chromosome 17 appear to be implicated in the development of psoriasis. Markers (indicators) for psoriasis have also been found on 10 other chromosomes, although specific genes for the diseases have not yet been discovered. Researchers believe that psoriasis is a multifactorial disorder, which means that it is the end result of a number of different factors. It appears to be caused by the combined action of multiple disease genes in a single individual that are triggered by irritants in the environment. Factors that increase the risk of developing psoriasis include:

- blood relatives with psoriasis
- stress
- exposure to cold temperatures
- injury, illness, or infection
- steroids and other medications
- mechanical stress (leaning on knees or skin exposure to chemicals, for example)

Trauma and certain bacteria may trigger psoriatic arthritis in patients with psoriasis.

Diagnosis

A medical history and physical examination is the basis for a diagnosis of psoriasis. In some cases, a microscopic examination of skin cells is also performed.

Blood tests can distinguish psoriatic arthritis from other types of arthritis.

Treatment

Psoriasis treatments include:

- Soaking in warm water and German chamomile (*Matricaria recutita*) or bathing in warm salt water

- Drinking as many as three cups a day of hot tea made with one or a combination of the following herbs: burdock root (*Arctium lappa*), dandelion (*Taraxacum mongolicum*) root, Oregon grape root (*Mahonia aquifolium*), sarsaparilla (*Smilax officinalis*), and balsam pear (*Momardica charantia*)
- Taking two 500–mg capsules of evening primrose oil (*Oenothera biennis*) a day. Pregnant women should not use evening primrose oil, and patients with liver disease or high cholesterol should use it only under a doctor's supervision.
- Eating a diet that includes plenty of fish, turkey, celery (for cleansing the kidneys), parsley, lettuce, lemons (for cleansing the liver), limes, fiber, and fruit and vegetable juices
- Eating a diet that eliminates animal products high in saturated and unsaturated fats, such as fried foods, dairy products, and fatty meats, that promote inflammation
- Drinking plenty of water (at least eight glasses) each day
- Regularly imagining clear, healthy skin

Other helpful alternative approaches include identifying and eliminating food allergens from the diet; enhancing liver function; augmenting the supply of hydrochloric acid in the stomach; and completing a **detoxification** program. Constitutional homeopathic treatment, if properly prescribed, can sometimes help resolve psoriasis.

Allopathic treatment

Age, general health, lifestyle, and the severity and location of symptoms influence the type of treatment used to reduce inflammation and decrease the rate at which new skin cells are produced. Because the course of this disease varies with each individual, doctors must experiment with or combine different treatments to find the most effective therapy for a particular patient.

Mild-moderate psoriasis

Steroid creams and ointments are commonly used to treat mild or moderate psoriasis, and steroids are sometimes injected into the skin of patients with a limited number of lesions. Two drugs, calcipotriene (Dovonex) and tazarotene (Tazorac) have been approved by the U.S. Food and Drug Administration (FDA) for the treatment of mile-to-moderate psoriasis.

Brief daily doses of natural sunlight can significantly relieve symptoms. **Sunburn**, however, has the opposite effect.

Certain moisturizers and bath oils can loosen scales, soften skin, and may eliminate the itch. (Often petroleum-based, coal tar-based, or other greasy ointments are used.) Adding a cup of oatmeal to a tub of bath water or using Aveeno in the bath can soothe the itch. Dilute, topical salicylic acid (an ingredient in aspirin) can be used to remove dead skin or increase the effectiveness of other therapies.

Moderate psoriasis

Administered under medical supervision, ultraviolet light B (UVB) is used to control psoriasis that covers many areas of the body or that has not responded to other treatment. Doctors combine UVB treatments with topical medications to treat some patients and sometimes prescribe home phototherapy, in which the patient administers his own UVB treatments.

Photochemotherapy (PUVA) is a medically supervised procedure that combines medication with exposure to ultraviolet light (UVA) to treat localized or widespread psoriasis. An individual with wide-spread psoriasis that has not responded to treatment may enroll in one of the day treatment programs conducted at special facilities throughout the United States. Psoriasis patients who participate in these intensive sessions are exposed to UVB and given other treatments for six to eight hours a day for two to four weeks.

Another form of treatment that has several advantages over standard phototherapy is therapy with an excimer laser system. Laser treatment for psoriasis uses a carefully focused beam of ultraviolet light that not only relieves symptoms quickly but also minimizes exposure of healthy skin to the ultraviolet rays.

Severe psoriasis

Methotrexate (MTX) can be given as a pill or as an injection to alleviate symptoms of severe psoriasis or psoriatic arthritis. Patients who take MTX must be carefully monitored by a doctor who checks blood liver enzymes to prevent liver damage. In the early years of its use, methotrexate was responsible for the death of a number of patients whose liver function had not been properly monitored.

Psoriatic arthritis can also be treated with nonsteroidal anti-inflammatory drugs (NSAIDs), such as acetaminophen (Tylenol) or aspirin. Hot compresses and warm water soaks may also provide some relief for painful joints.

Another medication used to treat severe psoriasis is etrentinate (Tegison), whose chemical properties are similar to those of **vitamin A**. Most effective in treating pustular or erythrodermic psoriasis, etrentinate also relieves some symptoms of plaque psoriasis. Etrentinate can enhance the effectiveness of UVB or

PUVA treatments and reduce the amount of exposure necessary.

Some doctors also use other systemic drugs that have not been approved specifically for the treatment of psoriasis. Among these so-called off-label drugs are isotretinoin (Accutane), hydroxyurea (Hydrea), mycophenolate mofetil, sulfasalazine, and 6-thioguanine. Accutane is a less effective psoriasis treatment than Tegison, but it can cause many of the same side effects, including **nosebleeds**, inflammation of the eyes and lips, **bone spurs**, **hair loss**, and birth defects. Tegison is stored in the body for an unknown length of time and should not be taken by a woman who is pregnant or planning to become pregnant. A woman should use reliable birth control while taking Accutane and for at least one month before and after her course of treatment.

Cyclosporin emulsion (Neoral) is used to treat stubborn cases of severe psoriasis. Cyclosporin is also used to prevent rejection of transplanted organs, and Neoral should be particularly beneficial to psoriasis patients who are young children or African Americans, or those who have diabetes. The drawback to cyclosporin, however, is that it has been implicated in an increased risk of **skin cancer** for psoriasis patients.

As of 2008, the latest drug approved by the FDA for use with psoriasis was a recombinant DNA (genetically engineered) product called alefacept (Amevive). Alefacept targets the T-cells that cause psoriasis without suppressing the patient's immune system. Not only does the new drug relieve the symptoms of psoriasis more rapidly than current treatments, but patients also remain symptom-free longer.

Other conventional treatments for psoriasis include:

- Capsaicin (*Capsicum frutecens*), an ointment that can stop production of the chemical that causes the skin to become inflamed and halts the runaway production of new skin cells. Capsaicin is available without a prescription but should be used under a doctor's supervision to prevent burns and skin damage.
- Hydrocortisone creams, topical ointments containing a form of vitamin D called calcitriol, and coal-tar shampoos and ointments can relieve symptoms but may cause such side effects as folliculitis (inflammation of hair follicles) and heightened risk of skin cancer.

Expected results

Most cases of psoriasis can be managed. However, some people who have psoriasis are so self-conscious and embarrassed about their appearance that they become depressed and withdrawn. The Social Security Administration grants disability benefits to about 400 psoriasis patients each year.

KEY TERMS

Arthritis—An inflammation of the joints.

Cyclosporin—A drug that suppresses the immune system and has been used to treat severe psoriasis. Some research indicates that cyclosporin may increase the risk of skin cancer for psoriasis patients.

Plaque—An area or patch of inflamed skin. The most common form of psoriasis is plaque psoriasis.

Prevention

A doctor should be notified if any of the following occurs:

- Psoriasis symptoms appear or reappear after treatment.
- Pustules erupt on the skin and the patient experiences fatigue, muscle aches, and fever.
- Unfamiliar, unexplained symptoms appear.

Resources

BOOKS

Camisa, Charles. *Handbook of Psoriasis*. New York: Wiley Blackwell, 2005.

Earls, Deirdre. *Your Healing Diet: A Quick Guide to Reversing Psoriasis and Chronic Diseases with Healing Foods*. Charleston, SC: BookSurge, 2006.

Langley, Richard G. B. *Psoriasis: Everything You Need to Know*. Westport, CT: Firefly Books, 2005.

Weinberg, Jeffrey M., ed. *Treatment of Psoriasis*. Basel: Berkhäuser, 2008.

PERIODICALS

Lowenthal, K. E., P. J. Horn, and R. E. Kalb. "Concurrent Use of Methotrexate and Acitretin Revisited." *Journal of Dermatological Treatment* (January 2008): 22 26.

Ormerod, A. D. "Adalimumab: A New Alternative Biologic Agent for Chronic Plaque Psoriasis." *British Journal of Dermatology* (March 2008): 435 436.

Su, Y. H., and J. Y. Fang. "Drug Delivery and Formulations for the Topical Treatment of Psoriasis." *Expert Opinion on Drug Delivery* (February 2008): 235 249.

Thass, J. J. "Siddha Medicine: Background and Principles and the Application for Skin Diseases." *Clinical Der matology* (January/February 2008): 62 78.

ORGANIZATIONS

American Academy of Dermatology, PO Box 4014, Schaumburg, IL, 60618 4014, (866) 503 7546, http://www.aad.org.

American Skin Association, 346 Park Ave. South, 4th floor, New York, NY, 10010, (800) 499 SKIN, http://www.americanskin.org/frameset.htm.

National Psoriasis Foundation, 6600 SW Ninty second Ave., Suite 300, Portland, OR, 97223 7195, (800) 723 9166, http://www.psoriasis.org.

Maureen Haggerty
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Psychic healing *see* **Cayce systems**

Psychoneuroimmunology

Definition

Psychoneuroimmunology (PNI), is a relatively recent branch of science that enforces beliefs that physicians have held for many centuries, perhaps well before the times of the ancient Greeks. The premise is that a patient's mental state influences diseases and healing. Specifically, PNI studies the connection between the brain and the immune system.

Origins

The term psychoneuroimmunology was coined by Robert Ader, a researcher in the Department of Psychiatry at the University of Rochester Medical Center in Rochester, New York. In the 1970s, studies by Ader and other researchers opened up new understandings of how experiences such as **stress** and **anxiety** can affect a person's immune system.

In the 1970s, Ader performed experiments on lab rats, which showed that environmental factors could impact the immune system. Ader's work went against accepted scientific knowledge, which held that the immune system was not related to other bodily systems, and had no way to physically interact with the nervous system. However, other studies confirmed Ader's findings. The field of PNI blossomed, and hundreds of studies explored various interactions between the immune system and other mental and physical processes.

Many PNI studies have focused on how stress, hostility, and **depression** impact the immune system. Many conditions such as **heart disease**, **osteoporosis**, arthritis, delayed wound healing, and premature **aging**, are related to stress and negative emotions. Fewer studies have been aimed at showing the benefits of happiness, or positive emotions, on health (perhaps because this is more difficult to test).

KEY TERMS

Cytokine—An immunoregulatory substance secreted by cells of the immune system. Cytokines act as signals between cells.

Many doctors have noted that a patient's desire to get well is related to the outcome of a disease. Clinical anecdotes recount cases of miraculous healing for no demonstrable reason, or cases where a terminally ill patient held on for months longer than expected to make it to a daughter's wedding or other important occasion. Faith in the physician (or shaman or other healer) has also long been thought to influence healing. The ancient Greek physician Galen wrote, "He cures most successfully in whom the people have the most confidence."

The **placebo effect** is also a curious aspect of healing. A placebo is a sugar pill or other non-active prescription, which might be given so that the patient thinks he or she is being treated medically. The actual incidence of the placebo effect is difficult to measure, but some researchers believe that as many as one-third of all patients will improve on a placebo.

Benefits

More than a particular therapy, PNI is a field of research. However, PNI has explored the benefits of many nontraditional or holistic approaches to healing. These include **psychotherapy** and counseling for people with **cancer**, and **biofeedback** and **relaxation** therapies to reduce stress. It is possible that PNI studies will lead to the discovery of new ways to enhance the immune system, just as it has already shown new ways the immune system can be suppressed. PNI gives credibility to many long-held folk beliefs about the effect of the mind on disease and healing. By demonstrating the physical means by which the mind influences the body, and vice versa, PNI provides a measure of validity to holistic approaches to healing.

Description

Psychoneuroimmunology provides a scientific framework for researchers to investigate the aspects of healing that go beyond standard clinical therapy. PNI researchers look for the physical links that allow the immune system to respond to psychological factors, such as the will to live to a certain date. They look

at the ways that mental states, such as hopelessness, can signal the immune system to lower the body's defenses.

Research and general acceptance

Though many scientists were at first skeptical of the findings of PNI, by the start of the twenty-first century the field gained wider credibility. A great deal of new research is being carried out, and there are several academic journals devoted to PNI. Researchers emphasize that they are not simply providing scientific backing for beliefs that happy people live longer, or that people who hold in their anger give themselves cancer. Instead, they are discovering how the immune system communicates with the neurological and endocrine systems.

Some studies focus on the function of cytokines, which are substances secreted by cells of the immune system. The two main classes of cytokines are pro-inflammatory (producing inflammation) and anti-inflammatory (fighting inflammation). Studies of cytokines show that psychological factors such as stress depress the immune system, but that deviations in the immune system can also trigger psychological and behavioral changes. The communication goes both ways. A person, who is fighting infection, perhaps from a cold, undergoes behavioral changes like **fatigue**, irritability, and loss of appetite. PNI maps complex interactions among the body's systems. Factors studied include mood, illness, immune response, susceptibility to disease, and maintenance of health.

In the early years of the twenty-first century, the United States Public Health Service funded hundreds of research grants in the field of PNI. PNI has been particularly enlightening for researchers and caregivers who deal with people who have cancer, as well as depression.

Resources

PERIODICALS

"Cancer and the Mind." *Harvard Mental Health Letter* (July 2003): 1.

DeVito, Paul L. "The Immune System vs. Stress." *USA Today Magazine* (July 1994): 27.

Kiecolt Glaser, Janice, K., et al. "Emotions, Morbidity, and Mortality." *Annual Review of Psychology*(2002): 83.

Sherwin, Nuland B. "The Uncertain Art." *American Scholar* (Summer 2001): 123.

Viljoen, M., et al. "Psychoneuroimmunology: From Philosophy, Intuition, and Folklore to a Recognized Science." *South African Journal of Science* (July/August 2003): 332 6.

ORGANIZATIONS

Association of Oncology Social Work. 1211 Locust Street, Philadelphia, PA 19107. (215) 599 6093. http://www.aosw.org.

OTHER

Azar, Beth. "Father of PNI Reflects on the Field's Growth." *APA Monitor Online*. June 1999 [cited May 11, 2004]. http://www.apa.org/monitor/jun99/pni.html

A. Woodward

Psychophysical integration *see* **Trager psychophysical integration**

Psychophysiology

Definition

Psychophysiology is the branch of physiology that is concerned with the relationship between mental (psyche) and physical (physiological) processes; it is the scientific study of the interaction between mind and body. The field of psychophysiology draws upon the work of physicians, psychologists, biochemists, neurologists, engineers, and other scientists.

A psychophysiological disorder is characterized by physical symptoms that are partly induced by emotional factors. Some of the more common emotional states responsible in forming illness include **anxiety**, **stress**, and fear. Common psychosomatic ailments include migraine headaches, attention deficit hyperactivity disorder (ADHD), arthritis, ulcerative **colitis**, and **heart disease**.

Origins

Historically, there has been a large chasm between the allopathic (mainstream) and alternative medical worlds with regard to views on psychophysiology. While the allopathic medical field continues to follow the Cartesian model of health, in which mind and body are seen as separate, the alternative medical field stands firmly on the notion that the mind and body are intricately connected. In general, treatment in the mainstream medical system is oriented toward fixing or curing isolated symptoms in the body. Alternative health providers strive to look at the symptoms, as well as the underlying pathology, or cause. While the first focuses on isolated parts of a whole system, the latter group strives to address the whole being, mind and body, emotions, and physical symptoms.

They believe that mental processes intricately affect bodily ones, and vice versa.

With a more holistic mentality, the population is experiencing an ever-progressing paradigm shift in which the body and mind are no longer viewed as separate, but rather as intricately interrelated. Medically, as well as culturally, Western society has reached the point at which the focus is increasingly on integrative mind/body healthcare. More patients and physicians are choosing to utilize therapies built upon the holistic models in which psyche (mind) and soma (physical body) are seen as one, or intimately related. They are utilizing such modalities as **meditation**, **yoga**, bodywork, and visualization techniques in efforts to relieve overall stress and to heal various psychosomatic illnesses.

KEY TERMS

Paradigm shift—A philosophical or spiritual change in the pattern or model by which one lives and views the world.

Rolfing—Form of therapeutic bodywork that seeks to heal the mind by improving the physical structure of the body.

Ulcerative colitis—Autoimmune disease of the colon, classified as a psychosomatic disorder.

Visualization techniques—A form of meditation, contemplation, and imagination that seeks to alter physical processes and directions of behavior or outcomes by focused mental awareness on specific images.

Benefits

The field of psychophysiology is leading the way to an ongoing investigation into the intricacies of the mind/body relationship. Applied psychophysiology focuses on the effects of emotional states on the central nervous system, by observing and recording data on such physiological processes as sleep rhythms, heart rate, gastrointestinal functioning, immune response, and brain function. Techniques used to measure such factors include electroencephalograms (EEGs), magnetic resonance imaging (MRI), and computerized axial tomography (CAT) scans. In an effort to quantify the effectiveness of different treatment techniques, the science of psychophysiology is being applied to many areas of alternative medicine, from **psychotherapy** and hypnosis to bodywork and meditation. Studies of the effects of emotional states on various physiological processes abound. For instance, it has been shown that there is a relation between loneliness and heart disease, as well as a connection between post traumatic stress disorder, **irritable bowel syndrome**, and **fibromyalgia**. By documenting the effects of emotions on health, this field hopes to improve the healing capacities of treatments. Many of the studies done by psychophysiologists occur in research institutions and universities.

There are several interpretations of what a healthy psychophysiology may look like. However, there are common characteristics that speak of mind/body health. Ultimately, such a holistic state exists when internal and mental awareness becomes strong enough to create a sense of embodiment, balance, and presence in an individual's body. Disease may be present in such a state, yet with this underlying, holistic understanding there exists more fighting power by which to heal. Science is proving this fact. Therapies that integrate mind/body processes have been shown to aid the healing processes for numerous diseases.

When stresses, traumas, or debilitating emotional states are present, individuals may experience physiological unrest. For example,if an individual with a known allergy to bee **stings** receives such a sting, the natural reaction could be panic. As a result of this psychological response, blood pressure and heart rate increase, digestive functions decrease, and the person becomes dizzy. If emotional stresses or traumas of this kind remain in the body/mind for extended periods of time, an imbalance in the healthy system may eventually manifest, as when individuals under chronic stress succumb to illness or disease. The field of psychophysiology is showing that the most effective treatments are those that address the emotional states of disease as well as the physical aspects.

Treatments

Treatments for psychosomatic illnesses are being synthesized from both the allopathic and alternative medical worlds. Methods vary from drug therapy and **biofeedback** to the use of meditation, yoga, and **massage therapy**. Many treatments have been shown to be effective; individuals have the freedom and responsiblity to discover for themselves the treatments that have the most personal benefit. What is effective for one person may not work for another. Consumers of mind/body treatments are encouraged to evaluate options, practitioners, and their individual needs. The field of psychophysiology conducts research to improve the information available to consumers.

In general, treatments are selected if they complement and strengthen an individual's awareness of the body/mind relationship. Such practices are most effective in achieving overall states of health when addressing the mind to affect the body, and vice versa. For example, two disciplines that have proven effective in establishing this awareness are meditation, a mind-centered activity, and **Rolfing**, a form of therapeutic bodywork. Treatments that simultaneously work with both the physiology and the psychology are highly beneficial. This thorough approach may be achieved by pairing modalities that complement one another. Examples include combining psychotherapy with bodywork, and certain drug therapies with meditation, visualization, and yoga.

Mind/Body

Meditation is an age-old process that has great potential in quieting the mind, calming the emotions, and balancing the physiology. For centuries, Eastern peoples and their traditions have focused on the art of meditation. Meditative techniques vary from bringing one's attention to the breath, to chanting a mantra (a specifically pre-established word or phrase), or to focusing one's gaze on a specific, unchanging image (a visualization technique). Focusing awareness inward to bodily sensations may interrupt unhealthy thought patterns, thereby reducing or preventing the effects of stress on the physiology. Studies as well as experiential phenomena have shown that meditation decreases blood pressure, muscle **pain**, and **cholesterol**, while improving digestion, relieving anxiety and **depression**, improving immunity, and boosting energy levels. Ultimately, meditation may lead to knowing one's self, both psychologically and physiologically. It is out of this state of embodied presence and attention that healing occurs.

Body/Mind

Certain forms of bodywork have been successful in affecting the mind by working through the body. Emotions, thoughts, and feelings may reside in the body, just as much as they do in the mind. For example, a depressed person's body may reflect the emotional state by hunched shoulders, sad facial expressions, and slow movements. Psychology has shown that by adopting positive physical expressions such as a smile or improved posture, a person will experience corresponding and measurable effects in the mind. These relationships, through the science of psychophysiology, are being experimentally validated.

By manipulating the structure of the body during bodywork, a healer may directly or indirectly affect both physiological and psychological health. Benefits from this type of therapy come from both the new changes in the physiology, as well as the changes in the consciousness and awareness of physically existing patterns. By becoming aware of such body/mind relations, healer and client break up old patterns in the physical tissue, the mind, and the emotions. An overall body/mind freedom is enhanced, bringing with it a greater chance for a holistic state of health.

Research and general acceptance

Interest in the mind/body relationship is as ancient as it is vast, and the field of psychophysiology is researching and validating this connection. The allopathic medical world has achieved great breakthroughs in human health, particularly with regard to the treatment of traumatic and life-threatening injuries and diseases. Medically, socially, and environmentally, a more holistic and preventive approach to healthcare is being sought, one that integrates and balances the mind/body relationship. Much work is being done to develop new knowledge; the field of psychophysiology is a major contributor to the exploration.

Training and certification

A variety of health professionals, such as physicians and psychologists, incorporate the principles of psychophysiology into their work. One of the objectives of the Association for Applied Psychophysiology and Biofeedback (AAPB) is to promote professional standards of practice, ethics, and education for its members. Certifications exist for professionals such as massage therapists and others who perform specialized techniques that incorporate psychophysiology principles.

Resources

BOOKS

Andreassi, John L. *Psychophysiology: Human Behavior and Physiological Response*. Mahwah, NJ: Lawrence Erl baum, 2000.

Borysenko, Joan, Ph.D. *The Power of the Mind to Heal*. Carlsbad, CA: Hay House, 1995.

Cacioppo, John T., ed. *Handbook of Psychophysiology*. Cambridge, UK: Cambridge University Press, 2000.

Chopra, Deepak, M.D. *Magical Health, Magical Body: Mastering the Mind/Body Connection for Perfect Health and Total Well Being*. Chicago, IL: Nightengale Conant, 2003.

ORGANIZATIONS

Association for Applied Psychophysiology and Biofeedback (AAPB). 10200 W. 44th Avenue, Suite 304. Wheat Ridge, CO 80033. (303) 422 8436. http://www.aapb.org.

Douglas Dupler

Psychosomatic medicine

Definition

Psychosomatic medicine is the study, diagnosis, and treatment of physical health conditions that stem from emotional problems. It emphasizes the unity of the mind and body in health and medicine. Many physicians believe understanding the psychological causes of illnesses is a key in understanding and treating the physical symptoms of the illnesses themselves.

Origins

Throughout recorded history, people are said to have been cured of diseases by various mystical practices, such as incantation, **prayer**, the laying on of hands, and other rituals. It is unclear exactly when medical practitioners made a connection between the mind and certain diseases, although records show that it dates back to at least the 1700s.

In 1774, German physician Franz Anton Mesmer (1734–1815) applied a scientific basis for mysticism when he waved magnets over some patients to cure them. He later discovered the magnets were not needed and he could get the same results by passing his hands over some patients. He called his technique "animal magnetism," and said it was based on the principle that illnesses occur when the body's flow of natural electromagnetic energy becomes blocked. He opened a practice in Vienna, Austria, and later went to Paris, where he lived and worked for six years, using magnetism and hypnosis to treat illnesses. He was eventually driven out of both cities and labeled a "quack" since his techniques did not always work.

Mesmer's work was studied by American scientist and statesman Benjamin Franklin (1706–1790) and French chemist Antoine Lavoisier (1743–1794), who became famous for isolating oxygen. Both spent years duplicating Mesmer's work, but with no successful results. However, the research led Franklin to conclude that the mind does have an influence over physical ailments; that in some patients, the belief that they will be cured actually cures them.

Further research into psychosomatic medicine was conducted by Austrian psychologist Sigmund Freud (1856–1939) in the late 1800s. Research continued, and by the 1960s the field had gained respect by the general medical community. Today, **biofeedback**, hypnosis, prayer, and humor are considered legitimate facets of psychosomatic medicine.

KEY TERMS

Biofeedback—The use of monitoring devices that display information about body functions, such as heart rate or blood pressure, to help patients learn to consciously control the functions.

Cholesterol—A compound found in animal tissue and blood of which high levels in the blood are linked to clogged arteries, heart disease, and gallstones.

Electromagnetic energy—Energy created by electromagnetism, the forces of electricity and magnetism.

Hypnosis—A sleeplike condition that can be artificially induced in people, in which they are susceptible to suggestions from the hypnotist.

Lipids—A group of organic compounds consisting of fats, oils, and related substances that, along with proteins and carbohydrates, are the structural components of living cells.

Meditation—Emptying the mind of thoughts, or concentrating on just one thing to help in relaxation.

Prostate—A gland in males that secretes a fluid into the semen that improves the movement and viability of sperm.

Psychoanalysis—A psychological theory and therapeutic method based on the idea that the mind works on conscious and unconscious levels and that childhood events have a psychological influence on people throughout their lives.

Psychosocial—Relating to both the psychological and the social aspects of a person.

Transendental Meditation—A focusing of the mind based in part on Hindu meditation techniques in which each person is given a word or phrase to meditate upon.

Benefits

The primary benefit of psychosomatic medicine is that it does not involve drugs, surgery, or other invasive treatments. It is also greatly beneficial in conditions created by the mind rather than a physical condition. In addition, in psychosomatic medicine, the patient has the greatest ability to control the healing process through various positive thinking techniques.

Description

In tne April 2002 issue of *Managed Healthcare Executive*, Dr. David Sobel, director of Patient Education and Health Promotions for Kaiser Permanente's

Northern California region, explained that one of the first things he noticed when he started practicing medicine is that a large number of his patients had problems that could not be explained by conventional medical and diagnostic techniques. He said that, "Up to 20% possess diagnosable psychiatric disorders but even more impressive is that upwards of 80% of the patients will be suffering significant levels of psychosocial distress." He went on to say "distress often expresses itself through physical or bodily symptoms...if not causing the symptoms, then certainly exacerbating them." He calls the condition a deficiency of mind-body regulation.

To address this, Kaiser Permanente developed a mind-body core program that includes teaching patients how to relax, manage **stress**, communicate more effectively, and think more positively.

Preparation

There is no preparation needed to undergo psychosomatic treatment, other than a willingness to believe it may be effective.

Precautions

Patients should be wary of psychosomatic practitioners who do not have degrees in medicine or psychology, or specialized training in either field. Some patients may also need conventional medical care or a combination of conventional and psychosomatic therapies.

Side effects

There are no known serious side effects of psychosomatic treatment in patients deemed suitable for the treatment by a qualified medical practitioner.

Research and general acceptance

A study published in 2002 by researchers at the Carnegie Mellon University Department of Psychology found that people with positive emotions were less likely to catch the **common cold**. A study by the University of California at San Francisco, published in 2002, reported that people with **AIDS** who had a positive attitude had a lower death rate from AIDS-related complications.

A Canadian study published in 2002 showed that people with breast or **prostate cancer**, who meditated and practiced **yoga** regularly, had an enhanced quality of life and reduced stress regarding their illness. A study published in 2000 by the Center for Health and **Aging** Studies at Maharishi University of Management in Fairfield, Iowa, showed that people who practiced Transcendental **Meditation** significantly reduced their **cholesterol** levels. Meditation also improved brain and immune system functions of patients in a study by several universities, which was published in 2003.

Training and certification

Many colleges and universities have psychosomatic medicine departments or training programs for certification. Practitioners usually are certified physicians or psychiatrists, but can also be other medical professionals, such as psychologists and nurses. However, practitioners can also include those with no medical training, such as hypnotists, counselors, ministers, and yoga and meditation instructors.

Resources

BOOKS

Dreher, Henry. *Mind Body Unity: A New Vision for Mind& Body Science and Medicine*. Baltimore, MD: John Hopkins University Press, 2004.

Ramos, Denise. *The Psyche of the Body: A Jungian Paradigm in the Understanding of the Psyche Body Phenomenon*. London, England: Brunner Routledge, 2004.

Scarf, Maggie. *Secrets, Lies, Betrayals: The Body/Mind Connection*. New York, NY: Random House, 2004.

Taylor, Graeme J. *Psychosomatic Medicine and Contempo rary Psychoanalysis (Stress and Health Series, Mono graph 3)*. Guilford, CT: International Universities Press, 1987.

Ullman, Dana. *The One Minute (or So) Healer: 500 Simple Ways to Heal Yourself Naturally*. Berkeley, CA: North Atlantic Books, 2004.

PERIODICALS

Carlson, Linda E., et al. "Mindfulness Based Stress Reduc tion in Relation to Quality of Life, Mood, Symptoms of Stress, and Immune Parameters in Breast and Prostate Cancer Outpatients." *Psychosomatic Medicine* (July August 2003): 571 81.

Cohen, Sheldon, et al. "Emotional Style and Susceptibility to the Common Cold." *Psychosomatic Medicine* (July August 2003): 652 7.

Davidson, Richard J., et al. "Alterations in Brain and Immune Function Produced by Mindfulness Medita tion." *Psychosomatic Medicine* (July August 2003): 564 70.

Jesitus, John. "Mind+Body Medicine: Putting Mind Over Health Matters." *Managed Healthcare Executive* (April 2002): 33 6.

Kroenke, Kurt. "Psychological Medicine: Integrating Psy chological Care into General Medicine Practice." *Brit ish Medical Journal* (June 29, 2002): 1536 8.

Moskowitz, Judith Tedlie. "Positive Affect Predicts Lower Risk of AIDS Mortality" *Psychosomatic Medicine* (July August 2003): 620 6.

Schneifer, R.H., et al. "Lower Lipid Peroxide Levels in Practitioners of the Transcendental Meditation Pro gram." *Psychosomatic Medicine* (January February 1998): 38 41.

ORGANIZATIONS

Academy of Psychosomatic Medicine. 5824 N. Magnolia, Chicago, IL 60660. (773) 784 2025. http://www.amp.org.

American Psychosomatic Society. 6728 Old McLean Village Drive, McLean, VA 22101. (703) 556 9222. http://www.psychosomatic.org.

Association for Psychosomatic Medicine. 4560 Delafield Ave., Bronx, NY 10471 3905. http://www.theamp.org.

OTHER

"Psychosomatic Medicine: The Puzzling Leap." National Library of Medicine. History of Medicine Division. *Emotions and Disease* [cited May 29, 2004] http://www.nlm.nih.gov/hmd/emotions/psychosomatic.html.

Ken R. Wells

Psychotherapy

Definition

Psychotherapy can be defined as a means of treating psychological or emotional problems such as neurosis or personality disorder through verbal and nonverbal communication. It is the treatment of psychological distress through talking with a specially trained therapist and learning new ways to cope rather than merely using medication to alleviate the distress. It is done with the immediate goal of aiding the person in increasing self-knowledge and awareness of relationships with others. Psychotherapy is carried out to assist people in becoming more conscious of their unconscious thoughts, feelings, and motives.

Psychotherapy's longer-term goal is making it possible for people to exchange destructive patterns of behavior for healthier, more successful ones.

Different approaches to psychotherapy

The psychodynamic approach was derived from principles and methods of psychoanalysis, and it encompasses psychoanalysis, Jungian analysis, Gestalt therapy, client-centered therapy, and somatic or body therapies, among other forms of psychotherapy. Psychoanalysis is therapy based upon the work of Austrian physician Sigmund Freud (1856–1939), and those who followed, Carl Jung, Alfred Adler, Erich Fromm, Karen Horney, and Erik Erikson. The basis of psychoanalytic therapy is the belief that behavior and personality develop in relation to unconscious wishes and conflicts from childhood. Gestalt therapy, developed by Frederick (Fritz) Perls, emphasizes the principles of self-centered awareness and accepting responsibility of one's own behavior. Client-centered therapy was formulated by Carl Rogers, and it introduced the idea that individuals have the resources within themselves for self-understanding and for change. Part of this concept is that the therapist exposes his or her own true feelings and does not adopt a professional posture, keeping personal feelings unclear. Somatic or body therapies include: dance therapy, holotropic breathwork, and Reichian therapy.

The behavioral approach encompasses various behavior modification techniques and theories, including assertiveness training/social skills training, operant conditioning, hypnosis/hypnotherapy, sex therapy, systematic desensitization, and others. Systematic desensitization was pioneered by Joseph Wolpe, after he became frustrated with psychoanalysis. This therapy is a combination of deep muscular **relaxation** and emotive imagery exercises, in which the client relaxes and the therapist verbally sets scenes for the client to imagine. These scenes include elements of the client's fears, building from the smallest fear toward the largest fear, and the therapist monitors the client and introduces the scenes, working to maintain the client's relaxed state.

The cognitive approach stresses the role that thoughts play in influencing behavior. Rational-emotive therapy and reality therapy are both examples of the cognitive approach. Rational-emotive therapy was pioneered by Albert Ellis in the mid-1950s. This therapy is based on the belief that events in and of themselves don't upset people, but people get upset about events because of their attitudes towards the events. Ellis's therapy set out to change people's attitudes about events through objective, firm direction from the therapist and talk therapy. Reality therapy, developed by William Glasser, is based upon the idea that humans seek to satisfy their complex needs, and the behaviors they adopt are to accomplish that satisfaction. In Glasser's theory, some people usually fulfill themselves and are generally happy, while others are unable to fulfill themselves and get angry or depressed.

The family systems approach includes family therapy in several forms and is the attempt to modify relationships within the family. Family therapy views behaviors and problems as the result of family interactions, rather than as belonging to a family member. One theory, developed by Murray Bowen, has become its own integrated system with eight basic concepts,

Types of psychotherapy

Type	Description	Disciplines	Proponents
Psychodynamic	Based on psychoanalysis, the psychodynamic approach believes behavior and personality stem from the unconscious wishes and conflicts from childhood.	Psychoanalysis, Jungian analysis, Gestalt therapy, Client-centered therapy, and somatic or body therapies.	Sigmund Freud, Carl Jung, Alfred Adler, Erich Fromm, Karen Horney, Erik Erikson, and Frederick (Fritz) Perls
Behavioral	Encompasses various behavior modification techniques and theories, but often includes the use of positive reinforcement in order to change attitudes and increase self-efficacy.	Assertiveness training/social skills training, operant conditioning, hypnosis/ hypnotherapy, sex therapy, systematic desensitization, biofeedback, and stress management.	Joseph Wolpe
Cognitive	Focuses on the influence thoughts have on behavior.	Rational-emotive therapy and reality therapy	Albert Ellis, William Glasser
Family systems	Believes behavior is influenced by family dynamics and attempts to modify relationships within the family.	Family therapy	Murray Bowen

(Illustration by Corey Light. Cengage Learning, Gale)

including differentiation of self and sibling position. This system attempts to help an individual become differentiated from the family, while remaining in touch with the family system.

In the practical application of these approaches, psychotherapy can take many forms. Some of the most commonly practiced forms include:

- Counseling, the provision of both advice and psychological support, is the most elemental form of psychotherapy. Counseling can be short-term therapy done to assist a person in dealing with an immediate problem such as marital problems or family planning, substance abuse, bereavement, or terminal illness. Or it can be longer-term, more extensive treatment that addresses feelings and attitudes that impair success.
- Group psychotherapy requires less therapist time, and is thus less expensive. In fact, the interactions that occur between members of the group are expected to provide the change and healing each member receives. The therapist functions as a facilitator, or one who encourages and controls the group interchanges. Group therapy provides each member with the additional benefit of sharing and feedback from others experiencing similar emotional problems. This sharing and feedback has been found to be therapeutic, and the group can actually function as a trial social setting, allowing people to try out newly-learned behaviors.
- Family therapy began in the 1930s, when Freudian analyst Alfred Adler used it in working with his patients' entire families. Since the 1950s, it has been a widely used and highly respected means of therapy based upon the belief that the relationships and interactions within a family have a profound impact upon the patient's mental difficulties. Family therapy generally does not deal with internal conflicts, but rather encourages positive interactions between the various family members.

KEY TERMS

Behavioral therapy—A collection of techniques for treating mental disorders based upon changing abnormal behavior rather than attempting to analyze its fundamental basis. It is particularly used in phobic or obsessional disorders, and seeks to eliminate symptoms rather than treating the underlying psychological cause.

Magnetism—(Animal magnetism) A discredited theory put forth by Viennese physician Franz Anton Mesmer stating that all persons possess magnetic forces that can be used to influence magnetic fluid in other people and therefore effect healing. Mesmer opened a clinic in Paris in 1878, and appeared to cure people apparently suffering from hysterical conditions, such as emotionally caused paralysis.

Neurosis —A term commonly used to describe a range of relatively mild psychiatric disorders in which the sufferer remains in touch with reality. Neurotic disorders include mild depression, anxiety disorders (including phobias and obsessive compulsive disorders), somatization disorders, dissociative disorders, and psychosexual disorders.

Personality disorder—A group of conditions characterized by a general failure to learn from experience or adapt appropriately to changes, resulting in personal distress and impairment of social functioning.

All forms of psychotherapy require an atmosphere of absolute mutual trust and confidentiality. Without this total safety, no form of therapy will be successful.

Origins

Psychotherapy had its beginnings in the ministrations of some of the earliest psychologists, priests, magicians, and shamans of the ancient world. They attempted to determine the causes of the person's emotional distress by talking, counseling, and educating, and interpreting both behavior and dreams. Many of these practices became suspect as the work of charlatans, and fell into disrepute over the centuries. There was little change or progress in the treatment of mental illness over the centuries that followed.

Austrian physician Franz Anton Mesmer (1734–1815) began using what he termed *magnetism* and both the power of suggestion and hypnosis in 1772. Mesmer's treatments, too, fell into disrepute after his theories were rejected by a medical board of inquiry in 1784. Then, nearly a century later, Mesmer's ideas were rediscovered by French neurologist Jean-Martin Charcot (1825–1893). Dr. Charcot used suggestion and hypnosis for treating psychological difficulties at Salpêtrière Hospital in Paris in the late nineteenth century. Mesmer is now known as the Father of Hypnosis.

In the late nineteenth and early twentieth century, Austrian physician Sigmund Freud studied Charcot's work, and came to believe that hypnosis was less a treatment for mental illness than a means of determining its underlying cause. Freud used hypnosis as one means of uncovering the often traumatic, not consciously recalled memories of his neurotic patients just as he used their dreams to evaluate their mental conflicts. He later abandoned hypnosis because he did not induce successful trances in his neurology patients. His *The Interpretation of Dreams*, published in 1899, made the point that a person's dreams were actually a window into the inner, unknown mind—the royal road to the unconscious. He used the information he obtained not only to help his patients, but also to collect data that eventually helped verify some of his psychodynamic assumptions.

Sigmund Freud theorized that the human personality is composed of three basic parts, the *id*, the *ego*, and the *superego*. The id is defined as the most elemental part, the one that unconsciously motivates people toward fulfilling instinctive urges. The ego is more related to intellect and judgement. It arbitrates between the internal, usually unrecognized desires all human beings have and the reality of the external world. The superego, unconscious controls dictated by moral or social standards outside of ourselves, is probably most easily described as another name for the conscience.

Freud believed that mental illness was the result of people being unable to resolve conflict, or inadequate settlement of disharmony among the ego, superego, and id. To deal with these internal psychic conflicts, people develop defense mechanisms, which is normally a healthy response. The defense mechanisms become harmful to mental health when overused, or used inappropriately. Freud further postulated that childhood psychic development is primarily based upon sexuality; he divided the first eighteen months of life into three sex-based phases: oral, anal, and genital.

Freud's earliest students, including Carl Jung and Alfred Adler, came to believe that Freud had overestimated the influence sexuality had on psychic development, and found other influences that helped to shape the personality. In the late 1800s and into the twentieth century, 1904 Nobel Prize winner Ivan

Petrovich Pavlov pioneered the research that would later result in behavioral therapies, such as the work of American behaviorist Burrhus Frederic Skinner. And in the 1930s, American psychologist Carl Ransom Rogers began his school of psychology that emphasized the importance of the relationship between the patient (or client, according to Rogers) and the therapist in bringing about positive psychic change.

Primal therapy, developed by Arthur Janov in the 1960s, is based upon the assumption that people must relive early life experiences with all the acuity of feeling that was somehow suppressed at the time in order to free themselves of compulsive or neurotic behavior. Primal therapy was a cathartic approach that many therapists now believe can impede progress because a person can become addicted to the release (even "high") associated with the catharsis and seek to keep repeating it for the momentary satisfaction. Transactional analysis, based on Eric Berne's work, came into favor in the 1970s, and supposes that all people function as either parent or child at various times, and teaches the person to identify which role he or she is filling at any given time and to evaluate whether this role is appropriate.

Benefits

The generally accepted aims of psychotherapy are:

- Increased insight or improved understanding of one's own mental state. This can range from simply knowing one's strengths and weaknesses to understanding that symptoms are signs of a mental illness and to deep awareness and acceptance of inner feelings.
- The resolution of disabling conflicts, or working to create a peaceful and positive settlement of emotional struggles that stop a person from living a reasonably happy and productive life.
- Increasing acceptance of self by developing a more realistic and positive appraisal of the person's strengths and abilities.
- Development of improved and more efficient and successful means of dealing with problems so that the patient can find solutions or means of coping with them.
- An overall strengthening of ego structure, or sense of self, so that normal, healthy means of coping with life situations can be called upon and used as needed.

Though there are no definitive studies proving that all five of these goals are consistently realized, psychotherapy in one form or other is a component of nearly all of both in-patient and community based psychiatric treatment programs.

Description

Classic Freudian psychotherapy is usually carried out in 50-minute sessions three to five times per week. The patient lies on a couch while he or she talks with the therapist. Freudian therapy characteristically requires ongoing treatment for several years, though in Freud's era it did not. Most other forms of individual psychotherapy, including Jungian, counseling, humanistic, Gestalt, or behavioral therapies, are carried out on a weekly basis (or more frequently, if necessary), in which the person meets with his or her therapist in the therapist's office, and may or may not continue for longer than a year.

Group therapy is held in a variety of settings. A trained group therapist chooses the people that presumably would benefit and learn from interactions with each other. The size of a group is usually five to 10 people, plus a specially trained therapist who guides the group discussion and provides examination of issues and concerns raised.

Child psychotherapy is done for the same reasons as adult psychotherapy—to treat emotional problems through communication. The obvious difference is that child psychotherapy must acknowledge the child's stage of development. This means that the therapist may use different techniques, including play, rather than only talking to the patient.

A newer direction in the treatment of mental disorders is the use of brief psychotherapy sessions, often combined with medication, to treat neurotic conditions. Another short-term psychotherapy is often termed crisis intervention, and is used to aid people in dealing with specific crises in their lives, such as the death of a loved one.

Research and general acceptance

Psychotherapy, in its many forms, has been accepted and used throughout the world for over one hundred years. It is normally covered as a valid treatment of mental disorder by both public and private health insurers. Because the various types of psychotherapy have different aims, and mental illnesses usually do not have absolute measurable signs of recovery, evaluating psychotherapy's effectiveness is difficult. As a general rule, the majority of people who undergo treatment with psychotherapy can expect to make appreciable gains. Studies have revealed, however, that not everyone who goes into therapy will be

helped, or helped as much as others, and some will even be harmed.

Training and certification

Though the actual clinical practice of psychotherapy is very much the same among disciplines, therapists come from a variety of different fields, including medicine, psychology, social work, and nursing.

Psychiatrists are required to complete four years of medical school and one year of internship, followed by a three-year residency in psychiatry. In order to be a psychoanalyst, a minimum of three years further training at a psychoanalytic institute is necessary, along with personal ongoing analysis.

Psychologists earn a Ph.D. in clinical psychology followed by a year of supervised practice, and additionally may take specialized training at a specific psychotherapeutic school, including therapy for themselves.

Social workers who specialize in mental health must earn a master's degree or doctorate before being allowed to practice.

Psychiatric nurses generally earn a master's degree and practice in hospitals or community mental health centers.

Most states in the United States require a license to practice as a psychotherapist, and by law in the majority of the states, they are accountable only to the other members of their profession.

Resources

BOOKS

Clayman, Charles B., M.D. *American Medical Association Home Medical Encyclopedia*. New York: Random House, 1989.

Coleman, James C. *Abnormal Psychology and Modern Life*. Glenview, Illinois: Scott, Foresman and Company, 1972.

Engler, Jack, and Daniel Goleman. *The Consumer's Guide to Psychotherapy*. New York: Simon & Schuster, 1992.

Taber, Clarence Wilbur. *Taber's Cyclopedic Medical Dictionary*. F. A. Davis Co., 1997.

OTHER

American Group Psychotherapy Association. "About Group Psychotherapy." http//www.agpa.org (1999).

CNN. "A Century Later, Science Still Grapples with Freud." www.cnn.com.

Electric Library. "Group Psychotherapy." www.encyclopedia.com (1999).

Lucidcafe. "Sigmund Freud, Austrian Originator of Psycho Analysis." www.lucidcafe.com.

Joan Schonbeck

Psyllium

Description

Psyllium is a seed used for medicinal purposes taken from the common fleawort, *Plantago psyllium* and related species. There are about 250 species of the genus *Plantago* found worldwide. The most common species producing seed for medicinal use, in addition to *P. psyllium,* are *P. afra*, *P. isphagula*, *P. ovata*, and *P. indica*.

Psyllium is extensively cultivated in many parts of the world. Shrubby perennial plants with narrow green leaves put up spikes of small flowers that mature into seedpods. The seeds and husks are harvested and used in healing. The seeds are small (1.5–2 cm) and brown or reddish-brown.

Psyllium has been used in **Ayurvedic medicine** in India and in **traditional Chinese medicine** for thousands of years. It has also been used in Europe for

Psyllium plants. *(©PlantaPhile, Germany. Reproduced by permission.)*

many years, but it became common in North American healing in the second half of the twentieth century. However, by 21st century, psyllium was widely accepted by both alternative and traditional healthcare professionals.

General use

Psyllium has three major uses that have been well documented by modern scientific research. These include the treatment of **diarrhea**, the relief of **constipation**, and the lowering of serum **cholesterol** levels. Psyllium has other traditional uses that not been rigorously scientifically documented.

Psyllium seed is high in dietary fiber, making it a good bulk laxative for treating chronic constipation. It is also used to soften stools and ease bowel movements after operations involving the anus and rectum, when **hemorrhoids** or anal fissures are present, or during **pregnancy** to lessen the strain of bowel movements.

Psyllium seeds are coated with a substance called mucilage that swells or "bulks up" when exposed to water. This extra volume stimulates the movement of material through the bowel. In addition, the moist, gummy mucilage lubricates the lining of the intestine. Both United States health authorities and the German Federal Health Agency's Commission E, established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications, approve the use of psyllium to treat constipation. Psyllium is the main ingredient in over-the-counter bulk laxatives such as Metamucil, Regulan, and Serutan.

Although it may at first seem contradictory, psyllium is also used to treat diarrhea and bouts of **irritable bowel syndrome**, a condition in which periods of diarrhea alternate with periods of constipation. As psyllium passes through the intestines, it absorbs water. This reduces the amount of fluid in the bowel and helps to control diarrhea. Both United States health authorities and the German Commission E have approved the use of psyllium to treat diarrhea.

German health authorities approved the use of psyllium to reduce serum cholesterol levels in the early 1990s, while the U. S. Food and Drug Administration (FDA) did not permit health claims to be made for psyllium content in foods until 1997. In that year, the FDA reviewed several scientific studies indicating that a daily intake of 10.2 grams of psyllium seed husk, combined with a diet low in saturated fats, consistently lowered blood cholesterol levels. Additional studies have confirmed the FDA's daily intake recommendation. Moreover, an improvement in the ratio of high-density lipoproteins (HDL, or "good" cholesterol) to low-density lipoproteins (LDL, or "bad" cholesterol) occurs when psyllium is used on a daily basis. The beneficial effects of psyllium on blood cholesterol levels, however, are somewhat affected by sex and age. Other surveys have found that wellness programs in which psyllium intake is one component of personalized behavioral change recommendations are more effective in lowering blood cholesterol than simply taking psyllium by itself. The FDA allows psyllium to be added to foods such as cereals (e.g., Bran Buds, Heartwise). The FDA permits foods containing psyllium to make the health claim that as part of a diet low in saturated fat and cholesterol, psyllium may help to prevent coronary **heart disease**).

In addition to these approved therapeutic uses, psyllium is used in traditional Chinese medicine to treat stomach and intestinal ulcers, **heartburn**, and to help manage non-insulin dependent (type 2) diabetes. Studies done by traditional medical parishioners have shown that psyllium taken before meals may reduced the rise in blood glucose (blood sugar) that occurred after eating, suggesting a valid role for psyllium in diabetes management. Additional studies are being undertaken.

Psyllium is also used to help control appetite in individuals who are dieting. The idea behind this is that psyllium slows stomach emptying and makes the individual feel fuller sooner and longer.

Some early studies suggested that psyllium might protect against **colorectal cancer**. Larger, better-designed studies have found only a minimal association between dietary fiber intake (including psyllium) and decreased rates of colorectal **cancer**. As of 2008, the role of psyllium in cancer prevention was still being investigated.

In Ayurvedic medicine, psyllium is used to cleanse the body by absorbing toxins in the large intestine so that they can be eliminated from the body. Some herbalists believe this action helps reduce the risk of colon cancer. Psyllium is also used by Ayurvedic practitioners to treat urethritis.

Preparations

Psyllium is available in a large number of over-the-counter (OTC) formulations. In the United States, it is sold in mainstream pharmacies and supermarkets under a variety of brand names including Metamucil, Fiberall, and Naturacil. Many other common laxatives include psyllium as an ingredient. Psyllium is also added to some breakfast cereals to increase their fiber content. In health food stores, psyllium can be obtained as powdered husks or seeds. A common dosage for

constipation is 2 tsp of psyllium (7 g) taken with at least one glass (8 oz) of water up to three times a day. The dose for diarrhea can be even higher—up to 40 grams per day.

Precautions

Psyllium is one of the safest laxatives available for long-term use. It is widely considered by the traditional medical community as very safe and effective when used in recommended doses for constipation and diarrhea.

People who are suspected of having an intestinal blockage or who suffer from narrowing of the esophagus or any other part of the intestinal tract should not use psyllium. People with diabetes, and children under age six should use psyllium only after talking to their doctor. Psyllium is generally accepted as safe to use throughout pregnancy and while breastfeeding. In rare cases psyllium can cause a severe allergic reaction. Allergic reaction is most common in people who have long-term workplace exposure to psyllium.

Although such accidents are unusual, cases have been reported of patients suffocating when a mass of psyllium blocked the upper airway. Although these incidents are most common in elderly patients or those with neurological disorders, anyone taking a psyllium preparation on a regular basis should drink a large glass of water or other liquid immediately following each dose.

Side effects

The use of psyllium may cause increased abdominal **gas**, stomach rumbling, and a feeling of bloating. A few patients may experience **nausea** and **vomiting**, but these side effects are rare.

Interactions

Psyllium slows the absorption from the intestine of some nutrients and may change the rate of absorption of some medications. Some nutrients that may be absorbed more slowly include **zinc**, **calcium**, **iron**, and vitamin B12. Carbohydrates are absorbed more slowly, which may make it necessary for insulin-dependent diabetics to adjust their insulin dose. Psyllium may also slow down or decrease the absorption of certain medications, including antibiotics, digoxin, lithium, tricyclic antidepressants, carbemazepine, and anti-diabetic medicines such as glyburide and metformin. Individuals taking any of these drugs should talk to their healthcare provider before beginning psyllium. Absorption problems can usually be avoided by taking psyllium an hour after taking other medications. Apart from affecting speed of absorption, as of 2008, psyllium is not known to interact with any standard pharmaceuticals.

KEY TERMS

Mucilage—A gummy, gelatinous substance that coats psyllium seeds and helps them absorb water.

Urethritis—An infection of the urethra or tube that drains the bladder.

Resources

BOOKS

Blumenthal, Mark, ed. *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*. Boston: Integrative Medicine Communications, 1998.

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thomp son Healthcare, 2007.

PERIODICALS

Jenkins, D. J., C. W. Kendall, V. Vuksan, et al. "Soluble Fiber Intake at a Dose Approved by the US Food and Drug Administration for a Claim of Health Benefits: Serum Lipid Risk Factors for Cardiovascular Disease Assessed in a Randomized Controlled Crossover Trial." *American Journal of Clinical Nutrition* 75 (May 2002): 834 839.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Poto mac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

Centre for International Ethnomedicinal Education and Research (CIEER). http://www.cieer.org.

OTHER

"Psyllium (Planto ovata, Planto isphagula)." *MedlinePlus*. October 1, 2006 [cited February 20, 2008]. http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient psyllium.html.

"Psyllium." *University of Maryland Medical Center*. April 1, 2002 [cited February 20, 2008]. http://www.umm.edu/altmed/articles/psyllium 000321.htm.

Tish Davidson, A. M.

Pukeweed *see* **Lobelia**

Pulmonary heart disease *see* **Heart disease**

Pulsatilla

Description

Pulsatilla nigricans, commonly known as pulsatilla, is a remedy derived from the plant commonly known as wind flower, pasque flower, or meadow anemone. The perennial plant is a member of the Ranunculaceae family and is native to central and northern Europe and southern England. This wild plant grows in sunny meadows, pastures, and fields.

A crown of leaves forms on the ground, from which a single flower grows in May and August. The stem reaches a height of about 6 in (15 cm) and has downy hairs that grow on it. The flower is colored dark violet-brown.

The plant was used medicinally during ancient times for eye ailments. During the 19th century, the eclectic physicians and contemporaries of Samuel Hahnemann, the father of **homeopathy**, noted pulsatilla's use in the treatment of melancholy, swelling of the knees, and nervous system disorders. In ancient times it was used as an external remedy for ulcers and eye inflammation.

The plant contains lactones, saponins, anemone camphor, tannins, and a volatile oil. It is antispasmodic and antibacterial and acts on the nervous system. When chewed, a caustic substance contained in the plant **burns** the tongue and throat. When applied topically, it may cause **blisters** on the skin. Though not used as widely as it was in the 19th century, pulsatilla may be used to treat painful periods, **insomnia**, headaches, **boils**, ovarian **pain**, and **asthma**.

The pulsatilla plant contains lactones, saponins, anemone camphor, tannins, and a volatile oil. It is antispasmodic and antibacterial and acts on the nervous system. *(Chris Gomersall / Alamy)*

KEY TERMS

Conjunctivitis—An inflammation of the mucous membranes that cover the outer eyeball and line the eyelids. The eye appears red or pink and is itchy or sore.

Infusion—An herbal tea created by steeping herbs in hot water (1 tsp herb to 1 cup water). Generally, leaves and flowers are used in infusions.

Perennial—A plant that persists for several years.

Succussion—A process integral to the creation of a homeopathic remedy in which a homeopathic solution is repeatedly struck against a firm surface. This is performed to thoroughly mix the substance and magnify its healing properties.

General use

Traditional Chinese medicine

Chinese anemone root (*Pulsatilla chinensis*) is a related herb used in **traditional Chinese medicine**. Bai tou weng, as it is referred to in Mandarin, is prescribed by Chinese medicine practitioners to clear heat and detoxify fire poison. It is used in damp heat conditions of the stomach and large intestine in dysentery. Dysentery is a disease marked by frequent watery stools and often accompanied by stomach pain, **fever** or dehydration. The herb has a bitter taste and is antimicrobial. The plant has also been used to treat **diarrhea**, **wounds**, and trauma.

Homeopathy

Homeopaths prescribe pulsatilla for acute ailments that are caused by grief, anger, fright, shock, consumption of rich foods, loss of vital fluids, exposure to the sun, suppression of **menstruation**, and mental strain. This herb is often called the queen of homeopathic remedies, as it is indicated in so many conditions. These conditions include arthritis, **bronchitis**, **chickenpox** with **cough** and low fever, colds, coughs, digestive troubles, eye and ear **infections**, fevers, headaches, **measles** with a cough and cold, **mumps** with swollen and painful glands, and menstrual difficulties.

Physical symptoms include thirstlessness, one-sided complaints, weakness, slow digestion, chilliness, and thick, yellow bodily discharges. The pains are cutting, stitching, or burning, and they wander from body part to body part. The lymph glands are often swollen, and the sweat and breath smell repugnant. The lips and mouth are dry, and a white or yellow-

coated tongue is often present. The patient may crave butter, but dislikes bread, hot food and drinks, fats, rich food, and meat. These foods cause **indigestion** and **nausea**. The patient is chilly, often with cold hands and feet, but dislikes heat.

Pulsatilla is generally chosen because it acts so well on ailments that are of an emotional nature. The remedy is typically suited for mild, gentle, and timid women and children with blonde hair and blue eyes. Pulsatilla patients are generally emaciated persons who are sympathetic, sad, weepy, sensitive, easily offended, jealous, depressed, shy, introspective, and anxious. The patient desires affection and the company of others, and is often fearful of being alone, of the dark, or in a crowd. She may be filled with remorse or despair and may be suicidal. She cries easily and is not afraid to show her emotions.

A typical indication of the pulsatilla patient lies in her erratic emotional and physical behavior. Her moods are always changing: one minute she may be happy, the next may find her crying. Ailments are one-sided or change location. For instance, arthritic pain may stop in one joint and appear in another. Pulsatilla is a useful remedy for teething babies who are weepy, whiny, and want to be carried.

Symptoms are worse in the morning, in the evening before midnight, in cold air, when the feet are wet, and while standing or lying down. They are also aggravated by warmth, while lying on the painless side, during and after eating, eating warm foods, after sleep, by rapid motion, and before, during, and after menstruation. Conditions that improve the symptoms include fresh air, lying on the painful side, pressure, gentle motion, cold, and cold applications.

SPECIFIC INDICATIONS. Arthritic inflammations have little swelling or redness. The pains are pulling, sore, and bruised, and shift from joint to joint. They are relieved by the cold, fresh air, and slow movement. Symptoms are worse from heat, wet weather, upon beginning to move, or after the **common cold**. The patient often has a **dry mouth**, fever, and lacks thirst.

Back pains occur in the lower back or small of the back. The back feels tired and weak, like it was sprained, and the pains are aching and pressing. The pains are worse when bending down or rising after long periods of sitting, but are relieved from gentle motion and walking slowly. The backache often occurs before and during the menstrual period.

Bronchitis accompanied by a dry cough that is worse in the evening or when lying down is indicative of this remedy. The cough is loose in the morning and the mucous expelled is bitter or salty. The cough is better when sitting up or in cool air and worse after eating.

Pulsatilla is a useful remedy for breastfeeding mothers with an overabundant supply of milk. It is often indicated in postnatal **depression** accompanied by crying.

The cold indicative of pulsatilla is accompanied by **sneezing**, **chills**, fever, and sometimes **nosebleeds**. The patient catches cold easily. The nose is stuffed in a warm room and in the evening, and is watery in fresh air. The discharge is thick and yellow or green. The sense of smell and taste is lost. Symptoms are relieved by fresh air.

Conjunctivitis with redness and swelling of the eyelids is accompanied by a thick, yellow discharge that oozes from the eyes. In the morning the eyes are often stuck shut. The eyes are typically itchy and burning. The symptoms are better from cold applications or cold air.

Constipation with ineffective urging and a backache occurs with this remedy. When the patient does defecate, the stools are large and hard.

The cough typical of this remedy is an exhausting cough that occurs in fits. The cough is dry at night and loose in the morning. There is a loud rattling in the chest that often wakes the patient. A sticky, yellow or green mucus is present, but may be difficult to expel. The throat may become raw, sore, and painful from the cough. The cough is better from fresh air and sitting up, and worse from exertion, lying down, heat, or a stuffy room.

The diarrhea is a greenish-yellow color and is slimy and watery. There is a rumbling in the abdomen before it is expelled. The pains in the abdomen are cutting. The diarrhea is worse at night, after eating, after eating starchy or rich food, when overheated, or in a stuffy room.

Digestive disturbances are caused by eating rich or fatty foods, pork, ice cream, fruit, or cold foods. The patient lacks appetite or thirst and often suffers from nausea and **vomiting**. He may have a dry mouth and may feel as if a lump was behind the sternum. Indigestion is accompanied by bitter-tasting belches, stomach pains, and **heartburn**. Diarrhea may also be present. Symptoms are worse after eating or drinking and at night.

Pulsatilla types do not fare well in hot weather and often suffer from exhaustion. They are worse from the sun, a stuffy room, or mental exertion.

Pulsatilla is indicated in fevers in which the patient is not thirsty and has a dry mouth. The fever is hot and burning and is typically one-sided, i.e. the body may be hotter on one side than the other. The sweat

produced may occur on one side of the body or be localized to one area. The patient may weep and moan while feverish. The fever is worse in heat, at night, under warm covers, in a stuffy room, or after washing. Intermittent fevers are worse between 2:00 p.m. and 3:00 p.m. These fevers are worse from heat and covering.

The **headache** pains occur in the front of the head or at the temples. The pains are throbbing, pressing, one-sided pains that are worse from movement, excessive sun, eating rich foods, hot drinks, bending over, standing, running, or blowing the nose.

Insomnia is caused by anxious dreams, a restless sleep, too much thinking, and a repetition of thoughts. When the feet become hot, the patient sticks them out of the bed. Then the patient is awakened because his feet are cold.

Menstrual difficulties are also indicative of this remedy and often occur as a result of suppressed menstruation. Menstruation is accompanied by vomiting, nausea, skin affections, sadness, weeping, and pain in the abdomen, liver, and back. The period is generally late. The flow may start and stop or be present only during the day. The pains are aching, dull, and wandering. They are better when the patient is doubled over. Symptoms are aggravated by wetting the feet.

Varicose veins are sore and stinging. They are worse while standing and better from walking and cold applications. They are also worse during **pregnancy** and when circulation in the limbs is poor.

Preparations

Pulsatilla nigricans is available in dried bulk form, and as a tincture. Pharmacies, health food stores, and Chinese herbal stores carry the various preparations. They are also available as prescribed by a herbalist, homeopathic doctor, and Chinese medicine practitioner.

The homeopathic preparation of pulsatilla is created in the following manner. The plant is collected when the flowers are in full bloom and pounded to a pulp. This pulp is soaked in alcohol, then strained and diluted. The final homeopathic remedy is created after the diluted mixture is succussed repeatedly. The remedy is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

The dried plant combines well with **cramp bark** as a treatment for painful periods. For skin conditions it is combined with **echinacea**.

An infusion is made by pouring one cup of boiling water over 1/2 tsp of the dried plant. The mixture steeps for 10-15 minutes then should be strained. Pulsatilla can be drunk up to three times daily.

For use in traditional Chinese medicine, the herb should be soaked for one hour in warm water, then simmered for 30-120 minutes. It is usually used in combination with other herbs.

The tincture dosage is 1-2 ml three times daily.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or health care practitioner should be consulted.

The recommended dose should not be exceeded.

Those seeking this remedy should not use the fresh plant.

Side effects

There are no known side effects.

Interactions

When taking any homeopathic remedy, use of **peppermint** products, coffee, or alcohol is discouraged. These products will cause the remedy to be ineffective.

Pulsatilla chinensis is contraindicated in chronic dysentery with a deficiency of Spleen and Stomach. It is only used for acute dysentery.

Resources

BOOKS

Cummings, M.D., Stephen, and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Pulse diagnosis

Definition

Pulse diagnosis is a diagnostic technique used in several healing systems to determine the health conditions and course of treatment for patients.

KEY TERMS

Acupuncture—Healing technique in traditional Chinese medicine utilizing the insertion of thin needles and other methods.

Ayurvedic medicine—Traditional healing system developed in ancient India and practiced around the world.

Diagnosis—Means of determining health problems and general condition in a patient.

Traditional Chinese medicine—Healing system developed in ancient China utilizing acupuncture, acupressure massage, herbal remedies, and other healing techniques.

Origins

As used in **Ayurvedic medicine** and **traditional Chinese medicine** (TCM), the techniques of pulse diagnosis have been developed over thousands of years, as these two systems of medicine are the world's oldest. **Acupuncture**, a branch of TCM, has long relied on pulse diagnosis as a main tool to determine the course of treatment. In Western medicine, every time a doctor checks the pulse of a patient and listens to the heartbeat with a stethoscope, the doctor is practicing a form of pulse diagnosis.

Benefits

Pulse diagnosis is a quick, inexpensive, and non-invasive diagnostic tool. When performed by trained professionals, it can be an effective means for determining the health conditions of patients.

Description

In conventional Western medicine, doctors check the pulse of patients by placing their hands on the wrist and by listening to the pulse at various points on the body with a stethoscope. Doctors check for abnormalities in rhythm and rate that may indicate heart problems, internal bleeding, and **fever**. Measuring blood pressure is essentially another pulse diagnosis, which indicates **hypertension**, circulatory conditions, and other problems.

In older healing systems, such as Ayurveda and TCM, doctors check the pulse just as Western doctors do, but they use a very intricate system of pulse measurements, and they rely on careful observations instead of diagnostic tools. Pulse diagnosis is considered as much an art as a science, and it takes physicians many years of training to become experts. Doctors skilled in pulse diagnosis can often find health problems with a quick touch. Some published observations have documented the effectiveness of pulse diagnosis by trained experts, comparing their diagnoses with the diagnoses with modern technology.

In Ayurvedic medicine, pulse diagnosis is called *nadi parkiksha*. The principle measurement of pulse is taken at the radial artery, a blood vessel that is located on the inside of the wrist. Ayurvedic doctors use three fingers to feel the pulse, and particular conditions are indicated depending on the pulse characteristics that each finger feels. Doctors note heart rate, counting how many beats occur per minute and per breathing cycle of the patient. Doctors also take deep and shallow readings of the pulse, pressing hard or gently on the artery. Ayurvedic doctors believe that the pulse can indicate how *prana*, or life energy, is flowing through a patient's system, and can indicate the condition of internal organs. Doctors check the pulse on both wrists, because each side of the body gives different indications.

Ayurvedic doctors may take pulse readings at other points on the body as well. These points include the brachial artery on the inside of the arm above the elbow, the carotid artery at the base of the neck, the femoral artery that travels down the inside of the leg, and pulse points at the temples, at the ankles, and on the top of the feet. Ayurvedic physicians use other diagnostic tools in conjunction with pulse analysis, including interviewing the patient and closely observing the physical characteristics of the tongue, voice, skin, eyes, appearance, urine, and stool, in addition to utilizing conventional diagnostic methods.

Pulse diagnosis in traditional Chinese medicine (including acupuncture) shares some similarities with Ayurvedic medicine. In TCM, pulse diagnosis is used to check the condition of the blood and of *qi* (chi), which is the invisible life energy that travels in channels (meridians) throughout the body. Using pulse diagnosis, physicians determine the condition of the internal organs, and describe conditions according to yin and yang (cold or hot, empty or full, weak or strong, etc.). Pulse diagnosis tells acupuncturists where there are problems with the flow of energy in the body.

In TCM, there are several pulse diagnosis techniques, but the one most commonly used is checking the radial arteries on each wrist. Each wrist has six positions that are checked, and the 12 positions on both wrists correspond to the 12 internal organs. At each position, there are three depths that are checked.

LI SHIZ-HEN (1518-1593)

Li Shiz hen was born in 1518 in the town of Kin Zhou (var. Qizhou) along the Yangtze River in the Hubei prov ince of China. His family was renowned for its medical expertise. At age 14, Shiz hen elected to study the family arts of medicine and pharmacology. As a medical student he distinguished himself with his scholarly writings.

Shiz hen served as a pharmacist for the Ming Dynasty. His reputation was such that he was assigned to an official position at the Imperial Academy of Medicine in Peking. There he earned the respect of the prince of China. Between 1552 and 1578, with the express permission of the Imperial family, Shiz hen engaged himself in studying the priceless ancient Chinese writings on medicinals, after which he undertook the massive task of reorganizing and classifying all of the information that was at his disposal. Shiz hen incorporated information that he learned from his own family along with the knowledge from the treasured ancient writings collected by the Chinese monarchs for centuries. The result of his decades long project was a massive encyclopedic text, called the *Bencao gangmu.* Shiz hen's work comprised 52 volumes, including all existing knowledge of botanicals and medicine that was available at the time. The books contained thousands of medical prescriptions and information on over 1,000 herbs. He presented the manuscript to the scholar Wang Shiz hen, who wrote an introduction for the book.

Shiz hen's voluminous work, also known as the *Great Herbal,* was the greatest written contribution from the Far East during the sixteenth century. In 1596, three years after Shiz hen's death, the Emperor Shen Tsun declared the book to be the official medical reference of China.

In all, the pulse can have 36 different qualities. Some of the observations noted during pulse diagnosis include the position of the artery, whether it is deep or shallow, the hardness or softness of the artery, the diameter of the blood vessel, the rate and strength of the pulse, and the rhythm of the heartbeat. TCM practitioners may take the pulse at other points on the body, frequently including the carotid artery at the base of the neck.

In TCM and acupuncture, pulse diagnosis is used in conjunction with other diagnostic techniques. TCM doctors closely interview patients, and pay attention to seeing, hearing, and smelling the patient. TCM practitioners also observe the tongue, and palpate (touch) parts of the body to check for swelling, **pain**, temperature, moisture, and other characteristics. TCM practitioners may also use conventional diagnostic techniques such as blood tests, scans, and others.

Preparation

Pulse diagnosis should be performed on patients under normal conditions to insure accuracy. The pulse should not be diagnosed after **exercise**, physical exertion, bathing, massage, sex, eating or drinking, while the patient is very hungry, or in a room where the temperature is very hot or cold.

Precautions

Pulse diagnosis can be a quick and inexpensive means of diagnosis, but it should be performed by a trained specialist to be most effective. Pulse diagnosis is best used in conjunction with other diagnostic techniques, including conventional ones. For patients with severe, chronic, or undetermined conditions, getting more than one diagnosis or opinion is recommended.

Training and certification

Pulse diagnosis is a technique that requires careful training by specialists. Pulse diagnosis is taught at schools that teach Ayurvedic medicine, traditional Chinese medicine, and acupuncture.

Resources

BOOKS

Lad, Dr. Vasant. *Ayurveda: The Science of Self Healing*. Wisconsin: Lotus Press, 1984.

Williams, Tom, Ph.D. *The Complete Illustrated Guide to Chinese Medicine*. Rockport, MA: Element, 1996.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine. 433 Front St., Catasaugua, PA 18032. (610) 266 1433.

Ayurvedic Institute of Albuquerque. P.O. Box 23445, Albuquerque, NM 87192. (505) 291 9698.

Douglas Dupler

Purification therapy *see* **Panchakarma**

Purple coneflower *see* **Echinacea**

Pygeum *see* **Saw palmetto**

Pyridoxine

Description

Pyridoxine, or vitamin B_6, is a member of the water-soluble family of B vitamins. It is necessary in the metabolism of proteins, fats, and carbohydrates; to make hormones and neurotransmitters; and to support the immune system. It also plays a role in the production of normal, healthy red blood cells and some of the neurotransmitters needed for proper nervous system function. In conjunction with **folic acid** and cobalamin, it acts to reduce homocysteine levels, thus lowering the risk of developing **heart disease**.

General use

Mild deficiencies of pyridoxine are common, despite the low daily requirements. The Recommended Daily Allowance (RDA) for babies under six months of age is 0.1 milligram (mg), and for babies six months to one year old, it is 0.3 mg. The daily requirement is 0.5 mg for children one to three years old, 0.6 mg for those four to eight years old, and 1 mg for nine- to 13-year-olds. Males aged 14–18 years need 1 mg, and those 19 years and older need 1.3 mg. The RDA for females aged 14–18 years is 1.2 mg for females, and for females over the age of 19, 1.3 mg. Requirements are somewhat increased during **pregnancy** (1.9 mg) and lactation (2 mg).

Pyridoxine has numerous therapeutic uses apart from treating deficiency. It has a calming effect on the nervous system and may alleviate **insomnia** by increasing serotonin levels in the brain. Because of the calming effects of pyridoxine, it has been tried as a possible adjunctive treatment for **schizophrenia**. As of 2008, however, the findings were inconclusive although additional studies on the use of pyridoxine for dealing with mental illness were under way.

Evidence suggests that pyridoxine reduces **nausea** for about a third of pregnant women who experience **morning sickness**. In addition, pyridoxine does not have any harmful effects on the fetus. It is also used to decrease the risk of heart disease by lowering homocysteine levels. Taken in conjunction with **magnesium** supplements, pyridoxine has been found to have beneficial effects on some people with **autism**. The vitamin B_6 and magnesium combination can also help to prevent the recurrence of **calcium** oxalate **kidney stones** in susceptible people. Those who are affected by **depression** or gestational diabetes may benefit from a moderate addition of it, as well. One type of hereditary **anemia** and several metabolic diseases are effectively treated with high doses of pyridoxine. A few chemotherapeutic agents, including vincristine, can be taken with fewer side effects when pyridoxine is added to the patient's regimen. The data are equivocal on whether **asthma** is improved by vitamin B_6 supplementation, but high doses—50 mg, taken twice daily—were used in the studies performed, creating a risk of nerve injury. There is some question as to the benefit to taking it for PMS, **carpal tunnel syndrome**, or diabetic neuropathy, although there is no harm in a trial of additional B_6 at a modest level. Taking B_6 has some benefit for those suffering from **osteoporosis** and **epilepsy**. Nevertheless, the advice of a healthcare professional should be sought before undertaking this, and any, supplemental treatment.

Preparations

Natural sources

Meats are the best food source of pyridoxine, followed by dairy and eggs. Although some grains contain B vitamins, they are generally lost in processing. Bananas, potatoes, mangoes, and avocados have the highest vitamin B_6 value among vegetarian foods. Fresh foods should be used because freezing destroys much of this vitamin. Minimizing the amount of water used in cooking prevents pyridoxine and other water soluble vitamins from leaching into it.

Supplemental sources

Pyridoxine supplements are available in both oral and injectable forms. Pyridoxine is also added to many processed grain products. Individuals may consider taking a balanced B complex supplement rather than high doses of an individual vitamin unless given instructions by a medical doctor to do so. Supplements ought to be stored in a cool, dry place, away from light, and out of the reach of children.

Deficiency

Symptoms of pyridoxine deficiency are nonspecific but may include nervousness, irritability, muscle twitches, insomnia, confusion, weakness, loss of coordination, and anemia. Frequent **infections** are likely as well due to the importance of vitamin B_6 to the immune system.

Risk factors for deficiency

Since meats are the best source of pyridoxine, followed by dairy and eggs, vegans are one of the groups at risk for deficiency. A balanced B vitamin supplement is adequate to prevent deficiency. People with malabsorption syndromes, chronic illnesses, or

hyperthyroidism may require somewhat larger amounts of vitamin B_6. Those who take birth control pills are more likely to have abnormally low levels and may benefit from a supplement of 25–50 mg per day. Elderly people are more likely to have a poor diet, and deficient pyridoxine will both increase their susceptibility to illness and prolong recovery. Alcoholics, smokers, and people who take certain medications, including estrogen, theophylline (for asthma), hydralazine (for **hypertension**), penicillamine (for **rheumatoid arthritis**), and isoniazid (for **tuberculosis**) are more likely to need extra pyridoxine. For asthmatics on theophylline, the side effects of this medication can also be reduced by the additional vitamin B_6. A healthcare professional ought to be consulted before individuals begin a program of supplementation.

Precautions

Allergic reactions to oral or injected pyridoxine are known to occur but are rare. It is possible to have toxic effects from large doses. At 2,000 mg daily, nerve damage may occur, causing numbness or tingling of the extremities and loss of coordination. These symptoms are usually, but not always, reversible. At 500 mg for daily dosages, there is possible toxicity if chronically taken many months or years. Finally, at 150 mg taken daily, there is rare, but possible, toxicity with long-term use. Thus, it is best to take no more than 50 mg a day unless under medical supervision to avoid the potential for toxicity. Chronic large doses may also cause photosensitivity. Pregnant women who take megadoses may create dependence in the newborn, who would be at risk for seizures. Nursing infants can also suffer adverse effects from large doses ingested in breast milk.

Side effects

High doses of pyridoxine may cause a rash in addition to the more serious complications listed under precautions.

Interactions

Optimal levels of **riboflavin**, **vitamin C**, magnesium, and **selenium** improve pyridoxine absorption. The effectiveness of levodopa is reduced by pyridoxine. Anyone taking levodopa, most commonly used to treat **Parkinson's disease**, should not take supplemental vitamin B_6. Other combination forms of medication for Parkinson's disease may not be affected. Phenytoin and phenobarbital, two medications sometimes used to control epilepsy, may also become less effective in the presence of extra vitamin B_6. Pyridoxine requirements are increased by the medications hydralazine, penicillamine, isoniazid, and some immunosuppressive agents. Both theophylline and estrogen containing medications, including birth control pills, block the metabolism of pyridoxine.

KEY TERMS

Chemotherapeutic agent—A medication used to treat disease, usually cancer.

Homocysteine—An amino acid produced from the metabolism of other amino acids. High levels are an independent risk factor for heart disease.

Neurotransmitter—One of a group of chemicals used by the nervous system to transmit messages between two neurons (nerve cells).

Serotonin—A neurotransmitter in the brain that helps to regulate moods, emotions, sleep, and appetite.

Vegan—A person who does not eat any animal products, including dairy and eggs.

Resources

PERIODICALS

Cherniack, E. Paul. "The Use of Alternative Medicine for the Treatment of Insomnia in the Elderly." *Psycho geriatrics* (March 2006): 21 30.

"Folic Acid, Pyridoxine [vitamin B6] and Cyanocobalamin [vitamin B12] Improve Symptoms in Patients with Schizophrenia" *Inpharma* (September 2, 2006): 16.

Ozyurek, H., et al. "Pyridoxine and Pyridostigmine Treat ment in Vincristine induced Neuropathy." *Pediatric Hematology and Oncology* (September 2007): 447 452.

Sun, Y., et al. "Efficacy of Multivitamin Supplementation Containing Vitamins B6 and B12 and Folic Acid as Adjunctive Treatment with a Cholinesterase Inhibitor in Alzheimer's Disease: A 26 week, Randomized, Double blind, Placebo controlled Study in Taiwanese Patients." *Clinical Therapy* (October 2007): 2204 2214.

Yazdanpanah, N., et al. "Effect of Dietary B Vitamins on BMD and Risk of Fracture in Elderly Men and Women: The Rotterdam Study." *Bone* (December 2007): 987 994.

Judith Turner
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Q

Qigong

Definition

Qigong (pronounced "chee-gung," also spelled *chi kung*) is translated from the Chinese to mean "energy cultivation" or "working with the life energy." Qigong is an ancient Chinese system of postures, exercises, breathing techniques, and meditations. Its techniques are designed to improve and enhance the body's *qi*. According to traditional Chinese philosophy, qi is the fundamental life energy responsible for health and vitality.

Origins

Qigong originated before recorded history. Scholars estimate qigong to be as old as 5,000–7,000 years. Tracing the exact historical development of qigong is difficult, because it was passed down in secrecy among monks and teachers for many generations. Qigong survived through many years before paper was invented, and it also survived the Cultural Revolutions in China of the 1960s and 1970s, which banned many traditional practices.

Qigong has influenced and been influenced by many of the major strands of Chinese philosophy. The Taoist philosophy states that the universe operates within laws of balance and harmony, and that people must live within the rhythms of nature—ideas that pervade qigong. When Buddhism was brought from India to China around the seventh century A.D., **yoga** techniques and concepts of mental and spiritual awareness were introduced to qigong masters. The Confucian school was concerned with how people should live their daily lives, a concern of qigong as well. The **martial arts** were highly influenced by qigong, and many of them, such as **t'ai chi** and kung fu, developed directly from it. **Traditional Chinese medicine** also shares many of the central concepts of qigong, such as the patterns of energy flow in the body. **Acupuncture** and **acupressure** use the same points on the body that qigong seeks to stimulate. In China, qigong masters have been renowned physicians and healers. Qigong is often prescribed by Chinese physicians as part of the treatment.

Due to the political isolation of China, many Chinese concepts have been shrouded from the Western world. Acupuncture was only "discovered" by American doctors in the 1970s, although it had been in use for thousands of years. With an increased exchange of information, more Americans have gained access to the once-secret teachings of qigong. In 1988, the First World Conference for Academic Exchange of Medical Qigong was held in Beijing, China, where many studies were presented to attendees from around the world. In 1990, Berkeley, California hosted the First International Congress of Qigong. In the past decade, more Americans have begun to discover the beneficial effects of qigong, which motivate an estimated 60 million Chinese to practice it every day.

Benefits

Qigong may be used as a daily routine to increase overall health and well-being, as well as for disease prevention and longevity. It can be used to increase energy and reduce **stress**. In China, qigong is used in conjunction with other medical therapies for many chronic conditions, including **asthma**, **allergies**, **AIDS**, **cancer**, headaches, **hypertension**, **depression**, mental illness, strokes, **heart disease**, and **obesity**.

Qigong is presently being used in Hong Kong to relieve depression and improve the overall psychological and social well-being of elderly people with chronic physical illnesses.

Description

Basic concepts

In Chinese thought, qi, or chi, is the fundamental life energy of the universe. It is invisible but present in

Beijing, woman in Ritan park using Qigong breathing exercise. *(© diyiming / Alamy)*

KEY TERMS

Martial arts—Group of diverse activities originating from the ancient fighting techniques of the Orient.

Meridians—Channels or conduits through which Qi travels in the body.

Qi—Basic life energy, according to traditional Chinese medicine.

Yin/Yang—Universal characteristics used to describe aspects of the natural world.

the air, water, food, and sunlight. In the body, qi is the unseen vital force that sustains life. We are all born with inherited amounts of qi, and we also get acquired qi from the food we eat and the air we breathe. In qigong, the breath is believed to account for the largest quantity of acquired qi, because the body uses air more than any other substance. The balance of our physical, mental, and emotional levels also affect qi levels in the body.

Qi travels through the body along channels called meridians. There are 12 main meridians, corresponding to the 12 principal organs as defined by the traditional Chinese system: the lung, large intestines, stomach, spleen, heart, small intestine, urinary bladder, kidney, liver, gallbladder, pericardium, and the "triple warmer," which represents the entire torso region. Each organ has qi associated with it, and each organ interacts with particular emotions on the mental level. Qigong techniques are designed to improve the balance and flow of energy throughout the meridians, and to increase the overall quantity and volume of qi. In qigong philosophy, mind and body are not separated as they often are in Western medicine. In qigong, the mind is present in all parts of the body, and the mind can be used to move qi throughout the body.

Yin and yang are also important concepts in qigong. The universe and the body can be described by these two separate but complementary principles, which are always interacting, opposing, and influencing each other. One goal of qigong is to balance yin and yang within the body. Strong movements or techniques are balanced by soft ones, leftward movements by rightward, internal techniques by external ones, and so on.

Practicing qigong

There are thousands of qigong exercises. The specific ones used may vary depending on the teacher, school, and objective of the practitioner. Qigong is used for physical fitness, as a martial art, and most frequently for health and healing. Internal qigong is performed by those wishing to increase their own energy and health. Some qigong masters are renowned for being able to perform external qigong, by which the energy from one person is passed on to another for healing. This transfer may sound suspect to Western logic, but in the world of qigong there are some amazing accounts of healing and extraordinary capabilities demonstrated by qigong masters. Qigong masters generally have deep knowledge of the concepts of Chinese medicine and healing. In China, there are hospitals that use medical qigong to heal patients, along with herbs, acupuncture, and other techniques. In these hospitals, qigong healers use external qigong and also design specific internal qigong exercises for patients' problems.

There are basic components of internal qigong sessions. All sessions require warm-up and concluding exercises. Qigong consists of postures, movements, breathing techniques, and mental exercises. Postures may involve standing, sitting, or lying down. Movements include stretches, slow motions, quick thrusts, jumping, and bending. Postures and movements are designed to strengthen, stretch, and tone the body to improve the flow of energy. One sequence of postures and movements is known as the "Eight Figures for Every Day." This sequence is designed to quickly and effectively work the entire body, and is commonly performed daily by millions in China.

Breathing techniques include deep abdominal breathing, chest breathing, relaxed breathing, and holding breaths. One breathing technique is called the "Six Healing Sounds." This technique uses particular breathing sounds for each of six major organs. These sounds are believed to stimulate and heal the organs.

Meditations and mind exercises are used to enhance the mind and move qi throughout the body. These exercises are often visualizations that focus on different body parts, words, ideas, objects, or energy flowing along the meridians. One mental **exercise** is called the "Inner Smile," during which the practitioner visualizes joyful, healing energy being sent sequentially to each organ in the body. Another mental exercise is called the "Microscopic Orbit Meditation," in which the practitioner intently meditates on increasing and connecting the flow of qi throughout major channels.

Discipline is an important dimension of qigong. Exercises are meant to be performed every morning and evening. Sessions can take from 15 minutes to hours. Beginners are recommended to practice between 15–30 minutes twice a day. Beginners may take classes once or twice per week, with practice outside of class. Classes generally cost between $10–$20 per session.

Preparations

Qigong should be practiced in a clean, pleasant environment, preferably outdoors in fresh air. Loose and comfortable clothing is recommended. Jewelry should be removed. Practitioners can prepare for success at qigong by practicing at regular hours each day to promote discipline. Qigong teachers also recommend that students prepare by adopting lifestyles that promote balance, moderation, proper rest, and healthy **diets**, all of which are facets of qigong practice.

Precautions

Beginners should learn from an experienced teacher, as performing qigong exercises in the wrong manner may cause harm. Practitioners should not perform qigong on either full or completely empty stomachs. Qigong should not be performed during extreme weather, which may have negative effects on the body's energy systems. Menstruating and pregnant women should perform only certain exercises.

Side effects

Side effects may occur during or after qigong exercises for beginners, or for those performing exercises incorrectly. Side effects may include **dizziness**, **dry mouth**, **fatigue**, headaches, **insomnia**, rapid heartbeat, shortness of breath, heaviness or numbness in areas of the body, emotional instability, **anxiety**, or decreased concentration. Side effects generally clear up with rest and instruction from a knowledgeable teacher.

Research and general acceptance

Western medicine generally does not endorse any of the traditional Chinese healing systems that utilize the concept of energy flow in the body, largely because this energy has yet to be isolated and measured scientifically. New research is being conducted using sophisticated equipment that may verify the existence of energy channels as defined by the Chinese system. Despite the lack of scientific validation, the results of energy techniques including qigong and acupuncture have gained widespread interest and respect. One California group of qigong practitioners now conducts twice-yearly retreats to improve their skills and energy level. Furthermore, qigong masters have demonstrated to Western observers astounding control over many physical functions, and some have even shown the ability to increase electrical voltage measured on their skin's surface. Most of the research and documentation of qigong's effectiveness for medical conditions has been conducted in China, and is slowly becoming more available to English readers. Papers from the World Conferences for Academic Exchange of Medical Qigong are available in English, and address many medical studies and uses of qigong. A video is now available that presents the basic concepts of medical qigong as well as specific exercise prescriptions for the treatment of **breast cancer**. The exercise prescriptions consist of movements, postures, visualizations, and positive affirmations.

In terms of mainstream research in the United States, the first ongoing long-term study of qigong began in 1999 at the Center for Alternative and Complementary Medicine Research in Heart Disease at the University of Michigan; it focuses on the speed of

healing of graft **wounds** in patients undergoing coronary bypass surgery. The National Center for Complementary and Alternative Medicine (NCCAM) has been funding studies of qigong since 2000. The first such study was conducted by a researcher in Arizona with patients using heart devices (pacemakers, etc.).

The breathing techniques of qigong are being studied intensively by Western physicians as of 2003 as a form of therapy for anxiety-related problems and for disorders involving the vocal cords. Qigong is also being used in the rehabilitation of patients with severe asthma or chronic obstructive pulmonary disease (COPD).

Training and certification

In China, qigong has been subject to much government regulation, from banning to increased requirements for teachers. In the United States at this time, qigong has not been regulated. Different schools may provide teacher training, but there are no generally accepted training standards. Qigong teachings may vary, depending on the founder of the school, who is often an acknowledged Chinese master. The organizations listed below can provide further information to consumers.

Resources

BOOKS

Lui, Dr. Hong, and Paul Perry. *Mastering Miracles: The Healing Art of Qi Gong as Taught by a Master*. New York: Warner Books, 1997.

MacRichie, Mames. *Chi Kung: Cultivating Personal Energy*. Boston: Element, 1993.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Sound Mind, Sound Body: Qi Gong. New York: Simon & Schuster, 2002.

Reid, Daniel. *A Complete Guide to Chi Gung*. Boston: Shambhala, 1998.

PERIODICALS

Baker, S. E.,C. M. Sapienza, and S. Collins. "Inspiratory Pressure Threshold Training in a Case of Congenital Bilateral Abductor Vocal Fold Paralysis." *International Journal of Pediatric Otorhinolaryngology* 67 (April 2003): 413 416.

Biggs, Q. M., K. S. Kelly, and J. D. Toney. "The Effects of Deep Diaphragmatic Breathing and Focused Attention on Dental Anxiety in a Private Practice Setting." *Dental Hygiene* 77 (Spring 2003): 105 113.

Emerich, K. A. "Nontraditional Tools Helpful in the Treatment of Certain Types of Voice Disturbances." *Current Opinion in Otolaryngology and Head and Neck Surgery* 11 (June 2003): 149 153.

Golden, Jane. "Qigong and Tai Chi as Energy Medicine." *Share Guide* (November December 2001): 37.

Johnson, Jerry Alan. "Medical Qigong for Breast Disease." *Share Guide* (November December 2001): 109.

Ram, F. S., E. A. Holloway, and P. W. Jones. "Breathing Retraining for Asthma." *Respiratory Medicine* 97 (May 2003): 501 507.

Tsang, H. W., C. K. Mok, Y. T. Au Yeung, and S. Y. Chan. "The Effect of Qigong on General and Psychosocial Health of Elderly with Chronic Physical Illnesses: A Randomized Clinical Trial." *International Journal of Geriatric Psychiatry* 18 (May 2003): 441 449.

ORGANIZATIONS

International Chi Kung/Qi Gong Directory. 2730 29th Street. Boulder, CO 80301. (303) 442 3131.

National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse. P.O. Box 7923, Gai thersburg, MD 20898 7923. (888) 644 6226. http:// nccam.nih.gov.

Qi: The Journal of Traditional Eastern Health and Fitness. PO Box 221343. Chantilly, VA 22022. (202) 378 3859.

Qigong Human Life Research Foundation. PO Box 5327. Cleveland, OH 44101. (216) 475 4712.

Qigong Magazine. PO Box 31578. San Francisco, CA 94131. (800) 824 2433.

Douglas Dupler
Rebecca J. Frey, PhD

Quan yin

Definition

Quan yin is the English transliteration of the Chinese name for a Buddhist divine figure whose Sanskrit name is Avalokitesvara. The meaning of this name is usually given as "the lord who hears and sees all," or "the lord who is seen within [the believer's soul]." The Chinese name Quan yin is sometimes translated as "the one who hears prayers." Quan yin is also known in China as Guanshiyin; in Japan as Kannon, Kanzeon, or Kwannon; in southeastern Asia as Quon Am; in Bali as Kanin; and in Tibet as Chen-resigs or Spyan-ras-gzigs. Although some English-language sources refer to Quan yin as a "goddess" or "saint," these terms are somewhat misleading because of their association with Western religions. Peter Matthiessen's phrase, "mythical embodiment of Buddhahood," or bodhisattva, is a more accurate description. A bodhisattva is a spirit or person who has earned the right, through renunciation of passions and cravings, to escape from the cycle of reincarnation and enter nirvana, but chooses to postpone their own bliss until they have helped others to achieve enlightenment.

Devotion to Quan yin as the bodhisattva of infinite mercy and compassion is widespread in the Buddhist world, and can be dated as far back as the first centuries of the Christian era. *(Beaconstox / Alamy)*

Origins

Devotion to Quan yin as the bodhisattva of infinite mercy and compassion is widespread in the Buddhist world, and can be dated as far back as the first centuries of the Christian era. It is important to note, however, that the notion of deity in Buddhism is quite different from Jewish and Christian concepts of God as creator and ruler of the universe. In classical Buddhist teachings, there are three forms or bodies of Buddhahood: the body of essence (Buddha as disembodied and impersonal absolute truth or reality; nirvana); the body of bliss (Buddha as a formless spirit with the power to save humans); and the body of emanation or transformation (Buddha assuming a human form to guide people to enlightenment). Avalokitesvara (Quan yin) is regarded as the embodiment of Buddha who guards the world between the appearance of Sakyamuni, the historical Siddhartha Gautama (born in India about 500 B.C.), and Maitreya, the Buddha of the future.

Avalokitesvara was originally portrayed as a male among Indian Buddhists, because a female bodhisattva is impossible according to the oldest Buddhist texts. Devotion to Avalokitesvara in the form of Quan yin was introduced into China as early as the first century A.D., and into Japan in the sixth or seventh century. Prior to the twelfth century A.D., Quan yin was always portrayed as a male in Chinese and Japanese art. The reason for later artistic representations of her as a female is not completely understood. Some scholars attribute the change to the popularity of a passage in the Lotus Sutra that speaks of Avalokitesvara as having the power to grant children to childless women, and to assume a human body of either sex in order to guide others to nirvana. By the eighth century, the Lotus Sutra was honored in China and Japan above all other Buddhist sacred texts because it was understood to mean that women could also attain enlightenment.

Other scholars think that a Chinese legend about Quan yin may have also played a part in popular devotion to this bodhisattva as a woman. According to the legend, Quan yin was born into this world as the daughter of a king of the Chou Dynasty (1050–256 B.C.), who was sentenced to death by her father for refusing to marry. When the executioner tried to behead her, his sword shattered before he could touch her. The legend helps to explain why Quan yin has been regarded in some parts of Asia as a protector of women who offers life as a Buddhist nun as an alternative to marriage. In Japan, the princess Chujo-Hime (753–781 A.D.), who was persecuted by her stepmother and became a Buddhist nun at the age of seventeen, was thought to be a living incarnation of Kannon. A memorial service is held each year in Japan on May 14 for Chujo-Hime at the Tokushoji Temple.

In Japan, the Pure Land sect of Buddhism honored Kannon or Kanzeon as one of the principal attendants of Amida, the Buddha of the Western Paradise. Japanese religious art often portrays the so-called Amida Raigo triad, which depicts Amida himself; Kannon, who represents the Buddha's mercy; and the Seishi Bosatsu, a bodhisattva who represents the Buddha's strength and power. The three are often shown as descending on a cloud at the moment of a Buddhist's death to lead him or her to the Western Paradise.

Popular modern Buddhist art portrays Quan yin as a barefoot woman dressed in a long flowing white

KEY TERMS

Avalokitesvara—The Sanskrit name of Quan yin.

Bodhisattva—A Buddhist holy person who has attained enlightenment, but postpones nirvana in order to help others become enlightened.

Lotus sutra—One of the most sacred texts of Buddhism, regarded as a summary of the supreme Buddhist teaching that leads one directly to enlightenment.

Nirvana—In Buddhism, release from the cycle of reincarnation through conquering one's hatreds, passions, and delusions.

robe, often pouring a stream of water from a small vase. The water represents peace and healing. She may also be shown holding a lotus, which represents purity; pearls, which symbolize illumination; or a bowl of rice seed, which represents fertility. Some statues also show her with several pairs of arms, each holding a different cosmic symbol, which symbolize the universal embrace of Buddha's compassion. She is also depicted standing on a fish, which represents her role as the special protector of fishermen and travelers.

Benefits

The benefits of devotion to Quan yin, like those of Western religious practice, include inner peace, a feeling of love leading to acts of compassion for others, and a stronger sense that one's existence has meaning. According to the National Center for Complementary and Alternative Medicine (NCCAM), religious and spiritual practices that emphasize positive beliefs and attitudes help the human immune system, lower the impact of emotional **stress** on the body, and lower the risk of developing **anxiety** disorders and **depression**.

According to a Buddhist nun who claims to have been taught the Quan Yin Method for attaining enlightenment by a Himalayan master, those who practice this method will "gain a happy and more relaxed life, liberate [themselves from the cycle of reincarnation], and save five generations of [their] family."

Description

Devotion to Quan yin or Kannon is fairly informal in most parts of eastern Asia. Devotees may meditate on the bodhisattva's qualities of mercy and compassion, and strive to put these qualities into action through service or acts of kindness toward others. In China, women sometimes offer small pieces of jade carved with images on Quan yin in her temples, or place them in domestic shrines. Other Buddhists may wear amulets with images of Quan yin or prayers of devotion. Peter Matthiessen tells of wearing an amulet made from a plum pit that was given to him by his Japanese spiritual teacher. The plum pit was inscribed with a ten-phrase **prayer** to Kanzeon in tiny Japanese characters. Some phrases from the prayer include: "Kanzeon! Devotion to Buddha! We are one with Buddha .... Our true Bodhisattva nature is eternal, joyful, selfless, pure. So let us chant each morning Kanzeon, with mindfulness! Every evening Kanzeon, with mindfulness!"

Some devotees go on pilgrimages to holy places associated with Quan yin. These include the mountainous island of Pu Tuo Shan off the coast of Shanghai, China, where Quan yin is said to have lived for nine years. At one time there were over a hundred shrines to Quan yin on the island, as well as a community of a thousand Buddhist monks. Japanese Buddhists may make the Bando Pilgrimage, which makes a circuit of 33 sites in eastern Japan sacred to Kannon. Visiting the shrines in the proper order is said to preserve the believer from hell and open the gate to the Western Paradise.

The Quan Yin Method for attaining nirvana requires 2-1/2 hours of **meditation** per day in addition to the following five precepts:

- Refraining from taking the life of any sentient beings. This precept requires strict adherence to a vegan or lactovegetarian diet.
- Refraining from speaking what is not true.
- Refraining from taking what is not offered.
- Refraining from sexual misconduct.
- Refraining from the use of intoxicants, which include gambling, pornography, and violent films or literature as well as alcohol, tobacco, and recreational drugs.

Preparations and precautions

There are no specific preparations necessary for devotion to Quan yin. Western readers, however, should obtain information about this bodhisattva from reliable histories of Buddhism or Asian religion rather than from popular New Age sources.

Research and general acceptance

No studies have been done as of 2004 comparing devotion to Quan yin to other forms of religious or spiritual practice. In the West, devotion to Quan yin is

more common among women who have left mainstream Jewish or Christian groups than it is among men. Some of these women identify Quan yin with such mother goddesses as Isis or with such Christian saints as the Virgin Mary. Scholars of religion, however, regard these comparisons as misleading and historically inaccurate.

Training and certification

Although there are Buddhist monasteries and study centers in the United States, they do not offer certification for teachers comparable to ordination for Christian or Jewish clergy. Readers who are interested in learning more about Quan yin or Buddhism in general may contact the monastery listed under Resources below.

Resources

BOOKS

Matthiessen, Peter. *The Snow Leopard*. New York: Penguin Books, 1987.

Pelletier, Kenneth, M.D. *The Best Alternative Medicine*, Chapter 11, "Spirituality and Healing." New York: Simon & Schuster, 2002.

Stanley Baker, Joan. *Japanese Art*. New York: Thames and Hudson, 1992.

Svoboda, Robert, and Arnie Lane. *Tao and Dharma*. Twin Lakes, WI: Lotus Press, 1995.

PERIODICALS

Hinohara, S. "Medicine and Religion: Spiritual Dimen sion of Health Care." *Humane Health Care* 1 (July December 2001): E2.

ORGANIZATIONS

Buddhist Association of the United States (BAUS). 1384 Broadway, 19th Floor, New York, NY 10018. (212) 398 8886. http://www.baus.org.

Chuang Yen Monastery. 2020, Route 301, Carmel, NY 10512. (845) 225 1819 or (845) 228 4288.

National Center for Complementary and Alternative Med icine (NCCAM). National Institutes of Health (NIH), Bethesda, MD 20892. http://nccam.nih.gov.

Supreme Master Ching Hai International Association. P. O. Box 730247, San Jose, CA 95173 0247. http://www. godsdirectcontact.org.

OTHER

Glassman, Hank. "Chujo Hime, Convents, and Women's Salvation." Lecture delivered at the International Symposium on Buddhist Convents, Columbia Univer sity, New York City, NY, 22 November 1998.

Rebecca Frey

Quercetin

Description

Quercetin is a widespread plant chemical, or phytochemical. Many food items contain quercetin. These include **garlic** and onions; broccoli, cauliflower, brussels sprouts, cabbage, and other brassica vegetables; leafy, green vegetables; apples, berries, and many other fruits; green and black tea; and red wine. This plant chemical is also found in commonly used medicinal herbal supplements such as St. John's wort (*Hypericum perforatum*) and *Ginkgo biloba*.

Quercetin is a particular type of phytochemical known as a flavonoid or bioflavonoid; more specifically, it is a member of a certain class of flavonoids called flavonols. Quercetin appears to have significant anti-inflammatory and antioxidant properties. **Antioxidants** act on free radicals, which are highly reactive molecules that initiate damaging chain reactions in the body. The body produces its own antioxidants that counter free radicals, but free radicals can still build up as a result of **stress**, age, pollution, cigarette smoke, or other causes. It is believed that the antioxidants found in fresh fruits and vegetables, sometimes by way of quercetin, may provide a protective effect. Practitioners of traditional medicine have long espoused the use of quercetin-containing plants to treat numerous medical conditions, including arthritis, **allergies**, **heart disease**, **cataracts**, cold sores, and **gout**, among others. Some practitioners also recommend quercetin supplements to treat **cancer**.

General use

For centuries, practitioners of traditional medicine in many different cultures have prescribed the intake of quercetin-containing plants to treat various illnesses. It was not until the 1930s, however, that Hungarian physiologist Albert Szent-Györgyi (1893–1986) first isolated flavonoids. His work introduced the scientific community to these phytochemicals.

At one point, scientists were concerned about quercetin because research had shown that it caused mutations in the DNA within bacteria and suggested that it might have a role in causing cancer in humans. Those concerns were allayed by subsequent studies in humans, as well as some in animals, that indicated quercetin instead may actually have a protective effect against cancer.

Cell-culture studies have indicated that quercetin both slows the growth of and encourages the programmed cell death (called apoptosis) of cancer cells.

The latter is especially important because cancer cells often do not undergo the programmed cell death that occurs in normal cells. In the late 2000s, the American Cancer Society, however, remained cautious with regard to quercetin because many of the studies of it had been performed on cell cultures or animals.

In addition to the cell-culture research, animal studies have also shown that quercetin may be effective in protecting against various cancers. In 2007, for instance, a research team published results from a small clinical trial that looked at quercetin's effects against colon cancer. Their results indicated that a combined treatment of quercetin and **curcumin**, a compound in curry, also worked against colon cancer in humans. In the study, published in *Clinical Gastroenterology & Hepatology*, the researchers provided the quercetin-containing supplement to five individuals who had a rare genetic condition, called familial adenomatous polyposis, which causes precancerous polyps to grow in their intestines and eventually leads to colon cancer. Over the course of the experiment, the researchers measured a 60% reduction in the number of polyps and a 50% decrease in the polyps' size. Another much larger study published in a 2006 issue of the *American Journal of Epidemiology*, however, showed no correlation between higher intakes of quercetin and other flavonols and a lower risk for colon cancer. This study reviewed self-reported dietary information as well as cancer incidence among 107,401 individuals. The researchers concluded that their results provided "little support for the hypothesis of an association between flavonoid intake and **colorectal cancer** risk, at least within the ranges of intakes consumed in the populations studied."

Another large cancer-related study published in a 2007 issue of the *American Journal of Epidemiology* indicated that quercetin seemed to have a preventive effect on pancreatic cancer, especially among smokers. This study's researchers estimated the intake of quercetin along with two other flavonols from self-reported dietary information collected from 183,518 individuals and then followed the participants for eight years to determine the incidence of pancreatic cancer. The researchers found that all three flavonols—the other two were kaempferol and myricetin—were associated with a significantly reduced risk of pancreatic cancer among current smokers, who have a comparatively high propensity for the disease.

Like the prostate-cancer study, many other studies have focused on fruit- and vegetable-rich **diets**, but not exclusively on quercetin. While such diets may be high in quercetin, the fact that they also contain many additional compounds makes it difficult for scientists to pinpoint the specific effects of quercetin.

The effects of quercetin on the cardiovascular system have also been studied. Animal studies have shown that quercetin prevents **hypertension** and cardiac hypertrophy (thickening of the heart muscle) in rats. In addition, numerous epidemiological studies point to a connection between quercetin and the prevention of **stroke** and cardiovascular disease, and a study in the November 2007 issue of the *Journal of Nutrition* reported that quercetin was able to reduce blood pressure in people who had hypertension.

Practitioners of traditional medicine may prescribe quercetin for various ailments, including **hay fever** and other allergies. It is thought that quercetin may reduce the amount of histamines that the body produces and releases in response to allergens, and this in turn may lessen the severity of allergy-related symptoms such as runny nose, watery eyes, and **hives**. This suspicion has also led to its use in treating insect **bites**. Quercetin is sometimes prescribed to treat arthritis, which is an inflammation of the joints, and to prevent **atherosclerosis** (sometimes called hardening of the arteries). It is also used treat or prevent cataracts and **macular degeneration**, which are thought to perhaps be related to the action of free radicals. Quercetin is also believed to lessen the burning **pain** associated with chronic prostatitis, which is an inflammation of the prostate, and to treat ulcers. Some users of quercetin assert that it helps **wounds** heal more quickly. In addition, practitioners may prescribe quercetin to help lower **cholesterol** levels, although research supporting this effect was lacking as of 2008.

Quercetin has potential implications in treatments for pain. According to a study in a 2003 issue of *Drug Development Research*, quercetin may alleviate some of the adverse effects that often occur with the use of morphine and other opioid drugs to treat moderate to severe pain. These adverse effects include drug tolerance, in which the effectiveness of the dose lessens over time, and drug dependence. The study, done on mice, showed that quercetin reversed the development of both morphine tolerance and dependence.

Various studies have shown that quercetin has antiviral properties. A study in a 2003 issue of the *Journal of Antimicrobial Chemotherapy*, for instance, reported that quercetin is a potential treatment for infection with the herpesvirus known as HSV-1. Indeed, some people use quercetin to treat cold sores, which are caused by HSV-1. The study also showed that quercetin counteracted a type of adenovirus. Adenoviruses infect numerous membranes in the body and are common causes of respiratory **infections**.

KEY TERMS

Bromelain—One or more enzymes found in pineapples and sometimes added to supplements to boost their effectiveness.

Flavonoids—Naturally occurring chemicals found in many fruits and vegetables that have potential beneficial effects on human health.

Phytochemicals—Plant chemicals.

Preparations

To help prevent cancer, the American Cancer Society recommends a daily diet that contains five or more servings of fruits and vegetables, but it does not have specific recommendations for any specific compound, including quercetin, that is contained within those fruits and vegetables.

Besides ingesting quercetin in foods, quercetin supplements are available in many health food stores as a powder and in capsule form. Quercetin supplements are sometimes combined with **bromelain**, which is an enzyme found in pineapple. This enzyme is thought to have anti-inflammatory properties, to fight allergies, and to heighten the activity of quercetin. Recommended dosages of quercetin can vary from 200–750 mg per day, often taken in several doses. Practitioners may also recommend that an individual increase his or her intake of the compound by taking various quercetin-containing extracts, such as *Ginkgo biloba*, or by consuming **green tea**, which is also high in quercetin.

Precautions

Major problems were unknown as of 2008, although some individuals may experience **nausea** from high doses of quercetin supplements.

Interactions

Persons taking quercetin supplements, particularly those containing bromelain, should consult their physician if they are taking other medications because possible drug interactions can occur. In addition, individuals who are undergoing chemotherapy should discuss this supplement with their doctors before taking it.

Resources

BOOKS

Mars, Brigitte. *The Desktop Guide to Herbal Medicine: The Ultimate Multidisciplinary Reference to the Amazing Realm of Healing Plants, in a Quick study, One stop Guide*. Laguna Beach, CA: Basic Health, 2007.

PERIODICALS

Cruz Correa M., Daniel A. Shoskes, Patricia Sanchez, Rhongua Zhao, Linda Hylind, Steven Wexner, et al. "Combination Treatment with Curcumin and Querce tin of Adenomas in Familial Adenomatous Polyposis." *Clinical Gastroenterology & Hepatology* 4 (August 2006): 1035 1038.

Edwards, Randi L., Tiffany Lyon, Sheldon E. Litwin, Alexander Rabovsky, J. David Symons, and Thunder Jalili. "Quercetin Reduces Blood Pressure in Hyper tensive Subjects." *Journal of Nutrition* 137 (November 2007): 2405 2411.

Lin, Jennifer, and Shumin M. Zhang. "Flavonoid Intake and Colorectal Cancer Risk in Men and Women." *American Journal of Epidemiology* 164, no. 7 (October 1, 2006): 644 651.

Nöthlings, Ute, Suzanne P. Murphy, Lynne R. Wilkens, Brian E. Henderson, Laurence N. Kolonel. "Flavonols and Pancreatic Cancer Risk: The Multiethnic Cohort Study." *American Journal of Epidemiology* 166, no. 8. (October 15, 2007): 924 931.

Leslie Mertz, Ph.D.

R

Rabies

Definition

Rabies is a viral illness that can affect any mammal but is most common in carnivores (flesh-eaters). It is sometimes referred to as a zoonosis, or disease of animals that can be communicated to humans. Rabies is usually transmitted in the saliva through a bite wound. The virus attacks the central nervous system, and is fatal once symptoms begin, with very rare exceptions.

Description

Rabies, also known as hydrophobia, belongs to the rhabdovirus family. Fewer than 10% of animal cases reported in the United States in 1998 were in domestic animals. Raccoons accounted for the largest number of cases in wild animals. Cases of rabies in humans are very infrequent in the United States, averaging one or two a year (down from over 100 cases annually in 1900), but the worldwide incidence is estimated to be between 30,000 and 50,000 cases each year. These figures are based on data collected by the World Health Organization (WHO) in 1997 and updated in 2002. Rabies is most common in developing countries in Africa, Latin America, and Asia, particularly India. Dog **bites** are the major origin of infection for humans in developing countries, but other important host animals may include the wolf, mongoose, and bat. Most deaths from rabies in the United States result from bat bites; the most recent victim was a man in Iowa who died in September 2002.

People whose work frequently brings them in contact with animals are considered to be at higher risk than the general population. This would include those in the fields of veterinary medicine, animal control, wildlife work, and laboratory work involving live rabies virus. People in these occupations and residents of or travelers to areas where rabies is a widespread problem should consider being immunized.

In late 2002, rabies re-emerged as an important public health issue. Dr. Charles E. Rupprecht, director of the World Health Organization (WHO) Collaborating Center for Rabies Reference and Research, has listed several factors responsible for the increase in the number of rabies cases worldwide:

- Rapid evolution of the rabies virus. Bats in the United States have developed a particularly infectious form of the virus.
- Increased diversity of animal hosts for the disease.
- Changes in the environment that are bringing people and domestic pets into closer contact with infected wildlife.
- Increased movement of people and animals across international borders. In one recent case, a man who had contracted rabies in the Philippines was not diagnosed until he began to feel ill in the United Kingdom.
- Lack of advocacy about rabies.

Causes and symptoms

The most common way to contract rabies is from the bite of an infected animal. Although bats are the most frequent source of human infection in the United States, dogs are the primary vector of rabies in most parts of the world. The disease may also be transmitted by tissues and body fluids other than saliva. Rare cases have occurred as a result of infection through corneal transplantation.

Rabies travels from the site of the bite along the peripheral nerves to the brain. The average incubation period in humans is 30–50 days, although it varies from 10 days to over a year. The initial symptoms are flu-like and nonspecific. They may include **fever**, **headache**, muscle **pain**, **sore throat**, **fatigue**, **nausea**, and **vomiting**. Altered sensation and muscle twitching in the area of the bite are signs that are more suspicious of rabies. When the virus reaches the brain, signs related to encephalitis (local or general inflammation of brain tissue)

KEY TERMS

Biopsy—The removal of a small sample of tissue for diagnostic purposes.

Direct fluorescent antibody test (dFA test)—A test in which a fluorescent dye is linked to an antibody for diagnostic purposes.

Encephalitis—Inflammation of the brain.

Rhabdovirus—A type of virus named for its rod- or bullet-like shape.

Vector—An animal or insect that carries a disease-producing organism.

Zoonosis (plural, zoonoses)—Any disease of animals that can be transmitted to humans. Rabies is an example of a zoonosis.

appear. This typically involves agitation, progressing to confusion, combativeness, seizures, and localized areas of paralysis. There may also be hypersensitivity to light, sound, and touch. The patient may be coherent at times, but less so as the disease progresses. Many viruses causing encephalitis may produce similar signs. The next stage is dysfunction of the brainstem. The well-known phenomenon of foaming at the mouth is caused by excessive saliva production combined with difficulty swallowing. Many patients will refuse liquids at this point due to the painful muscle contractions caused by swallowing. This is how rabies came to be known as hydrophobia, which means "fear of water." Coma ensues soon after brainstem involvement, and death occurs when the respiratory center is affected. The course of the disease is four to 20 days after symptoms appear, unless life support is used.

Diagnosis

Early in its course, and without a known history of an animal bite, rabies can be difficult to diagnose. Symptoms of the early encephalitic (brain tissue inflammation) phase are similar to those of most viral types of encephalitis. When signs of brainstem dysfunction appear shortly after this time, rabies becomes a more likely possibility. Several tests are available for rabies diagnosis, but none are extremely reliable in the living patient. Part of the challenge is that rabies is so limited to nerve tissue until the late phases of the disease. The examination of brain tissue reveals a characteristic known as a Negri body, which is diagnostic. Direct fluorescent antibody (dFA) staining of saliva, skin biopsy, and corneal impressions may also yield a diagnosis.

Treatment

Local wound cleansing is important. Anyone who has experienced an animal bite should wash it thoroughly with soap and water. Rabies is a fatal illness, so a bite that breaks the skin warrants a call to a health care provider for evaluation of whether post-exposure prophylaxis (PEP) is necessary. Alternative treatments are recommended as a complementary therapy to conventional treatment in the case of rabies. Observation of the animal for signs of rabies is recommended whenever possible.

Allopathic treatment

If a person is bitten by a domestic animal and the owner is known, vaccination status should be checked. People bitten by healthy, immunized animals are unlikely to need post-exposure prophylaxis (PEP). The animal can be confined for 10 days. If it is healthy at the end of that time, it is presumed not to have been capable of transmitting rabies at the time of the bite, so PEP for the person bitten is not necessary.

Wild animals that have bitten can be captured, destroyed, and tested for rabies. Postexposure vaccine and specific immune globulin can be given if deemed necessary. In the United States, if the person who was bitten has not had prophylactic immunization and has a high-risk bite, generally five rabies vaccinations and one injection of human rabies immune globulin are given. There have been no cases in this country of people contracting rabies after receiving correctly administered PEP.

Bites from mice, rats, or squirrels rarely require rabies prevention because these rodents are typically killed by any encounter with a larger, rabid animal, and would therefore be less likely to be carriers. Bites from raccoons, bats, or unvaccinated dogs or cats are more suspect. Anyone bitten by a bat in the United States should receive PEP unless the bat is captured and proven not to be rabid.

If a pet is bitten by an animal suspected to have rabies, its owner should contact a veterinarian immediately and notify the local animal control authorities. Domestic pets with current vaccinations should be revaccinated immediately; unvaccinated dogs, cats, or ferrets are usually euthanized (put to sleep). Further information about domestic pets and rabies is available on the American Veterinary Medical Association (AVMA) web site.

Expected results

Survival of rabies after the appearance of symptoms is exceedingly rare.

Prevention

The following precautions should be observed in environments where humans and animals may likely come into contact. Domesticated animals, including household pets, should be vaccinated against rabies. Booster shots, given according to the manufacturer's recommendations, are required to maintain immunity. Wild animals should not be touched or petted, no matter how friendly an animal may appear. It is also important not to touch an animal that appears ill or passive, or whose behavior seems odd, such as failing to show the normal fear of humans. These are all possible signs of rabies. Many animals, such as raccoons and skunks, are nocturnal and their activity during the day should be regarded as suspicious. People should not interfere with fights between animals. Because rabies is transmitted through saliva, a person should wear rubber gloves when handling a pet that has had an encounter with a wild animal. Windows and doors should be screened. Some victims of rabies have been attacked by infected animals, particularly bats, that entered through unprotected openings. Finally, garbage or pet food should not be left outside because it may attract wild or stray animals.

Members of the high-risk occupations mentioned above should consider prophylactic immunization. Those who receive this pre-exposure vaccine still require PEP in the event of a potentially infective episode, but they have several advantages. One is that they require fewer post-exposure vaccines. A second advantage is that the timing of the PEP may be less critical for people who are in remote areas, or don't have ready access to vaccine for other reasons. Last, some people may be exposed without being aware of it, and the prophylactic vaccine might protect them.

Resources

BOOKS

"Central Nervous System Viral Diseases: Rabies (Hydrophobia)." Section 13, Chapter 162 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

Corey, Lawrence. "Rabies Virus and Other Rhabdoviruses." *Harrison's Principles of Internal Medicine*, edited by Anthony S. Fauci et al., 14th ed.; New York: McGraw Hill, 1998.

PERIODICALS

Fooks, A. R., N. Johnson, S. M. Brookes, et al. "Risk Factors Associated with Travel to Rabies Endemic Countries." *Journal of Applied Microbiology* 94 (2003) (Supplement): 31S 36S.

"Human Rabies Iowa, 2002." *Morbidity and Mortality Weekly Report* 52 (January 24, 2003): 47 48.

Messenger, S. L., J. S. Smith, L. A. Orciari, et al. "Emerging Pattern of Rabies Deaths and Increased Viral Infectivity." *Emerging Infectious Diseases* 9 (February 2003): 151 154.

Smith, J., L. McElhinney, G. Parsons, et al. "Case Report: Rapid Ante Mortem Diagnosis of a Human Case of Rabies Imported Into the UK from the Philippines." *Journal of Medical Virology* 69 (January 2003): 150 155.

Stringer, C. "Post Exposure Rabies Vaccination." *Nursing Standard* 17 (February 5 11, 2003): 41 42.

Weiss, R. A. "Cross Species Infections." *Current Topics in Microbiology and Immunology* 278 (2003): 47 71.

ORGANIZATIONS

American Veterinary Medical Association (AVMA). 1931 North Meacham Road, Suite 100, Schaumburg, IL 60173 4360. http://www.avma.org.

Centers for Disease Control and Prevention. 1600 Clifton Rd., NE, Atlanta, GA 30333. (800) 311 3435, (404) 639 3311. http://www.cdc.gov

Institut Pasteur. 25 28, rue du Dr. Roux, 75015 Paris, France. +33 (0) 1 45 68 80 00. http://www.pasteur.fr/haut_ext.html.

OTHER

CDC. "Epidemiology of Rabies." http://www.cdc.gov/ncidod/dvrd/rabies/Epidemiology/Epidemiology.htm.

National Association of State Public Health Veterinarians, Inc. "Compendium of Animal Rabies Prevention and Control, 2003." *Morbidity and Mortality Weekly Report Recommendations and Reports* 52 (March 21, 2003) (RR 5): 1 6.

Judith Turner
Rebecca J. Frey, PhD

Radiation injuries

Definition

Radiation injuries are caused by ionizing radiation emitted by such sources as the sun, x-ray and other diagnostic machines, tanning beds, and radioactive elements released in nuclear power plant accidents and detonation of nuclear weapons during war and as terrorist acts.

Description

Ionizing radiation is made up of unstable atoms that contain an excess amount of energy. In an attempt to stabilize, the atoms emit the excess energy into the atmosphere, creating radiation. Radiation can either be electromagnetic or particulate.

Radiation sources

Natural sources	
Radon gas	55%
Inside the body	11%
Rocks, soil, and groundwater	8%
Cosmic rays	8%
Artificial sources	
Medical x-rays	11%
Nuclear medicine	4%
Consumer products (such as tobacco, televisions, and smoke detectors)	3%
Miscellaneous (including occupational exposure, nuclear fallout, and the production of nuclear materials for energy and weaponry)	<1%

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Bone marrow suppression—Decrease in production of blood components, including red blood cells, white blood cells, and platelets. This can result in anemia, increased susceptibility to infections, and excessive bleeding.

Cosmic radiation—Radiation of high penetrating power originating in outer space. It consists partly of high-energy atomic nuclei.

Dirty bomb—A bomb made with conventional explosives that also contains radioactive isotopes. When the bomb explodes, the radioactive material spreads contamination over a wide area.

DNA—Deoxyribonucleic acid. The chemical of chromosomes and hence the vehicle of heredity.

Esophagitis—Inflammation of the esophagus.

Isotope—An unstable form of an element that gives off radiation to become stable. Elements are characterized by the number of electrons around each atom. One electron's negative charge balances the positive charge of each proton in the nucleus. To keep all those positive charges in the nucleus from repelling each other (like the same poles of magnets), neutrons are added. Only certain numbers of neutrons work. Other numbers cannot hold the nucleus together, so it splits apart, giving off ionizing radiation. Sometimes one of the split products is not stable either, so another split takes place. The process is called radioactivity.

Melanoma—A highly malignant form of skin cancer associated with overexposure to ultraviolet radiation from sunlight.

Pneumonitis—Inflammation of the lungs.

The energy of electromagnetic radiation is a direct function of its frequency. The high energy, high frequency waves that can penetrate solids to various depths cause damage by separating molecules into electrically charged pieces, a process known as ionization. X rays are a type of electromagnetic radiation. Atomic particles come from radioactive isotopes as they decay to stable elements. Electrons are called beta particles when they radiate. Alpha particles are the nuclei of helium atoms—two protons and two neutrons—without the surrounding electrons. Alpha particles are too large to penetrate a piece of paper unless they are greatly accelerated in electric and magnetic fields. Both beta and alpha particles are types of particulate radiation. When over-exposure to ionizing radiation occurs, there is chromosomal damage in deoxyribonucleic acid (DNA). DNA is very good at repairing itself; both strands of the double helix must be broken to produce genetic damage.

Because radiation is energy, it can be measured. There are a number of units used to quantify radiation energy. Some refer to effects on air, others to effects on living tissue. The roentgen, named after Wilhelm Conrad Roentgen, who discovered x rays in 1895, measures ionizing energy in air. A rad expresses the energy transferred to tissue. The rem measures tissue response. A roentgen generates about a rad of effect and produces about a rem of response. The gray and the sievert are international units equivalent to 100 rads and rems, respectively. A curie, named after French physicists who experimented with radiation, is a measure of actual radioactivity given off by a radioactive element, not a measure of its effect. The average annual human exposure to natural background radiation is roughly 3 milliSieverts (mSv).

Any amount of ionizing radiation will produce some damage; however, there is radiation everywhere, from the sun (cosmic rays) and from traces of radioactive elements in the air (radon) and the ground (uranium, radium, carbon-14, potassium-40 and

many others). Earth's atmosphere protects us from most of the sun's radiation. Living at 5,000 feet altitude in Denver, Colorado, doubles exposure to radiation, and flight in a commercial airliner increases it 150-fold by lifting us above 80% of that atmosphere. Because no amount of radiation is perfectly safe and because radiation is ever present, arbitrary limits have been established to provide some measure of safety for those exposed to unusual amounts. Less than 1% of them reach the current annual permissible maximum of 20 mSv.

A 2001 ruling by the Federal Court of Australia indicated that two soldiers died from **cancer** caused by minimal exposure to radiation while occupying Hiroshima in 1945. The soldiers were exposed to less than 5 mSv of radiation. The international recommendation for workers is safety level of up to 20 mSv. The ruling and its support by many international agencies suggests that even extremely low doses of radiation can be potentially harmful.

Ultraviolet (UV) radiation exposure from the sun and tanning beds

UV radiation from the sun and tanning beds and lamps can cause skin damage, premature **aging**, and skin cancers. Malignant melanoma is the most dangerous of skin cancers and there is a definite link between type UVA exposure used in tanning beds and its occurrence. UVB type UV radiation is associated with **sunburn**, and while not as penetrating as UVA, it still damages the skin with over exposure. Skin damage accumulates over time, and effects do not often manifest until individuals reach middle age. Light-skinned people who most often burn rather than tan are at a greater risk of skin damage than darker-skinned individuals that almost never burn. The U.S. Food and Drug Administration (FDA) and the Centers for Disease Control (CDC) discourage the use of tanning beds and sun lamps and encourage the use of sunscreen with at least an SPF of 15 or greater. In addition, the rising incidence of melanoma in the United States has led the Environmental Protection Agency (EPA) to develop a sun safety education program for school-age children in order to begin changing public attitudes toward tanning.

Overexposure during medical procedures

Ionizing radiation has many uses in medicine, both in diagnosis and in treatment. X rays, CT scanners, and fluoroscopes use it to form images of the body's insides. Nuclear medicine uses radioactive isotopes to diagnose and to treat medical conditions. In the body, radioactive elements localize to specific tissues and give off tiny amounts of radiation. Detecting that radiation provides information on both anatomy and function. During the past 10 years, skin injuries caused by too much exposure during a medical procedure have been documented. In 1995, the FDA issued a recommendation to physicians and medical institutions to record and monitor the dosage of radiation used during medical procedures on patients in order to minimize the amount of skin injuries. The FDA suggested doses of radiation not exceed 1 Grey (Gy). (A Grey is roughly equivalent to a sievert.) As of 2001, the FDA was preparing further guidelines for fluoroscopy, the procedure most often associated with medical-related radiation skin injuries such as **rashes** and more serious **burns** and tissue death. Injuries occurred most often during angioplasty procedures using fluoroscopy.

CT scans of children have also been problematic. Oftentimes the dosage of radiation used for an adult isn't decreased for a child, leading to radiation overexposure. Children are more sensitive to radiation; a February 2001 study indicates 1,500 out of 1.6 million children under 15 years of age receiving CT scans annually will develop cancer. Studies show that decreasing the radiation by half for CT scans of children will effectively decrease the possibility of overexposure while still providing an effective diagnostic image. The benefits to receiving the medical treatment utilizing radiation is still greater than the risks involved; however, more stringent control over the amount of radiation used during the procedures will go far to minimize the risk of radiation injury to the patient.

Recent evidence suggests that some ethnic groups may be more vulnerable than others to radiation damage. A study done at New York University found that Jews are more likely to develop **ovarian cancer** as a delayed side effect of diagnostic x-rays of the abdomen than non-Jews. These findings require confirmation by further research, but they do indicate that ethnicity and other genetic factors are involved in susceptibility to radiation damage.

Side effects from radiation therapy to treat cancer

As many as half of all cancer patients receive some form of radiation therapy as a component of treatment. The therapy can be delivered from either an external or an internal source, although the former is more common. The machines used for external radiation have become more specialized to deliver the appropriate dose to either a superficial or a deep location on the body. Depending on the type and site of cancer being treated, internal sources of radiation can be injected, swallowed, or placed within the body in

sealed containers. These are implanted into or near the tumor, either temporarily or permanently.

Some types of tumors may be eliminated by radiation therapy, if the patient is able to withstand the necessary dose. In other cases, radiation is used in conjunction with other methods of treatment. It may be given before surgery, to shrink a tumor to an operable size, or after surgery, to try to destroy any cancerous cells that may remain. Radiation can be used to make patients with incurable disease more comfortable by decreasing the bulk of tumors to reduce **pain** or pressure. Treatment that is given as a comfort measure only is known as palliation, or palliative therapy.

Occupational radiation exposure

Specialists in industrial and occupational health are increasingly aware of the rising number of injuries related to on-the-job radiation exposure. One study of Swedish workers exposed to high levels of low-frequency magnetic fields found an increased incidence of kidney, liver, and pituitary gland tumors among the men, and a higher rate of **leukemia** and brain tumors among the women.

Sadly, the delayed effects of occupational radiation exposure have also delayed the adoption of necessary protection for workers at risk. A study of the high rate of **lung cancer** among Navajo Indians who worked in uranium mines during World War II did not bring about even partial protection for the miners until 1962. It was not until 1990 that Congress passed the Radiation Exposure Compensation Act to provide care for the injured miners.

The effects of cosmic radiation on human beings are also being investigated because of concern for the safety of air crew. Although findings are still inconclusive as of 2002, recent reports of an increased incidence of cancer among airline pilots and cabin crew members have led epidemiologists to study the long-term effects of cosmic radiation at the altitudes of modern aircraft flight.

Radiation exposure from nuclear accidents, weaponry, and terrorist acts

Between 1945 and 1987, there were 285 nuclear reactor accidents, injuring over 1,550 people and killing 64. The most striking example was the meltdown of the graphite core nuclear reactor at Chernobyl in 1986, which spread a cloud of radioactive particles across the entire continent of Europe. Information about radiation effects is still being gathered from that disaster, however 31 people were killed in the immediate accident and 1,800 children have thus far been diagnosed with thyroid cancer. In a study published in May 2001 by the British Royal Society, children born to individuals involved in the cleanup of Chernobyl and born after the accident are 600% more likely to have genetic mutations than children born before the accident. These findings indicate that exposure to low doses of radiation can cause inheritable effects.

Since the terrorist attack on the World Trade Center and the Pentagon on September 11, 2001, the possibility of terrorist-caused nuclear accidents has been a growing concern. All 103 active nuclear power plants in the United States are on full alert, but they are still vulnerable to sabotage such as bombing or attack from the air. A no-fly zone of 12 miles below 18,000 feet has been established around nuclear power plants by the Federal Aviation Administration (FAA). There is also growing concern over the security of spent nuclear fuel—more than 40,000 tons of spent fuel is housed in buildings at closed plants around the country. Unlike the active nuclear reactors that are enclosed in concrete-reinforced buildings, the spent fuel is stored in non-reinforced buildings. Housed in cooling pools, the spent fuel could emit dangerous levels of radioactive material if exploded or used in makeshift weaponry. Radioactive medical and industrial waste could also be used to make "dirty bombs." Since 1993, the Nuclear Regulatory Commission (NRC) has reported 376 cases of stolen radioactive materials.

One response on the part of health care workers has been stepped-up training in radiation disaster management. Emergency department personnel are being trained as of 2002 to use radiologic monitoring and other specialized equipment for treating victims of a terrorist attack involving radiation.

Causes and symptoms

Radiation can damage every tissue in the body. The particular manifestation will depend upon the amount of radiation, the time over which it is absorbed, and the susceptibility of the tissue. The fastest growing tissues are the most vulnerable, because radiation as much as triples its effects during the growth phase. Bone marrow cells that make blood are the fastest growing cells in the body. A fetus in the womb is equally sensitive. The germinal cells in the testes and ovaries are only slightly less sensitive. Both can be rendered useless with very small doses of radiation. More resistant are the lining cells of the body—skin and intestines. Most resistant are the brain cells, because they grow the slowest.

The length of exposure makes a big difference in what happens. Over time the accumulating damage, if

not enough to kill cells outright, distorts their growth and causes scarring and/or cancers. In addition to leukemias, cancers of the thyroid, brain, bone, breast, skin, stomach, and lung all arise after radiation. Damage depends, too, on the ability of the tissue to repair itself. Some tissues and some types of damage produce much greater consequences than others.

There are three types of radiation injuries.

- External irradiation: as with x-ray exposure, all or part of the body is exposed to radiation that either is absorbed or passes through the body.
- Contamination: as with a nuclear accident, the environment and its inhabitants are exposed to radiation. People are affected internally, externally, or with both internal and external exposure.
- Incorporation: dependent on contamination, the bodies of individuals affected incorporate the radiation chemicals within cells, organs, and tissues and the radiation is dispersed throughout the body.

Immediately after sudden irradiation, the fate of those affected depends mostly on the total dose absorbed. This information comes mostly from survivors of the atomic bomb blasts over Japan in 1945.

- Massive doses incinerate immediately and are not distinguishable from the heat of the source.
- A sudden whole-body dose over 50 Sv produces such profound neurological, heart, and circulatory damage that patients die within the first two days.
- Doses in the 10–20 Sv range affect the intestines, stripping their lining and leading to death within three months from vomiting, diarrhea, starvation, and infection.
- Victims receiving 6–10 Sv all at once usually escape an intestinal death, facing instead bone marrow failure and death within two months from loss of blood coagulation factors and the protection against infection provided by white blood cells.
- Between 2–6 Sv gives the person a fighting chance for survival if he or she is supported with blood transfusions and antibiotics.
- One or two Sv produces a brief nonlethal sickness with vomiting, loss of appetite, and generalized discomfort.

Side effects of radiation therapy

Damage caused to normal cells can show up either in the time frame shortly following radiation treatment, or as long as years after radiation has been completed. Symptoms that frequently occur soon after treatment include loss of appetite, **fatigue**, and skin changes. Less commonly, patients have **headache**, **nausea**, **vomiting**, **hair loss**, and weakness. In more severe cases, dehydration, seizures, and shock-type reactions can occur. The severity and type of effects will depend on the region of the body receiving treatment, the type of radiation used during the course of treatment, and the dose. There is also individual variation in the response. Skin rashes are common. They may take the form of redness, burn, dryness, **itching**, or soreness. Organs that were in the path of the beam may show changes, including scarring, functional changes (such as decrease in elasticity), and loss of cells. Tissues that have a rapid turnover of cells may be most severely affected, including the skin and lining of the gastrointestinal tract. More severe injuries may include long-term bone marrow suppression, and occasionally even other cancers, particularly sarcomas.

People who receive radiation in the region of the head and neck are likely to experience a dry and sore mouth to some degree. The skin may become dry, and the area under the chin may droop. Sense of taste can be altered or lost. Some may experience hair loss, earaches, or difficulty swallowing due to inflammation of the esophagus.

Radiation treatments given for or around the breast, chest, or lung can also cause esophagitis and accompanying trouble swallowing. Changes in the lung tissue may lead to pneumonitis or pulmonary fibrosis. The patient may develop a **cough**. Breast treatments may cause pain and swelling. Blood counts can decrease.

Side effects from treatment of the stomach and abdominal area can induce nausea and **diarrhea**. In the pelvic region, radiation may result in difficulties with urination, and **infertility** in both males and females. Women may also have symptoms of dryness, itching, or burning of the vagina.

Diagnosis

The various effects of radiation on the body are well recognized. Patients who are scheduled to undergo radioactive treatments should be informed of the potential side effects they will encounter based on the area being treated and the dose of radiation being used. Advice for coping with minor injuries should be given, as well as descriptions of what symptoms should prompt a call or a visit to the treating physician.

Treatment

It is clearly important to have some idea of the dose received as early as possible, so that attention can be directed to those victims in the 2-10 Sv range that

might survive with treatment. Blood transfusions, protection from infection in damaged organs, and possibly the use of newer stimulants to blood formation can save many victims in this category.

Local radiation exposures usually damage the skin and require careful wound care, removal of dead tissue, and skin grafting if the area is large. Again infection control is imperative.

One of the best known, and perhaps even mainstream, treatments of radiation injury is the use of *Aloe vera* preparations on damaged areas of skin. It has demonstrated remarkable healing properties even for chronic ulcerations resulting from radiation treatment. Another topical herb that may be effective against skin inflammation following radiation therapy is **chamomile** cream. Studies support the benefits of chamomile for skin inflammation and wound healing. Additional topical herbs that may be helpful are **calendula** and **St. John's wort**. These therapies can prove very helpful since skin reaction is one of the most common side effects of radiation therapy.

Guided imagery is a method that may be used following radiation treatment, especially to help ease pain. Several nutritional supplements help with healing **wounds**. These include **essential fatty acids** (Omega 3 and 6), **vitamin A**, vitamin B, and magnesium/zinc.

If the tumor being treated is determined to be sensitive to radiation, there are a few herbs that are said to reduce the adverse effects of radiation exposure. Ginseng is one that research suggests may have this benefit. Other nutrients thought to have some protective effects are coenzyme Q10, **kelp**, **pantothenic acid**, and **glutathione** with L-cysteine and L-methionine. **Garlic** and **vitamin C** support immune function. **Grape seed extract** is a powerful antioxidant that protects against cell damage by free radicals. Any nutritional measures to support optimum health before treatment are beneficial.

Allopathic treatment

The type of treatment used depends on the area and severity of the injury. Something as serious as bone marrow suppression would require more intensive therapy, whereas more minor conditions are treated symptomatically. Radiation-induced esophagitis may necessitate intravenous or gastrostomy feeding for a time until the injury is healed. If a perforation or a stricture develops, surgery may be necessary. Products are available to keep the eyes (drops with vitamin A) and oral mucosa moist, as the cells producing mucus and tears are often damaged.

Expected results

Tissue damage resulting from radiation exposure tends to be chronic in nature, and may even be progressive. For the lesser and more common types of problems, long-term treatment of symptoms should be anticipated.

Prevention

Part of preventing radiation injury involves doing research on the condition being treated. It is a good idea to be certain that radiation is the best available treatment for a particular cancer type before embarking on a course of therapy.

Information on preventing or minimizing damage from radiation produced by terrorist devices or other nuclear emergencies is available in a series of fact sheets that can be downloaded from the Centers for Disease Control (CDC) web site. The fact sheets cover such topics as basic radiation facts, acute radiation sickness (ARS), dirty bombs, effects of radiation on health, possible effects of radiation on unborn children, and protective measures in the case of a nuclear event.

Resources

BOOKS

Altman, Robert, and Michael Sarg. *The Cancer Dictionary*, revised edition. New York: Checkmark Books, 2000.

Balch, James, and Phyllis Balch. *Prescription for Nutritional Healing*. New York: Avery Publishing Group, 1997.

Johns Hopkins University. *Johns Hopkins Family Health Book*. New York: HarperCollins Publishers, 1999.

PERIODICALS

Brugge, D., and R. Goble. "The History of Uranium Mining and the Navajo People." *American Journal of Public Health* 92 (September 2002): 1410 1419.

"'Dirty Bomb' Threat Puts Spotlight on Unprepared EDs: Do You Have a Plan?" *ED Management* 14 (September 2002): 97 100.

Fears, T. R., C. C. Bird, D. Guerry 4th, et al. "Average Midrange Ultraviolet Radiation Flux and Time Outdoors Predict Melanoma Risk." *Cancer Research* 62 (July 15, 2002): 3992 3996.

Grunwald, Michael and Peter Behr. "Are Nuclear Plants Secure? Industry Called Unprepared for Sept. 11 Style Attack." *Washington Post*, November 3, 2001, p. A01.

Hakansson, N., B. Floderus, P. Gustavsson, et al. "Cancer Incidence and Magnetic Field Exposure in Industries Using Resistance Welding in Sweden." *Occupational and Environmental Medicine* 59 (July 2002): 481 486.

Harlap, S., S. H. Olson, R. R. Barakat, et al. "Diagnostic X Rays and Risk of Epithelial Ovarian Carcinoma in Jews." *Annals of Epidemiology* 12 (August 2002): 426 434.

Lim, M. K. "Cosmic Rays: Are Air Crew at Risk?" *Occupational and Environmental Medicine* 59 (July 2002): 428 432.
Vergano, Dan. "'Dirty' Bombs Latest Fear." *USA Today*, November 3, 2001.

ORGANIZATIONS

American College of Occupational and Environmental Medicine (ACOEM). 1114 North Arlington Heights Road, Arlington Heights, IL 60004. (847) 818 1800. www.acoem.org.
Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. www.cdc.gov.

Judith Turner
Rebecca J. Frey, PhD

Radiesthesia

Definition

Radiesthesia is also commonly known as dowsing. It is regarded principally as a mystic art that has many facets and applications. Basically, it is the process of locating the presence of an object, or assessing the energy given off by a subject, with an implement known as a dowsing rod, which is a Y-shaped hazel, beech, or alder branch or a **copper** rod. Dowsers may also use a pendulum, which is often weighted with a crystal or some other heavy weight. It is said that the important factor is the length of the line to which the weight is attached.

Origins

The concept of radiesthesia was known to the ancient Egyptians and Chinese; their artwork bears witness to this fact. Some estimate that dowsing may date as far back as 7,000 years.

The British Society of Dowsers was formed in the 1930s. The art was given the name radiesthesia by French priest Alex Bouly, derived from the Latin words radiation and perception. However, to many people it is still called dowsing. Modern practitioners of radiesthesia claim that their art uses a "sense" that was once commonly acknowledged, but that has been lost with time. **Radionics** is the process of dowsing using specially designed electrical equipment.

Benefits

While some may call its usefulness to question, the least that can be said is that radiesthesia does no harm.

KEY TERMS

Divining—The act of locating an object using a special sense or instinct.

Geopathic stress—Any variation in normal energy patterns which some believe can cause illness.

Rates—The subtle emanations of energy which may be detected with radionic equipment.

It does not employ radiation, it does not involve the administration of chemicals, and it is noninvasive. Some radiesthesia practitioners claim that they can not only diagnose illness and potential illness, but that they can also cure the patient by altering their energy patterns.

Description

Many different types of objects have traditionally been found with the aid of radiesthesia. Perhaps water wells most readily spring to mind. However, the list is long and includes minerals, lost objects, and people, including bodies, animals, and plants.

Practitioners specializing in this field list several uses of radiesthesia for health purposes. They claim that, in addition to locating areas and causes of disease, dowsing can indicate energy levels before and after healing sessions.

Radiesthesia is used by some who follow a holistic way of life to detect how fresh fruit and vegetables are before they buy them, claiming that the freshest produce gives off more energy than that which is not so fresh. It can also be used to assess the quality of soil and indicate steps to improve soil quality, they say.

The basic concept of radiesthesia is that there is some kind of interaction between the mind of the dowser and the object or information being sought. Practitioners refer to this interaction as the use of a kind of sixth sense, or extra sensory perception. It has also been described as a particular kind of instinct. Some who practice radiesthesia say that as many as 80% of people have the ability to dowse but many are unaware of it.

Some practice radiesthesia without even a prosthesis (a divining rod or pendulum), they just instinctively sense things. When used, a diving rod or pendulum is described as an implement that will help the dowser to focus on the object at hand.

To measure a human energy field, it should first be ascertained that the subject is not wearing any jewelry

or crystals. Then the therapist should stand three paces away, facing the patient. L-rods (divining rods) should be held parallel to the ground and pointing towards the patient. The dowser's mind should be focused and a conscious decision must be taken to measure the energy field of the patient's body.

Radiesthesia is also used to pick a location to build a house for example, so as to avoid certain situations such as groundwater, geopathic **stress**, or any other factor that is believed to be detrimental to health. In times gone by, important buildings such as churches, hospitals, palaces, castles and homes, were commonly built after consultation with a dowser regarding the best location.

Usually, when consulting with a radiesthesia practitioner, the patient will first be asked to provide a full case history prior to radiesthesia analysis. If radionic equipment is used, a detector pad will measure energy emanations, which are known as rates, and will be used in the analysis. These rates are said to correspond to organs, diseases, psychological condition, the elements, and even to indicate which alternative therapy would be best to treat the patient.

Preparations

The special equipment necessary for radiesthesia is the dowser's chosen divining implement, which may include specially designed electronic equipment. However, patients will be advised to remove jewelry and any crystals, and possibly anything metal attached to their clothes.

Precautions

Those who are seeking treatment for serious disease are advised to consult an alternative practitioner with regard to a radiesthesia consultation and to mention this to their allopathic physician.

Side effects

There are no known side effects associated with radiesthesia.

Research and general acceptance

Although there are many unexplained accounts of the successful use of radiesthesia, or dowsing, the practice is still the target of much ridicule and even contempt from some areas of the allopathic medical profession.

Training and certification

Since radiesthesia is considered an art, it is an acquired art more than a discipline that can be learned. However, the Radionics Institute, which was founded in 1988, offers various courses in addition to their world-wide training forum.

Resources

ORGANIZATIONS

The American Society of Dowsers. http://www.newhampshire.com/dowsers.org/.

The British Society of Dowsers. Sycamore Cottage, Tamley Lane, Hastingleigh, Ashford, Kent TN26 5HW, United Kingdom.

The Radionics Association. Baerlein House, Goose Green, Deddington, Oxon. OX15 0SZ, United Kingdom. (01869) 338852. http://www.interlog.com/~radionic/#institute.

Radionics Institute. 411 (W) 75 Eastdale, Toronto, Canada, M4C 5N3. http://www.mystical www.co.uk/dowsing.html.

OTHER

"Introduction to dowsing." http://home.interstat.net/~slawcio/dowsing.html.

Patricia Skinner

Radionics

Definition

Radionics is a highly controversial field that claims to detect and modulate life force using electronic devices. Patients can be diagnosed and treated without even meeting the practitioner, who uses a radionic "black box" to tune into "vibrational frequencies" from a sample of hair or blood. The device is then used to "broadcast" healing frequencies back to the patient, who may be hundreds of miles away.

Origins

The seeds of radionics can be found in **radiesthesia**, a diagnostic technique employing pendulums or dowsing rods developed by three French priests during the early 1900s. The founding father of radionics was Albert Abrams, an American neurologist (1864–1924) who believed that his machines could, from a sample of blood, hair, or even handwriting, determine a patient's sex, race, financial status, religion, and underlying causes of illness. His therapeutic machines were hermetically sealed and were not sold, only leased on the condition that they never be opened. Investigators who examined the devices around the time of Abrams' death found nothing inside to which they could attribute potential medical benefit. The principles of distance healing were

developed by a U.S. chiropractor, Ruth Drown, during the 1930s. Drown also maintained that her devices could produce x-ray-like images of a patient's condition, based solely on a blood sample. A scientific committee that examined these images in 1950 detected no recognizable anatomic structures in them, and concluded they were simply "fog patterns."

Benefits

For legal reasons, most radionics practitioners and manufacturers of radionics equipment are cautious of making public pronouncements about specific health benefits. However, a journal published by radionics founder Albert Abrams claimed the technology was effective against diseases as serious as **cancer**, **tuberculosis**, and **syphilis**. Court testimony has indicated that similar claims are made by present-day practitioners.

Description

Radionics advocates believe that underlying causes of diseases emit radio-like frequencies that can be detected by their equipment. A bundle of hair or a card containing a few dried drops of blood is placed into a receptacle in the machine. This "witness" is then analyzed using either a moving pendulum or a detector pad on which changes in surface tension are noted. In this way, areas of "resonance" are detected. Treatment may employ both appropriate frequencies generated by the machine, as well as the extra-sensory abilities of the healer. During the 1990s, computerized "adaptive biofeedback-type" devices were developed, allegedly capable of monitoring and responding "every 200 millionths of a second" to changes in the patient's body. Radionic treatment may be supplemented by homeopathic remedies, **color therapy**, and herbal extracts.

Precautions

Patients need to understand that the claims of radionics are highly controversial and, in some cases, grandiose. One radionics organization based in Canada not only offers certification in 18 healing-related fields, but also advertises its willingness to advise on such diverse subjects as gambling, animal breeding, management consulting, gardening, financial investments, engineering, prospecting, and archeology. This institute claims that radionics has been proven "in hundreds of controlled studies over the past 80 years," but refuses to divulge the names of its graduates "given the controversial nature of radionics." Furthermore, this group will not correspond with any potential client until an initial fee of at least $300 has been paid in U.S. currency. Another manufacturer of radionics-type equipment claims the ability "to enter the mind of any person on this planet" and to "compel them to do your will." It is particularly important to carefully read the literature offered by radionics practitioners, which often contains revealing disclaimers. A medical opinion should be sought in all cases of serious illness.

KEY TERMS

Placebo effect—The ability of substances possessing no medicinal value to nonetheless achieve health benefits through the patient's belief and consequent optimism.

Side effects

Radionic therapy is non-invasive and has no known side effects.

Research and general acceptance

Most physicians dismiss radionics as quackery, arguing that any observed benefits are caused only by **placebo effect**. In the United States, medical devices must be approved by the federal Food and Drug Administration (FDA), and a 1998 district court decision in Minnesota determined that the sale of an unapproved radionics "black box" device violated state laws against deceptive trade practices and consumer fraud. The sale of such equipment to terminally ill patients constituted "health quackery at its worst," said Hubert Humphrey III, the state's attorney general. "This deplorable conduct aimed at vulnerable, desperate consumers is health fraud in its darkest form and will not be tolerated in Minnesota," Humphrey said. Radionics advocates, on the other hand, say they suffer from systematic government oppression.

Training and certification

Home-study courses and/or certification in radionics are offered by institutions in the United States, Canada, and the United Kingdom. In some cases these institutes also market radionics equipment.

Resources

ORGANIZATIONS

The Radionic Association. Berlin House, Goose Green, Deddington, Oxford England OX5 4SZ.

David Helwig

Rashes

Definition

Rash is a popular term for a group of spots or an area of red, inflamed skin. A rash is usually a symptom of an underlying condition or disorder. Often only temporary, a rash is rarely a sign of a serious problem.

Description

A rash may occur on only one area of the skin, or it can cover almost all of the body. A rash may or may not itch. Depending on how it looks, a rash may be described as:

- blistering (raised oval or round collections of fluid within or beneath the outer layer of skin)
- macular (flat spots)
- nodular (small, firm, knotty rounded masses)
- papular (small, solid, slightly raised areas)
- pustular (pus-containing skin blisters)

Causes and symptoms

There are many theories as to why skin rashes occur. Sometimes the cause can be determined, and sometimes it cannot. Generally, a skin rash is an intermittent symptom, fading and reappearing. Rashes may accompany a range of disorders and conditions.

- Infectious illnesses. A rash is a symptom of many different infectious illnesses or conditions caused by bacteria, viruses, fungi, and other organisms. These include chickenpox, scarlet fever, Rocky Mountain spotted fever, ringworm, herpes, shingles, measles, scabies, and Lyme disease.
- Shared cosmetics and similar personal care items. It is not unusual for people to develop rashes from sharing face powder, mascara, and similar items with other family members or friends.
- Allergic reactions. One of the most common symptoms of an allergic reaction is an itchy rash. Contact dermatitis is a rash that appears after the skin is exposed to an allergen, such as metal, rubber, some cosmetics or lotions, or some types of plants (such as poison ivy, oak, or sumac). Drug reactions are another common allergic cause of rash. In this case, a rash is only one of a variety of possible symptoms, including fever, seizures, nausea and vomiting, diarrhea, heartbeat irregularities, and breathing problems. This rash usually appears soon after the first dose of the medicine is taken, although allergic reactions may be delayed for several days. Common culprits include such drugs as nevirapine, a medication used to treat HIV infection, and minocycline, a drug used to treat acne.
- Autoimmune disorders. Conditions in which the immune system attacks the body (like with systemic lupus erythematosus or purpura) often have a characteristic rash.
- Nutritional disorders. Scurvy, for example, is a disease caused by a deficiency of vitamin C and produces a rash as one of its symptoms.
- Cancer. A few types of cancer, such as chronic lymphocytic leukemia, can be the underlying cause of a rash.

Young girl with poison ivy rash on her face, which she is treating with calamine lotion. *(© Scott Camazine / Alamy)*

Rashes in infants

Rashes are extremely common in infancy, are not usually serious, and can be treated at home most of the time.

Diaper rash is caused by prolonged skin contact with bacteria and the baby's waste products in a damp diaper. This rash has red, spotty sores and there may

KEY TERMS

Atopic dermatitis—An intensely itchy inflammation often found on the face of people prone to allergies. In infants and early childhood, it's called infantile eczema.

Dermatitis (dermatoses)—A general term for inflammation of the skin.

Eczema—A superficial type of inflammation of the skin that may be very itchy and weeping in the early stages; later, the affected skin becomes crusted, scaly, and thick. There is no known cause.

Psoriasis—A common chronic skin disorder that causes red patches anywhere on the body.

Purpura—A group of disorders characterized by purple, red, or brown areas of discoloration visible through the skin.

Scabies—A contagious parasitic skin disease characterized by intense itching.

Systemic lupus erythematosus—A chronic immune disorder that attacks multiple parts of the body, including skin, blood vessels, kidneys, and connective tissue. Patients sometimes have a butterfly rash.

be an ammonia smell. In most cases, the rash will respond to drying efforts within three days. A diaper rash that does not improve in this time may be a **yeast infection** requiring prescription medication. A doctor should be consulted if the rash is solid, bright red, and is associated with a **fever**, or if the skin develops **blisters**, **boils**, or pus.

Infants can also get a rash on their cheeks and chin caused by contact with food, saliva, and stomach contents. This rash will come and go, but usually responds to a good cleaning after meals. About one-third of all infants develop **acne**, usually after the third week of life, in response to their mothers' hormones before birth. This rash will disappear in a few weeks to a few months. Heat rash is a mass of tiny pink bumps on the back of the neck and upper back caused by blocked sweat glands. The rash usually appears during hot, humid weather, although a baby with a fever can also develop the rash.

A baby should been seen by a doctor immediately if a rash:

- appears suddenly and is purple or blood colored
- looks like a burn
- appears while the infant seems to be sick

Diagnosis

A family doctor, naturopathic doctor, or dermatologist (skin disease specialist) can diagnose and treat rashes. Diagnosis can be made based on the patient's medical history, the appearance of the rash, the location of the rash, and any other accompanying symptoms. In some cases, the doctor may take a biopsy (skin sample) of the rash to assist in the diagnosis.

Treatment

Alternative treatments for rashes focus on relieving symptoms, clearing the rash, and rejuvenating the skin. There are many forms of alternative medicine that have remedies for rashes.

Herbals

Herbal remedies are very common in the treatment of different types of rashes. **Shingles** may be relieved by taking 30–50 drops of **St. John's wort** tincture in water three to six times a day. A variety of different herbals can be applied to different kinds of rashes.

- agrimony (*Agrimonia eupatoria*) tea spray: hives and moist rashes
- aloe (*Aloe vera*) gel: weeping rash, shingles, burns, sunburn
- amaranth (*Amaranthus hypochondriacus*) tea wash: hives
- beech (*Fagus grandifolia*) tea wash: diaper rash and poison ivy or oak rash
- black walnut (*Juglans nigra*) leaf tea: rashes, rashes caused by parasites, scabies
- burdock (*Articum lappa*) decoction: hives, eczema
- calendula (*Calendula officinalis*) infusion: hives, burns, sunburn; calendula lotion: plant-contact dermatitis
- cattail (*Typha latifolia*) paste: poison ivy rash
- chamomile tea wash: poison ivy, oak, or sumac rash
- chickweed (*Stellaria media*) salve: severe rashes, hives
- comfrey (*Symphytum officinale*) ointment, cream, or lotion: inflamed rash; cold tea compress from comfrey root: plant-contact dermatitis
- heartsease (*Viola tricolor*) infusion: hives
- goldenseal (*Hydrastis canadensis*) wash: poison ivy rash, rash caused by infection, diaper rash
- jewelweed (*Impatiens pallida*) rub: poison ivy or oak rash and skin irritation caused by briars, brambles, or nettles
- nettle (*Urtica dioca*) infusion: hives

- oak bark (*Querus alba*) tea: rashes
- oatmeal bath: plant-contact dermatitis
- pennyroyal (*Hedeoma pulegiodes*) tea wash: hives, shingles, measles, scabies, mumps, chickenpox, diaper rash, and poison ivy or oak rash
- pine (*Pinus* species) ashes: measles, chickenpox, and mumps rash
- plantain (*Plantago major*) poultice: poison ivy rash
- poplar (*Populus candicans*) tea wash: rashes
- sage (*Salvia officinalis*) tea wash: poison ivy or oak rash, and moist, weepy rashes
- sassafras (*Sassafras albidum*) root tea: rashes, shingles
- slippery elm (*Ulmus fulva*) bark paste: rashes
- solomon's seal (*Polygonatum multiflorum*) mashed root: poison ivy or oak rash
- St. John's wort (*Hypericum perforatum*) oil: shingles, and dry, itchy rashes
- sumac (*Rhus glabra*) tea wash: poison ivy rash
- thyme (*Thymus vulgaris*) salve: rashes
- witch hazel (*Hamamelis virginiana*) tincture: poison ivy or oak rash, diaper rash, and weeping rash
- yellow dock (*Rumex crispus*) decoction: hives

It is a good idea, however, to be careful in using herbal remedies. Cases have been reported of patients developing body rashes from **allergies** to such herbs as **feverfew**.

Homeopathy

Homeopathic remedies are individually prescribed for each patient. Some possible homeopathic remedies include:

- calcium sulfide (*Hepar sulphuris*) for rash with pus
- graphite (*Graphites*) for dry, red, cracked, itchy rash in the skin folds
- honeybee (*Apis*) for swelling and hives from bee stings
- nosode (*Medorrhinum*) for sharply defined red, possibly shiny, rash suggesting yeast infection
- poison ivy (*Rhus toxicodendron*) for plant contact dermatitis, itching hives, and restlessness
- stinging nettle (*Urtica urens*) for stinging hives with little inflammation
- sulfur for dry, red, cracked, itchy rash anywhere, including around the anus.

Other treatments

Other rash remedies include:

- Aromatherapy. The essential oils thyme, lavender, jasmine, and German chamomile may relieve allergy-induced eczema.
- Ayurveda. Rashes and hives are treated by drinking fresh cilantro juice and applying the pulp onto the rash. Fresh coconut water, melon rind, or a paste of turmeric (one part) and sandalwood (two parts) in goat's milk can be applied to the affected area. Hot milk (1 cup) containing coriander (1 teaspoon), cumin (1/2 teaspoon), and raw sugar (1 teaspoon) can be ingested once or twice daily to heal rashes and hives and restore skin health.
- Chinese medicine. Hives are treated with herbal preparations, acupuncture, ear acupuncture, and cupping. Preparations applied to the skin to relieve the itching associated with hives include Jie Du Cha Ji (Resolve Toxin Smearing Liquid), Zhi Yang Po Fen (Relieve Itching Powder), and Zhi Yang Xi Ji (Relieve Itching Washing Preparation). Contact dermatitis and drug dermatitis are treated with herbal formulas comprised of herbs chosen specifically for the patient's symptoms.
- Diet. An increased intake of mackerel, salmon, and herring provides essential fatty acids that may decrease itching and inflammation.
- Hydrotherapy. Hives can be relieved by rubbing the affected area with an ice cube, taking a cool bath, or using a cold compress.
- Hypnosis. Emotional stress can trigger many different dermatoses including certain rashes. Hypnosis has been helpful in treating atopic dermatitis, herpes, itching, psoriasis, hives, and other dermatoses.
- Juice therapy. Red rashes are treated with fresh apple, dark grape, papaya, or pineapple juices drunk at room temperature between meals.
- Supplements. Rashes may be treated with skin-repairing vitamins A, C, B complex, and zinc. Vitamin E can reduce skin dryness (decreasing the itch).

Allopathic treatment

Treatment of rashes focuses on providing relief of the **itching** that often accompanies them. Soothing lotions, topical corticosteroids (such as hydrocortisone), or oral antihistamines (Benadryl) can provide some relief. Topical antibiotics may be administered if the patient, particularly a child, has caused an infection by scratching.

For diaper rash, the infant's skin should be exposed to the air as much as possible. Ointments are not needed unless the skin is dry and cracked. Experts also recommend switching to cloth diapers and cleaning affected skin with plain water.

Expected results

Most rashes that have an acute cause (such as an infection or an allergic reaction) will disappear as soon

as the infection or irritant is removed from the system. Rashes that are caused by chronic conditions (such as autoimmune disorders) may remain indefinitely or may fade and then return periodically.

Prevention

Some rashes can be prevented, depending on the cause. A person known to be allergic to certain drugs or substances should avoid those things in order to prevent a rash. It is also a good idea to avoid sharing cosmetics and personal care items (including lip balms) with other family members or friends. Diaper rash can be prevented by using cloth diapers, keeping the diaper area very clean, breast-feeding, and changing diapers often. A person should launder clothing and rinse his or her skin first with rubbing alcohol and then with water after contact with a plant that can cause **contact dermatitis**.

Resources

BOOKS

"Rashes and Skin Problems." In *The Alternate Advisor: The Complete Guide to Natural Therapies and Alternative Treatments*. Richmond, VA: Time Life Books, 1997.

Reichenberg Ullman, Judyth, and Robert Ullman. *Homeopathic Self Care: The Quick and Easy Guide for the Whole Family*. Rockland, CA: Prima Pub lishing, 1997.

Ying, Zhou Zhong, and Jin Hui De. *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Bennett, Paul J., and Mukta Panda. "RHE1: It is Not Nice to Fool with Mother Nature: The Case of the Herbal Induced Rash." *Southern Medical Journal* 94 (Decem ber 2001): S29 S30.

Disdier, Patrick, Brigitte Granel, et al. "A Teenager with Rash and Fever." *Lancet* 358 (December 15, 2001): 2046.

"Mommy, Did You Borrow My Blush?" *Consumer Reports* 66 (October 2001): 9.

Shenefelt, Philip D. "Hypnosis in Dermatology." *Archives of Dermatology* 136 (March 2000): 393 399.

ORGANIZATIONS

American Academy of Dermatology. 930 N. Meacham Rd., P.O. Box 4014, Schaumburg, IL 60168. (708) 330 0230. http://www.aad.org.

Belinda Rowland
Rebecca J. Frey, PhD

Raspberry

Description

Raspberry (*Rubus ideaeus*) is a deciduous bush from the Rosaceae family that grows up to 6 ft (2 m) high, with erect and thorny stems, a thin spine and perennial roots. The bush is well-known for its fruit, a red spherical berry that grows continuously on the branches. Cymes (clusters) of white flowers bloom in late spring to early summer. Raspberries can be grown in many temperate countries, in either dry or moist wooded areas.

General use

Raspberry leaves are used as an astringent and stimulant. High concentrations of tannin found in the plant are the source of its astringent effects. It also contains flavonoids, pectin, citric and malic acids, and a crystallizable fruit sugar and water. Raspberries are high in minerals, especially **iron**, **magnesium**, and **calcium**. Raspberry is well regarded as a women's herb. The leaves are brewed into a tea that is used during **pregnancy** as well as to increase breast milk after the baby is born. Some women use tea made from raspberry leaves to regulate their menstrual cycles and to decrease heavy menstrual flow. It is also used for gastrointestinal disorders, respiratory illness, the cardiovascular system and for sores in the mouth and throat. The fruit has been found be anticarcinogenic.

Pregnancy

Raspberry leaves have been used for centuries by women during pregnancy. But it wasn't until a 1941

Raspberry. *(© blickwinkel / Alamy)*

KEY TERMS

Cyme—A flower cluster whose main branch ends in a flower that blooms before the others at its side or base.

Ellagic acid—A yellow crystalline compound derived from tannins and used to prevent bleeding. It is found in raspberries and is thought to help prevent cancer.

study in the British medical journal *Lancet* that raspberry leaves were scientifically confirmed to contain a complex biochemical that is a uterine relaxant. Raspberry leaves are commonly used throughout pregnancy for many reasons, including helping **morning sickness**, preventing miscarriage, strengthening the uterus, regulating contractions, and relaxing the uterus during labor. Some pet breeders give a tincture of red raspberry leaves to pregnant cats who are likely to have difficulty in kittening.

Gastrointestinal disorders

Because it is an astringent, raspberry is a gentle antidiarrheal. It is also used to reduce **nausea** and **vomiting**, usually for morning sickness.

Mouth and throat sores

Raspberry tea is helpful for healing mouth and throat sores when used as a mouthwash or gargle. It can also be used for bleeding gums and other oral inflammations. Some herbalists recommend it for colds, **measles**, and coughs.

Cancer treatment

The fruit of the raspberry may help prevent **cancer**, according to a January 1999 report in *Cancer Weekly Plus*. "Ellagic acid in raspberries has been shown in previous studies to be effective in inhibiting cancers in rats and mice," the study detailed. "The compound is . . . at especially high levels in blackberries and raspberries." Researchers at the Hollings Cancer Center at the Medical University of South Carolina in Charleston gave one cup of raspberries a day to each participant for one year. The study concluded that " . . . eating red raspberries may possibly prevent cancer by inhibiting the abnormal division of cells and promoting the normal death of healthy cells."

A 2001 study has found that black raspberries appear to be as helpful as red raspberries in preveting or slowing the growth of cancer. Black raspberries, according to an article in the journal Cancer Research, help to protect against esophageal cancer, which is the sixth-leading cause of deaths from cancer worldwide. Esophageal cancer is one of the deadliest forms of the disease— five-year survival rates range from 8% to 12%. Researchers think that ellagic acid is not the only beneficial compound in raspberries, however, and are presently studying other substances found in the fruit.

Diabetes

Some studies have shown that raspberries may help reduce glucose levels and therefore may be helpful to people with diabetes.

Preparations

Raspberry leaf tea can be made by adding 1 tsp of the leaf to one cup of boiling water. The leaf should be infused for 10 min and then strained. The infusion can be taken once or twice a day. During pregnancy, use 0.5 oz of leaf to one pt of boiling water and drink once a day. For infant **diarrhea**, dilute this infusion by 50%. A tincture made of raspbery leaf can be taken three times a day, in 2–4 ml doses.

Precautions

Wilted raspberry leaves develop a mild poison that may make people ill. When picking the leaves for the tea, the user should make sure that the plant is flowering. Leaves used for steeping to make tea must be fully dried. Another important precaution is to be sure that the raspberries are not contaminated by a gastrointestinal parasite called *Cyclospora*. The parasite causes a disease called *cyclosporiasis,* which caused several serious outbreaks in the mid-1990s in the United States and Canada. The *Cyclospora* parasite was found in raspberries imported from Guatemala.

Side effects

Although raspberry is used as an antidiarrheal herb, overuse may actually cause diarrhea. In addition, some people may be allergic to raspberries and other berries. Lastly, the tea may sometimes be too tonifying in the early stages of pregnancy; it should be discontinued if contractions increase.

Interactions

No known adverse interactions with other medications have been reported.

Resources

BOOKS

Weiner, Michael. *Weiner's Herbal*. New York: Quantum Books, 1990.

PERIODICALS

Ackers, Marta Louise, and Barbara L. Hervaldt. "An out break in 1997 of cyclosporiasis associated with imported raspberries." *New England Journal of Medicine* (May 29, 1997): 1545 9.

"Black Raspberries Show Multiple Defenses in Thwarting Cancer." *Cancer Weekly* (November 13, 2001): 24.

Henderson, Charles W. "Red Raspberries May Help Fight Cancer." *Cancer Weekly Plus* (January 18, 1999).

Katherine Y. Kim
Rebecca J. Frey, PhD

Raynaud's syndrome

Definition

Raynaud's syndrome is a disorder in which the fingers or toes (digits) suddenly experience decreased blood circulation. It is also called Raynaud's disease.

Description

Raynaud's syndrome can be classified as one of two types: primary, or idiopathic (of unknown cause) disease; and secondary, which is also called Raynaud's phenomenon.

Primary Raynaud's disease is milder and causes fewer complications. About half of all cases of Raynaud's disease are of this type. Women are four times more likely than men to develop primary Raynaud's disease, and the average age of diagnosis is between 20 and 40 years. About 30% of all cases of primary Raynaud's disease progress after diagnosis, while 15% of cases actually improve.

Secondary Raynaud's disease is more complicated, severe, and more likely to get worse over time. A number of medical conditions or other triggers predispose a person to secondary Raynaud's disease, but do not directly cause the disorder. These include:

- Scleroderma. Scleroderma is a serious disease of the connective tissue, in which tissues of the skin, heart, esophagus, kidney, and lung become thickened, hard, and constricted. About 30% of patients

Raynaud's syndrome. *(© Hercules Robinson / Alamy)*

diagnosed with scleroderma will then develop Raynaud's disease.

- Other diseases of connective tissue. These include systemic lupus erythematosus, rheumatoid arthritis, dermatomyositis, and polymyositis.
- Diseases that cause arterial blockage. These include atherosclerosis or hardening of the arteries.
- A severe form of high blood pressure which is caused by diseased arteries in the lung, called pulmonary hypertension.
- Disorders of the nervous system. These include herniated discs in the spine, strokes, tumors within the spinal cord, polio, and carpal tunnel syndrome.
- Other blood disorders.
- Trauma. Injuries that lead to Raynaud's are typically caused by exposure to constant vibration (workers who use chainsaws, jackhammers, or other vibrating equipment); repetitive movements (keyboard instrumentalists, assembly line workers, typists); electric shock; repeated use of the lower side of the palm as a hammer; or extreme cold (frostbite).
- Environmental toxins. Workers in the plastics industry who are exposed to high levels of vinyl chloride may develop a scleroderma-like illness that includes Raynaud's syndrome.
- Prescription medications. Drugs that increase the risk of developing Raynaud's include those used for migraine headaches or high blood pressure, and some cancer chemotherapy agents. Cases have also been reported of Raynaud's disease developing in reaction to quinine.

KEY TERMS

Contract—To squeeze down, become smaller.

Cyanosis—Blueness of the skin, caused by inadequate blood flow or oxygen supply. The affected area of skin is said to be cyanotic.

Dilate—To expand in diameter and size.

Endothelium—A thin layer of smooth tissue that lines the inside of blood vessels, the heart and abdomen, and other body cavities.

Idiopathic—Of unknown cause. Primary Raynaud's is an idiopathic disorder.

Prostaglandins—Unsaturated fatty acids that are associated with the contraction of smooth muscle, control of inflammation, and regulation of body temperature. Researchers think that prostaglandins may hold a clue to the cause of Raynaud's.

Rheumatology—The branch of medicine that specializes in the treatment of arthritis and related conditions, including Raynaud's disease.

Causes and symptoms

Causes

Both primary and secondary types of Raynaud's symptoms are believed to be due to overreactive arterioles, or small arteries. While cold normally causes the muscle which makes up the walls of arteries to contract (squeeze down to become smaller), in Raynaud's disease the degree is extreme. Blood flow to the area is severely restricted. Some attacks may also be brought on or worsened by **anxiety** or emotional distress.

Although the cause of primary Raynaud's is not known as of 2002, researchers are focusing on prostaglandin metabolism and the function of endothelial cells in the body. Prostaglandins are a group of unsaturated fatty acids involved in the contraction of smooth muscle and the control of inflammation and body temperature. Endothelial cells form the layer of smooth tissue that lines the inside of the heart, blood vessels, and other body cavities.

Recent advances in gene mapping and sequencing indicate that Raynaud's may be linked to abnormal forms of a gene known as the Fibrillin-1 gene. This gene affects the composition of the protein molecules in human connective tissue.

Symptoms

Classically, there are three distinct phases to an episode of Raynaud's symptoms. When first exposed to cold, the arteries respond by contracting intensely. The digits in question, or in rare instances, the tip of the nose or tongue, become pale and white as they are deprived of blood flow and the oxygen carried by the blood. In response, the veins and capillaries dilate, or expand. Because these vessels carry deoxygenated blood, the digit becomes cyanotic, which means that it turns blue. The digit often feels cold, numb, and tingly. After the digit begins to warm up again, the arteries dilate. Blood flow increases significantly, and the digits turn a bright red. During this phase, the patient often describes the digits as feeling warm, and throbbing painfully.

Raynaud's disease may initially only affect the tips of the fingers or toes. When the disease progresses,

it may eventually affect the entire finger or toe. Ultimately, all the fingers or toes may be affected. About 10% of the time, a complication called sclerodactyly may occur. In sclerodactyly, the skin over the affected digits becomes tight, white, thick, smooth, and shiny.

When the most serious complications of Raynaud's disease or phenomenon occur, the affected digits develop deep sores, or ulcers, in the skin. The tissue may even die, thus becoming gangrenous, and requiring amputation. This complication occurs only about 1% of the time in primary Raynaud's disease.

Diagnosis

While the patient's symptoms will be the first clue pointing to Raynaud's disease, a number of tests may also be performed to confirm the diagnosis. Special blood tests called the antinuclear antibody test (ABA) and the erythrocyte sedimentation rate (ESR) are often abnormal when an individual has a connective tissue disease.

When a person has connective tissue disease, his or her capillaries are usually abnormal. A test called a nailfold capillary study can demonstrate such abnormalities. In this test, a drop of oil is placed on the skin at the base of the fingernail. This allows the capillaries in that area to be viewed more easily with a microscope.

A cold stimulation test may also be performed. In this test, specialized thermometers are taped to each of the digits that have experienced episodes of Raynaud's disease. The at-rest temperature of these digits is recorded. The hand or foot is then placed completely into a container of ice water for 20 seconds. After removing the hand or foot from this water, the temperature of the digits is recorded immediately. The temperature of the digits is recorded every five minutes until they reach the same temperature they were before being put into the ice water. A normal result occurs when this pretest temperature is reached in 15 minutes or less. If it takes more than 20 minutes, the test is considered suspicious for Raynaud's disease or phenomenon.

Treatment

The first type of treatment for Raynaud's symptoms is simple prevention. Patients need to stay warm, and keep hands and feet well covered in cold weather. Patients who smoke cigarettes should stop, because nicotine worsens the problem. Most people—especially those with primary Raynaud's—are able to deal with the disease by taking these basic measures.

Because episodes of Raynaud's disease have also been associated with **stress** and emotional upset, the disease may be improved by helping a patient learn to manage stress. Regular **exercise** is known to decrease stress and lower anxiety. Hypnosis, **relaxation** techniques, and visualization are also useful methods to help a patient gain control of his or her emotional responses. **Biofeedback** training is a technique during which a patient is given continuous information on the temperature of his or her digits, and then taught to voluntarily control this temperature. **Acupuncture** is also used for treating these circulatory and heat distribution problems.

Some alternative practitioners believe that certain dietary supplements and herbs may be helpful in decreasing the vessel spasm of Raynaud's disease. Suggested supplements include **vitamin E** (found in fruits, vegetables, seeds, and nuts), **magnesium** (found in seeds, nuts, fish, beans, and dark green vegetables), and fish oils. Several types of herbs have been suggested, including peony (*Paeonia lactiflora*) and **dong quai** (*Angelica sinensis*). The circulatory herbs **cayenne** (*Capsicum frutescens*), **ginger** (*Zingiber officinale*), and prickly ash (*Zanthoxylum americanum*) can help enhance circulation to the extremities. Additionally, a tincture of one-half teaspoon of a combination of equal parts of *ginkgo biloba*, prickly ash, and ginger may be consumed three times daily.

Practitioners of **traditional Chinese medicine** (TCM) recommend certain formulas called *si ni*, which means cold extremities. TCM regards Raynaud's as an indication that the person is hypersensitive to cold outside the body because he or she is already cold inside. The Chinese practitioner will typically recommend various combinations of herbs regarded as warming to correct this condition. The *si ni* formulas contain different combinations of ginger, **aconite**, bupleurum, bitter orange, and honey-baked **licorice**.

Allopathic treatment

People with more severe cases of Raynaud's disease may need to be treated with medications to attempt to keep the arterioles relaxed and dilated. Some medications that are more commonly used to treat high blood pressure, such as calcium-channel blockers, or reserpine, are often effective for treatment of Raynaud's symptoms. Nitroglycerin paste can be used on the affected digits, and seems to be helpful in healing skin ulcers.

When a patient has secondary Raynaud's phenomenon, treatment of the coexisting condition may help control the Raynaud's as well. In the case of

connective tissue disorders, this often involves treatment with corticosteroid medications.

Expected results

The prognosis for most people with Raynaud's disease is very good. In general, primary Raynaud's disease has the best prognosis, with a relatively small chance for serious complications (1%). In fact, about 50% of all patients do well by taking simple precautions, and never even require medications. The prognosis for people with secondary Raynaud's disease or phenomenon is less predictable. This prognosis depends greatly on the severity of the patient's other associated condition, such as scleroderma or lupus.

Prevention

As of 2002, there is no known way to prevent the development of Raynaud's disease. Once a person realizes that he or she suffers from this disorder, however, steps can be taken to reduce the frequency and severity of episodes.

Resources

BOOKS

Creager, Mark A., and Victor J. Dzau. "Vascular Disease of the Extremities." In *Harrison's Principles of Internal Medicine,* edited by Anthony S. Fauci, et al. 14th ed. New York: McGraw Hill, 1998.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*. New York: Simon & Schuster, 2002.

"Raynaud's Disease and Phenomenon," Section 16, Chapter 212 in *The Merck Manual of Diagnosis and Therapy*, 17th edition, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2003.

PERIODICALS

Agarwal, N., and B. Cherascu. "Concomitant Acral Necrosis and Haemolytic Uraemic Syndrome Follow ing Ingestion of Quinine." *Journal of Postgraduate Medicine* 48 (July September 2002): 197 198.

Dharmananda, Subhuti. "Raynaud's Disease: Chinese Medical Perspective." *Internet Journal of the Institute for Traditional Medicine and Preventive Health Care* 1 (July 2002): 1 7.

Heitmann, C., M. Pelzer, M. Trankle, et al. "The Hypoth enar Hammer Syndrome." [in German] *Der Unfall chirurg* 105 (September 2002): 833 836.

Kodera, T., F. K. Tan, T. Sasaki, et al. "Association of 5 Untranslated Region of the Fibrillin 1 Gene with Jap anese Scleroderma." *Gene* 297 (September 4, 2002): 61 67.

ORGANIZATIONS

American College of Rheumatology. 1800 Century Place, Suite 250, Atlanta, GA 30345. (404) 633 3777. www.rheumatology.org.

Institute of Traditional Medicine. 2017 SE Hawthorne Blvd., Portland, OR 97214. (503) 233 4907. www.itmonline.org.

National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse. National Insti tutes of Health, 1 AMS Circle, Bethesda, MD 20892. (301) 495 4484 or (toll free)(877) 22 NIAMS. www.niams.nih.gov.

OTHER

National Institutes of Health. *Questions and Answers About Raynaud's Phenomenon*. Bethesda, MD: National Institutes of Health, 2001. NIH Publication No. 01 4911.

"Raynaud's Disease." http://www.alternaticemedicine.com/digest/issue04/04354R00.sh.

Kathleen D. Wright
Rebecca J. Frey, PhD

Reconstructive therapy *see* **Prolotherapy**

Red cedar

Description

Red cedar, also called western red cedar or western redcedar, is the species *Thuja plicata*. It should not be confused with the eastern red cedar, *Juniperus virginiana*, or the Lebanon cedar, *Cedrus libani*, which are unrelated species. Eastern red cedar is toxic if taken internally.

Western red cedar is a tree that grows to a height of 125 ft (60 m) in moist soils in mixed coniferous forests. It has red-brown or gray-brown bark with thick longitudinal fissures that is easily peeled. Its foliage develops in sprays about 6 in (15 cm) long with small, highly aromatic leaves. The leaves, twigs, bark, and roots are all used medicinally.

Western red cedar is found in northwestern North America, in the United States and western Canada from Alaska through northern California and in the Rocky Mountains from British Columbia through Montana. Other names for *Thuja plicata* include giant red cedar, giant arborvitae, shinglewood, and canoe cedar. It is one of the most commercially important logging trees in the western United States.

A relative of the western red cedar, *Thuja orientalis* grows in the eastern part of the United States and

Red Cedar. *(© blickwinkel / Alamy)*

Canada as well as in China where it is called *ce bai ye or ya bai shu*. The naming of this species is confusing. It is called yellow cedar and sometimes also arbor vitae while *Thuja plicata* is sometimes called giant arbor vitae. More confusing, another relative, Chinese arbor vitae, is referred to in literature interchangeably as *Biota orientalis* and *Thuja orientalis*. It is used in **traditional Chinese medicine** in many of the same ways as *Thuja plicata*.

General use

Red cedar is of major cultural importance to Native American tribes living in the Pacific Northwest. The wood, bark, limbs, and roots were used to provide many of the needs of the tribe, ranging from shelter to cooking implements to medicine. Red cedar also has spiritual significance to some of these tribes and is used in ritual ways. Red cedar was a major medicinal herb for these Pacific Northwest cultures, although by the late 2000s it was not much used medicinally.

Native American tribes used the twigs, leaves, roots, bark, and leaf buds of red cedar to treat many different symptoms. Internal uses include:

- boiling limbs to make a tuberculosis treatment
- chewing leaf buds for sore lungs
- boiling leaves to make a cough remedy
- making a decoction of leaves to treat colds
- chewing leaf buds to relieve toothache pain
- making an infusion to treat stomach pain and diarrhea
- chewing the inner bark of a small tree to bring about delayed menstruation
- making a bark infusion to treat kidney complaints
- making an infusion of the seeds to treat fever
- using a weak infusion internally to treat rheumatism and arthritis

External uses include:

- making a decoction of leaves to treat rheumatism
- washing with an infusion of twigs to treat venereal disease, including the human papilloma virus and other sexually transmitted diseases
- making a poultice of boughs or oil to treat rheumatism
- making a poultice of boughs or oil to threat bronchitis
- making a poultice or oil from inner bark to treat skin diseases, including topical fungal infections and warts
- using shredded bark to cauterize and bind wounds

Scientific research supports some of these traditional uses of red cedar. Extracts of red cedar have been shown to have antibacterial properties against common bacteria. Compounds with antifungal properties have also been isolated. The aromatic and decay-resistant properties of western red cedar are attributed to organic compounds called tropolones.

Preparations

Most preparations of red cedar call for boiling the medicinal parts to make a decoction or for making a tea or infusion. As of 2008, little information existed on dosages.

An essential oil to be used topically can be prepared from red cedar. It is toxic if taken internally and has the ability to produce convulsions or even death if taken in even small quantities. A 1999 study done in Switzerland noted an increase in poisoning deaths from plant products, including *Thuja*, due possibly to an increase in people practicing herbal healing and **aromatherapy**.

KEY TERMS

Decoction—A preparation made by boiling an herb, then straining the solid material out. The liquid is then taken internally as a drink.

Precautions

As noted above, the oil of all species of *Tthuja* can cause convulsions. Decoctions of the bark of red cedar can also cause miscarriage. Therefore, pregnant women should not use red cedar.

Side effects

Many people develop **asthma** and bronchial spasms from exposure to red cedar or red cedar dust. This response is an allergic reaction to plicatic acid present in the wood. Red cedar-induced asthma is a serious occupational hazard to loggers in western North America. Estimates of the number of loggers who develop occupational asthma due to red cedar exposure range from 4–13.5%. There are also reports of **contact dermatitis** (rash) caused by exposure to western red cedar heartwood.

Interactions

There were no studies and little observational evidence as of 2008 to indicate whether red cedar interacts with other herbs or with Western pharmaceuticals.

Resources

OTHER

"Thuja plicata." *Gymnosperm Database,* May 30, 2007. http://www.conifers.org/cu/th/plicata.htm. (February 16, 2008).

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

Tish Davidson, A. M.

Red clover

Description

Red clover (*Trifolium pratense*) is a familiar meadow herb, one of 250 species in the Leguminosae, or pea family. The Irish shamrock is another species in this family of plants. Red clover is a European native naturalized throughout North America and Canada. This familiar short-lived perennial grows wild along roadsides, in meadows, and in fields, and is extensively cultivated as a forage crop for cattle. It grows best in soils that are rich in **calcium**, **potassium**, and **phosphorus**. The common names for this sweet herb include wild clover, meadow trefoil, bee bread, trefoil, cow grass, purple clover, and three-leafed grass.

Red Clover. *(© Arco Images / Alamy)*

Red clover grows to about 2 ft (61 cm) high from a short, woody rootstock. The leaves are palmate and arranged alternately along the round, grooved, and hairy stem. They are divided into three oblong or oval leaflets, a characteristic that has given the genus its name. The dark green leaves often have a splash of a pale green or white on each leaflet. The leaf margins are toothed. The red-purple or magenta-hued blossoms comprise numerous florets that form a globe-shaped flower on the end of the stalk. Red clover blooms throughout the summer. The edible blossoms are sweet-tasting with a honey-like fragrance. Bees are attracted to clover blossoms, but seem to prefer the white blossoms of another common variety of clover, often growing nearby.

General use

In folk tradition, red clover was associated with the Christian doctrine of the Trinity because of its threefold leaflets. In England it was worn as a magic charm to protect against evil. The herb's value as a medicinal remedy was not well known until the herb made its way to North America. Native American herbalists soon found numerous medicinal uses for this common wayside beauty. Red clover was used as a **cancer** treatment; the blossoms, combined with other herbs, became commercially popular in the United States in the 1930s. Numerous so-called "Trifolium Compounds" were marketed as blood purifiers, or alteratives, to help clear the body of metabolic toxins. The herb was listed in the *National Formulary* of the United States until 1946.

Red clover has most often been used to treat such skin inflammations as **psoriasis** and **eczema**. It also acts as an expectorant and demulcent, and is helpful in the treatment of **bronchitis** and spasmodic coughs, particularly **whooping cough**. Red clover may stimulate the liver and gall bladder and has been used for **constipation** and sluggish appetite. The blossoms were smoked as a remedy for **asthma**. An infusion of red clover blossoms used as a skin wash, or a poultice prepared from fresh blossoms, may relieve the irritation of **athlete's foot** or insect **bites**. The infusion is also useful as an external skin wash in the treatment of persistent sores and ulcers, and may help speed healing. As an eyewash, red clover tincture diluted with fresh water may relieve **conjunctivitis**. An ointment prepared from red clover is helpful for lymphatic swellings, and a compress made with it may relieve the **pain** of arthritis and **gout**. More recently, red clover has been studied as an alternative remedy for **hot flashes** in menopausal women as well as hot flashes in men following surgery for **prostate cancer**.

Many of the chemical constituents present in red clover have been identified, including volatile oil, isoflavonoids, coumarin derivatives, and cyanogenic glycosides. Few scientific studies, however, have confirmed the folk use of red clover remedies. The genistein found in red clover has been found to contribute to the shrinking of cancerous tumors in vitro by preventing growth of the new blood vessels that feed the tumors. One of the first studies using purified extract of red clover, published in 1999, concluded that use of red clover in standardized extracts that include specific quantities of the four isoflavones genistein, daidzein, biochanin and formononetin, resulted in improved heart health in postmenopausal women. Red clover is considered by some herbalists to be a phytoestrogenic herb, useful in restoring estrogen balance in women. The chemical formononetin, found in red clover, acts on the body in a similar way as estrogen.

KEY TERMS

Alterative—A herb that changes one's physical condition, especially a blood cleanser.

Demulcent—A substance or agent used to soothe irritated mucous membranes.

Expectorant—A substance or medication that causes or eases the bringing up of sputum or phlegm from the respiratory tract.

Infusion—An herbal preparation made by adding herbs to boiling water and then steeping the mixture to allow the medicinal herb to infuse into the water.

Isoflavone—A type of phytoestrogen, or compound derived from plants that has weak estrogen-like activity. Red clover contains measurable quantities of four different isoflavones.

Palmate—A type of leaf that has lobes or leaflets radiating from a central point.

Tincture—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture.

Preparations

Red clover blossoms are the medicinally active part of this herb. Fully open blossoms can be harvested throughout the flowering season. Pick the flower heads on a sunny day after the morning dew has evaporated. Spread the blossoms on a paper-lined tray to dry in a bright and airy room away from direct sun. The temperature in the drying room should be at least 70°F (21°C). When the blossoms are completely dry, store dried flowers in a dark glass container with an air-tight lid. The dried herb will maintain medicinal potency for 12–18 months. Clearly label the container with the name of the herb and the date and place harvested.

Tincture: Combine 4 oz of fresh or dried red clover blossoms with 1 pint of brandy, gin, or vodka in a glass container. The alcohol should be enough to cover the flowers. The ratio should be close to 50/50 alcohol to water. Stir and cover. Place the mixture in a dark cupboard for three to five weeks. Shake the mixture several times each day. Strain and store in a tightly capped, clearly labeled dark glass bottle. A standard dose is 1–3 mL of the tincture three times a

day. Tinctures properly prepared and stored will retain medicinal potency for two years or longer.

Infusion: Place 2 oz fresh clover blossoms, less if dried, in a warmed glass container. Bring 2.5 cups of fresh nonchlorinated water to the boiling point and add it to the herbs. Cover the tea and steep for about 30 minutes, then strain. Drink cold, a few mouthfuls at a time throughout the day, up to one cup per day. The prepared tea may be kept for about two days in the refrigerator.

Ointment: Add fresh clover blossom to a glass pan of nonchlorinated water. Simmer on low heat or in a crock pot for two days. Strain. Allow most of the water to evaporate and combine the plant extract with an equal amount of melted beeswax. Pour while warm into small airtight containers.

Precautions

Red clover is a safe and mild remedy. No adverse effects have been reported in humans when taking therapeutic doses of the herb. Allergic reactions to red clover are rare but possible. Numerous reports of toxicity, even death, however, have been reported in cattle who overgraze in fields of clover.

Side effects

No side effects in humans have been reported for nonfermented red clover. Fermented extracts of red clover, however, may cause bleeding.

Interactions

No interactions have been reported between red clover and other herbs. It has, however, been reported to have adverse interactions with certain allopathic medications, particularly heparin, ticlopidine, and warfarin. Red clover also reduces the body's absorption of combined estrogens.

Resources

BOOKS

Coon, Nelson. *An American Herbal: Using Plants For Healing*. Emmaus, PA: Rodale Press, 1979.

Duke, James A., Ph.D. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Foster, Steven, and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston and New York: Houghton Mifflin Company, 1990.

Hoffmann, David. *The New Holistic Herbal,* 2nd ed. Boston: Element, 1986.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

Weiss, Gaea, and Shandor Weiss. *Growing & Using the Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Howes, J., M. Waring, L. Huang, and L. G. Howes. "Long Term Pharmacokinetics of an Extract of Isoflavones from Red Clover (*Trifolium pratense*)." *Journal of Alternative and Complementary Medicine* 8 (April 2002): 135 142.

Moyad, M. A. "Complementary/Alternative Therapies for Reducing Hot Flashes in Prostate Cancer Patients: Reevaluating the Existing Indirect Data from Studies of Breast Cancer and Postmenopausal Women." *Urology* 59 (April 2002) (4 Supplement 1): 20 33.

ORGANIZATIONS

American Botanical Council. 6200 Manor Road, Austin, TX 78714 4345. (512) 926 4900. www.herbalgram.org.

OTHER

Grieve, Mrs. M. *A Modern Herbal*. http://www.botanical.com.

Clare Hanrahan
Rebecca J. Frey, PhD

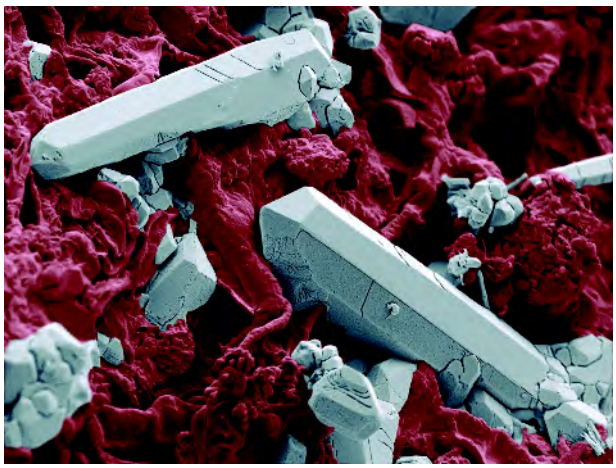
Red yeast rice extract

Description

Native to China, red yeast rice extract is the by-product of *Monascus purpureus* Went (red yeast) fermenting on rice. Part of the Monascaceae family, *Monascus purpureus* is identified by its ascospores. The color of the mycelium is initially white, but soon changes to pink and then yellow-orange due to an increase in acidity and the development of hyphae. They explain that as the culture ages, it is characterized by a dark crimson color at the substratum.

General use

Documented as early as 800 ***A.D.***, Chinese red yeast rice was used in the preserving, flavoring, and coloring of food and wine. However, in addition to red yeast rice's culinary properties, it was soon discovered that red yeast rice possessed medicinal properties as well. The ancient Chinese pharmacopoeia, *Ben Cao Gang Mu-Dan Shi Bu Yi*, published during the Ming Dynasty (1368–1644), recorded a detailed description of red yeast rice and its manufacture. According to the pharmacopoeia, red yeast rice promotes blood circulation and stimulates the digestive system and spleen.



Red yeast rice results from fermenting regular rice with a fungus Monascus purpureus. *(Scimat / Photo Researchers, Inc.)*

KEY TERMS

Ascomycete—Any class of higher fungi with septate hyphae and spores formed in the asci.

Ascospores—Any spores contained in the ascus, which is the oval or tubular spore case of an ascomycete.

Cholesterol—A waxy, fat-like substance, or lipid, required for important body functions. Excess cholesterol, however, can cause hardening of the arteries, which can lead to such serious health problems as heart disease. LDL cholesterol is considered "bad" because it can promote cholesterol build-up and hardened arteries. HDL cholesterol is considered "good" cholesterol because it helps break up cholesterol build-up.

HMG-CoA reductase—Hepetic hydroxy-methyl-glutaryl coenzyme A is an enzyme created in the liver that promotes the production of cholesterol.

Monacolin—An HMG-CoA reductase inhibitor, which assists in the lowering of cholesterol levels.

Rhabdomyolysis—The necrosis or disintegration of skeletal muscle.

Statin—An HMG-CoA reductase inhibitor, which assists in the lowering of cholesterol levels.

Triglycerides—A blood fat lipid that increase the risk of heart disease.

Recent studies of red yeast rice indicate that it contains substances similar to those found in cholesterol-reducing (statin) prescription medications. In addition, research indicates red yeast rice may contain other cholesterol-reducing and be itself an agent useful in lowering **cholesterol**.

Traditional red yeast rice can be purchased in typical Chinese groceries. However, in this form, the extract possesses negligible to very low levels of statin compounds. Instead, manufacturers grow and process the *M. purpureus* Went under controlled conditions to increase the levels of statin. The powdered extract is then sold in capsule form.

In 2001, the Food and Drug Administration (FDA) determined that standardized red yeast rice extract (in this case, Cholestin®; developed by Pharmanex) possessed strong chemical similarities to the drug lovastatin, another cholesterol-reducing drug. Unfortunately, a pharmaceutical company, Merck & Co., trademarked lovastatin as Mevacor®. Because of the similarity, the FDA classified standardized red yeast rice extract as a drug. Under the Dietary Supplement Health Education Act of 1994, it could no longer be sold as a dietary supplement under penalty of law. As such, standardized red yeast rice extract has virtually disappeared from the United States marketplace.

Recent studies have indicated that taking the standardized dose (600 mg) of red yeast rice extract orally, two to four times per day, may assist in a significant reduction of total cholesterol (TC), low-density lipoprotein (LDL) cholesterol ("bad" cholesterol), and triglycerides (TG). It can also slightly increase levels of high-density lipoprotein (HDL) cholesterol ("good" cholesterol). Red yeast rice appears to achieve these benefits by reducing the production of cholesterol in the liver. This cholesterol synthesis reduction stems from one ingredient in particular, monacolin, which acts as an inhibitor of the enzyme responsible for cholesterol production. (The enzyme is known as hepatic hydroxy-methyl-glutaryl coenzyme A (HMG-CoA) reductase.) By lowering high cholesterol levels and promoting blood circulation, red yeast rice may help reduce the risks of heart, coronary, and cerebral vascular diseases. As such, people suffering from high cholesterol (240 mg/dl or above) could benefit from using red yeast rice extract. According to the Natural Dietary Supplements Pocket Reference, a 20% decrease in total cholesterol has been documented for treatments longer than one month. Additionally, red yeast rice extract possesses antioxidant qualities.

Preparations

Although there have been several studies on red yeast rice extract, there remains little information regarding its safety for long-term usage. There are also certain medical risks associated with this extract. As such, it is strongly suggested that anyone considering

using red yeast rice extract for the prevention and treatment of high cholesterol consult with their physician before doing so. This is particularly important for people suffering from high cholesterol and/or **heart disease**. A baseline liver enzyme check is recommended beforehand, in addition to subsequent checks thereafter. In general, however, the recommended dose for adults is 600 mg (oral dose), two to four times per day.

Additionally, due to the 2001 FDA decision, only a doctor may legally prescribe standardized red yeast rice extract. As such, health-food stores now selling this product are doing so illegally. There are, however, several dietary supplements available to the public, which can be as effective as red yeast rice extract. Pharmanex, for example, has removed red yeast rice extract from their supplement, Cholestin®, and replaced it with other cholesterol-reducing, natural substances. It is advisable to consult with a physician regarding the available options.

Precautions

Due to the lack of medical evidence regarding red yeast rice extract's safety for use by youths and children, it is recommended that it not be given to people younger than age 20. Those at risk of or suffering from liver disease shouldn't take red yeast rice extract, as it may affect liver function. Due to the product's statin content, usage is also contraindicated for people with serious **infections** or physical disorders, who are pregnant or breastfeeding, or have had an organ transplant.

Side effects

Although the risks are low, usage can result in liver damage, kidney toxicity, and rhabdomyolysis (disintegration of skeletal muscle). Side effects are mild, including **headache**, **dizziness**, flatulence, **heartburn**, and stomachache. When the extract is no longer being taken, any side effects fade quickly.

Interactions

Because of its statin content, red yeast rice extract should not be taken with other HMG-CoA reductase inhibitors, such as atorvastatin and lovastatin. This interaction would increase the effects of these medications, thus increasing the risk of liver damage. However, **niacin** supplements can be safely used to enhance the cholesterol-lowering effects.

Due to the increased risk of rhabdomyolysis, red yeast rice extract should not be taken with high-dose nicotinic acid (more than 1,000 mg/per day). A physician should be contacted immediately if any muscle **pain**, tenderness, or weakness is experienced.

Alcohol consumption while using red yeast rice extract should not exceed two drinks a day. Also, grapefruit, grapefruit juice, and grapefruit products (like marmalade) should be strictly avoided. Grapefruit enhances the blood concentration of HMG-CoA reductase inhibitors by as much as 15 times, thus greatly increasing the risk of side effects and liver damage.

Resources

BOOKS

Burnham, T. H., S. L. Sjweain, and R. M. Short (eds.). *The Review of Natural Products*. Facts and Comparisons, 1997.

Kuhn, Winston. *Herbal Therapy and Supplements: A Scien tific and Traditional Approach*. Lippincott, 2001.

McKenna, Dennis J., Kerry Hughes, and Kenneth Jones (eds.). *Natural Dietary Supplements Pocket Reference*. Institute for Natural Products Research, 2000.

PERIODICALS

Changling, Li, Zhu Yan, Wang Yinye, Jia Shi Zhu, Joseph Chang, and David Kritchevsky. "Monascus Purpureus fermented rice (red yeast rice): A natural food product that lowers blood cholesterol in animal models of hypercholesterolmia." *Nutrition Research* (February, 1998): 71 81.

Havel, Richard. "Dietary supplement or drug? The case of Cholestin." *American Journal of Clinical Nutrition* (February, 1999): 175 176.

Heber, David, A. Lembertas, Q. Y. Lu, S. Bowerman, and V. L. Go. "An analysis of nine proprietary Chinese red yeast rice dietary supplements: Implication of variabil ity in chemical profile and contents." *The Journal of Alternative and Complementary Medicine* (April, 2001): 133 139.

Heber, David, Ian Yip, Judith Ashley, David Elashoff, Robert Elashoff, and Vay Go. "Cholesterol lowering effects of a proprietary Chinese red yeast rice dietary supplement." *American Journal of Clinical Nutrition* (February, 1999): 231 236.

Juzlova, P., L. Martinkova, and V. Kren. "Secondary metabolites of the fungus Monascus: a review." *Journal of Industrial Microbiology* (March 1996): 163 170.

Wang, Junxian, Zongliang Lu, Jiamin Chi, et al. "Multi center clinical trial of the serum lipid lowering effects of a Monascus Purpureus (red yeast) rice preparation from traditional Chinese medicine." *Current Therapeu tic Research* (December 1997): 964 978.

OTHER

"Red Yeast Rice." Health and Age. [cited June 5, 2004]. http://www.healthandage.com/html/res/com/ConsSupplements/RedYeastRicecs.html.

"Red Yeast Rice." Whole Health MD. [cited June 5, 2004]. http://www.wholehealthmd.com/refshelf/substances_view/1,1525,10054,00.html.

"Red Yeast Rice Analysis." Herbal Alternatives. [cited June 5, 2004]. http://www.dotcomtech.co.uk/content/herbal_ remedies/cholesterol/redyeastanalysis.html.

Sharpe, Ed. "Red yeast rice: Cholesterol busting superfood or just another pharmaceutical?" [cited June 5, 2004]. http://www.delano.com/referencearticles/red yeast rice sharpe.html.

Lee Ann Paradise

Reflexology

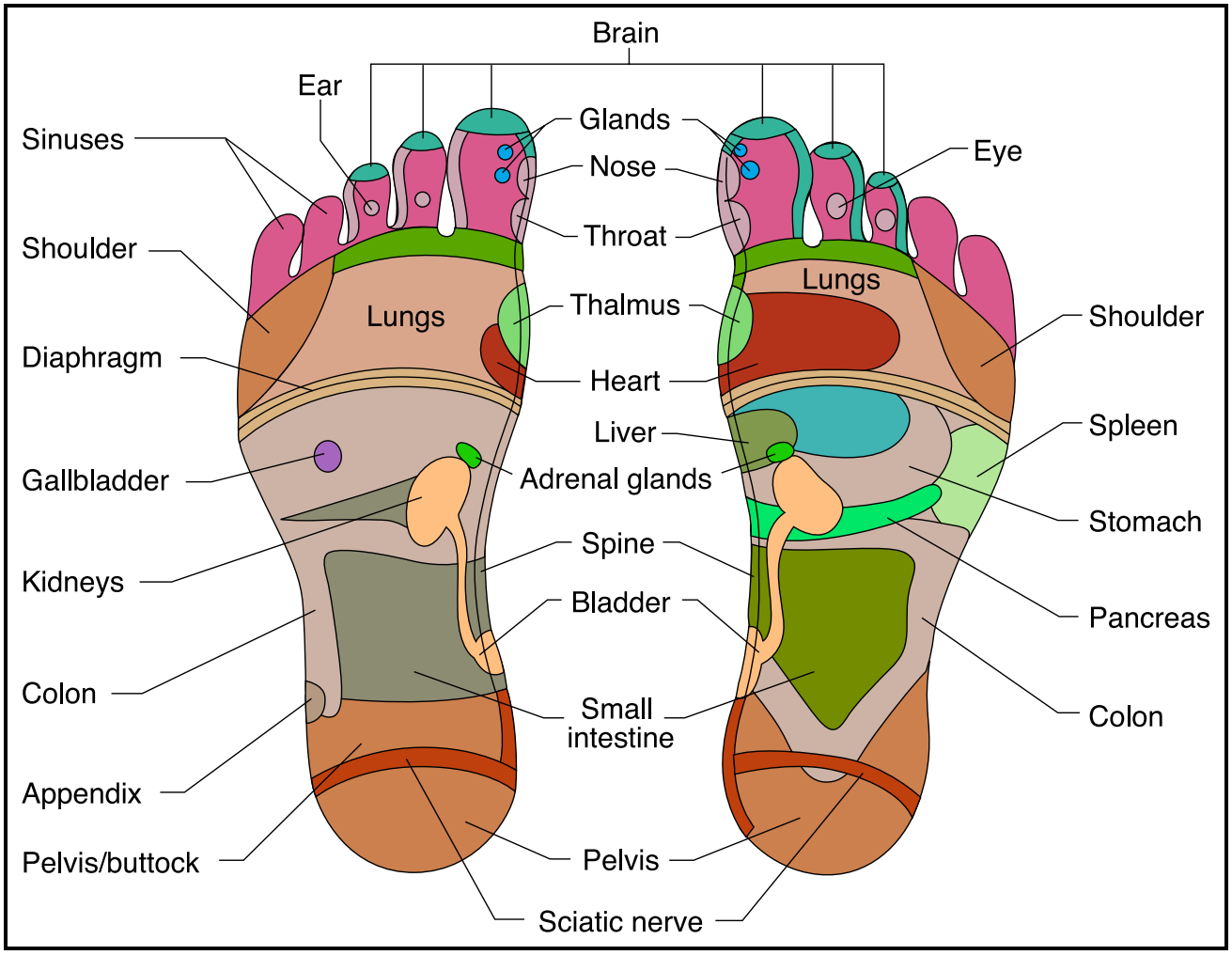
Definition

Reflexology is a therapeutic method of relieving **pain** by stimulating predefined pressure points on the feet and hands. This controlled pressure is designed to alleviate the source of the discomfort. In the absence of any particular malady or abnormality, reflexology may be as effective for promoting good health and for preventing illness as it may be for relieving symptoms of **stress**, injury, and illness.

Reflexologists work from maps of predefined pressure points that are located on the hands and feet. These pressure points are reputed to connect directly through the nervous system and to affect the bodily organs and glands. The reflexologist manipulates the pressure points according to specific techniques of reflexology therapy. By means of this touching therapy and the application of pressure at the respective foot or hand location, the reflexologist attempts to strengthen any part of the body that is the source of pain, illness, or potential debility.

Origins

Reflexology is a healing art of ancient origin. Although its origins are not well documented, it



Reflexology employs the principle that the reflex points on the feet, when hand pressure is applied, will reflexively stimulate energy to a related muscle or organ in the body and promote healing. *(Illustration by GGS Information Services. Cengage Learning, Gale)*

dates to 4,000-plus years ago. Evidence of this exists in reliefs found on the walls of a Sixth Dynasty Egyptian tomb (c. 2450 B.C.) that depict two seated men receiving massage on their hands and feet. From Egypt, the practice may have entered the Western world during the conquests of the Roman Empire. The concepts of reflexology have also been traced to pre-dynastic China (possibly as early as 3000 B.C.) and to ancient Indian medicine. In addition, the Inca civilization may have subscribed to the theories of reflexology and passed on the practice of this treatment to the Native Americans in the territories that eventually became parts of the United States.

In modern times, Sir Henry Head first investigated the concepts underlying reflexology in England in the 1890s. Therapists in Germany and Russia were researching similar notions at approximately the same time, although with a different focus. Less than two decades later, the physician William H. Fitzgerald presented a similar concept that he called zone analgesia or zone therapy. Fitzgerald's zone analgesia was a method of relieving pain through the application of pressure to specific locations throughout the entire body. Fitzgerald divided the body into 10 vertical zones, five on each side, that extended from the head to the fingertips and toes, and from front to back. Every aspect of the human body appears in one of these 10 zones, and each zone has a reflex area on the hands and feet. Fitzgerald and his colleague, Edwin Bowers, demonstrated that by applying pressure on one area of the body, they could anesthetize or reduce pain in a corresponding part. In 1917, Fitzgerald and Bowers published *Relieving Pain at Home*, an explanation of zone therapy.

In the 1930s, the physical therapist Eunice D. Ingham explored the direction of the therapy and made the startling discovery that pressure points on the human foot were situated in a mirror image of the corresponding organs of the body with which the respective pressure points were associated. Ingham documented her findings, which formed the basis of reflexology, in *Stories the Feet Can Tell*, published in 1938. Although Ingham's work in reflexology was inaccurately described as zone therapy by some, there are differences between the two therapies of pressure analgesia. Among the more marked differences, reflexology defines a precise correlation between pressure points and afflicted areas of the body. Furthermore, Ingham divided each foot and hand into 12 respective pressure zones, in contrast to the 10 vertical divisions that encompass the entire body in Fitzgerald's zone therapy.

In 1968 two siblings, Dwight Byers and Eusebia Messenger, established the National Institute of Reflexology. By the early 1970s the institute had grown and was renamed the International Institute of Reflexology.

Reflexology foot massage. *(© Niall McDiarmid / Alamy)*

Benefits

Reflexology promotes healing by stimulating the nerves in the body and encouraging the flow of blood. In the process, reflexology not only quells the sensation of pain but relieves the source of the pain as well.

Anecdotally, reflexologists claim success in the treatment of a variety of conditions and injuries. One condition is **fibromyalgia**. People with this disease are encouraged to undergo reflexology therapy to alleviate any of a number of chronic bowel syndromes associated with the condition. Frequent brief sessions of reflexology therapy are also recommended as an alternative to drug therapy for controlling the muscle pain related to fibromyalgia and for relieving difficult breathing caused by tightness in the muscles of the patient's neck and throat.

EUNICE D. INGHAM (1889–1974)

Eunice D. Ingham was born on February 24, 1889. A physical therapist by occupation, she was a colleague of Dr. Shelby Riley, who along with Dr. W. H. Fitzgerald actively developed zone therapy, a similar but distinct therapy from reflexology. Unlike reflexology, zone therapy does not connect the zones with the body as a whole. In the 1930s, Ingham discovered an unmistakable pattern of reflexes on the human foot; she subsequently devoted the rest of her life to publicizing the message of reflexology until shortly before her death on December 10, 1974.

Ingham traveled and lectured widely about reflexology, initially to audiences of extremely desperate or aging patients who had lost hope in finding relief. Because of their sometimes astonishing improvement, reflexology became better known and respected among the medical community and gained credibility for its therapeutic value. Ingham described her theories of reflexology in her 1938 book, entitled *Stories the Feet Can Tell*, which included a map of the reflex points on the feet and the organs that they parallel. The book was translated into seven languages, although it was erroneously published as *Zone Therapy* in some countries, an error which led to misunderstanding about the true nature of reflexology and inaccurately linked it to zone therapy.

Practitioners claim that when applied properly, reflexology can alleviate allergy symptoms, as well as stress, back pain, and chronic **fatigue**. The techniques of reflexology can be performed conveniently on the hand in situations in which a session on the feet is not practical, although practitioners consider the effectiveness of limited hand therapy to be less pronounced than with the foot pressure therapy.

Description

In a typical reflexology treatment, the therapist and patient engage in a preliminary discussion prior to therapy to enable the therapist to focus more accurately on the patient's specific complaints and to determine the appropriate pressure points for treatment.

A reflexology session involves pressure treatment that is most commonly administered in foot therapy sessions of approximately 40 to 45 minutes in duration. The foot therapy may be followed by a brief 15-minute hand therapy session. No artificial devices or special equipment are associated with this therapy. The human hand is the primary tool used in reflexology. The therapist applies controlled pressure with the thumb and forefinger, generally working toward the heel of the foot or the outer palm of the hand. Most reflexologists apply pressure with their thumbs bent; however, some also use simple implements, such as the eraser end of a pencil. Reflexology therapy is not massage, and it is not a substitute for medical treatment.

Reflexology is a complex system that identifies and addresses the mass of 7,000 nerve endings that are contained in the foot. Additional reflexology addresses the nerves that are located in the hand. This completely natural therapy is used to afford relief without the use of drugs.

Preparations

In order to realize maximum benefit from a reflexology session, the therapist as well as the patient should be situated so as to afford optimal comfort for both. Patients in general receive treatment in a reclining position, with the therapist positioned as necessary—to work on bare feet or on bare hands.

A reflexology patient removes both shoes and socks in order to receive treatment. No other preparation is involved. No prescription drugs, creams, oils, or lotions are used on the skin.

Precautions

Reflexology is completely safe. It may even be self-administered in a limited form whenever desired. The qualified reflexologist offers a clear and open disclaimer that reflexology does not constitute medical treatment in any form, nor is reflexology given as a substitute for medical advice or treatment. The ultimate purpose of the therapy is to promote wellness; fundamentally it is a form of preventive therapy.

People with serious and long-term medical problems are urged to seek the advice of a physician. Diabetes patients in particular are urged to approach this therapy cautiously. Likewise pregnant women are cautioned emphatically to avoid reflexology during the early phases of **pregnancy** altogether, as accidentally induced labor and subsequent premature delivery can result from reflexology treatment.

A consultation with a reflexologist is recommended in order to determine the safety and appropriateness of reflexology therapy for a specific health problem or condition.

Side effects

Because reflexology is intended to normalize the body functions, the therapy does not cause a condition to worsen. Most patients find that pain diminishes over the course of the therapy. It has been noted, however, that some patients experience greater discomfort in the second session than in the first session because a significant easing of pain and tension is generally associated with the initial therapy session. As a result, when pressure is reapplied to the tender points of the foot during the second session, the sensitivity has been heightened. This increase in sensitivity may cause minor additional discomfort for the patient.

Research and general acceptance

Reflexology is practiced worldwide at different levels of medical care. The Association of Reflexologists lists nearly six dozen professional organizations worldwide from the United States to the Japan, and from Ireland to India. These associations include:

- Academy of Reflexology Austria
- Reflexology Association of British Columbia
- China Reflexology Association
- Danish Reflexologists Association
- Holistic Association of Reflexologists Japan
- Polish Instytut of Reflexology (Polish language)
- Association of Reflexology Portugal
- South African Reflexology Society
- British Reflexology Association
- Reflexology Association of America

Several studies and/or reports have indicated the reflexology is effective in treating pain associated with child birth, **cancer**, and **multiple sclerosis**; in treating so-called "mousearm" arising from extended use of a computer mouse; and in treating back pain. Additional research, however, is necessary.

Regulatory status

Ongoing legislative debate ensued during the 1990s regarding the legal status of the reflexology trade. The reflexology community, along with legislators and other bodywork practitioners, engaged in reassessment of the reflexology business and its relationship to **massage therapy** and massage parlors. Organizations and individuals brought judicial appeals of certain court cases that threatened the legitimate licensing of reflexologists as practitioners of alternative medicine. Such professional reflexology interests as the RAA documented in detail the disparities between reflexology and massage, citing the purpose of reflexology, which is to stimulate internal body functions (glands and organs) as opposed to the topical muscular and joint relief associated with massage. In a status update in 1998 the association reported that 19 states had laws requiring the licensing of massage/reflexology therapists. Licensing laws established educational requirements and required candidates to pass written, oral, and/or practical examinations.

Also at issue was a trend among municipalities to license massage parlors (and reflexologists) under the business codes affecting adult entertainment business. B. Kunz and K. Kunz reported that judicial decisions in two states—Tennessee and New Mexico—had excluded the practice of reflexology practice from the laws pertaining to massage parlors. Those courts held that reflexology is a business separate and distinct from massage parlors and deserving of its own respective licensing standards. In Sacramento, California, reflexologists petitioned successfully to become licensed as practitioners of somatic therapy rather than as providers of adult entertainment. Likewise, in the Canadian province of Ontario, a nonprofit organization to register reflexology practitioners was established in order to define a distinct classification for therapists separate from erotic body rubbers, which was the original classification given to reflexologists. Work to legitimize reflexology was continuing as of 2008.

Training and certification

Reflexology is taught in seminars, classes, and training films. In the United States, certification is earned after students meet national standards for skill and knowledge by taking and passing an examination that has written, practical, and documentation components. The documentation component of the certification exam is the performance of reflexology sessions on clients. The exam is prepared by the independently organized American Reflexology Certification Board (ARCB), which certifies the competency of reflexology practitioners on an individual basis. To prepare for the exam, students frequently enroll in reflexology programs, but it lieu of that, the ARCB recommends the following:

- 40 hours of reflexology history, theory
- 55 hours of anatomy and physiology

KEY TERMS

Pressure points—Specific locations on the feet and hands that correspond to nerve endings. Pressure on these locations are used to connect to and affect the organs and glands of the human body via the spinal cord.

Zone therapy—Also called zone analgesia, a method of relieving pain by applying pressure to specific points on the body. It was developed in the early 20th century by William Fitzgerald.

- five hours of business ethics and standards
- 10 hours of supervised practicum

In addition, the ARCB makes a study guide available to students who apply for and are accepted for testing with the exam.

Individuals can only legally practice reflexology in the United States by abiding by any and all state, city, and county laws and regulations. According to the ARCB, only North Dakota and Tennessee had reflexology state-level laws regulating reflexology as of early 2008. The ARCB noted that other states had statewide massage laws that may refer to reflexology.

Once individuals are certified, they must pay an annual fee to the ARCB and obtain continuing education in the amount of 12 hours every two years to maintain the certification. If certification lapses in annual fee or continuing education for a certain period of time, they must retake the written and practical exams.

Resources

BOOKS

Kolster, Bernard C., and Astrid Waskowiak Inge. *The Reflexology Atlas*. Rochester, VT: Healing Arts Press, 2006.

Kunz, Barbara, and Kevin Kunz. *Complete Reflexology for Life*. London: DK Adult, 2007.

Muller, Marie France. *Facial Reflexology: A Self care Manual*. Rochester, VT: Healing Arts Press, 2005.

OTHER

American Reflexology Certification Board. "The Differences Between Reflexology and Massage." Reflexology Association of America. http://www.reflexology usa.org/articles/differences.html (March 28, 2008).

ORGANIZATIONS

Association of Reflexologists, 5 Fore Street, Taunton Somerset, England, TA1 1HX, http://www.aor.org.uk.

International Institute of Reflexology, 5650 First Avenue North, PO Box 12642, St. Petersburg, FL, 33733 2642, (727) 343 4811, http://www.reflexology usa.net/.

Reflexology Association of America, 4012 Rainbow St. KPMB#585, Las Vegas, NV, 89103 2059, (401) 578 6661, http://www.reflexology usa.org/.

Gloria Cooksey
Leslie Mertz, Ph.D.

Reiki

Definition

Reiki is a form of therapy that uses simple hands-on, no-touch, and visualization techniques, with the goal of improving the flow of life energy in a person. Reiki (pronounced *ray-key*) means "universal life energy" in Japanese, and Reiki practitioners are trained to detect and alleviate problems of energy flow on the physical, emotional, and spiritual level. Reiki touch therapy is used in much the same way to achieve similar effects that traditional **massage therapy** is used—to relieve **stress** and pain, and to improve the symptoms of various health conditions.

Origins

Reiki was developed in the mid–1800s by Dr. Mikao Usui, a Japanese scholar of religion. According to the story that has been passed down among reiki teachers, Usui was a Christian who was intrigued by the idea that Christ could heal sick people by touching them with his hands. Searching for clues that would explain the secrets of healing with hands, Usui made a long pilgrimage around the world, visiting many ancient religious sects and studying ancient books. Some reiki teachers claim that Usui found clues leading back nearly 10,000 years to healing arts that originated in ancient Tibet. During his intense studies, Usui claimed he had a spiritual experience, which enabled him to heal with his own hands by becoming aware of and tapping into the universal life force. After that, he dedicated his life to helping the sick and poor. His reputation grew as he healed sick people for many years in Kyoto, Japan. Before his death, Usui passed on his healing insights using universal life energy to Dr. Chujiru Hayashi, a close acquaintance. Hayashi, in turn, passed on the healing techniques in 1938 to Hawayo Takata, a Japanese woman from Hawaii, whom he had cured of life-threatening illness using reiki methods. Takata became a firm believer and proponent of reiki, and during the 1970s formed an initiation

program for training reiki masters to preserve Usui's teachings. Before she died, she prepared her granddaughter, Phyllis Lei Furumoto, to continue the lineage. Takata had personally trained 21 practitioners before she died at the age of 80 in 1980. Along with other reiki masters authorized by Takata, Furumoto formed the reiki Alliance. A faction led by Barbara Ray formed the American Reiki Association, which was known as Radiance Technique Association International. Today, there are over 1,000 reiki masters practicing around the world, whose methods can all be traced back directly to Dr. Usui.

KEY TERMS

Attunement—Life energy teaching given by a Reiki master to a student.

Chakra—One of seven major energy centers in the body, as defined by Hindu and yoga philosophy.

Relaxation response—The body's response to relaxation techniques,during which metabolism and stress levels decrease and immune response increases.

Benefits

Reiki claims to provide many of the same benefits as traditional massage therapy, such as reducing stress, stimulating the immune system, increasing energy, and relieving the **pain** and symptoms of health conditions. Practitioners have reported success in helping patients with acute and chronic illnesses, from **asthma** and arthritis to trauma and recovery from surgery. Reiki is a gentle and safe technique, and has been used successfully in some hospitals. It has been found to be very calming and reassuring for those suffering from severe or fatal conditions. Reiki can been used by doctors, nurses, psychologists and other health professionals to bring touch and deeper caring into their healing practices.

Description

The basic philosophy of reiki

The basic concept underlying reiki is that the body has an energy field that is central to its health and proper functioning, and this energy travels in certain pathways that can become blocked or weakened. This idea of energy flow in the body is also a central concept in Ayurvedic medicine and **traditional Chinese medicine**, including acupuncture.

Reiki practitioners believe that everyone has the potential to access the universal life energy, but that over time most people's systems become blocked and the energy becomes weakened in them. A reiki practitioner is trained to be able to detect these blockages, and practitioners will use their hands, thoughts, and own energy fields to improve the energy flow in a patient. Reiki is one of the more esoteric alternative medical practices, because no one is sure exactly how it works on the physiological level. Practitioners claim that it works on very subtle energy levels, or possibly works on the *chakra* system. The chakras are the system of seven energy centers along the middle of the body believed to be connected with the nervous and endocrine systems, as defined by **yoga** and Ayurvedic medicine. Reiki masters claim that healing energy can even be sent to a person from far away, noting that reiki works on the same principles that enables praying to work for some patients, although a practitioner needs advanced training to be able to send energy from afar.

According to the original principles of Usui, patients must also have a proper attitude for reiki to work most effectively. Patients must take responsibility for their own health, and must want to be healed. Furthermore, when energy is received from a reiki healer, patients must be willing to give back energy to others, and to compensate the healer in some way, as well. Finally, Usui claimed that a healing attitude was free from worry and fear, was filled with gratitude for life and for others, and placed emphasis on each person finding honest and meaningful work in their lives—all this, in order to complete the picture of overall health.

A reiki session

Reiki sessions can take various forms, but most commonly resemble typical bodywork appointments, where the receiver lies clothed on his or her back on a flat surface or massage table. A session generally lasts from an hour to an hour and a half. Reiki is a simple procedure, consisting of calm and concentrated touching, with the practitioner focusing on healing and giving energy to specific areas on the receiver's body. Practitioners place their hands over positions on the body where the organs and endocrine glands reside, and the areas that correspond to the chakra centers. Practitioners also use mental visualization to send healing energy to areas of the receiver's body that need it. In special cases or with injuries, a no-touch technique is used, in which the practitioner's hands are sometimes held just above the body without touching

it. Advanced practitioners rely on intuition and experience to determine which areas of a body need the most energy healing.

The practitioner's hands are held flat against the receiver's body, with the fingertips touching. There can be over 20 positions on both sides of the body where the hands are placed. The positions begin at the crown of the head and move towards the feet. The receiver usually turns over once during the session. The practitioner's hands are held in each position for a usually five minutes, to allow the transfer of energy and the healing process to take place. In each position, the hands are kept stationary, unlike typical massage where the hands move, and both the giver and receiver attempt to maintain an attitude of awareness, openness, and caring.

Reiki practitioners recommend that those receiving reiki for the first time go through a series of three to four initial treatments over the course of about a week, to allow for cleansing and the initial readjustment of energy. Reiki sessions can cost from $30–100 per session. Insurance coverage is rare, and consumers should consult their individual policies as to whether or not such therapies are included.

Self-treatment with reiki

Although reiki practitioners believe that formal training is necessary to learn the proper methods of energy channeling and healing, individuals can still use some of the basic positions of reiki to relieve stress and to stimulate healing on themselves or another. The positions can be performed anywhere and for however long they are needed. Positions generally move from the top of the body down, but positions can be used wherever there is pain or stress. Mental attitude is important during reiki; the mind should be cleared of all stressful thoughts and concentrated on compassion, love, and peace as forms of energy that are surrounding, entering, and healing the body.

The following positions are illustrated in *Reiki: Energy Medicine:*

- Position one: Hands are placed on the top of the head, with the wrists near the ears and the fingertips touching on the crown of the head. Eyes should be closed. Hold for five minutes or more, until the mind feels clear and calm.
- Position two: Cup the hands slightly and place the palms over the closed eyes, with the fingers resting on the forehead.
- Position three: Place the hands on the sides of the head, with the thumbs behind the ear and the palms over the lower jaws, with the fingers covering the temples.
- Position four: Place one hand on the back of the neck, at the base of the skull, and put the other hand on the head just above it, parallel to it.
- Position five: Wrap the hands around the front of the throat, and rest them there gently with the heels of the hands touching in front.
- Position six: Place each hand on top of a shoulder, close to the side of neck, on top of the trapezius muscle.
- Position seven: Form a T-shape with the hands over the chest, with the left hand covering the heart and the right hand above it, covering the upper part of the chest.
- Position eight: The hands are placed flat against the front of the body with fingertips touching. Hold for five minutes or so, and repeat four or five times, moving down a hand-width each time until the pelvic region is reached, which is covered with a v-shape of the hands. Then, for the final position, repeat this technique on the back, beginning as close to the shoulders as the hands can reach, and ending by forming a T-shape with the hands at the base of the spine.

Side effects

Reiki generally has no side effects, as it is a very low-impact and gentle procedure. Some receivers report feeling tingling or sensations of heat or cold during treatment. Others have reported sadness or anxiety during treatment, which practitioners claim are buried or repressed emotions being released by the new energy flow.

Research and general acceptance

Reiki has been used in major clinics and hospitals as part of alternative healing practice, and doctors, dentists, nurses, and other health professionals have been trained to use its gentle touch techniques as part of their practice. It appears to offer particular benefits to special-care patients and their caregivers. Reiki has also become increasingly popular among veterinarians in small-animal practices for treating behavioral disorders as well as physical illnesses in dogs and cats. To date, the little scientific research that has been conducted with reiki implies that its techniques bring about the *relaxation response*, in which stress levels decrease, and immune response increases. Reiki practitioners claim that the most important measurement of their technique is whether the individual feels better after treatment. They also claim that science cannot measure the subtle energy changes that they are attempting to make.

MIKAO USUI (1865–1926)

Mikao Usui, born in the Gifu Prefecture (Japan), was an ethereal child who sought to unravel the mysteries of the universe. As an adult he developed an interest in the meta physical healing talent of Buddha. Usui became determined to regenerate the healing secrets of Buddha in order to improve the lot of humanity. He traveled to many temples and spoke with holy people, but all said that the secret of Buddha's powers were lost to the world due to lack of use.

Eventually the abbot of a Zen monastery encouraged Usui to study the ancient writings containing the secrets on healing. Usui learned two new languages, Chinese and Sanskrit, in order to understand the writings better, and from his reading he obtained the formula for healing. The Sutras in particular provided the enlightenment that he sought.

Usui next set out to obtain the power to heal. It is widely believed that he developed that ability after spend ing 21 days in retreat and in fasting on the holy Mountain of Kori yama, where he had a vision of light and received the knowledge of the symbols of reiki and their use in healing. He officially formulated Usui Reiki therapy in 1922 and touted as many as one million followers during his lifetime.

Prior to the transition (death) of Usui, he imparted the secrets of healing to 16 teachers in order that the secrets would not be lost again.

Training and certification

Reiki practitioners undergo a series of *attunements*, which are sessions with reiki masters that teach the basic methods of energy healing. Several organizations provide resources for reiki training. Reiki practitioners believe these attunements are necessary for correct technique. The masters teach each person how to activate the universal life energy in themselves before they can pass it on to others. These initiations often are held during weekend workshops. Trainees can achieve up to four levels of attunements, until they reach the level of master themselves. The certification process is not a formal one; masters approve students when they feel satisfied with their progress.

Resources

BOOKS

Baginski, B.J. and S. Sharamon. *Reiki: Universal Life Energy*. Mendocino, CA: LifeRhythm, 1988.

Barnett, Libby and Maggie Chambers. *Reiki: Energy Med icine*. Rochester, VT: Healing Arts Press, 1996.

Brown, Fran. *Living Reiki: Takata's Teachings*. Mendocino, CA: LifeRhythm, 1992.

PERIODICALS

Feary, A. M. "Touching the Fragile Baby: Looking at Touch in the Special Care Nursery (SCN)." *Australian Journal of Holistic Nursing* 9 (April 2002): 44 48.

Rexilius, S. J., et al. "Therapeutic Effects of Massage Ther apy and Handling Touch on Caregivers of Patients Undergoing Autologous Hematopoietic Stem Cell Transplant." *Oncology Nursing Forum* 29 (April 2002): E35 E44.

ORGANIZATIONS

The International Association of Reiki Professionals. P.O. Box 481, Winchester, MA 01890. www.iarp.org.

OTHER

The American Reiki Masters Association (ARMA). P.O. Box 130, Lake City, FL 32056 0130. (904) 755 9638.

The Center for Reiki Training. 29209 Northwestern High way, #592, Southfield, MI 48034. (800) 332 8112.

Global Reiki Healing Network. www.reiki.org.

Reiki Alliance. P.O. Box 41, Cataldo, ID 83810 1041. (208)682 3535.

Douglas Dupler
Rebecca J. Frey, PhD

Reishi mushroom

Description

Reishi mushrooms are some of the most widely used medicinal mushrooms in the world. Their scientific name is *Ganoderma lucidum*. In Chinese medicine, reishi mushrooms are known as *ling zhi*, which means spiritual plant as the Chinese believe the herb is healing for the spirit. Some Asians make good luck charms from the mushrooms in addition to using them as medicine.

The Latin name *Ganoderma* means shiny skin, which describes the reddish brown caps of the mushrooms. Reishi mushrooms are kidney-shaped and grow to 8 in (20 cm) or more in diameter. They grow in moist and temperate forest areas of Asia, Europe, South America, and the United States. Reishi mushrooms typically attach themselves to trees, particularly **oak** and plum trees.

Reishi mushrooms have a long history. They have been used in China and Japan for nearly 4,000 years as a

Reishi mushroom. *(© blickwinkel / Alamy)*

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue.

Bronchitis—An infection in the lungs.

Chronic—Referring to a disease or condition that is severe and occurring over a long period of time.

Hepatitis—A viral infection of the liver.

health tonic and as folk medicine for liver problems, heart conditions, **asthma**, **cancer**, high blood pressure, and arthritis. In **Traditional Chinese medicine**, reishi mushrooms are classified in a group of herbs known as *Fu Zheng*, which Chinese herbalists believe are the most powerful herbs for all-around strength, health, and longevity. Other Fu Zheng herbs include **Korean ginseng** and **astragalus**. Reishi mushrooms have been rare and expensive for most of their history because they are difficult to cultivate and find in the wild. In the 1980s, a Japanese man named Shigeaki Mori developed an intricate and effective method of cultivating them, which has made them widely available and affordable.

Reishi mushrooms have been well researched and tested, mostly in China and Japan. Scientists have isolated several chemicals in them that have pharmacological (medicinal) effects on the body. Reishi mushrooms contain compounds called polysaccharides, which have been shown to help the body fight cancerous tumors and also stimulate the immune system to combat **infections** and viruses. In studies on mice, reishi mushrooms have shown very strong results against cancerous tumors. One Japanese study suggests that reishi mushrooms may serve as a chemopreventive against colon cancer.

Other substances called triterpenes have been found in reishi mushrooms and shown to lower blood pressure and improve circulation. Reishi mushrooms also contain sterols, which may influence the hormonal system; and natural antihistamines, which reduce allergic reactions and inflammation in the body. More recently, reishi mushrooms have been identified as a source of **antioxidants**, which are enzymes or other organic compounds that counteract the damaging effects of oxidation on human tissue.

In Asia, numerous clinical studies with humans have documented reishi mushrooms' healing properties. They have shown significant results in treating **hepatitis**, chronic **bronchitis**, asthma, and **heart disease**. Reishi mushrooms have also been shown to lower blood pressure, lower **cholesterol**, increase white blood cell count, reduce allergic reactions, and have a calming effect on the central nervous system when given to humans in observed studies.

General use

Reishi mushrooms are recommended as a general tonic for health, energy, and longevity. They are prescribed for diseases including coronary heart disease, cancer, and **AIDS**; and for such chronic infections as bronchitis, hepatitis, and **mononucleosis**. Reishi mushrooms are also used to treat high blood pressure, asthma, nervous disorders, **chronic fatigue syndrome**, and arthritis. In China, they are used by mountain climbers to combat altitude sickness and are given as an antidote to patients who have eaten poisonous mushrooms.

Preparations

Reishi mushrooms are available dried and as powder, tinctures, tablets, capsules, and syrup. Reishi products can be found in health food stores, herb stores, and Chinese markets. The recommended daily dosage varies with conditions. For severe conditions such as cancer, heart disease, and chronic infections, 9–15 g daily in three equally divided dosages is recommended. For a general health tonic and for less severe conditions of asthma, high blood pressure, infections, and nervous disorders, 2–6 g can be taken daily, in three equal portions.

Tea can be made from dried mushrooms or powder, and the recommended ratio is 2–5 g of dried mushroom per liter of water. The mixture should be simmered on low heat for more than two hours, to extract all the active ingredients. The tea can be drunk twice daily. For severe health conditions or for an antidote to mushroom poisoning, some herbalists recommend a strong reishi tea mixture, with up to 20 g of dried mushrooms per liter of water.

Precautions

People with **allergies** to molds or fungi should use care with reishi mushrooms, although allergic reactions to them are generally rare. Consumers should search for reishi products that are made by reputable manufacturers. Some dried mushrooms have been sold as Reishi mushrooms when they were actually similar mushrooms by the scientific names of *Ganoderma oregonense* and *Ganoderma tsugae*. These resemble reishi mushrooms in appearance and taste and are in the same genus, but according to herbalists have different and less-effective healing properties.

Side effects

In clinical studies, reishi mushrooms have been shown to be nontoxic in high doses, and severe side effects have not been observed. Mild side effects may include stomach upset, **dry mouth**, **diarrhea**, and skin rash, and generally disappear after several days. Side effects can be alleviated by stopping use, or in the case of stomach upset and diarrhea, taking the supplement with meals.

Interactions

For treating severe conditions, large doses of **vitamin C**, from 1–10 g per day, may be prescribed in conjunction with reishi mushrooms. Prescribing vitamin C has been observed to reduce the side effect of diarrhea that may occur with patients who are given large doses of reishi mushrooms.

Reishi mushrooms have been reported to intensify the effects of blood-thinning (anticoagulant) drugs, including aspirin, dalteparin **sodium**, enoxaparin sodium, and warfarin. Patients taking these medications should not use tonics or other preparations containing reishi mushrooms without consulting their physicians.

Resources

BOOKS

Hobbs, Christopher. *Medicinal Mushrooms*. Loveland, CO: Botanica, 1986.

Lu, Henry C. *Chinese Herbal Cures*. New York: Sterling, 1994.

Willard, Terry, Ph.D. *Reishi Mushroom: Herb of Spiritual Potency and Medical Wonder*. Issaquah, Washington: Sylvan, 1990.

PERIODICALS

Bao, X. F., X. S. Wang, Q. Dong, et al. "Structural Features of Immunologically Active Polysaccharides from *Ganoderma lucidum*." *Phytochemistry* 59 (January 2002): 175 181.

Lu, H., E. Kyo, T. Uesaka, et al. "Prevention of Develop ment of N,N' Dimethylhydrazine Induced Colon Tumors by a Water Soluble Extract from Cultured Medium of *Ganoderma lucidum* (Rei shi) Mycelia in Male ICR Mice." *International Journal of Molecular Medicine* 9 (February 2002): 113 117.

Shi, Y. L., A. E. James, I. F. Benzie, and J. A. Buswell. "Mushroom Derived Preparations in the Prevention of H2O2 Induced Oxidative Damage to Cellular DNA." *Teratogenesis, Carcinogenesis, and Mutagenesis* 22 (2002): 103 111.

Wang, Y. Y., K. H. Khoo, S. T. Chen, et al. "Studies on the Immuno Modulating and Antitumor Activities of *Ganoderma lucidum* (Reishi) Polysaccharides: Func tional and Proteomic Analyses of a Fucose Containing Glycoprotein Fraction Responsible for the Activities." *Bioorganic and Medicinal Chemistry* 10 (April 2002): 1057 1062.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl Street, Boulder, CO 80302. (303)449 2265.

Douglas Dupler
Rebecca J. Frey, PhD

Relaxation

Definition

Relaxation therapy is a broad term used to describe a number of techniques that promote **stress** reduction, the elimination of tension throughout the body, and a calm and peaceful state of mind.

Origins

Relaxation therapy as a general tern includes various forms: transcendental **meditation** (TM), **yoga**, t'ai chi, **qigong**, and vipassana (a Buddhist form of meditation meaning insight and also known as mindfulness meditation). Progressive relaxation, a treatment that is designed to rid the body of **anxiety** and related tension through progressive relaxation of the muscle groups, was first described by Edmund Jacobson in his book *Progressive Relaxation*, published in 1929. In 1975, Herbert Benson published his groundbreaking work *The Relaxation Response*, which described in detail the stress-reduction mechanism in the body that short-circuits the "fight-or-flight" response and lowers blood pressure, relieves muscle tension, and controls heart rate. This work gave further credence and legitimacy to the link between mind and body medicine. A number of relaxation techniques used commonly in the

early 2000s, such as cue-controlled relaxation, are a direct result of Benson's work in this area.

Benefits

Stress and tension have been linked to numerous ailments, including **heart disease**, high blood pressure, **atherosclerosis**, **irritable bowel syndrome**, ulcers, anxiety disorders, **insomnia**, and **substance abuse**. Stress can also trigger a number of distinct physical symptoms, including **nausea**, **headache**, **hair loss**, **fatigue**, and muscle **pain**. Relaxation therapies have been shown to reduce the incidence and severity of stress-related diseases and disorders in many patients.

Description

A number of different relaxation methods are available. Some of the most widely taught and most frequently practiced by healthcare providers are progressive relaxation, cue-controlled relaxation, breathing exercises, **guided imagery**, and **biofeedback**.

Progressive relaxation

Progressive relaxation is performed by first tensing, and then relaxing, the muscles of the body, one group at a time. Muscle groups can be divided a number of different ways, but a common method is to use the following groupings: 1) Hands and arms; 2) head, neck, and shoulders; 3) torso, including chest, stomach and back; and 4) buttocks, thighs, lower legs, and feet. The patient lies or sits in a comfortable position and then starts with the first muscle group, focusing on the feeling of the muscles and the absence or presence of tension. The patient then tenses the first muscle in the group, holds the tension for approximately five seconds, and releases and relaxes for up to 30 seconds. The contrast allows the individual to notice difference between feelings of tension and those of relaxation. The procedure is repeated with the next muscle in the group and so on, until the first group is completed. The patient then starts on the next muscle group.

Progressive relaxation can be guided with verbal cues and scripts, either memorized by the patient or provided on instructional audiotapes. The procedure remains the same, but the individual is prompted on which muscles to flex and relax and given other cues about noticing the difference between the tense and relaxed state. Some individuals may prefer progressive relaxation that is prompted with a tape because it allows them to completely clear their minds and to just follow instructions.

Deep breathing exercises

Individuals under stress often experience fast, shallow breathing. This type of breathing, known as chest breathing, can lead to shortness of breath, increased muscle tension, and inadequate oxygenation of blood. Breathing exercises can both improve respiratory function and relieve stress and tension.

Before starting to learn breathing exercises, individuals should first become aware of their breathing patterns. This can be accomplished by placing one hand on the chest and one hand on the abdomen and observing which hand moves further during breathing. If it is the hand placed on the chest, then chest breathing is occurring, and breathing exercises may be beneficial.

Deep breathing exercises are best performed while lying flat on the back, usually on the floor with a mat. The knees are bent, and the body (particularly the mouth, nose, and face) is relaxed. One hand is placed on the chest and one on the abdomen to monitor breathing technique. The individual takes a series of long, deep breaths through the nose, attempting to raise the abdomen instead of the chest. Air is exhaled through the relaxed mouth. Deep breathing can be continued for up to 20 minutes. After the **exercise** is complete, the individual checks again for body tension and relaxation. Once deep breathing techniques have been mastered, an individual can use deep breathing at any time or place as a quick method of relieving tension.

Release-only relaxation

Like progressive relaxation, release-only relaxation focuses on relieving feelings of tension in the muscles. However, it eliminates the initial use of muscle tensing as practiced in progressive relaxation, focusing instead solely on muscle relaxation. Release-only relaxation is usually recommended as the next step in relaxation therapy after progressive relaxation has been mastered.

In release-only relaxation, breathing is used as a relaxation tool. The individual sits in a comfortable chair and begins to focus on breathing, envisioning tension leaving the body with each exhale. Once deep abdominal breathing is established, the individual begins to focus on releasing tension in each muscle group, until the entire body is completely relaxed.

Cue-controlled relaxation

Cue-controlled relaxation is an abbreviated tension-relief technique that combines elements of release-only relaxation and deep breathing exercises. It uses a cue,

such as a word or mental image, to trigger immediate feelings of muscle relaxation. The cue must first be associated with relaxation in the individual's mind. Individuals choose the cue and then use it in breathing and release-only relaxation exercises repeatedly until the cue starts to automatically trigger feelings of relaxation outside the treatment sessions. Cues can be as simple as a given word such as "one" and are frequently used on relaxation audiotapes. They can also be a visual cue, such as a mental image of a white sand beach, a flower-filled meadow, or clear blue sky. Guided imagery also uses visualization exercises to produce feelings of relaxation.

Guided imagery

Guided imagery is a two-part process. The first component involves reaching a state of deep relaxation through breathing and muscle relaxation techniques. During the relaxation phase, individuals close their eyes and focuses on the slow in and out of their breath. Instead, individuals might focus on releasing the feelings of tension from their muscles, starting with the toes and working up to the top of the head. Relaxation tapes often feature soft music or tranquil, natural sounds such as rolling waves and chirping birds in order to promote feelings of relaxation.

Once complete relaxation is achieved, the second component of the exercise is the imagery, or visualization, itself. Relaxation imagery involves conjuring up pleasant images that rest the mind and body. These may be past experiences or idealized new situations.

The individual may also use mental rehearsal. Mental rehearsal involves imagining a situation or scenario and its ideal outcome. It can be used to reduce anxiety about an upcoming situation, such as **childbirth**, surgery, or even a critical event such as an important competition or a job interview. Individuals imagine themselves going through each step of the event, visualizing harmony and good will in the whole process and positive outcome.

Biofeedback

Biofeedback, or applied psychophysiological feedback, is a patient-guided treatment that teaches individuals to manipulate muscle tension through relaxation, visualization, and other cognitive techniques. The name biofeedback refers to the biological signals that are fed back, or returned, to the individual in order for him or her to develop the relaxation techniques.

During biofeedback, one or more special sensors are placed on the body. These sensors measure muscle tension, brain waves, heart rate, and body temperature, and translate the information into a visual and/or audible readout, such as a paper tracing, a light display, or a series of beeps. While viewing the instantaneous feedback from the biofeedback monitors, the individual begins to recognize what thoughts, fears, and mental images influence physical reactions. By monitoring this relationship between mind and body, the individual can then use thoughts and mental images deliberately to manipulate heart beat, brain wave patterns, body temperature, and other bodily functions, and to reduce feelings of stress. This is achieved through relaxation exercises, mental imagery, and other cognitive therapy techniques.

As the biofeedback response takes place, the individual can actually see or hear the results of the relaxation efforts instantly through the sensor readout on the biofeedback equipment. Once these techniques are learned and the individual is able to recognize the state of relaxation or visualization necessary to alleviate symptoms, the biofeedback equipment itself is no longer needed. The person then has a powerful, self-administered treatment technique for dealing with problem symptoms.

Dozens of other effective therapies promote relaxation, including hypnosis, meditation, yoga, **aromatherapy**, **hydrotherapy**, t'ai chi, massage, **art therapy**, and others. Individuals should choose a type of relaxation therapy based on their own interests and lifestyle requirements.

Preparations

When considering relaxation therapy to alleviate physical symptoms such as nausea, headache, high blood pressure, fatigue, or gastrointestinal problems, individuals should consult a doctor first to make sure that an underlying disorder or disease is not causing the symptoms. A complete physical examination and comprehensive medical history will be performed, and even if an organic cause for the symptoms is found, relaxation exercises may still be recommended as an adjunct, or complementary, treatment to relieve discomfort.

Relaxation therapy should always take place in a quiet, relaxing atmosphere in which the person has a comfortable place to sit or recline. Some people find that quiet background music improves their relaxation sessions. If an instructional audiotape or videotape is to be used, the appropriate equipment should be available.

The relaxation session, which can last anywhere from a few minutes to an hour, should be uninterrupted. Taking the phone off the hook, turning off

cell phones, dimming the lights, and asking family members for privacy and silence can ensure a more successful and relaxing session.

Precautions

Most commonly practiced relaxation techniques are completely safe and free of side effects.

Relaxation techniques that involve special exercises or body manipulation such as massage, t'ai chi, and yoga should be taught or performed by a qualified healthcare professional or instructor. These treatments may not be suitable for individuals with certain health conditions such as arthritis or **fibromyalgia**. These individuals should consult with their healthcare professional before engaging in such therapies.

Biofeedback may not be recommended in some individuals who use a pacemaker or other implantable electrical devices. These individuals should inform their biofeedback therapist before starting treatments, as certain types of biofeedback sensors have the potential to interfere with implantable devices.

Relaxation therapy may not be suitable for some patients. Patients must be willing to take an active role in the treatment process and to practice techniques learned in treatment at home.

Some relaxation therapies may also be inappropriate for cognitively impaired individuals (e.g., patients with organic brain disease or a traumatic brain injury) depending on their level of functioning. Given the wide range of relaxation therapies available, if one type of relaxation treatment is deemed inappropriate for these patients, a suitable alternative can usually be recommended by a qualified healthcare professional.

Side effects

Relaxation therapy can induce sleepiness, and some individuals may fall asleep during a session. Relaxation therapy should not be performed while operating a motor vehicle or in other situations in which full and alert attention is necessary. Other than this, there are no known adverse side effects to relaxation therapy.

Research and general acceptance

Relaxation therapies are generally well-accepted by the medical community for relief of stress and anxiety.

Some research has also indicated that relaxation therapy may be useful for certain physiological conditions. One study, for example, reported results indicating that relaxation therapy reduced the incidence of preterm labor in women at risk for delivering prematurely. It also found that women who discontinued relaxation exercises for whatever reasons delivered earlier and had lower birth-weight babies than those who continued the treatment. Positive benefits of relaxation therapy have also been reported for persons who have high blood pressure. Another study of 90 individuals who had previously experienced a **heart attack** reported a more favorable long-term outcome among the patients when they underwent both relaxation therapy and exercise training than exercise training alone. In 2006, researchers conducted a study of the therapy's impact on patients with chronic heart failure. For the study, 121 patients were split into control and experimental groups, with the experimental group receiving training in progressive muscle relaxation. The experimental group reported greater reduction in psychological distress compared to the control group. The researchers concluded that the training might be useful as part of a disease-management program for these patients, although further research would be necessary to discover if any other benefits could be attributed to the relaxation therapy.

Not all research supports relaxation therapy as a treatment option. A report published in 2001 reviewed numerous studies of the effectiveness of relaxation therapies on bronchial **asthma**. The report concluded that "little evidence in its favor has been presented." It noted, however, that healthcare professionals "continue to include relaxation training as a component in the nonpharmacological treatment of asthma."

Training and certification

Relaxation therapy techniques are used by many licensed therapists, counselors, psychologists, psychiatrists, and other healthcare professionals. Many self-help books, audiotapes, and videos are available that give instruction in relaxation techniques.

KEY TERMS

Qigong—An exercise practice derived from traditional Chinese medicine and designed to facilitate energy flow throughout the body.

T'ai chi—A martial art that uses exercise to balance the body's energy flow to the body center in order to promote physical well-being.

HERBERT BENSON (1935–)

Dr. Herbert Benson, the guru of mind/body medicine, was born in 1935. He graduated from Wesleyan University and the Harvard School of Medicine. He nurtured his interest in mind/body relationships and developed an expertise in behavioral medicine and spiritual healing. In his research, Benson straddled the thin line between med icine and religion. He conceived of what he called a three legged approach to health care: self care, pharmaceuti cals, and medical treatment or surgery. His most significant work was his discovery of the relaxation response, which is the connection between lowered blood pressure and tran scendental meditation. He was quoted by Daphne How land of BeWell.com saying that "[B]elief is one of the most powerful healing tools we have in our therapeutic arsenal."

Benson served as the Mind/Body Institute Associ ate Professor of Medicine at Harvard School of Medical and worked as the Chief of the Division of Behavioral Medicine at the Beth Israel Deaconess Medical Center in Boston, Massachusetts. In 1988 he founded the Mind/Body Medical Institute in Boston, where he served as founding president. He lectured extensively about his work. On November 5, 1997 Benson addressed the Committee on Appropriations of the U.S. House of Representatives and spoke on the topic of "Healing and the Mind." Benson authored scores of scientific papers along with six books pertaining to his years of study, including *The Mind/Body Effect* in 1979, *Relaxation Response* in 1990, and *Timeless Healing: The Power and Biology of Belief* in 1996. Altogether his books sold over four million copies. Among his many honors and awards Benson received the John Templeton Spirituality and Medicine Curricu lar Award in 1999.

Resources

BOOKS

Davis, Martha et al. *The Relaxation & Stress Reduction Workbook*. 5th edition. Oakland, CA: New Harbinger Publications, Inc., 2000.

PERIODICALS

Yu, Doris. "Abstract 2506: Relaxation Therapy in Patients with Chronic Heart Failure: A Randomized Controlled Trial." *Circulation* 114, no. 2 (2007): 517.

ORGANIZATIONS

The American Psychological Association, 750 First St. NE, Washington, DC, 20002 4242, (800) 374 2721, http://www.apa.org.

Paula Ford-Martin
Leslie Mertz, Ph.D.

Rescue Remedy

Description

Rescue Remedy is the trademarked name of a combination of five **Bach flower essences** intended for use in emotional or psychological emergencies. It contains the essences of star of Bethlehem, rock rose, impatiens, cherry plum, and clematis. It is by far the most popular of the Bach preparations, and is available as a cream as well as in liquid form for internal use.

In terms of their history, the Bach flower essences are a variation of homeopathic remedies. Dr. Edward Bach (1886–1936), the English practitioner who first prepared them, was trained in both mainstream medicine and **homeopathy**. He worked as a bacteriologist and pathologist in the University College Hospital as well as the London Homoeopathic Hospital during the 1920s. Although Bach developed a series of homeopathic oral vaccines still known as the seven Bach nosodes, he was not satisfied with these preparations and decided that using plant material for homeopathic healing would be more effective than using disease organisms. He began experimenting around 1928 with flower extracts in order to treat personality problems and emotional conditions, which he thought had more important effects on a person's overall state of health than infectious diseases. He moved from London to a country setting in Oxfordshire in 1930 in order to devote himself fully to investigating the healing properties of local plants. By the time Bach died in 1936, he had discovered all of the 38 single flower essences presently in use. As of 2004, tinctures of the Bach **flower remedies** are still prepared at the Bach Centre in Mount Vernon, England.

Rescue Remedy is prepared in the same fashion as the Bach single flower essences, by either the sun method or by boiling. In the sun method, flower heads are floated in a clear glass bowl filled with natural spring water and allowed to soak in bright sunlight for three hours. The flowers are then removed and the water is mixed with brandy in a 50/50 ratio. In the boiling method, flowering twigs are boiled for half an hour in a large pan of spring water. After the water has cooled, the plant parts are removed and the remaining water is mixed with an equal part of brandy.

Flower essences included in rescue remedy

Clematis

Cherry plum

Impatiens

Rock rose

Star of Bethlehem

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Antidote—In homeopathy, a food or other substance that counteracts homeopathic remedies. Coffee, camphor, menthol, peppermint-flavored mouthwash or toothpaste, and eucalyptus are considered antidotes. People under the care of a homeopath are advised not to use them while they are taking prescribed remedies.

Nosode—A homeopathic medicine made from disease material. Nosodes are given in order to prevent infectious diseases.

Tincture—A medication or preparation made by adding plant, animal, or chemical ingredients to alcohol or a mixture of alcohol and water. The Bach flower remedies are examples of tinctures.

General use

According to the Bach Centre, Dr. Bach intended Rescue Remedy "as an emotional first-aid kit and not as a quick replacement for the 38 individual remedies." The single remedies are selected according to the personality of the user and are said to take several weeks or months to bring about deeper changes in the person's feelings or behavior. For example, someone who is afraid of something specific and identifiable would be advised to take Mimulus, whereas someone who suffers from nameless **anxiety** would take Aspen. Bach is said to have chosen the five essences included in Rescue Remedy because he thought that they would act rapidly and cover most types of emotional crisis. His indications for the five flower essences in Rescue Remedy are as follows:

- Star of Bethlehem. For shock and emotional numbness resulting from trauma or bereavement.
- Rock rose. For terror, panic attacks, and hysteria; also recommended for recurrent nightmares.
- Impatiens. For those who tend to think and act impulsively, or become tense and irritable when upset.
- Cherry plum. For fear of losing physical or emotional control.
- Clematis. To prevent "spaciness" or passing out in crisis situations.

None of the Bach flower remedies are intended for use in treating infectious diseases or internal injuries.

Rescue Remedy cream is recommended for soothing such external skin problems as **sunburn**, windburn, scabs, minor **burns**, dryness, or **eczema**. It can also be applied after sports or **exercise** for discomfort caused by **bruises** or sore muscles.

Many people who use Rescue Remedy recommend it for pets and plants, as well as for humans. One alternative veterinarian suggests adding the remedy to a cat or dog's drinking water for such situations as a history of abuse or abandonment; recovery following veterinary surgery; fear of veterinarians; grief from losing a human caregiver or fellow pet; hyperactivity or aggressiveness; anxiety following a move or changes in the household; litter box problems; excessive self-grooming; and jealousy. The dose recommended for domestic pets is ten drops per gallon of water.

Preparations

The liquid form of Rescue Remedy is available in the United States for about $12 for a 20-mL bottle. Unlike the individual flower essences, which are taken two drops at a time, Rescue Remedy is taken in four-drop doses. It can be dropped directly on the tongue—care being taken not to touch the dropper —or added to a glass of water and sipped slowly. People who are concerned about the alcohol content of the tincture may add the Rescue Remedy to a cup of hot tea or other warm beverage, which will cause the alcohol to evaporate. Rescue Remedy is safe to use several times a day to treat emotional **stress**, as the flower essences in it are too dilute to cause any overdose effects.

Rescue Remedy cream contains crab apple in addition to the five flower essences in the liquid preparation. Crab apple was included in the mixture for its cleansing qualities. A 1-oz tube sells for about $11. The cream can be applied as often as needed.

Precautions

Rescue Remedy and the other Bach flower essences do not require any special precautions for use in most

circumstances. The Bach Centre in England, however, does recommend that persons taking disulfiram (Antabuse) as part of treatment for alcohol abuse should consult their physician before using any of the Bach flower essences. Disulfiram works by changing the body's metabolism of alcohol in such a way that anyone taking the medication will experience **nausea**, **dizziness**, chest pains, and other unpleasant symptoms if they ingest even a small amount of alcohol. Although the amount of alcohol in four drops of Rescue Remedy is very small, it could conceivably trigger a reaction to disulfiram.

Unlike other homeopathic remedies, Bach flower essences are not affected by such substances as coffee, camphor, **eucalyptus**, or toothpaste and drinks containing **peppermint**. Practitioners of homeopathy refer to these substances and flavorings as antidotes, and advise their patients not to use them while taking prescribed remedies. Flower essences, however, can be taken with coffee, carbonated beverages, peppermint herbal tea, **cough** drops, or any other food flavored with peppermint or eucalyptus.

Side effects

No side effects from using the liquid form of Rescue Remedy have been reported as of 2004. Some practitioners of alternative medicine consider Rescue Remedy to be preferable to **kava kava** and other herbs used to treat anxiety, precisely because it is not dangerous in repeated doses, is not addictive, and does not affect the digestive tract or central nervous system.

Interactions

Apart from possible interactions with disulfiram due to its alcohol content, Rescue Remedy is not known to interact with prescription medications, herbal preparations, or other homeopathic remedies.

Resources

BOOKS

Stein, Diane. "Flower Remedies and Gem Elixirs." In *All Women Are Healers: A Comprehensive Guide to Natural Healing*. Freedom, CA: The Crossing Press, 1990.

PERIODICALS

Downey, R. P. "Healing with Flower Essences." *Beginnings* 22 (July August 2002): 11 12.

Foster, Steven. "Herbal 911: Be Prepared for Any Emer gency with an All Natural Medicine Chest." *Better Nutrition* (January 2002): 24 25.

Gaeddert, Andrew. "Herbal Medicine Help People with Anxiety, Panic, and PTSD? Ask the Herbalist Post Traumatic Stress Disorder." *Townsend Letter for Doctors and Patients* (August September 2002): 4 5.

Reichenberg Ullman, Judyth. "Homeopathy for Sports Injuries Healing with Homeopathy." *Townsend Letter for Doctors and Patients* (July 2003): 2 3.

ORGANIZATIONS

Dr. Edward Bach Centre. Mount Vernon, Bakers Lane, Sotwell, Oxon United Kingdom OX10 0PZ. +44 (0) 1491 834 678. Fax: +44 (0) 1491 825 022. http://www.bachcentre.com.

Nelson Bach USA, Ltd. 100 Research Drive, Wilmington, MA 01887. (800) 319 9151 or (978) 988 3833. Fax: (978) 988 0233. http://www.nelsonbach.com/usa.html.

OTHER

Dr. Edward Bach Centre. *Frequently Asked Questions*. [cited June 14, 2004]. http://www.bachcentre.com/centre/faq.htm.

Rebecca Frey

Restless leg syndrome

Definition

The condition known as restless leg syndrome (RLS) is a movement disorder caused by an irresistible urge to move the legs due to unpleasant sensations. It occurs primarily during times of **relaxation**, such as when a person is trying to go to sleep.

Description

RLS occurs most commonly in people over the age 40. Almost half of patients over age 60 who complain of **insomnia** are diagnosed with RLS. Those who have a family history of RLS may first experience the disorder as young adults, or even as children. It is not usually described as painful, although some people may complain of a disagreeable creeping, tugging, or aching sensation. A related condition, experienced by as many as 80% of RLS sufferers, is known as periodic limb movements of sleep (PLMS), or nocturnal myoclonus. In PLMS, jerky leg movements occur about every 20–40 seconds during sleep, and the arms may be affected as well.

Causes and symptoms

Although RLS appears to be familial in some cases, other causes should be ruled out and treated before starting medication. Certain diseases and conditions are more highly associated with RLS. People experiencing symptoms should be examined and tested for **anemia**, uremia, and electrolyte and vitamin imbalance. Renal failure is a major predisposing factor. RLS can also be associated with **pregnancy**. As

many as one in seven pregnant women may experience RLS to some degree. The disorder usually disappears after delivery, but it can recur with subsequent pregnancies or later in life.

Many medications can induce or worsen the symptoms of RLS. A prescribed medication should not be discontinued without consulting a healthcare provider. Medications that may cause problems for some patients include some antidepressants, antihistamines, most anti-nausea medications, phenothiazine tranquilizers, sinemet, some **calcium** channel blockers used for **hypertension**, and a few antipsychotic drugs. Patients with RLS or PLMS should have a healthcare provider ask whether alternative medications are available if one is prescribed that may worsen RLS symptoms.

Most individuals with RLS experience mild symptoms. They may lie down to rest at the end of the day and, just before sleep, experience discomfort in their legs that prompts them to stand up, massage the leg, or walk briefly. Eighty-five percent of RLS patients either have difficulty falling asleep or wake several times during the night; almost half experience daytime **fatigue** or sleepiness. It is common for symptoms to be intermittent. They may disappear for several months and then return for no apparent reason. Two-thirds of patients report that their symptoms become worse with time. Some older patients claim to have had symptoms since they were in their early 20s but were not diagnosed until their 50s. Suspected underdiagnosis of RLS may be attributed to the difficulty experienced by patients in describing their symptoms. An estimated 2–15% of the population has some degree of RLS symptoms.

Diagnosis

A carefully taken history generally enables a physician to distinguish RLS from similar types of disorders that cause nighttime discomfort in the limbs, such as **muscle cramps**, circulatory diseases, and damage to nerves that detect sensations or cause movement (**peripheral neuropathy**).

The most important tool the doctor has in diagnosing RLS is the history obtained from the patient. Several common medical conditions are known either to cause or to be closely associated with RLS. A healthcare provider may link a patient's symptoms to one of these conditions, which include anemia, diabetes, disease of the spinal nerve roots (lumbosacral radiculopathy), **Parkinson's disease**, late-stage pregnancy, kidney failure (uremia), and complications of stomach surgery. In order to identify or eliminate such causes, blood tests may be performed to determine the presence of serum ferritin, folate, **vitamin B_{12}**, creatinine, and thyroid-stimulating hormones. The physician may also ask if symptoms are present in any close family member, since it is common for RLS to run in families, and this type is sometimes more difficult to treat.

Treatment

The best alternative therapy combines both conventional and alternative approaches. Levodopa may be combined with a therapy that relieves **pain**, relaxes muscles, or focuses in general on the nervous system and the brain. Any such combined therapy that allows a reduction in dosage of levodopa is advantageous, since this approach will reduce the likelihood of unacceptable levels of drug side effects. Of course, the physician who prescribes the medication should monitor any combined therapy.

Acupuncture

Patients who also suffer from **rheumatoid arthritis** may benefit especially from **acupuncture** to relieve RLS symptoms. Acupuncture is believed to be effective in arthritis treatment and may stimulate those parts of the brain that are involved in RLS. Some practitioners also believe that acupuncture benefits RLS patients who do not have rheumatoid arthritis.

Homeopathy

Homeopaths believe that disorders of the nervous system are especially important because the brain controls so many other bodily functions. They tailor a remedy to the individual patient and base it on individual symptoms as well as on the general symptoms of RLS.

Reflexology

Reflexologists claim that the brain, head, and spine all respond to indirect massage of specific parts of the feet.

Nutritional supplements

Supplementation of the diet with **vitamin E**, calcium, **magnesium**, and **folic acid** may be helpful for people with RLS.

Allopathic treatment

If causes related to diet, metabolic abnormalities, and medication have been excluded or treated, therapeutic medications may be helpful. Some medications, including those mentioned above, may cause symptoms

KEY TERMS

Nocturnal myoclonus—Another name for PLMS.

Periodic limb movements in sleep (PLMS)—Random movements of the arms or legs that occur at regular intervals during sleep.

of RLS. Patients should check with a healthcare provider about these possible side effects, especially if symptoms first occur after starting a new medication.

In some people whose symptoms cannot be linked to a treatable associated condition, drug therapy may be necessary to provide relief and restore a normal sleep pattern. Prescription drugs that are normally used for RLS may include dopaminergic agents (such as levodopa and/or carbidopa, used to treat Parkinson's syndrome), dopamine agonists, opioids, benzodiazepines, anticonvulsants, **iron** (for anemic patients), and clonidine. Patient response is variable, so it is best to consult a healthcare provider to determine the best medication or combination regimen for the individual circumstances. Careful monitoring of side effects and good communication between patient and doctor can result in a flexible program of therapy that minimizes side effects and maximizes effectiveness.

Expected results

RLS usually does not indicate the onset of other neurological disease. It may remain static, although two-thirds of patients get worse with time. The symptoms usually progress gradually. Treatment with dopamine agonists is effective in moderate to severe cases that may include significant PLMS. These drugs, however, produce significant side effects, including sleepiness and **nausea**. An individually tailored treatment plan is optimal. The prognosis is usually best if RLS symptoms are recent and can be traced to another treatable condition that is associated with RLS.

Prevention

Diet is one factor that can prevent symptoms of RLS. A helpful diet includes an adequate intake of iron and the B vitamins, especially B_{12} and folic acid. Strict vegetarians should take vitamin supplements to obtain sufficient vitamin B_{12}. Ferrous gluconate may be easier to digest than ferrous sulfate, if iron supplements are prescribed. **Caffeine**, alcohol, and nicotine use should be minimized or eliminated. Even a hot bath before bed has been shown to prevent symptoms for some sufferers.

Resources

BOOKS

Buchfuhrer, Mark J., Wayne A. Hening, and Clete A. Kushida. *Restless Legs Syndrome: Coping with Your Sleepless Nights*. New York: Demos Medical, 2006.

Gunzel, Jill. *Restless Legs Syndrome: The RLS Rebel's Sur vival Guide*. Tucson, AZ: Wheatmark, 2006.

Hening, Wayne A., Mark J. Buchfuhrer, and Hochang B. Lee. *Clinical Management of Restless Legs Syndrome*. Caddo, OK: Professional Communications, 2007.

Ondo, William G, ed. *Restless Legs Syndrome: Diagnosis and Treatment*. London: Informa Healthcare, 2006.

PERIODICALS

Kushida, Clete, et al. "Burden of Restless Legs Syndrome on Health related Quality of Life." *Quality of Life Research* (May 2007): 617 624.

Nineb, A., et al. "Restless Legs Syndrome Is Frequently Overlooked in Patients Being Evaluated for Poly neuropathies." *European Journal of Neurology* (July 2007): 788 792.

Pearson, V. E., et al. "Medication Use in Patients with Restless Legs Syndrome Compared with a Control Population." *European Journal of Neurology* (January 2008): 16 21.

Surani, Salim, and Alamgir Khan. "Sleep Related Disorders in the Elderly: An Overview." *Current Respiratory Medicine Reviews* (November 2007): 286 291.

ORGANIZATIONS

Restless Legs Syndrome Foundation, 1610 Fourteenth St NW, Suite 300, Rochester, MN, 55901, (877) INFO RLS, http://www.rls.org.

Judith Turner
David Edward Newton, Ed.D.

Resveratrol

Description

Resveratrol (*trans*-3,5,4_-trihydroxy-*trans*-stilbene) is a phytochemical, or plant chemical, that is found in the skin of red grapes, in peanuts, blueberries, and in a variety of other fruits, seeds, and plants, as well as in wine and grape juice. Specifically, resveratrol is a phytoalexin, which is a compound made by the plants to fight microbes, in particular a pathogen called *Botrytis cinerea*, and in response to environmental stresses. Many phytoalexins, including resveratrol, have implications for treating various human health problems.

Resveratrol was first identified in 1940, when it was isolated from the roots of a plant called white hellebore (*Veratrum grandiflorum*), also known as Mao Ye Li Lu

in China. White hellebore is native to China, where it is found in the Hubei, Hunan, Jiangxi, Sichuan, Yunnan, and Zhejiang provinces. In 1963, it was also discovered to be a component of Japanese knotweed (*Polygonum cuspidatum*), a plant that is native to Eurasia and was introduced to the New World. Since then, resveratrol has been found in more than 70 other plant species. The scientific world became especially interested in resveratrol in 1992 when research was published that suggested the phytochemical might be a reason why French people, who consume considerable amounts of wine as well as fatty foods, have a lower incidence of coronary **heart disease** than do persons in other Western populations. After that, numerous studies were conducted into resveratrol's potential health benefits.

General use

Foods and drinks containing resveratrol have been a historical part of the human diet, and wine has traditionally been associated with health. It was only after the 1992 study linking the phytochemical to a possible reduction in heart disease, however, that scientists and health experts began to explore the potential health benefits of resveratrol and resveratrol-containing foods and beverages for conditions ranging from the **common cold** to **cancer**. The results of many studies were available in the early 2000s.

Numerous studies in animals and in human cell cultures have shown that resveratrol has anti-cancer properties that affect the initiation and growth of tumors; curb the formation of blood vessels, called angiogenesis, that is involved in cancer progression; and suppress metastasis, or the spread of cancer. Research has indicated that resveratrol can act on various pathways involved in the progression of cancer, including the uncontrolled cell growth characteristic of cancers. Resveratrol is a strong antioxidant, and it is believed that this antioxidant activity is likely responsible for much of its anti-cancer effects.

One such research study into resveratrol in 1997 examined the effects of purified resveratrol from grapes and other foods on **skin cancer** in mice. The researchers found that resveratrol inhibited early cancerous lesions and reduced the number of tumors. Several additional studies on mice have also shown that the topical application of resveratrol seems to protect against the development of skin cancer.

Studies of resveratrol on various other cancers have also been conducted. For example, scientists gave mice resveratrol in their drinking water for seven weeks and reported in a 2000 study that they found a 70 percent reduction in the formation of small intestinal tumors, as well as the prevention of colon tumor development. It is believed that resveratrol, in part, works by turning off the genes that help tumor cells proliferate and turning on the genes that assist the body's immune system in battling cancer. Another colon cancer study, this time on rats, showed in 2006 that resveratrol reduced the occurrence of tumors and lesions and decreased the size of those tumors that did appear. Research in 2001 on the effects of resveratrol on **lung cancer** showed that the phytochemical was successful in reducing the size of tumors under certain conditions and in dampening their ability to spread. Other studies on additional cancers, including **prostate cancer** and **leukemia**, also showed that resveratrol appears to inhibit the proliferation of the cancers in lab experiments conducted on cancer cells. Additional research was under way as of 2008 that was expected to shed light on the phytochemical's potential impact on human cancers.

The benefits of resveratrol may extend beyond cancer. In 2002, for instance, a study conducted in Spain followed 4,300 people for one year, taking note of their susceptibility to colds and their consumption of beer, wine, and distilled spirits. While they found that beer and spirits provided no apparent protection against colds, wine consumption did. The research results showed that both men and women who drank an average of two or more glasses of wine a day had 40 percent fewer colds than those who did not drink any alcoholic beverages and revealed an even greater reduction if they drank red wine in particular. The researchers suggested that resveratrol could be one of the components of wine that may have a role in that reduction.

Resveratrol may also be useful against the flu. According to a study published in 2005, it blocked the **influenza** virus from multiplying.

Resveratrol has become increasingly well-known for its connection to longevity. Studies have shown increases in longevity for the yeast *Saccharomyces cerevisiae*, the nematode or roundworm known as *Caenorhabditis elegans*, the fruit fly (*Drosophila melanogaster*), and a vertebrate. The vertebrate was a type of fish, *Nothobranchius furzeri*, which has a short lifespan (no more than 13 weeks in captivity). The researchers supplemented the diet of the fish with different amounts of resveratrol. At 120 micrograms of resveratrol per gram of food, the median lifespan increased by 33 percent and the maximum lifespan by 27 percent. When the researchers increased the concentration of resveratrol to 600 micrograms, median and maximum lifespans increased by 56 and 59 percent respectively. The researchers noted that both males and females experienced the rise in longevity, that both remained fertile,

and that the eggs from the fish developed and grew into normal adults. Beyond the hike in longevity, the researchers also reported results that indicated resveratrol had a positive influence on the decline in locomotor activity and on the cognitive deficit that typically occurs during **aging** in vertebrates. Although the researchers were unsure how resveratrol achieved its results, they reported, "(T)he observation that its supplementation with food extends vertebrate lifespan and delays motor and cognitive age-related decline could be of high relevance for the prevention of aging-related diseases in the human population." (Valenzano 4)

Another study in 2006 also noted an improvement in physical prowess in mice that were fed resveratrol. After receiving a diet containing resveratrol for 15 weeks, mice were able to run longer on a treadmill. No human studies of resveratrol on longevity or athletic prowess have been conducted to indicate how the phytochemical might work in people.

In addition to these potential health benefits, alternative-medicine practitioners sometimes recommend resveratrol to prevent heart attacks because the phytochemical has been shown to inhibit the aggregation of blood-clotting cells known as platelets.

Preparations

Resveratrol is available in a range of foods, as well as in beverages such as grape juice and wine. It is also available as a supplement in capsule form.

Precautions

Although several studies have indicated that resveratrol may fight **breast cancer**, some researchers believe that it may actually promote the disease. Some medical and alternative-medicine practitioners recommend certain people should avoid resveratrol. These include children under the age of 18 and women who are taking oral contraceptives, who are pregnant, or who are trying to become pregnant. In addition, individuals who have West Nile virus should consult their healthcare practitioner before taking resveratrol.

Side effects

No known side effects exist, although no research has been conducted on high doses in humans.

Interactions

Individuals who are being treated for West Nile virus and women who are taking oral contraceptives should consult their physician before taking resveratrol.

KEY TERMS

Phytoalexin—A compound made by some plants to fight various microbes, such as bacteria, viruses, and fungi, or as a response to environmental stress.

Phytochemical—A plant chemical.

Resources

BOOKS

Aggarwal, Bharat, and Shishir Shishodia, eds. *Resveratrol in Health and Disease (Oxidative Stress and Disease)*. Boca Raton, Fl: CRC, 2005.

Corder, Roger. *The Red Wine Diet*. Garden City Park, NY: Avery, 2007.

PERIODICALS

Athar, Mohammad, Jung Ho Back, Xiuwei Tang, Kwang Ho Kim, Levy Kopelovich, David R. Bickers, et al. "Resveratrol: A review of Preclinical Studies for Human Cancer Prevention." *Toxicology and Applied Pharmacology* 224, no. 3 (November 1, 2007): 274 283.

Palamara, Anna T., Lucia Nencioni, Katia Aquilano, Gio vanna De Chiara, Leyanis Hernandez, Federico Coz zolino, et al. "Inhibition of Influenza: A Virus Replication by Resveratrol." *Journal of Infectious Dis eases* 191, no. 10 (May 15, 2005): 1719 1729.

Stipp, David. "Can Red Wine Help You Live Forever?" *Fortune* January 19, 2007. http://money.cnn.com/2007/01/18/magazines/fortune/Live_forever.fortune/index.htm (April 13, 2008).

Valenzano, Dario R., Eva Terzibasi, Tyrone Genade, Antonino Cattaneo, Luciano Domenici, and Alessan dro Cellerino. "Resveratrol Prolongs Lifespan and Retards the Onset of Age Related Markers in a Short Lived Vertebrate." *Current Biology* 16, no. 3 (February 7, 2006): 296 300.

Yang, M. R., S. R. Lee, W. Oh, E. W. Lee, J. Y. Yeh, J. J. Nah, et al. "West Nile Virus Capsid Protein Induces p53 Mediated Apoptosis Via the Sequestration of HDM2 to the Nucleolus." *Cellular Microbiology* 10, no. 1 (January 2008): 165 176.

OTHER

"Red Wine and Resveratrol: Good for Your Heart?" *MayoClinic.com* March 9, 2007. http://www.mayoclinic.com/health/red wine/HB00089. (April 13, 2008).

"Resveratrol." *Micronutrient Nutrition Center, Linus Paul ing Institute* March 4, 2005. http://lpi.oregonstate.edu/infocenter/phytochemicals/resveratrol/. (April 13, 2008).

Leslie Mertz, Ph.D.

Retinal detachment

Definition

Retinal detachment is a serious eye disorder in which the retina, a thin tissue of cells located in the back of the eye, separates from the underlying tissue layers.

Description

There are three layers of the eyeball. The outer, tough, white layer is called the sclera. Lining the sclera is the choroid, a thin membrane that supplies nutrients to part of the retina. The retina is located at the back of the eye and consists of three cellular layers.

The retina contains the light-sensitive receptors for sight and processes visual images. A retinal detachment occurs between the two outermost layers of the retina, the photoreceptor layer that receives light and the outermost pigmented epithelium. When a tear in the retina occurs, the fluids in the eye may leak and pull the retina out of place, or detach it from the layers. Because the choroid supplies the photoreceptors within the retina with nutrients, a detachment can basically starve the photoreceptors. If a detachment is not repaired within 24–72 hours, permanent damage may occur.

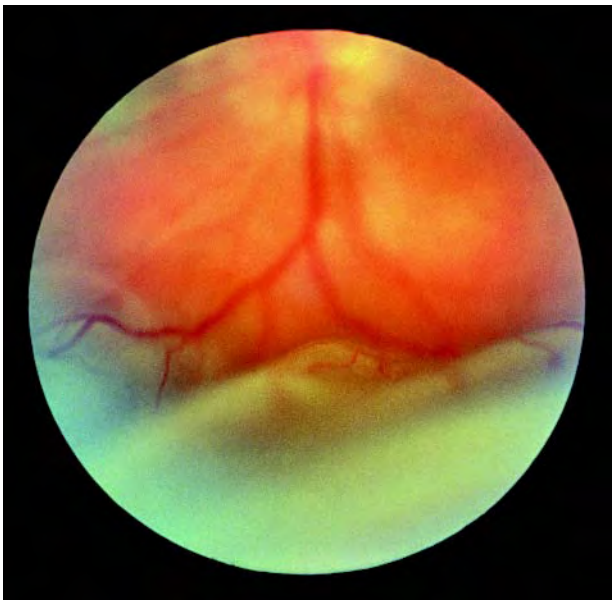
Causes and symptoms

Several conditions may cause retinal detachment:

- Scarring or shrinkage of the vitreous (substance comprising the insides of the eye) can pull the retina inward.
- Small tears in the retina allow liquid to seep behind the retina and push it forward.
- Injury to the eye can loosen the retina. Trauma is the most common cause of retinal detachment in children, although it is comparatively unusual in the adult population.
- Bleeding behind the retina, most often due to diabetic retinopathy or injury, can push it forward.
- Retinal detachment may be spontaneous. This occurs more often in the elderly or in very nearsighted (myopic) eyes.
- Cataract surgery causes retinal detachment 2% of the time.
- Myopia.
- Diabetes.
- Congenital factors (those that people are born with).
- Family history of retinal problems.
- High blood pressure.
- Stress.
- Tumors.

Retinal detachment will cause a sudden defect in vision. It may look as if a curtain or shadow has just descended before the eye. If most of the retina is detached, there may be only a small hole of vision remaining. If only a portion of the retina is involved, there will be a blind spot that may not even be noticed. Retinal detachment is often associated with *floaters*, which are little dark spots that float across the eye and can be mistaken for flies in the room. There may also be flashes of light. Anyone experiencing sudden flashes of light or floaters should contact their eye doctor immediately since these may be symptoms of detachment.

Retinal detachment. *(© Medical-on-Line / Alamy)*



Opthalmoscope view of the inner eye, showing a detached retina. *(Paul Parker / Photo Researchers, Inc.)*

KEY TERMS

Cauterize—To damage with heat or cold so that tissues shrink; used as a method to stop bleeding.

Diabetic retinopathy—A disorder of the eye associated with diabetes that damages the blood vessels in the back of the eye.

Ophthalmologist—A medical doctor who specializes in eye diseases and eye health; can prescribe drugs and perform surgery.

Optometrist—A professional who evaluates and tests sight for correction like glasses or contact lens.

Retina—The thin layer of tissue at the back of the eye that contains light-sensitive receptor cells and processes visual images.

Diagnosis

Diagnosis of retinal detachment should be done by an ophthalmologist. A person who has flashes, floaters, or has a curtain-like blockage of their visual field should see an ophthalmologist immediately because early treatment is required to prevent loss of sight. An optometrist may also diagnose retinal detachment during a routine eye examination.

Treatment

No alternative treatment is recommended for acute retinal detachment. Vision may be lost if the problem is not diagnosed and attended to promptly. However, some alternative therapies such as **behavioral optometry** prescribe eye **relaxation** exercises and use techniques that attempt to prevent and naturally heal **myopia** (near-sightedness). Nearsighted (myopic) people are at greatest risk for retinal detachment. Some alternative therapies that reduce **stress** to the eyes may promote general eye health. Also, alternative treatments to control high blood pressure such as diet, Chinese herbs, massage for stress relief, relaxation exercises, and **yoga**, may also indirectly prevent retinal damage by reducing high blood pressure and relieving stress. **Antioxidants** such as **bilberry** may also be used to decrease inflammation.

Allopathic treatment

Traditional treatment of retinal detachment involves immediate surgery to repair the retina. Small holes or tears may be sealed with a laser or with cryotherapy (freezing) under local anesthesia in a doctor's office. More extensive repairs are done in the hospital under general anesthesia. These may involve injection of silicone oil to help the retina reattach.

Expected results

Retinal detachment is a serious condition that can result in blindness. If retinal detachment is diagnosed in its early stages and repair is made quickly, the patient's sight usually returns to normal. If the retina is fully detached, and extensive surgery is needed, the patient's sight may be partially or fully restored. The amount of restoration depends on the severity of the damage and how soon it is treated.

Prevention

To prevent retinal detachment, people should be keenly aware of eye function and diseases that may affect it. Regular eye examinations can detect changes that the patient may not notice. In such diseases as diabetes, with a high incidence of retinal disorders, routine eye examinations can detect early changes. Good control of diabetes can help prevent diabetic eye disease. High blood pressure and stress should be controlled daily. Blood pressure control can prevent **hypertension** from damaging the retinal blood vessels, and stress management techniques can also reduce blood pressure. Wearing eye protection can also prevent direct injury to the eyes.

Early treatment can prevent both progressing to detachment, and blindness from other events like hemorrhage. Other diseases can cause the tiny holes and tears in the retina through which fluid can leak. Preventive treatment uses a laser to cauterize the blood vessels so that they do not bleed and seals the holes so they do not leak.

Resources

PERIODICALS

Butler, T. K. H., A. W. Kiel, and G. M. Orr. "Anatomical and Visual Outcome of Retinal Detachment Surgery in Children." *British Journal of Ophthalmology* 85 (December 2001): 1437 1439.

"Eye Disorders: Retinal Detachment." *Harvard Health Letter* (December 1, 1998).

Jonas, Jost B., et al. "Retinal Redetachment After Removal of Intraocular Silicon Oil Tamponade." *British Journal of Ophthalmology* 85 (October 2001): 1203.

ORGANIZATIONS

American Academy of Ophthalmology. P.O. Box 7424, San Francisco, CA 94120 7424. (415) 561 8500.

American Optometric Association. 243 North Lindbergh Blvd., St. Louis, MO 63141. (314) 991 4100.

Angela Woodward
Rebecca J. Frey, PhD

Retinol *see* **Vitamin A**

Retinopathy

Definition

Retinopathy is a noninflammatory disease of the retina. There are many causes and types of retinopathy.

Description

The retina is the thin membrane that lines the back of the eye and contains light-sensitive cells (photoreceptors). Light enters the eye and is focused onto the retina. The photoreceptors send a message to the brain via the optic nerve. The brain then interprets the electrical message sent to it, resulting in vision. The macula is a specific area of the retina responsible for central vision. The fovea is about 1.5 mm in size and is located in the macula. The fovea is responsible for sharp vision. When looking at something, the fovea should be directed at the object.

Retinopathy, or damage to the retina, has various causes. A hardening or thickening of the retinal arteries is called arteriosclerotic retinopathy. High blood pressure in the arteries of the body can damage the retinal arteries and is called hypertensive retinopathy. Diabetes damages the retinal vessels resulting in a condition called diabetic retinopathy. **Sickle cell anemia** also affects the blood vessels in the retina. Exposure to the sun (or looking at the sun during an eclipse) can cause damage (solar retinopathy), as well as certain drugs (for example, chloroquine, thioridazine, and large doses of tamoxifen). The arteries and veins can become blocked, resulting in a retinal artery or vein occlusion. These are just some of the causes of the various retinopathies.

Retinopathies are divided into two broad categories: simple or nonproliferative retinopathies and proliferative retinopathies. The simple retinopathies include the defects identified by bulging of the vessel walls, bleeding into the eye, small clumps of dead retinal cells called cotton wool exudates, and closed vessels. This form of retinopathy is considered mild. The proliferative, or severe, forms of retinopathies include the defects identified by newly grown blood vessels, scar tissue formed within the eye, closed-off blood vessels that are badly damaged, and by the retina breaking away from its mesh of nourishing blood vessels (**retinal detachment**). These severe forms can cause blindness.

While each disease has its own specific effect on the retina, there is a general scenario for many of the retinopathies. However, not all retinopathies necessarily affect the blood vessels. Blood flow to the retina is disrupted, either by blockage or breakdown of the various vessels. This can lead to bleeding (hemorrhage)

Opthalmoscope image of diabetic retinopathy, damage to the retina caused by diabetes. *(Paul Parker / Photo Researchers, Inc.)*

and fluids, cells, and proteins leak into the area (exudates). There can be a lack of oxygen to surrounding tissues (hypoxia) or decreased blood flow (**ischemia**). Chemicals produced by the body then can cause new blood vessels to grow (neovascularization); however, these new vessels generally leak and cause more problems. Neovascularization can even grow on the colored part of the eye (iris). The retina can swell and vision will be affected.

Diabetic retinopathy is the leading cause of blindness in people ages 20-74. Diabetic retinopathy will occur in 90% of people with type 1 diabetes (insulin dependent) and 65% of persons with type 2 diabetes (non-insulin dependent) by about 10 years after the onset of diabetes. In the United States, new cases of blindness are most often caused by diabetic retinopathy. Among these new cases of blindness, 12% are people between the ages of 20-44 years, and 19% are people between the ages of 45-64 years.

Causes and symptoms

There are many causes of retinopathy. Some of the more common ones are listed below.

Diabetic retinopathy

Diabetes is a complex disorder characterized by an inability of the body to properly regulate the levels of sugar and insulin (a hormone made by the pancreas) in the blood. As diabetes progresses, the blood vessels that

feed the retina become damaged in different ways. The damaged vessels can have bulges in their walls (aneurysms) that can leak blood into the surrounding jelly-like material (vitreous) that fills the inside of the eyeball. They can become completely closed, or new vessels can begin to grow where there would not normally be blood vessels. Although these new blood vessels are growing in the eye, they can't nourish the retina and they bleed easily, releasing blood into the inner region of the eyeball, which can cause dark spots and cloudy vision. Diabetic retinopathy begins before any outward signs of disease are noticed. Once symptoms are noticed, they include poorer than normal vision, fluctuating or distorted vision, cloudy vision, dark spots, episodes of temporary blindness, or permanent blindness.

Hypertensive retinopathy

High blood pressure can affect the vessels in the eyes. Some blood vessels can narrow. The blood vessels can thicken and harden (arteriosclerosis). There will be flame-shaped hemorrhages and macular swelling (**edema**). This edema may cause distorted or decreased vision.

Sickle cell retinopathy

Sickle cell **anemia** occurs mostly in blacks and is a hereditary disease that affects the red blood cells. The sickle-shaped blood cell reduces blood flow. People will not have visual symptoms early in the disease; symptoms are more systemic. However, patients need to be followed closely in case new blood vessel growth occurs.

Retinal vein and artery occlusion

Retinal vein occlusion generally occurs in the elderly. There is usually a history of other systemic disease, such as diabetes or high blood pressure. The central retinal vein (CRV), or the retinal veins branching off of the CRV, can become compressed and stop the drainage of blood from the retina. This may occur if the central retinal artery hardens. Symptoms of retinal vein occlusion include a sudden, painless loss of vision or field of vision in one eye. There may be a sudden onset of floating spots (floaters) or flashing lights. Vision may be unchanged or decrease dramatically. Retinal artery occlusion is generally the result of an embolism that dislodges from somewhere else in the body and travels to the eye. Transient loss of vision may precede an occlusion. Symptoms of a central retinal artery or branch occlusion include a sudden, painless loss of vision or decrease in visual field. Ten percent of the cases of a retinal artery occlusion occur because of giant cell arteritis (a chronic vascular disease).

Solar retinopathy

Looking directly at the sun or watching an eclipse can cause damage. There may be a loss of the central visual field or decreased vision. The symptoms can occur hours to days after the incident.

Drug-related retinopathies

Certain medications can affect different areas of the retina. Doses of 20-40 mg a day of tamoxifen usually does not cause a problem, but much higher doses may cause irreversible damage. Patients taking chloroquine for lupus, **rheumatoid arthritis**, or other disorders may notice a decrease in vision. If so, discontinuing medication will stop, but not reverse, any damage. However, patients should never discontinue medication without the advice of their doctor. Patients taking thioridazine may notice a decrease in vision or color vision. These drug-related retinopathies generally only affect patients taking large doses. However, patients need to be aware if any medication they are taking will affect the eyes. Patients need to inform their doctors of any visual effects.

Diagnosis

The damaged retinal blood vessels and other retinal changes are visible to an eye doctor when an examination of the retina (fundus exam) is done. This can be done using a hand-held instrument called an ophthalmoscope. This allows the doctor to see the back of the eye. Certain retinopathies have classic signs (for example, peculiar fan shapes in sickle cell, dot and blot hemorrhages in diabetes, flame-shaped hemorrhages in high blood pressure). Patients may then be referred for other tests to confirm the underlying cause of the retinopathy. These tests include blood tests and measurement of blood pressure. Fluorescein angiography, where a dye is injected into the patient and the back of the eyes are viewed and photographed, helps to locate leaky vessels. Sometimes patients may become nauseated from the dye. Alternative practitioners often take thorough physical and psychological profiles of patients, considering lifestyle, **stress**, work habits, diet, emotional issues, and others to determine overall health factors that may be affecting the eyes and related organs.

Treatment

There are many alternative treatments available for retinopathy. When retina problems indicate other disorders such as diabetes, high blood pressure, or sickle cell anemia, those disorders are treated as well. **Holistic medicine** often treats eye disorders not only

by promoting healing in the eyes but by strengthening the overall system on the physical, mental, and emotional levels.

Dietary and nutritional therapy

A diet to promote retinal healing includes plenty of fresh and raw vegetables, fruits, beans, peas, and whole grains. **Diets** should be low in fat, particularly fat from animal and dairy sources. Processed, artificial, and refined foods should be avoided, including sugar and white flour. Alcohol and **caffeine** intake should be reduced as well.

Certain foods may help heal retinopathies and injured blood vessels in the eye, especially food rich in **antioxidants** like **carotenoids** (found in some vegetables) and flavenoids (found in some fruits). Foods rich in carotenoids, such as carrots, tomatoes, melons, and green leafy vegetables, should be eaten often. **Lutein** and zeaxanthin are carotenoids found in spinach and collard greens, and support eye function and retinal healing. Lycopenes are similar compounds found in tomatoes, guava, watermelon, and pink grapefruit. The **bioflavonoids** rutin and **quercetin** promote healthy circulation in the blood vessels of the retina, and are found in red onions, grapes, citrus fruits, cherries, and blue-green algae. **Garlic** may also help retinal problems by reducing blood clotting. Blueberries and huckleberries are related to bilberries, the herb most used for retinal problems. **Green tea** also contains antioxidants that may help repair blood vessels in the retina. **Grape seed extract** and **pine bark extract** contain powerful bioflavenoid antioxidants called oligomeric proanthocyanidins (OPCs), which help repair blood vessels and increase circulation.

Nutritional supplements for retina support include the **amino acids** cysteine, taurine, alpha-lipoic acid, and **glutathione**. An essential fatty acid (EFA) supplement such as **flaxseed** oil or **evening primrose oil** is recommended. EFAs improve circulation and nerve function in the retina. Vitamins A, C, and E support retinal and blood vessel healing, as do the B-complex vitamins and the minerals **zinc** and **selenium**.

Herbal support

Bilberry is a strongly recommended herb, containing compounds called anthocyanocides, eye-tropic bioflavenoids, that have been shown to strengthen blood vessels and reduce bleeding in the retina. Ginkgo is also used regularly for retina problems, as it has antioxidant and circulation improving qualities. The herb marigold is a natural source of lutein. Other herbs used frequently for retinopathy include agrimony, **milk thistle**, **dandelion**, **goldenseal**, and **eyebright**.

Traditional medicines

Traditional Chinese medicine utilizes **acupuncture**, **acupressure**, diet, and herbal remedies for eye problems. Chinese medicine views eye problems as related to liver dysfunction, and uses herbs such as ju hua, wood betony, burdock, **licorice**, dandelion, ginkgo, and **gotu kola** to strengthen both the eyes and liver. **Ayurvedic medicine** uses dietary and herbal therapies for retina problems. Low-fat vegetarian diets are recommended, which provide plenty of foods with sour, salty, and pungent flavors, and the herbs milk thistle, gingko, and others are used as well. **Fasting** is also practiced to cleanse the liver, improve circulation, and promote healing. **Homeopathy** prescribes the remedies **euphrasia** and **calendula** for eye disorders, and other remedies for systemic healing.

Allopathic treatment

Retinal specialists are ophthalmologists who specialize in retinal disorders. Retinopathy is a disorder of the retina that can result from different underlying systemic causes, so general doctors should be consulted as well. For drug-related retinopathies, the treatment is generally discontinuation of the drug (only under the care of a medical doctor). Surgery with lasers can help to prevent blindness or lessen any losses in vision. The high-energy light from a laser is aimed at the weakened blood vessels in the eye, destroying them. Scars will remain where the laser treatment was performed. For that reason, laser treatment cannot be performed everywhere. For example, laser photocoagulation at the fovea would destroy the area for sharp vision.

Panretinal photocoagulation may be performed. This is a larger area of treatment in the periphery of the retina, and the method is used to decrease neovascularization. Prompt treatment of proliferative retinopathy may reduce the risk of severe vision loss by 50%. Patients with retinal artery occlusion should be referred to a cardiologist. Patients with retinal vein occlusion need to be referred to a doctor because they may have an underlying disorder like high blood pressure.

In 2001, scientists reported that gene therapy may one day help halt or perhaps prevent blood vessel overgrowth that leads to diabetic retinopathy. Early studies indicate that the therapy will help prevent abnormal blood vessels from coming back after surgery.

Expected results

Nonproliferative retinopathy has a better prognosis than proliferative retinopathy. Prognosis depends upon the extent of the retinopathy, the cause, and promptness of treatment.

Prevention

Complete eye examinations done regularly can help detect early signs of retinopathy. Patients on certain medications should have more frequent eye exams. They also should have a baseline eye exam when starting the drug. People with diabetes must take extra care to be sure to have thorough, periodic eye exams, especially if early signs of visual impairment are noticed. Anyone experiencing a sudden loss of vision, decrease in vision or visual field, flashes of light, or floating spots should contact their eye doctor right away. Proper medical treatment for any of the systemic diseases known to cause retinal damage will help prevent retinopathy. For diabetics, maintaining proper blood sugar and blood pressure levels is important as well; however, over time some form of retinopathy will usually occur in diabetics. Eating properly, particularly for diabetics, and stopping **smoking** will also help delay retinopathy. Frequent, thorough eye exams and control of systemic disorders are the best prevention.

Having sound overall physical and mental health habits, including lifestyle, diet, **exercise**, and stress management, is good prevention for eye disorders. Overexposing the eyes to sunlight should be avoided by those with retina problems, and sunglasses are a necessity. Sound work habits such as reading in adequate lighting, and taking frequent breaks from televisions, computers, and intricate tasks, are recommended practices for those with eye disorders. Eye exercises, originally developed by Dr. William Bates, are also a good preventative and supportive measure for the eyes. Many books are available that illustrate these and other vision exercises.

Resources

BOOKS

Grossman, Marc, and Glen Swartwout. *Natural Eye Care: An Encyclopedia*. Los Angeles: Keats, 1999.

Horton, Jonathan, C. *Disorders of the Eye*. New York: McGraw Hill, 1998.

PERIODICALS

"Gene Therapy May Be a Tool for Prevention." *Diabetes Week* (October 8, 2001).

ORGANIZATIONS

Cambridge Institute for Better Vision. 65 Wenham Rd., Topsfield, MA 01983.

The Foundation Fighting Blindness. Executive Plaza I, Suite 800, 11350 McCormick Rd., Hunt Valley, MD 21031 1014. (888) 394 3937. http://www.blindness.org.

Optometric Extension Program. 2912 South Daimler St., Santa Ana, CA 92705.

Prevent Blindness America. 500 East Remington Rd., Schaumburg, IL 60173. (800) 331 2020. http://www.prevent blindness.org.

Prevent Blindness America (Diabetes and Eyesight). 500 East Remington Rd., Schaumburg, IL 60173. (800) 331 2020. http://www.diabetes sight.org.

Douglas Dupler
Teresa Norris

Rheumatic fever

Definition

Rheumatic **fever** (RF) is an illness that occurs as a complication of untreated or inadequately treated **strep throat** infection. Rheumatic fever causes inflammation of tissues and organs and can result in serious damage to the heart valves, joints, central nervous system and skin.

Rheumatic fever is rare in the United States, though there were outbreaks in both New York City and in Utah in the 1990s. The disease is more prevalent in the developing world, where rheumatic fever is the leading cause of **heart disease**. In some countries, as many as one to two percent of children are afflicted with the disease.

Description

Though the exact cause of rheumatic fever is unknown, the disease usually follows the contraction of a throat infection caused by a member of the Group A streptococcus (strep) bacteria (called strep throat). The streptococcus A bacteria has also been linked to many serious diseases, including "flesh-eating" disease and **toxic shock syndrome**. About 9,700 cases of invasive diseases linked to strep A were reported in the United States in 1997. Rheumatic fever may occur in people of any age, but is most common in children between the ages of five and 15. Poverty, overcrowded living conditions, and inadequate access to medical care increase the likelihood of contracting the disease.

The initial strep throat is easily treated with a 10-day course of antibiotics taken orally. However, when a throat infection occurs without symptoms, or when a

patient neglects to take the prescribed medication for the full 10-day course of treatment, there is up to an estimated 3% chance that he or she will develop rheumatic fever. Other types of strep **infections** (such as of the skin) do not put the patient at risk for RF.

Causes and symptoms

Two different theories exist as to how a bacterial throat infection can result in rheumatic fever. One theory, less supported by research evidence, suggests that the bacteria produce some kind of poisonous chemical (toxin). This toxin is sent into circulation throughout the bloodstream, thus affecting other systems of the body. Research more strongly supports the theory that the disease is caused by an interaction between antibodies produced to fight the group A streptococcus bacteria and the heart tissue. The body produces immune cells (antibodies), that are specifically designed to recognize and destroy invading agents. The antibodies are able to recognize the bacteria because the bacteria contain special markers called antigens on their surface. Due to a resemblance between Group A streptococcus bacteria's antigens and antigens present on the body's own cells, the antibodies mistakenly attack the body itself, specifically heart muscle.

In 2002, a report announced that scientists had mapped the genome (genetic material) of an A streptococcus bacterium responsible for acute rheumatic fever. The discovery will help researchers map the factors in the strain of bacterium that help it overcome the body's defenses.

It is interesting to note that members of certain families seem to have a greater tendency to develop rheumatic fever than do others. This could be related to the above theory, in that these families may have cell antigens that more closely resemble streptococcal antigens than do members of other families.

Symptoms of rheumatic fever usually begin one to six weeks after a **sore throat**. Symptoms may include **fatigue** and fever, stomach **pain** and **vomiting**. In about 75% of all cases of RF one of the first symptoms is arthritis. The joints (especially those of the ankles, knees, elbows, and wrists) become red, hot, swollen, shiny, and extremely painful. Unlike many other forms of arthritis, symptoms may not occur symmetrically (affecting a particular joint on both the right and left sides, simultaneously). Rather, pain may move from joint to joint. The arthritis of RF rarely strikes the fingers, toes, or spine. The joints become so tender that even the touch of bedsheets or clothing is terribly painful.

KEY TERMS

Antibodies—Specialized cells of the immune system created to recognize organisms that invade the body (such as bacteria, viruses, and fungi). Antibodies are then able to set off a complex chain of events designed to kill invaders.

Antigen—A special, identifying marker on the outside of cells.

Arthritis—Inflammation of the joints.

Autoimmune disorder—A disorder in which the body's antibodies mistake the body's own tissues for foreign invaders. The immune system therefore attacks and causes damage to these tissues.

Chorea—Involuntary movements in which the arms or legs may jerk or flail uncontrollably.

Immune system—The system of specialized organs, lymph nodes, and blood cells throughout the body, which work together to prevent foreign invaders (bacteria, viruses, fungi, etc.) from taking hold and growing.

Inflammation—The body's response to tissue damage. Includes heat, swelling, redness, and pain in the affected part.

Pancarditis—Inflammation the lining of the heart, the sac around the heart, and the muscle of the heart.

A peculiar type of involuntary movement, coupled with emotional instability, occurs in about 10% of all RF patients (the figure used to be about 50%). The patient begins experiencing a change in coordination, often first noted by changes in handwriting. The arms or legs may flail or jerk uncontrollably. The patient seems to develop a low threshold for anger and sadness. This feature of RF is called Sydenham's chorea or St. Vitus' dance.

A number of skin changes are common in rheumatic fever patients. A rash called erythema marginatum develops (especially in those patients who will develop heart problems from their illness), which takes the form of pink splotches that may eventually spread into each other. The rash does not itch. Bumps the size of peas or larger may occur under the skin. These are called subcutaneous nodules; they are hard to the touch, but not painful. These nodules most commonly occur over the knee and elbow joint, as well as over the spine.

The most serious result of RF is called pancarditis (pan means total; carditis refers to inflammation of the heart). Pancarditis is an inflammation that affects all

aspects of the heart, including the lining of the heart (endocardium), the sac containing the heart (pericardium), and the heart muscle itself (myocardium). Heart damage caused by RF has the most serious long-term effects. The valves within the heart (structures that allow the blood to flow only in the correct direction, and only at the correct time in the heart's pumping cycle) are frequently damaged, which may result in blood leaking back in the wrong direction, or being unable to pass a stiff, poorly moving valve. Damage to a valve can result in the heart having to work very hard in order to circulate the blood. The heart may not be able to "work around" the damaged valve, which may result in a consistently inadequate amount of blood entering the circulation. About 40-80% of all RF patients develop a form of carditis. Heart damage, however, may not be apparent until months or years after a bout with rheumatic fever. The effect of the disease on the heart also depends on the avoidance of recurrences. The severity of heart damage is often related to the number of attacks of RF a patient experiences.

Diagnosis

The initial description of diagnostic criteria for RF were created by William Cheadle in 1889, during a virulent outbreak of the disease in London. In the 1950s, T. Duckett Jones created a list of both major and minor diagnostics for RF. According to the "Jones Criteria," a patient can be diagnosed with RF if he or she exhibits either two major criteria (conditions), or one major and two minor criteria. In either case, it must also be proven that the individual has had a previous infection with streptococcus.

The major criteria include:

- carditis
- arthritis
- chorea
- subcutaneous nodules
- erythema marginatum

The minor criteria include:

- fever
- joint pain (without actual arthritis)
- evidence of electrical changes in the heart (determined by measuring electrical characteristics of the heart's functioning during a test called an electrocardiogram, or EKG)
- evidence (through a blood test) of the presence in the blood of certain proteins, which are produced early in an inflammatory/infectious disease

Tests are also performed to provide evidence of recent infection with group A streptococcal bacteria. The doctor may swab the throat and grow a culture to see if the bacteria will grow and multiply. The culture will be processed and examined to identify streptococcal bacteria. Blood tests can be performed to see if the patient is producing antibodies only made in response to a recent strep infection. A doctor may also do an electrocardiogram in order to check for abnormalities in the heartbeat. An echocardiogram, or ultrasound test, may be ordered to check the heart vales, cardiac function and the heart's structure.

Treatment

Though there are no proven effective alternative remedies for rheumatic fever itself, alternative methods may help patients with the results and symptoms of the disease, such as pain relief and improved cardiac function. **Rheumatoid arthritis** can be treated with a number of alternative therapies:

- Massage: A massage therapist uses gentle strokes to stimulate circulation in and around the joints.
- Aromatherapy: Often combined with massage, the essential oils of rosemary, benzoin, German chamomile, camphor, juniper, or lavender are used to help relieve pain. Oils of cypress, fennel, lemon, and wintergreen may be used to detoxify or reduce inflammation.
- Acupuncture: Uses small needles to stimulate appropriate acupoints for pain relief.
- Osteopathy: Recommends stretching and trigger point therapy to improve mobility, as well as craniofacial massage.

Allopathic treatment

Penicillin is still the most effective treatment for rheumatic fever. A 10-day course of penicillin by mouth, or a single injection of penicillin G is the first line of treatment for RF. Patients will need to remain on some regular dose of penicillin to prevent recurrence of RF. This can mean a small daily dose of penicillin by mouth, or an injection every three weeks. Some practitioners keep patients on this regimen for five years, or until they reach 18 years of age (whichever comes first). Other practitioners prefer to continue treating those patients who will be regularly exposed to streptococcal bacteria (teachers, medical workers), as well as those patients with known RF heart disease.

Of major concern to medical professionals is compliance in taking oral penicillin. A full course of penicillin must be taken to prevent rheumatic fever. However, it is not always easy for patients to follow

such a strict regimen. Researchers have found that the time-honored practice of thrice-daily dosing may be unnecessary. Research has shown that twice-daily dosing is just as effective as more frequent doses, and compliance may be improved, since both doses can be administered at home.

Arthritis typically improves quickly when the patient is given a preparation containing aspirin, or some other anti-inflammatory agent (ibuprofen). Mild carditis will also improve with such anti-inflammatory agents; although more severe cases of carditis will require steroid medications. A number of medications are available to treat the involuntary movements of chorea, including diazepam for mild cases, and haloperidol for more severe cases.

Expected results

The long-term prognosis of an RF patient depends primarily on whether he or she develops carditis. This is the only manifestation of RF that can have permanent effects. Those patients with mild or no carditis have an excellent prognosis. Those with more severe carditis have a risk of heart failure, as well as a risk of future heart problems, which may lead to the need for valve replacement surgery.

Prevention

Initial prevention of rheumatic fever depends upon prompt medical attention. Patients should see a physician if they have sore throat that lasts for more than 24 hours and is accompanied by fever. Treatment of a streptococcal throat infection with an appropriate antibiotic will usually prevent the development of rheumatic fever. Prevention of RF recurrence requires continued antibiotic treatment, perhaps for life. Prevention of complications of already-existing RF heart disease require that the patient always take a special course of antibiotics when he or she undergoes any kind of procedure (even dental cleanings) that might allow bacteria to gain access to the bloodstream.

Because of the prevalence of the Strep A bacteria, it is difficult to completely eradicate rheumatic fever. However, progress in identifying a genetic marker for predisposition to the disease and in mapping the virulence (ability to overcome the body's defenses) or the bacteria that lead to rheumatic fever may help lead to a vaccine. Researchers are also seeking to develop a rapid test for strep which would mean earlier detection and more prompt treatment of strep. In addition, in 1999, testing began on a vaccine against group A streptococcus. The development of such a vaccine was halted in the 1970s after children who received the experimental vaccine developed rheumatic fever. In 1979, the Food and Drug Administration (FDA) prohibited group A strep vaccines from ever being licensed for use, the only vaccine to carry such a prohibition. Clinical trials have been approved by the FDA, however, it will be several years before a vaccine is approved. Doctors at the National Institute of Allergy and Infectious Diseases remain hopeful that a vaccine will someday be available.

Resources

BOOKS

Kaplan, Edward L. "Rheumatic Fever." In *Harrison's Principles of Internal Medicine*. edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Ryan, Kenneth. "Streptococci." In *Sherris Medical Micro biology: An Introduction to Infectious Diseases*. Nor walk, CT: Appleton and Lange, 1994.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases*. New York: John Wiley and Sons, Inc., 1995.

Todd, James. "Rheumatic Fever." In *Nelson Textbook of Pediatrics*. edited by Richard Behrman. Philadelphia: W.B. Saunders Co., 1996.

Woodham, Anne and Dr. David Peters. *Dorling Kindersley Encyclopedia of Healing Therapies*. New York: Dorling Kindersley, 1997.

PERIODICALS

Albert, Daniel A., et al. "The Treatment of Rheumatic Carditis: A Review and Meta Analysis." *Medicine* 74, no. 1 (January 1995): 1+.

Bass, James W., Donald A. Person, and Debora S. Chan. "Twice Daily Oral Penicillin for Treatment of Strepto coccal Pharyngitis: Less is Best." *Pediatrics 2000* 105 (February, 2000): 423 424.

Capizzi, Stephen A., et al. "Rheumatic Fever Revisited: Keep This Diagnosis on Your List of Suspects." *Post graduate Medicine* 102, no. 6 (December 1997): 65+.

Eichbaum, Q.G., et al. "Rheumatic Fever: Autoantibodies Against a Variety of Cardiac, Nuclear, and Strepto coccal Antigens." *Annals of the Rheumatic Diseases* 54, no. 9 (September 1995): 740+.

Harder, B. "Deciphering Virulence: Heart Harming Bacte ria Flaunt Unique Viral Genes." *Science News* 161, no. 13 (March 30, 2002): 197.

Markowitz, Milton. "Rheumatic Fever: A Half Century Perspective." *Pediatrics* (July, 1998): 272 275.

Pollack, Andrew. "In the Works: Tests on Strep Vaccine Restart, Gingerly." *The New York Times* (July 20, 1999): Section F, Page 7, Column 1.

"Rheumatic Fever." In *Clinical Reference Systems* (July 1, 1999): 1264.

Stollerman, Gene H. "Rheumatic Carditis." *Lancet* 346, no. 8972 (August 12, 1995): 390+.

Stollerman, Gene H. "Rheumatic Fever." *Lancet* (March 29, 1997): 935 943.

ORGANIZATIONS

Centers for Disease Control and Prevention. (404) 332 4559. http://www.cdc.gov.

Amy Cooper
Teresa G. Odle

Rheumatoid arthritis

Definition

Rheumatoid arthritis (RA) is a chronic disease causing inflammation and deformity of the joints. Other systemic problems throughout the body may also develop, including inflammation of blood vessels (vasculitis), the development of bumps (rheumatoid nodules) in various parts of the body, lung disease, blood disorders, and weakening of the bones (**osteoporosis**).

Description

The skeletal system of the body is made up of different types of strong, fibrous tissue called connective tissue. Bone, cartilage, ligaments, and tendons are all forms of connective tissue that have different compositions and characteristics.

The joints are structures that hold two or more bones together. Synovial joints allow for movement between the bones being joined, the articulating bones. The simplest synovial joint involves two bones, separated by a slight gap called the joint cavity. The ends of each articular bone are covered by a layer of cartilage. Both articular bones and the joint cavity are surrounded by a tough tissue called the articular capsule. The articular capsule has two components: the fibrous membrane on the outside and the synovial membrane, or synovium, on the inside. The fibrous membrane may include tough bands of tissue called ligaments, which are responsible for providing support to the joints. The synovial membrane has special cells and many tiny blood vessels called capillaries. This

The hands of a 65 year old man with severe Rheumatoid arthritis. *(© jbcn / Alamy)*

Rheumatoid Arthritis

Risk Factors
- Family history

Physical Effects
- Affects joints
- Autoimmune disease
- Bony spurs
- Enlarged or malformed joints

Treatment Options
- Glucocorticoids
- Non-steroidal anti-inflammatory drugs
- MethotreXate
- Disease-modifying antirheumatic drugs

Pain Management
- Support groups
- Exercise
- Joint splitting
- Physical therapy
- Passive exercise
- Joint replacement
- Heat and cold
- Message therapy
- Acupuncture
- Psychological approaches (relaxation, visualization)
- Tai Chi
- Low stress yoga

(Illustration by Corey Light. Cengage Learning, Gale)

membrane produces a supply of synovial fluid that fills the joint cavity, lubricates it, and helps the articular bones move smoothly about the joint.

In rheumatoid arthritis, the synovial membrane becomes severely inflamed. Usually thin and delicate, the synovium becomes thick and stiff, with numerous infoldings on its surface. The membrane is invaded by white blood cells, which produce a variety of destructive chemicals. The cartilage along the articular surfaces of the bones may be attacked and destroyed, and the bone, articular capsule, and ligaments may begin to erode. These processes severely interfere with movement in the joint.

RA exists all over the world and affects men and women of all races. In the United States alone, about

KEY TERMS

Articular bones—Two or more bones connected to each other via a joint.

Joint—Structures holding two or more bones together.

Synovial joint—A type of joint that allows articular bones to move.

Synovial membrane—The membrane that lines the inside of the articular capsule of a joint and produces a lubricating fluid called synovial fluid.

two million people suffer from the disease. Women are three times more likely than men to have RA. About 80% of people with RA are diagnosed between the ages of 35 and 50. RA appears to run in families, although certain factors in the environment may also influence the development of the disease.

Causes and symptoms

The underlying event that promotes RA in a person is unknown. Given the known genetic factors involved in RA, some researchers have suggested that an outside event occurs and triggers the disease cycle in a person with a particular genetic makeup. In late 2001, researchers announced discovery of the genetic markers that predict increased risk of RA. The discovery should soon aid research into diagnosis and treatment of the disease. Recent research has also shown that several autoimmune diseases, including RA, share a common genetic link. In other words, patients with RA might share common genes with family members who have other autoimmune diseases like systemic lupus, **multiple sclerosis**, and others.

Many researchers are examining the possibility that exposure to an organism (a bacteria or virus) may be the first event in the development of RA. The body's normal response is to produce cells that can attack and kill the organism, protecting the body from the foreign invader. In an autoimmune disease like RA, this immune cycle spins out of control. The body produces misdirected immune antibodies, which accidentally identify parts of the person's body as foreign. These immune cells then produce a variety of chemicals that injure and destroy parts of the body.

Reports in late 2001 suggest that certain **stress** hormones released during **pregnancy** may affect development of RA and other autoimmune diseases in women. Researchers have observed that women with autoimmune disorders will often show lessened symptoms during the third trimester of pregnancy. The

symptoms then worsen in the year after pregnancy. Further, women appear to be at higher risk of developing new autoimmune disorders following pregnancy.

RA can begin very gradually or it can strike without warning. The first symptoms are **pain**, swelling, and stiffness in the joints. The most commonly involved joints include hands, feet, wrists, elbows, and ankles. The joints are typically affected in a symmetrical fashion. This means that if the right wrist is involved, the left wrist is also involved. Patients frequently experience painful joint stiffness when they first get up in the morning, lasting perhaps an hour. Over time, the joints become deformed. The joints may be difficult to straighten, and affected fingers and toes may be permanently bent. The hands and feet may also curve outward in an abnormal way.

Many patients also notice increased **fatigue**, loss of appetite, weight loss, and sometimes **fever**. Rheumatoid nodules are bumps that appear under the skin around the joints and on the top of the arms and legs. These nodules can also occur in the tissue covering the outside of the lungs and lining the chest cavity (pleura), and in the tissue covering the brain and spinal cord (meninges). Lung involvement may cause shortness of breath and is seen more in men. Vasculitis, an inflammation of the blood vessels, may interfere with blood circulation. This can result in irritated pits (ulcers) in the skin, **gangrene**, and interference with nerve functioning that causes numbness and tingling.

Diagnosis

There are no tests available that can absolutely diagnose RA. Instead, a number of tests exist that can suggest the diagnosis of RA. Blood tests include a special test of red blood cells, the erythrocyte sedimentation rate, which is positive in nearly 100% of patients with RA. However, this test is also positive in a variety of other diseases. Tests for **anemia** are usually positive in patients with RA, but can also be positive in many other unrelated diseases. Rheumatoid factor is an autoantibody found in about 66% of patients with RA. However, it is also found in about 5% of all healthy people and in 10–20% of healthy people over the age of 65. Rheumatoid factor is also positive in a large number of other autoimmune diseases and other infectious diseases.

A long, thin needle can be inserted into a synovial joint to withdraw a sample of the synovial fluid for examination. In RA, this fluid has certain characteristics that indicate active inflammation. The fluid will be cloudy, relatively thinner than usual, with increased protein and decreased or normal glucose. It will also contain a higher than normal number of white blood cells. While these findings suggest inflammatory arthritis, they are not specific to RA.

Treatment

There is no cure available for RA. However, treatment is available to combat the inflammation in order to prevent destruction of the joints and other complications of the disease. Efforts are also made to provide relief from the symptoms and to maintain maximum flexibility and mobility of the joints.

A variety of alternative therapies have been recommended for patients with RA. **Meditation**, hypnosis, **guided imagery**, **relaxation**, and **reflexology** techniques have been used effectively to control pain. **Acupressure** and **acupuncture** have also been used for pain; work on the pressure points should be done daily in combination with other therapies. Bodywork can be soothing and is thought to improve and restore chemical balance within the body. A massage with **rosemary** and **chamomile**, or soaking in a warm bath with these **essential oils**, can provide extra relief. Stiff joints may also be loosened up with a warm **sesame oil** massage, followed by a hot shower to further heat the oil and allow entry into the pores. Movement therapies like **yoga**, **t'ai chi**, and **qigong** also help to loosen up the joints.

A multitude of nutritional supplements can be useful for RA. Fish oils, the enzymes **bromelain** and pancreatin, and the **antioxidants** (vitamins A, C, and E, **selenium**, and **zinc**) are the primary supplements to consider.

Many herbs also are useful in the treatment of RA. Anti-inflammatory herbs may be helpful, including **turmeric** (*Curcuma longa*), **ginger** (*Zingiber officinale*), **feverfew** (*Chrysanthemum parthenium*), **devil's claw** (*Harpagophytum procumbens*), **Chinese thoroughwax** (*Bupleuri falcatum*), and **licorice** (*Glycyrrhiza glabra*). **Lobelia** (*Lobelia inflata*) and **cramp bark** (*Vibernum opulus*) can be applied topically to the affected joints.

Homeopathic practitioners recommend *Rhus toxicondendron* and **bryonia** (*Bryonia alba*) for acute prescriptions, but constitutional treatment, generally used for chronic problems like RA, is more often recommended. Yoga has been used for RA patients to promote relaxation, relieve stress, and improve flexibility. Nutritionists suggest that a vegetarian diet low in animal products and sugar may help to decrease both inflammation and pain from RA. Beneficial foods for patients with RA include cold water fish (mackerel, herring, salmon, and sardines) and flavonoid-rich berries (cherries, blueberries, **hawthorn** berries, blackberries, etc.). The enzyme bromelain, found in pineapple juice has also been found to have significant anti-inflammatory effects.

RA, considered an autoimmune disorder, is often connected with food **allergies** or intolerances. An elimination/challenge diet can help to decrease symptoms of RA as well as identify the foods that should be eliminated to prevent flare-ups and recurrences.

Hydrotherapy can help to greatly reduce pain and inflammation. Moist heat is more effective than dry heat, and cold packs are useful during acute flare-ups. Various yoga exercises done once a day can also assist in maintaining joint flexibility.

Allopathic treatment

Nonsteroidal anti-inflammatory agents and aspirin are used to decrease inflammation and to treat pain. While these medications can be helpful, they do not interrupt the progress of the disease. Low-dose steroid medications can be helpful at both managing symptoms and slowing the progress of RA, as well as other drugs called disease-modifying antirheumatic drugs. These include gold compounds, D-penicillamine, antimalarial drugs, and sulfasalazine. Methotrexate, azathioprine, and cyclophosphamide are all drugs that suppress the immune system and can decrease inflammation. All of the drugs listed have significant toxic side effects, which require healthcare professionals to carefully compare the risks associated with these medications to the benefits.

Total bed rest is sometimes prescribed during the very active, painful phases of RA. Splints may be used to support and rest painful joints. Later, after inflammation has somewhat subsided, physical therapists may provide a careful **exercise** regimen in an attempt to maintain the maximum degree of flexibility and mobility. Joint replacement surgery, particularly for the knee and the hip joints, is sometimes recommended when these joints have been severely damaged. Another surgery used to stop pain in a stiff joint, such as the ankle, is the fusion of the affected bones together (arthrodesis, or artificial anklylosis).

Prognosis

About 15% of all RA patients will have symptoms for a short period of time and will ultimately get better, leaving them with no long-term problems. A number of factors are considered to suggest the likelihood of a worse prognosis. These include:

- race and gender (female and Caucasian)
- more than 20 joints involved
- extremely high erythrocyte sedimentation rate
- extremely high levels of rheumatoid factor
- consistent, lasting inflammation
- evidence of erosion of bone, joint, or cartilage on x rays
- poverty
- older age at diagnosis
- rheumatoid nodules
- other coexisting diseases
- certain genetic characteristics, diagnosable through testing

Patients with RA have a shorter life span, averaging a decrease of three to seven years of life. Patients sometimes die when very severe disease, infection, and gastrointestinal bleeding occur. Complications due to the side effects of some of the more potent drugs used to treat RA are also factors in these deaths.

Prevention

There is no known way to prevent the development of RA. The most that can be hoped for is to prevent or slow its progress.

Resources

BOOKS

Aaseng, Nathan. *Autoimmune Diseases*. New York: F. Watts, 1995.

Lipsky, Peter E."Rheumatoid Arthritis." *Harrison's Princi ples of Internal Medicine*. 14th ed. edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Schlotzhauer, M. *Living with Rheumatoid Arthritis*. Balti more: Johns Hopkins University Press, 1993.

PERIODICALS

Akil, M., and R. S. Amos."Rheumatoid Arthritis: Clinical Features and Diagnosis." *British Medical Journal*. 310 (March 4, 1995): 587+.

Gremillion, Richard B. and Ronald F. Van Vollenhoven. "Rheumatoid Arthritis: Designing and Implementing a Treatment Plan."*Postgraduate Medicine*. 103 (February 1998): 103+.

Moran, M. "Autoimmune Diseases Could Share Common Genetic Etiology."*American Medical News*.44; no. 38: (October 8, 2001):38.

Ross, Clare. "A Comparison of Osteoarthritis and Rheu matoid Arthritis: Diagnosis and Treatment." *The Nurse Practitioner*. 22 (September 1997): 20+.

"Suspect Gene Mapped, May Lead to New Diagnostic Markers and Drug Targets."*Immunotherapy Weekly*. (December 26, 2001):24.

Vastag, Brian. "Autoimmune Disorders and Hormones." *JAMA, Journal of the American Medical Association*. 286, no. 19 (November 21, 2001):1.

ORGANIZATIONS

American College of Rheumatology. 60 Executive Park South, Suite 150, Atlanta, GA 30329. (404)633 1870. http://www.rheumatology.org. acr@rheumatology.org.

Arthritis Foundation. 1330 West Peachtree St., Atlanta, GA 30309. (404)872 7100. http://www.arthritis.org. help@arthritis.org.

Kathleen Wright
Teresa Norris

Rheumatoid spondylitis *see* **Ankylosing spondylitis**

Rhinitis

Definition

Rhinitis is inflammation of the mucous lining of the nose.

Description

Rhinitis is a nonspecific term that covers nasal congestion due to **infections**, **allergies**, and other disorders. In rhinitis, the mucous membranes of the nose become infected or irritated, producing a discharge, congestion, and swelling of the tissues.

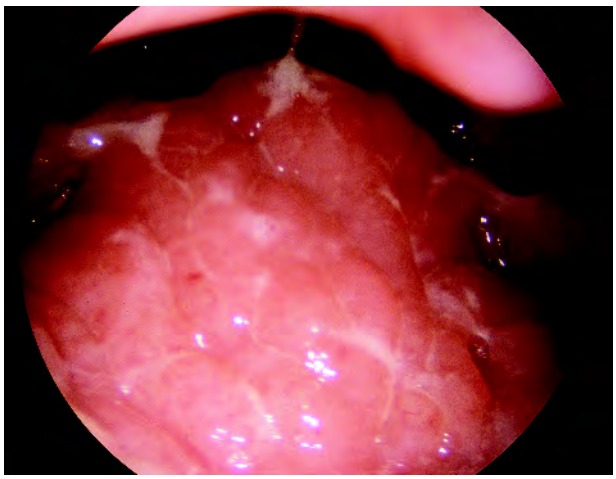
The most widespread form of infectious rhinitis is the **common cold**. The common cold is the most frequent viral infection in the general population. Colds are self-limited, lasting about three to 10 days, although they are sometimes followed by a bacterial infection.

Causes and symptoms

Colds can be caused by as many as 200 different viruses which are transmitted by **sneezing** and coughing, by contact with soiled tissues or handkerchiefs, or by close contact with an infected person.

The onset of a cold is usually sudden. The virus causes the lining of the nose to become inflamed and produce large quantities of thin, watery mucus. The inflammation spreads from the nasal passages to the throat and upper airway, producing a dry **cough**, **headache**, and watery eyes. After several days, the nasal tissues becomes less inflamed and the watery discharge is replaced by a thick, sticky mucus. This change in the appearance of the nasal discharge helps to distinguish rhinitis caused by a viral infection from allergic rhinitis.

Allergies are another frequent cause of rhinitis which is called allergic rhinitis. Allergies occur when a person's immune system overreacts to a substance called an allergen. Airborne allergens can be just about anything but are commonly mold, pollen, dust mites, and pet dander. Symptoms of allergy include watery eyes, nasal discharge, sneezing, and headache.



Posterior rhinoscopy showing acute rhinopharyngitis. *(Ism/Phototake, Reproduced by permission.)*

Diagnosis

Viral rhinitis is diagnosed based on symptoms. Symptoms that last longer than a week may require further testing to rule out a secondary bacterial infection, or an allergy. Allergies can be evaluated by blood tests, skin testing for specific substances, or nasal smears.

Treatment

The many alternative treatments for colds and allergies will not be addressed here. Treatments specifically for rhinitis, regardless of the cause, are described.

Herbal remedies

Flavonoids have anti-inflammatory activities and can be found in many plants including **licorice**, **parsley**, legumes (beans), onions, **garlic**, berries, and citrus fruits. Herbals which may help lessen the symptoms of rhinitis include:

- astragalus (*Astragalus membranaceous*) root
- baical skullcap (*Scutellaria baicalensis*) decoction
- echinacea (*Echinacea* spp.)
- elderflower (*Sambucus nigra*) tea
- garlic, which contains anti-inflammatory compounds
- goldenseal (*Hydrastis canadensis*)
- horehound (*Marrubium vulgare*) tea relieves congestion
- licorice (*Glycyrrhiza glabra*) has anti-inflammatory activity

KEY TERMS

Allergen—A substance that causes an allergic reaction because of a hypersensitive immune system.

Inflammation—A protective response caused by tissue damage that serves to destroy the offending agent. Inflammation is characterized by redness, swelling, pain, and fluid discharge.

- mullein (*Verbascum thapsus*) is a decongestant and soothes mucous membranes
- nettle (*Urtica dioica*) tea stops nasal discharge
- onion, which contains anti-inflammatory compounds
- thyme (*Thymus vulgaris*) tea, which is anti-inflammatory and soothes sore nasal tissues
- walnut (*Juglans nigra* or *regia*) leaf tea, which stops nasal discharge

Other remedies

Other natural remedies for rhinitis include those from **traditional Chinese medicine**. Chronic rhinitis is treated with **acupuncture**, ear acupuncture, and herbals taken internally or used externally. The most common rhinitis remedy is Bi Yan Pian (Bi is for nose.) There are many others, depending on the specific pattern of the patient. **Magnolia** flower and xanthium are commonly used herbs for rhinitis.

Less common Chinese remedies include Huo Dan Wan (**Agastache** and Pig's Gall Bladder Pill) taken three times daily. A decoction of Yu Xing Cao (*Herba houttuyniae*) may be taken internally. The patient can apply 30% Huang Lian Shui (**Coptis** Fluid), Huang Bai Shui (Phellodendron Fluid), Yu Xing Cao (*Herba houttuyniae*) juice, E Bu Shi Cao (*Herba centipedae*) decoction, or 1% ephedrine solution directly to the nose.

Colored **light therapy** is based upon the theory that an unhealthy body is lacking a specific color frequency. Green colored light therapy may relieve chronic rhinitis.

Homeopathic physicians prescribe any of 10 different remedies, depending on the appearance of the nasal discharge, the patient's emotional state, and the stage of infection.

Vitamin C is a natural antihistamine. **Vitamin A** and **zinc** may also be helpful.

Allopathic treatment

There is no cure for the common cold; treatment is given for symptom relief. Medications include aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) for headache and muscle **pain**, and decongestants to relieve stuffiness or runny nose. Antibiotics are ineffective against viral infections. Allergies are treated with antihistamines (Benadryl).

Expected results

Most colds resolve completely in about a week. Complications are unusual but may include sinusitis (inflammation of the nasal sinuses), bacterial infections, or infections of the middle ear. Allergies may resolve or may be lifelong.

Prevention

There is no vaccine effective against colds, and infection does not prevent one from getting colds. Prevention depends on washing hands often, minimizing contact with persons already infected, and not sharing hand towels, eating utensils, or water glasses. In 2002, researchers discovered a new antiseptic skin cleanser that may prevent hand-to-hand transmission of the rhinovirus that causes colds. The cleaner's active ingredient is salicylic or pyroglutamic acid, and each showed promising results for killing the virus on subject's hands.

Allergies may be prevented by avoiding the cause of the allergy, although this is not always possible or practical. Patients may become desensitized to the offending allergen by receiving a series of injections. In 2002, Australian researchers discovered a new potential vaccine that might boost immune response to allergens without the risk of side effects that come with some desensitizing vaccines available today.

Resources

BOOKS

Berman, Stephen, and Ken Chan. "Ear, Nose, & Throat." *Current Pediatric Diagnosis & Treatment*. Edited by William W. Hay, Jr., et al. Stamford, CT: Appleton & Lange, 1997.

Jackler, Robert K., and Michael J. Kaplan. "Ear, Nose, & Throat." In *Current Medical Diagnosis & Treatment 1998,* edited by Lawrence M. Tierney Jr., et al. Stam ford, CT: Appleton & Lange, 1997.

King, Hueston C., and Richard L. Mabry. "Rhinitis." In *Current Diagnosis 9,* edited by Rex B. Conn, et al. Philadelphia: W. B. Saunders Company, 1997.

Ying, Zhou Zhong, and Jin Hui De. "Common Diseases of the Nose." *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

"Antispetic Skin Cleansers May Prevent Rhinovirus Trans mission." *Clinical Infectious Diseases* (February 1, 2002): ii.

Cocilovo, Anna. "Colored Light Therapy: Overview of its History, Theory, Recent Developments and Clinical Applications Combined with Acupuncture." *American Journal of Acupuncture* 27 (1999): 71 83.

"Potential Vaccine Boosts Hope for Pollen Relief." *Immu notherapy Weekly* (March 6, 2002): 3.

Rebecca Frey
Belinda Rowland
Teresa G. Odle

Rhodiola rosea

Description

Siberian golden root *Rhodiola rosea* is native to the Altai Mountains of Siberia where it is known as *zolotov koren*. It is naturalized and widely distributed throughout higher elevations in Eastern Europe, Asia, and Scandinavia and in Ukraine's Carpathian Mountains where it was used to strengthen and protect against the harshness and **stress** of the arctic climate. It has been a folk remedy in these cold mountainous regions for centuries. An Alaskan variety has long been in common use as a staple food in the Eskimo diet, and various species of Rhodiola, some endangered, are found throughout the mountainous areas of North America. Wild *Rhodiola* is becoming a rare genetic resource.

The Greek physician Dioscorides mentioned the herb, then known as *rodia riza*, in the book *De Materia Medica*. The roots of this hardy plant exude a slight rose scent when freshly cut, a quality that inspired the Swiss botanist Linnaeus to assign it the scientific name *Rhodiola rosea*. Other common names are rose root, king's crown, and Sedum rhodiola. In Germany it is called *Rosenwurz*, in Japan *iwa-benkeior*, and in China, where it is a mainstay of traditional medicine, it is known as *Hong Jing Tian*. Researchers with the Swedish Herbal Institute, after decades of study, standardized a unique extract (SHR-5) of *Rhodiola rosea* marketed as Arctic Root.

Rhodiola rosea is a prized member of the *Crassulaceae*, or Stonecrop family, a worldwide family of succulents with about 25 genera and as many as 1,400 species. The genus *Rhodiola* has 200 or more related species. This perennial herb thrives on sunny mountain slopes, on sea cliffs, and in rock crevices and ledges at altitudes of 11,000 to 18,000 feet above sea level. In arctic areas the herb may grow among mats of moss. This drought-tolerant species can survive in sandy to clay soil; however, in soil rich with bird manure or near human habitat, the plant may grow lush and profuse.

The thick, fleshy and scaly aerial stems release a rose-like scent when cut and bear numerous simple leaves that last for a single season or less. Leaves are distributed alternately, sometimes whorl-like, along the stems. The succulent leaf blades, widening gradually from the base, are somewhat spoon shaped, without stalks. The veins are inconspicuous. There is a tap root and the ground-level or under-ground stems are horizontal or vertical and often branched. The plant is not self-fertile and requires bees and flies to pollinate. It is dioecious, bearing either male or female individual flowers. Both male and female plants are needed to propagate seed. The yellow flowers bloom from May to August and the seeds begin to ripen in July.

General use

The Vikings prized this Alpine herb and used it to bolster strength and stamina. In Norway, the herb was once planted on peat-moss roofs as a fire-protecting cover. In Mongolia it was used to treat **tuberculosis** and **cancer**. Russian cosmonauts used it to increase endurance on long space journeys, and Olympian athletes took the herb to increase strength and hasten recovery from physical exertion.

This beneficial mountain herb was mentioned in scientific writings in Iceland, Sweden, Norway, France, and Germany as early as the sixteenth century. It was listed in the first Swedish Pharmacopeia in 1775 and in the early 2000s is mentioned in the national pharmacopoeias of France, Sweden, Denmark, and the former USSR.

In Siberia, Rhodiola tea is said to promote long life. Those who drink it regularly are said to live beyond 100 years. The promise of such longevity motivated Chinese emperors to finance expeditions into Siberia to collect and bring back the plant, which became one the most popular medicinal herbs of middle Asia. *Rhodiola rosea* is commercially grown in Russia and China and in other suitable climates where its attributes have long been valued.

This beneficial tonic herb is classed as a superior herb in **traditional Chinese medicine**. It has been demonstrated as effective in the treatment of **Post-traumatic stress disorder** (PTSD), helping to alleviate typical symptoms such as **depression**, mood-swings, hyper vigilance, **insomnia**, nightmares, flashbacks,

and panic attacks. During wartime, this potent herb was traditionally included in packages that families sent to soldiers on the front lines.

Clinical studies

Researchers in the former Soviet Union studied the beneficial effects of Siberian *Rhodiola rosea*, from as early as the 1930s, though much of this research was kept as a state secret, particularly during the cold war era. The Russian botanist and nutritionist, L. Utkin, discovered Rhodiola's effectiveness in enhancing physical strength in 1931. In 1947, the Russian scientist and professor Lazarev found that *Rhodiola rosea* could boost physical resistance to environmental stressors. Russian physician and scientist Dr. Israel Brekhman, coined the term *Adaptogen* to describe the biologically active properties of this prized traditional medicine.

Not all species have the adaptogenic properties of *R. rosea*, which contains a full spectrum of rosavin, rosarin, and rosin. These substances are derived from the plant rhizomes. Other phytochemical components include the phenylethanol derivatives salidroside and tyrosol, various flavonoids, monoterpernes, triterpenes, and phenolic and gallic acids. The biologically active compounds contained in the roots have large variation and potency varies among the species.

Since the mid-twentieth century there have been hundreds of research studies in Scandinavian countries. Much of the extensive research reported in Russian language journals was only made available in the late twentieth century for study by Western researchers, who replicated and confirmed some claims of the medicinal properties of *Rhodiola rosea*.

Benefits

- Promotes metabolic homeostasis by promoting cellular energy metabolism.
- Enhances physical endurance and recovery from exertion.
- Increases resistance to chemical, biological, and physical stressors.
- Improves memory, concentration, and hearing.
- Relieves anxiety and panic attacks.
- Restores sexual potency in males (through normalization of prostrate).
- Detoxifies the liver and eliminates toxins in muscle tissue.
- Regulates the heart beat, counteracting heart arrhythmias.
- Maintains optimal levels of serotonin and other neurotransmitters in the brain.
- Reduces the cortisol stress hormone, preventing many age-related diseases.
- Alleviates depression, improves sleep, and eliminates fatigue.
- Decreases risk of heart disease by reducing harmful blood lipids.
- Inhibits the spread of bacteria and viral agents.
- Inhibits the growth of tumors (anti-tumor effects demonstrated in animal studies), particularly in glandular tissue such as lungs and breasts.
- Reduces fat, improving the ratio of lean body mass to fat.
- Regulates blood sugar levels for diabetics.

Preparations

Rhodiola tincture is traditionally prepared by means of root decoction. The fresh rhizomes are soaked for a week in 40% alcohol to make a tincture known in the former Soviet Union as *nastojka*.

Native Eskimo people buried the roots for use when short of food and ate fermented stems, leaves, and young flower buds with walrus blubber or other oil. They consumed the young leaves and flowering stems as fresh salad, cooked them as a potherb, or prepared them as a kind of sauerkraut. As a remedy for intestinal discomfort, they steeped the flowers into ingest as a tea or ate them raw for a tuberculosis cure.

Commercially prepared tinctures, capsules, and teas are widely available. Clinical dosages are from standardized extracts containing effective amounts of active agents: Typically *Rhodiola rosea* is standardized to 3% Rosavins and 1% Salidroside, the ratio found in the natural root. An effective dose is from 200–600 mg/day.

Researchers also suggest varying dosage, depending upon the ratio of rosavin in the extract. For chronic use, the suggested daily dose is as follows:

- 360–600 mg daily of an extract standardized for 1% rosavin
- 180–300 mg daily of an extract standardized for 2% rosavin, or
- 100–170 mg of an extract standardized for 3.6% rosavin

A person may begin taking *Rhodiola rosea* several weeks before any expected increase in physiological, chemical, or biological stress and continue daily dosage throughout the duration of the stressful period.

KEY TERMS

Adaptogen—A plant with biologically active components that increase the adaptive ability of an organism stressed by internal and external factors; helps to counter and prevent damage from adverse physical, chemical, or biological stressors.

Antitumor—A property of plant chemistry that acts to prevent or inhibit the formation or growth of tumors.

Perennial—A plant with a lifecycle persisting more than two years, reoccurring year after year.

Rhizome—A fleshy plant stem that grows horizontally under or along the ground. Roots are sent out below this stem and leaves or shoots are sent out above it.

Succulent—Any type of drought-tolerant plant that stores water in its fleshy parts, such as stems and leaves.

Superior herb—The highest of three categories of herbal plants in traditional Chinese medicine. A superior herb is a non-toxic tonic that acts safely over time to assist the body in self-healing by eliminating toxins and nourishing, strengthening, and supporting cells, tissues, and organs and by supporting the immune system to maintain health and vitality.

Tonic—Herbal remedies with a slow, nourishing, gently stimulating and well-tolerated action in the body.

For circumstances of limited or short-term stress, a single dose, as high as three times the daily dose, may be beneficial in boosting the system to deal with the acute stress. *Rhodiola rosea* may be taken in appropriate dosages for only one day (acute administration) or with chronic conditions, daily up to four months.

Consumers should be aware that only the species *Rhodiola rosea* has been found to contain the full spectrum of the three pharmacologically active agents, rosavin, rosarin, and rosin. These agents, collectively known as rosavins, are believed to given the herb its beneficial effect.

Precautions

Rhodiola rosea is non-toxic. There are no known or suspected safety risks when it is taken in recommended doses. Though clinical trials have revealed no serious adverse effects, the safe use of *Rhodiola rosea* by pregnant or nursing women, young children, or by people with severe liver or kidney disease has not been established. If individuals are prone to insomnia, it is advisable not to take the herb late at night, as it may disrupt sleep patterns. Consumers ought to consult a qualified herbalist or medical doctor before taking *Rhodiola* if they are also taking any prescription drug.

It would be prudent with chronic use of *Rhodiola rosea* to allow brief intervals without taking the herb, in keeping with established dosage patterns used with other plant adaptogens.

Resources

BOOKS

Winston, David, and Steven Maimes. *Adaptogens: Herbs for Strength, Stamina, and Stress Relief*. Rochester, VT: Healing Arts Press, 2007.

PERIODICALS

"Rhodiola." *Healthy for Men* (February/March 2006).
Tuttle, Dave. "Rhodiola: The Cellular Energy Boosting Herb." *Life Extension* (February 2006).
Vastag, Brian. "Warming to a Cold War Herb." *Science News Online* 172, no. 12 (September 22, 2007).

OTHER

"Herbal Extract Found to Increase Lifespan." *ScienceDaily* (December 7, 2007). http://www.sciencedaily.com?/releases/2007/12/071205115232.htm (February 12, 2008).

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (512) 926 4900, http://abc.herbalgram.org.

Clare Hanrahan

Rhubarb root

Description

Rhubarb, also called sweet round-leaved dock or pieplant, is usually thought of as a fruit, but it is actually one of the few perennial vegetables in existence. Ordinary garden rhubarb carries the botanical name of *Rheum rhaponticum*, though there are other members of this botanical group that are also used for medicinal purposes. Chinese rhubarb, which is called *da huang* in traditional Chinese medicine, has the botanical name *Rheum palmatum*. Chinese rhubarb has a much stronger taste and properties than the common American variety. Rhubarb is a member of the same family as buckwheat, the Polygonaceae family. It originally came from Mongolia in northern Asia, but was

Rhubarb root. *(© Arco Images / Alamy)*

long ago introduced to both India and Turkey. It was formerly called India or Turkey rhubarb.

In the 1760s, in England, an Oxfordshire pharmacist named Hayward began developing and growing the type of rhubarb most commonly grown today. Records indicate that rhubarb was first grown as a market crop in England in 1810. But because it was unknown, few people purchased it. In the next one hundred years, its popularity grew tremendously.

The average life expectancy of rhubarb plants is five to eight years. Although rhubarb produces seeds, they can give birth to plants remarkably different from the parent plant. For this reason, rhubarb cultivation is usually done by cutting and replanting pieces of its large storage root.

Rhubarb is an early plant that is extremely hardy. It is relatively immune to attack by insects or disease. It puts out smaller feeder roots in early spring; even in colder regions, reddish bud-like projections appear in early April. These develop rapidly into long thick succulent stalks that can grow from 1–3 ft (approximately 30–90 cm) in length. Rhubarb stalks are generally ready for harvesting by late May. One very large spade-shaped leaf with curled edges grows at the tip of each stalk. There is considerable evidence that these leaves should be considered poisonous due to their high content of salts of oxalic acid. Oxalic acid is a powerful but toxic cleaning agent. Although M. Grieve reports that people have eaten both the leaves and the newly formed rhubarb buds without any problem, she also mentions several sources that listed several cases of death by rhubarb leaf poisoning around 1910. Rhubarb stalks have a tangy, sweet-sour taste much prized for the making of desserts, especially pies. Rhubarb stalks are a good source of ascorbic acid (**vitamin C**).

Chinese rhubarb produces a yellowish root with a distinctive network of white lines running along the outer surface. Chinese rhubarb root is much larger and more firmly textured than its Western relatives, and has much stronger laxative qualities, but it is also less astringent. The root of Western garden rhubarb is smaller, spongier, and is usually pinkish in color. It has sporadic star-shaped spots evident along its transverse sections.

KEY TERMS

Astringent—A substance that constricts or contracts the soft tissues or canals of the body. Rhubarb root has an astringent effect on the intestines.

Crohn's disease—A chronic inflammatory disease that can affect any part of the gastrointestinal tract from the mouth to the anus.

Diuretic—A group of drugs that help remove excess water from the body by increasing the amount lost in urine.

Electrolytes—Substances whose molecules split into electrically charged particles when dissolved or melted.

Hypokalemia—A condition in which the levels of potassium in the bloodstream are too low.

Oxalic acid—A poisonous white crystalline acid, used for bleaching, as a cleanser, and as a laboratory reagent. Rhubarb leaves contain small quantities of oxalic acid.

General use

Western herbalism

Rhubarb root has properties that make it a highly effective laxative. Its astringent qualities help to improve bowel tone after it has purged the intestines, making it an excellent agent for improving the tone and health of the digestive tract. Its laxative effects make it a valuable aid in the treatment of chronic **constipation**, hemorrhoids, and **gastroenteritis**. Skin eruptions caused by problems in elimination are also treated with rhubarb root. The Western rhubarb root, being milder, is used in treating infant digestive problems, constipation, or **diarrhea**.

Traditional Chinese medicine

Da huang, or Chinese rhubarb, is one of the most ancient and best known plants used in Chinese herbal medicine. Rhubarb and its wide range of uses were first documented in the *Divine Husbandman's Classic of Materia Medica*, which was written during the later Han Dynasty, around 200 A.D. The Chinese also used rhubarb root as a laxative and purgative for the treatment of both constipation and diarrhea, depending upon the dosage used. Larger doses cause purging that removes toxins from the intestinal tract, while smaller doses are believed to moisten the mucous membranes of the intestines and improve their tone. The tannins that are also found in the root may eventually cause binding of the bowel. Chinese rhubarb's laxative component normally works within eight hours.

Rhubarb root has been found useful in controlling gastrointestinal hemorrhage by promoting the formation of blood platelets. This increase in the number of platelets shortens blood clotting time and is helpful in treating **jaundice**. Recent studies in China and Japan demonstrated that rhubarb root can delay or stop the progression of chronic renal failure. One of the tannin components of rhubarb root, lindleyin, has been shown to act as an anti-inflammatory agent with fever-reducing properties similar to those of aspirin. Lindleyin is used in treating endometriosis and some menstrual problems. Emodin, another component of Chinese rhubarb root, has been found to inhibit the growth of cancer cells. Chinese herbalists have found rhubarb root helpful in external applications for **burns**, suppurative sores and ulcers, **conjunctivitis**, and traumatic injuries. There is some empirical evidence that *da huang* can reduce high blood pressure during **pregnancy**, although it should be used very cautiously in pregnancy. It has the ability to fight such anaerobic infectious agents as *Candida albicans*. Chinese herbalists also use rhubarb root for diseases and disorders in the upper body, including sinus and lung **infections**, nosebleeds, and eye infections. According to the principles of traditional Chinese medicine, rhubarb root makes the heat in the upper body discharge through the bowel.

More recently, Japanese researchers have suggested that rhubarb root is effective in treating the severe diarrhea associated with cholera. One of the tannins isolated from rhubarb root, galloyl-tannin, appears to counteract the toxin secreted by the bacterium that causes cholera.

Although some of the individual chemical compounds that can be isolated from rhubarb have been reported to cause **cancer**, there is no evidence as of 2002 that rhubarb by itself or herbal preparations containing it cause cancer in humans.

Preparations

Rhubarb root is usually taken from plants four or more years of age. It is dug up in the autumn, usually October, washed thoroughly, external fibers removed, and dried completely. The root is then pulverized and stored in a tightly closed container. Chinese rhubarb root usually comes from either China or Turkey. It can be purchased either in a powdered form or as a tincture. Putting 1.5–1 tsp (2.5–5 cc) of pulverized rhubarb root in 1 cup (240 cc) of water can make a decoction,

or tea. This mixture is brought to a boil and then simmered at reduced heat for 10 minutes. Rhubarb tea can be taken twice a day. The tincture can be taken in a dose of 1–2 ml three times a day. Chinese herbal preparations of rhubarb root are individually compounded for each patient. Rhubarb root may be combined with other herbs.

Precautions

Chinese rhubarb should be prescribed only by a trained herbalist. It should not be taken by children under twelve years of age, or by pregnant or nursing women. It should also not be used by persons with acute and chronic inflammatory diseases of the intestine, including Crohn's disease, appendicitis, and intestinal obstruction. When rhubarb is used for its laxative-purgative qualities, the patient should be reminded that constipation is often caused by poor diet and lack of proper **exercise**. Correcting these patterns can improve bowel function without the use of any other therapy. People who use rhubarb root long-term for bowel problems may find that its effectiveness is decreased by extended use, and can also cause excessive loss of electrolytes from the intestinal tract. Loss of electrolytes, especially potassium, can lead to muscle weakness, and in extreme cases, cardiac arrhythmias. It should be noted that rhubarb root can color the urine either a deep yellow or even red. It is possible to become intoxicated from an overdose of rhubarb, though the plant is generally safe to take in the recommended doses and manner. Signs of overdosage include vertigo, nausea and **vomiting**, and severe abdominal cramps. Long-term use can lead to hypokalemia and cirrhosis of the liver.

Some specialists in internal medicine maintain that rhubarb should not be taken by people who are susceptible to **gallstones** or **kidney stones**.

Side effects

Severe abdominal cramping is a common side effect of rhubarb root. This problem can often be alleviated by reducing the dose.

Interactions

Due to the possible loss of **potassium**, rhubarb root should not be taken in combination with cardiac medications, diuretics, other laxatives or cathartics, or steroids. Loss of potassium from the system can be decreased by combining the rhubarb root with **licorice** root.

Resources

BOOKS

Grieve, M., and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. New York: Barnes and Noble Publishing, 1992.

Hoffman, David, and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. New York: Barnes and Noble Publishing, 1999.

PERIODICALS

Mantani, N., N. Sekiya, S. Sakai, et al. "Rhubarb Use in Patients Treated with Kampo Medicines A Risk For Gastric Cancer?" *Yakugaku Zasshi* 122 (June 2002): 403 405.

Oi, H., D. Matsuura, M. Miyake, et al. "Identification in Traditional Herbal Medications and Confirmation by Synthesis of Factors That Inhibit Cholera Toxin Induced Fluid Accumulation." *Proceedings of the National Academy of Sciences of the United States* 99 (March 5, 2002): 3042 3046.

ORGANIZATIONS

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. www.aaom.org.

Rocky Mountain Herbal Institute. P. O. Box 579, Hot Springs, MT 59845. (406) 741 3811. www.rmhiherbal.org.

OTHER

Herbal Advisor. http://www2.AllHerb.com.

On Health. http://www.OnHealth.com.

Joan Schonbeck
Rebecca J. Frey, PhD

Rhus toxicodendron

Description

Rhus toxicodendron is the **homeopathy** remedy commonly known as poison ivy. This plant from the Anacardiaceae family grows in fields and wooded areas in North America. The plant is commonly identified by its pointy leaves that grow in threes.

There are two varieties of this plant. Poison ivy is a twining vine with a thick stem that branches out into slender stems. Poison **oak** is a shrub that reaches a height of 4 ft (1.2 m). The plant is also known as mercury vine or poison vine.

A main constituent of the plant is toxicodendric acid, a volatile substance that is most potent after dusk,

KEY TERMS

Polychrest—A homeopathic remedy that is used in the treatment of many ailments.

in damp or cloudy weather, or in June and July. This oil is poisonous when it comes in contact with the skin. Symptoms of poisoning include an itchy red rash that forms **blisters**, **fever**, loss of appetite, **nausea**, **headache**, delirium, swollen glands, and oral ulcers.

The medicinal use of poison ivy was discovered by accident. A French physician in the late eighteenth century discovered that a patient's chronic rash had been cured as a result of accidental poison ivy exposure. The doctor then went on to use the leaves and stalk of the plant in the treatment of skin disease, paralysis, and rheumatic complaints.

General use

Rhus toxicodendron (Rhus tox.) is a remedy frequently indicated for conditions that are accompanied by fever, swollen glands, inflammation of mucous membranes and/or muscles, skin conditions, and restlessness. Homeopaths prescribe Rhus tox. for a number of complaints including poison ivy, chicken pox, back **pain**, colds, herpes, **hives**, flu, **mumps**, **measles**, **sore throat**, nerve pain, muscle **strains** and **sprains**, **dermatitis**, arthritis, **bursitis**, carpal tunnel, rheumatism, and fevers. Ailments arise from overexertion, a change in weather, cold/damp weather, or from getting wet or chilled.

A portrait of the typical Rhus tox. patient is as follows. The patient has a red face, swollen glands, and dry lips. He may have **muscle cramps** or joint pains that are pressing, shooting, and sore. Because of his pains he is not comfortable unless he is moving. The patient may be hungry without having an appetite or have a **dry mouth** even though he is very thirsty. Drinking cold beverages may trigger nausea and **vomiting** and may cause pain in the stomach. Other symptoms include a gnawing pain in the stomach with a full and heavy feeling, a swollen liver that is painful when pressed, bladder weakness, inflammation of the glands of the abdomen and groin, and paralysis or numbing of limbs due to exposure to the cold.

The complaints are left-sided or move from the left side to right side. The patient's tongue is red-tipped, and he has a metallic taste in his mouth. He often has a violent thirst, but has difficulty swallowing solids. He dislikes the cold and is sensitive to dampness. He craves oysters, milk, and sweets and may have an aversion to meat. He is restless, anxious, confused, absent-minded, depressed, irritable, tearful, apprehensive, and often wants to be left alone.

The patient's ailments are generally worse in the morning and at night (particularly after midnight), while lying down, from physical exertion, from a change in weather, during wet weather, in open air, from touch, and from cold food or drinks. Symptoms are relieved by motion or a change in position, warmth, perspiration, or drinking hot beverages.

Specific indications

Rhus tox. is one of the major homeopathic remedies for mumps with hard swollen glands, fever, and a white or yellow coated tongue with a red tip. The left side will swell first or be worse on the left side. The glands are painful to the touch. Symptoms are better from heat and worse from cold.

Rhus tox. is one of the best remedies indicated in chronic or acute rheumatic or arthritic conditions. Sharp, aching pains are present in the bones. The joints are stiff and lame and the muscles, ligaments, and tendons feel sore and bruised. The pains are worse with movement, but are eased with gentle **exercise**. In acute arthritis, the joints are smooth and shiny with little redness. There is numbness or tingling in the affected part. In chronic arthritis conditions there is less swelling, but much stiffness of the joints. The pains may cause the patient to get up at night, causing sleeplessness. The symptoms are worse during damp weather, during fever, at night, or while chilled; continued movement and warmth makes them better.

Inflammations and conditions of the skin are common, and the patient may suffer from large blisters, hives, **eczema**, moist eruptions, or abscesses. Both men and women may have an eczematous rash in the genital area. Conditions of chicken pox, poison ivy, or poison oak are accompanied by red, itchy skin and inflamed blisters that are filled with an oozy pus or a clear fluid. Inflamed blisters are also common with herpes outbreaks. Cold sores appear on the lips. Hives may occur as a result of fever or getting wet. Hives are accompanied by a burning, **itching** rash that is worse from scratching or from cold conditions.

The headache typical of Rhus tox. is centered in the back of the head. The headache is of a pulsating nature with a buzzing in the ears. The head muscles are sore and the pains are sharp and stitching. The pain is improved by keeping the head warm. Walking around also improves the headache.

Inflammation of the eyes occurs as a result of exposure to cold conditions, damp weather, and through suppressing perspiration. The patient is sensitive to light and has sore, swollen, itchy, watery eyes. The lids are often glued together. Stitching pains in the eyes are made worse from moving the eyes. Restlessness and fever usually accompany these eye conditions.

Flu is accompanied by bone, joint, and leg pains. The patient has a fever, and suffers from **sneezing** and exhaustion.

A sore throat may be accompanied by a hoarse voice that is caused by talking or singing too much. The throat is dry and is worse from swallowing or cold drinks. It is made better from continued use.

The **cough** typical of Rhus tox. is an irritating, tickling cough that is better from hot drinks and worse from the cold. The cough is often brought on by swimming in cold water.

Rhus tox. is used to treat many kinds of fevers when all the symptoms match. The fever is of a dry and burning nature. A profuse sweat may occur at the slightest exertion. The patient may feel better from sweating but get chilled, which aggravates his symptoms. The fever is often on one side of the body. During typhoid fever, the abdomen is distended and painful.

A backache that is centered in the lower back or small of the back is made better from lying on a hard surface or from movement or heat. The back feels weak and tired. Caused by damp weather or injury, the ache is aggravated by wet weather or movement.

Nerve pain or **sciatica** may be present. It is ameliorated with movement or heat and made worse by lying on the painful side, bathing in cold water, or being exposed to the cold.

Preparations

The leaves and stalk of the plant are gathered when the poison is the most potent, generally at night. They are then pounded to a pulp and mixed with alcohol. The mixture is then strained and diluted.

Rhus tox. is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, consult your homeopath or healthcare practitioner.

Do not exceed the recommended dose.

Side effects

The only side effects are individual aggravations that may occur with homeopathic remedies.

Interactions

When taking any homeopathic remedy, do not use **peppermint** products, coffee, or alcohol. These products may cause the remedy to be ineffective.

Resources

BOOKS

Cummings, M.D., Stephen, and Dana Ullman, M.P.H. *Everybody's Guide to Homeopathic Medicines*. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

Kent, James Tyler. *Lectures on Materia Medica*. Delhi, India: B. Jain Publishers, 1996.

Jennifer Wurges

Riboflavin

Description

Riboflavin, also known as Vitamin B_2, is a water-soluble vitamin that the body needs to remain healthy. Humans cannot make riboflavin, so they must get it from foods in their diet. Riboflavin has many functions in common with the other members of the B complex family, including support of the immune and nervous systems and formation of healthy red blood cells. Riboflavin provides essential factors for the production of cellular enzymes that turn proteins, fats, and carbohydrates into energy. It also participates in cell reproduction, and keeps skin, hair, nails, eyes, and mucous membranes healthy. **Folic acid** (vitamin B_9) and **pyridoxine** (vitamin B_6) are activated by riboflavin.

Recent research has found that riboflavin is one of three vitamins involved in the regulation of circadian (daily) rhythms in humans and other mammals. Riboflavin helps to activate certain light-sensitive cells in the retina of the eye that synchronize the animal's daily biological rhythms with the solar light/darkness cycle.

General use

The United States Institute of Medicine (IOM) of the National Academy of Sciences has developed values called Dietary Reference Intakes (DRIs) for vitamins and minerals. The DRIs consist of three sets of numbers. The Recommended Dietary Allowance (RDA) defines the average daily amount of the

Clementines are a good source of Riboflavin. *(© imagebroker / Alamy)*

nutrient needed to meet the health needs of 97–98% of the population. The Adequate Intake (AI) is an estimate set when there is not enough information to determine an RDA. The Tolerable Upper Intake Level (UL) is the average maximum amount that can be taken daily without risking negative side effects. The DRIs are calculated for children, adult men, adult women, pregnant women, and breastfeeding women.

The IOM has not set RDAs for riboflavin in children under one year old because of incomplete scientific information. Instead, it has set AI levels for this age group. No UL levels have been set for any age group because no negative (toxic) side effects have been found with large doses of riboflavin. RDAs for riboflavin measured in micrograms (mg).

The following are the RDAs and AIs for riboflavin for healthy individuals:

- children birth–6 months: AI 0.3 mg
- children 7–12 months: AI 0.4 mg
- children 1–3 years: RDA 0.5 mg
- children 4–8 years: RDA 0.6 mg
- children 9–13 years: RDA 0.9 mg
- boys 14–18 years: RDA 1.3 mg
- girls 14–18 years: RDA 1.0 mg
- women age 19 and older: RDA 1.1 mg
- men age 19 and older: RDA 1.3 mg
- pregnant women: RDA 1.4 mg
- breastfeeding women: RDA 1.6 mg

High doses of riboflavin, as much as 400 mg per day, have been shown to reduce the frequency of migraine headaches by half in susceptible people. The severity of the events was also reportedly decreased. This may be an effect of improved use of cellular energy in the brain. It is

Recommended dietary allowance of riboflavin

Age	mg/day
Children 0-6 mos.	0.3 (AI)
Children 7-12 mos.	0.4 (AI)
Children 1-3 yrs.	0.5
Children 4-8 yrs.	0.6
Children 9-13 yrs.	0.9
Boys 14-18 yrs.	1.3
Girls 14-18 yrs.	1.0
Men ≥19 yrs.	1.3
Women ≥19 yrs.	1.1
Pregnant women	1.4
Breastfeeding women	1.6
Foods that contain riboflavin	**mg**
Yogurt, low fat, 1 cup	0.52
Milk, 2%, 1 cup	0.40
Tempeh, cooked, 4 oz.	0.40
Beef tenderloin, broiled, 4 oz.	0.35
Milk, nonfat, 1 cup	0.34
Egg, boiled, 1 large	0.27
Almonds, roasted, 1 oz.	0.24
Spinach, cooked, 1/2 cup	0.21
Chicken, dark meat, roasted, 3 oz.	0.18
Salmon, broiled, 3 oz.	0.13
Asparagus, cooked, 1/2 cup	0.11
Chicken, light meat, roasted, 3 oz.	0.10
Broccoli, steamed, 1/2 cup	0.09
Bread, white, enriched, 1 slice	0.09
Bread, whole wheat, 1 slice	0.07

AI = Adequate Intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

theorized that riboflavin may help decrease the odds of getting **cataracts**, but the evidence for this is not definitive. One large study had a group taking both **niacin** (vitamin B_3) and riboflavin, and while the group had a significantly lower total incidence of cataracts, they had a somewhat higher than average incidence of a specific cataract subtype. Memory may be improved by these supplements, according to some research done on older people. Riboflavin and **vitamin C** both help boost the body's level of **glutathione**, which is an antioxidant with many beneficial effects. There is not enough evidence to support the effectiveness of riboflavin for sickle-cell **anemia**, **canker sores**, or as an athletic performance aid.

Preparations

Natural sources

Beef liver is a very rich source of riboflavin, but dairy products also supply ample amounts. Higher fat sources

contain less than those with low fat. In the United States starting in 1943, riboflavin, along with thiamin and niacin, has been added to flour. Some breakfast cereals are also fortified with riboflavin. Vegetable that are a good source of riboflavin include avocados, mushrooms, spinach, and other dark green, leafy vegetables. Nuts, legumes, nutritional yeast, and **brewer's yeast** contain riboflavin as well. Cooked foods provide as much of this vitamin as raw ones do, since the substance is heat stable. Light, however, does break down riboflavin. To preserve it dairy and grain products should be stored in something opaque or kept them away from light.

The following list gives the approximate riboflavin content for some common foods:

- spinach, cooked, 1/2 cup: 0.21 mg
- asparagus, cooked, 1/2 cup: 0.11 mg
- broccoli, steamed 1/2 cup: 0.09 mg
- milk, 2% 1 cup 0.40 mg
- milk, nonfat 1 cup: 0.34 mg
- yogurt, low fat: 1 cup: 0.52 mg
- egg, boiled, 1 large: 0.27 mg
- almonds, roasted, 1 ounce: 0.24 mg
- salmon, broiled, 3 ounces: 0.13 mg
- chicken, light meat, roasted, 3 ounces: 0.10 mg
- chicken, dark meat, roasted, 3 ounces: 0.18 mg
- beef tenderloin, broiled, 4 ounces: 0.35 mg
- tempeh, cooked, 4 ounces 0.4 mg
- bread, whole wheat, 1 slice: 0.07 mg
- bread, white, enriched, 1 slice 0.09 mg

Supplemental sources

Riboflavin is available as an oral single vitamin product. Individuals should consider taking a balanced B complex supplement rather than high doses of an individual vitamin unless there is a specific indication to do so. Supplements should be stored in a cool, dry place, away from light, and out of the reach of children.

Deficiency

Ariboflavinosis is the term for the condition of vitamin B_2 deficiency. Since small amounts can be stored in the liver and kidneys, a dietary inadequacy may not become apparent for several months. Insufficient levels of riboflavin have noticeable effects on several areas of the skin. Commonly the corners of the mouth are cracked. Facial skin and scalp tend to itch and scale, as does the scrotal skin. The eyes **fatigue** easily and are sensitive to light, and may also become watery, sore, or bloodshot. Trembling, neuropathy, **dizziness**, **insomnia**, poor digestion, slow growth, and **sore throat** and tongue have also been reported. Anemia may develop if the deficiency is severe. People who are deficient in riboflavin are likely to be lacking in other B vitamins, and possibly additional nutrients, as well.

Recent studies done at the National **Cancer** Institute indicate that riboflavin deficiency increases a woman's risk of developing cervical cancer. Further studies of this connection are underway.

Risk factors for deficiency

Riboflavin deficiency is uncommon in developed countries, but some populations may need more than the RDA in order to maintain good health. War refugees are a population at high risk for riboflavin deficiency. Vegans and others who do not use dairy products may want to take a balanced B vitamin supplement; one study of Swedish vegans found that over 90% were not getting enough riboflavin in their diet. Those with increased need for riboflavin and other B vitamins may include people under high **stress**, including those experiencing surgery, chronic illnesses, liver disease, or poor nutritional status. Diabetics may have a tendency to be low on riboflavin as a result of increased urinary excretion. Athletes, and anyone else with a high-energy output may need additional vitamin B_2. This includes anyone who exercises with some regularity. The elderly are more likely to suffer from nutritional inadequacy as well as problems with absorption; the dietary preferences of many elderly people often exclude foods that are high in riboflavin. Smokers and alcoholics are at higher risk for deficiency as tobacco and alcohol suppress absorption. Birth control pills may possibly reduce riboflavin levels, as can phenothiazine tranquilizers, tricyclic antidepressants, and probenecid. Individuals should consult a health care professional to determine if supplementation is appropriate.

Recent advances in human genetics indicate that certain genotypes are at greater risk for riboflavin deficiency than others.

Precautions

Riboflavin should not be taken by anyone with a B vitamin allergy or chronic renal disease. Other populations are unlikely to experience any difficulty from taking supplemental B_2.

Side effects

Taking supplemental riboflavin causes a harmless intense orange or yellow discoloration of the urine.

KEY TERMS

Antioxidant—Any one of a group of substances that function to destroy cell-damaging free radicals in the body.

Genotype—The genetic makeup of an organism or group of organisms with respect to a biological trait or set of traits.

Migraine—A very severe headache, often accompanied by nausea and vomiting. It is usually experienced on one side of the head, and may be preceded by visual symptoms.

Neuropathy—Abnormality of the nerves which may be manifested as numbness, tingling, or weakness of the affected area.

Vegan—A vegetarian who omits all animal products from the diet.

Interactions

Probenecid (a drug treating **gout**) impairs riboflavin absorption, and propantheline bromide (a drug treating peptic ulcers) reportedly both delays and increases absorption. Phenothiazines (antipsychotic drugs) increase the excretion of riboflavin, thus lowering serum levels, and oral contraceptives may also decrease serum levels. Tricyclic antidepressants may lower the levels of riboflavin in the body. Long-term use of phenobarbitol seems to increase the rate of destruction of riboflavin by the liver. Supplementation should be discussed with a health care provider if these medications are being used. Absorption of riboflavin is improved when taken together with other B vitamins and vitamin C.

Riboflavin supplements may lower the effectiveness of chloroquine and other antimalarial medications. Riboflavin should not be taken at the same time as tetracycline antibiotics because it interferes with the absorption and effectiveness of these medications. It may also interfere with the effectiveness of sulfa-containing drugs used to treat bacterial **infections**.

Resources

BOOKS

Berkson, Burt and Arthur J. Berkson. *Basic Health Publications User&s Guide to the B complex Vitamins*. Laguna Beach, CA: Basic Health Publications, 2006.

Bratman, Steven, and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. Pennsylvania: Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: the complete guide*. Arizona: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehensive Database*. California: Therapeutic Research Faculty, 1999.

Lieberman, Shari and Nancy Bruning. *The Real Vitamin and Mineral Book: The Definitive Guide to Designing Your Personal Supplement Program*, 4th ed. New York: Avery, 2007.

PERIODICALS

Blanck, H. M., B. A. Bowman, M. K. Serdula, et al. "Angular Stomatitis and Riboflavin Status Among Adolescent Bhutanese Refugees Living in Southeastern Nepal." *American Journal of Clinical Nutrition* 76 (August 2002): 430 435.

Larsson, C. L., and G. K. Johansson. "Dietary Intake and Nutritional Status of Young Vegans and Omnivores in Sweden." *American Journal of Clinical Nutrition* 76 (July 2002): 100 106.

McNulty, H., M. C. McKinley, B. Wilson, et al. "Impaired Functioning of Thermolabile Methylenetetrahydrofolate Reductase Is Dependent on Riboflavin Status: Implications for Riboflavin Requirements." *American Journal of Clinical Nutrition* 76 (August 2002): 436 441.

Shahar, S., K. Chee, and W. C. Wan Chik. "Food Intakes and Preferences of Hospitalized Geriatric Patients." *BMC Geriatrics* 2 (August 6, 2002): 3.

Silberstein, S. D., and P. J. Goadsby. "Migraine: Preventive Treatment." *Cephalalgia* 22 (September 2002): 491 512.

Wolf, G. "Three Vitamins Are Involved in Regulation of the Circadian Rhythm." *Nutrition Reviews* 60 (August 2002): 257 260.

Ziegler, R. G., S. J. Weinstein, and T. R. Fears. "Nutritional and Genetic Inefficiencies in One Carbon Metabolism and Cervical Cancer Risk." *Journal of Nutrition* 132 (August 2002): 2345S 2349S.

ORGANIZATIONS

American Dietetic Association, 216 West Jackson Blvd, Chicago, IL, 60606, (312) 899 0040, www.eatright.org.

Office of Dietary Supplements (ODS), National Institutes of Health, 6100 Executive Boulevard, Room 3B01, MSC 7517, Bethesda, MD, 20892, (301) 435 2920, www.ods.od.nih.gov.

Judith Turner
Rebecca J. Frey, PhD
Helen Davidson

Ringing ears *see* **Tinnitus**

Rolfing

Definition

Rolfing, also called Rolf therapy or structural integration, is a holistic system of bodywork that uses deep manipulation of the body's soft tissue to realign and

Therapist uses his elbows to give a deep massage to a patient as part of Rolfing therapy. *(Horacio Sormani / Photo Researchers, Inc.)*

balance the body's myofascial structure. Rolfing improves posture, relieves chronic **pain**, and reduces **stress**.

Origins

Ida Pauline Rolf (1896–1979) was a biochemist from New York who developed structural integration over the course of many years after an accident as a young woman. She was kicked by a horse's hoof on a trip out West and developed symptoms resembling those of acute **pneumonia**. She made her way to a hospital in Montana, where she was treated by a physician who called in an osteopath to assist in her treatment. After the osteopath treated her, she was able to breathe normally. After her return to New York, her mother took her to a blind osteopath for further treatment. He taught her about the body's structure and function, after which Rolf became dissatisfied with conventional medical treatment. Following completion of a doctorate in biochemistry from Columbia University in 1920, Rolf studied atomic physics, mathematics, and homeopathic medicine in Europe. After 1928, when her father died and left her an inheritance that allowed her to pursue her own studies, she explored various forms of alternative treatment, including **osteopathy**, **chiropractic** medicine, tantric **yoga**, the **Alexander technique** of tension reduction through body movement, and Alfred Korzybski's philosophy of altered states of consciousness.

By 1940, Rolf had synthesized what she had learned from these various disciplines into her own technique of body movement that she called structural integration, which later became known as Rolfing. During the Second World War, Rolf continued to study with an osteopath in California named Amy Cochran. In the mid-1960s, Gestalt therapist Fritz Perls invited Rolf to Esalen, where she began to develop a following among people involved in the human potential movement. In 1977, she published *Rolfing: The Integration of Human Structures*, the definitive book on structural integration bodywork. She continued to refine the therapy until her death in 1979. Rolf's work is carried on through her Guild for Structural Integration, now known as the Rolf Institute of Structural Integration, which she founded in 1971 in Boulder, Colo.

Benefits

Rolfing helps to improve posture and bring the body's natural structure into proper balance and alignment. This can bring relief from general aches and pains, improve breathing, increase energy, improve self-confidence, and relieve physical and mental stress. Rolfing has also been used to treat such specific physical problems as chronic back, neck, shoulder, and joint pain, and repetitive stress injuries, including **carpal tunnel syndrome**. Many amateur and professional athletes, including Olympic skaters and skiers, use Rolfing to keep in top condition, to prevent injuries, and to more quickly recover from injuries.

Description

Rolfing is more than just a massage of the body's surface. It is a system that reshapes the body's myofascial structure by applying pressure and energy, thereby freeing the body from the effects of physical and emotional traumas. Although Rolfing is used extensively to treat sports injuries and back pain, it is not designed as a therapy for any particular condition. Rather, it is a systematic approach to overall wellness. It works by counteracting the effects of gravity, which

KEY TERMS

Atrophy—A progressive wasting and loss of function of any part of the body.

Carpal tunnel syndrome—A condition caused by compression of the median nerve in the carpal tunnel of the hand, characterized by pain.

Fascia—The sheet of connective tissue that covers the body under the skin and envelops every muscle, bone, nerve, gland, organ, and blood vessel. Fascia helps the body to retain its basic shape.

Osteopathy—A system of medical practice that believes that the human body can make its own remedies to heal infection. It originally used manipulative techniques but also added surgical, hygienic, and medicinal methods when needed.

Parasympathetic nervous system—A part of the autonomic nervous system that is concerned with conserving and restoring energy. It is the part of the nervous system that predominates in a state of relaxation.

Structural integration—The term used to describe the method and philosophy of life associated with Rolfing. Its fundamental concept is the vertical line.

over time pulls the body out of alignment. This pull causes the body's connective tissue to become harder and stiffer, and the muscles to atrophy. Signs of this stiffening and contraction include slouching or an overly erect posture.

Rolfing identifies the vertical line as the ideal that the body should approximate. The mission statement of the Guild for Structural Integration describes Rolfing as "a method and a philosophy of personal growth and integrity .... The vertical line is our fundamental concept. The physical and psychological embodiment of the vertical line is a way of Being in the physical world [that] forms a basis for personal growth and integrity."

The basic ten

Basic Rolfing treatment consists of 10 sessions, each lasting 60–90 minutes and costing about $100 each. The sessions are spaced a week or longer apart. After a period of integration, specialized or advanced treatment sessions are available. A "tuneup" session is recommended every six months. In each session, the Rolfer uses his or her fingers, hands, knuckles, and elbows to rework the connective tissue over the entire body. The tissues are worked until they become pliable, allowing the muscles to lengthen and return to their normal alignment. The deep tissue manipulation improves posture and agility, and increases the body's range of movement. Rolfers also believe that the blocked energy accumulated in the tissue from emotional tension is released through Rolfing treatment, causing the patient to feel more energetic and have a more positive frame of mind.

Clients are asked to wait for a period of six to 12 months before scheduling advanced work, known as the PostTen/Advanced Series. This period allows the body to integrate the work done in the "Basic Ten."

Rolfing movement integration

Rolfing movement integration, or RMI, is intended to help clients develop better awareness of their vertical alignment and customary movement patterns. They learn to release tension and discover better ways to use body movement effectively.

Rolfing rhythms

Rolfing rhythms are a series of exercises intended to remind participants of the basic principles of Rolfing: ease, length, balance, and harmony with gravity. In addition, Rolfing rhythms improve the client's flexibility as well as muscle tone and coordination.

Preparations

No pre-procedure preparations are needed to begin Rolfing treatment. The treatment is usually done on a massage table with the patient wearing only undergarments. Prior to the first session, however, the client is asked to complete a health questionnaire, and photographs are taken to assist with evaluation of his or her progress.

Precautions

Since Rolfing involves vigorous deep tissue manipulation, it is often described as uncomfortable and sometimes painful, especially during the first several sessions. In the past decade, however, Rolfers have developed newer techniques that cause less discomfort to participants. Since Rolfing is a bodywork treatment that requires the use of hands, it may be a problem for people who do not like or are afraid of being touched. It is not recommended as a treatment for any disease or a chronic inflammatory condition such as arthritis, and can worsen such a condition. Anyone with a serious medical condition, including **heart disease**, diabetes, or respiratory problems, should consult with a medical practitioner before undergoing Rolfing.

IDA P. ROLF PH.D. (1896–1979)

Born in New York City and raised in the Bronx, Ida P. Rolf attended school in the New York area, graduating from Barnard College in 1916. In 1920, she graduated from the Columbia University College of Physicians and Surgeons with a doctorate in biological chemistry. For the next 12 years, she worked in the departments of chemotherapy and organic chemistry at the Rockefeller Institute. During an extended leave of absence, she studied atomic physics and mathematics at the Swiss Technical University in Zurich and homeopathic medicine in Geneva. During the 1930s, she studied osteopathy, chiropractic medicine, tantric yoga, the Alexander Technique of tension reduction through body movement, and the philosophy of altered states of consciousness of Alfred H.S. Korzybski.

Her interest in body structure, movement, and manipulation began after being kicked by a horse shortly after graduating from Barnard. The accident left her with acute pneumonia. Dissatisfied with conventional medical treatment, she began her quest for more natural and effective ways of treating the body.

By 1940, Dr. Rolf had developed a technique of body movement she called structural integration, also known today as Rolfing. The therapy reshapes the body's muscular structure by applying pressure and energy, freeing the body from physical and emotional traumas. In 1977, she authored *Rolfing: The Integration of Human Structures*. She continued to teach and refine her therapy until her death in 1979. Dr. Rolf's desire to teach her work to others led to her establishing the Guild for Structural Engineering, now known as the Rolf Institute of Structural Integration, 205 Canyon Blvd., Boulder, CO 80302.

Side effects

There are no reported serious side effects associated with Rolfing when delivered by a certified practitioner to adults and juveniles.

Research and general acceptance

There is a growing amount of mainstream scientific research documenting the effectiveness of Rolf therapy. A 1988 study published in the *Journal of the American Physical Therapy Association* indicated that Rolfing stimulates the parasympathetic nervous system, which can help speed the recovery of damaged tissue. Other studies done in the 1980s concerned the effectiveness of Rolfing in treating figure skaters and children with **cerebral palsy**. In 1992 a presentation was made to the National Center of Medical Rehabilitation Research regarding Rolfing in the treatment of degenerative joint disease. A 1997 article in *The Journal of Orthopedic and Sports Physical Therapy* reported that Rolfing can provide effective and sustained pain relief from lower back problems.

Training and certification

Rolfing practitioners must be trained and certified by the Rolf Institute of Structural Integration in Boulder, CO, at its Washington, D.C. campus, or at one of several other training sites throughout the United States. The institute plans to open a training site in Palo Alto, CA, in 2001. Training normally takes about eight months. The institute has a code of ethics, standards of practice, and a continuing education program. There are more than 1,000 certified Rolfing practitioners in 27 countries around the world as of 2000.

Resources

BOOKS

Anson, Brian. *Rolfing: Stories of Personal Empowerment*. Berkeley, CA: North Atlantic Books, 1998.

Claire, Thomas. *Bodywork: What Type of Massage to Get and How to Make the Most of It*. New York: William Morrow and Co., 1995.

Levine, Andrew S., and Valerie J. Levine. *The Bodywork and Massage Sourcebook*. Lincolnwood, IL: Lowell House. 1999.

Rolf, Ida P. *Rolfing: The Integration of Human Structures*. New York: Harper and Row, 1977.

Rolf, Ida P. *Rolfing: Reestablishing the Natural Alignment and Structural Integration of the Human Body for Vitality and Well Being*. Rochester, VT: Healing Arts Press, 1989.

ORGANIZATIONS

Rolf Institute of Structural Integration. 209 Canyon Blvd. P.O. Box 1868. Boulder, CO 80306 1868. (303) 449 5903. (800) 530 8875. http://www.rolf.org/.

Ken R. Wells

Roman chamomile *see* **Chamomile**

Rosacea

Definition

Rosacea is a skin disease typically appearing in persons during their 30s and 40s. It is marked by redness (erythema) of the face, flushing of the skin, and

Rosacea is a common inflammatory condition of the skin of the face that causes redness. *(© Medical-on-Line / Alamy)*

KEY TERMS

Blackhead—A plug of fatty cells capped with a blackened mass.

Chalazion—A small cyst on the eyelid that develops because the Meibomian gland becomes plugged.

Erythema—A diffuse red and inflamed area of the skin.

Papule—A small, hard bump on the skin.

Pustule—A small, pus-filled bump on the skin.

Retinoid—A synthetic vitamin A derivative used in the treatment of a variety of skin disorders.

Rhinophyma—Long-term swelling and overgrowth in skin tissue of the nose that leaves it with a knobby, bulb-like look.

Telangiectasia—Small blood veins visible at the surface of the skin of the nose and cheeks.

the presence of hard pimples (papules) or pus-filled pimples (pustules) as well as small, visible spider-like veins called telangiectasia. In later stages of the disease, the face may swell and the nose may take on a bulbous appearance, a condition called rhinophyma.

Description

Rosacea produces redness and flushing of the skin, as well as pustules and papules. Areas of the face, including the nose, cheeks, forehead, and chin, are the primary sites, but some persons experience symptoms on their necks, backs, scalp, arms, and legs. It is a common disease that afflicts one out of every 20 Americans.

The similarity in appearance of rosacea to **acne** led people in the past to erroneously call the disease acne rosacea or adult acne. Like acne, the skin can have pimples and papules. Unlike acne, however, persons with rosacea do not have blackheads.

Causes and symptoms

There is no known specific cause of rosacea. A history of redness and flushing precedes the disease in most patients. The consensus among many experts is that multiple factors may lead to an overreaction of the facial blood vessels, which triggers flushing. Over time, persistent episodes of redness and flushing leave the face continually inflamed. Pimples and blood-vessel changes follow.

Unidentified genetic factors may also come into play because 40% of rosacea sufferers have a family member who has rosacea. The disease is more common in women and in persons with light skin and fair hair. It may be more common in persons with a Celtic, English, Scandinavian, Swedish, Welsh, Polish, Lithuanian, or Balkan background.

Because certain antibiotics are useful in the treatment of rosacea, some researchers suspect a bacterium or other infectious agent may be the cause. One of the newest suspects is a bacterium called *Helicobacter pylori*, which has been implicated in causing stomach ulcers. The evidence supporting this suspicion is mixed.

Other investigators have observed that a particular parasite, the microscopic mite *Demodex folliculorum*, can be found on areas of the skin affected by rosacea. However, this mite can also be detected in the skin of persons who do not have the disease. It is likely that this mite does not cause rosacea, but merely aggravates it.

Rosacea may be caused by factors such as a deficiency of B-complex vitamins or hydrochloric acid (HCl) in the stomach. Some researchers suspect that yeast may cause rosacea.

In early stages of rosacea, patients typically experience repeated episodes of flushing. Later, areas of the face are persistently red and telangiectasia, as well as inflamed papules and pustules, appear on the nose and cheeks. Over time, the skin may take on a roughened, orange-peel texture. Very late in the disorder, a small group of patients with rosacea will develop rhinophyma, which can give the nose a reddened, bulbous appearance. The late actor W.C. Fields was affected with this condition. Men are three times more likely than women to develop rhinophyma.

Up to one-half of patients with rosacea may experience symptoms related to their eyes. Ocular rosacea,

as it is called, frequently precedes the other manifestations on the skin. Telangiectasia may appear around the borders of the eyelid, the eyelids may be chronically inflamed, and small lumps called chalazions may develop. The cornea of the eye (the transparent covering over the lens) can also be affected, and in some cases vision will be affected. Most of these eye symptoms do not threaten sight, however.

Diagnosis

Diagnosis of rosacea is made by the presence of clinical symptoms. There is no specific test for the disease. Episodes of persistent flushing, redness (erythema) of the nose, cheeks, chin, and forehead, accompanied by pustules and papules are hallmarks of the disease. A dermatologist (skin disease specialist) will attempt to rule out a number of other diseases that have similar symptoms. Acne vulgaris is perhaps the disorder most commonly mistaken for rosacea, but acne patients do not have redness and spider-like veins. Blackheads and cysts are seen in acne patients, but not in those with rosacea.

Other diseases that produce some of the same symptoms as rosacea include perioral **dermatitis**, seborrheic dermatitis, and **systemic lupus erythematosus**.

Treatment

There is no cure for rosacea, but alternative and complementary treatments can be helpful in reducing the skin irritation and number of outbreaks associated with the disease. Green-tinted makeup can mask the redness associated with rosacea. Because rosacea may cause psychological distress, **psychotherapy** or support groups can be an important component of treatment.

Patients should avoid using skin care products that contain alcohol, **witch hazel**, **peppermint**, menthol, **eucalyptus** oil, or clove oil. Skin care products should be fragrance-free and have a smooth, non-grainy consistency. Men can shave with an electric razor to lessen skin irritation on the face.

Persons who are treated for rosacea with antibiotics over a long period are more prone to yeast **infections**. Long-term antibiotic use can decrease normal bacteria populations and increase the number of yeast. Eating a yeast-free diet (eliminating breads and other yeast products and sugars) can help to restore normal bacteria to the body.

Identifying food triggers

Certain foods are known to trigger an outbreak of rosacea. Although individual triggers vary, the following foods may aggravate rosacea: hot spices (pepper, paprika, and **cayenne**), marinated meat, soy sauce, vanilla, vinegar, red plums, peas, lima and navy beans, sharp cheeses, cider, Asian food dishes, canned fish products, processed beef and pork, chocolate, tomatoes, citrus fruit, alcohol, and hot beverages. Nitrates, sulfites, and certain drugs can also trigger outbreaks. Food **allergies** can also cause rosacea. The three foods that most often cause food allergies are wheat products, sugar, and dairy products.

Rosacea patients should keep a food diary to identify the specific foods that trigger rosacea outbreaks. Outbreaks can occur hours—or as long as a day—after the offending food has been eaten. The patient should stop eating a suspect food for a few months to observe the severity of the rosacea symptoms. If the rosacea improves, the patient can then eat a small amount of the offending food to confirm whether it triggers an outbreak. Once a rosacea trigger food is identified, it can be eliminated from the patient's diet.

Other treatments

Applying liquid-filled cold packs, a washcloth soaked in ice-cold water, or a compress of cold milk and ice-cold water to the neck and face can relieve flushing. Sucking on ice chips can also help relieve flushing. A cold compress of **chamomile** tea can soothe irritated skin. Applying ice to the face may feel good but it can cause **frostbite**, which would worsen the reddening.

Some practitioners advocate gentle circular massage for several minutes daily to the nose, cheeks, and forehead. However, controlled studies on the effectiveness of this technique are lacking.

A deficiency of hydrochloric acid (HCl) in the stomach may be a cause of rosacea, and supplementation with HCl capsules (taken after meals) may bring relief in some cases.

Hypnosis may reduce **stress**, promote healthful behavior, and control bad habits. **Hypnotherapy** is especially useful in treating skin disease that can be triggered by emotions, including rosacea. As a complementary therapy, hypnosis has been shown to improve rosacea, especially the flushing component.

Nutritionists recommend eating more dark green vegetables such as kale, broccoli, asparagus, and spinach. These foods, and others that contain high levels of vitamins A and C, **bioflavonoids**, and beta-carotene, can improve rosacea by increasing capillary strength and boosting the immune system. Apple juice and dark grape juice drunk at room temperature between meals can help persons with rosacea.

A deficiency of B-complex vitamins can lead to rosacea. Vitamin E's antioxidant properties can help prevent skin damage. **Zinc** can speed wound healing. Omega-3 and omega-6 fatty acid deficiencies can lead to dry, irritated skin, which can worsen rosacea. **Omega-3 fatty acids** can be found in **flaxseed** oil, cod liver oil, salmon, mackerel, and herring. Omega-6 fatty acid is found in **evening primrose oil**.

Allopathic treatment

The mainstay of treatment for rosacea is oral antibiotics. These appear to work by reducing inflammation in the small blood vessels and structure of the skin, not by destroying bacteria that are present. One of the more widely used oral antibiotics is tetracycline. In many patients, antibiotics are effective against the papules and pustules that can appear on the face. But antibiotics appear to be less effective against the background redness, and they have no effect on telangiectasia. Patients frequently take a relatively high dose of antibiotics until their symptoms are controlled, and then they slowly reduce their daily dose to a level that just keeps their symptoms in check. Other oral antibiotics used include erythromycin and minocycline.

Some patients are concerned about long-term use of oral antibiotics. For them, a topical agent applied directly to the face may be tried in addition to an oral antibiotic or in its place. Topical antibiotics are also useful for controlling the papules and pustules of rosacea, but do not control the redness, flushing, and telangiectasias. The newest of these topical agents is metronidazole gel, which can be applied twice daily.

Vitamin A derivatives called retinoids also appear useful in the treatment of rosacea. An oral retinoid called isotretinoin, which is used in severe cases of acne, reduces the pustules and papules in severe cases of rosacea that do not respond to antibiotics. Isotretinoin must be taken with care, particularly in women of childbearing age, because the drug is known to cause birth defects.

Topical vitamin A compounds may have a role in the treatment of rosacea. Accumulating evidence suggests that topical isotretinoin and topical azelaic acid can reduce the redness and pimples.

For later stages of the disorder, a surgical procedure may be needed to improve the appearance of the skin. To remove the telangiectasias, a dermatologist may use an electrocautery device to apply an electrical current to the blood vessel. This procedure **cuts** off the blood to the blood vessel, effectively destroying it and eliminating its appearance as a red line. Special lasers, called tunable dye lasers, can selectively destroy these tiny blood vessels. A variety of surgical techniques can be used to improve the shape and appearance of a bulbous nose. Surgeons may use a scalpel or laser to remove excess tissue from the nose and restore a more natural appearance.

Expected results

The prognosis is good for controlling symptoms of rosacea and improving the appearance of the face. Many people require lifelong treatment and achieve good results. There is no known cure for the disorder.

Prevention

Rosacea cannot be prevented, but once its is correctly diagnosed, outbreaks can be treated and repeated episodes can be limited. Patients can reduce outbreaks of rosacea by following this advice:

- Use mild soaps and cleansers. Avoiding anything that irritates the skin is a good preventive measure for persons with rosacea. Astringents and alcohol should be avoided.
- Learn what triggers flushing. Reducing factors in the diet and environment that cause flushing of the face is another good preventive strategy. The specific things that provoke flushing vary considerably from person to person and it usually takes some trial and error to figure these out.
- Cover the face. Limiting exposure of the face to excesses of heat and cold can also help. A sunscreen with a skin protection factor (SPF) of 15 or greater, used daily, can reduce rosacea outbreaks and limit the damage the sun causes to the skin and small blood vessels. Protective clothing (hats in the summer and scarves or ski masks in the winter) can reduce the skin's exposure to sun and cold temperatures.

Resources

BOOKS

Helm, Klaus F. and James G. Marks. *Atlas of Differential Diagnosis in Dermatology*. New York: Churchill Liv ingstone, 1998.

Macsai, Marian S., et al. "Acne Rosacea." In *Eye and Skin Disease*. Edited by Mark J. Mannis, et al. Philadelphia: Lippincott Raven, 1996.

PERIODICALS

Jansen, Thomas and Gerd Plewig. "Rosacea: Classification and Treatment." *Journal of the Royal Society of Medi cine* 90 (March 1997): 144 150.

Litt, Jerome Z. "Rosacea: How to Recognize and Treat an Age Related Skin Disease." *Geriatrics* 52 (November 1997): 39 + .

Shenefelt, Philip D. "Hypnosis in Dermatology." *Archives of Dermatology* 136 (March 2000): 393 399.

Thiboutot, Diane M. "Acne Rosacea." *American Family Physician* 50 (December 1994): 1691 1697.

ORGANIZATIONS

American Academy of Dermatology. 930 N. Meacham Road, PO Box 4014, Schaumburg, IL 60168 4014. (847) 330 0230. http://www.aad.org.

National Rosacea Society. 800 S. Northwest Highway, Suite 200, Barrington, IL 60010. (888) 662 5874. http://www.rosacea.org.

OTHER

"Rosacea." MotherNature.com. http://www.mothernature.com/library/books/homeseniors/rosacea.asp.

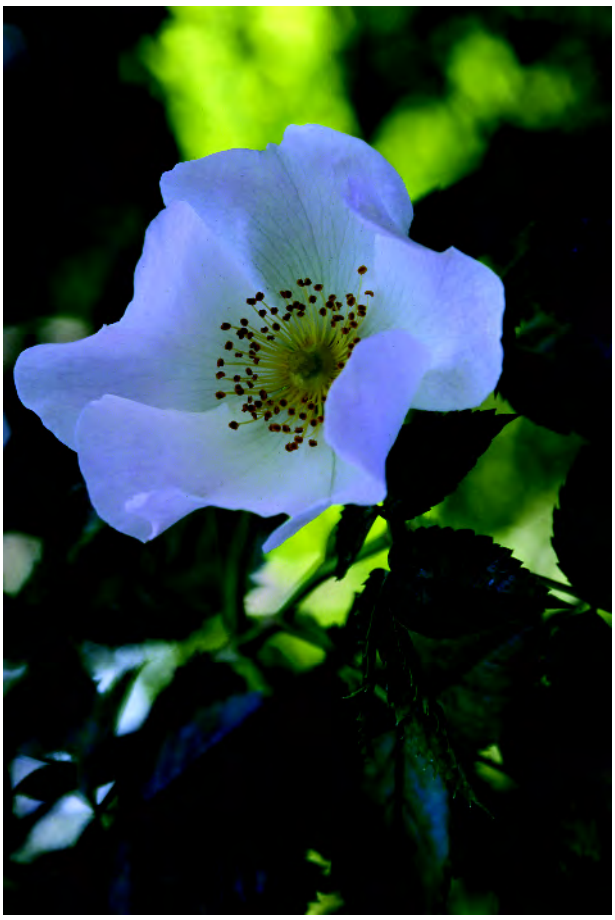
Belinda Rowland

Rose hip

Description

Rose hips are the edible and nutritious fruit of the beautiful deciduous rose, a perennial member of the most extensive genus of classified plants. Botanists disagree on the number of species of rose, claiming 30–5,000, or more. There are more than 10,000 cultivated varieties of this fragrant native of Europe and the Middle East. Roses have been a garden favorite as far back as 2,600 B.C. during the time of the ancient Sumerians. This beneficial beauty was named the "Queen of Flowers" by the Greek poet Sappho writing in 600 B.C. Since that time legend and history have intertwined and volumes have been written about the cultivation and virtues of the much-loved rose. Garlands of roses decorated the statues of gods and goddesses in Greece and Rome. Early Christians considered rose hips to be sacred, and crafted the first rosary beads from rose hips. The rose is considered a symbol of love everywhere, despite, or perhaps because of, the thorny stems which can render a sharp prick to the unwary who are attracted to the fragrant and lovely blossoms.

Most species of rose grow as an upright shrub or a climbing vine. Wild roses often grow in thorny thickets or briers. The usually pinnate leaves are arranged alternately along the stems with two to four pairs of finely toothed, dark-green, oval leaflets and one terminal leaflet. The large blossoms of wild roses have five petals. They grow singly on the stem or in clusters of two or three. Cultivated varieties may have many more petals with colors as varied as white, yellow, pink, and many shades of red. A rose's true fruits are the numerous tiny achenes, each enclosing a single seed, contained within the hip. Rose hips develop from the stem tip that swells to enclose the hairy achenes. The smooth skin of the hip is first green, then turns shades of orange and, when fully ripe, a deep red.



Rose hip blossom. *(©PlantaPhile, Germany. Reproduced by permission.)*

Among the species of rose particularly valued for the hips are *Rosa rugosa*, known as Japanese rose; *R. canina* , known variously as wild briar, witches briar, dog rose, hip fruit, or hip tree; *R. acicularis*; and *R. cinnamomea*. The dog rose, so-named because of the belief that this wild briar could cure the bite of a rabid dog, thrives in stony ground, along embankments, in hedgerows, and on the edge of woods. The long and fibrous root and herbaceous trunk of this hardy species produces numerous shoots that divide into many thorny branches. The dagger-like thorns may also have inspired the common name, taken from the Old French word *dague* meaning dagger. The branches may reach 10 feet in length. They arch out and curve downward bearing an abundance of

KEY TERMS

Achene—Any small hard one-seeded fruit that does not split open at maturity to discharge its seed.

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue. The vitamin C in rose hips is a well-known antioxidant.

Leukorrhea—A whitish vaginal discharge caused by inflammation of the mucous membrane.

Mastitis—Inflammation of the breast.

sweet-smelling, stalked flowers. The dog rose hips are said to contain the highest amounts of vitamin C of all the varieties, with 10 to 50 times that of an orange. In England, during the Second World War, the scarcity of citrus products led to a nationwide effort to harvest and process the nutritional hips of the dog rose. The dog rose hips, abundant in the countryside, provided the populace with adequate **vitamin C** to prevent the onset of the deficiency disease known as scurvy.

R. rugosa, also known as large-hip rose or wrinkled rose, is found growing wild in the northern United States and Canada, along coastal areas, and around seaside sand dunes. The dwarf shrub is valued for the size of the fleshy rose hips. This species is also distinguished by its very wrinkled leaves. This species is used in Chinese medicine. An infusion of the flowers, known as *mei gui hua*, is said to promote blood circulation, stimulate the flow of energy, and provide relief for stomach distress, liver stagnation, dysentery, mastitis, and leukorrhea.

General use

Rose petals and hips, and the seeds contained within the achenes, are medicinally valuable. The leaves are also sometimes used. Rose hips and seeds contain vitamins C, E, B, and K, tannin, pectin, carotene, malic and citric acid, flavonoids, fatty and volatile oils, and proteins. The vitamin content of the hips varies depending on the species, the growing conditions, the time and manner of harvest, and the care taken in drying and storage. The hips of roses grown in cooler climates have been found to have a higher content of vitamin C.

Rose hips are an abundant natural source of vitamin C, regarded as an important antioxidant. Used regularly as a tonic or food supplement, these compact, nutritious hips will help build the body's defense against colds and flu, catarrh, sore throats, and chest **infections**. Six to eight fresh raw rose hips, taken daily, will help prevent illness. Rose hip tea, taken following a course of antibiotic therapy, will help re-establish the beneficial bacteria in the digestive system. The natural balance of intestinal flora may have been disrupted or destroyed by the action of antibiotic drugs. Rose hip tea can also soothe the nervous system and relieve exhaustion. An infusion of the leaves and petals is said to help bring down fevers. A decoction of the seed is diuretic and is used for kidney ailments and problems with the lower urinary tract. The pectin and fruit acid content of the seeds have a laxative and mildly diuretic effect. Rose hip preparations can also ease the pelvic congestion and pain of **menstruation**.

The essential oil of rose, used in aromatherapy, has an uplifting effect, helpful in dispelling **depression**, **stress**, and nervous tension. The species generally used for oil distillation is a hybrid of *R.centifolia* and *R. gallica*. The oil is extracted from the fresh petals by water or steam distillation. Rose hip seed oil is vitamin rich and contains as much as 35% linoleic acid and 44% gamma-linolenic acid, or GLA. There are as many as 300 chemical constituents in rose oil, though only about one-third of these have been identified. This essential oil promotes tissue regeneration and is helpful in the treatment of **eczema**, **psoriasis**, and dry, sun-damaged, and aging skin. Newer methods of extracting the medicinal oil from rose hip seeds have yielded a purer product, without the need to evaporate the solvents used in older methods.

Preparations

Herbalists in centuries past, such as the Roman scholar Pliny the Elder, recorded numerous ways to prepare roses to extract their medicinal virtues. A variety of products using rose petals, hips, and seeds are commercially available, including perfumes and lotions, essential oil, rosewater, and tablets and tinctures.

The bright-red rose hips should be harvested in the fall after the first frost. The hips are cut lengthwise to facilitate drying and placed on a paper-lined tray in a warm and airy room out of direct sunlight. The irritant hairs on the dry hips can be winnowed by shaking the hips vigorously in a wire sieve. The hips should be stored in clearly labeled, dark glass containers in a cool location. The dried hips will retain medicinal potency for up to one year.

Decoction: Use about 2.5 tsp of thinly sliced, fresh or dried rose hips per 8 oz of cold water. Bring to a boil in a glass or ceramic pot. Reduce heat and simmer for

about 10 minutes. Drink cold in small doses throughout the day.

Tincture: Combine 4 oz of finely cut fresh rose petals and hips, or 2 oz dry powdered herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts. Cover and store the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped, dark-glass bottle. A standard dose is 10–15 drops of the tincture in water, up to three times a day.

Rose hip syrup: Clean the freshly gathered hips by removing the seed-bearing achenes and any fine hairs. Prepare a strong decoction and mix with honey and/or sugar in a double boiler. Stir and simmer until the sugar is dissolved. Pour into small glass containers. Cool and seal with a tight-fitting lid. Refrigerate.

Precautions

It would be wise to use heavy gloves when harvesting the thorny rose. Pregnant women should not use essential oil of rose during the first four weeks of **pregnancy**.

Side effects

Some people may experience **diarrhea** or such allergic reactions as **hives** or throat swelling from large doses of rose hips. Patients who experience an allergic reaction should stop taking rose hips and contact their physician at once.

Interactions

No interactions with conventional prescription medications have been reported as of 2002.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, Inc., 1997.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics Company, 1998.

"Rose Hips." In: *Organic Gardening Collection, No. 4* Rodale, Inc., 1999.

PERIODICALS

Daels Rakotoarison, D. A., B. Gressier, F. Trotin, et al. "Effects of *Rosa canina* Fruit Extract on Neutrophil Respiratory Burst." *Phytotherapy Research* 16 (March 2002): 157 161.

Szentmihalyi, K., P. Vinkler, B. Lakatos, et al. "Rose Hip (*Rosa canina L.*) Oil Obtained from Waste Hip Seeds by Different Extraction Methods." *Bioresource Technol ogy* 82 (April 2002): 195 201.

ORGANIZATIONS

American Herbalists Guild. 1931 Gaddis Road, Canton, GA 30115. (770) 751 6021. www.americanherbalistsguild.com.

American Rose Society. P. O. Box 30000, Shreveport, LA 71130. (318) 938 5402. www.ars.org.

Clare Hanrahan
Rebecca J. Frey, PhD

Rosemary

Description

Rosemary, a herb whose botanical name is *Rosmarinus officinalis*, is a sun-loving shrub, native to the south of France and other Mediterranean regions. It is widely cultivated for its aromatic and medicinal properties. This pine-scented evergreen of the Lamiaceae, or mint, family, can grow to 5 ft (1.5 m) in height in favorable settings. Rosemary thrives in chalky or sandy soil in full sun. The herb grows wild on dry, rocky slopes near the sea. Its name is derived from the Latin *ros marinus*, meaning "sea dew." Other common names for the herb include polar plant, compass-weed, or compass plant. The specific name, *officinalis,* refers to the herb's inclusion in official Western listings of medicinal herbs. Rosemary was a favored herb in early apothecary gardens.

Legend abounds around this lovely perennial known as the "herb of remembrance." It is said that rosemary will grow particularly well in gardens tended by strong-willed women. Young brides traditionally carried a sprig of rosemary in their wreaths or wedding bouquets. The young couple may even have been brought together with the magic of a touch of rosemary, as in the refrain of an old ballad: "Young men and maids do ready stand/With sweet rosemary in their hands." Greek scholars wore a bit of the pungent herb in their hair when engaged in study as an aid to increase concentration. The fragrant herb was exchanged between friends as a symbol of loyalty, and tossed onto the graves of departed loved ones. Gypsy travelers sought rosemary for its use as a rinse for highlighting dark hair, or as a rejuvenating face wash. In the fourteenth century, Queen Isabella of Hungary used an alcohol extract of the flowering herb to treat **gout**. In ancient Egypt the herb was buried with the pharaohs. Rosemary was believed to

Rosemary blooming. *(© blickwinkel / Alamy)*

have magical powers to banish evil spirits. It was burned in sick rooms as a disinfectant, and was used to ward off the plague.

Rosemary's deep, woody taproot produces stout, branching, scaly, light brown stalks covered with simple, sessile narrow leaves about 1 in long and opposite, growing in whorls along the square stalks. Rosemary leaves are dark green on top and pale green on the underside with a distinctive mid vein. They curl inward along the margins. Tiny two-lipped, light blue or violet flowers grow in a cluster of five to seven blossoms each on a pair of short, opposite spikes. Each pair of flower spikes alternates along the sides of the stalk. This graceful aromatic herb blooms in late spring and early summer bearing two tiny seeds in each flower. Bees are attracted to rosemary flowers.

General use

Rosemary can be used to make an essential oil, a fixed oil, or teas and tinctures. These different products have different uses.

Volatile oil of rosemary

The volatile oil in rosemary leaves and blossoms, called a "sovereign balm" by the seventeenth-century herbalist Nicholas Culpeper, has a long history of medicinal uses in the West. Other chemical constituents of rosemary include **bitters**, borneol, linalol, camphene, camphor, cineole, pinene, resin, tannins, and rosmarinic acid, which acts as an antioxidant. Research has yielded promising results regarding the cancer-inhibiting effects of this antioxidant component of rosemary oil. In addition, rosemary is a circulatory stimulant. It has been shown to increase coronary blood flow, and is useful in treatment of blood pressure problems. A flavonoid known as diosmin in the volatile oil of rosemary can restore strength to fragile capillaries. Many of the traditional uses for this healing herb, discovered through trial and error and passed down through the generations, have not been clinically verified. Rosemary is still, however, officially listed as a medicinal herb in the *United States Pharmacopoeia*.

KEY TERMS

Carminative—A substance or medication that causes gas to be expelled from the stomach and intestines.

Carnosol—An antioxidant compound found in rosemary that appears to have anticancer properties.

Emmenagogue—A medication that helps to bring on menstruation or increase menstrual flow.

Flavonoids—Plant pigments that have a variety of effects on human physiology. The diosmin contained in rosemary is a flavonoid.

Sessile—Attached directly at the base without an intermediate stalk; issuing directly from the main stem of a plant.

Simple—A type of leaf that is not divided into parts.

Essential oil of rosemary

The essential oil of rosemary has potent antibacterial and antifungal effects. It was burnt as an incense in rituals, and used in sick rooms to provide protection from disease and infection. The herb has also been used as a digestive stimulant and liver tonic. It increases the flow of bile through its ability to relax the smooth muscle in the digestive tract and gallbladder. Rosemary's astringent properties, due to its tannin content, may help in the treatment of **diarrhea**, and reduce excessive menstrual flow. Rosemary can be used as a carminative (gas-relieving medication) to ease the discomfort of **colic** and dyspeptic disorders. The pungent herb has an energizing effect; it is used in **aromatherapy** to improve memory and focus, dispel **depression**, and relieve **migraine headache**. An external application of essential oil of rosemary, as a component in liniments, can ease **pain** in rheumatism. An infusion of rosemary, combined with **sage** (*Salvia officinale*), makes a good **sore throat** gargle. When used as a hair rinse, rosemary will stimulate hair follicles, and may help to reduce **dandruff**. A poultice of the herb may be applied to soothe **eczema**, or to speed the healing of **wounds**. Essential oil of rosemary is a component of many commercially available lotions, perfumes, liniments, soaps, and mouthwash preparations. Lastly, dried rosemary is used widely as a culinary herb.

More recently, carnosol, a naturally occurring antioxidant compound found in rosemary, has been studied for its anticancer properties. Carnosol appears to be effective against **cancer** by reducing inflammation and by inhibiting the expression of cancer genes. Carnosic acid, another compound found in rosemary, appears to reduce the risk of **skin cancer** by protecting skin cells against the effects of ultraviolet radiation.

Preparations

Dried: Rosemary leaves and blossoms may be harvested during the second year of growth. Carefully trim the branches in 4 in (10 cm) lengths, leaving at least two-thirds of the shrub intact. Strip the leaves from the stems and spread out on a tray, or hang the branches in bunches away from direct sunlight in a bright, airy room. Store the dried herb in tightly sealed dark containers.

Infusion: In a glass teapot, combine 1 oz (28.35 g) of fresh or dried flowering tops with 1 pt of non-chlorinated water that has been brought just to the boiling point. Steep the mixture in a covered container for 10–15 min. Strain. Drink the tea warm up to three cups per day.

Oil infusion: Pack a quart jar with fresh rosemary leaves and flowering tops. Pour enough olive oil in the jar to cover the herbs completely. Seal and place on a sunny windowsill for 2–3 weeks. Strain the oil through cheesecloth into a large glass container. Squeeze the remainng oil from the cloth. Pour this first oil infusion over additional fresh herbs in a jar to cover. Seal and place on a sunny window sill for an additional two weeks. Strain again through cheesecloth. Store this second oil infusion in tightly sealed, clearly labeled, dark glass containers.

Compress: Soak a cotton pad with the hot infusion of rosemary leaf and apply to **bruises** or **sprains**, or as an aid in the healing of wounds and skin irritations.

Precautions

Rosemary should not be used in medicinal preparations during **pregnancy** or breast-feeding, although it is safe to use in cooking in small quantities to season foods. Persons with high blood pressure, **epilepsy** or diverticulosis, chronic ulcers, or **colitis**, should not take rosemary internally for medicinal purposes. Rosemary acts as an emmenagogue, stimulating the flow of menstrual blood. The essential oil of rosemary was once used in folk practice in attempts to induce abortion. As with all **essential oils**, only small amounts of it should be used, either topically or internally. An overdose of essential oil of rosemary may lead to deep coma, **vomiting**, spasms, uterine bleeding, **gastroenteritis**, kidney irritation, and even death, according to the *PDR for Herbal Medicines*. No documented cases have been reported, however.

Side effects

No side effects are known when rosemary is used in designated therapeutic doses, properly harvested, prepared, and administered. Some persons, however, may be allergic to rosemary or its oils, and experience **nausea** and vomiting.

Interactions

Relatively few interactions between rosemary and Western pharmaceuticals have been reported. Rosemary appears to increase the effects of doxorubicin, a cancer medication. Although further studies are necessary, as of 2002 patients taking doxorubicin are advised to consult their physician before taking rosemary.

Resources

BOOKS

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Polunin, Miriam, and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Com pany, 1992.

Prevention's 200 Herbal Remedies, 3rd ed. Emmaus, PA: Rodale Press, Inc., 1997.

Price, Shirley. *Practical Aromatherapy*. London: Thorsons/ HarperCollins, 1994.

Weiss, Gaea, and Shandor Weiss. *Growing & Using The Healing Herbs*. New York: Wings Books, 1992.

PERIODICALS

Lo, A. H., Y. C. Liang, S. Y. Lin Shiau, et al. "Carnosol, an Antioxidant in Rosemary, Suppresses Inducible Nitric Oxide Synthase Through Down Regulating Nuclear Factor KappaB in Mouse Macrophages." *Carcinogen esis* 23 (June 2002): 983 991.

Offord, E. A., J. C. Gautier, O. Avanti, et al. "Photopro tective Potential of Lycopene, Beta Carotene, Vitamin E, Vitamin C and Carnosic Acid in UVA Irradiated Human Skin Fibroblasts." *Free Radicals in Biology and Medicine* 32 (June 15, 2002): 1293 1303.

ORGANIZATIONS

American Botanical Council. PO Box 144345. Austin, TX 78714 4345.

International Aromatherapy and Herb Association. 3541 West Acapulco Lane. Phoenix, AZ 85053 4625. (602) 938 4439. http://www.aztec.asu.edu./iaha/.

Clare Hanrahan
Rebecca J. Frey, PhD

Rosen method

Definition

Rosen method bodywork is a gentle hands-on approach to **relaxation** and awareness that was developed by Marion Rosen through her 30 years of experience as a physical therapist. Rosen method movement consists of playful, low impact exercises designed to move all of the joints in the body and facilitate breathing.

Origins

Rosen method is one of many somatic, or bodywork, therapies which later developed out of the partnership between physical therapists and psychoanalysts between the two World Wars. Born in Germany, Marion Rosen originally studied "breath therapy." After fleeing Nazi Germany, Rosen trained in physical therapy and emigrated to the United States. In 1944 she graduated from a physical therapy program at the Mayo Clinic. After working in Kaiser Permanente Hospital, she opened a private physical therapy practice in Oakland, California.

Over the years Rosen treated many individuals who continued to experience chronic **pain** from earlier injuries, although there was now no evidence of physical injury or trauma. She began to see that the people who talked about their injuries healed faster. Gradually she developed the theory that all trauma—physical, mental, and emotional—is held in the body as chronic muscle tension. She observed that as her patients relaxed, they often experienced thoughts and emotions that had been held unconsciously in their bodies over long periods of time.

Rosen developed a reputation in the medical community as someone who could successfully treat patients that failed to respond to conventional medical treatment. Patients with **asthma**, chronic pain and psychosomatic illnesses responded favorably. Besides treating patients with injuries or physical complaints, Rosen became interested in the restorative and transformational potential of her approach for people who were basically healthy.

In 1972, she began to teach her method to a few individuals, and in 1980 she expanded to teaching public classes. Rosen method now has 13 centers for training practitioners. There are approximately 600 practitioners from 15 countries in North America, Europe, and Australia.

Rosen method movement classes were created in response to patients' requests for exercises to decrease

injuries. Marion developed an enjoyable way to move all of the joints in the body by setting to music the range of motion tests used by physical therapists.

Benefits

According to the *Clinician's Complete Reference to Complementary and Alternative Medicine*, Rosen method is considered "ideally suited" for arthritis, back pain, chronic **fatigue**, headaches and **stress**. It is "one of the better therapies" for asthma, **colic**, **hypertension**, **insomnia**, **constipation**, menstrual cramps, **osteoarthritis**, preconception, and **restless leg syndrome**. It is considered a "valuable adjunctive therapy" for **allergies**, **colitis** and **Crohn's disease**, **emphysema**, postpartum care, **pregnancy** and **childbirth**, and **premenstrual syndrome**. Rosen method is also experienced as a valuable complement to **psychotherapy**. Some people are drawn to this approach for emotional and spiritual growth.

Rosen method movement classes help to improve range of motion, increase breathing capacity and encourage ease in movement. The exercises are especially helpful for people who are recovering from injuries or seldom **exercise**.

Description

Rosen method bodywork sessions are conducted on a massage table. The patient is partially clothed and covered with a blanket. During a session the practitioner uses gentle, direct, non-manipulative touch to bring awareness to chronically tight muscles in the body. The practitioner responds to subtle changes in the breath and muscles with touch and words. This allows the client to recognize the memories and feelings which have unconsciously been "held down" by muscle tension. As the tight muscles relax, the breath moves with ease and the client may feel invigorated and have a greater sense of well-being.

Rosen method bodywork sessions last from fifty to sixty minutes and are usually received once every week or every other week. The number and frequency of the sessions depend upon the goals of the client. Strict confidentiality is always maintained. With the consent of the client, a Rosen practitioner may consult with other mental health or medical professionals.

Certified Rosen method practitioners charge 60-90 dollars for a session. Lower cost sessions are frequently available from Rosen interns. Rosen method is not specifically covered by medical insurance.

In Rosen method movement classes, the exercises are done to music with a partner or by oneself. Some exercises are done on the floor. Students wear comfortable clothes for moving. Movement classes last 50-60 minutes and cost from seven to 10 dollars per class.

Precautions

Rosen method practitioners do not work with people with a history of serious mental illness and psychosis or those who need strong defenses to get through the circumstances of life. Rosen method is not recommended during the early stages (less than one year) of recovery from alcohol or drug addiction. It is also not recommended during the acute phase of any physical or emotional trauma. People with medical conditions or in psychotherapy are advised to consult their physicians or therapists before receiving sessions.

Research and general acceptance

No scientific studies have been conducted concerning the benefits of Rosen method. Although Rosen was honored by the International **Somatics** Congress in 1999 for her contribution to the field of somatics, Rosen method is not well-known by the general public or health care professionals.

Training and certification

Certification in Rosen method requires two years of classroom instruction, followed by an internship of 350 patient hours and 55 hours of supervision and review. This internship period requires a minimum of nine months and may last up to 18 months. Classroom instruction is offered either through weekly classes or an intensive format. Many Rosen practitioners are certified or licensed massage therapists.

Certification as a Rosen method movement teacher requires 125 hours of instruction either through weekly classes or intensives and completion of an internship involving teaching, observation, and supervision.

Linda Chrisman

Royal jelly

Description

Royal jelly, which is sometimes called bee's milk, is a thick creamy liquid secreted by special glands in young worker bees who serve as "nurses" to the hive.

Royal jelly is a liquid secreted by special glands in young worker bees. *(Bon Appetit / Alamy)*

All bee larvae are fed a small amount of royal jelly mixed with honey for the first three days of their lives. Starting on day four, however, most of the bees are weaned from this diet and develop into worker bees. But one bee, hatched from an egg identical to the rest, is fed exclusively on royal jelly. That bee becomes the queen. She will grow, on average, 40% larger than her fellow bees, perhaps 50% heavier, and live up to 40 or 50 times as long. And all the while, she will be producing enormous numbers of eggs, equal to more than twice her own body weight, every single day.

This phenomenon has led numerous researchers and practitioners to explore both the chemical composition and the potential therapeutic uses of royal jelly, particularly over the last several decades. Among other things, the complex substance has been found to be rich in **amino acids** (including the eight essential to human life), **essential fatty acids**, vitamins, minerals, RNA, DNA, and many other elements of clinically proven usefulness. Other compounds in royal jelly have yet to be identified.

KEY TERMS

Apitherapy—A form of alternative therapy based on the use of honey and other bee products.

Propolis—A reddish resinous cement that bees make from tree buds to strengthen the structures of their hives.

General use

Proponents of **apitherapy** (which also includes the use of other hive products, such as **bee pollen**, propolis, and bee venom) make many claims for the virtues of royal jelly. Among other things, it is said to increase appetite and general vigor; retard **aging**; boost longevity; accelerate healing; strengthen the immune system; and exhibit antibiotic and antiviral properties. Specific claims for royal jelly have been made in connection with **Parkinson's disease** and other nervous disorders; arthritis; and reproductive and sexual functioning.

Clinical studies over the last several decades have reported evidence supporting some of these claims, including shrinking tumors in mice, reducing **cholesterol** levels in humans, fighting microbial and viral **infections**, and reducing the trembling associated with Parkinson's disease. These accounts are case reports only, however, and not the results of controlled clinical trials.

Preparations

Royal jelly is available in various forms. In its pure state, it is a jelly that must be kept under refrigeration. It is also found in honey, which works to preserve it naturally. Royal jelly may be purchased in a freeze-dried form in capsules or tablets, sometimes combined with other bee products; it is also available as a liquid. In addition, royal jelly may appear as an ingredient in cosmetics, skin care products, and assorted ointments and salves.

Synthetic royal jelly has also been manufactured and marketed, but according to some sources, it does not produce the same effects, on either bees or human subjects, in clinical trials.

Precautions

Although apitherapy proponents maintain that royal jelly is not only entirely safe but almost miraculously beneficial, a number of deaths have been linked to its use. Australian researchers have reported cases of **asthma** said to have been induced by royal jelly (including at least

one death), and a Japanese report blames royal jelly for causing a case of **gastroenteritis**. More research is needed, however, to clearly determine the connection between royal jelly and potential allergic reactions.

Side effects

Some side effects have been reported for royal jelly, including occasional central nervous system symptoms, agitation, heart palpitations, **insomnia**, and **anxiety**.

Interactions

No instances of interactions with other medications have been reported.

Resources

BOOKS

Cassileth, Barrie R. *The Alternative Medicine Handbook*. New York: W. W. Norton & Company, 1998.

ORGANIZATIONS

American Apitherapy Society. 5390 Grande Road, Hillsboro, OH 45133. (937) 364 1108. http://www.apitherapy. org/.

Peter Gregutt

Rubella

Definition

Rubella is a highly contagious viral disease, spread through contact with discharges from the nose and throat of an infected person. A person infected with the rubella virus is contagious for about seven days before any symptoms appear and continues to spread the disease for about four days after the appearance of symptoms. Rubella has an incubation period of 12–23 days.

Description

Rubella is also called German **measles** or the three-day measles. This disease was once a common childhood illness, but its occurrence has been drastically reduced since vaccine against rubella became available in 1969. In the three decades following the introduction of the vaccine, reported rubella cases dropped 99.6%. Only 229 cases of rubella were reported in the United States in 1996. A recent study indicates, however, that the age group pattern of rubella is shifting. As of 2002, the number of cases reported in people aged 15 years or younger is dropping, while the number of cases in people between 25 and 45 is rising.

View of a chest rash in a child suffering from Rubella (German measles). *(Dr. P. Marazzi / Photo Researchers, Inc.)*

People of any age who have not been vaccinated or previously caught the disease can become infected. Having rubella once or being immunized against rubella normally gives lifetime immunity. This is why vaccination is so effective in reducing the number of rubella cases. The United States had a public health goal of eliminating all rubella within its borders by the year 2000; however, this goal was not attained because of new **strains** of the rubella virus entering the country from the Caribbean and Central America. The availability of molecular typing indicates that three separate strains of the virus caused localized outbreaks that were quickly contained. As of 2002, cases of rubella in the United States are more common among Hispanics than among Caucasians, Native Americans, or African Americans.

Women of childbearing age who do not have immunity against rubella should be the most concerned about infection. Rubella infection during the first three months of **pregnancy** can cause a woman to miscarry or cause the baby to be born with severe birth defects, including mental retardation and sensory impairments. In addition, recent studies indicate that infants exposed to rubella in utero (in the womb) are at increased risk of developing **schizophrenia** as adults.

Although it has been practically eradicated in the United States, rubella is still common in less developed countries because of poor immunization penetration, creating a risk to susceptible travelers. Some countries have chosen to target rubella vaccination to females only. As a result, outbreaks among foreign-born males have occurred on cruise ships and at summer camps in the United States. The United Kingdom is considering targeting immigrants of either sex from underdeveloped

KEY TERMS

Immunoglobulin—Any of several classes of proteins in the blood that function as antibodies.

Incubation period—The time it takes for a person to become sick after being exposed to a disease.

Trimester—One-third or 13 weeks of pregnancy.

countries for rubella immunization following several cases of babies born with congenital rubella syndrome.

Causes and symptoms

Rubella is caused by the rubella virus (*Rubivirus*). Symptoms are generally mild, and complications are rare in anyone who is not pregnant.

The first visible sign of rubella is a fine red rash that begins on the face and rapidly moves downward to cover the whole body within 24 hours. The rash lasts about three days, which is why rubella is sometimes called the three-day measles. A low **fever** and swollen glands, especially in the head (around the ears) and neck, often accompany the rash. Joint **pain** and sometimes joint swelling can occur, more often in women. It is quite common to get rubella and not show any symptoms (subclinical infection).

Symptoms disappear within three to four days, except for joint pain, which may linger for a week or two. Most people recover fully with no complications. Although rubella causes only mild symptoms of low fever, swollen glands, joint pain, and a fine red rash in most children and adults, it can have severe complications for women in their first trimester of pregnancy. Babies may be miscarried or stillborn and a high percentage are born with birth defects. Birth defects are reported to occur in 50% of women who contract the disease during the first month of pregnancy, 20% of those who contract it in the second month, and 10% of those who contract it in the third month. The most common birth defects resulting from congenital rubella infection are eye defects, such as **cataracts**, **glaucoma**, and blindness, deafness, congenital heart defects, and mental retardation. Taken together, these conditions are called congenital rubella syndrome (CRS). The risk of birth defects drops after the first trimester, and by the fifth month, there are rarely any complications.

Diagnosis

The rash caused by the rubella virus and the accompanying symptoms are so similar to other viral **infections** that it is impossible for a physician to make a confirmed diagnosis on visual examination alone. The only sure way to confirm a case of rubella is by checking for antibodies with a blood test or in a laboratory culture.

When the body is infected with the rubella virus, it produces both immunoglobulin G (IgG) and immunoglobulin M (IgM) antibodies to fight the infection. Once IgG exists, it persists for a lifetime, but the special IgM antibody usually wanes over six months. A blood test can be used either to confirm a recent infection (IgG and IgM) or determine whether a person has immunity to rubella (IgG only). The lack of antibodies indicates that a person is susceptible to rubella.

All pregnant women should be tested for rubella early in pregnancy, whether or not they have a history of vaccination. If the woman lacks immunity, she is counseled to avoid anyone with the disease and to be vaccinated after giving birth.

Treatment

Rather than vaccinating a healthy child against rubella, some alternative practitioners recommend allowing the child to contract the disease naturally at the age of five or six years, since the immunity conferred by contracting the disease naturally lasts a lifetime. It is, however, difficult for a child to contract rubella naturally when everyone around him or her has been vaccinated.

Ayurvedic practitioners recommend making the patient comfortable and giving the patient **ginger** or clove tea to hasten the progress of the disease. **Traditional Chinese medicine** uses a similar approach. Believing that inducing the skin rash associated with rubella hastens the progress of the disease, traditional Chinese practitioners prescribe herbs such as **peppermint** (*Mentha piperita*) and chai hu (*Bupleurum chinense*). **Cicada** is often prescribed as well. Western herbal remedies may be used to alleviate rubella symptoms. Distilled **witch hazel** (*Hamamelis virginiana*) helps calm the **itching** associated with the skin rash and an eyewash made from a filtered diffusion of **eyebright** (*Euphrasia officinalis*) can relieve eye discomfort. Antiviral western herbal or Chinese remedies can be used to assist the immune system in establishing equilibrium during the healing process. Depending on the patient's symptoms, among the remedies a homeopath may prescribe are *Belladonna,Pulsatilla,* or *Phytolacca*. These can be used with or with out **bilberry**.

Allopathic treatment

There is no drug treatment for rubella. Bed rest, fluids, and acetaminophen or Motrin for pain and temperatures over 102°F (38.9°C) are usually all that is necessary.

Babies born with suspected CRS are isolated and cared for only by people who are sure they are immune to rubella. Congenital heart defects are treated with surgery.

Expected results

Complications from rubella infection are rare in children, pregnant women past the fifth month of pregnancy, and other adults.

Prevention

Vaccination is the best way to prevent rubella and is normally required by law for children entering school. Rubella vaccine is usually given in conjunction with measles and **mumps** vaccines in a shot referred to as MMR (mumps, measles, and rubella). Children receive one dose of MMR vaccine at 12–15 months and another dose at four to six years. The MMR vaccine has aroused some controversy since early 2000 because of media reports that it increases the risk of **wheezing** and lower respiratory tract disorders in young children. A recent study of vaccine safety has concluded, however, that there is no connection between the MMR vaccine and a reported rise in the incidence of wheezing in children.

Pregnant women should not be vaccinated; women who are not pregnant should avoid conceiving for at least three months following vaccination. To date, however, accidental rubella vaccinations during pregnancy have not clearly been associated with the same risk as the natural infection itself. Women may be vaccinated while they are breast-feeding. People whose immune systems are compromised, either by the use of such drugs as steroids or by disease, should discuss possible complications with their doctor before being vaccinated.

Resources

BOOKS

Cooper, Louis Z. "Rubella." In *Rudolph's Pediatrics*, 21st ed., edited by M. M. Rudolph, J. I. E. Hoffman, and C. D. Rudolph. Stamford, CT: McGraw Hill, 2002.

Gershon, Anne. "Rubella (German Measles)." In *Harrison's Principles of Internal Medicine*, 15th ed., edited by Anthony S. Fauci. New York: McGraw Hill, 2001.

PERIODICALS

Brown, A. S., and E. S. Susser. "In Utero Infection and Adult Schizophrenia." *Mental Retardation and Devel opmental Disabilities Research and Review* 8 (January 2002): 51 7.

Carvill, S., and G. Marston. "People with Intellectual Dis ability, Sensory Impairments and Behaviour Disorder: A Case Series." *Journal of Intellectual Disability Research* 46 (March 2002): 264 72.

Case Definitions for Infectious Conditions under Public Health Surveillance. *Morbidity and Mortality Weekly Report* 46 (1997): 30.

Dixon, B. "Triple Vaccine Fears Mask Media Efforts at Bal ance." *Current Biology* 12 (March 5, 2002): R151 R152.

Mullooly, J. P., J. Pearson, L. Drew, et al. "Wheezing Lower Respiratory Disease and Vaccination of Full Term Infants." *Pharmacoepidemiology and Drug Safety* 11 (January February 2002): 21 30.

Reef, S. E., T. K. Frey, K. Theall, et al. "The Changing Epidemiology of Rubella in the 1990s: On the Verge of Elimination and New Challenges for Control and Pre vention." *Journal of the American Medical Association* 287 (January 23, 2002): 464 72.

Sheridan E., C. Aitken, D. Jeffries, et al. "Congenital Rubella Syndrome: A Risk in Immigrant Populations." *Lancet* 359 (February 23, 2002): 674 675.

ORGANIZATIONS

March of Dimes Resource Center. 1275 Mamaroneck Ave nue, White Plains, NY 10605. (888) 663 4637. http:// www.modimes.org.

National Organization of Rare Disorders. 55 Kenosia Avenue PO Box 1968 Danbury, CT 06813 1968. (800) 999 6673. orphan@rarediseases.org. http://www.rarediseases.org.

Kathleen Wright
Rebecca J. Frey, PhD

Rubenfeld synergy

Definition

The Rubenfeld synergy method is a hybrid of various bodywork and **psychotherapy** techniques, aimed at accessing stored emotions and memories. This psychophysical approach uses talk, touch, and movement to remove tensions, imbalances, and energy blocks.

Origins

Rubenfeld synergy is a trademarked system for mind-body integration. It was developed during the early 1960s by former orchestra and choral conductor Ilana Rubenfeld. A graduate of the Juilliard School of Music, where she studied with Pablo Casals, Rubenfeld played viola, oboe, and piano. Later, she became a

conductor and served as assistant to well-known conductor Leopold Stokowski (1882–1977). When she experienced back and shoulder spasms from her work, Rubenfeld began seeking ways to promote her own healing and eventually developed a system to help others as well. Her method incorporates elements from the following:

- Body/mind teachings of Frederick M. Alexander and Moshe Feldenkrais
- Hypnotherapy methods of Milton Erickson
- Gestalt psychotherapy approach and techniques of Fritz and Laura Perls

Rubenfeld was an Alexander teacher and trainer who studied with the Perls, trained also with Moshe **Feldenkrais**, and became one of his first teachers in the United States. Her synthesis of the various elements became the Rubenfeld Synergy Method in the 1970s.

Benefits

Reported benefits of the Rubenfeld synergy method include recovery from physical and emotional trauma, release of tension, improved ease of movement, and **pain** management, as well as improved body image, self-esteem, and mind-body awareness.

Description

A typical Rubenfeld synergy session lasts between 45 and 50 minutes. A practitioner determines the number and frequency of patient visits to match the individual's needs. Patients may remain fully clothed during the sessions, which combine gentle touch and talk. Clients may sit or lie down or may move about during the session. A wide range of techniques may be used by the practitioner, including dream work, aura analysis, sound, imagination, breathing exercises, humor, **spirituality**, and verbal expression. Practitioners say that motions, memories, and suppressed or denied emotions can be stored in any part of the body as energy blocks, tensions, and imbalances that can affect physical and emotional well-being. For example, practitioners may suggest that sexually abused women store memories from their negative experiences in the pelvis.

A patient undergoing Rubenfeld synergy therapy is considered an equal partner in the healing process. The practitioner may place considerable emphasis on a lifestyle governed by choices instead of habits.

Precautions

Rubenfeld synergy may involve substantial physical contact. Patients should be aware that traditional psychotherapists often frown upon such touching because of the risk of inducing improper fantasies. As with all therapies involving touch, it is important to ensure that a practitioner is certified to reduce risk of improper behavior.

Side effects

There are few, if any, known side effects.

Research and general acceptance

Some aspects of Rubenfeld synergy method, including psychotherapy techniques and **stress** management, are known and generally respected by the medical establishment. Other aspects, such as aura analysis, are well outside the boundaries of traditional medicine.

Training and certification

Training and certification are offered through the Omega Institute in Rhinebeck, New York, or at a conference site near Philadelphia. Admission in the program carries no formal prerequisites; applicants need only submit two letters of recommendation, an application form, and a non-refundable application fee. Training takes place over four years and consists of three seven-day sessions and three weekend regional meetings each year. Besides the weeklong sessions and weekend meetings, the program requires that trainees must themselves experience the Rubenfeld method and participate in 20 private sessions a year with a Rubenfeld practitioner. Graduate practitioners are referred to as Rubenfeld synergy practitioners or synergists. Practitioners must be recertified every three years.

Resources

BOOKS

Rubenfeld, Ilana. *The Listening Hand: Self Healing through the Rubenfeld Synergy Method of Talk and Touch*. New York: Bantam Doubleday Dell, 2001.

ORGANIZATIONS

International Association of Rubenfeld Synergists (INARS), 7 Kendall Rd., Kendall Park, NJ, 08824, (877) RSM 2468, http://www.rubenfeldsynergy.com.

OTHER

"Rubenfeld Synergy Method." American Cancer Society, May 23, 2007. http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Rubenfeld_Synergy_Method.asp?(March 4, 2008).

David Helwig
Leslie Mertz, Ph.D.

Rubeola *see* **Measles**
Rudbeckia *see* **Echinacea**
Runny nose *see* **Rhinitis**

Russian massage

Definition

Russian massage is a system of therapeutic and **sports massage** developed in the former Soviet Union. It uses a variety of manipulations of the body's soft tissues to achieve benefits, including **stress** reduction and relief from muscle aches.

Origins

Many cultures around the world developed forms of **massage therapy**, including the ancient peoples of China, India, and Greece. One early advocate was Hippocrates, the Greek physician widely considered to be the father of medicine. Per Henrik Ling, a nineteenth-century Swedish physician who employed vigorous massage to stimulate circulation of the blood and lymph, is usually considered the founder of modern European massage. Massage was not studied or used scientifically in Russia until 1860. Treatment methods were developed further after World War II when pharmaceuticals were in short supply. The Soviet Union employed physiatrists—medical doctors with Ph.D. degrees in physical therapy—to research the benefits of using natural healing modalities. They developed a form of petrissage to reverse atrophy in muscles and help stimulate new growth. Russian physiologists found all movements of massage function on the basis of neurohormone and neuroendocrine reflexes. Unlike other massage therapies, Russian massage is based on the physiology of a dysfunction rather than on anatomy as the principal guideline for treatment.

Benefits

Practitioners say that Russian massage is useful for a wide range of musculoskeletal, cardiovascular, gastrointestinal, neurological, gynecological, internal disorders, and in post-surgical situations. In Russia, massage therapists are regarded as medical professionals. The massage therapy department is often the largest in Russian hospitals and clinics because it is crucial to rehabilitation. Patients describe it as "waking up" both body and mind. It has been used to increase circulation of blood and lymphatic flow, to stimulate production of endorphins, control physical and mental stress, and to increase range of movement. Ailments said to benefit from massage therapy include **asthma**, **insomnia**, arthritis, **bursitis**, **carpal tunnel syndrome**, hip **sprains and strains**, rotator cuff injuries, myofascial **pain**, temporomandibular joint (TMJ) problems, **headache**, spastic colon, **colic**, **constipation**, and immune function disorders. Because of its gentle, non-invasive nature, Russian massage is considered especially suitable for seniors.

KEY TERMS

Endorphin—A morphine-like chemical produced in the brain, spinal cord, and other places in the body. A natural pain reliever.

Description

Russian massage is considered less invasive and more relaxing than many other forms of massage therapy. It uses four principal techniques:

- petrissage, a stretching or kneading motion
- effleurage, a gliding, relaxing stroke
- friction, a rubbing action
- vibration, a continuous-motion stroke ranging from very fast to very slow

Treatments may be as short as 15 minutes or as long as almost one hour. They may be repeated daily or every other day, but may also be interrupted after a dozen or so treatments to ensure that patient does not become dependant on massage.

Precautions

Like other types of massage therapy, Russian massage involves intimate personal contact. To lessen the possibility of unprofessional conduct, it is important to ensure that practitioners belong to a known regulatory body.

Massage should not be used on **burns**, in cases of deep vein thrombosis (**blood clots**), infectious diseases, or in other situations in which it is clearly inappropriate. In **cancer** patients, there is no evidence that massage causes the disease to spread. However, it is nonetheless advisable to avoid direct pressure at tumor sites. There is controversy over the advisability of massage following a **heart attack**. Some studies have suggested that the heart is not unduly strained by gentle massage, but this issue should be discussed with a physician. Massage is also not recommended in cases of **phlebitis**.

Side effects

Adverse effects from massage therapy are quite rare, and are usually related to unusually vigorous methods or used when contraindicated.

Research and general acceptance

The usefulness of Russian and other forms of massage therapy is acknowledged by most medical professionals, some of whom have undertaken massage training themselves. One 1995 study found that 54% of family practitioners and primary-care doctors in the United States were prepared to recommend therapeutic massage to their patients, and 34% would refer patients to a massage therapist. Many health insurance plans now cover prescribed massage therapy.

Training and certification

In Russia, massage therapists are highly trained health professionals who start with a college degree in nursing or some related discipline such as physiotherapy, then undertake months of specialized training. In the United States, massage therapists are regulated in at least 29 states. There are numerous regulatory bodies, including the American Massage Therapy Association, which recommends a minimum 500 hours of classroom instruction. The U.S. National Certification Board for Therapeutic Massage and Bodywork administers a national certification examination. In the United Kingdom, there are also a number of regulatory organizations, of which some are members of the British Complementary Medicine Association, that conducts regular membership reviews. The International Therapy Examinations Council conducts examinations for would-be massage therapists.

Resources

ORGANIZATIONS

American Massage Therapy Association. 820 Davis St., Suite 100, Evanston, IL 60201 4444. 847 864 0123. http://www.amtamassage.org.

British Massage Therapy Council. 17 Rymers Lane, Oxford OX4 3JU. 01865 774123. http:\\www.bmtc.co.uk.

David Helwig

Ruta

Description

Ruta is today primarily a homeopathic remedy made from the plant *Ruta graveolens*. This plant is also called rue, herb of grace, herb of repentance, bitter herb, or rue bitterwort. It grows to a height of about 3 ft (1 m) and has fleshy leaves and yellowish flowers. Ruta is native to southern Europe, but it is cultivated worldwide. The plant has a strong, unpleasant odor.

Ruta graveolens blooming. *(© blickwinkel / Alamy)*

Chemical compounds found in ruta include rutin, a flavonoid; alkaloids, including graveoline and rutacridine; lignans in the root; and furocoumarins, which are compounds that are toxic to both animals and humans. Symptoms of ruta poisoning in humans include **nausea**, **vomiting**, stomach **pain**, exhaustion, and convulsions. Animals that eat ruta while grazing develop tremors, frequent urination, difficulty breathing, loss of coordination, and inability to stand up.

General use

Homeopathic medicine operates on the principle that "like heals like." This means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow another homeopathic law, the Law of Infinitesimals. In opposition to traditional medicine, the Law of Infinitesimals states that the *lower* a dose of curative, the more effective it is. To achieve a very low dose, the curative is diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

KEY TERMS

Abortifacient—A medication or other substance that causes a miscarriage or abortion.

Emmenagogue—A preparation given to bring on a woman's menstrual period.

Furocoumarins—Toxic compounds found in ruta that can cause nausea, vomiting, and convulsions in humans.

Periosteum—The specialized layer of connective tissue that covers all bones in the body.

Rectal prolapse—A condition where the lining of the rectum, the last part of the large intestine, protrudes through the anus.

Rutin—A bright greenish-yellow flavonoid (plant pigment) found in ruta that has been credited with antioxidant properties.

Sciatica—Pain extending from the buttocks to the foot caused by pressure on the sciatic nerve.

In homeopathic medicine, ruta is used as a first-aid remedy. It is used to treat **strains** and **sprains**, injuries of the cartilage and tendons around the joints, injuries to tissues lying over the bone, injuries of the periosteum, and **sciatica**. Ruta is often used for pain and stiffness in the hands, wrists, feet, and legs.

Ruta is also a remedy for eyestrain. It is primarily used when the eyes feel hot, red, or are burning after periods of close work such as reading or sewing. Ruta is also used to treat **headache** that results from eyestrain.

In homeopathic dentistry, ruta is used to relieve pain. It is also used to treat infection of the tooth socket after a tooth is pulled. Other homeopathic uses for ruta include treatment of plantar **warts** on the feet, blood and mucus in stools, pain in the rectum, rectal prolapse, and general weakness and **depression**.

In homeopathic medicine, the fact that certain symptoms get better or worse under different conditions is used as a diagnostic tool to indicate what remedy will be most effective. Symptoms that benefit from treatment with ruta get worse with heavy use of the eyes; in cold, damp weather; with rest or lying down; and by stooping or crouching. Symptoms improve with movement.

Homeopathy also ascribes certain personality types to certain remedies. People with the ruta personality are said to be depressed, chronically dissatisfied, quarrelsome, and apt to contradict others. They may be anxious and lack a sense of personal satisfaction. They exhibit restlessness, but still feel unmotivated and despairing.

In addition to homeopathic use, ruta has been used by folk herbalists for centuries. The ancient Greeks used it for coughs. In the Middle Ages, this herb was used as a charm against witchcraft. It was also used as an abortifacient and an emmenagogue, or preparation to bring on a woman's menstrual period. Michelangelo (1475-1564) and artists of his time believed ruta improved eyesight. Because of its intense odor, ruta was used to ward off plague, repel flies, kill fleas, and prevent the spread of typhus. It has also been used to treat mushroom poisoning, snake **bites**, poisonous insect **stings**, **epilepsy**, and internal parasites.

Preparations

Ruta is prepared from the whole plant, picked before it flowers, and is then dried. For homeopathic remedies, the dried plant material is finely ground then prepared by extensive dilutions. There are two homeopathic dilution scales: the decimal (x) scale with a dilution of 1:10 and the centesimal (c) scale with a dilution of 1:100. Once the mixture is diluted, shaken, strained, then rediluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Ruta is available commercially in tablets in many different strengths. Dosage depends on the symptoms being treated.

Homeopathic and orthodox medical practitioners agree that by the time the initial remedy solution is diluted to strengths used in homeopathic healing, it is likely that very few molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called "potentization" that has not yet been explained by mainstream scientists.

Precautions

Pregnant women should not use ruta because it stimulates contraction of the uterus and can cause miscarriage. Many people get **contact dermatitis** (skin **rashes**) from handling fresh ruta. People should wear gloves when harvesting this plant to prevent this rash.

Side effects

When taken in the recommended dilute form, no side effects have been reported, except for individual aggravations that can occur with homeopathic remedies. Concentrated quantities of ruta can cause miscarriage.

Interactions

Ruta has been reported to cause negative interactions with **sodium** warfarin, a blood-thinning medication.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. Bos ton: DK Publishers, 1996.

Hammond, Christopher. *The Complete Family Guide to Homeopathy*. London: Penguin Studio, 1995.

Jonas, Wayne B., and Jennifer Jacobs. *Healing with Homeopathy*. New York: Warner Books, 1996.

Lockie, Andrew, and Nicola Geddes. *The Complete Guide to Homeopathy*. London: Dorling Kindersley, 1995.

Ullman, Robert, and Judyth Reichenberg Ullman. *Home opathic Self Care*. Rocklin, CA: Prima Publishing, 1997.

PERIODICALS

Bernardo, L. C., M. B. de Oliveira, C. R. da Silva, et al. "Biological Effects of Rutin on the Survival of *Escher ichia coli* AB1157 and on the Electrophoretic Mobility of Plasmid PUC 9.1 DNA." *Cellular and Molecular Biology* 48 (July 2002): 517 520.

el Agraa, S. E., S. M. el Badwi, and S. E. Adam. "Prelimi nary Observations on Experimental *Ruta graveolens* Toxicosis in Nubian Goats." *Tropical Animal Health and Production* 34 (July 2002): 271 281.

ORGANIZATIONS

Foundation for Homeopathic Education and Research. 21 Kittredge St., Berkeley, CA 94704. (510) 649 8930.

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206) 776 4147.

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790.

Tish Davidson
Rebecca J. Frey, PhD

S

Saccharomyces boulardii

Description

Saccharomyces boulardii is a live strain of nonpathogenic yeast. It is a subtype of the species *Saccharomyces cerevisiae* also known as baker's yeast or **brewer's yeast**, although it has different metabolic, physiologic, taxonomic, and genetic properties.

S. boulardii is categorized as a probiotic, or a microorganism that has beneficial properties for the host when ingested. *S. boulardii* has been patented for use in a lyophilized form as a human probiotic agent.

When consumed, *S. boulardii* aids digestion by maintaining the normal balance of healthy intestinal yeast and microflora in the colon. Colonic microflora promote gastrointestinal health by digesting lactose to acidify the digestive tract with lactic acid; aiding the digestion of protein to free **amino acids**; enhancing the digestion and absorption of numerous nutrients; protecting the body from an overgrowth of harmful bacteria and yeast such as *Candida*; and boosting the immune system by reducing the activity of potentially harmful or cancer-promoting toxins and bacterial enzymes.

S. boulardii is largely resistant to acidity, passes through the digestive tract to the colon, and is excreted in the stool in three to five days.

General use

S. boulardii is primarily used to treat or prevent acute **diarrhea** (including traveler's diarrhea) and antibiotic-induced diarrhea (including *Clostridium difficile*) in children and adults. It has also been used to manage bloating and **gas** associated with diarrhea.

Several studies conducted in adults have shown a wide variety of other digestive health benefits associated with *S. boulardii*. It has been used for the treatment of symptoms associated with gastrointestinal disorders such as ulcerative **colitis**, urinary tract **infections**, **irritable bowel syndrome**, and inflammatory bowel diseases, including **Crohn's disease**.

Results from a 2005 study published in the *European Journal of Gastroenterology & Hepatology* showed that 250 mg of *S. boulardii*, taken three times daily for four weeks during maintenance treatment with the drug mesalazine, resulted in confirmed clinical remission of colitis in 70 percent of participating patients.

Several pediatric studies have proven the effectiveness of *S. boulardii* for the treatment and prevention of diarrhea, as well as the prevention of cow milk-induced food allergy in infants and young children. *S. boulardii* has been particularly beneficial in reducing the incidence of antibiotic-associated diarrhea in children. A 2006 meta-analysis published in the *Journal of Pediatrics* evaluated the results of six placebo-controlled, randomized trials of antibiotic-associated diarrhea and **probiotics**. Compared to placebo, children treated with probiotics reduced the risk of antibiotic-associated diarrhea from 28.5% to 11.9%.

Other published health benefits of *S. boulardii* in infants and children include reduced incidence of upper respiratory infections. As more clinical data are published about the beneficial effects of *S. boulardii*, additional scientific evidence will be available to support health-risk reduction claims.

Preparations

S. boulardii is available in capsule and powder form. Capsules may be preferred because the powder forms generally have a shorter shelf life.

S. boulardii can be taken with or without food. The product label provides instructions on how to take it, which may include swallowing the capsule whole, sprinkling the contents of the capsule on food, or mixing the powder with liquid or semi-soft foods such as applesauce or yogurt. The daily dosage on the product label should not be exceeded. The specific storage instructions on the

product label should be followed. In general, *S. boulardii* should be stored at room temperature, away from moisture. Some *S. boulardii* supplements may need to be refrigerated.

Even though *S. boulardii* is largely resistant to gastric acidity, some of the yeast's health benefits may be dependant on its viability once consumed, since environmental gastric conditions can somewhat hinder its delivery to the intestines. Enteric-coated tablets and microencapsulation have been investigated as delivery options to protect the yeast from degradation due to microorganisms in the gastrointestinal tract. A January 2008 study published in *Pharmaceutical Research* found that microencapsulation of *S. boulardii* enabled the release of a higher percentage of viable yeasts. Other delivery methods have also been investigated, including aqueous suspension and freeze-dried forms of *S. boulardii* in microsphere preparations.

The appropriate dose of *S. boulardii* to yield maximum positive health benefits varies by manufacturer. The dose is also dependant on the intended therapeutic use. Studies have shown that 250 mg of *S. boulardii* lyophilized dietary supplement (with a biological activity of 9.4 x 10 billion viable cells) once per day is a well-tolerated optimal dose yielding gastrointestinal benefits, although dosages up to 1,000 mg per day also have been given with therapeutic results.

Precautions

S. boulardii is generally safe and well-tolerated when taken according to proper dosing guidelines. People who are susceptible to developing yeast infections and people with yeast **allergies** and allergies to *S. boulardii* should not take *S. boulardii*. People who have lactose allergies or lactose intolerance should consult their physician before taking *S. boulardii*.

S. boulardii supplementation is not appropriate for people who have severely weakened immune systems due to disease or **cancer** treatments, as they can develop serious infections, including fungal blood infections (fungemia). People with a central venous catheter should not take *S. boulardii*.

In the United States, *S. boulardii* is classified as a dietary supplement. Although *S. boulardii* has been labeled "generally regarded as safe," by the FDA, there are no safety reviews or approved therapeutic uses by the FDA. There also are significant differences in the biological activity and composition of the various preparations of *S. boulardii*. Therefore, it is important to read labels carefully and consult a physician before taking *S. boulardii*.

KEY TERMS

Colon—Large intestine; the lower part of the digestive system that is primarily responsible for conserving water by absorbing it from the bowel contents.

Clostridium difficile—A species of bacteria of the genus *Clostridium* that causes diarrhea associated with antibiotic use.

Microflora—intestines. Microflora reinforce the barrier function of the intestinal mucosa to help prevent the attachment of pathogenic microorganisms and the entry of allergens.

Nonpathogenic—Incapable of causing disease; harmless.

Probiotics—Live microorganisms or bacteria which, when administered in adequate amounts, confer a health benefit on the host.

Side effects

Except reported cases of fungemia in patients with weakened immune systems who had an indwelling catheter, there have been no reported severe, adverse, or toxic effects of *S. boulardii* supplementation. Side effects are generally mild and may include gas, increased thirst, or **constipation**. Taking the supplement with food may decrease stomach upset. Drinking plenty of liquids during a bout of diarrhea will help avoid dehydration.

If symptoms such as **hives**, rash, **itching**, **wheezing**, chest or throat tightness, difficulty breathing, **fever**, blue skin color, or swelling of the lips, tongue, face or throat occur while taking *S. boulardii*, the person should seek emergency attention, as these are signs of an allergic reaction that requires immediate treatment.

Interactions

Alcohol kills active yeast, so alcoholic beverages should be avoided while taking *S. boulardii*.

S. boulardii supplements should not be taken in combination with medication for active yeast infections. It also should not be taken at the same time as antifungal medications, such as nystatin, fluconazole, or itraconazole because these medications kill the active yeast. Antifungal medications can be taken two to three hours after taking *S. boulardii*.

Antibacterial antibiotics do not interfere with the action of *S. boulardii* and can be taken at the same time as this supplement.

Other drug interactions have not been determined, as most supplements, including *S. boulardii*, have not been thoroughly tested for interactions with other herbs, supplements, drugs, or food.

Resources

BOOKS

Bender, D. A. *A Dictionary of Food and Nutrition*. New York: Oxford University Press, 2005.
Berdanier, C., and J. T. Dywer, eds. *Handbook of Nutrition and Food,* 2nd ed. Boca Raton, FL: CRC Press, 2006.
Elmer G. W., L. V.McFarland, and M. Mcfarland. *The Power of Probiotics: Improving Your Health with Bene ficial Microbes (Haworth Series in Integrative Healing.)* New York: Routledge, 2007.

PERIODICALS

Czerucka D., T. Piche, and P. Rampal. "Review Article: Yeast as Probiotics Saccharomyces Boulardii." *Alimentary Pharmacology & Therapeutics* 15, no. 6 (September 2007): 767 778.
Szajewska H., M. Ruszczynski, and A. Radzikowski. "Pro biotics in the Prevention of Antibiotic Associated Diarrhea in Children: A Meta Analysis of Randomized Controlled Trials." *Journal of Pediatrics* 149, no. 3 (September 2006): 367 372.

ORGANIZATIONS

Alternative Medicine Foundation, PO Box 60016, Potomac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.
American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.
Food and Agricultural Organization of the United Nations, http://www.fao.org.
Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agriculture. 10301 Baltimore Ave., Room 105, Beltsville, MD, 20705, (301) 504 5414, http://fnic.nal.usda.gov.
International Food Information Council, 1100 Connecticut Ave. NW, Suite 430, Washington, DC, 20036, (202) 296 6540, http://www.ific.org.

Angela M. Costello

Sacro-occipital technique *see* **Craniosacral therapy**
SAD *see* **Seasonal affective disorder**

Safflower flower

Description

Safflower is an annual herb whose botanical name is *Carthamus tinctorius*. It is a member of the Asteraceae family. It has long, spiny leaves and yellow or reddish flowers on a stiff, upright stem. The seeds produce an edible oil. Safflower grows to a height of about 3 ft (1 m) in poor, dry soils in full sun. The origins of this plant are not clear, although some herbalists suggest the basin of the Euphrates River. Today safflower grows wild in Iran, northwest India, and North Africa. It has also spread to the Far East and North America. Safflower is cultivated extensively both as a herb and as a food crop.

Other names for safflower include false saffron, dyer's **saffron**, American saffron, bastard saffron, Mexican saffron, and zaffer. Despite these names, safflower is in no way related to true saffron, although it is sometimes used to adulterate that spice because true saffron is very expensive and safflower is relatively cheap. In Chinese medicine, safflower flower is called *hong hua*; in India it is known as *koosumbha*.

General use

Safflower flower has been used in traditional Chinese medicine for thousands of years. It is used to treat menstrual disorders. Safflower flower is an emmenagogue, meaning that it is given to bring on **menstruation**. Safflower is also used to treat menstrual **pain**, to firm up the uterus after **childbirth**, to ease stiffness and pain in the joints, and sometimes also to treat trauma to the abdomen. According to traditional Chinese usage, safflower flower is a blood regulator; that is, it invigorates and harmonizes the blood and dissolves blood clots. Safflower is said to have a warm nature and a pungent taste. Chinese practitioners use safflower oil in *tui na* massage.

Safflower flowers are also used to treat such childhood problems as **measles**, fevers, and skin rashes. Applied externally, safflower flower is used to cleanse wounds. Interestingly, on the other side of the world, North Americans used safflower flower in the nineteenth century in much the same way as the Chinese—to bring on menstruation and to treat measles. They also used it to induce sweating.

Safflower seeds can be pressed to produce an edible oil. The unpurified form of this oil is used as a laxative or purgative to cleanse the bowels. Processed safflower oil does not have laxative properties. The processed oil is used extensively in cooking and for making margarine and salad dressings. The oil is also used in paints and varnishes and is burned for lighting where electricity is unavailable.

Safflower has other nonmedicinal uses. Its flowers produce a dye that in times past was used for dyeing silk yellow or red. Today, chemical dyes have largely replaced safflower flower dye. The flowers were also

Safflower plant. *(©PlantaPhile, Germany. Reproduced by permission.)*

dried and ground together with finely powdered talc to produce cosmetic rouge.

Modern scientific research shows that safflower oil lowers serum **cholesterol** levels, making it useful in preventing **heart disease**. The claim has also been made that safflower flowers prevent coronary artery disease because they are a digestive bitter and assist in the digestion of oils. Infusions of safflower flowers are used to lower the accumulation of lactic acid in the muscles during athletic competition. In addition, a compound has been isolated from safflower that stimulates the immune system in mice. Additional studies are ongoing to confirm this effect.

More recently, safflower has been identified as the source of several flavonoids with strong antioxidative activity. Flavonoids are water-soluble plant pigments that help to lower inflammation as well as counteract the damaging effects of oxidation on body tissues. **Quercetin**, which is one of the flavonoids found in safflower, is a well-known antioxidant.

As of 2002, several groups of Asian researchers are studying the effectiveness of traditional herbal medicines containing safflower extract in treating bone disease. Although these studies are still in their early stages, preliminary findings indicate that safflower extract inhibits bone resorption and thus may be useful in treating diseases involving bone loss.

Many other medicinal claims have been made for safflower that are less well documented by modern scientists. These include claims that it reduces pain; has antibacterial action; reduces fever; reduces enlarged breasts; and can be used to purge the body of parasitic **worms**.

Preparations

Harvesting safflower flowers requires some care. The flowers are picked just as they begin to wilt and can be used fresh or dried. If they are to be dried, they must be kept away from sunlight during the drying process or they will lose their distinctive reddish-yellow color. Dried flowers are not normally kept more than one year.

Safflower flowers can be used alone or in formulas. They can be prepared as dried powder, tinctures, or decoctions. Used alone, a common daily dosage is

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue.

Decoction—An extract of a plant's flavor or essence made by boiling or simmering parts of the plant in water.

Emmenagogue—A substance or medication that brings on a woman's menstrual period. Safflower flowers have been used as an emmenagogue.

Flavonoid—Any of a group of water-soluble plant pigments that are thought to have antioxidative, anti-inflammatory, and antiviral properties.

Quercetin—An important flavonoid found in safflower that has strong anti-inflammatory and antioxidative activity.

Resorption—The breakdown or dissolving of bone tissue by biochemical processes in the body.

3 g of decoction or 1 g of powder. A standard infusion of safflower flowers uses 4–8 oz of dried flowers. A common Chinese formula that uses safflower flower is pseudoginseng and dragon blood formula. This formula is used to treat traumatic injuries such as **sprains** or fractures that are accompanied by pain and swelling. The role of the safflower flower in this formula is to move congealed blood and reduce pain.

Precautions

Because safflower flower brings on menstruation, it should not be used by pregnant women. Large doses can cause spontaneous abortion. In addition, because safflower may prolong blood clotting time, it should not be given to patients with peptic ulcers or hemorrhagic illnesses.

Side effects

The unprocessed oil of safflower seed can cause severe diarrhea.

Interactions

Safflower flower is often used in conjunction with other Chinese herbs with no reported interactions. As of 2002, there are no reported interactions of safflower extract or oil with standard pharmaceuticals. Its use in dissolving clots, however, suggests that it should not be taken with allopathic medications given to thin the blood.

Resources

BOOKS

Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. London, UK: Dorling Kindersley Publishers, 1996.

Molony, David. *Complete Guide to Chinese Herbal Medi cine*. New York: Berkeley Books, 1998.

Reid, Daniel. *Chinese Herbal Medicine*. Boston, MA: Shambhala, 1996.

PERIODICALS

Hong, H. T., H. J. Kim, T. K. Lee, et al. "Inhibitory Effect of a Korean Traditional Medicine, Honghwain Jahage (Water Extracts of *Carthamus tinctorius L.* seed and Hominis Placenta) on Interleukin 1 Mediated Bone Resorption." *Journal of Ethnopharmacology* 79 (Feb ruary 2002): 143 148.

Lee, J. Y., E. J. Chang, H. J. Kim, et al. "Antioxidative Flavonoids from Leaves of *Carthamus tinctorius*." *Archives of Pharmacal Research* 25 (June 2002): 313 319.

Yuk, T. H., J. H. Kang, S. R. Lee, et al. "Inhibitory Effect of *Carthamus tinctorius L.* Seed Extracts on Bone Resorption Mediated by Tyrosine Kinase, COX 2 (Cyclooxygenase) and PG (Prostaglandin) E2." *American Journal of Chinese Medicine* 30 (2002): 95 108.

ORGANIZATIONS

American Association of Oriental Medicine (AAOM). 909 22nd St. Sacramento, CA 95816. (916) 451 6950. www.aaom.org.

Centre for International Ethnomedicinal Education and Research (CIEER). www.cieer.org.

OTHER

Herbal Dave. http://www.herbaldave.com.

Tish Davidson
Rebecca J. Frey, PhD

Saffron

Description

Saffron is an herbal preparation harvested from the stigma of the *Crocus sativus* flower. It is dark orange and threadlike in appearance, with a spicy flavor and pungent odor. The plant is grown in India, Spain, France, Italy, the Middle East, and the eastern Mediterranean region.

General use

In addition to its culinary uses, saffron is prescribed as a herbal remedy to stimulate the digestive system, ease **colic** and stomach discomfort, and minimize **gas**. It is also used as an emmenagogue, to stimulate and promote menstrual flow in women.

Saffron. *(©PlantaPhile, Germany. Reproduced by permission.)*

Preliminary studies have shown that saffron may also be a useful tool in fighting **cancer**. According to a 1999 study, use of the herb slowed tumor growth and extended lifespan in female rats. A 2002 study done at Indiana University indicated that saffron may not only be effective in treating certain types of cancer, but significantly less likely to cause birth defects if given to pregnant women than all-trans-retinoic acid (ATRA), the compound most often given to treat these cancers. Saffron may thus be a preferable alternative to treating ATRA-sensitive cancers in women of childbearing age.

A 2004 review of previous research in animal models and with cultured human malignant cell lines concluded that clinical trials are warranted to define the possible chemopreventive properties of saffron. A 2006 study at the National Institute of Pediatrics in Mexico concluded: "saffron itself, as well as its carotenoid components, might be used as potential cancer chemopreventive agents."

Additional human studies have indicated that saffron has powerful antioxidant properties; that is, it helps to protect living tissues from free radicals and other harmful effects of oxidation. In Iran and Japan, pharmacology studies in 2000 and 2002 confirmed that saffron extract has an anticonvulsant activity.

Two chemical components of saffron extract, crocetin and crocin, reportedly improved memory and learning skills in learning-impaired rats in a Japanese study published in early 2000. These properties indicate that saffron extract may be a useful treatment for neurodegenerative disorders and related memory impairment.

In 2005 in the Journal of Ethnopharmacology researchers reported on the first scientific study to test the effectiveness of saffron as a treatment for symptoms of mild to moderate **depression**. Daily dosages of 30 mg saffron extract (standardized to 0.7 mg of safranal) were compared to 20 mg of fluoxetine (generic Prozac) in 38 people. Participants were aged 18 to 55 years. At the conclusion of the six-week trial, both treatments demonstrated significant improvements in depressive symptoms. There was no significant difference between the herbal treatment and the drug treatment as far as the amount of improvement demonstrated. However, participants who took the saffron extract did not report side effects, such as **sexual dysfunction**, **tremor**, or sweating, sometimes attributed to fluoxetine. Symptoms were evaluated with the Hamilton Rating Scale for Depression prior to the study and at intervals of one, two, four and six weeks.

Preparations

Saffron is harvested by drying the orange stigma of the *Crocus sativus* flower over fire. Over 200,000 crocus stigmas must be harvested to produce one pound of saffron. This volume makes the herb extremely expensive, and it is often cut with other substances of a similar color (e.g., marigold) to keep the price down.

Safranal, a terpene aldehyde, is formed during the drying process. It is the constituent responsible for much of saffron's characteristic fragrance.

Because saffron is frequently used as a spice to flavor a variety of dishes, particularly in Mediterranean recipes, it can often be purchased by mail order and at gourmet food stores as well as at health food stores. The herb is usually sold in either powdered form or in its original threadlike stigma form. Saffron can cost as much to $10 per gram.

For medicinal purposes, saffron can be taken by mouth in powder, tincture, or liquid form. To make a liquid saffron decoction, mix 6–10 stigmas or strands of saffron in one cup of cold water, bring the mixture to a boil, and then let it simmer. The saffron is then strained out of the decoction, which can be drunk either hot or cold. An average recommended dose of saffron decoction is 1/2–1 cup daily.

Saffron should be stored in an airtight container in a cool location away from bright light to maintain its potency. The herb can be frozen. Properly stored saffron can be used for up to two years. A good measure of the herb's freshness and potency is its odor. If the saffron does not have a noticeable pungent smell, it is probably past its peak.

Precautions

Because saffron can stimulate uterine contractions, pregnant women should never take the herb for medicinal purposes.

KEY TERMS

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Crocetin—A reddish-yellow plant pigment found in saffron that has been studied for its anticancer effectiveness.

Decoction—A herbal extract produced by mixing an herb with cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. Decoctions are usually chosen over infusion when the botanical or herb in question is a root, seed, or berry.

Emmenagogue—A medication or substance given to bring on a woman's menstrual period.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with such disease processes as cancer.

Stigma—The thread-like filament found in the center of a flower where pollen collects.

Tincture—A liquid extract of an herb prepared by steeping the herb in an alcohol and water mixture.

Saffron should always be obtained from a reputable source that observes stringent quality control procedures and industry-accepted good manufacturing practices. Because of its high cost, saffron is sometimes found in adulterated form, so package labeling should be checked carefully for the type and quality of additional ingredients.

Botanical supplements are regulated by the FDA; however, as of 2008 they were not required to undergo any approval process before reaching the consumer market and were classified as nutritional supplements rather than drugs. Legislation known as the Dietary Supplement Health and Education Act (DSHEA) was passed in 1994 in an effort to standardize the manufacture, labeling, composition, and safety of botanicals and supplements. In January 2000, the FDA's Center for Food Safety and Applied **Nutrition** (CFSAN) announced a ten-year plan for establishing and implementing these regulations by the year 2010.

Side effects

Although there are no known side effects or health hazards associated with recommended dosages of saffron preparations in healthy individuals, people with chronic medical conditions should consult with their healthcare professional before taking the herb. In addition, pregnant women should never take saffron, as the herb stimulates uterine contractions and may cause miscarriage.

Despite earlier reports of serious adverse effects from as little as 5 grams of saffron, there is no scientific evidence as to the toxicity of *Crocus sativus*. According to Subhuti Dharmananda, director of the Institute for Traditional Medicine in Portland, Oregon, "all recent research reports indicate that saffron is non-toxic." The so-called meadow saffron *(Colchicum autumnale)* is highly toxic, however, and is sometimes mistaken for the non-toxic medicinal plant *Crocus sativus*.

Interactions

As of 2008, there were no reported negative interactions between saffron and other medications and herbs, although certain drugs with the same therapeutic properties as saffron may enhance the effect of the herb.

Resources

PERIODICALS

Dharmananda, Subhuti. "Saffron: An Anti Depressant Herb." *Institute for Traditional Medicine* (May 2005). www.itmonline.org/arts/saffron.htm (February 6, 2008).

Noorbala, A. A. "Hydro alcoholic Extract of Crocus Sati vus versus Fluoxetine in the Treatment of Mild to Moderate Depression: A Double Blind, Randomized Pilot Trial." *Journal of Ethnopharmacology* 97, no. 2 (2005): 281 284.

ORGANIZATIONS

Institute for Traditional Medicine, 2017 SE Hawthorne Blvd., Portland, OR, 97214, (503) 233 4907, http://www.itmonline.org.

Office of Dietary Supplements. National Institutes of Health, Building 31, Room 1B25. 31 Center Dr., MSC 2086, Bethesda, MD, 20892 2086, (301) 435 2920, http://odp.od.nih.gov/ods/.

United States Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway, College Park, MD, 20740, (888) SAFEFOOD, http://www.cfsan.fda.gov.

Paula Ford-Martin
Clare Hanrahan

Sage

Description

Sage (*Salvia officinalis*) is native to the Mediterranean and naturalized throughout Europe and North America. Known as garden sage, meadow sage, and

true sage, this pungent herb is a member of the Lamiaceae, or mint, family. The genus name is taken from the Latin *salvare* meaning "to save." The specific name *officinalis* indicates that sage was included on official lists of medicinal herbs. There are numerous species of sage, including clary sage (*S. sclarea*) named because of its traditional use as an eyewash. Native Americans used the roots and leaves of lyre-leafed sage (*S. lyrata L.*), also known as cancerweed, as a salve for sores and in a tea to treat colds and coughs. Another species, known as divine sage (*S. divinorum*), a native of Oaxaca, Mexico, has been used for centuries by local shamans to achieve altered states of consciousness in healing rituals. There are many more garden varieties, including red or purple sage (*S. officinalis purpurascens*), which is valued particularly for its medicinal purposes.

Sage thrives in full sun and well-drained soils, growing wild in some areas. It is a hardy, evergreen shrub with a deep taproot and an erect root stalk that produces woody, square, slightly downy, branching stems that may reach a height of 4 ft (1.2 m). This familiar garden perennial has long, light green leaf stalks that bear simple, opposite, lance- or oval-shaped leaves. The strong and pliable leaves are veined, with a velvet-like, somewhat crinkled, texture and may grow to 2 in (5.1 cm) long in some varieties. Leaf margins resemble a fine embroidery finish with rounded, minutely toothed edges. They are a gray green on the top, and lighter on the underside. The entire plant is strongly aromatic, with a familiar pungency. Fresh leaves are bitter to the taste. Sage blossoms in the middle of summer with small white, blue, or purple flowers.

General use

Sage is a celebrated herb long valued for its many uses in medicine, magic, and meal preparation. Poets, shamans, herbalists, cooks, emperors, and common folk have touted its virtues for thousands of years. The Romans revered the herb as a sacred plant, and the Egyptians used it to treat the plague. Nicholas Culpeper, the seventeenth-century herbalist and astrologer, believed sage was under the dominion of Jupiter. Folk belief placed the herb under the influence of Venus, and sage was traditionally used to aid conception. One folk tradition encouraged eating a bit of sage each day during the month of May to assure immortality. Failing to live up to this promise, sage was traditionally planted on graves.

Sage's main constituents include volatile oil, diterpene **bitters**, thujone, camphor, tannins, triterpenoids, resin, flavonoids, estrogenic substances, phenolic acids, including rosmarinic and caffeic acids, and saponins. It acts as a carminative, antiperspirant, antispasmodic, astringent, antiseptic, and antibiotic. More recently sage has been discovered to have antiallergic effects.

KEY TERMS

Antioxidant—Any one of a group of substances that destroy cell-damaging free radicals in the body.

Carminative—Something that prevents the formation of intestinal gas or allows it to be expelled.

Thujone—A natural chemical compound found in sage as well as in wormwood and certain other spices. Thujone in large quantities can cause hallucinations and convulsions.

Tonic—A preparation or medicine that invigorates, strengthens, or restores tone to body tissues.

Sage has been used as a general tonic. It is the preferred beverage tea in many cultures, particularly in China, where the root of the species *S. miltiorrhiza*, known as *dan shen*, is used for its soothing and healing qualities. Sage has antioxidant properties that have recently been used by the food industry to improve the stability of oils that must be kept in storage for long periods of time.

Sage is also high in **calcium**. It provides potassium, **magnesium**, and **zinc** as well as vitamins C and B-complex. Sage is calming to the central nervous system and may reduce anxiety. It can soothe spasms in smooth and skeletal muscles. Sage is a bitter digestive stimulant and acts to relieve digestive problems. The herb also contains estrogenic substances that help to regulate **menstruation**.

Taken cold, the tea is astringent and diuretic, and will help to reduce night sweats in menopausal women and reduce milk flow in breast-feeding mothers. Taken hot, a sage infusion acts as an expectorant and is good for common colds and flu. A strong infusion of sage, used as a hair rinse, may darken hair color and help reduce **hair loss**. The antibacterial properties in sage make it a useful mouthwash for gingivitis and an antiseptic **sore throat** gargle. Sage is still listed in the *United States Pharmacopoeia* as a treatment for bleeding gums and sore throats. A tea made from the leaves may be used as an antiseptic wash for **wounds** and sores. Crushed leaves may be applied to relieve insect **bites**. The powdered herb, added to toothpaste and powders, helps to whiten teeth.

Some research indicates that sage may boost insulin action and be helpful to treat non-insulin dependent diabetes. The herb may reduce blood sugar levels and promote bile flow. Among its many virtues, sage is said to improve memory and bring prosperity to the household. Dried sage, burned as a smudge, is used in Native American rituals as a purifying and cleansing herb believed to promote healing, wisdom, protection, and longevity.

Preparations

The leaf is the medicinal part of the herb. Both the fresh and dried leaves may be used for medicinal or culinary purposes. The leaves are harvested when the herb begins to flower in the summer of its second year. The leaves are removed from the woody branches and spread in a single layer on a tray or screen in a warm, airy, and shady place. Exposure to direct sunlight during the drying process will result in a significant loss of the volatile oil. Dried leaves are stored in a dark, airtight container.

To make an infusion, 1 pint of nonchlorinated water that has just reached the boiling point is poured over 2–3 tsp of dried or fresh sage leaves in a glass container. The mixture is covered and steeped for 10–15 minutes. This liquid can be drunk warm or cold, up to 3 cups daily, or used as a gargle or hair rinse.

Tinctures of sage are available commercially. A standard dose is 16–40 drops, up to three times daily.

To make a sage compress, a clean, cotton cloth is soaked in an infusion of sage leaves and then applied to wounds or sores to aid healing.

Precautions

Sage preparations in medicinal doses should not be used during **pregnancy**, although use of small amounts of sage for culinary purposes is safe. Breastfeeding women should avoid sage unless they are using the herb to reduce the flow of breast milk when weaning. People with **epilepsy** should not use sage due to the thujone content in the herb. Thujone may trigger convulsions in these people, and the essential oil contains as much as 25% thujone. The essential oils may accumulate in the system, so long-term use of **essential oils** (more than two weeks at a time) should be avoided. Those allergic to sage or other plants in the mint family should avoid this herb.

Side effects

There are no adverse side effects when sage is taken in designated therapeutic doses. However, sage may interfere with absorption of iron and other minerals

Interactions

As of 2002, no interactions have been reported between sage and standard prescription medications.

Resources

BOOKS

The Herbal Healer, Prevention Health Library. Emmaus, PA: Rodale Press, Inc., 1998.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Prevention's 200 Herbal Remedies, 3rd edition. Emmaus, PA: Rodale Press, Inc., 1997.

Reid, Daniel. *Chinese Herbal Medicine*. Boston, MA: Shambhala, 1996.

PERIODICALS

Miura, K., H. Kikuzaki, and N. Nakatani. "Antioxidant Activity of Chemical Components from Sage (*Salvia officinalis L.*) and thyme (*Thymus vulgaris L.*) Measured by the Oil Stability Index Method." *Journal of Agricul tural and Food Chemistry* 50 (March 27, 2002): 1845 1851.

Shi, T. Y., and H. M. Kim. "Inhibition of Immediate Type Allergic Reactions by the Aqueous Extract of *Salvia plebeia*." *Immunopharmacology and Immunotoxicology* 24 (May 2002): 303 314.

Zainuddin, A., J. Pokorny, and R. Venskutonis. "Antioxi dant Activity of Sweetgrass (*Hierochloe odorata Wahlnb.*) Extract in Lard and Rapeseed Oil Emul sions." *Nahrung* 46 (February 2002): 15 17.

ORGANIZATIONS

United States Pharmacopoeia (USP). 12601 Twinbrook Parkway, Rockville, MD 20852. (800) 822 8772. www.usp.org.

OTHER

"1001 Herbs for a Healthy Life." www.herb.com.

Clare Hanrahan
Rebecca J. Frey, PhD

Saliva sample testing

Definition

Saliva sample testing is a technique used to collect samples of a person's saliva, or spit, to check for or monitor certain drugs, hormones (chemical messengers from one cell or group of cells to another), antibodies (substances in the body's blood or fluids that act against foreign substances such as bacteria), and other molecules (the smallest chemical elements)

Saliva sample testing is a technique used to collect samples of a person's saliva, or spit, to check for or monitor certain drugs, hormones, antibodies and other molecules present in the body. *(imagebroker / Alamy)*

present in the body. With a saliva sample, diagnostic data for diseases or conditions such as human immunodeficiency virus (HIV), hypogonadism (reduced or absent secretion of hormones from the sex glands, the gonads), **measles**, **hepatitis** (a liver disease caused by the hepatitis A virus), certain cancers, low fertility, **menopause** and others are available without having to draw a person's blood. Saliva can reveal use of alcohol and many drugs. With simple, use-at-home kits, women can self-determine when they are ovulating, which is especially useful when trying to conceive a child. Researchers also have found they can detect **stress** in a person through saliva samples.

Origins

In ancient times, saliva served as "judge and jury" when a person was accused of a wrong-doing. The suspect was given a mouthful of dry rice; and if his **anxiety** reduced saliva flow to the point that he could not swallow the rice, he was considered guilty as charged. To this day, a **dry mouth** signals nervousness. Spittoons were common in history until it was discovered that saliva carried germs.

Scientists began to realize that along with germs, saliva carried clues about our bodies. Saliva contains important enzymes (organic substances that accelerate chemical changes) that help digest food, and this natural body fluid serves as an antimicrobial, fighting viruses and diseases that enter our bodies. Additional properties in saliva help fight off bacteria.

In the twentieth century, researchers learned that saliva carried clues to the presence of diseases and conditions that once were only monitored by measuring blood, urine, or other fluids. For example, a Spanish gynecologist named Biel Cassals, M.D., noticed in 1969 that saliva would "fern," or crystallize during hormonal changes, almost identically to the changes observable in cervical mucous. These changes in cervical mucous have helped predict when a woman was about to ovulate. Further studies of salivary ferning through the 1990s showed that saliva also could also help predict ovulation (when an egg is released from an ovary in response to a hormonal signal) with excellent accuracy. By the twentieth-first century, at-home kits using saliva to help women trying to conceive children were introduced and marketed.

Since the 1980s, some nutritional practitioners have used saliva samples to measure certain imbalances and disease processes in order to determine a person's need for a nutritional plan and for dietary supplements. In addition to hormones related to ovulation, some physicians and other practitioners have measured other hormone levels in saliva, including testosterone, cortisol, and **melatonin**. Melatonin levels are much higher at night than in the daytime. Sometimes supplements are suggested for people who have trouble sleeping.

By 2004, more and more uses for saliva sample testing were in experimental stages or being approved by the U.S. Food and Drug Administration (FDA). In fact, saliva research has led to many important discoveries. Saliva holds a complete imprint of a person's DNA, or genetic makeup. In effect, saliva once again serves as judge and jury, since a crime laboratory can determine who committed a crime based on the saliva left after licking an envelope seal, for example. Saliva tests are increasingly being used to test people for the presence of drugs and alcohol and may one day be used to test them immediately upon being pulled over or at police checkpoints.

Benefits

Laboratory tests such as saliva sample tests are used to help a person detect a disease or other condition. Saliva sample testing is particularly beneficial because is it less invasive or non-invasive. Non-invasive means the skin does not have to be broken or an organ or cavity of the body does not have to be entered. As a result, test results may be more accurate in that less stress on the system during the production of the specimen means less interference of stress effects on the factors being tested. In some cases, a swab is put in the mouth to collect the saliva or sufficient quantities of saliva need to be gathered by spitting for several minutes into a collecting tube, but studies have shown that many patients prefer this collection method to

KEY TERMS

Cervical—Having to do with the lower part of the uterus (womb), which reaches into the vagina and leads to the outside of the body.

Cortisol—A hormone related to performance and stress levels, detectable in saliva.

Melatonin—A hormone, detectable in saliva, sometimes called "the chemical equivalent of night" that is involved in regulating sleeping and waking cycles or the complex rhythms related to light and dark, the seasons of the year, and fertility.

N.D. or Doctor of Naturopathic Medicine—In some states, Naturopathic doctors, medically trained in diagnostics and natural and alternative therapies, are licensed as Naturopathic physicians. In other states, they may be licensed or registered as Naturopathic doctors. They are distinct from other naturopathic doctors, who may be correspondence school trained in traditional alternatives, by being medically trained graduates of accredited programs in naturopathic medicine, and board certified by a state's Department of Health. Information on finding a naturopathic physician may be found at www.naturopathic.org.

Ovulation—When an ovum, or egg, is released from a woman's ovary. Ovulation is determined by certain hormonal activity, which reveals itself in patterns seen in a woman's cervical mucous. For example, the ferning pattern at the time of greatest fertility, a pattern which facilitates sperm conductance for fertilization of the egg.

Pathologist—A physician specializing in the study of disease, particularly as is involves cellular changes in the body and laboratory tests and methods.

being pricked in the arm or finger with a needle. Health care workers say saliva samples are much easier to obtain, especially from children.

Saliva sample tests offer other benefits as well, depending on the specific test and its use. The saliva test for HIV provides results in about 20 minutes, while the person waits at the testing facility. In the past, people having HIV tests had to wait for days or weeks to learn results and often did not return to learn the results. Another major benefit of oral HIV tests is that they can reduce transmission of HIV to health care workers, who once had to worry about accidentally pricking themselves with the needle they had used to test an HIV-infected patient. Those who test for HIV with saliva kits will not have to worry about handling blood and no cases of HIV transmission through saliva have been documented. The HIV sample test's non-invasive nature and rapid results may even lead to increased screening, especially among young people. The ease and rapid results could make the test valuable in Africa and other countries with widespread need for testing.

Finding less invasive methods to test for a number of diseases is a benefit for many people. Research has been done on a saliva test to detect a person's immune response to the anthrax vaccine, in the event of a bioterror attack, which would help emergency workers rapidly determine who has been immunized and who has not without having to have access to their medical records.

At-home kits that use saliva instead of urine to help determine ovulation have made it more convenient for women trying to conceive children to track their hormonal cycles, eliminating a lot of the "guesswork." Instead of simply predicting ovulation, the new saliva-based tests more precisely indicate the timing of ovulation. They also allow women to save results from previous months and compare cycles to determine patterns. The tests are reportedly accurate up to 98% for timing of ovulation.

Saliva sampling is also a more accurate way of measuring a woman's hormone levels, pre-, peri-, and post-menopause, for fertility studies and hormone replacement therapy. The reproductive hormones of estrogen and progesterone weave a complex pattern throughout the length of a woman's cycle. For women who are still cycling, a blood test for hormone levels reveals only a single snapshot of this very complex pattern, whereas the saliva sampling, done throughout the cycle, reveals the relationships and balance of the hormones. For women who are no longer cycling, saliva sampling is able to quantify and qualify the amounts and rates of hormone level changes, and may reveal that a woman's symptoms, for example, are a result of low progesterone rather than low estrogen. Saliva sampling may be used as a very effective diagnostic tool in helping a woman balance her hormone levels, thereby guiding the **aging** process with a more fluid, and graceful adjustment over time.

Description

In most cases, the saliva sample test works by using a plastic stick with a pad on the end to swab or

rub against the patient's gums to gather saliva. Other tests work by simply inserting a foam pad on a stick into the person's mouth, having the person pucker his or her lips, and moving the pad slightly around for a period of time until enough saliva fluid has been gathered. Still others rely on spitting directly into a collecting container.

The collected saliva then is exposed to a reagent, a chemical substance that is known to react a certain way, to indicate a positive result or measures ranges. For instance, the pad from an HIV saliva collection is put in a vial of reagent solution and within 20 minutes, certain colored lines may appear, indicating a positive result. Other samples may be collected at home, mailed in to a lab, and may take longer to be analyzed and reported back.

Women who test at home for ovulation will place a drop of saliva onto the device, let it dry and look through a dial that magnifies and lights up the sample for about 45 seconds.

Preparation

Preparation may depend on the use of the test and it is best to follow any instructions given by laboratory personnel or on a home test kit package. For some saliva tests, it is recommended that the person have nothing in his or her mouth for at least five minutes before sample collection. Certain foods may need to be avoided for a period of time prior to testing. These foods are indicated in the instructions. One such set of instructions advises the avoidance of eating, drinking and teeth brushing for a minimum of 60 minutes prior to collection. If sublingual (under the tongue) hormone drops are being used, a person will need to wait until after collecting the saliva before taking the drops. Saliva sampling may not be accurate or useful if a person has gingivitis, or **gum disease**.

Precautions

If a person has a condition such as **Sjögren's syndrome** that causes dry mouth and poor saliva production, he or she may not be a candidate for saliva sample testing. Certain medications also can cause a dry mouth.

When using at-home ovulation saliva test kits, women must remember not to use them to help prevent **pregnancy**. The kits are not designed for that purpose. **Smoking**, eating, drinking, and teethbrushing can affect test results, as can how the person puts saliva on the slide. Further, any home test kit is not intended or recommended to take the place of periodic visits to a physician or other health professional.

Some involved in HIV prevention have expressed concerns about saliva sampling for HIV, including an unintended effect of making the general population wrongly believe that HIV can be spread through saliva. Others have been concerned that the ease of saliva testing could cause abuse of testing, with authorities testing without first getting consent from people.

Caution should be used when having saliva sample tests for nutritional measurements. It is best to check with a registered alternative medicine practitioner or licensed physician before paying for at-home saliva tests for this purpose. Some saliva sample tests will be completed at medical offices or sent to laboratory facilities. Those done at home are recommended to be completed with kits approved by the FDA or by a professional healthcare provider.

Side effects

There are no known side effects to saliva sample testing.

Research and general acceptance

In March 2004, the FDA approved saliva sample testing for HIV. Home-based test kits have been approved by the FDA for use in determining ovulation. Many other tests were under constant experimentation or in the approval process throughout the early twenty-first century. Manufacturers must go through an exhaustive process of clinical trials and application with the FDA before marketing these types of products to the public.

Training and certification

The Clinical Laboratory Improvement Amendments (CLIA) passed by Congress in 1988 and finalized in 1992, regulate clinical laboratories in the United States, including education and training of lab personnel. Generally, test samples are processed by medical laboratory technicians (MLTs) or clinical laboratory technicians (CLTs). They usually have an associate degree and have completed an accredited program for lab technicians. The technicians are supervised by other laboratory professionals with more advanced scientific training. Technologists with special training reviewing results under microscopes or preparing tissue samples to diagnose disease also will handle a sample, depending on the type of test involved. A laboratory director oversees the operation. He or she usually is a physician (an M.D. or, as allowed in some states, an N.D.) or doctoral level scientist (Ph.D.) with training in interpreting disease via cell samples. Often, the physician is a board-certified pathologist.

Resources

PERIODICALS

Berger, Abi. "Saliva Test Could Diagnose Cancers." *British Medical Journal* (March 25, 2000): 825.

"FDA Approves Oral HIV Rapid Saliva Test 99 Percent Accuracy Results in 20 Minutes." *British Medical News Today* (March 27, 2004).

"Oral HIV Testing Can Increase Belief in Disease Transmission Through Saliva." *Biotech Week* (September 10, 2003): 229.

"Saliva based Rapid Test Kit Hits Market." *Medical Devi ces & Surgical Technology Week* (September 23, 2001).

Young, Karen. "FDA Clears New Saliva based Test for Determining Ovulation." *Diagnostics & Imaging Week* (August 14, 2003): 3 4.

ORGANIZATIONS

U.S. Food and Drug Administration Office of In Vitro Diagnostic Device Evaluation and Safety. HFZ 440 2098 Gaither Road, Rockville, MD 20850. (301) 594 3084. http://www.fda.gov/cdrh/oivd.

OTHER

Barrett, Stephen M.D. *Dubious Urine/Saliva Testing*. [cited June 14, 2004]. http://www.canoe.ca/HealthAlternative Columns/001220.html.

Consumer Information. Home use Tests. U.S. Food and Drug Administration. 2004. [cited June 14, 2004]. http://www.fda.gov/cdrh/oivd.

History of Method Development. Website. Craig Medical Distribution Inc. 1997. http://www.craigmedical.com/ ovulation_abstract.htm.

Home use Tests. Ovulation (Saliva Test). U.S. Food and Drug Administration. 2004. [cited June 14, 2004]. http://www.fda.gov/cdrh/oivd.

Latest Defense Against Bioterrorism: Saliva. Montana State University. 2003. [cited June 14, 2004]. http://techlink. msu.montana.edu/articles/saliva.html.

New Saliva Test Offers Fast, Simple Means of Measuring Stress. Northwestern University. 1997. [cited June 14, 2004]. http://www.northwestern.edu/univ relations/media.

Saliva. National Institute of Dental and Carniofacial Research, National Institutes of Health. http:// www.nidcr.nih.gov/spectrum/nidcr2/2textsec5.htm.

The Saliva Story Part 1. Website. Aeron Life Cycles Clinical Laboratory. [cited June 14, 2004]. http://www.areon. com/volume_2_number_1.htm.

The Young Prefer Rapid Saliva HIV Test. David Douglas, HIV and AIDS News Stories. August 3, 2001. [cited June 14, 2004]. http://www.hivandhepatitis.com.

Teresa G. Odle

Sargassum seaweed

Description

Sargassum seaweed is a type of seaweed found along the coasts of Japan and China. Two species, *Sargassum fusiforme* and *Sargassum pallidum,* are both referred to as sargassum seaweed or gulfweed in English and *hai zao* in Chinese.

Sargassum seaweed is a brown algae with leafy segments supported at the surface of the ocean by air bladders. Many species of sargassum are found worldwide. In fact, the Sargasso Sea, an area of the Caribbean near the West Indies, is named for its large floating masses of sargassum seaweed. The sargassum used in healing, however, is usually of Asian origin.

General use

Sargassum seaweed, or *Hai zao*, has been used in **traditional Chinese medicine** (TCM) since at least the eighth century A.D. According to TCM, this seaweed has a cold nature and a salty, bitter taste.

The primary use of sargassum seaweed is to treat goiters. A goiter is a nodule in the neck caused by enlargement of the thyroid gland. The thyroid needs **iodine** to produce a critical hormone, thyroxin, which regulates body metabolism. When too little iodine is consumed in the diet, the thyroid gland enlarges. The primary natural sources of dietary iodine are sea salt, fish, and vegetables that live in the ocean. In the days before good refrigeration, it was often difficult for people living far from the ocean to get enough iodine in their **diets**. In modern times, widespread refrigeration or freezing of fish and good transportation to inland markets have made iodine deficiency and goiters rare in the developed world. In addition, commercial salt manufacturers often produce a version of their product, called iodized salt, that is available in supermarkets and has iodine artificially added. Despite these advances, iodine deficiency is still a worldwide problem and is a major cause of mental and learning disabilities, particularly in undeveloped regions.

The use of sargassum seaweed as a source of iodine to treat goiters is a scientifically sound practice. In TCM, sargassum seaweed is also used to treat other thyroid disorders such as Hashimoto's disease. In addition, it is prescribed as a diuretic to increase the production of urine and reduce **edema**, and it is used to threat **pain** from hernia and swollen testes. Sargassum seaweed is found in many common Chinese formulas. In combination with silkworm, prunella (a plant also known as selfheal), and scrophularia (a plant root), it is used to treat scrofuloderma, which is **tuberculosis** of the skin. When sargassum seaweed is combined with water chestnut, it is used to treat silicosis, a debilitating and sometimes-fatal lung disease. Silicosis is also known as grinder's disease or potter's rot.

Sometimes, modern herbalists use sargassum seaweed to promote weight loss because it encourages water loss. This treatment can be risky because of the role iodine plays in setting the metabolic rate of the body. In China and Japan, fresh sargassum seaweed is sometimes stir-fried and eaten as a vegetable.

Reliable scientific evidence shows that sargassum seaweed is good at increasing dietary iodine as a treatment for goiter. There is little scientific evidence that sargassum seaweed is useful in treating other thyroid problems, such as Hashimoto's disease. Research shows that sargassum seaweed also has mild diuretic and anti-fungal properties. Studies on different, but related, species of sargassum seaweed showed that they contained **antioxidants** that helped protect the livers of rats when they were subjected to chemical damage in laboratory experiments. In general, antioxidants are thought to slow **aging** and protect the body from damage caused by free radicals.

Some research has shown that *Sargassum fusiforme* may be useful in the fight against human immunodeficiency virus (HIV). A study published in a 2008 issue of *Virology Journal* reported that a bioactive portion, or fraction, of the seaweed blocked infection with HIV and also inhibited the virus from replicating following infection. The study's authors concluded that *Sargassum fusiforme* was "a lead candidate for anti-HIV-1 drug development."

Preparations

Sargassum seaweed is collected from the ocean throughout the year. To store for future use, it is dried at cool temperatures away from direct sunlight. This alga is a component of several Chinese formulas, including a goiter treatment called *haizao yuhu tang* and a scrofuloderma treatment known as *neixiao lei li wan*. Dosage varies depending on the condition being treated.

Precautions

Because thyroid problems are serious, people with enlarged thyroid or nodules in the neck should seek professional help from a physician and not try to treat these problems solely with alternative remedies. Sargassum seaweed should be used with caution for weight loss because of the interactions of this product and the thyroid gland.

Side effects

A report published in the *Journal of General Internal Medicine* in 2006 stated, "Physicians should advise patients with underlying thyroid disease to avoid all complementary or alternative medications containing iodine." The report authors based their warning on a case study involving a woman who had developed iodine-induced **hyperthyroidism** (overactive thyroid gland) after drinking a tea prescribed by a Chinese alternative practitioner. The tea was made with **kelp**, Sargassum weed, and kombu. After she had stopped drinking the tea, her hyperthyroidism disappeared in time.

KEY TERMS

Diuretic—Any substance that increases the production of urine.

Edema—Water retention in the body that often causes swelling of the hands and feet.

Hashimoto's disease—A condition in which the body makes antibodies to destroy the thyroid; tendency toward this disease is thought to be inherited.

Scrofuloderma—Abscesses on the skin that are a symptom of the lung disease tuberculosis.

Silicosis—A serious lung disease caused by prolonged inhaling of dust from stone or sand that contains silicon dioxide; also called grinder's disease or potter's rot.

Interactions

Some traditional Chinese herbalists claim that **licorice** and sargassum seaweed should not be used together; however, no scientific research supported this claim as of 2008. Studies of interactions between sargassum seaweed and Western pharmaceuticals did not exist as of 2008; however, individuals taking medication for thyroid disorders should discuss the use of this remedy with their healthcare provider before using it.

Resources

PERIODICALS

Mssig, Karsten, Claus Thamer, Roland Bares, Hans Peter Lipp, Hans Ulrich Hring, and Baptist Gallwitz. "Iodine Induced Thyrotoxicosis After Ingestion of Kelp Containing Tea." *Journal of General Internal Medicine* 21, no. 6 (June 2006): C11 C14.

Paskaleva, E., X. Lin, K. Duus, J. McSharry, J. Veille, C. Thornber, et al. "Sargassum Fusiforme Fraction Is a Potent and Specific Inhibitor of HIV 1 Fusion and Reverse Transcriptase." *Virology Journal* 5, no. 1 (Jan uary 15, 2008): 8.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medicine (AAAOM), PO Box 162340, Sacramento, CA, 95816, (916) 443 4770, http://www.aaaomonline.org.

Tish Davidson
Teresa G. Odle
Leslie Mertz, Ph.D.

Sassafras

Description

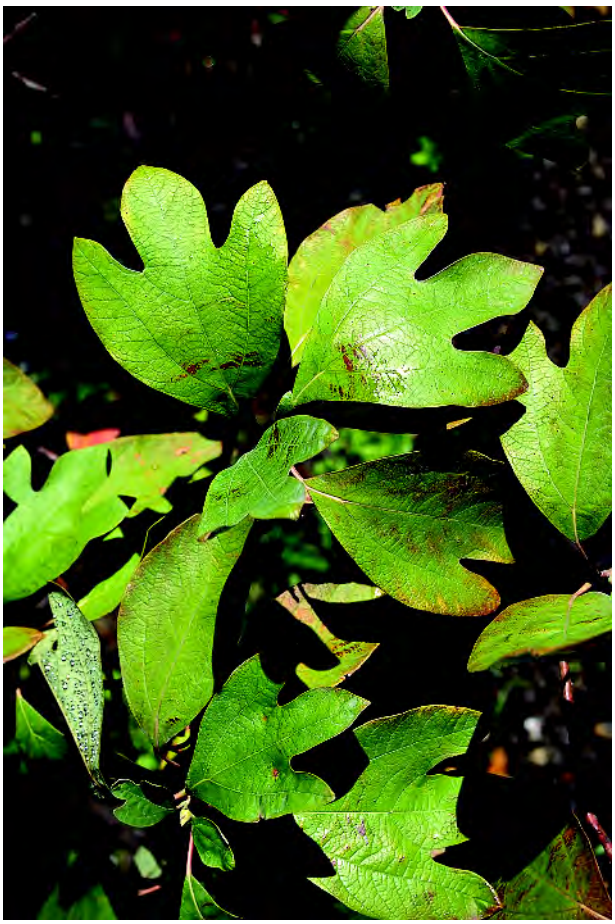
Sassafras is a small tree, *Sassafras albidum*, belonging to the laurel family native to eastern North America. Sassafras grows in woodlands in rich, sandy, well-drained soil from Maine to Florida, reaching a height of about 75 ft (25 m). The tree has also been imported to Europe, probably by the Spaniards who discovered it in Florida.

All parts of the sassafras tree are aromatic with a pleasant odor and a slightly sweet but astringent taste. The root and root bark were formerly used medicinally. The root is thick and woody. When alive, it is whitish, but rapidly turns cinnamon brown on exposure to air. Other names for sassafras are ague tree, cinnamon wood, saxifrax, saxafrax, and saloop. There are other plants that have the word sassafras in their name that are completely unrelated to *Sassafras albidum*. These include black sassafras (*Oliveri cortex*); swamp sassafras (*Magnolia glauca*); Australian sassafras (*Antherosperma moschatum*); sassafras goesianum (*Massoja aromatica,*); and California sassafras (*Umbellularia californica*).

General use

Sassafras should not be taken internally or used for healing except for topical applications. In the 1960s scientists determined that the volatile oil derived from sassafras root contains safrole as its chief component. Safrole is a known carcinogen in animal studies. Safrole in concentrations of 80–90%, similar to its concentration in the volatile oil, produced tumors in the livers of laboratory animals. In 1960 the United States Food and Drug Administration (FDA) banned sassafras volatile oil as a food and flavoring additive. In 1976 it prohibited the interstate shipment of sassafras bark for making tea. A safrole-free sassafras extract is now available; however, there are questions about its potentially cancer-causing properties.

Prior to the discovery that sassafras contains a carcinogen, it had a long and widespread history of folk use as a medicine. Native Americans used sassafras to cure many different conditions, but especially as a spring blood tonic. Before long, Native Americans introduced the European settlers to sassafras. It became a sought-after herb in Europe. Sassafras root bark was imported from the United States, and sassafras trees were also planted in Europe. Sassafras tea, sold under the name saloop, was a popular beverage in London.



Sassafras. *(©PlantaPhile, Germany. Reproduced by permission.)*

Before sassafras was discovered to be a carcinogen, it was used as a diuretic as well as to treat urinary tract disorders and kidney problems. It was also used as an ineffective treatment for **syphilis**. Other herbal practitioners used sassafras to treat rheumatism and arthritis. It was given to women to ease painful **menstruation** and help their recovery from **childbirth**. Other conditions treated with sassafras include high blood pressure, colds, flu, and **bronchitis**. The volatile oil was used in dentistry in combination with cloves and other herbs to relieve **toothache**. By far the most common use of sassafras, however, was to flavor root beer.

KEY TERMS

Carcinogen—Any substance that has the potential to cause cancer.

Diuretic—Any substance that increases the production of urine.

Volatile oil—A distilled oil obtained from plant tissue. This type of oil is called volatile because it evaporates rapidly.

Externally, sassafras washes were used to soothe the eyes. The volatile oil was used as a liniment and to treat **bruises** and swellings. The volatile oil was also used to control head and body lice. The risks in applying sassafras oil externally are still unclear.

Despite the fact that sassafras contains a proven carcinogen, it is still used today in many parts of the Appalachian Mountains, where the root is locally gathered. In 1994, there was evidence that teas containing sassafras were still being sold in some health food stores. Even the health community has not fully grasped the harmful effects of sassafras. A 1993 article in *Midwifery Today and Childbirth Education* recommended sassafras as a cure for breast inflammation after childbirth. Many reputable studies, however, indicate that there is a definite health hazard in using even small amounts of sassafras either as oil or tea.

Preparations

Sassafras should not be used. In times past, before its potentially harmful effects were recognized, it was available as a volatile oil, as bark that could be brewed into tea, and as a component of tonic formulas and tonic teas. Since use of sassafras is not recommended, there is no recommended dosage.

Precautions

Sassafras should not be used.

Side effects

It has been reported that as little as one teaspoon of pure sassafras oil can kill an adult, and only a few drops can kill a toddler. The signs of sassafras poisoning include **nausea**, **vomiting**, confusion, and paralysis. The potentially hazardous dose of safrole has been determined to be 0.66 mg/kg of a person's body weight. This amount is less than the dose often found in sassafras tea.

Interactions

Sassafras should not be used. Since it is toxic, drug interactions have not been investigated.

Resources

BOOKS

Lawless, Julia. *The Illustrated Encyclopedia of Essential Oils*. Rockport, MA: Element, 1995.

PDR for Herbal Medicines. Montvale, New Jersey: Medical Economics Company, 1998.

Peirce, Andrea. *The American Pharmaceutical Association Practical Guide to Natural Medicines*. New York: Wil liam Morrow and Company, 1999.

OTHER

Plants for the Future: Sassafras albidum. http://www.metalab.unc.edu.

Tish Davidson

Saw palmetto

Description

Saw palmetto is an extract derived from the deep purple berries of the saw palmetto fan palm (*Serenoa repens*), a plant indigenous to the coastal regions of the southern United States and southern California. There is an estimated one million acres of wild saw palmetto palms in Florida, where the bulk of commercial saw palmetto is grown.

General use

Saw palmetto is used by natural health practitioners to treat a variety of ailments in men and women, such as testicular inflammation, urinary tract inflammation, coughs, and respiratory congestion. It is also used to strengthen the thyroid gland, balance the metabolism, stimulate appetite, and aid digestion. Most of the evidence supporting these uses is anecdotal and has not been proven by controlled clinical trials.

Early and numerous clinical trials have reported the effectiveness of saw palmetto in treating irritable bladder and urinary problems in men with benign prostate hyperplasia (BPH), a non-cancerous enlargement of the prostate gland. An analysis in 2002 of 21 trials testing the effectiveness of saw palmetto extract in treating BPH symptoms found "mild to moderate" improvement. The trials involved more than 3,000 men. Saw palmetto extract in dosages of 320mg daily

Saw palmetto. *(© Florida Images / Alamy)*

has been shown to be effective in treating mild cases of BPH, according to a 2006 report in *Better Nutrition*.

BPH produces a swelling of the prostate gland that obstructs the urethra. This condition causes painful urination, reduced urine flow, difficulty starting or stopping the flow, dribbling after urination, and more frequent nighttime urination. Saw palmetto does not reduce **prostate enlargement**. Instead, it is thought to work in a variety of ways. First, it inhibits the conversion of testosterone into dihydrotestosterone (DHT). BPH is thought to be caused by an increase in testosterone to DHT. Second, saw palmetto is believed to interfere with the production of estrogen and progesterone, hormones associated with DHT production.

In addition to causing **pain** and embarrassment, BPH can lead to serious kidney problems if undiagnosed and left untreated. It is a common problem in men over the age of 40. Estimates are that 50–60% of all men develop BPH in their lifetimes. The Agency for Health Care Policy and Research estimates there are six million men between the ages of 50–79 who have BPH serious enough to require some type of therapy. Yet only half of them seek treatment from physicians. Health practitioners in both the allopathic and natural medicine communities recommend annual prostate exams for men over the age of 50 and an annual blood test that measures prostate specific antigen, a marker for **prostate cancer**.

A study published in the February 9, 2006, issue of the *New England Journal of Medicine* called into question the effectiveness of saw palmetto extract in the treatment of advanced BPH. Researchers reported that saw palmetto showed "no significant difference" in a standard measure of men's urinary tract health than in measurements of the placebo group. The federally funded study was part of a National Institutes of Health (NIH) effort to test alternative treatments. In the year-long study of 225 men over age 50, all diagnosed with advanced BPH, 112 received twice-daily dosages of 160 milligrams of saw palmetto extract, while a control group of 113 received a placebo pill formulated to mimic the taste and strong smell of the saw palmetto extract. Researchers speculate that the positive findings in earlier studies may have been due to patients' ability to detect that they were receiving placebo pills. Writing in 2006 in the *Johns Hopkins Health Alerts*, Hopkins professor, H. Ballentine Carter, contends: "The mixed results from clinical trials can be explained by differences in study design and among the groups of men that were studied."

In 2007, *The Herb Quarterly* reported on research findings in Milan, Italy, demonstrating that saw palmetto, in combination with a standard antibiotic, is an effective treatment for chronic bacterial prostatitis in patients who had not responded to a standard antibiotic alone. After six weeks, 64% of the men treated with the herb and antibiotic combination showed complete eradication of the infection-causing bacteria. When the combined treatment was continued for another six weeks, the total treatment success rate increased to 84%.

History

Saw palmetto berries have been used in American folk medicine for several hundred years as an aphrodisiac and for treating prostate problems. Native Americans in the southeast United States have used saw palmetto since the 1700s to treat male urinary problems. In the 1800s, medical botanist John Lloyd noted that animals that ate saw palmetto appeared healthier and fatter than other livestock. Early American settlers noticed the same effects and used the juice from saw palmetto berries to gain weight, to improve general disposition, as a sedative, and to promote reproductive health.

In the United States, the medicinal uses of saw palmetto were first documented in 1879 by J. B. Read, a physician in Savannah, Georgia, who published a paper on the medicinal benefits of the herb in the April 1879 issue of the *American Journal of Pharmacy*. He found the herb useful in treating a wide range of conditions. "By its peculiar soothing power on the mucous membrane it induces sleep, relieves the most troublesome coughs, promotes expectoration, improves digestion, and increases fat, flesh and strength. Its sedative and diuretic properties are remarkable," Read wrote. "Considering the great and diversified power of the saw palmetto as a therapeutic agent, it seems strange that it should have so long escaped the notice of the medical profession."

A pungent tea made from saw palmetto berries was commonly used in the early 1900s to treat prostate enlargement and urinary tract **infections**. It was also used in men to increase sperm production and sex drive, although these uses have been discounted in the 2000s. One of the first published medical recommendations that saw palmetto was effective in treating prostate problems appeared in the 1926 edition of *United States Dispensatory*. In the late 1920s, the use of medicinal plants, including saw palmetto, began to decline in the United States, while at the same time, their use was on the rise in Europe.

Preparations

People taking saw palmetto should use only standardized extracts that contain 85–95% fatty acids and sterols. Dosages vary depending on the type of saw palmetto used. A typical dose is 320 mg per day of standardized extract or 1–2 g per day of whole berries that have been dried and ground. It may take up to four weeks of use before beneficial effects are seen. In late 1999, the Web-based independent consumer organization ConsumerLab.com tested 27 leading brands of saw palmetto for fatty acid and sterol content. Ten of the brands contained less than the minimum recommended level of 85% fatty acids and sterols. The 17 brands that passed the test were listed on the organization's Web site, as of early 2008.

Precautions

A case of probable saw palmetto-induced acute **hepatitis** and **pancreatitis** was reported in 2006 in *Southern Medical Journal*. A 55-year-old reformed alcoholic who had been taking saw palmetto intermittently for a four-year period to treat BPH, experienced severe pain, **nausea**, and **vomiting**. According to the report, the patient responded clinically and biochemically to withdrawal of saw palmetto. The symptoms returned when saw palmetto was again administered. The case illustrates the importance of patients revealing details of the use of any herbal supplements as an important part of any complete medical history.

Saw palmetto should be used only under a doctor's supervision by people with prostate **cancer**, **breast cancer**, or any sex hormone related diseases. Although the effects of saw palmetto on a fetus are unknown, pregnant women are advised not to take saw palmetto. Saw palmetto can alter hormonal activity that could have an adverse effect on the fetus. Women taking birth control pills or estrogen replacement products should consult a physician before taking saw palmetto. Persons taking testosterone or other anabolic steroids should not take saw palmetto without first consulting their doctor.

Physicians who accept saw palmetto as an effective remedy for prostate problems nevertheless point out that it is not completely free of side effects. In rare cases, allergic reactions to saw palmetto have been reported. Symptoms include difficulty breathing, constriction of the throat, **hives**, and swelling of the lips, tongue, or face. Persons experiencing any of these symptoms should stop taking saw palmetto and seek immediate medical attention.

Side effects

Other reported minor side effects are rare. They include cramps, nausea, **diarrhea**, and **headache**.

Interactions

Saw palmetto may interfere with such hormone-related drugs as testosterone and estrogen replacements, including Premarin, Cenestin, Vivelle, Fempatch, and Climara. It may also interact with birth control pills, such as Triphasil, Ovral, Lo-Ovral, Nordette, Alesse, Demulen, and Ortho-Novum. Individuals on these types of medications should consult with their doctor before taking saw palmetto. There are no known restrictions on food, beverages, or physical activity while taking saw palmetto.

Several herbs and minerals have been used in conjunction with saw palmetto in treating BPH. A 1996 European study showed positive results in treating patients with a daily dose of 320 mg of saw palmetto extract and 240 mg of **nettle** root extract. Many alternative health practitioners also recommend saw palmetto be used in combination with the herb pygeum africanung, pumpkin seeds, **zinc**, **flaxseed** oil, certain **amino acids**, **antioxidants**, and **diets** high

KEY TERMS

Anabolic steroids—A group of mostly synthetic hormones sometimes taken by athletes to temporarily increase muscle size.

Aphrodisiac—Any substance that excites sexual desire.

Estrogen—A hormone that stimulates development of female secondary sex characteristics.

Hyperplasia—Enlargement of a part of the body, such as the prostate gland, due to an abnormal increase in the number of its cells.

Placebo—An inert or innocuous substance used in controlled experiments intended to test the efficacy of another substance.

Progesterone—A steroid hormone that is a biological precursor to corticoid (another steroid hormone) and androgen (a male sex hormone).

Testosterone—A male hormone produced in the testes or made synthetically that is responsible for male secondary sex characteristics.

Urethra—The canal that carries urine from the bladder.

in protein and soy products. Factors that can impair the effectiveness of saw palmetto include beer, cigarette smoke, and some chemical pesticides used on fruit and vegetables. Some physicians recommend using saw palmetto in addition to a prescription medicine, such as Proscar, Hytrin, or Cardura.

Resources

PERIODICALS

Carter, H. Ballentine. "Saw Palmetto Losing Ground" *Johns Hopkins Health Alerts,* March 15, 2007. www.johnshopkinshealthalerts.com/alerts/prostate_disorders/JohnsHopkinsPrescriptionDrugsHealthAlert_681 1.html (February 29, 2008).

Castleman, Michael. "A New Use for Saw Palmetto." *The Herb Quarterly* (Winter 2007): 11.

Helmer, Jodi. "Saw Palmeto." *Better Nutrition* 68, no. 6 (June 2006).

Jibrin, Ismaila, et al. "Saw Palmetto induced Pancreatitis." *Southern Medical Journal* 99, no. 6 (June 2006): 611 612.

"Saw Palmetto Shows No Benefit for Enlarged Prostate." *Tufts University Health & Nutrition Letter* 24, no. 3 (May 2006).

Seppa, Nathan. "Saw Palmetto Flunks Prostate Exam." *Science News* 169, no. 8 (February 25, 2006): 126 126.

Ken R. Wells
Clare Hanrahan

Scabies

Definition

Scabies, also known as *Sarcoptic acariasis,* is a contagious, parasitic skin infection caused by a tiny mite (*Sarcoptes scabiei*).

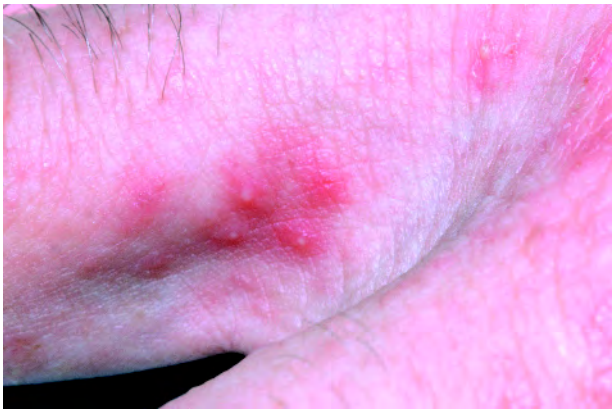
Description

Scabies is caused by a tiny, 0.3 mm-long, parasitic insect called a mite. When a human comes into contact with the female mite, the mite burrows under the skin, laying eggs along the lines of its burrow. These eggs hatch, and the resulting offspring rise to the surface of the skin, mate, and repeat the cycle either within the skin of the original host, or within the skin of its next victim, causing red lesions.

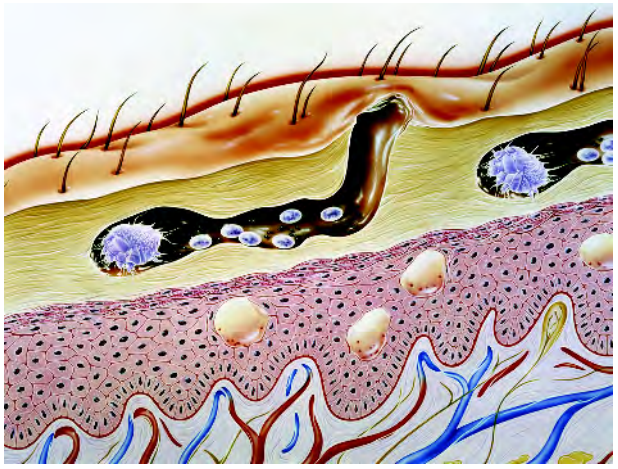
The intense **itching**, or pruritus, that is almost always caused by scabies is due to a reaction within the skin to the feces of the mite. The first time someone is infected with scabies, he or she may not notice any itching for four to six weeks. With subsequent **infections**, the itchiness will begin within hours of picking up the first mite.

Causes and symptoms

Scabies is most common among people who live in overcrowded conditions, and whose ability to practice good hygiene is limited. Scabies can be passed between people by close skin contact. Although the mites can only live away from human skin for about three days, sharing clothing or bedclothes can pass scabies among family members or close contacts. In May 2002, the Centers for Disease Control (CDC) included scabies in



Scabies, an itchy condition of the skin caused by a tiny mite (Sarcoptes scabiei). *(© Medical-on-Line / Alamy)*



Scabies mites burrowing in the top layer (epidermis) of human skin. *(John Bavosi / Photo Researchers, Inc.)*

its updated guidelines for the treatment of sexually transmitted diseases.

Mite burrows within the skin are seen as winding, slightly raised gray lines along a person's skin. The female mite may be found at one end of the burrow, as a tiny pearl-like bump underneath the skin. Because of the intense itching, burrows may be obscured by scratch marks left by the patient. The most common locations for burrows include the sides of the fingers, between the fingers, the top of the wrists, around the elbows and armpits, around the nipples of the breasts in women, in the genitalia of men, around the waist (beltline), and on the lower part of the buttocks. Babies may have burrows on the soles of their feet, palms of their hands, and faces. The itching from scabies becomes worse after a hot shower and at night. Scratching, however, seems to serve some purpose in scabies, as the mites are apparently often inadvertently removed. Most infestations with scabies are caused by no more than 15 mites altogether.

Infestation with huge numbers of mites (on the order of thousands to millions) occurs when an individual does not scratch, or when an individual has a weakened immune system. These patients include those who live in institutions; are mentally retarded, or physically infirm; have other diseases which affect the amount of sensation they have in their skin (leprosy or syringomyelia); have **leukemia** or diabetes; are taking medications which lower their immune response (**cancer** chemotherapy, drugs given after organ transplantation); or have other diseases which lower their immune response (such as acquired immunodeficiency syndrome or **AIDS**). This form of scabies, with its major infestation, is referred to as crusted scabies or Norwegian scabies. Infected patients have thickened, crusty areas all over their bodies, including over the scalp. Their skin appears scaly, and their fingernails may be thickened and horny.

KEY TERMS

Mite—An insect parasite belonging to the order Acarina. The organism that causes scabies is a mite.

Pruritus—An unpleasant itching sensation. Scabies is characterized by intense pruritus.

Topical—A type of medication applied to the skin or body surface.

Diagnosis

Diagnosis can be made simply by observing the characteristic burrows of the mites causing scabies. A sterilized needle can be used to explore the pearly bump at the end of a burrow, remove its contents, and place it on a slide to be examined. The mite itself may then be identified under a microscope.

Occasionally, a type of mite carried on dogs (*Sarcoptes scabiei var. canis*) may infect humans. These mites cannot survive for very long on humans, however, so the infection is less severe.

Treatment

A paste made from two herbs, **neem** (*Azadirachta indica*) and **turmeric** (*Curcuma longa,*) applied to the affected area daily for 15 days has been found to be effective in treating scabies.

Allopathic treatment

Several types of lotions (usually containing 5% permethrin) can be applied to the body, and left on for 12–24 hours. One topical application is usually sufficient, although the scabicide may be reapplied after a week if mites remain. Preparations containing lindane are no longer recommended for treating scabies as of 2003 because of the potential for damage to the nervous system. Itching can be lessened by the use of calamine lotion or antihistamine medications.

In addition to topical medications, the doctor may prescribe oral ivermectin. Ivermectin is a drug that was originally developed for veterinary practice as a broad-spectrum antiparasite agent. Studies done in humans, however, have found that ivermectin is as safe and effective as topical medications for treating scabies. A study published in 2003 reported that

ivermectin is safe for people in high-risk categories, including those with compromised immune systems.

Expected results

The prognosis for complete recovery from scabies infestation is excellent. In patients with weak immune systems, the biggest danger is that the areas of skin involved with scabies will become secondarily infected with bacteria.

Prevention

Good hygiene is essential in the prevention of scabies. When a member of a household is diagnosed with scabies, all that person's recently worn clothing and bedding should be washed in very hot water. Extensive cleaning of the household, however, is not necessary because the mite does not live long away from the human body.

Resources

BOOKS

Darmstadt, Gary L., and Al Lane. "Arthropod Bites and Infestations." In *Nelson Textbook of Pediatrics,* edited by Richard Behrman. Philadelphia: W.B. Saunders Co., 1996.

Maguire, James H. "Ectoparasite Infestations and Arthro pod Bites and Stings." In *Harrison's Principles of Internal Medicine,* edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

"Scabies (The Itch)." Section 10, Chapter 114 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases.* New York: John Wiley and Sons, Inc., 1995.

PERIODICALS

Burroughs, R. F., and D. M. Elston. "What's Eating You? Canine Scabies." *Cutis* 72 (August 2003): 107 109.

Burstein, G. R., and K. A. Workowski. "Sexually Trans mitted Diseases Treatment Guidelines." *Current Opin ion in Pediatrics* 15 (August 2003): 391 397.

Fawcett, R. S. "Ivermectin Use in Scabies." *American Fam ily Physician* 68 (September 15, 2003): 1089 1092.

Santoro, A. F., M. A. Rezac, and J. B. Lee. "Current Trend in Ivermectin Usage for Scabies." *Journal of Drugs in Dermatology* 2 (August 2003): 397 401.

ORGANIZATIONS

American Academy of Dermatology (AAD). 930 East Woodfield Road, Schaumburg, IL 60173. (847) 330 0230. http://www.aad.org.

Kathleen D. Wright
Rebecca J. Frey, PhD

Scallion

Description

A variety of onion, the scallion (*Allii fistulosi*) is a pointy-leafed perennial that can reach about 20 inches in height. The herb has been a popular remedy in Asian folk medicine for thousands of years, having been first described about 2,000 years ago in the Chinese herbal classic *Shen Nong Ben Cao Jing*. The plant, which flourishes in warm climates, is native to Asia but has been found growing in many parts of the world.

While the scallion's fresh bulb is the part that is most often used as a drug, the entire plant is believed to have medicinal properties. Scallion, which belongs to the Liliaceae family, is sometimes called green onion, spring onion, Welsh onion, or Japanese bunching onion. The scallion bulb is called *Cong Bai* in Chinese, and the root of the scallion is called *Cong Xu*.

Scallions. *(© blickwinkel / Alamy)*

KEY TERMS

Antioxidant—An agent that helps to protect cells from damage caused by free radicals, the destructive fragments of oxygen produced as a byproduct during normal metabolic processes.

Atherosclerosis—Narrowing and hardening of the arteries due to plaque buildup.

Carbuncle—A Staphylococcal skin infection that affects the hair follicles. The term may also be used to refer to a group of boils.

General use

While not approved by the FDA or widely used by Western herbalists, scallion is believed by Eastern herbalists to possess a number of important properties. Often used to treat the common cold, it is also believed to fight fungal and bacterial infections and to cause or increase perspiration. The herb may also act as a metabolic stimulant.

Because scallion has not been studied extensively in people, its effectiveness is based mainly on the results of animal and laboratory studies as well as its ancient reputation as a folk remedy. In a 1999 investigation, scallion was shown to block the growth of several types of fungi. In a 1998 study, scallion extract was shown to inhibit the activity of the *Aspergillus niger* and *Aspergillus flavus* fungi. In a 1985 Chinese study of scallion's antibacterial properties, the herb was shown to be effective against microorganisms such as *Pseudomonas aeruginosa* and *Micrococcus luteus*.

Exactly how scallion works is unknown. Its therapeutic effects (as well as its pungent flavor) are often attributed to the herb's volatile oils, which include sulfurous compounds such as allicin, dipropyl disulfide, and allyl sulfide. Allicin may be of particular importance. This agent, also found in **garlic** (*Allium sativum*), has been shown to fight bacteria and fungi, help prevent atherosclerosis, lower **cholesterol** levels, and act as an antioxidant. Other constituents of scallion include starch, sugars, cellulose, fatty acids, pectin, and vitamins A and C.

In the philosophy of Chinese folk medicine in which diseases are often believed to occur due to disruptions in the flow of bodily energy, scallion is considered warm and acrid. The whitish bulb of the scallion, called *Cong Bai* by Chinese herbalists, is mainly used to treat the common cold. Often combined with other herbs, it may be used to shorten the duration of a cold or alleviate symptoms such as runny nose, fever and **chills**, nasal congestion, and **headache**. It is also recommended for **diarrhea**, stomachache, abdominal bloating, earache, mastitis (breast inflammation), pinworms, kidney stones, carbuncles, urinary difficulties, and sores or abscesses. In a more general sense, the bulb is believed to improve digestion, remove impurities from the body, and restore vital functions.

While the bulb of the scallion is usually favored, other parts of the plant have been used to treat a long list of maladies. The roots, called *Cong Xu* in Chinese herbalism, are sometimes recommended for cold-related headaches, throat sores, and **frostbite**. The leaves are employed to treat cold symptoms, carbuncles, **stroke**, and traumatic injuries. Scallion seeds are reputed to enhance vision and improve kidney function. They may also be used to treat dizziness as well as **impotence** due to kidney problems, among other health complaints. Juice derived from the bulb (or from the whole plant) is thought to detoxify the body and thin the blood. It may also be used for **nosebleeds**, headaches, carbuncles, hematuria (the presence of blood in the urine), internal parasites, and traumatic injuries.

Some of the more intriguing research related to scallion has been conducted in China and Japan. One Japanese investigation focused on scallion and the common cold. In the study, which involved 107 people suffering from colds, equal amounts (15 g) of scallion bulb and ginger were combined with a few grams of salt. The mixture was applied externally to a number of areas on the body, including the back, chest, palms, and soles of the feet. All of the study participants treated with the scallion mixture recovered in a day or two. One application of scallion was usually sufficient to achieve results, though a few people in the study required two treatments. In several instances, the mixture reduced **fever** completely within half an hour.

An enema prepared by combining scallion, **ginger** juice, and **pinellia** root may be helpful in treating acute mastitis (breast inflammation), according to one study.

Preparations

The optimum dosage of scallion has not been established with any certainty. When scallion bulb is used internally, the dosage is typically 9–15 g a day. A preparation can be made by boiling scallion in water or wine. The bulb, mashed, can also be applied externally to an affected area of skin.

When other parts of scallion (such as the leaves, roots, and seeds) are used internally, daily dosage is 3–15 g. Like the bulbs, scallion's leaves and roots may be applied externally.

Tablets containing scallion in combinations are also available.

Scallion may be ingested as a food. The herb is a favorite ingredient in Chinese cooking, where it is used in raw and cooked form.

Because scallion has been recommended for a variety of purposes and can be used internally and externally, consumers are advised to consult a doctor experienced in the use of alternative remedies or Chinese medicine to determine proper dosage.

Precautions

Scallion is not known to be harmful when taken in recommended dosages. It is important to note that the long-term effects of taking the herb (in any amount) have not been investigated. Due to lack of sufficient medical study, scallion should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

The volatile oils present in the herb may cause skin irritation or **eczema** in susceptible people. Because scallion can increase sweating, people who are perspiring heavily should avoid this herb.

Side effects

When taken in recommended dosages, scallion is not associated with any bothersome or significant side effects.

Interactions

Scallion should not be combined with honey, according to some practitioners of Chinese folk medicine. When used internally, scallion has been mixed with ginger, white pepper, and pig's feet without apparent harm. When used externally, scallion has been safely combined with a variety of other herbs, including ginger and powdered **fennel** seed.

Resources

BOOKS

Editors of Time Life Books. *The Drug and Natural Medicine Advisor*. Alexandria, Va.: Time Life Books, 1997.

PERIODICALS

Abramovitz, D., et al. "Allicin Induced Decrease in For mation of Fatty Streaks (Atherosclerosis) in Mice Fed a Cholesterol Rich Diet." *Coronary Artery Disease* 10, no. 7 (1999): 515 9.

Chen, H. C., M. D. Chang, and T. J. Chang. "Antibacterial Properties of Some Spice Plants Before and After Heat Treatment." *Chung Hua Min Kuo Wei Sheng Wu Chi Mien I Hsueh Tsa Chih* 18, no. 3 (1985): 190 5.

Eilat, S., et al. "Alteration of Lipid Profile in Hyperlipidemic Rabbits by Allicin, an Active Constituent of Garlic." *Coronary Artery Disease* 6, no. 12 (1995): 985 90.

Prasad, K., et al. "Antioxidant Activity of Allicin, an Active Principle in Garlic." *Mol Cell Biochemistry* 148, no. 2 (1995): 183 9.

Yin, M. C. and W. S. Cheng. "Inhibition of Aspergillus Niger and Aspergillus Flavus by Some Herbs and Spices." *Journal of Food Protection* 61, no. 1 (1998): 123 5.

Yin, M. C. and S. M. Tsao. "Inhibitory Effect of Seven Allium Plants upon Three Aspergillus Species." *Inter national Journal of Food Microbiology* 49, no. 1 2 (1999): 49 56.

ORGANIZATIONS

American Botanical Council. P. O. Box 144345, Austin, TX 78714 4345. http://www.herbalgram.org.

OTHER

Internet Grateful Med: Medline. http://igm.nlm.nih.gov.

Greg Annussek

Scarlet fever

Definition

Scarlet **fever** is an infection caused by a strain of the streptococcus bacterium. It can be transmitted through the air or by physical contact and primarily affects children between four and eight years of age. In temperate climates, scarlet fever is most common during the late fall, winter, and early spring.

Scarlet fever is characterized by a **sore throat**, a fever of 103–104°F (39.4–40°C), and a sandpaper-like rash on reddened skin. If scarlet fever is untreated, serious complications can develop, such as **rheumatic fever** (a **heart disease**) or kidney inflammation (glomerulonephritis).

Description

Scarlet fever, or scarlatina, gets its name from the characteristic flush of the patient's skin, especially on the cheeks. Fever and sluggishness accompany a sore throat and raised rash that progressively covers much of the body. Symptoms usually begin within two to five days after a person is exposed. The fever usually subsides within a few days, and recovery is complete by two weeks. After the fever is gone, the skin on the

Scarlet fever rash caused by bacterium streptococcus.
(Biophoto Associates / Photo Researchers, Inc.)

face and body flakes, with the skin on the palms of the hands and soles of the feet peeling more dramatically.

Scarlet fever is highly contagious when the patient is in the early stages and is not being treated with antibiotics. It is spread by **sneezing**, coughing, or direct contact with an infected person. Early in the twentieth century, severe scarlet fever epidemics were common. Today the disease is rare, partially because of the availability of antibiotics. However, antibiotics are not the entire reason, since the decline began before their widespread use. One theory is that the strain of bacteria that causes scarlet fever has become weaker over time.

Causes and symptoms

Scarlet fever is caused by Group A streptococcal bacteria (*Streptococcus pyogenes*). In addition to causing scarlet fever, Group A streptococci bacteria cause many different illnesses, such as **strep throat**, wound or skin **infections**, **pneumonia**, serious **kidney infections**, and **toxic shock syndrome**. The strain of streptococcus that causes scarlet fever is slightly different from the strain that causes most strep throats. The scarlet fever strain produces an erythrogenic toxin, which is what causes the skin to turn red.

The main symptoms and signs of scarlet fever are fever, sluggishness, sore throat, and a bumpy rash that blanches (turns white) when it's pressed. The rash appears first on the upper chest and spreads to the neck, abdomen, legs, arms, and in folds of skin such as under the arm or in the groin. The skin around the mouth tends to be pale, while the cheeks are flushed. In children, the disease causes a "strawberry tongue," in which inflamed bumps on the tongue rise above a bright red coating. Strawberry tongue is rarely seen in

KEY TERMS

Clindamycin—An antibiotic that can be used instead of penicillin.

Erythrogenic toxin—A toxin or agent produced by the scarlet fever-causing bacteria that causes the skin to turn red.

Erythromycin—An antibiotic that can be used instead of penicillin.

Glomerulonephritis—A serious inflammation of the kidneys that can be caused by streptococcal bacteria; a potential complication of untreated scarlet fever.

Pastia's lines—Red lines in the folds of the skin, especially in the armpit and groin, that are characteristic of scarlet fever.

Penicillin—An antibiotic that is used to treat bacterial infections.

Procaine penicillin—An injectable form of penicillin that contains an anesthetic to reduce the pain of the injection.

Rheumatic fever—A heart disease that is a complication of a strep infection.

Sheep blood agar plate—A petri dish filled with a nutrient gel containing red blood cells that is used to detect the presence of streptococcal bacteria in a throat culture. Streptococcal bacteria will break down the red blood cells, leaving a clear spot around the bacterial colony.

Strawberry tongue—A sign of scarlet fever in which the tongue appears to have a red coating with large raised bumps.

adults. Finally, dark red lines (called Pastia's lines) may appear in the creases of skin folds.

Diagnosis

A medical practitioner must diagnose and treat scarlet fever. The doctor notes the symptoms and eliminates the possibility of other diseases. **Measles** is a viral infection that is also associated with a fever and rash. However, scarlet fever can be distinguished from measles by the quality of the rash, the presence of a sore throat in scarlet fever, and the absence of the severe eye inflammation and severe runny nose that usually accompany measles.

Because scarlet fever may begin with a sore throat, the doctor will first determine if the problem is bacterial or viral in nature by checking for specific symptoms. For example, inflammation of the lymph nodes in the neck is typical in strep infections but not viral infections. On the other hand, **cough**, **laryngitis**, and stuffy nose tend to be associated with viral infections rather than strep infections.

Laboratory tests are necessary to make a definitive diagnosis of a strep infection and to distinguish a strep throat from a viral sore throat. One test that can be performed is a blood cell count. Bacterial infections are associated with an elevated white blood cell count. In viral infections, the white blood cell count is generally below normal. A throat culture can distinguish between a strep infection and a viral infection. A throat swab from the infected person is brushed over a nutrient gel containing red blood cells (a sheep blood agar plate) and incubated overnight. If streptococcal bacteria are present in the sample, they will break down the red blood cells and leave a clear zone in the gel surrounding the bacteria.

The doctor will also distinguish between a strep throat and scarlet fever. In a strep infection, the throat is sore and appears beefy and red. White spots appear on the tonsils. Lymph nodes under the jaw line may swell and become tender. These symptoms may or may not be present with scarlet fever. The main feature that distinguishes scarlet fever from a strep throat is the presence of the sandpapery, red rash.

Treatment

Because of the nature of the infection and the danger of serious complications, scarlet fever cannot be treated solely with alternative therapies. A course of antibiotics and treatment by a physician is imperative. However, alternative therapies may be used to relieve the symptoms of fever and sore throat.

Fever

For fever, especially in children, there are some alternative treatments. Naturopathy recommends sponging with tepid water if the fever rises over 102°F (38.9°C). Rest and plenty of water are advised.

Homeopathy treats the specific type of fever, so it will be necessary to consult with a homeopath to determine the correct remedy for the patient. Some common homeopathic remedies for fever are:

- *Aconite* 6c at the onset of fever that is accompanied by thirst, chills, dry burning skin, and restlessness.
- *Belladonna* 6c for high fever with dry burning skin, red face, dilated pupils, and swollen glands.
- *Arsenicum album* 6c for patients who are restless and agitated, alternately hot and cold, thirsty, and patients whose fever is worse after midnight.
- *Byronia* 6c for the patient who is shivery and sweating, very thirsty at long intervals, and having headaches and pain.
- *Ferrum phosphoricum* (iron phosphate) 6c for a mild fever of slow onset accompanied by frequent bouts of sweating, shivering, and headaches.

Western herbalism may be used to treat fever, but treatment requires a qualified medical herbalist. The herbalist may recommend a bath with tepid infusions of limeflower, elderflower, **yarrow**, or German **chamomile**. Herbs such as **catnip**, **hyssop**, **lemon balm**, and vervain can lower the temperature and increase perspiration. German chamomile, **lavender**, and limeflower promote **relaxation**, and **echinacea** and **garlic** fight infection.

Chinese herbs in combinations can treat specific patterns of fever. They can also be used to balance the energies, specifically the yin (cool and moist) after the illness subsides.

Sore throat

Some recommended treatments for sore throat are:

- Aromatherapy, in which the patient gargles with water and very small amounts of geranium or tea tree essential oils. A massage using diluted eucalyptus oil may also be helpful.
- Naturopathy may suggest fasting to eliminate toxins and the use of garlic to fight infection. Naturopaths will also recommend fruit juices high in vitamin C, especially citrus fruit juices, to soothe irritation.
- Hydrotherapy, in which water is utilized to restore health, uses humidifiers to prevent the irritation of a sore throat by dry air. It may also recommend using a

cold abdominal pack and throat compress to stimulate both circulation and the immune system.

- Western herbalism will recommend gargling with an infusion of antiseptic herbs such as calendula or sage, and may use echinacea to fight infection.

Allopathic treatment

Although the symptoms of scarlet fever often clear within a few days, the patient should receive antibiotic treatment to reduce the severity of symptoms, prevent complications, and keep from spreading the infection to others. Antibiotics may be taken either orally or by injection. After a patient has been on antibiotics for 24 hours, he or she is no longer contagious. The rash itself is not contagious. Antibiotic treatment will shorten the course of the illness in small children but may not do so in adolescents or adults. Nevertheless, a full course of treatment with antibiotics is important for preventing complications.

Since penicillin injections are painful, oral penicillin may be preferable. If the patient is unable to tolerate penicillin, alternative antibiotics such as erythromycin or clindamycin may be substituted. The patient must take the entire course of medication—usually 10 days—for the therapy to be effective and to ensure that the bacteria have been killed. Because symptoms subside quickly, there is a temptation to stop therapy prematurely. However, not completing the medication increases the risk of developing rheumatic fever and kidney inflammation. If the patient is considered too unreliable to take all of the pills or is unable to take oral medication, daily injections of procaine penicillin can be given in the hip or thigh muscle.

After the contagious period has passed, the patient does not need to be isolated. Bed rest is not necessary. Aspirin or Tylenol (acetaminophen) may be given for fever or **pain** relief.

Expected results

If the patient is treated promptly with antibiotics, full recovery can be expected. Patients who have had scarlet fever develop immunity to the disease and cannot catch it again. However, about 10% of children don't respond to an initial antibiotic treatment, so it may be necessary for a second throat culture and the use of a different antibiotic.

Prevention

Although scarlet fever is only contagious before treatment with antibiotics is begun, it is wise to avoid exposure to children at any stage of the disease. Doing so will help prevent the spread of scarlet fever.

Resources

BOOKS

Berkow, Robert M.D., ed. *The Merck Manual of Diagnosis and Therapy*. 16th ed. Rahway, NJ: Merck, 1992.

Driscoll, John. "Scarlet Fever." In *The Columbia University College of Physicians and Surgeons Complete Home Medical Guide*. 3rd rev. ed. New York: Crown Publishers, 1995.

Woodham, Anne, and David Peters, M.D. *Encyclopedia of Healing Therapies*. New York: DK Pub., 1997.

Wyngaarden, James B., Lloyd H. Smith, and J. Claude Bennett, eds. *Cecil Textbook of Medicine*. 19th ed. New York: W.B. Saunders Company, 1992.

PERIODICALS

Gregory, Tanya. "Scarlet Fever and Its Relatives." *Patient Care* (June 15, 1998): 109.

Schmitt, B. D. "Scarlet Fever" *Clinical Reference Systems* (July 1, 1999): 1293.

Amy Cooper

Schisandra

Description

Schisandra (*Schisandra chinensis*) is an aromatic, woody vine that is native to northern and northeastern China. It is predominately cultivated in the Chinese provinces Jilin, Hebei, Heilongjiang, and Lianoning. Schisandra is also found in Russia and Korea.

The schisandra plant reaches a height of up to 25 ft (7.5 m) and has pink flowers. Schisandra fruit is fully ripened in the fall and appears as numerous spikes of tiny, bright red berries. The berries have sweet, sour, hot, salty, and bitter tastes—hence the Chinese name for schisandra, "Wu Wei Zi" (five-flavored herb). Other names for schisandra include schizandra, five taste fruit, and herb of five tastes.

Constituents and bioactivities

Schisandra fruit contains a wide variety of compounds with biological activities. Constituents of schisandra include:

- acids
- lignans (deoxyschizandrin, gomisins, pregomisin, schizandrin, and others)
- phytosterols (beta-sitosterol and stigmasterol)
- vitamins C and E
- volatile oils

Schisandra fruit contains at least 30 different lignans. Lignans, which are sometimes described as

Schisandra, used in traditional medicine as a remedy for irritable bowel syndrome and other maladies. *(Dr. Nick Kurzenko / Photo Researchers, Inc.)*

KEY TERMS

Adaptogen—A medicine that increases the body's ability to fight disease and any stress it encounters including those from chemical, environmental, mental, and physical sources.

Lignans—Chemicals found in plants that have estrogen-like, liver-protective, and anti-inflammatory activities.

Phytosterols—Plant-based oils that appear to have a cholesterol-lowering effect.

Tonic—A preparation or medicine that invigorates, strengthens, or restores tone to tissues. Schisandra is considered to be an overall tonic that is good for any organ or system of the body.

Volatile oil—The fragrant oil that can be obtained from a plant by distillation. The word "volatile" means that the oil evaporates in the open air.

phytoestrogens (plant-derived compounds with estrogen-like activity), are known to have liver-protective (anti-hepatotoxic) action and to regenerate damaged liver tissue. In addition, lignans interfere with a compound called platelet activating factor, which promotes inflammation. The results of a study in rats showed that a lignan-enriched extract of *Schisandra chinensis* protected against liver damage from either aflatoxin (a toxin produced by a mold) or cadmium chloride (a toxic chemical). The liver-protective function is partly due to schisandra's antioxidant activity. However, treating the rats with **vitamin E**, an antioxidant, did not protect them from liver damage. This indicates that schisandra's liver-protective activity is not due to its vitamin E content. Schisandra increases liver function, which helps the body's metabolism become more efficient.

Research has shown that schisandra has adaptogenic properties, which means that it helps the body to fight disease and adapt to stresses from physical, mental, chemical, and environmental sources. Schisandra also has tonic (restoring tone to tissues), expectorant (promoting the clearing of lung mucus), and cough-suppressant (reducing coughing) activities. It stimulates the nervous system by increasing the speed of nervous responses, leading to quicker and stronger reflexes. Schisandra has been shown to stimulate breathing, decrease blood pressure, act as a vasodilator (causing blood vessels to dilate), improve blood circulation, improve heart function, strengthen uterine contractions, improve vision, normalize blood sugar levels, and assist in food digestion and absorption of nutrients. It can activate all major body systems.

General use

Schisandra is a Chinese tonic herb used in **traditional Chinese medicine** as a lung astringent and Kidney tonic. Historically, it was used to treat mental illness, night sweats, coughs, thirst, **insomnia**, chronic dysentery (bloody, mucusy **diarrhea**), premature ejaculation, and physical exhaustion. The Chinese consider it an energy tonic that can be used to restore lost vitality. Schisandra can improve overall health and increase energy levels.

Schisandra is an overall tonic that is used to treat the following conditions:

- Fluid imbalance. Because of its kidney tonic effect, schisandra is useful in treating thirst, night sweats,

excessive sweating, urinary incontinence, and the frequent urge to urinate.

- Circulatory disorders. Schisandra may be used to treat poor circulation and poor heart function.
- Intestinal disease. Schisandra has been used to treat diarrhea and dysentery.
- Fatigue. Schisandra may help to reduce fatigue, improve endurance, improve work performance, and build strength. It is recommended for persons who need high levels of energy, such as athletes.
- Liver disease. Schisandra is used to treat hepatitis and poor liver function. In one clinical study, schisandra successfully treated 76% of the patients with hepatitis. It has been shown to improve both virally and chemically induced hepatitis. More recently, schisandra has been found to protect the liver against the side effects of anti-Alzheimer's medications.
- Mental and emotional illness. Schisandra has been shown to improve mental clarity, concentration, and coordination. It reduces forgetfulness, irritability, and nervous exhaustion. Schisandra is used to treat stress and may be part of a useful treatment for depression.
- Respiratory disease and disorder. Schisandra is used to treat allergies. It treats respiratory symptoms such as shortness of breath, chronic cough, and wheezing.
- Sensory organ failure. Schisandra has been used to help improve failing sight and hearing. It enhances the sensation of touch.
- Sexual disorder. Schisandra tones the sexual organs of both men and women. It increases the production of sexual fluids, improves male sexual stamina, and treats premature ejaculation and low sex drive.
- Skin rash. Schisandra has been used to treat skin conditions, including hives and eczema.
- Sleep disorder. Because of its adaptogenic properties, schisandra can relieve insomnia and dream-disrupted sleep.
- Other. Schisandra counteracts respiratory paralysis caused by morphine overdose, and strengthens uterine contractions to promote healthy labor and childbirth.

Schisandra is one of nine herbs combined in a Chinese dietary supplement called Equiguard, which is given to support the functioning of the kidneys and prostate gland in men. A recent study indicates that Equiguard may be helpful in treating **prostate cancer** because it appears to prevent the **cancer** cells from forming new colonies.

Preparations

Only the fruit of schisandra is used for medicinal purposes. Schisandra berries are harvested when fully ripe and allowed to dry in the sun. Schisandra's dried fruit is used, and the herb is prepared in the form of powder, tincture (an alcoholic extract), and wine. It is also found, usually in combination with other herbs, in capsules, tea, decoction (a water extract). Schisandra may be found in Chinese herb shops or health food stores. Recommended doses of schisandra are 1.5–15 g of dried fruit daily, 2–4 ml of tincture three times daily, 1.5–6 g of powder daily, one to three cups of tea once daily, or 1.5 g in capsule form daily.

The decoction is prepared by boiling 5 g of crushed berries in 100 ml of water. This decoction is divided into three doses, which are taken over a 24-hour period. The tea is prepared by steeping 1–6 g of dried schisandra berries in one to three cups of boiling water.

For use as a general tonic in China, patients are advised to chew dried schisandra berries daily for 100 days. Skin conditions are usually treated with a medicinal wine formulation.

It may take several weeks for the energy-increasing effects of schisandra to be felt.

Precautions

Schisandra should not be used during **pregnancy** or in patients who are having trouble urinating.

Side effects

Schisandra is safe for long-term use; it has relatively few side effects. It has, however, been reported to cause upset stomach, **heartburn**, decreased appetite, and skin rash.

Interactions

Schisandra interacts with acetaminophen in a positive way. In a laboratory study, gomisin A, a lignan found in schisandra, offered some degree of liver protection to rats given doses of acetaminophen high enough to cause liver damage.

Schisandra has been reported to increase the effects of antidiabetic medications and anesthetics; it should therefore be discontinued before major surgery. Schisandra should not be taken together with terfenadine because it appears to increase the risk of cardiac arrhythmia as a side effect of this medication.

Schisandra is often used in Chinese herbal formulas as a harmonizing agent because it complements

and coordinates well with other herbs. Schisandra is often found in combination with **Korean ginseng** (*Panax ginseng*).

Resources

BOOK

Chevallier, Andrew. "Schisandra." In *The Encyclopedia of Medicinal Plants*. New York: DK Publishing, 1996.

PERIODICALS

Hsieh, T. C., X. Lu, J. Guo et al. "Effects of Herbal Prepa ration Equiguard on Hormone Responsive and Hormone Refractory Prostate Carcinoma Cells: Mechanistic Studies." *International Journal of Oncology* 20 (April 2002): 681 689.

Ip, Siu Po, et al. "Effect of a Lignan Enriched Extract of Schisandra Chinensis on Aflatoxin B1 and Cadmium Chloride Induced Hepatotoxicity in Rats." *Pharma cology & Toxicology*. 78 (1996): 413 416.

Pan, S. Y., Y. F. Han, P. R. Carlier, et al. "Schisandrin B Protects Against Tacrine and Bis(7) Tacrine Induced Hepatotoxicity and Enhances Cognitive Function in Mice." *Planta Medica* 68 (March 2002): 217 220.

Schar, Douglas. "5 Cutting Edge Superherbs." *Prevention*. 51 (December 1999): 110+.

ORGANIZATIONS

American College of Acupuncture and Oriental Medicine. 9100 Park West Drive, Houston, TX 77063. (800) 729 4456. www.acaom.edu.

American College of Traditional Chinese Medicine. 455 Arkansas Street, San Francisco, CA 94107. (415) 282 7600. www.actcm.edu.

OTHER

"Schisandra." *Healthnotes Online*. http://www.puritan.com/healthnotes/Herb/Schisandra.htm.

"Schizandra." *Planet Botanic*. http://www.planetbotanic.com/schizand.htm.

Belinda Rowland
Rebecca J. Frey, PhD

Schizophrenia

Definition

Schizophrenia is a psychotic disorder or group of disorders marked by disturbances in thinking, emotional responsiveness, and behavior. Schizophrenia is the most chronic and disabling of the severe mental disorders, associated with abnormalities of brain structure and function, disorganized speech and behavior, delusions, and hallucinations. It is considered a psychotic disorder or a psychosis.

Description

The term schizophrenia comes from two Greek words that mean "split mind." It was coined around 1908, by the Swiss doctor Eugen Bleuler, to describe the splitting apart of mental functions that he regarded as the central characteristic of schizophrenia. (Note that the splitting apart of mental functions in schizophrenia differs from the split personality of people with multiple personality disorder.)

Schizophrenic patients are typically unable to filter sensory stimuli and may have enhanced perceptions of sounds, colors, and other features of their environment. If untreated, most people diagnosed with schizophrenia gradually withdraw from interactions with other people, and lose their ability to take care of personal needs and grooming.

Although schizophrenia was described by doctors as far back as Hippocrates (500 B.C.), it is difficult to classify. Some psychiatrists prefer to identify schizophrenia as a group or family of disorders, rather than a single entity, because of the lack of agreement in classification, as well as the possibility that different subtypes of the disorder may eventually be shown to have different causes.

Stages of schizophrenia

The course of schizophrenia in adults can be divided into three phases or stages. In the acute phase, the patient has an overt loss of contact with reality (psychotic episode) that requires intervention and treatment. In the second or stabilization phase, the initial psychotic symptoms have been brought under control, but the patient is at risk for relapse if treatment is interrupted. In the third or maintenance phase, the patient is relatively stable and can be kept indefinitely on antipsychotic medications. Even in the maintenance phase, however, relapses are not unusual, and patients do not always return to full functioning.

The patient's first psychotic episode, in most cases, is preceded by a prodromal (warning) phase, with a variety of behaviors that may include angry outbursts, withdrawal from social activities, loss of attention to personal hygiene and grooming, anhedonia (loss of one's capacity for enjoyment), and other unusual behaviors. There is no typical pattern or course of the disorder following the first acute episode. About 70% of patients diagnosed with schizophrenia have a second psychotic breakdown within five to seven years after the first one. About 10% of patients recover from the first psychotic episode and never experience another episode. About 55% of patients have chronic symptoms, and the remaining individuals

have intermittent episodes over the course of their lives but can lead fairly normal lives otherwise.

Subtypes of schizophrenia

A standard professional reference, the fourth revised (2000) edition of *The Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*) categories the five subtypes of schizophrenia as follows.

PARANOID. The key feature of this subtype of schizophrenia is the combination of false beliefs (delusions) and hearing voices (auditory hallucinations), with relatively unaffected mood and cognitive functions (reasoning, judgment, and memory). The delusions of paranoid schizophrenics usually involve thoughts of being persecuted or harmed by others, or exaggerated opinions of their own importance, but may also reflect feelings of jealousy or excessive religiosity. The delusions are typically organized into a coherent framework. Paranoid schizophrenics function at a higher level than other subtypes but are at risk for suicidal or violent behavior under the influence of their delusions.

DISORGANIZED. Disorganized schizophrenia (formerly called hebephrenic schizophrenia) is marked by disorganized speech, thinking, and behavior, coupled with flat or inappropriate emotional responses to a situation (affect). The patient may act silly or withdraw socially to an extreme extent. Most patients in this category have weak personality structures prior to their initial acute psychotic episode.

CATATONIC. Catatonic schizophrenia is characterized by disturbances of movement that may include rigidity, stupor, agitation, bizarre posturing, and repetitive imitations of the movements or speech of other people. These patients are at risk for malnutrition, exhaustion, or self-injury. This subtype appears to be more common in non-Western countries than in Europe or North America. Catatonia as a symptom is most commonly associated with mood disorders.

UNDIFFERENTIATED. Patients in this category have the characteristic positive and negative symptoms of schizophrenia but do not meet the full criteria for the paranoid, disorganized, or catatonic subtypes.

RESIDUAL. Patients in this category have had at least one acute schizophrenic episode, continue to have some negative symptoms of schizophrenia, but do not have current psychotic symptoms, such as delusions and hallucinations. They may have negative symptoms, such as withdrawal from others, or mild forms of positive symptoms, which indicate that the disorder has not completely resolved.

Demographics

In the United States, Canada, and Western Europe, the sex ratio in schizophrenia is 1.4:1, with males being affected slightly more often than females. However, there is a significant gender difference in average age at onset; the average for males is between ages 18 and 25, whereas for women there are two peaks, one between ages 25 and 35 and a second rise in incidence after age 45. About 15% of all women who develop schizophrenia are diagnosed after age 35. In some women, the first symptoms of the disorder appear postpartum (after giving birth). Many women with schizophrenia are initially misdiagnosed as having **depression** or **bipolar disorder** because women with schizophrenia are likely to have more difficulties with emotional regulation than men with the disorder. In general, however, females have higher levels of functioning prior to symptom onset than males.

Schizophrenia is rarely diagnosed in pre-adolescent children, although case reports of patients as young as age five or six have been reported. Childhood schizophrenia is at the upper end of the spectrum of severity and shows a greater gender disparity. It affects one or two children in every 10,000; the male/female ratio is 2:1.

The incidence of schizophrenia in the United States appears to be uniform across racial and ethnic groups, with the exception of minority groups in urban neighborhoods in which they are a small proportion of the total population. A study done in the United Kingdom replicated U.S. findings: There are significantly higher rates of schizophrenia among racial minorities living in large cities. The rates of schizophrenia are highest in areas in which these minority groups form the smallest proportion of the local population. The British study included Africans, West Indians of African descent, and Asians.

The incidence of schizophrenia in most developed countries appears to be higher among people born in cities than among those born in rural areas. In addition, there appears to be a small historical/generational factor, with the incidence of schizophrenia gradually declining in later-born groups.

Schizophrenia is a leading cause of disability, not only in the United States, but in other developed countries around the world. The World Health Organization (WHO) counts schizophrenia in the world's ten leading causes of disability. According to the National Institute of Mental Health (NIMH), schizophrenia affects 1.1% of the American population over age 18. Other estimates run as high as 1.5% of the population. Schizophrenia is disproportionately costly to

society for reasons that go beyond the sheer number of people affected by the disorder. In the United States, patients with schizophrenia account for 2.5% of all healthcare costs.

In addition, the onset of the disorder typically occurs during a young person's last years of high school or their first years in college or the workforce; thus, it often destroys their long-term plans. According to the Federal Agency for Healthcare Research and Quality, 70 to 80% of people diagnosed with schizophrenia are either unemployed or underemployed (working in jobs well below their actual capabilities). Ten percent of Americans with permanent disabilities have schizophrenia, as well as 20 to 30% of the homeless population.

Causes and symptoms

Causes

Schizophrenia is considered the end result of a combination of genetic, biochemical, developmental, and environmental factors, some of which are still not completely understood. There is no known single cause of the disorder.

Researchers have known for many years that first-degree biological relatives of patients with schizophrenia have a 10% risk of developing the disorder, as compared with 1% in the general population. The monozygotic (identical) twin of a person with schizophrenia has a 40 to 50% risk. The fact that this risk is not higher, however, indicates that environmental as well as genetic factors are implicated in the development of schizophrenia.

Some specific regions on certain human chromosomes have been linked to schizophrenia. However, these regions tend to vary across ethnic groups. Scientists are inclined to think that the genetic factors underlying schizophrenia vary across different ethnic groups, so that it is highly unlikely that susceptibility to the disorder is determined by only one gene. Because of this assumption, schizophrenia is considered a polygenic disorder.

Research conducted by the National Institute of Mental Health (NIMH) in 2007 suggested that certain genes create an imbalance between the pathways mediating D2 and D1 dopamine receptors, increasing the risk for schizophrenia.

Other studies conducted by the NIMH have demonstrated the existence of a connection between two abnormalities of brain functioning in patients with schizophrenia. The researchers used radioactive tracers and positron emission tomography (PET) to show that reduced activity in a part of the brain called the prefrontal cortex was associated in the patients, but not in the control subjects, with abnormally elevated levels of dopamine (a chemical that transmits signals in the brain) in the striatum. High levels of dopamine are related to the delusions and hallucinations of psychotic episodes in schizophrenia. These findings suggest that treatment directed at the prefrontal cortex might be more effective than present antipsychotic medications, which essentially target dopamine levels without regard to specific areas of the brain.

There is some evidence that schizophrenia may be a type of developmental disorder related to the formation of faulty connections between nerve cells during fetal development. The changes in the brain that normally occur during puberty then interact with these connections to trigger the symptoms of the disorder. Other researchers have suggested that a difficult **childbirth** may result in developmental vulnerabilities that eventually lead to schizophrenia.

Certain environmental factors during **pregnancy** are also associated with an increased risk of schizophrenia in the offspring. These include the mother's exposure to starvation or famine, **influenza** during the second trimester of pregnancy, and Rh incompatibility in a second or third pregnancy.

Some researchers are investigating a possible connection between schizophrenia and viral **infections** of the hippocampus, a structure in the brain that is associated with memory formation and the human **stress** response. It is thought that damage to the hippocampus might account for the sensory disturbances found in schizophrenia. Another line of research related to viral causes of schizophrenia concerns a protein deficiency in the brain.

Environmental stressors related to home and family life (e.g., parental death or divorce, family dysfunction) or to separation from the family of origin in late adolescence (e.g., going away to college or military training; marriage) may trigger the onset of schizophrenia in individuals with genetic or psychological vulnerabilities.

Symptoms

The onset of symptoms in schizophrenia may be either abrupt (sudden) or insidious (gradual). Often, however, it goes undetected for two to three years after the onset of symptoms because the symptoms occur in the context of a previous history of cognitive and behavioral problems. The patient may have had panic attacks, social phobia, or **substance abuse** problems, any of which can complicate the process of

diagnosis. Patients with schizophrenia do not always have the same set of symptoms, and each patient's symptoms may change over time.

The symptoms of schizophrenia are divided into two major categories: positive and negative.

POSITIVE SYMPTOMS. The positive symptoms of schizophrenia are defined by *DSM-IV* as excesses or distortions of normal mental functions. The positive symptoms of schizophrenia include four "first-rank" or Schneiderian symptoms, named for the German psychiatrist Kurt Schneider who proposed these symptoms as diagnostic of the disorder in 1959. Positive symptoms include:

- delusions
- somatic hallucinations
- hearing voices commenting on one's behavior or talking to each other
- thought insertion or withdrawal

Delusions are false but strongly held beliefs that result from the patient's inability to separate real from unreal events. The most common form of delusion in patients with schizophrenia is persecutory; individuals believe that others—family members, clinical staff, terrorists—are victimizing them. Another common delusion is referential, which means that the person interprets objects or occurrences in the environment (e.g., a picture on the wall, a song played on the radio, laughter in the corridor) as being directed at or referring to them.

Hallucinations are disturbances of sense perception. Somatic hallucinations refer to sensations or perceptions about one's body that have no known medical cause, such as the notion that one's brain is radioactive.

Auditory hallucinations (e.g., hearing voices) are the most common form of hallucination in schizophrenia, although visual, tactile, olfactory, and gustatory hallucinations may also occur.

Thought insertion and/or withdrawal refer to delusions that other beings or forces (e.g., God, the FBI, the CIA, martians) have the power to put thoughts or ideas into one's mind or remove them.

Other positive symptoms of schizophrenia include:

- Disorganized speech and thinking. A person with schizophrenia may ramble from one topic to another (derailment or loose associations); may give unrelated answers to questions (tangentiality); or may say things that cannot be understood because there is no grammatical structure to the language ("word salad" or incoherence).
- Disorganized behavior. This symptom includes such behaviors as agitation; age-inappropriate silliness; inability to maintain personal hygiene; dressing inappropriately for the weather; sexual self-stimulation in public; shouting at people. In one case study, the patient played his flute for hours on end while standing on top of the family car.
- Catatonic behavior. Catatonic behaviors have been described with regard to the catatonic subtype of schizophrenia. This particular symptom is sometimes found in other mental disorders.

NEGATIVE SYMPTOMS. The negative symptoms of schizophrenia represent a loss or reduction of normal functioning, according to the *DSM-IV*. Negative symptoms represent the lack or absence of behaviors and include:

- Blunted or flattened affect. This term refers to loss of emotional expressiveness. The person's face may be unresponsive or expressionless, and speech may lack vitality or warmth.
- Alogia. Alogia is sometimes called poverty of speech. The person has little to say and is not able to expand on his or her statements. A doctor examining the patient must be able to distinguish between alogia and unwillingness to speak.
- Avolition. The person is unable to begin or stay with goal-directed activities. The person may sit in one location for long periods of time or show little interest in joining group activities.
- Anhedonia. Anhedonia refers to the loss of one's capacity for enjoyment or pleasure.

In general, the negative symptoms are more difficult for doctors to evaluate than the positive symptoms because they may be influenced by a concurrent depressive disorder or a dull and unstimulating environment. However, negative symptoms account for much of the morbidity (unhealthiness) associated with schizophrenia.

OTHER SYMPTOMS AND CHARACTERISTICS. Although the following symptoms and features are not diagnostic criteria of schizophrenia, most patients with the disorder have one or more:

- Dissociative symptoms, particularly depersonalization and derealization.
- Anosognosia. This term originally referred to the inability of stroke patients to recognize their physical disabilities, but it is sometimes used to refer to lack of insight in patients with schizophrenia. Anosognosia is associated with higher rates of noncompliance with treatment, a higher risk of repeated psychotic episodes, and a poorer prognosis for recovery.

- High rates of substance abuse disorders. About 50% of patients diagnosed with schizophrenia meet criteria for substance abuse or dependence. While substance abuse does not cause schizophrenia, it can worsen the symptoms of the disorder. Patients may have particularly bad reactions to amphetamines, cocaine, PCP (angel dust) or marijuana. It is thought that patients with schizophrenia are attracted to drugs of abuse as self-medication for some of their symptoms. The most common substance abused by patients with schizophrenia is tobacco; 90% of patients are heavy cigarette smokers, compared to 25 to 30% in the general adult population. Smoking is a serious problem for people with schizophrenia because it interferes with the effectiveness of their antipsychotic medications as well as increasing their risk of lung cancer and other respiratory diseases.
- High risk of suicide. About 40% of patients with schizophrenia attempt suicide at least once, and 10% eventually complete the act.
- High rates of obsessive-compulsive disorder and panic disorder.
- Downward drift. Downward drift is a sociological term that refers to having lower levels of educational achievement and/or employment than one's parents.

VIOLENT BEHAVIOR. The connection between schizophrenia and personal assault or violence deserves mention because it is a major factor in the reactions of family members and the general public to the diagnosis. Researchers in both the United Kingdom and the United States have found that schizophrenia carries a heavier stigma than most other mental disorders, largely because of the mass media's fascination with bizarre murders, dismemberment of animals, or other gruesome acts that are found to have been committed by a person with schizophrenia. Many patients report that the popular image of a schizophrenic as "a time bomb waiting to explode" is a source of considerable emotional stress.

Risk factors for violence in a patient diagnosed with schizophrenia include male sex, age below 30, prediagnosis history of violence, paranoid subtype, nonadherence to medication regimen, and heavy substance abuse. By contrast, it should be noted that most crimes of violence are committed by people without a diagnosis of schizophrenia.

Diagnosis

There are no symptoms that are unique to schizophrenia, and no single symptom that is a diagnostic hallmark of the disorder. In addition, there are no laboratory tests or imaging tests that can establish or confirm a diagnosis of schizophrenia. The diagnosis is based on a constellation or group of related symptoms that are, according to *DSM-IV-TR*, "associated with impaired occupational or social functioning."

As part of the process of diagnosis, the doctor takes a careful medical history and orders laboratory tests of the patient's blood or urine in order to rule out general medical conditions or substance abuse disorders that may be accompanied by disturbed behavior. X rays or other imaging studies of the head may also be ordered. Medical conditions to be ruled out include **epilepsy**, head trauma, brain tumor, Cushing's syndrome, Wilson's disease, Huntington's disease, and encephalitis. Drugs of abuse that may cause symptoms resembling schizophrenia include amphetamines (speed), cocaine, and phencyclidine (PCP). In older patients, **dementia** and delirium must be ruled out. If the patient has held jobs involving exposure to mercury, polychlorinated biphenyls (PCBs), or other toxic substances, environmental poisoning must also be considered in the differential diagnosis.

The doctor must also rule out other mental disorders that may be accompanied by psychotic symptoms, such as mood disorders; brief psychotic disorders; dissociative disorder not otherwise specified or dissociative identity disorder; delusional disorder; schizotypal, schizoid, or paranoid personality disorders; and pervasive developmental disorders. In children, childhood-onset schizophrenia must be distinguished from communication disorders with disorganized speech and from attention-deficit/hyperactivity disorder.

After other organic and mental disorders have been ruled out, it must be determined whether the patient meets the following criteria, as specified by *DSM-IV-TR*:

- Presence of positive and negative symptoms. The patient must have two (or more) of the following symptoms during a one-month period: delusions; hallucinations; disorganized speech; disorganized or catatonic behavior; negative symptoms.
- Decline in social, interpersonal, or occupational functioning, including personal hygiene or self-care.
- Duration. The symptomatic behavior must last for at least six months.
- Diagnostic exclusions. Mood disorders, substance abuse disorders, medical conditions, and developmental disorders have been ruled out.

Treatment

In the late 2000s treatment of schizophrenia focused on symptom reduction and relapse prevention, since the causes of the disorder had not yet been clearly identified.

KEY TERMS

Affect—The expression of emotion displayed to others through facial expressions, hand gestures, tone of voice. Types of affect include: flat (inanimate, no expression), blunted (minimally responsive), inappropriate (incongruous expressions of emotion relative to the content of a conversation), and labile (sudden and abrupt changes in type and intensity of emotion).

Agranulocytosis—A blood disorder characterized by a reduction in the number of circulating white blood cells (granulocytes). White blood cells defend the body against infections. Agranulocytosis is a potential side effect of some of the newer antipsychotic medications used to treat schizophrenia.

Akathisia—Agitated or restless movement, usually affecting the legs and accompanied by a sense of discomfort; a common side effect of neuroleptic medications.

Anhedonia—Loss of the capacity to experience pleasure. One of the so-called negative symptoms of schizophrenia, anhedonia is also a symptom of major depression.

Anosognosia—Lack of awareness of the nature of one's illness. The term is usually applied to stroke patients, but is sometimes used to refer to lack of insight on the part of patients with schizophrenia. Anosognosia appears to be caused by the illness itself; it does not appear to be a form of denial or inappropriate coping mechanism. It is, however, a factor in a person's adherence to treatment regimens and the increased risk of relapse.

Atypical antipsychotics—A group of medications for the treatment of psychotic symptoms that were introduced in the 1990s. The atypical antipsychotics include clozapine, risperidone, quetiapine, ziprasidone, and olanzapine. They are sometimes called serotonin dopamine antagonists (SDAs).

Blunted affect—A term that refers to the loss of emotional expressiveness sometimes found in patients with schizophrenia. It is sometimes called flattened affect.

Catatonia—Disturbance of motor behavior with either extreme stupor or random, purposeless activity.

Delusion—A false belief that is resistant to reason or contrary to actual fact. Common delusions in schizophrenia include delusions of persecution, delusions about one's importance (sometimes called delusions of grandeur), or delusions of being controlled by others.

Dementia praecox—A late nineteenth-century term for schizophrenia.

Dopamine—A neurotransmitter that acts within certain brain cells to help regulate emotions and movement. Some of the symptoms of schizophrenia are related to excessive levels of dopamine activity in a part of the brain called the striatum.

Dopamine receptor antagonists (DAs)—The older class of antipsychotic medications, also called neuroleptics. These primarily block the site on nerve cells that normally receives the brain chemical dopamine.

Dystonia—Painful involuntary muscle cramps or spasms; one of the extrapyramidal side effects associated with antipsychotic medications.

Extrapyramidal symptoms (EPS)—A group of side effects associated with antipsychotic medications. EPS include parkinsonism, akathisia, dystonia, and tardive dyskinesia.

First-rank symptoms—A list of symptoms that have been considered to be diagnostic of schizophrenia. These include delusions, somatic hallucinations, hearing voices commenting on one's behavior, and thought insertion or withdrawal. First-rank symptoms are sometimes called Schneiderian symptoms, after Kurt Schneider, the German psychiatrist who listed them in 1959.

Unfortunately, not all patients with schizophrenia receive adequate treatment.

Medications

Antipsychotic medications are the primary treatment for schizophrenia. Drug therapy for the disorder, however, is complicated by several factors: the unpredictability of a given patient's response to specific medications, the number of potentially troublesome side effects, the high rate of substance abuse among patients with schizophrenia, and the possibility of drug interactions between antipsychotic medications and antidepressants or other medications that may be prescribed for the patient.

One of the most difficult challenges in treating schizophrenia patients with medications is helping them stay on medication. Many schizophrenics do not take their medication because it does not

KEY TERMS (CONTINUED)

Hallucination—False sensory perceptions. A person experiencing a hallucination may hear sounds or see people or objects that are not really present. Hallucinations can also affect the senses of smell, touch, and taste.

Hebephrenic schizophrenia—An older term for what was later known as the disorganized subtype of schizophrenia.

Huntington's chorea—A hereditary disease that typically appears in midlife, marked by gradual loss of brain function and voluntary movement. Some of its symptoms resemble those of schizophrenia.

Morbidity—The unhealthiness or disease characteristics associated with a mental disorder.

Negative symptoms—Symptoms of schizophrenia that represent a loss or reduction of normal functioning.

Neuroleptic—Another name for the older type of antipsychotic medications given to schizophrenic patients.

Parkinsonism—A set of symptoms originally associated with Parkinson's disease that can occur as side effects of neuroleptic medications. The symptoms include trembling of the fingers or hands, a shuffling gait, and tight or rigid muscles.

Polygenic—A trait or disorder that is determined by a group of genes acting together. Most human characteristics, including height, weight, and general body build, are polygenic. Schizophrenia and late-onset Alzheimer's disease are considered polygenic disorders.

Positive symptoms—Symptoms of schizophrenia that represent excesses or distortions of normal mental functions.

Prodromal—Premonitory; having the character of a warning. The first psychotic episode in schizophrenia is often preceded by a prodromal phase.

Psychosis—Severe state that is characterized by loss of contact with reality and deterioration in normal social functioning; examples are schizophrenia and paranoia. Psychosis is usually one feature of an overarching disorder, not a disorder in itself.

Reality testing—A phrase that refers to a person's ability to distinguish between subjective feelings and objective reality.

Referential—A type of delusion in which the person misinterprets items, minor occurrences, or other people's behavior as referring to them. Misinterpretations of this sort that are not as resistant to reality as a delusion are sometimes called ideas of reference.

Schneiderian symptoms—Another name for first-rank symptoms of schizophrenia.

Serotonin dopamine antagonists (SDAs)—A second-generation of antipsychotic drugs, also called atypical antipsychotics. SDAs include clozapine (Clozaril), risperidone (Risperdal), and olanzapine (Zyprexa).

Striatum—A part of the basal ganglia, a deep structure in the cerebral hemisphere of the brain. Abnormally high levels of dopamine in the striatum are thought to be related to the delusions and hallucinations of schizophrenia.

Supportive—An approach to psychotherapy that seeks to encourage the patient or offer emotional support to him or her, as distinct from insight-oriented or educational approaches to treatment.

Tardive dyskinesia (TD)—A condition that involves involuntary movements of the tongue, jaw, mouth, or face or other groups of skeletal muscles that usually occurs either late in antipsychotic therapy or even after the therapy is discontinued. It may be irreversible.

Wilson's disease—A rare hereditary disease marked by high levels of copper deposits in the brain and liver. It can cause psychiatric symptoms resembling schizophrenia.

adequately control their symptoms or produces adverse side effects. After the patient has been stabilized, an antipsychotic drug may be given in a long-acting form called a depot dose. Depot medications last for two to four weeks; they have the advantage of protecting the patient against the consequences of forgetting or skipping daily doses. In addition, some patients who do not respond to oral neuroleptics have better results with depot form.

NEUROLEPTICS. The first antipsychotic medications for schizophrenia were introduced in the 1950s and known as dopamine antagonists (DAs). Sometimes called neuroleptics, they include haloperidol (Haldol), chlorpromazine (Thorazine), perphenazine (Trilafon), and fluphenazine (Prolixin). About 40% of patients, however, fail to respond to treatment with these medications. Neuroleptics can control most of the positive symptoms of schizophrenia as well as reduce the frequency

and severity of relapses, but they have little effect on negative symptoms. In addition, these medications have problematic side effects, ranging from **dry mouth**, blurry vision, and restlessness (akathisia) to such long-term side effects as tardive dyskinesia (TD), a disorder characterized by involuntary movements of the mouth, lips, arms, or legs. TD affects about 15 to 20% of patients who have been receiving neuroleptic medications over a period of years. Discomfort related to these side effects is one reason why 40% of patients treated with the older antipsychotics do not adhere to their medication regimens.

ATYPICAL ANTIPSYCHOTICS. The atypical antipsychotics are newer medications introduced in the 1990s. They are sometimes called serotonin dopamine antagonists (SDAs). These medications include aripiprazole (Abilify), clozapine (Clozaril), risperidone (Risperdal), quetiapine (Seroquel), ziprasidone (Geodon), and olanzapine (Zyprexa). These drugs are more effective in treating the negative symptoms of schizophrenia and have fewer side effects than the previous antipsychotics. Clozapine has been reported to be effective in patients who do not respond to neuroleptics, and it helps to reduce the risk of suicide attempts. The atypical antipsychotics, however, do have weight gain as a side effect, and patients taking clozapine must have their blood monitored periodically for signs of agranulocytosis (a drop in the number of white blood cells).

The Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) Schizophrenia Study, funded by the NIMH and coordinated by the University of North Carolina at Chapel Hill, investigated the effectiveness of several atypical antipsychotic drugs against that of a conventional drug. Contrary to expectations, however, it was found that the new drugs did not perform significantly better than the older drug. The results of the CATIE study also had implications to help schizophrenics and their physicians make decisions about which other drugs to try when one antipsychotic medication was unacceptable, either because it did not adequately control symptoms or produced adverse side effects.

OTHER PRESCRIPTION MEDICATIONS. Patients with schizophrenia have a lifetime prevalence of 80% for major depression; others suffer from **phobias** or other **anxiety** disorders. The doctor may prescribe antidepressants or a short course of benzodiazepines along with antipsychotic medications.

Inpatient treatment

Patients with schizophrenia are usually hospitalized during acute psychotic episodes, to prevent harming themselves or others, and to begin treatment with antipsychotic medications. A patient having a first psychotic episode is usually given a computed tomography (CT) or magnetic resonance imaging (MRI) scan to rule out structural brain disease.

Outpatient treatment

Since the 1990s, patients with schizophrenia who have been stabilized on antipsychotic medications have been given psychosocial therapies of various types to assist them with motivation, self-care, and forming relationships with others. In addition, because many patients have had their education or vocational training interrupted by the onset of the disorder, they may be helped by therapies directed toward improving their social functioning and work skills.

Specific outpatient treatments that have been used with patients with schizophrenia include:

- Rehabilitation programs. These programs may offer vocational counseling, job training, problem-solving, and money management skills, use of public transportation, and social skills training.
- Cognitive-behavioral therapy and supportive psychotherapy.
- Family psychoeducation. This approach is intended to help family members understand the patient's illness, cope with the problems it creates for other family members, and minimize stresses that may increase the patient's risk of relapse.
- Self-help groups. These groups provide mutual support for family members as well as patients. They can also serve as advocacy groups for better research and treatment, and to protest social stigma and employment discrimination.

Alternative and complementary therapies

Alternative and complementary therapies that as of 2008 were being investigated for the treatment of schizophrenia included gingko biloba, an Asian shrub, and vitamin therapy. One Chinese study reported that a group of patients who had not responded to conventional antipsychotic medications benefited from a thirteen-week trial of gingko extract, with significantly fewer side effects. Vitamin therapy is recommended by naturopathic practitioners on the grounds that many hospitalized patients with schizophrenia suffer from nutritional deficiencies. The supplements recommended include **folic acid**, **niacin**, vitamin B_6, and **vitamin C**. **Essential fatty acids** (such as **fish oil** or flax oil supplements) and ginseng may help to balance the mind and decrease or improve the side effects of anti-psychotic medication but should not be taken without consultation with a doctor. Grounding and

stress reducing therapies such as breathwork and **movement therapy** (**yoga**, **t'ai chi**, and **qigong**) are also beneficial. However, long-term compliance with a medication regime is critical to controlling the disease.

Prognosis

Patients with early onset of schizophrenia are more often male, have a lower level of functioning prior to onset, a higher rate of brain abnormalities, more noticeable negative symptoms, and worse outcomes. Patients with later onset are more likely to be female, with fewer brain abnormalities and thought impairment, and more hopeful prognoses.

The average course and outcome for people with schizophrenia are less favorable than those for most other mental disorders. About 20% of patients with schizophrenia recover the full level of functioning that they had before the onset of the disorder, according to NIMH statistics, but the remaining 80% have problems reentering mainstream society. These patients are often underachievers in school and in the workplace, and they usually have difficulty forming healthy relationships with others. The majority (60–70%) of patients with schizophrenia do not marry or have children, and most have very few friends or social contacts. The impact of these social difficulties as well as the stress caused by the symptoms themselves is reflected in the high suicide rate among patients with schizophrenia. About 10% commit suicide within the first 10 years after their diagnosis—a rate 20 times higher than that of the general population.

Schizophrenics with a high number of stressful changes in their lives, or who have frequent contacts with critical or emotionally involved family members, are more likely to relapse. Overall, the most important component of long-term care for schizophrenic patients is their compliance with their regimen of antipsychotic medications.

Prevention

As of 2008, there was no known method for preventing schizophrenia.

Resources

BOOKS

Kingdon, David G., and Douglas Turkington. *Cognitive Therapy of Schizophrenia (Guides to Individualized Evidence Based Treatment)*. New York: Guilford Press, 2008.

Lieberman, Jeffrey A., T. Scott Stroup, and Diana O. Perkins, eds. *The American Psychiatric Publishing Textbook of Schizophrenia*. Arlington, VA: American Psychiatric Publishing, 2006.

Sadock, Benjamin J., and Virginia A. Sadock. *Kaplan and Sadock's Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychology*. Philadelphia: Lippincott Williams & Wilkins, 2007.

VandenBos, Gary R., ed. *APA Dictionary of Psychology*. Washington, DC: American Psychological Association, 2006.

PERIODICALS

Barrowclough, Christine, et al. "Group Cognitive Behavioural Therapy for Schizophrenia." *British Journal of Psychiatry* 189, no. 6 (December 2006): 527 532.

Carr, Vaughan J., Terry J. Lewin, and Amanda L. Neil. "What Is the Value of Treating Schizophrenia?" *Australian and New Zealand Journal of Psychiatry* 40, no. 11 12 (November 2006): 963 971.

Gray, Richard, et al. "Adherence Therapy for People with Schizophrenia." *British Journal of Psychiatry* 189, no. 6 (December 2006): 508 514.

Lawrence, R., T. Bradshaw, and H. Mairs. "Group Cognitive Behavioural Therapy for Schizophrenia: A Systematic Review of the Literature." *Journal of Psychiatric and Mental Health Nursing* 13, no. 6 (December 2006): 673 681.

Lipkovich, I., et al. "Predictors of Risk for Relapse in Patients with Schizophrenia or Schizoaffective Disorder During Olanzapine Drug Therapy." *Journal of Psychiatric Research* 41, no. 3 4 (April/June 2007): 305 310.

Yanos, P. T., and R. H. Moos. "Determinants of Functioning and Well Being Among Individuals with Schizophrenia: An Integrated Model." *Clinical Psychology Review* 27, no. 1 (January 2007): 58 77.

ORGANIZATIONS

American Academy of Child & Adolescent Psychiatry, 3615 Wisconsin Ave. NW, Washington, DC, 20016 3007, (202) 966 7300, http://www.aacap.org.

American Psychiatric Association, 1000 Wilson Blvd., Suite 1825, Arlington, VA, 22209 3901, (703) 907 7300, http://www.psych.org.

Mental Health America, 2000 N. Beauregard St., 6th Floor, Alexandria, VA, 22311, (800) 969 6642, (703) 684 7722, http://www.nmha.org.

National Alliance for Research on Schizophrenia and Depression (NARSAD), 60 Cutter Mill Rd., Suite 404, Great Neck, NY, 11021, (800) 829 8289, www.narsad.org.

National Alliance on Mental Illness (NAMI), Colonial Place Three, 2107 Wilson Blvd., Suite 300, Arlington, VA, 22201 3042, (703) 524 7600, http://www.nami.org.

National Institute of Mental Health, 6001 Executive Blvd., Bethesda, MD, 20892 9663, (866) 615 6464, (301) 443 4513, http://www.nimh.nih.gov.

Paula Ford-Martin
Teresa G. Odle
Angela M. Costello

Sciatica

Definition

Sciatica refers to **pain** or discomfort associated with the sciatic nerve. This nerve runs from the lower part of the spinal cord, down the back and side of the leg, to the foot. Injury to or pressure on the sciatic nerve can cause the characteristic pain of sciatica: a sharp or burning pain, or even numbness, that radiates from the lower back or hip, possibly following the path of the sciatic nerve to the foot.

Description

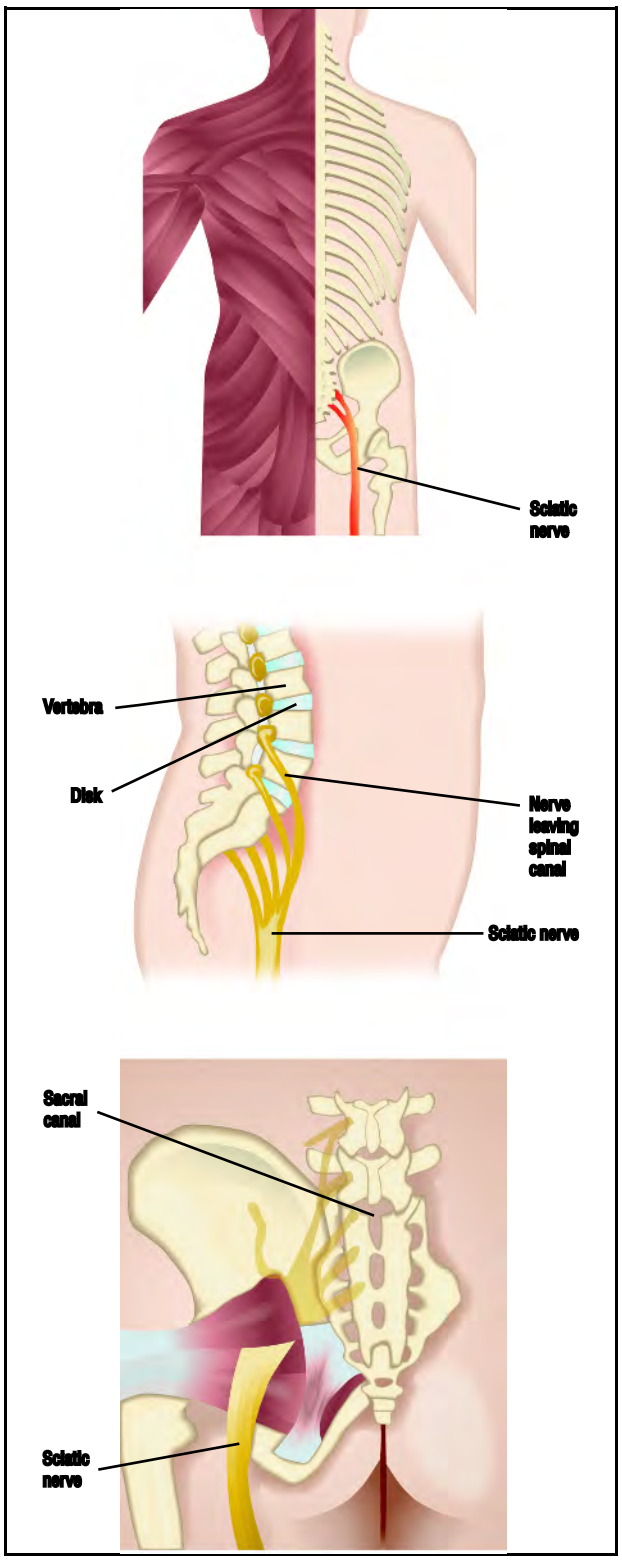
The sciatic nerve is the largest and longest nerve in the body. About the thickness of a person's thumb, it spans from the lower back to the foot. The nerve originates in the lower part of the spinal cord, the so-called lumbar region. As it branches off from the spinal cord, it passes between the bony vertebrae (the component bones of the spine) and runs through the pelvic girdle, or hip bones, and the buttock area. The nerve passes through the hip joint and continues down the back and side of the leg to the foot.

Sciatica is a fairly common disorder and approximately 40% of the population experiences it at some point in their lives. However, only about 1% have coexisting sensory or motor deficits. Sciatic pain has several root causes and treatment may hinge upon the underlying problem.

Of the identifiable causes of sciatic pain, lumbosacral radiculopathy and back strain are the most frequently suspected. The term lumbosacral refers to the lower part of the spine, and radiculopathy describes a problem with the spinal nerve roots that pass between the vertebrae and give rise to the sciatic nerve. This area between the vertebrae is cushioned with a disk of shock-absorbing tissue. If this disk shifts or is damaged through injury or disease, the spinal nerve root may be compressed by the shifted tissue or the vertebrae.

This compression of the nerve roots sends a pain signal to the brain. Although the actual injury is to the nerve roots, the pain may be perceived as coming from anywhere along the sciatic nerve.

The sciatic nerve can be compressed in other ways. Back strain may cause **muscle spasms** in the lower back, placing pressure on the sciatic nerve. In rare cases, infection, **cancer**, bone inflammation, or other diseases may be causing the pressure. More likely, but often overlooked, is the piriformis syndrome. As the sciatic nerve passes through the hip joint, it shares the space with several muscles. One of these muscles, the piriformis



(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)

KEY TERMS

Bodywork—Any healing technique involving hands-on massage or manipulation of the body. Types of bodywork that involve movement reeducation or movement patterning are also categorized as movement therapy.

Disk—Dense tissue between the vertebrae that acts as a shock absorber and prevents damage to nerves and blood vessels along the spine.

Electromyography—A medical test in which a nerve's ability to conduct an impulse is measured.

Lumbosacral—Referring to the lower part of the backbone or spine.

Myelography—A medical test in which a special dye is injected into a nerve to make it visible on an x ray.

Piriformis—A muscle in the pelvic girdle, or hip bones, that is closely associated with the sciatic nerve.

Radiculopathy—A condition in which the spinal nerve root of a nerve has been injured or damaged.

Spasm—Involuntary contraction of a muscle.

Vertebrae—The component bones of the spine.

muscle, is closely associated with the sciatic nerve. In some people, the nerve actually runs through the muscle. If this muscle is injured or has a spasm, it places pressure on the sciatic nerve, in effect, compressing it.

In many sciatica cases, the specific cause is never identified. About half of affected individuals recover from an episode within a month. Some cases can linger a few weeks longer and may require aggressive treatment. In some cases, the pain may return or potentially become chronic.

Causes and symptoms

Persons with sciatica may experience some lower back pain, but the most common symptom is pain that radiates through one buttock and down the back of that leg. The most identified cause of the pain is compression or pressure on the sciatic nerve. The extent of the pain varies between individuals. Some people describe pain that centers in the area of the hip, and others perceive discomfort all the way to the foot. The quality of the pain also varies; it may be described as tingling, burning, prickly, aching, or stabbing.

Onset of sciatica can be sudden, but it can also develop gradually. The pain may be intermittent or continuous, and certain activities, such as bending, coughing, **sneezing**, or sitting, may make the pain worse.

Chronic pain may arise from more than just compression on the nerve. According to some pain researchers, physical damage to a nerve is only half of the equation. A developing theory proposes that some nerve injuries result in a release of neurotransmitters and immune system chemicals that enhance and sustain a pain message. Even after the injury has healed, or the damage has been repaired, the pain continues. Control of this abnormal type of pain is difficult.

Diagnosis

Before treating sciatic pain, as much information as possible must be collected. The individual is asked to recount the location and nature of the pain, how long it has continued, and any accidents or unusual activities prior to its onset. This information provides clues that may point to back strain or injury to a specific location. Back pain from disk disease, piriformis syndrome, and back strain must be differentiated from more serious conditions, such as cancer or infection. Lumbar stenosis, an overgrowth of the covering layers of the vertebrae that narrows the spinal canal, must also be considered. The possibility that a difference in leg lengths is causing the pain should be evaluated; the problem can be easily be treated with a foot orthotic or built-up shoe.

Often, a straight-leg-raising test is done, in which the person lies face upward and the health-care provider raises the affected leg to various heights. This test pinpoints the location of the pain and may reveal whether it is caused by a disk problem. Other tests, such as having the individual rotate the hip joint, assess the hip muscles. Any pain caused by these movements may provide information about involvement of the piriformis muscle, and piriformis weakness is tested with additional leg-strength maneuvers.

Further tests may be done depending on the results of the physical examination and initial pain treatment. Such tests might include magnetic resonance imaging (MRI) and computed tomography scans (CT scans). Other tests examine the conduction of electricity through nerve tissues, and include studies of the electrical activity generated as muscles contract (electromyography), nerve conduction velocity, and evoked potential testing. A more invasive test involves injecting a contrast substance into the space between the vertebrae and making x-ray images of the spinal cord (myelography), but this procedure is usually done only if surgery is being considered as an option. All of these tests can reveal problems with the vertebrae, the disk, or the nerve itself.

Treatment

Massage is a recommended form of therapy, especially if the sciatic pain arises from muscle spasm. Symptoms may also be relieved by icing the painful area as soon as the pain occurs. Ice should be left on the area for 30–60 minutes several times a day. After two or three days, a hot water bottle or heating pad can replace the ice. **Chiropractic** or **osteopathy** may offer possible solutions for relieving pressure on the sciatic nerve and the accompanying pain. **Biofeedback** may also be useful as a pain control method. Bodywork, such as the **Alexander technique**, can assist an individual in improving posture and preventing further episodes of sciatic pain.

Acupuncture is another alternative approach that appears to offer relief to many persons with sciatica, as indicated by several clinical trials in the United States and Europe. The World Health Organization (WHO) lists sciatica as one of 40 conditions for which acupuncture is recognized as an appropriate complementary treatment.

Practitioners of **Ayurvedic medicine** regard sciatica as a disorder resulting from an imbalance in vata, one of three doshas or energies in the human body. The traditional Ayurvedic treatment for vata disorders is vasti, or administration of an oil-based enema to cleanse the colon. An Ayurvedic herbal preparation that is used to treat sciatica is made from the leaves of *Nyctanthes arbor tristis*, which is also known as Parijat or "sad tree." A recent study of an alcohol-based extract of this plant indicates that it is effective as a tranquilizer and local anesthetic, which supports its traditional Ayurvedic use.

Western herbalists typically treat sciatica with **valerian** root to relax the muscle spasms that often accompany sciatica, and with **white willow** bark for pain relief.

Homeopathic remedies for sciatica include *Ruta graveolens*, *Colocynth* (for sciatic pain that is worse in cold or damp weather), or *Mag phos* (for lightning-like pains that are soothed by heat and made worse by coughing).

Allopathic treatment

Initial treatment for sciatica focuses on pain relief. For acute or very painful flare-ups, bed rest is advised for up to a week in conjunction with medication for the pain. Pain medication includes acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, or muscle relaxants. If the pain is unremitting, opioids may be prescribed for short-term use or a local anesthetic will be injected directly into the lower back. Massage and heat application may be suggested as adjuncts.

If the pain is chronic, different pain relief medications are used to avoid long-term dosing of NSAIDs, muscle relaxants, and opioids. Antidepressant drugs, which have been shown to be effective in treating pain, may be prescribed alongside short-term use of muscle relaxants or NSAIDs. Local anesthetic injections or epidural steroids are used in selected cases.

As the pain allows, physical therapy is introduced into the treatment regime. Stretching exercises that focus on the lower back, buttock, and hamstring muscles are suggested. The exercises also include finding comfortable, pain-reducing positions. Corsets and braces may be useful in some cases, but evidence for their general effectiveness is lacking. However, they may be helpful to prevent exacerbations related to certain activities.

With less pain and the success of early therapy, the individual is encouraged to follow a long-term program to maintain a healthy back and prevent reinjury. A physical therapist may suggest exercises and regular activity, such as water **exercise** or walking. Patients are instructed in proper body mechanics to minimize symptoms during light lifting or other activities.

If the pain is chronic and conservative treatment fails, surgery to repair a **herniated disk** or cut out part or all of the piriformis muscle may be suggested, particularly if there is neurologic evidence of nerve or nerve-root damage.

A new minimally invasive surgical treatment for sciatica was introduced in 2002. It is known as microscopically assisted percutaneous nucleotomy, or MAPN. MAPN allows the surgeon to repair a herniated disk with less damage to surrounding tissues; it shortens the patient's recovery time and relieves the pain of sciatica as effectively as more invasive surgical procedures.

Expected results

Most cases of sciatica are treatable with pain medication and physical therapy. After four to six weeks of treatment, an individual should be able to resume normal activities.

Prevention

Some sources of sciatica are not preventable, such as disk degeneration, back strain due to **pregnancy**, or accidental falls. Other sources of back strain, such as

poor posture, overexertion, being overweight, or wearing high heels, can be corrected or avoided. Cigarette **smoking** may also predispose people to pain, and should be discontinued with the onset of pain.

General suggestions for avoiding sciatica or preventing a repeat episode include sleeping on a firm mattress; using chairs with firm back support; and sitting with both feet flat on the floor. Habitually crossing the legs while sitting can place excess pressure on the sciatic nerve. Sitting a lot can also place pressure on the sciatic nerves, so it is recommended to take short breaks and move around during the work day, during long trips, or when in any other situation that requires sitting for extended periods of time. If lifting is required, the back should be kept straight and the legs should provide the lift. Regular exercise, such as swimming and walking, can strengthen back muscles and improve posture. Exercise can also help maintain a healthy weight and lessen the likelihood of back strain.

Resources

BOOKS

Maigne, Robert. "Sciatica." In *Diagnosis and Treatment of Pain of Vertebral Origin: A Manual Medicine Approach*. Baltimore: Williams & Wilkins, 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Sciatica." New York: Simon & Schuster, 2002.

Rydevik, Björn, Mitsuo Hasue, and Peter Wehling. *Etiology of Sciatic Pain and Mechanisms of Nerve Root Compression,* vol. 1: The Lumbar Spine, 2d ed., edited by Sam W. Wiesel, et al. Philadelphia: W.B. Saunders Company, 1996.

PERIODICALS

Chiodo, A., and A. J. Haig. "Lumbosacral Radiculopathies: Conservative Approaches to Management." *Physical Medicine and Rehabilitation Clinics of North America* 13 (August 2002): 609 621.

Douglas, Sara. "Sciatic Pain and Piriformis Syndrome." *The Nurse Practitioner* 22 (May 1997): 166.

Greiner Perth, R., H. Bohm, and H. El Saghir. "Micro scopically Assisted Percutaneous Nucleotomy, An Alternative Minimally Invasive Procedure for the Operative Treatment of Lumbar Disc Herniation: Pre liminary Results." *Neurosurgical Review* 25 (August 2002): 225 227.

Parziale, John R., Thomas H. Hudgins, and Loren M. Fishman. "The Piriformis Syndrome." *The American Journal of Orthopedics* (December 1996): 819.

Saxena, R. S., B. Gupta, and S. Lata. "Tranquilizing, Anti histaminic and Purgative Activity of *Nyctanthes arbor tristis* Leaf Extract." *Journal of Ethnopharmacology* 81 (August 2002): 321 325.

Wheeler, Anthony H. "Diagnosis and Management of Low Back Pain and Sciatica." *American Family Physician* (October 1995): 1333.

ORGANIZATIONS

American Academy of Medical Acupuncture (AAMA). 4929 Wilshire Blvd., Suite 428, Los Angeles, CA 90010. (323) 937 5514. www.medicalacupuncture.org.

American Academy of Orthopaedic Surgeons (AAOS). 6300 North River Road, Rosemont, IL 60018. (847) 823 7186 or (800) 346 AAOS. www.aaos.org.

American Physical Therapy Association (APTA). 1111 North Fairfax Street, Alexandria, VA 22314. (703)684 APTA or (800) 999 2782. www.apta.org.

National Center for Homeopathy. 801 North Fairfax Street, Alexandria, VA 22314. (703) 548 7790. www.homeopathic.org.

National Institute of Ayurvedic Medicine. 584 Milltown Road, Brewster, NY 10509. (845) 278 8700. www.niam.com.

Kathleen Wright
Rebecca J. Frey, PhD

Scoliosis

Definition

Scoliosis is defined as an abnormal side-to-side or front-to-back curvature of the spine.

Description

When viewed from the rear, the spine usually appears perfectly straight. Scoliosis is a lateral (side-to-side) curve in the spine, usually combined with a rotation of the vertebrae. The lateral curvature of scoliosis should not be confused with the normal set of front-to-back spinal curves visible from the side. While a small degree of lateral curvature does not cause any medical problems, larger curves can cause postural imbalance and lead to muscle **fatigue** and **pain**. More severe scoliosis can interfere with breathing and lead to arthritis of the spine (spondylosis).

Approximately 10% of all adolescents have some degree of scoliosis, though fewer than 1% have curves that require medical attention beyond monitoring. Scoliosis is found in both boys and girls, but a girl's spinal curve is much more likely to progress than a boy's. Girls require scoliosis treatment about five times as often. The reason for these differences is not known.

Causes and symptoms

Four out of five cases of scoliosis are *idiopathic*, meaning that the cause is unknown. Idiopathic scoliosis tends to run in families; genetic screening has identified several different patterns of genetic transmission as of late 2001. In some families, idiopathic scoliosis is transmitted

An x ray of a spine with scoliosis, the appreciable lateral deviation in the normally straight vertical line of the spine. *(© Medical-on-Line / Alamy)*

in an autosomal dominant pattern, while in others the mode of inheritance is X-linked. Children with idiopathic scoliosis appear to be otherwise entirely healthy, and have not had any bone or joint disease early in life. Scoliosis is not caused by poor posture, diet, or carrying a heavy book-bag exclusively on one shoulder.

Idiopathic scoliosis is further classified according to age of onset:

- Infantile. Curvature appears before age three. This type is quite rare in the United States, but is more common in Europe.
- Juvenile. Curvature appears between ages three and 10. This type may be equivalent to the adolescent type, except for the age of onset.
- Adolescent. Curvature appears between ages of 10 and 13, near the beginning of puberty. This is the most common type of idiopathic scoliosis.
- Adult. Curvature begins after physical maturation is completed.

Causes are known for three other types of scoliosis:

- Congenital scoliosis is due to congenital birth defects in the spine, often associated with other organ defects.
- Neuromuscular scoliosis is due to loss of control of the nerves or muscles that support the spine. The most common causes of this type of scoliosis are cerebral palsy and muscular dystrophy.
- Degenerative scoliosis may be caused by degeneration of the discs that separate the vertebrae or arthritis in the joints that link them.

Scoliosis causes a noticeable asymmetry in the torso when viewed from the front or back. The first sign of scoliosis is often seen when a child is wearing a bathing suit or underwear. A child may appear to be standing with one shoulder higher than the other, or to have a tilt in the waistline. One shoulder blade may appear more prominent than the other due to rotation. In girls, one breast may appear higher than the other, or larger if rotation pushes that side forward.

Curve progression is greatest near the adolescent growth spurt. Scoliosis that begins early on is more likely to progress significantly than scoliosis that begins later in puberty.

More than 30 states have screening programs in schools for adolescent scoliosis, usually conducted by trained school nurses or gym teachers.

KEY TERMS

Adams test—A screening test in which a child being examined for scoliosis is asked to bend forward with the feet together and the knees straight.

Cobb angle—A measure of the curvature of scoliosis, determined by measurements made on x rays.

Scoliometer—A tool for measuring trunk asymmetry; it includes a bubble level and angle measure.

Spondylosis—Arthritis of the spine.

Diagnosis

Diagnosis for scoliosis is typically continued by an orthopedist. A complete medical history is taken,

including questions about family history of scoliosis. The physical examination includes determination of pubertal development in adolescents, a neurological exam (which may reveal a neuromuscular cause), and measurements of trunk asymmetry. Examination of the trunk is done while the patient is standing, bending over, and lying down. The forward bending test is sometimes referred to as the Adams test. It involves both visual inspection and use of a simple mechanical device called a scoliometer.

If a curve is detected, one or more x rays will usually be taken to define the curve or curves more precisely. An x ray is used to document spinal maturity, any pelvic tilt or hip asymmetry, and the location, extent, and degree of curvature. The curve is defined in terms of where it begins and ends, in which direction it bends, and by an angle measure known as the Cobb angle. The Cobb angle is found by projecting lines parallel to the vertebrae tops at the extremes of the curve, projecting perpendiculars from these lines, and measuring the angle of intersection. To properly track the progress of scoliosis, it is important to project from the same points of the spine each time.

Occasionally, magnetic resonance imaging (MRI) is used, primarily to look more closely at the condition of the spinal cord and nerve roots extending from it if neurological problems are suspected.

Treatment

Although important for general health and strength, **exercise** has not been shown to prevent or slow the development of scoliosis. It may help to relieve pain from scoliosis by helping to maintain range of motion. Good **nutrition** is also important for general health, but no specific dietary regimen has been shown to control scoliosis development. In particular, dietary **calcium** levels do not influence scoliosis progression.

Chiropractic treatment may relieve pain, but it cannot halt scoliosis development, and should not be a substitute for conventional treatment of progressing scoliosis. **Acupuncture** and **acupressure** may also help reduce pain and discomfort, but they cannot halt scoliosis development either.

Other movement therapies (**yoga**, **t'ai chi**, **qigong**, and dance) improve flexibility and are useful when used with movement education therapies such as **Feldenkrais**, the **Rosen method**, the **Alexander technique**, and **Pilates**.

Allopathic treatment

Treatment decisions for scoliosis are based on the degree of curvature, the likelihood of significant progression, and the presence of pain, if any.

Curves less than 20° are not usually treated, except by regular follow-up for children who are still growing. Watchful waiting is usually all that is required in adolescents with curves of 20–30°, or adults with curves up to 40° or slightly more, as long as there is no pain.

For children or adolescents whose curves progress to 30°, and who have a year or more of growth left, bracing may be required. Bracing cannot correct curvature, but may be effective in halting or slowing progression. Bracing is rarely used in adults, except where pain is significant and surgery is not an option, as in some elderly patients.

Two general styles of braces are used for daytime wear. The Milwaukee brace consists of metal uprights attached to pads at the hips, rib cage, and neck. The underarm brace uses rigid plastic to encircle the lower rib cage, abdomen, and hips. Both of these brace types hold the spine in a vertical position. Because it can be worn out of sight beneath clothing, the underarm brace is better tolerated and often leads to better compliance. A third style, the Charleston bending brace, is used at night to bend the spine in the opposite direction. Braces are often prescribed to be worn for 22–23 hours per day, though some clinicians allow or encourage removal of the brace for exercise.

Bracing may be appropriate for scoliosis due to some types of neuromuscular disease, including spinal muscular atrophy, before growth is finished. Duchenne muscular dystrophy is not treated by bracing, since surgery is likely to be required, and since later surgery is complicated by loss of respiratory capacity.

Surgery for idiopathic scoliosis is usually recommended if:

- The curve has progressed despite bracing.
- The curve is greater than 40–50° before growth has stopped in an adolescent.
- The curve is greater than 50° and continues to increase in an adult.
- There is significant pain.

Orthopedic surgery for neuromuscular scoliosis is often done earlier. The goals of surgery are to correct the deformity as much as possible, to prevent further deformity, and to eliminate pain as much as possible. Surgery can usually correct 40–50% of the curve, and sometimes as much as 80%. Surgery cannot always completely remove pain.

The surgical procedure for scoliosis is called spinal fusion, because the goal is to straighten the spine as much as possible, and then to fuse the vertebrae together to prevent further curvature. To achieve fusion, the involved vertebra are first exposed, and

then scraped to promote regrowth. Bone chips are usually used to splint together the vertebrae to increase the likelihood of fusion. To maintain the proper spinal posture before fusion occurs, metal rods are inserted alongside the spine and attached to the vertebrae by hooks, screws, or wires. Fusion of the spine makes it rigid and resistant to further curvature. The metal rods are no longer needed once fusion is complete, but are rarely removed unless their presence leads to complications.

Spinal fusion leaves the involved portion of the spine permanently stiff and inflexible. While this leads to some loss of normal motion, most functional activities are not strongly affected, unless the very lowest portion of the spine (the lumbar region) is fused. Normal mobility, exercise, and even contact sports are usually all possible after spinal fusion. Full recovery takes approximately six months.

Expected results

The prognosis for a person with scoliosis depends on many factors, including the age at which scoliosis begins and the treatment received. More importantly, mostly unknown individual factors affect the likelihood of progression and the severity of the curve. Most cases of mild adolescent idiopathic scoliosis need no treatment and do not progress. Untreated severe scoliosis often leads to spondylosis, and may impair breathing.

Prevention

There is no known way to prevent the development of scoliosis. Progression of scoliosis may be prevented through bracing or surgery.

Resources

BOOKS

Neuwirth, Michael, and Kevin Osborn. *The Scoliosis Handbook*. New York: Henry Holt & Co., 1996.

PERIODICALS

Justice, C.M., N. H. Miller, B. Marosy, et al. "Genetic Heterogeneity Comprising Both X Linked and Auto somal Dominant Forms of Inheritance in Families with Familial Idiopathic Scoliosis." *American Journal of Human Genetics* 69 (October 2001): 384.

Splete, Heidi. "Catch Curves Like Scoliosis in Time for Bracing (Watch Your Patients' Backs)." *Pediatric News* 35 (November 2001): 42 43.

ORGANIZATIONS

National Scoliosis Foundation. 5 Cabot Place Stoughton, MA 02072. (800) 673 6922. NSF@scoliosis.org. http://www.scoliosis.org.

The Scoliosis Association. PO Box 811705 Boca Raton, FL 33481 1705. (407) 368 8518. normlipin@aol.com. http://www.scoliosis assoc.org.

Scoliosis Research Society. 611 East Wells Street Milwaukee, WI 53202. (414) 289 9107. Tjackson@execinc.com. http://www.srs.org.

Paula Ford-Martin
Rebecca J. Frey, PhD

Scratches *see* **Cuts and scratches**

Scullcap *see* **Skullcap**

Seasickness *see* **Motion sickness**

Seasonal affective disorder

Definition

Seasonal affective disorder (SAD) is a form of **depression** most often associated with lack of daylight in extreme northern and southern latitudes from the late fall to the early spring.

Description

Although researchers in the late 2000s remained uncertain about what causes seasonal affective disorder, they suspected that it has something to do with the hormone **melatonin**. Melatonin is thought to play an active role in regulating the internal body clock, which dictates when humans feel like going to bed at night and getting up in the morning. Although seasonal affective disorder is most common when light is low, it may occur in the spring, which is often called reverse or spring-onset SAD. Some research also has indicated that SAD has a genetic factor; about 29% of cases in the United States run in families.

Causes and symptoms

The body produces more melatonin at night than during the day, and scientists believe the compound helps people feel sleepy at nighttime. There is also more melatonin in the body during winter, when the days are shorter. Some researchers believe that excessive melatonin release during winter in people with SAD may account for their feelings of drowsiness or depression. One variation on this theory is that people's internal clocks may become out of sync during winter with the light-dark cycle, leading to a long-term disruption in melatonin release. Another possible

Symptoms of seasonal affective disorder (SAD)

- Increased sleep/oversleeping
- Depression
- Lethargy
- Weight gain
- Carbohydrate cravings/overeating
- Decreased sex drive
- Avoidance of social interaction
- Difficulty performing daily tasks
- Mood changes, and in some, periods of mania in the spring and summer
- Anxiety, tension, and inability to tolerate stress

(Illustration by Corey Light. Cengage Learning, Gale)

cause of SAD is that people may not adjust their habits to the season or sleep more hours when it is darker, as would be natural.

Seasonal affective disorder, while not an official category of mental illness listed by the American Psychiatric Association, is estimated to affect at least 10 million Americans. Another 25 million Americans may have a mild form of SAD, sometimes called the winter blues or winter blahs. The risk of SAD increases the further from the equator a person lives. A 1990 study by researchers at the Uniformed Services University of the Health Sciences found a 1.4% incidence of the disorder among people living in Florida, compared with 9.7% among residents of New Hampshire. Other factors that influence the incidence and severity of SAD are sex and age. Women are more likely than men to develop SAD, but men with the disorder are more severely depressed than most women who have it. SAD appears to decrease in severity with age; the elderly have milder SAD symptoms than adolescents.

Comparative studies indicate that the incidence of SAD in the United States and Canada is about twice as high as in European countries at the same latitudes north of the Equator. These findings suggest that cultural factors are also involved in the disorder.

The symptoms of SAD are similar to those of other forms of depression. People with SAD may feel sad, irritable, or tired, and may find themselves sleeping too much. They may also lose interest in normal or pleasurable activities (including sex), become withdrawn, crave carbohydrates, and gain weight.

Diagnosis

Doctors usually diagnose seasonal affective disorder based on the patient's description of symptoms, including the time of year when they occur. There is also a diagnostic questionnaire called the Seasonal Pattern Assessment Questionnaire (SPAQ), used in all Canadian university hospitals and widely used in the United States to assess SAD patients.

Treatment

The first-line treatment for seasonal affective disorder is **light therapy** (also known as phototherapy). The most commonly used phototherapy equipment is a portable lighting device known as a light box. The box may be mounted upright on a wall, or slanted downward toward a table. The patient sits in front of the box for a prescribed period of time (anywhere from 15 minutes to several hours). Some patients with SAD undergo light therapy sessions two or three times daily, and others only once. The time of day and the number of times treatment is administered depend on the physical needs and lifestyle of the patient. Light therapy treatment for SAD typically begins in the fall months as the days begin to shorten and continues throughout the winter and possibly the early spring.

The light from a slanted light box is designed to focus on the table it sits upon, so patients may look down to read or do other sedentary activities during therapy. Patients using an upright light box must face the light source (although they should not look directly into the light). The light sources in these light boxes typically range from 2,500 to 10,000 lux. In contrast, average indoor lighting is 300 to 500 lux, and a sunny summer day measures about 100,000 lux).

A study conducted in 2001 by researchers at the University of Washington School of Medicine found that dawn simulation, a form of light therapy in which the patient is exposed to white light of gradually increasing brightness is even more effective in treating SAD than exposure to bright light. Dawn simulation is started around 4:30 or 5 a.m., while the patient is still asleep.

Patients with eye problems should see an ophthalmologist regularly both before and during light therapy. Because some UV rays are emitted by the light boxes used in phototherapy, patients

taking photosensitizing medications and those who have sun-sensitive skin should consult a healthcare professional before beginning treatment. Patients with medical conditions that make them sensitive to UV rays should also see a doctor before starting phototherapy.

Light therapy appears to be safe for most people. However, it can cause side effects of eyestrain, headaches, **insomnia**, **fatigue**, **sunburn**, and dry eyes and nose in some patients. Most of these effects can be managed by adjusting the timing and duration of light therapy sessions. A strong sun block and eye and nose drops can alleviate the others.

Some researchers suspect that small doses of melatonin may be helpful in treating the symptoms of SAD. They argue that the hormone may help people adjust their circadian rhythms so as to develop normal sleep patterns. As of 2008, evidence in support of this hypothesis was inconclusive. Some studies have shown that melatonin treatments can help patients with SAD, while others find no benefit from melatonin therapy in dealing with the symptoms of SAD.

KEY TERMS

Cognitive behavioral therapy—Psychotherapy aimed at helping people change their attitudes, perceptions, and patterns of thinking.

Dawn simulation—A form of light therapy in which the patient is exposed while asleep to gradually brightening white light over a period of an hour and a half.

Lux—The International System unit for measuring illumination, equal to one lumen per square meter.

Melatonin—A naturally occurring hormone involved in regulating the body's internal clock.

Negative air ionization—A procedure by which air molecules are ionized to produce an environment similar to summer air, in which negative ions are more common than they are in winter air.

Serotonin—A chemical messenger in the brain thought to play a role in regulating mood.

Allopathic treatment

Like other types of mood disorders, seasonal affective disorder may also respond to medication and **psychotherapy**. Common drugs prescribed for mood disorders are:

- Selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine (Prozac), paroxetine (Paxil), and sertraline (Zoloft)
- Monoamine oxidase inhibitors (MAO inhibitors), such as phenelzine sulfate (Nardil) and tranylcypromine sulfate (Parnate)
- Lithium salts, such as lithium carbonate (Eskalith), often used in people with bipolar mood disorders, are often useful with SAD patients who also suffer from bipolar disorder (excessive mood swings; formerly known as manic depression)

A number of psychotherapy approaches are useful as well. Interpersonal psychotherapy helps patients recognize how their mood disorder and their personal relationships are interrelated. Cognitive-behavioral therapy explores how the patient's view of the world may be affecting mood and outlook.

A new treatment for SAD that is still in the experimental phase is the use of high-density negative air ionization. A 2006 study by Michael Terman and Jiuan Su Terman at Columbia University and New York State Psychiatric Institute found that high-density (but not low-density) negative air ionization produced significant benefits for patients with SAD. They recommended the therapy for patients who do not benefit from post-awakening bright light therapy, which they regard as still the most affective treatment for SAD.

Expected results

Most patients with seasonal affective disorder respond to light therapy, dawn simulation, and/or antidepressant drugs. Others respond to sleeping more hours in a dark room. Some researchers estimate that as much as 9.5 hours of sleep are important in winter months and that sleeping more increases the person's levels of natural melatonin.

Resources

BOOKS

Rohan, Kelly. *Seasonal Affective Disorder (Treatments that Work)*. New York: Oxford University Press, 2008.

Rosenthal, Norman E. *Winter Blues: Everything You Need to Know to Beat Seasonal Affective Disorder*, rev. ed. New York: Guilford Press, 2006.

Smith, Laura L., and Charles H. Elliott. *Seasonal Affective Disorder for Dummies*. Indianapolis, IN: For Dummies, 2007.

PERIODICALS

Lewy, Alfred, et al. "Circadian Uses of Melatonin in Humans." *Chronobiology International* (2006): 403 412.

Oyane, Nicolas M., et al. "Self reported Seasonality Is Associated with Complaints of Sleep Problems and

Deficient Sleep Duration: The Hordaland Health Study." *Journal of Sleep Research* (March 2008): 62 72.
Westrin, Åsa, and Raymond W. Lam. "Long Term and Pre ventative Treatment for Seasonal Affective Disorder." *CNS Drugs* (November 2007): 901 909.
Winkler, Dietmar, et al. "Treatment of Seasonal Affective Disorder." *Expert Review of Neurotherapeutics* (July 2006): 1039 1048.

ORGANIZATIONS

Depression and Bipolar Support Alliance, 730 N. Franklin St., Suite 501, Chicago, IL, 60610, (312) 642 0049, http://www.ndmda.org/.
National Institute of Mental Health, Mental Health Public Inquiries. 5600 Fishers Lane, Room 15C 05, Rockville, MD, 20857, (888) 826 9438, http://www.nimh.nih.gov.
Society for Light Treatment and Biological Rhythms, 4648 Main St., Chincoteague, VA, 23336, http://www.sltbr.org.

Paula Ford-Martin
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Seaweed *see* **Kelp**
Seaweed, sargassum *see* **Sargassum seaweed**
Seborrhea *see* **Cradle cap**
Seizure disorder *see* **Epilepsy**

Recommended dietary allowance of selenium

Age	mcg/day
Children 1-3 yrs.	20
Children 4-8 yrs.	30
Children 9-13 yrs.	40
Adolescents 14-18 yrs.	55
Adults ≥ 19 yrs.	55
Pregnant women	60
Breastfeeding women	70

Foods that contain selenium	mcg
Brazil nuts (from Brazil), 1 oz.	544
Egg, 1 whole	14
Fish (cod, shellfish, tuna) 1 oz.	10-20
Enriched noodles or macaroni, 1 cup	10
Rice, white, 1 cup	10
Organ and muscle meat, 1 oz.	8-12
Turkey or chicken, 1 oz.	7-11
Rice, brown, long-grain, 1 cup	7
Cheddar cheese, 1 oz.	5
Walnuts, 1 oz.	5
Oatmeal or bran, 1 cup	3-4
Garlic, 1 oz.	0.25

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

Selenium

Description

Selenium (Se) is a nonmetallic element with an atomic number of 34 and an atomic mass of 78.96. No commercially important ores of selenium exist. It is usually obtained as by-product in the refining of **copper** sulfide, with which it occurs as an impurity. Selenium occurs naturally in organic form in two unusual **amino acids**, selenomethionine and selenocysteine.

General use

The role of selenium in human **nutrition** and other therapeutic applications provoked intense controversy from about 1980 into the late 2000s. In contrast to such major minerals as **magnesium** and **calcium**, neither selenium's benefits nor its toxic aspects were fully understood as of 2008. In the late twentieth century selenium was considered a toxic element that was not necessary to human health. In 1989, however, selenium was reclassified as an essential micronutrient in a balanced human diet when the National Research Council established the first recommended daily allowance (RDA) for it. It is considered a minor mineral, or a *trace element*, as distinct from a *major mineral* such as calcium or **phosphorus** or an *electrolyte* such as **sodium** or chloride. The human body contains less than 1 mg of selenium. The selenium is concentrated in the liver, kidneys, and pancreas. In males, selenium is also found in the testes and seminal vesicles. Selenium has a variety of applications in the late 2000s, ranging from standard external preparations for skin problems to experimental and theoretical applications in nutrition and internal medicine.

Alternative medicine

Naturopaths use selenium supplements to treat **asthma**, **acne**, **tendinitis**, **infertility** in men, and postmenopausal disorders in women. Selenium is also considered an important component in naturopathic life extension (longevity) **diets** because of its role in tissue repair and maintaining the youthful elasticity of skin.

Dermatology

Selenium has been used since the 1960s in **dandruff** shampoos and topical medications for such skin disorders as folliculitis (hot tub syndrome) and tinea versicolor, a mild infection of the skin caused by the yeast-like fungus *Pityrosporum orbiculare*. A compound of selenium, selenium sulfide, has antibiotic and antifungal properties. It is absorbed by the outermost layer of skin cells, the epithelium. Inside the cells, the compound splits into selenium and sulfide ions. The selenium ions counteract the enzymes that are responsible for producing new epithelial cells, thus lowering the turnover of surface skin cells. As a result, **itching** and flaking of the skin associated with dandruff and tinea versicolor is reduced.

Nutrition

Prior to 1989, there were no established recommended daily allowance (RDA) values for selenium. In 1989, the National Research Council of the National Academy of Sciences defined the RDAs for selenium as follows: Children, less than six months of age: 15 mcg/day; seven to 12 months: 20 mcg/day; males and females, one to three years: 20 mcg/day; four to eight years: 30 mcg/day; nine to 13 years: 40 mcg/day; males, over 14 years: 55 mcg/day; females, over 14 years: 60 mcg/day; pregnant and lactating women: 70 mcg/day.

The amount of selenium in the diet is influenced by its level in the soil. Most selenium is absorbed from food products, whether plants grown in the soil or animals that have eaten the plants. Much of the selenium in foods is lost during processing. About 60% of dietary selenium is absorbed as food passes through the intestines. Selenium leaves the body in the urine and feces; males also lose some selenium through ejaculation of semen. Selenium levels in soil vary widely, not only in different countries but also across different regions. For example, in the United States, the western states have higher levels of selenium in the soil than the eastern states. South Dakota has the highest rates of soil selenium in the United States, while Ohio has the lowest.

Foods that are high in selenium contain the element in an organic form, selenomethionine or selenocysteine. This form of selenium is considerably less toxic than inorganic compounds of selenium or elemental selenium. Good sources of selenium include brewer's yeast, **wheat germ**, wheat bran, **kelp** (seaweed), shellfish, Brazil nuts, barley, and oats. Onions, **garlic**, mushrooms, broccoli, and Swiss chard may contain high amounts of selenium if they are grown in selenium-rich soil. Selenium is also present in drinking water in some parts of the world and can be added to drinking water as a health measure. Nursing mothers should note that human milk is much richer in selenium than cow's milk.

There is no widely recognized deficiency syndrome for selenium, unlike the syndromes associated with calcium or magnesium (hypocalcemia and hypomagnesemia, respectively). However, many researchers who have investigated Keshan disease (also known as Kashin-Beck disease), a form of **heart disease** in children, believe that it is caused by selenium deficiency. The disease can be prevented but not cured with supplemental selenium; it responds to treatment with 50 g per day. The symptoms of Keshan disease, which is named for the region of China where it was discovered, include enlargement of the heart and congestive heart failure. The soil in the Keshan region is low in selenium. The researchers observed that the local Chinese treat Keshan disease with **astragalus** (*Astragalus membranaceus*), a plant that absorbs selenium from the soil.

Selenium toxicity was a matter of controversy in the late 2000s. Humans can show symptoms of selenium toxicity after doses as low as 1 mg of sodium selenite, the element's most common inorganic compound in nature. By contrast, some researchers speculate that the organic forms of selenium may accumulate in the body and interfere with the functioning of **sulfur** molecules in the body or that they may cause genetic mutations. These longstanding questions await further research. In addition, researchers disagree about how much selenium will produce symptoms of toxicity. It has been suggested that toxicity can result from a daily intake of 2 mg in people who already have body stores of 2.5 mg of selenium or higher. Another measurement suggests that selenium toxicity may occur wherever the food or water regularly contains more than 5 to 10 parts per million of selenium. Patients with symptoms of selenium toxicity usually have blood plasma levels of 100 g/dL or higher, which is about four times the upper limit of normal levels.

The symptoms of selenium toxicity are not always clearly defined. People living in areas of selenium-rich soil sometimes develop heart, eye, or muscular problems. Eating foods containing high amounts of selenium over a long period of time increases the risk of tooth decay. It is thought that the selenium may compete with the fluoride in teeth, thus weakening their structure. Other symptoms associated with high levels of selenium include a metallic taste in the mouth, garlic-like breath odor, **dizziness**, **nausea**, skin inflammation, **fatigue**, and the loss of hair or nails. The symptoms of acute selenium poisoning include **fever**, kidney and liver damage, and eventual death.

Internal medicine

Selenium is most widely recognized as a substance that speeds up the metabolism of fatty acids and works together with **vitamin E** (tocopherol) as an antioxidant. **Antioxidants** are organic substances that are able to counteract the damage done to human tissue by oxidation (the breakdown of fatty acids). Selenium's antioxidant properties have been studied with respect to several diseases and disorders. In addition, selenium appears to work as an anti-inflammatory agent in certain disorders.

CARDIOVASCULAR DISEASES. Low levels of selenium have been associated with high risk of heart attacks and strokes. It is thought that the antioxidant properties of selenium can help prevent **atherosclerosis** (narrowing and hardening of the arteries) by decreasing the formation of fatty deposits in the arteries. It does so by soothing the inflamed arterial walls and binding the free radicals that damage the tissues lining the arteries. Other studies indicate that selenium reduces the symptoms of **angina** pectoris.

CATARACTS. **Cataracts** contain only one-sixth as much selenium as normal lens tissue. The healthy lens requires adequate levels of three antioxidant enzymes: superoxide dismutase, catalase, and **glutathione** peroxidase. Glutathione peroxidase in the human eye is dependent on selenium, which suggests that a selenium deficiency speeds up the progression of cataracts.

CANCER. Low dietary levels of selenium have been associated with an increased incidence of **cancer**. Cancers of the respiratory system and the gastrointestinal tract seem to be especially sensitive to the level of selenium in the body. In one study, patients with histories of **skin cancer** were given 200 g of selenium per day. Results indicated that the patients had a reduced incidence of rectal, prostate, and lung cancers as well as a lower rate of mortality from all cancers. In addition, cervical dysplasias (abnormal growths of tissue) in women are associated with low levels of selenium in the women's diet. In animal studies, as little as 1–4 parts per million of selenium added to the water or food supply is associated with a decreased incidence of cancer. As of 2008, it was not known, however, exactly how selenium protects against cancer. Some researchers believed that it may prevent mutations or decrease the rate of cell division, particularly on the outer surfaces of the body. One study of the effects of a selenium compound on mammary tissue indicated that selenium may inhibit the growth of tumors in deeper layers of tissue, not just cancers arising from the epithelium.

Some researchers have explored the possibility that selenium may reduce the risk of **prostate cancer**. As of 2008, studies on the question were inconclusive, with the best evidence pointing to the element's effectiveness among certain groups of men, but not in males in general.

PERIODONTAL DISEASE. Selenium appears to speed up the healing of fragile gum tissue as well as opposing the actions of free radicals, which are damaging to gum tissue.

RHEUMATOID ARTHRITIS. Selenium may be useful for treating several autoimmune diseases, especially lupus and **rheumatoid arthritis** (RA). It has been found that patients suffering from RA have low selenium levels. Selenium is necessary for production of the enzyme glutathione peroxidase, which reduces the production of inflammatory substances in the body (prostaglandins and leukotrienes) as well as opposing free radicals. Although supplemental selenium by itself has not been shown to cause improvement in RA, selenium taken together with vitamin E appears to have measurable positive results.

OSTEOARTHRITIS. Research indicates that selenium is beneficial in the prevention and treatment of **osteoarthritis** (OA), particularly OA resulting from physical wear and tear or structural problems in the patient's joints. Selenium supplements are even more effective when given together with vitamins in treating OA.

Preparations

Selenium is available in topical preparations and as a dietary supplement.

External preparations

Selenium sulfide for the treatment of dandruff is available as over-the-counter (OTC) scalp preparations or shampoo containing 1% or 2.5% solutions of the drug. A topical 2.5% solution of selenium sulfide is available for the treatment of tinea versicolor. Common trade names include Exsel, Selsun, and Selsun Blue.

Dietary supplements

Selenium is widely available in vitamin/mineral dietary supplements and in nutritional antioxidant formulas. Although the average diet supplies enough selenium, some naturopaths recommend daily supplements of 100–200 mcg for adults and 30–150 mcg for children. Sexually active males are advised to take higher doses. Some naturopaths recommend taking selenium together with vitamin E on the grounds

that their combined effect is greater than the sum of their individual effects. As of 2008, there were no definitive studies on the positive effects on health of selenium taken as a dietary supplement.

Precautions

Topical preparations

Persons using selenium compounds to control dandruff or tinea versicolor should be careful to avoid applying the product to damaged or broken skin. In addition to irritating skin, selenium can enter the body through broken skin. This process, known as percutaneous absorption, can cause selenium toxicity if the preparation is used for a long period of time. Patients should wash their hands carefully after applying the selenium product to affected areas. Doing so will minimize absorption through small breaks in the skin of the hands.

Nutritional supplements

It is difficult to assess the effectiveness of dietary supplements containing selenium because as of the late 2000s there was little agreement on standards for interpreting selenium levels in human blood. Depending on their intake, healthy adults may have blood plasma levels of selenium in the range of 8–25 mcg/dL. In addition, most of the selenium in the body is not carried in the blood but is stored in tissue. Analysis of hair has not been useful in measuring selenium. In the absence of a useful test, people who wish to take supplemental selenium should first find out whether they live in an area that already has high levels of selenium in the drinking water and soil. Most people probably do not need more selenium than is in standard vitamin/mineral supplements. In addition, the body seems to utilize selenium more efficiently when it is taken together with vitamin E.

Side effects

The side effects of contact with compounds containing selenium sulfide include stinging of the skin, irritation of the lining of the eyes, hair discoloration or loss, and oily scalp. Both topical products and megadoses of selenium taken by mouth can cause selenium toxicity. The symptoms of selenium toxicity include nausea, **vomiting**, tiredness, abdominal **pain**, a garlicky breath odor, and the loss of hair and fingernails. These symptoms usually last 10–12 days after the selenium preparation is discontinued.

KEY TERMS

Antioxidant—A substance that works to counteract the damage done to human tissue by the breakdown of fatty acids. Dietary antioxidants include beta-carotene and vitamins C and E as well as selenium.

Epithelium—The layer of tissue that covers body surfaces and lines the inner surfaces of body cavities and hollow organs.

Free radical—A highly reactive molecule that binds to and destroys compounds in tissue cells. Most free radicals in the human body are produced in the body, while others come from the environment and foods.

Glutathione peroxidase—An enzyme that functions as an antioxidant, in the activation of other enzymes, and in the transport of minerals and amino acids. Human glutathione is dependent on selenium.

Keshan disease—A form of heart disease in children, first discovered in the Keshan region of China. It may represent a selenium deficiency syndrome.

Percutaneous absorption—The process by which certain strong medications, such as selenium compounds, can enter the body through the skin.

Trace element—An element that is required in only minute quantities for the maintenance of good health. Trace elements are also called micronutrients.

Interactions

Topical preparations containing selenium may interact with the metals in costume jewelry. Patients should remove all their jewelry before applying the shampoo or lotion.

With regard to dietary supplements, there is some evidence that **vitamin C** inactivates selenium within the digestive tract. Persons who are concerned about their selenium intake may prefer to take supplemental selenium in the absence of vitamin C. As with all supplement use, consultation with a healthcare professional is advised.

Resources

BOOKS

Mann, Jim, and Stewart Truswell, eds. *Essentials of Human Nutrition*, 3rd ed. New York: Oxford University Press, 2007.

Surai, Peter. *Selenium in Nutrition and Health*. Nottingham, UK: Nottingham University Press, 2006.

PERIODICALS

Cheung, Eric, et al. "Diet and Prostate Cancer Risk Reduc tion." *Expert Review of Anticancer Therapy* (January 2008): 43 50.

Kalantari, Parisa, et al. "Nutritional Control of HIV AIDS: A Case for Selenium." *American Journal of Infectious Diseases* (October 2007): 195 201.

"Selenium May Increase Type 2 Diabetes Risk." *Inpharma* (September 22, 2007): 16.

Williams, Rebecca. "Acute Selenium Toxicity: Australia's Second Fatality." *Pathology* (April 2007): 289 290.

Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Senior nutrition

Definition

Senior **nutrition** addresses the special dietary requirements of the elderly. Although wise food choices and a balanced diet are essential for older adults to maintain a healthy lifestyle and to promote longevity, there are various obstacles that prevent or limit seniors from practicing and benefiting from good eating habits. Such obstacles include loneliness, **depression**, economic concerns, lack of cooking skills or desire to cook, inadequate nutritional knowledge, reduced capacity to absorb and utilize nutrients, oral/dental problems and difficulty in chewing, loss of appetite, and eating/nutrient complications due to the use of various medications. In addition, older adults need certain vitamins and nutrients to aid in the maintenance of their health.

Origins

After age 50, adults experience significant reduction in metabolism (the rate at which the body **burns** energy) and changes in physiology that significantly affect their nutritional needs. These changes are often significant; for example, the metabolic rate of an individual can decline as much as 30% over the lifetime. These changes often call for decreased-calorie **diets**, but there are many complications that can affect a senior's balance of food intake and energy needs.

Aging causes a decrease in lean tissue mass and an increase in body fat. These changes are significant because an older person utilizes dietary protein less efficiently and may need more than the recommended amount of high-quality protein to maintain lean tissue mass. Lean muscle mass can decrease by as much as 25%, accompanied by an increase in body fat. Complications may also arise because of

Recommended amount of calories for adults over the age of 50

	Low physical activity	Moderate physical activity	High physical activity
Men	2,000	2,200-2,400	2,400-2,800
Women	1,600	1,800	2,000-2,200

Suggested daily servings from the major food groups

Grains	5-10 ounces (with at least three oz. from whole grains)
Vegetables	2-3 1/2 cups, with a variety of color and type
Fruits	1 1/2 to 2 1/2 cups
Milk, yogurt, cheese	3 cups of milk (1 cup of yogurt, 1 1/2 to 2 oz. of cheese, or 2 cups of cottage cheese are equivalent to one cup of milk)
Meat, poultry, fish, dry beans, eggs, nuts	5-7 oz. of lean meat, poultry or fish (1/4 cup of cooked beans or tofu, 1 egg, 1/2 oz of nuts or seeds, or 1 tablespoon of peanut butter are equivalent to one ounce of meat.

Selecting the smallest serving amounts will result in 1,600 calories per day; the largest servings will add up to approximately 2,800 calories.

(Illustration by Corey Light. Cengage Learning, Gale)

Senior nutrition

Health risks of underweight older adults

- Constipation
- Decreased immunity
- Decreased muscle strength
- Hypothermia (lowered body temperature)
- Osteoporosis (bone loss)
- Poor memory

Health risks of overweight or obese older adults

- Coronary heart disease
- High blood cholesterol
- High blood pressure
- Gallbladder disease
- Some types of cancer
- Stroke
- Type 2 diabetes

SOURCE: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services

(Illustration by GGS Information Services. Cengage Learning, Gale)

age-related digestive problems, oral/dental problems, and eating/nutrient problems related to medication. Other complicating factors for the elderly include loneliness, depression, economic concerns, and lack of cooking skills and nutritional knowledge (such as eating too many processed/refined foods of low nutritional value). These factors often result in seniors under-consuming the proper foods to meet their energy and nutrient requirements and can lead to weakness, chronic **fatigue**, and a weakened immune system.

Benefits

Nutritional studies have clearly demonstrated that sound dietary habits adopted by seniors can promote longevity and reverse some of the effects of aging, reduce the risks and severity of illness and disease, increase overall levels of wellness and vitality, and improve quality of life.

The three leading causes of death among adults are **heart disease**, **stroke**, and **cancer**. Diabetes, **atherosclerosis**, and liver disease are also in the top ten causes of human mortality. All of these diseases have been correlated with dietary habits and alcohol intake, and research has shown that these and many other diseases can be reversed or eliminated through dietary and lifestyle changes. Seniors, who face the most risk from these diseases, can therefore greatly benefit from healthy nutritional practices, especially if they are initiated early in life.

Description

Nearly 90% of Americans above age 65 have one or more degenerative disorders (diseases that develop over time), including heart disease, cancer, arthritis, diabetes, and **osteoporosis**. Once considered diseases of old age, these conditions were later seen as lifestyle-related diseases, which means that changes in habits, including diet, can significantly reduce their risks. For instance, Dean Ornish, a California cardiologist, demonstrated that heart disease could be reversed by a low-fat, vegetarian diet combined with **exercise** and **stress** reduction techniques such as **meditation** and **yoga**. Furthermore, it has been strongly demonstrated that improper diet is directly correlated with disease and premature aging. **Obesity**, for example, shortens life expectancy and increases the risk of diabetes, **hypertension**, and heart disease. For seniors, it is never too late to adopt informed nutritional practices to improve health and chances for longer, healthier life.

Longevity studies (in which researchers attempt to determine the behaviors that contribute to long life in human populations) have shown that moderation is a key component to a life-extending diet. In the longest-living people, stability of overall body weight—in which people remain consistently at no more than 5% under their ideal weight or no more than 10 to 20% overweight—implying moderation of diet, has been found to be very important. Moderation of alcohol intake, meaning no more than two drinks per day, is also important, as is eating breakfast every day. As people age and metabolism slows, it easier to gain weight and harder to lose weight after it is put on. This underscores the importance for seniors to adopt diets that reduce large fluctuations in weight.

In the marketplace of dietary knowledge, the numerous fads and claims can be extremely confusing for the conscientious eater. For instance, there are diets that restrict fats and favor carbohydrates, such as the **Ornish diet** mentioned above. Then there are diets that restrict carbohydrates and recommend higher amounts of fats and proteins to be consumed, such as the **Atkins diet** that was very popular into the early 2000s. The confusion can be compounded by the fact that different people and different age groups, including seniors, have different dietary requirements and tastes.

Within the alternative healthcare model, there are many diets that have been shown to improve health. These include **vegetarianism**, **veganism**, the Ornish diet, macrobiotics, the **Mediterranean diet**, juicing, the raw food diet, and others. Seniors may not have the time or energy to experiment with various diets

until finding a satisfactory one, nor is it advisable that seniors enforce strict guidelines that might take the pleasure and freedom out of eating and preparing food. Nutrition is made easier within the alternative healthcare model because there are simple principles that can be applied to make any senior's diet more nutritionally sound.

An alternatively healthy diet for seniors contains a wide variety of fresh fruits and vegetables, whole grains, and legumes (peas, lentils and beans, including soybeans and soy products), and is moderate in the consumption of animal products, including meat, eggs, and dairy products. In this diet, the majority of daily calories, or energy, comes from fruits, vegetables, whole grains, legumes, and nuts and seeds, all plant sources. This plant-based diet is naturally high in fiber, which is important for seniors because fiber assists in the digestive process, which is slower and more sensitive in the elderly. Eating fiber also lowers blood **cholesterol**. A sound senior diet also contains adequate protein, derived primarily from vegetable and low-fat animal sources; avoids the intake of saturated fat, which raises cholesterol levels in the blood; and emphasizes the careful intake of healthy fats.

In the alternative healthcare model, there are general principles that make dietary choices easy and uncomplicated, which in itself is important for the elderly. First, food should be as fresh and in as close to its natural state as available. Fresh and natural food contains the highest amount of life energy, sometimes known as *chi* or *prana,* which can be lost when food is overly processed, overcooked, or stale. Furthermore, fresh food, such as fresh fruits and vegetables, contains no harmful food additives and no added ingredients such as sugar and fat, both of which should be moderated by seniors. Fresh and natural foods are also more nutrient dense than processed foods, which means that they contain more vitamins and minerals for the same amount of calories. This is particularly important for seniors, who should strive to maximize the intake of nutrients while maintaining consistent body weight and not consuming more calories than are needed. Foods that contain empty calories—that is, calories without other nutrients, such as foods that are high in sugar or junk foods—should be limited in the diet.

More and more health-conscious people have turned to the alternative of juicing fresh vegetables and fruits as a healthy supplement to daily meals because they provide concentrated essential nutrients, vitamins and minerals, that the body does not have to first chew and digest. This process requires the purchase of a juicer, the price for which runs from $100 to $500.

Another principle within the alternative health model is the holistic view of the world. Humans are connected to the whole living system of the earth. Food choices that are healthiest for the individual would also be healthiest for the earth, and likewise, keeping the earth's living system healthy improves the health of the human population. It has been estimated that worldwide 33% of all disease is related to environmental degradation. Thus, organically grown foods are the healthiest choice for consumers. The production of those foods is safest for people and the environment because they contain no toxic chemicals. Healthy fresh **organic food** choices also eliminate unnecessary packaging and artificial ingredients. Healthy choices also emphasize locally grown foods, which reduce transportation and refrigeration. Finally, eating seasonal fruits and vegetables keeps the diet aligned with the natural rhythm of the seasons.

Food can be broken down into the categories of carbohydrates, fats, and proteins, and nutritional science attempts to determine the optimal quantities of each in the diet. Some diets are very rigorous about the measurement of overall calories and exactly how many carbohydrates, fats, and proteins should be included, but general dietary guidelines should suffice for most seniors.

Carbohydrates are a basic energy source found in foods and can provide up to 70% of daily calories in a senior's diet. The simplest carbohydrates are sugars, such as those found in fruits, honey, table sugar, and corn syrup, while complex carbohydrates are found in whole grains and legumes and other plant and animal sources. Small amounts of sugar are not unhealthy, although sugar is no substitute for nutrient-rich foods. A piece of fresh fruit, for instance, would be a far better choice for a sweet tooth than a soft drink. Sugar can be a factor in tooth decay and obesity, which can lead to heart disease, diabetes, hypertension, **gallstones**, back problems, and arthritis. Complex carbohydrates are a healthier source of energy and fiber, and whole grains, pastas, breads, beans, cereals, fruits, and vegetables are recommended to supply them in the diet.

Seniors should pay close attention to the amount and type of fat in the diet. The Ornish diet, shown to reverse the effects of heart disease, recommends no more than 10% of all calories coming from fat, and cautions against any saturated fats, or those fats that are present mainly in meat and dairy products as well as in tropical oils such as palm and coconut oils, and some nuts and seeds. Some seniors may not need to be this stringent about fats in the diet, but just getting fat content down to 20 to 30% of total calories will reduce

the risks of disease and improve overall health. Generally, for seniors, saturated fats should be greatly reduced and avoided as much as possible. The best fats to consume are generally from plant sources, such as olive oil and canola oil, which are the healthiest choices for cooking oils, and occasional use of avocados, nuts, seeds, and nut butters. Clarified butter (ghee) is a substitute for butter, which contains high amounts of saturated fat and should be avoided.

Seniors should also take care to get plenty of **essential fatty acids** (EFAs) in the diet, particularly omega-3 EFA and omega-6 EFA, important nutrients for the elderly and essential fats for the body. Omega-3 EFA is found in cold-water fish such as salmon and mackerel as well as in walnuts, **wheat germ**, and **flaxseed**. EFAs can also be obtained in nutritional supplements such as **evening primrose oil**, wheat germ oil, **borage oil**, flaxseed oil, and hemp seed oil.

Finally, seniors should take care to avoid the consumption of trans-fatty acids (TFAs). These are artificial fats that are created during industrial cooking processes and have been widely implicated in heart disease and atherosclerosis. These unhealthy oils are found in some margarine, vegetable shortening, and partially hydrogenated oils, which are present in many processed foods. Deep-fried foods should also be avoided, which contribute these unhealthy fats to the diet. By paying close attention to ingredients and then avoiding partially hydrogenated oils, seniors can avoid many unhealthy foods.

Proteins are the basic building blocks used by the body. Americans in general consume more protein than is required, and the excess consumption of red meat, dairy products, and eggs, all high in saturated fats, contributes to the prevalence of many degenerative diseases. Seniors should be careful not to eat too much protein, particularly from meat, dairy, and egg sources. Excess protein in the diet can stress the digestive system, liver, and kidneys, and also contribute to the development of osteoporosis, or weakness of the bones due to **calcium** loss, a condition afflicting many seniors, particularly women. Two to four ounces (57–113 g) of protein per day is sufficient for most seniors, which would be a piece of lean meat the size of a deck of cards, or a couple servings of soy or beans. Healthy sources of protein include legumes, tofu, nuts and seeds, low-fat dairy products, fish, egg whites, and lean meats. Soy products are an excellent addition to the senior diet, providing high-quality and low-fat protein while containing several age-protective nutrients.

Other dietary habits can help seniors optimize nutrition. Sound diets contain a variety of wholesome foods. At least five servings per day of fruits and vegetables are recommended. Variety is important to provide a full range of vitamins and minerals and helps seniors avoid eating too much of any food that may not be the healthiest. Furthermore, seniors should strive to eat less rather than more at mealtime and to stop eating while still slightly hungry. Overeating inhibits digestion and causes weight gain, which healthy seniors avoid doing. Regular exercise also contributes to sound nutrition by improving metabolism and digestion and thus the absorption of nutrients by the body. Food choices should not inhibit seniors' autonomy and freedom, but enhance them. Food preparation should emphasize taste and the pleasure of eating. Seniors should also drink plenty of fresh, clean water as part of their diet. Spring water or filtered water is best, and up to eight glasses per day is recommended. Drinking plenty of water prevents dehydration (which can lead to low blood pressure, heat stroke, **nausea**, dryness of mouth, **vomiting**, and **constipation**), improves digestion, and helps the body flush out impurities. **Green tea** is a healthy substitute for coffee, as it contains an antioxidant shown to have anti-aging effects as well as less **caffeine**.

Caffeine is really a drug with many unhealthy side effects. Although it acts quickly on the central nervous system, resulting in almost immediate increased mental clarity and energy, caffeine accumulates in the fat tissues of the body and can lead to nervousness, exhaustion of the adrenal gland, important vitamins and minerals being leeched from the body, increased acidity in the gastrointestinal tract, and it can dangerously increase heart and blood pressure rates when consumed with decongestants or bronchodilators. It is considered by some doctors to be implicated in hypertensive heart disease. Medical schools and journals have linked excessive caffeine consumption to benign breast disease, prostate problems, cancer of the bladder and lower urinary tract, and **heart attack**.

Nutritional and Herbal Supplementation

Seniors can inform and avail themselves of the many nutritional and herbal supplements available for specific health problems by consulting alternative physicians—medical doctors, osteopaths, naturopaths, homeopaths, chiropractors—and herbalists for recommendations. Many physicians who primarily practice conventional medicine can also provide a variety of information about herbs and supplements. Seniors can consult many books on vitamins, minerals, and nutritional/herbal supplements, and a great deal of information on this subject is available on the Internet.

Senior nutrition includes two additional ways in which the elderly can fulfill their nutritional requirements. Although there is ample evidence that a varied and plant-based diet consisting of fresh fruits, vegetables, whole grains, legumes, and moderate amounts of animal products prolongs life expectancy and improves overall health, informed use of nutritional supplements can add extra protection and support for the mature body in the aging process and herbal supplements can be safely used to support the treatment of age-related illnesses and as general health tonics.

It should again be noted that there is general acceptance that the best way for seniors to get plenty of nutrients is through a varied diet because supplements cannot make up for a diet that is not nutritionally balanced in the first place; that nutrients from food sources are more efficiently utilized by the body; that seniors should try to add natural foods to their diets that are high in nutrients known or recommended to help in the treatment of certain disease or degenerative conditions; and that nutritional supplements can then be properly used to supply any extra support or protection that seniors may need.

Generally if a senior is eating a balanced, healthy diet over 1,200 calories a day, vitamin-mineral supplement may be unnecessary. However, some physicians feel much food is grown in soil depleted of nutrients and a high quality, broad spectrum multivitamin and mineral supplement, taken once per day, is recommended to seniors to supplement their diets by providing a range of nutrients. It should contain the B vitamins, B_6 and B_{12}, and **folic acid**, which may help prevent heart disease, and the minerals **zinc** and **copper**, which aid immunity. Some nutritionists advise that seniors should take a multi vitamin/mineral supplement that provides no more than 100% of the recommended daily allowance (RDA), and caution against taking one nutrient by itself because nutrients interact with each other and single-dose nutrient interaction can be harmful, even toxic, and may actually cause a deficiency of another nutrient.

In addition to a multivitamin, many health professionals, however, advise seniors to add **antioxidants** to their supplementation routine. These include **vitamin A** (or **beta carotene**), **vitamin C**, **vitamin E**, and the mineral **selenium**. Antioxidants may have several positive effects on the body, such as slowing the aging process, reducing the risks of cancer and heart disease, and reducing the risks of illness and infection by supporting the immune system.

Coenzyme Q_{10} is an antioxidant that was gaining use as of 2008 by the elderly, as it may retard aging, improve the health of the heart and reduce the effects of heart disease, help lower blood pressure, aid in treatment of periodontal disease, help lower blood pressure, and aid in the prevention of toxicity from drugs used to treat many diseases associated with aging.

Essential fatty acids, particularly omega-3, are also recommended for seniors, as, according to Andrew Weil, author of *Spontaneous Healing,* "they appear to reduce inflammatory changes in the body, protect against abnormal blood clotting, and, possibly, protect against cancer and degenerative changes in cells and tissues."

Calcium supplementation is recommended for the elderly, particularly for women, to strengthen bones and prevent bone loss. Also, the senior stomach may secrete less hydrochloric acid, the enzyme involved in food digestion, which may reduce the amount of calcium that is absorbed. Calcium supplements that are balanced with **magnesium** have less constipating effect and are better absorbed.

Another nutrient concern is sufficient intake of **iron**. Many sources of iron need to be eaten to meet the need for it. While the best source or iron is meat, people can also get iron from whole grains, cooked dry beans, and some fruits and vegetables. Vitamin C aids absorption of iron, so vitamin C foods such as citrus fruits, greens, and tomatoes should be included in the same meal with iron.

The supplement **glucosamine** sulfate together with **chondroitin** and MSN may be useful for seniors with joint problems and **pain**.

Natural sources of fiber, such as **psyllium** seed husks, may be used by those seniors who need added fiber in their diet.

There are many herbs that support vitality and health in old age. In Chinese medicine, ginseng is the fabled elixir of youth, and **astragalus** and ginkgo are also recommended to the elderly. Ginkgo has been shown to enhance memory and brain function. **Grape seed extract** and **pine bark extract** (pycnogenol) are herbal derivatives that have powerful antioxidant, and thus anti-aging, effects in the body. In the Ayurvedic or traditional East Indian system, **ashwaganda** and **gotu kola** are herbs prescribed for their rejuvenating effects on the elderly, and **triphala** is used to improve digestion and as a mild laxative. Seniors can inform themselves of the many herbs available for specific problems and also consult alternative physicians and herbalists for recommendations on herbal supplements.

KEY TERMS

Arthritis—An inflammatory condition affecting joints.

Atherosclerosis—Disease characterized by hardening and narrowing of the arteries, leading to strokes and heart disease.

Cancer—A disease caused by uncontrolled abnormal cell growth.

Carbohydrates—Digestible sugars and starches in food that are the major sources of energy.

Chi—Basic life energy in Chinese medicine system, contained in food, air, and water.

Diabetes—Lack of the hormone insulin leading to uncontrolled carbohydrate metabolism.

Fats—Long chains of fatty acids that are stored in animal tissue.

Macrobiotics—A diet emphasizing grains, certain vegetables, legumes, and fish.

Osteoporosis—A reduction in the amount of bone mass leading to fractures after minimal trauma.

Prana—Basic life energy, found in food, air, and water, as defined in the East Indian Ayurveda and yoga philosophies.

Proteins—Organic compounds of amino acids in vegetable and animal matter.

Saturated fat.—A fatty acid that is totally hydrogenated (chemically bound) and holds the greatest risk for development of atherosclerosis.

Stroke—A blood clot or blood vessel bursting and interrupting blood flow to the brain, which may cause coma, paralysis, speech problems, and dementia.

Vegetarianism—The theory or practice of living only on vegetables and fruits.

Vegan—A vegetarian who excludes animal products from the diet and from other uses.

Resources

BOOKS

Bales, Connie Watkins, and Christine Seel Ritchie, eds. *Handbook of Clinical Nutrition and Aging*. Totowa, NJ: Humana Press, 2003.

Dangour, Alan, Emily Grundy, and Astrid Fletcher, eds. *Ageing Well: Nutrition, Health, and Social Interventions*. Boca Raton, FL: CRC Press, 2007.

PERIODICALS

Vegetarian Times. http://www.vegetariantimes.com (April 23, 2008).

OTHER

Vegetarian Resource Group. http://www.vrg.org (April 23, 2008).

ORGANIZATIONS

Center for Science in the Public Interest, 1875 Connecticut Ave. NW, Suite 300, Washington, DC, 20009, (202) 332 9110, http://www.cspinet.org.

National Institute on Aging, Building 31, Room 5C27, 31 Center Drive, MSC 2292, Bethesda, MD, 20892, (301) 496 1752, http://www.nia.nih.gov.

United States Administration on Aging, 330 Independence Ave. SW, Washington, DC, 20201, (202) 619 0724, http://www.aoa.gov.

United States Department of Agriculture Food and Nutrition Information Center, 10301 Baltimore Ave., Department of Agriculture, Beltsville, MD, 20705 2351, (301) 504 5719, http://www.nal.usda.gov/fnic/.

Douglas Dupler
Ruth Ann Carter
Helen Davidson

Senna

Description

Senna, *Cassia angustifolia*, is known by the name Egyptian senna. A member of the Leguminaceae family, senna is a shrub-like plant whose leaves and pods have been used for centuries in the East and West as a purgative. This property of senna was first described in the ninth century A.D. by Arabian physicians in the service of the caliph of Baghdad. Senna's reputation as a powerful laxative has grown through the ages. Today, senna can be found as an ingredient in many over-the-counter laxative products in the United States. Senna is also considered an important herb in **traditional Chinese medicine** and Indian Ayurvedic and unani medicine. The two species used most often for medicinal purposes are Alexandrian senna and Tinnevelly senna. The Alexandrian variety is obtained mainly from Egypt and the Sudan. Tinnevelly senna is primarily cultivated in India.

Senna contains naturally occurring chemicals called anthraquinone glycosides. They are strong stimulant laxatives that soften stools and increase muscle contractions of intestine, thereby increasing bowel movements. "Like **aloe**, **buckthorn**, and cascara sagrada, senna contains anthraquinone glycosides, chemicals that stimulate the colon," reports James A. Duke, Ph.D. Senna usually starts to work in three to nine hours. Anthraquinone laxatives, such as senna, are believed to alleviate **constipation** by increasing the

Senna (Cassia angustifolia). *(© Holt Studios International Ltd. / Alamy Ltd / Alamy)*

amount of water and electrolytes in the intestine. They also work by stimulating contractions of the colon muscles, which help to accelerate the passage of stool. Senna is considered among the strongest of the anthraquinone laxatives. Its effectiveness as a purgative has been supported by centuries of anecdotal reports as well as modern human and animal studies.

General use

Senna is widely accepted as a stool softener and a short-term treatment for constipation. Senna leaf is approved by the World Health Organization (WHO) for short-term use in occasional constipation. Senna is also approved in the United States and in European countries as an ingredient in over-the-counter and prescription laxative preparations. The herb is approved by the German government for any condition in which alleviating constipation or softening stools is desirable. Senna may be recommended for people with hemorrhoids, anal fissures, or those undergoing surgery involving the abdomen, anus, or rectum. Senna may also be used to clear the bowel in order to improve the visibility of abdominal organs during an ultrasound procedure.

Clinical studies in the United States and abroad involving various age groups suggest that senna is effective in managing constipation associated with a number of causes including surgery, childbirth, and use of narcotic **pain** relievers. A study in the medical journal *Diseases of the Colon and Rectum* showed that senna was able to prevent or treat postoperative constipation after proctologic surgery. The *South African Medical Journal* shows that treatment with senna was successful in 93%-96% of women suffering from postpartum constipation. By comparison, only 51%-59% of women in the placebo group experienced relief. Senna is considered to be one of the more effective agents for relieving constipation caused by narcotic pain relievers such as morphine. In another study, published in the *Journal of Pain and Symptom Management*, researchers recommended the use of senna in terminal **cancer** patients with opiate-induced constipation, citing the effectiveness of the herb and its relatively low cost. A study published in the medical journal *Pharmacology* suggests that a combination of senna and bulk laxatives can alleviate chronic constipation in geriatric patients.

KEY TERMS

Albuminuria—The presence of high levels of the protein albumin in the urine.

Electrolytes—Substances in the blood, such as sodium and potassium, that help to regulate fluid balance in the body.

Hematuria—The presence of blood in the urine.

Lazy bowel syndrome—An inability to have a bowel movement without the aid of chemical laxatives.

Licorice root—An herb believed to be helpful in treating ulcers, respiratory problems, and a variety of other conditions.

Purgative—A substance that encourages bowel movements.

Stimulant laxatives—Powerful laxatives that increase the frequency of bowel movements by stimulating muscle contractions that accelerate the passage of stool.

Preparations

The recommended dosage of senna, which is generally taken at bedtime, ranges from 0.6-2.0 g a day. Tablets, syrups, oral solutions, and other medications that list senna as an ingredient usually contain standardized amounts of the herb and its active agents. People who choose to prepare senna using unprocessed leaves or pods may have difficulty determining exact dosages. No matter which form or preparation of senna is chosen, using the lowest effective dosage helps to avoid side effects.

Consumers who wish to brew a medicinal tea from unprocessed senna should use 1-2 tsp of the dried leaves of the herb per cup of boiling water and let it steep for about 10 minutes. Senna is generally considered to have an unpleasant taste, so adding sugar or honey to the mixture may help to make it more palatable. **Anise**, **ginger**, chamomile, coriander, **fennel**, and **peppermint** can also be added to the tea to improve its taste and to reduce **gas** and cramping. Up to one cup of senna tea a day is recommended to alleviate constipation. It should not be taken for longer than one or two weeks.

Precautions

Senna and other stimulant laxatives should not be used for longer than two to four weeks without medical supervision. Using senna longer than recommended can result in lazy bowel syndrome and permanent damage to the intestinal lining. Chronic use or misuse can also cause electrolyte and fluid imbalances, which can have adverse effects on the heart. To prevent or treat constipation, most doctors recommend making dietary changes or trying milder, bulk-forming laxatives such as **psyllium** before using senna or other anthraquinone purgatives. Dietary approaches involve eating a high-fiber diet, drinking six to eight glasses of water a day, and getting plenty of regular **exercise**.

Unless otherwise indicated by a doctor, senna should not be used by anyone with an intestinal obstruction, stomach inflammation, or intestinal inflammatory diseases such as Crohn's disease, colitis, **irritable bowel syndrome**, or appendicitis. Senna should also be avoided by those with undiagnosed abdominal pain. Senna should not be used by children younger than age 12. Senna should not be used by pregnant or breast-feeding women. It may significantly reduce drug absorption and lessen the efficiency of any over-the-counter or prescription medication. Children and seniors, who may be more susceptible to senna's effects, should start with smaller dosages of the herb.

Side effects

Stimulant laxatives such as senna tend to have more side effects than other purgatives, so it is important to take the lowest effective dosage. The side effects of senna include stomach cramps, diarrhea , and gas, which can be severe if the herb is used longer than recommended or in large amounts. The effects of senna can be immediate, sometimes too fast or intense. These problems may be avoided by reducing the dosage and adding other herbs. More serious effects include fainting, dehydration, and electrolyte disorders such as low blood potassium, albuminuria, and hematuria. **Potassium** deficiency can lead to muscle weakness and disorders of heart function. Potassium levels may drop even further if senna is combined with cardiac glycoside medications, diuretics, or corticosteroids. People using diet pills or teas should be sure that if senna is an ingredient they use the products short term (a month or less).

Interactions

Because of its potential effect on potassium levels, senna should not be combined with antiarrhythmic drugs, thiazide diuretics, corticoadrenal steroids, or **licorice** root without the supervision of a doctor.

Resources

BOOKS

Duke, James A,. Michael Castleman, and Alice. Feinstein. *The Green Pharmacy*. Rodale Press, 1997.

Foster, Steven and Varro E. Tyler. *Tyler's Honest Herbal: A Sensible Guide to the Use of Herbs and Related Rem edies*. Haworth, 1998.

Goldberg, Burton. *Alternative Medicine: The Definitive Guide*. Future Medicine Publishing, 1993.

PERIODICALS

Agra, Y. Sacristan and M.A. Gonzalez. "Efficiency of Senna versus Lactulose in Terminal Cancer Patients Treated with Opioids." *Journal of Pain and Symptom Manage ment* (1998) 15(1): 1 7.

Corman, M.L."Management of Postoperative Constipation in Anorectal Surgery." *Diseases of the Colon and Rec tum* (1979) 22(3): 149 51.

"Go for Natural Laxative Relief, but Best if not from Senna or Cascara." *Environmental Nutrition* (May 2002): 7.

Shelton, M.G."Standardized Senna in the Management of Constipation in the Puerperium: A Clinical Trial." *South African Medical Journal* (1980) 57(3): 78 80.

ORGANIZATIONS

American Botanical Council. P.O. Box 144345, Austin, TX 78714 4345. (512) 926 4900. http://www.herbalgram. org.

Herb Research Foundation.1007 Pearl Street, Suite 200, Boulder, CO 80302. (303) 449 2265. Info@herbs.org. http://www.herbs.org.

OTHER

Prevention Magazine. http://www.prevention.com.

Greg Annussek
Teresa G. Odle

Sensory deprivation

Definition

Sensory deprivation, or Restricted Environmental Stimulation Therapy (REST), is a technique by which sensory input (sound, light, smell, etc.) is minimized. This practice encourages an extremely deep level of **relaxation**. REST is typically conducted in a float tank, in which the person is suspended in a solution of warm water and Epsom salt, without sound or light. This relaxation technique produces significant physical and mental benefits.

Origins

In the 1950s, sensory deprivation experiments were conducted to determine the effects of restricted environmental stimulation on mental and physical functions. For 24 hours a day, students were confined to a bed in cramped cubicles with their vision and hearing blocked by various means, such as opaque goggles and u-shaped pillows around their heads. The students' physical and psychological functions quickly deteriorated under these harsh conditions.

In 1954, Dr. John Lilly, a neurophysiologist at the National Institute of Mental Health in Bethesda, Maryland, developed the Floatation Restricted Environmental Stimulation Technique. By suspending a person in water, external stimuli (such as light and sound) were reduced almost completely, but without the harsh conditions of similar experiments.

Dr. Lilly refined his technique between 1960 and 1970, allowing subjects to float freely in an Epsom salt and water solution contained within a dark, soundproof chamber. The solution was warmed to skin temperature so that the person would not react to cold or heat.

From his experiments, Lilly determined that external stimuli such as gravity, light, sound, and touch, accounted for 90% of the central nervous system's workload. Although extended sensory deprivation could be harmful, extended sensory overload could

Sensory deprivation is a technique by which sensory input (sound, light, smell, etc.) is minimized. This practice encourages an extremely deep level of relaxation. *(67Photo / Alamy)*

KEY TERMS

Adrenaline—Also known as the "emergency hormone," adrenaline is produced by the body during times of stress. Excess adrenaline levels can increase blood pressure and heart rate, leading to heart disease.

Cortisol—Also known as the "stress hormone," cortisol is produced by the body during stress. Excess levels of cortisol can lead to a variety of health-related issues.

Endorphin—A natural substance released by the body to relieve fatigue and pain, and bring on a sense of well-being.

Homeostasis—The statch the body has reached its optimal level of internal balance and stability.

Parasympathetic response—A state of deep relaxation and the mechanism by which the body naturally regenerates itself and maintains chemical and metabolic balance.

also have detrimental effects on a person's mental and physical well-being. By reducing excess stimuli appropriately, he could actually lower **stress** levels. Drs. Peter Suedfeld and Roderick Borrie of the University of British Columbia began experimenting on the therapeutic benefits of this technique in the late 1970s. However, they renamed the technique Restricted Environmental Stimulation Therapy (REST) or, more appropriately, Floatation REST.

Since that time, several studies have been conducted on the benefits of Floatation REST, as well as other forms of REST. The consistently positive findings of these studies have led to the incorporation of Floatation REST into physical and mental health care programs, as well as fitness training and professional sports medicine. Currently, floatation centers can be found in major cities in Asia, Australia, Europe, and North America. Individuals can also purchase float tanks for their homes.

Benefits

Floatation REST has many physical and mental benefits because it provides an unparalleled level of relaxation. With the elimination of external stimuli, the central nervous system's workload is reduced by as much as 90%. This reduction focuses a person's energy inward, and promotes relaxation (the parasympathetic response). The parasympathetic response is the mechanism by which the body naturally regenerates itself and maintains chemical and metabolic balance. Old **wounds** and injuries are allowed to heal faster. Increased T-cell production strengthens the immune system. This deep level of relaxation also benefits the cardiovascular system. Known as the vasodilatory effect, the body's circulation is increased while the blood pressure and heart rate are reduced. Furthermore, the elimination of gravity on the body allows muscles and joints to release tension and heal more rapidly. For this reason, people suffering from musculoskeletal and rheumatic conditions greatly benefit from Floatation REST, as can women throughout the length of their **pregnancy**.

As the brain relaxes into a *theta* state, endorphins are released into the bloodstream, reducing **pain** and **fatigue**. The increased endorphin levels also promote a general sense of well-being and happiness and, therefore, increase vitality and further reduce levels of stress and tension. The blood levels of stress hormones such as adrenaline and cortisol are reduced by various body messages, receptor site activity, and organ processes. Combined, these positive effects help reduce the risks of high blood pressure and cardiovascular disease. Stress-related health problems, such as **migraine headache**, **hypertension**, and **insomnia**, are similarly reduced.

The brain, freed of external stimuli, begins working more efficiently. This provides the floater with an accelerated ability to learn, process information, and use his or her creative mind. This increased level of mental performance and concentration can be carried over into daily life. Equally important, Floatation REST can help with eliminating compulsive behaviors such as **alcoholism** and **smoking**. People with psychological and emotional problems, such as **anxiety** and **depression**, can also benefit from this therapy.

An added benefit to Floatation REST stems from the Epsom salts used to provide buoyancy. According to the Archangel Vitamin, Health, and **Nutrition** Center's *Health Newsletter*, Epsom salt "draws toxins from the body, sedates the nervous system, reduces swelling, relaxes muscles, and is a natural emollient (and exfoliative)." Also, because the solution does not leech salt from the skin, the floater's skin will not wrinkle during the treatment.

Description

Modern float tanks are large enough in size and shape to allow a full-sized adult to easily enter, exit, and lie comfortably. The bottom of the light-proof and sound-insulated chamber is filled with a shallow 10–12-in (24.4–31 cm) pool of 30% **magnesium** sulfate (Epsom salt) solution. The density of this solution provides the floater with complete buoyancy and

weightlessness. Indeed, the solution's density makes it impossible for the user to sink.

A float session begins when the tank's door is closed. Light is completely eliminated and sound is reduced to near zero through the combination of the tank's insulation and submersion of the floater's ears. Earplugs can further block outside noises. The air and water within the tank are maintained at a constant skin temperature. This neutral temperature prevents the physical and mental distractions caused by cold and heat. The silky nature of the solution further reduces the separation between the floater's skin and its surroundings, so that the body seems to gradually disappear. The combined elements of the tank, therefore, virtually eliminate all external stimulation for the floater.

Without environmental stimulation to process, the central nervous system's activity drops dramatically, sending the floater into a state of deep relaxation. The body undergoes positive physiological changes that work toward achieving homeostasis—the state of physical equilibrium. Muscular tension is released and proper blood flow is enhanced. Additionally, the body begins to balance any neurochemical imbalances caused by tension and stress. Their is increased production of endorphins and T-cells, which provide pain relief and increased immunity, respectively. In essence, relieved of outward stimuli, the floater's central nervous system can concentrate most of its energies inward for the restoration of physical and mental health.

During a float session, the brain also enters the *theta* state, usually only accessible in the brief moments before falling asleep. This level of consciousness provides access to the right brain, which is associated with concentration, creativity, and learning. The brain can more easily retain information while in the *theta* state.

A typical float session lasts an hour, although longer sessions are available. After the floater rinses off the salt solution in a shower, most float centers provide a rest area to recuperate and reflect on the float session. This downtime with other floaters and staff enhances the relaxation process. In total, the entire session lasts one-and-one-half to two hours. Repeated weekly sessions are suggested to achieve the full benefits of Floatation REST.

Preparations

Persons interested in Flotation REST should consult with the local floatation center before the session. Most centers provide items such as towels, shampoo, soap, and hairdryers for their clients. Bathing suits are not required, and most people float without wearing one. It is recommended that a session be scheduled in advance, to avoid a long wait.

Precautions

People suffering from high blood pressure, **heart disease**, or kidney conditions should consult a physician or family doctor before undergoing Floatation REST. Those who have claustrophobia, certain psychological disorders, or discomfort in the dark, may find the treatment unpleasant.

Side effects

Prolonged exposure to the Epsom salt solution may cause **diarrhea** and dry skin. Otherwise, Floatation REST has no known negative side effects.

Research and general acceptance

Unfortunately, sensory deprivation remains stigmatized by the general public. Many people continue to associate it negatively with the experiments conducted in the 1950s and 1960s. Science fiction movies such as *Altered States* have done little to improve the therapy's public image. For this reason, the term floatation REST is more accurately and commonly used. Floatation centers have begun appearing in cities throughout the world, and are growing in popularity. Studies confirming the positive physical and mental benefits of Floatation REST further enhance their popularity.

Floatation REST has been researched and studied for decades. The positive findings have impressed even those who were once strongly opposed to it. Journalist Michael Hutchinson tried to debunk the therapy but ended up writing what some call the "definitive" book on Floatation REST. Hutchinson says in *The Book of Floating* that "there's no doubt that floatation therapy works—as a therapeutic, educational, and entertainment tool, it has powerful effects on a number of levels, including the physical, emotional, intellectual, and spiritual."

Research scientists and physicians confirm the benefits of floatation REST. In their study for *Health Psychology*, Jacobs and colleagues found that the results indicated that, "Floatation REST can be an effective means of teaching normal subjects to lower systolic and diastolic pressure and heighten their perception of relaxation."

In their literature review, *Floatation REST in Applied Psychophysiology*, Drs. Thomas Fine and Roderick Borrie concluded that floatation REST can have positive

psychophysiological effects and clinical applications, as well as use in pain management, performance enhancement, and the treatment of chronic illness and depression. Further studies support these findings.

Training and certification

There is no training or certification required for those undergoing floatation REST. The floater does not even need to know how to swim.

All floatation centers must adhere to strict health and safety regulations. Ultraviolet lights, chemicals, and filtration help assure that water hygiene within the tanks is maintained at all times. Tanks can be easily opened from within, so a floater cannot be locked inside.

Resources

BOOKS

Barabasz, Arreed, and Marianne Barabasz, eds. *Clinical and Experimental Restricted Environmental Stimulation*. New York: Springer Verlang, 1993.

Hutchison, Michael. *The Book of Floating: Exploring the Private Sea*. New York: William Morrow, 1985.

Lilly, John. *The Deep Self: Profound Relaxation and the Tank Isolation Technique*. New York: Simon & Schus ter, 1977.

Suedfeld, Peter. *Restricted Environmental Stimulation*. Hoboken, NJ: Wiley, 1980.

PERIODICALS

Borrie, Roderick. "The Use of Restricted Environmental Stimulation Therapy in Treating Addictive Behaviors." *International Journal of Addiction*. (1990 1991): 995 1015.

Fine, Thomas, and John Turner. "Rest assisted Relaxation and Chronic Pain." *Health and Clinical Psychology*(1985): 511 18.

Jacobs G., R. Heilbronner, and J. Stanley. "The Effects of Short Term Flotation REST on Relaxation: A Con trolled Study." *Health Psychology*(March, 1984): 99 112.

Kjellgren, A., U. Sundequist, T. Norlander, and T. Archer. "Effects of Floatation REST on Muscle Tension Pain." *Pain Research and Management* (Winter 2001): 181 9.

Turner, John, and Thomas Fine. "Restricting Environmen tal Stimulation Influences Levels and Variability of Plasma Cortisol." *Journal of Applied Psychology* (October 1991): 2010 13.

Wallbaum, A.B., R. Rzewnicki, H. Steele, and P. Suedfeld. "Progressive Muscle Relaxation and Restricted Envi ronmental Stimulation Therapy for Chronic Tension Headache: A Pilot Study." *International Journal of Psychosomatics* (1991): 33 9.

OTHER

Fine, Thomas, and Roderick Borrie. *Floatation REST in Applied Psychophysiology*. [cited June 14, 2004]. http://www.drborrie.com/rest2.html.

"Float Tank Australia." *Introduction to Floating*. [cited June 14, 2004]. http://www.floattank.com/what.html.

Floatation.com. [cited May 30, 2004]. http://www.floatation.com/index.html.

London Floatation Tank Centre. [cited June 14, 2004]. http://www.londonfloatcentre.com.

Think Tank International. *About Floatation*. [cited June 14, 2004]. http://www.thinktank.com.sg/float.htm.

Tudor, Silke. "Going into the Tank." [cited June]. http://www.sfweekly.com/issues/2000 03 01/nightcrawler.html.

Lee Ann Paradise

Sensory integration disorder

Definition

Sensory integration disorder or dysfunction (SID) is a neurological disorder that results from the brain's inability to integrate certain information received from the body's five basic sensory systems. These sensory systems are responsible for detecting sights, sounds, smell, tastes, temperatures, **pain**, and the position and movements of the body. The brain then forms a combined picture of this information in order for the body to make sense of its surroundings and react to them appropriately. The ongoing relationship between behavior and brain functioning is called sensory integration (SI), a theory that was first pioneered by A. Jean Ayres, Ph.D., OTR in the 1960s.

Description

Sensory experiences include touch, movement, body awareness, sight, sound, smell, taste and the pull of gravity. Distinguishing between these is the process of sensory integration (SI). While the process of SI occurs automatically and without effort for most, for some the process is inefficient. Extensive effort and attention are required in these individuals for SI to occur, without a guarantee of it being accomplished. When this happens, goals are not easily completed, resulting in sensory integration disorder (SID).

The normal process of SI begins before birth and continues throughout life, with the majority of SI development occurring before the early teenage years. The ability for SI to become more refined and

KEY TERMS

Axon—A process of a neuron that conducts impulses away from the cell body. Axons are usually long and straight.

Cortical—Regarding the cortex, or the outer layer of the brain, as distinguished from the inner portion.

Neurotransmission—When a neurotransmitter, or chemical agent released by a particular brain cell, travels across the synapse to act on the target cell to either inhibit or excite it.

Proprioceptive—Pertaining to proprioception, or the awareness of posture, movement, and changes in equilibrium and the knowledge of position, weight, and resistance of objects as they relate to the body.

Tactile—The perception of touch.

Vestibular—Pertaining to the vestibule; regarding the vestibular nerve of the ear which is linked to the ability to hear sounds.

effective coincides with the **aging** process as it determines how well motor and speech skills, and emotional stability develops. The beginnings of the SI theory by Ayres instigated ongoing research that looks at the crucial foundation it provides for complex learning and behavior throughout life.

Causes and symptoms

The presence of a sensory integration disorder is typically detected in young children. While most children develop SI during the course of ordinary childhood activities, which helps establish such things as the ability for motor planning and adapting to incoming sensations, others SI ability does not develop as efficiently. When their process is disordered, a variety of problems in learning, development, or behavior become obvious.

Those who have sensory integration dysfunction may be unable to respond to certain sensory information by planning and organizing what needs to be done in an appropriate and automatic manner. This may cause a primitive survival technique called "fright, flight, and fight," or withdrawal response, which originates from the "primitive" brain. This response often appears extreme and inappropriate for the particular situation.

The neurological disorganization resulting in SID occurs in three different ways: the brain does not receive messages due to a disconnection in the neuron cells; sensory messages are received inconsistently; or sensory messages are received consistently, but do not connect properly with other sensory messages. When the brain poorly processes sensory messages, inefficient motor, language, or emotional output is the result.

According to Sensory Integration International (SII), a non-profit corporation concerned with the impact of sensory integrative problems on people's lives, the following are some signs of sensory integration disorder (SID):

- oversensitivity to touch, movement, sights, or sounds
- underreactivity to touch, movement, sights, or sounds
- tendency to be easily distracted
- social and/or emotional problems
- activity level that is unusually high or unusually low
- physical clumsiness or apparent carelessness
- impulsive, lacking in self-control
- difficulty in making transitions from one situation to another
- inability to unwind or calm self
- poor self concept
- delays in speech, language, or motor skills
- delays in academic achievement

While research indicates that sensory integrative problems are found in up to 70% of children who are considered learning disabled by schools, the problems of sensory integration are not confined to children with learning disabilities. SID transfers through all age groups, as well as intellectual levels and socioeconomic groups. Factors that contribute to SID include: premature birth; **autism** and other developmental disorders; learning disabilities; delinquency and **substance abuse** due to learning disabilities; stress-related disorders; and brain injury. Two of the biggest contributing conditions are autism and attention-deficit hyperactivity disorder (ADHD).

Diagnosis

In order to determine the presence of SID, an evaluation may be conducted by a qualified occupational or physical therapist. An evaluation normally consists of both standardized testing and structured observations of responses to sensory stimulation, posture, balance, coordination, and eye movements. These test results and assessment data, along with information from other professionals and parents, are carefully analyzed by the therapist who then makes recommendations about appropriate treatment.

Treatment

Sensory integration disorder (SID) is treatable with occupational therapy, but some alternative methods are emerging to complement the conventional methods used for SID.

Therapeutic body brushing is often used on children (not infants) who overreact to tactile stimulation. A specific non-scratching surgical brush is used to make firm, brisk movements over most of the body, especially the arms, legs, hands, back and soles of the feet. A technique of deep joint compression follows the brushing. Usually begun by an occupational therapist, the technique is taught to parents who need to complete the process for three to five minutes, six to eight times a day. The time needed for brushing is reduced as the child begins to respond more normally to touch. In order for this therapy to be effective, the correct brush and technique must be used.

A report in 1998 indicates the use of cerebral electrical stimulation (CES) as being helpful to children with conditions such as moderate to severe autistic spectrum disorders, learning disabilities, and sensory integration dysfunction. CES is a modification of Transcutaneous Electrical Nerve Stimulation (TENS) technology that has been used to treat adults with various pain problems, including arthritis and carpal tunnel syndrome. TENS therapy uses a low voltage signal applied to the body through the skin with the goal of replacing painful impressions with a massage-like sensation. A much lower signal is used for CES than that used for traditional TENS, and the electrodes are placed on the scalp or ears. Occupational therapists who have studied the use of CES suggest that CES for children with SID can result in improved brain activity. The device is worn by children at home for 10 minutes at a time, twice per day.

Music therapy helps promote active listening. Hypnosis and **biofeedback** are sometimes used, along with **psychotherapy**, to help those with SID, particularly older patients.

Allopathic treatment

Occupational therapists play a key role in the conventional treatment of SID. By providing sensory integration therapy, occupational therapists are able to supply the vital sensory input and experiences that children with SID need to grow and learn. Also referred to as a "sensory diet," this type of therapy involves a planned and scheduled activity program implemented by an occupational therapist, with each "diet" being designed and developed to meet the needs of the child's nervous system. A sensory diet stimulates the "near" senses (tactile, vestibular, and proprioceptive) with a combination of alerting, organizing, and calming techniques.

Motor skills training methods that normally consist of adaptive physical education, movement education, and gymnastics are often used by occupational and physical therapists. While these are important skills to work on, the sensory integrative approach is vital to treating SID.

The sensory integrative approach is guided by one important aspect—the child's motivation in selection of the activities. By allowing them to be actively involved, and explore activities that provide sensory experiences most beneficial to them, children become more mature and efficient at organizing sensory information.

Expected results

By combining alternative and conventional treatments and providing these therapies at an early age, sensory integration disorder may be managed successfully. The ultimate goal of both types of treatment is for the individual to be better able to interact with his or her environment in a more successful and adaptive way.

Resources

PERIODICALS

"Body Brushing Therapy for Tactile Defensiveness." *Lat itudes* (April 30, 1997).
"Brain Stimulation for Autism?" *Latitudes* (October 31, 1998).
"Sensory Integration Therapy." *Latitudes* (December 31, 1994).
Morgan, Nancy. "Strategies for Colic." *Birth Gazette* (Sep tember 30, 1996).

ORGANIZATIONS

Sensory Integration International/The Ayres Clinic, 1514 Cabrillo Avenue, Torrance, CA 90501 2817. http:// www.sensoryint.com.

OTHER

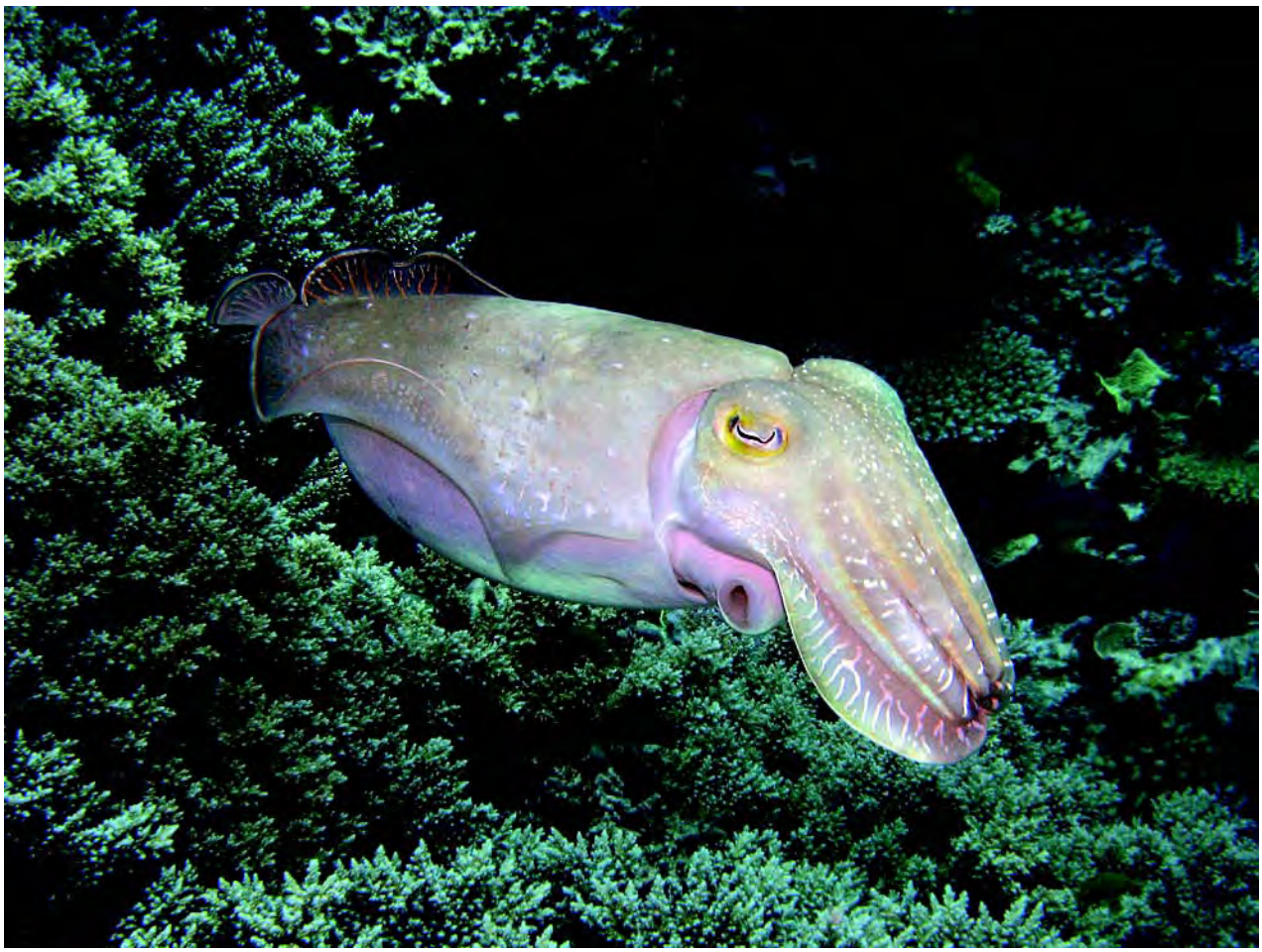
"Sensory Integration Dysfunction." http://home.ptd.net/ blnelson/SIDEWEBPAGE2.htm.
Sensory Integration Network. http://www.sinetwork.org.
Southpaw Enterprises, Inc. http://www.southpawenterprises.com.

Beth Kapes

Sepia

Description

Sepia (*Sepia officinalis*) is the homeopathic name for "cuttlefish" or squid remedy. The remedy is made from the contents of the "ink bag" of the cuttlefish.



Sepia (Sepia officinalis), or cuttlefish. *(David Wall / Alamy)*

General use

Sepia's primary role in the world of alternative medicine is as one of the homeopathic remedies. In fact, it is classed as one of the 20 polychrests, which are those having the widest range of application, and which are also recommended for inclusion in the set of basic remedies that should be kept on hand in every household.

Homeopathy is a method of treatment devised by Samuel Hahnemann that works on the principle of treating "like with like," *(similia similibus curentor)*. Hahnemann devised a system of more than 100 remedies, formulated to be administered in minute doses, effective, yet safe and without side effects. He discovered the principle of minute doses by gradually reducing medicines until he arrived at an effective dose with no side effects.

Hahnemann also discovered the method of "potentizing" his remedies by sucussing (similar to shaking) them vigorously. Until now, no one has been able to discover exactly why this works. Even in his lifetime, Hahnemann's new methods were proven to be effective and safe.

According to homeopathy, the chief centers of action of the sepia remedy are those of the mind, mental processes and reproductive organs, upon which it is considered to act deeply over extended periods of time and to which it is more appropriate as a long-term remedy rather than a "quick fix."

Sepia is considered one of the chief remedies for the treatment of female ailments. It is particularly indicated for the following type: Irritable, tall thin girls who have pale sallow skin. These girls may often be ill, in fact never really well, and tired most of the time. They may often be at odds with others because of their attitudes. They feel better after exercise and improve with company, and when sociably occupied forget their ailments. These girls often suffer from heavy prolonged periods with intense cramping

KEY TERMS

Amenorrhea—Absence of periods.

Candidiasis—Overgrowth of candida yeast in the body which may cause a variety of symptoms.

Fibroids—Fibrous non-cancerous growths on the uterus or surrounding tissue.

Ink bag—The part of a cuttlefish that contains their dye, also known as sepia.

Menorrhagia—Heavy and painful periods.

Officinalis—Denoting that the substance is available without prescription.

Potentize—To trigger effectiveness of a substance.

and general discomfort. Backache and constipation may also be experienced.

The ink of the cuttlefish was previously known as Indian ink, and was widely used by artists in the past because of its dark reddish brown pigment.

Uses for sepia

- women's problems related to menstruation
- constipation, particularly as a result of pregnancy or menstruation
- dandruff, particularly when associated with "pigmented patches"
- delayed menstruation, particularly if yeast infections are a problem
- problems associated with menopause, especially menstrual flooding and feeling that the womb will "drop out"
- amenorrhea when accompanied by depression and general aches and pains
- menorrhagia when accompanied by dragging pain in the lower abdomen, backache, depression, and irritability
- miscarriage when accompanied by dragging pains and irritability
- non-malignant swellings and tumors of the uterus (such as fibroids), again, when accompanied by the dragging pains and emotional make-up outlined above
- bedwetting in children when it occurs soon after falling asleep, and involuntary passing of urine on sneezing or coughing
- irritability, especially when connected with menstruation
- morning sickness, especially where cravings are worse in the morning and there is a craving for vinegar or pickles
- in cases of thrush or candidiasis
- young mothers who are having difficulty developing maternal feelings
- babies who dislike being held
- depression that is accompanied by irritability and an exaggerated sense of responsibility
- infertility, particularly when associated with loss of libido, exhaustion, and apathy

Preparations

Homeopathic remedies come in several strengths, or potencies. Common examples include 6x, 12c, and 30c. For minor ailments, the 6x potency may be taken twice daily for seven to ten days. For acute conditions, either the 6x remedy may be taken every two to four hours for three to five days, or the 30 remedy may be taken once every four hours three times only.

For extremely serious conditions, such as severe **pain** or accidents, **burns** or hemorrhage, the patient can take either the 6x remedy once every fifteen minutes, for six to eight doses or until the condition improves, or the 30 potency once every 15 to 30 minutes for four to six doses or until the condition improves.

Precautions

Homeopathic remedies work best if the correct remedy is picked. The best person to do this is an experienced homeopathic physician. Some naturopathic physicians are among the finest homeopathic practitioners.

Homeopathic remedies should be dissolved under the tongue. Handling of the remedies should be kept to a minimum as they react with handling and may be spoiled. They should also be kept away from heat and light, and should not be swallowed with a drink. After taking a homeopathic dose, patients should not eat, drink, smoke, or clean their teeth for about fifteen minutes if possible.

Side effects

Homeopathic remedies are not known to produce side effects, unless taken in massive doses, as they have no effect except when matched with particular symptoms. Individual aggravations may occur.

Interactions

Homeopathic remedies can be taken in conjunction with allopathic medicine. Sepia should not be taken at the same time as bryonia or **lachesis**, as they may react adversely to each other. Coffee, peppermints, and some essential oils may counteract the effects of homeopathic remedies. Dental treatment may also affect the action of remedies.

Resources

BOOKS

Smith, Trevor. *Homeopathic Medicine, A Doctor's Guide to Remedies for Common Ailments*. UK: Thorsons Publishers, 1982.

Treacher, Sylvia. *Practical Homeopathy, A Beginner's Guide to Natural Remedies*. Bath: Parragon Books, 2000.

OTHER

American Association of Naturopathic Physicians. http://www.naturopathic.org.

Holistic online. http://www.holisticonline.com.

Patricia Skinner

Septicemia *see* **Blood poisoning**

Black sesame. *(© tbkmedia.de / Alamy)*

Sesame oil

Description

Sesame oil is derived from a plant species called *Sesamum indicum*, which is a herbaceous annual belonging to the Pedaliaceae family that reaches about 6 ft (1.8 m) in height. Sesame has been used for millennia in Chinese and Indian systems of medicine. Though often recommended as a laxative, the herb was used as early as the 4th century AD as a Chinese folk remedy for toothaches and **gum disease**. In modern times, sesame has been embraced by Western herbalists for a variety of therapeutic purposes. The oil is also used in cooking and as an ingredient in margarine and salad dressings as well as in certain cosmetics and skin softening products. Native to Asia and Africa, sesame is primarily cultivated in India, China, Africa, and Latin America. Only the seeds and oil of the sesame plant are used for medicinal purposes.

Sesame oil, which is also referred to as benne, gingili, or teel oil, is made from the black seeds of *Sesamum indicum*. The large, round seeds are extracted by shaking the dried plant upside down after making an incision in the seed pods. The oil and seeds are believed by herbalists to have several important properties, including anticancer, antibacterial, and anti-inflammatory effects. Some of these claims have been supported by cell culture and human studies. Sesame may also have some power as an analgesic. In *The Green Pharmacy*, prominent herbalist James Duke states that sesame contains at least seven pain-relieving compounds and is a rich source of antioxidants and other therapeutic agents. Some authorities believe that sesame also has weak estrogen-like effects.

Sesame oil is high in polyunsaturated fat. When used in moderation, this type of fat can benefit the heart by helping the body to eliminate newly made **cholesterol**, according to the American Heart Association. In 2003, the American Heart Association issued a report that cooking with sesame oil lowers blood pressure and lessens the dose of blood pressure medication needed.

General use

Nutrition and digestion

While not approved by the Food and Drug Administration (FDA), sesame oil is reputed to have a number of therapeutic uses. Its centuries-old reputation as a laxative persists into the 2000s. It is also used to treat blurred vision, **dizziness**, headaches, and to generally fortify the constitution during recuperation from severe or prolonged illness. When used in place of saturated fats, sesame oil may help to lower cholesterol levels and prevent **atherosclerosis**. The oil is taken internally for all the purposes mentioned above.

Menopausal symptoms

Due to its estrogen-like effects, sesame oil is sometimes recommended to alleviate the vaginal dryness associated with change of life. During **menopause**, women often experience this problem due to a decline in levels of female hormone. The vaginal lining becomes drier, thinner, and less elastic, which may lead to **pain** or irritation during intercourse. Some women insert cotton pads treated with sesame oil to increase lubrication and relieve symptoms associated with vaginal dryness.

Cancer

Research suggests that sesame oil may have potential as a **cancer** fighter. One cell culture study, published in the journal *Prostaglandins, Leukotrienes, and Essential Fatty Acids* in 1992, found that sesame oil blocked the growth of malignant melanoma in human cells. The researchers speculated that the **linoleic acid** (an essential fatty acid) in sesame oil may be responsible for its anticancer properties. Another test tube study, published in *Anticancer Research* in 1991, investigated the effects of sesame oil on human colon cancer cells. The results suggested that the oil may inhibit the development of the disease.

Traditional Asian medicine

Sesame oil plays a prominent role in Indian **Ayurvedic medicine**. It is sometimes rubbed into the skin during abhyanga, a form of Indian massage that focuses on over 100 points on the body (called marma points). Abhyanga is believed to improve energy flow and help free the body of impurities. Some practitioners of Ayurvedic medicine recommend sesame oil as an antibacterial mouthwash. In one small study involving 25 subjects in general good health, sesame oil was shown to reduce the growth of oral bacteria. These results suggest that the oil may help to prevent tooth and gum disease. According to tradition, sesame oil may also be applied externally to the abdomen to relieve cramps and stomach pain associated with **premenstrual syndrome** (PMS).

Sesame oil also has a reputation as a sedative in Indian and **Tibetan medicine**. It can be used to relieve **anxiety** and **insomnia** by applying a few drops directly onto the interior of the nostrils. Its calming effects are supposedly carried to the brain by way of blood vessels in the nose.

Preparations

The optimum daily dosage of sesame oil has not as of 2008 been established. People generally take 1 tsp of the oil at bedtime to relieve **constipation**.

Vaginal dryness associated with menopause may be relieved by following this procedure: Soak a quilted cotton cosmetic pad in sesame oil and then wring out the excess oil. A freshly treated cotton square may be inserted into the vagina overnight and removed each morning for seven days. After the first week, this treatment is typically used once a week (or as often as needed) as a form of maintenance therapy.

To relieve anxiety or insomnia, place one drop of pure raw sesame oil into each nostril.

KEY TERMS

Analgesic—Any substance that functions as a pain reliever.

Antioxidant—An agent that helps to protect cells from damage caused by free radicals, the destructive fragments of oxygen produced as a byproduct during normal metabolic processes.

Linoleic acid—An essential fatty acid that is found in sesame oil.

Melanoma—A common form of skin cancer originating in the cells that provide the skin with coloring.

Because sesame oil has been recommended for so many different purposes and can be used internally and externally, consumers are advised to consult a doctor experienced in the use of alternative remedies or Chinese/Ayurvedic medicine to determine the proper dosage.

Precautions

Sesame oil is not known to be harmful when taken in recommended dosages, though it is important to remember that the long-term effects of taking sesame-derived remedies (in any amount) have not been investigated. Due to lack of sufficient medical study, sesame oil should be used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

Because of its laxative effects, sesame oil should not be used by people who have **diarrhea**.

Sesame oil is best kept refrigerated to protect it from oxidation. It should also be protected from light and heat. While the oil may be added to cooked food, it should not be employed during the cooking process because high temperatures can compromise its therapeutic effects. In other words, it should not be used for frying, boiling, or baking. Sesame oil may be used in a low-temperature sauté without losing much of its medicinal value, according to some authorities.

No more than 10% of a person's total caloric intake should be derived from polyunsaturated fats such as those found in sesame oil, according to the American Heart Association.

While some body builders inject themselves with sesame oil to enhance muscles, this practice is not recommended and may be potentially dangerous. According to a report published in the *Journal of the American Academy of Dermatology* in 2000, injecting sesame or other plant-derived oils may lead to the

development of cysts. Scarring, skin thickening, and scleroderma or other connective tissue diseases may also occur as a result of such injections.

Side effects

When taken in recommended dosages, sesame oil is not associated with any bothersome or significant side effects.

Interactions

Sesame oil is not known to interact adversely with any drug or dietary supplement. Sesame seeds have been combined with **biota** seeds, **dong quai**, and white mulberry leaf without apparent harm.

Resources

OTHER

MedlinePlus. http://www.nlm.nih.gov/medlineplus/. (February 29, 2008).
Sahelian, Ray. "Sesame Oil." http://www.raysahelian.com/sesame.html. (February 29, 2008).

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (800) 373 7105, http://abc.herbalgram.org/site/PageServer.

Greg Annussek
Rhonda Cloos, RN

Sexual dysfunction

Definition

Sexual dysfunction is broadly defined as the inability to fully enjoy sexual intercourse. Specifically, sexual dysfunction is a group of disorders that interfere with a full sexual response cycle. These disorders make it difficult for a person to enjoy or to have sexual intercourse. While sexual dysfunction rarely threatens physical health, it can take a heavy psychological toll, bringing on **depression**, **anxiety**, and debilitating feelings of inadequacy.

Description

Sexual dysfunction takes different forms in men and women. A dysfunction can be lifelong and always present, or it can be temporary. It can be situational or generalized, occurring despite the situation. In either gender, symptoms of a sexual problem include the lack or loss of sexual desire, anxiety during intercourse, **pain** during intercourse, or the inability to achieve orgasm. In addition, a man may have a sexual problem if he:

- Ejaculates before he or his partner desires.
- Does not ejaculate, or experiences delayed ejaculation.
- Is unable to have an erection sufficient for pleasurable intercourse.

Also, a woman may have a sexual problem if she:

- Feels vaginal or other muscles contract involuntarily before or during sex.
- Has inadequate lubrication.

The most common sexual dysfunctions in men include:

- Erectile dysfunction: an impairment of a man's ability to have or maintain an erection that is firm enough for coitus or intercourse.
- Premature ejaculation, or rapid ejaculation, with minimal sexual stimulation before, on, or shortly after penetration and before the person wishes it.
- Ejaculatory incompetence: the inability to ejaculate within the vagina despite a firm erection and relatively high levels of sexual arousal.
- Retarded ejaculation: a condition in which the bladder neck does not close off properly during orgasm so that the semen spurts backward into the bladder.

Female sexual dysfunctions include:

- Sexual arousal disorder: the general arousal aspect of sexual response is inhibited. A woman with this disorder does not lubricate, her vagina does not swell, and the muscle that surrounds the outer third of the vagina does not tighten—a series of changes that normally prepare the body for orgasm ("the orgasmic platform"). Also, in this disorder, the woman typically does not feel erotic sensations.
- Orgasmic disorder: the orgasmic component of the female sexual response is impaired. The woman may be sexually aroused but never reach orgasm.
- Vaginismus: a condition in which the muscles around the outer third of the vagina have involuntary spasms in response to attempts at vaginal penetration.
- Painful intercourse.

Causes and symptoms

Many factors, of both physical and psychological origin, can affect sexual response and performance. Injuries, such ailments as **infections**, and drugs of abuse are among the physical influences. Certain prescription medications, such as drugs to regulate blood **cholesterol** levels, may also affect sexual functioning.

KEY TERMS

Acupuncture—A type of Chinese medicine in which certain points on the body are stimulated to energize the flow of healthful qi (pronounced chee).

Ejaculatory incompetence—Inability to ejaculate inside the vagina.

Erectile dysfunction—Difficulty achieving or maintaining an erect penis.

Orgasmic disorder—Impairment of the ability to reach sexual climax.

Premature ejaculation—Rapid ejaculation before the person wishes it, usually in less than one to two minutes after beginning intercourse.

Retrograde ejaculation—A condition in which the semen spurts backward into the bladder.

Sexual arousal disorder—The inhibition of the general arousal aspect of sexual response.

Vaginismus—A condition in which muscles around the outer third of the vagina have involuntary spasms in response to attempts at vaginal penetration, thus making penetration impossible or difficult.

In addition, there is increasing evidence that chemicals and other environmental pollutants depress sexual function. As for psychological factors, sexual dysfunction may have roots in traumatic events such as rape or incest, guilt feelings, a poor self-image, depression, chronic **fatigue**, certain religious beliefs, or marital problems. Dysfunction is often associated with anxiety. If a man operates under the misconception that all sexual activity must lead to intercourse and to orgasm by his partner, he may consider the act a failure if his expectations are not met.

In Chinese medicine, sexual dysfunction is considered an imbalance of yin and yang. Yin and yang are the two dependent and constantly interacting forces of energy in the world, according to ancient Chinese thought. Yin energy is receptive, dark, feminine, and cool. It is associated with the heavy, the cold, and the moist. Yang energy is masculine, active, bright, and warm. It is associated with the dry, the light, and the hot. People with sexual dysfunction who have yin deficiency are too dry and tired, causing premature ejaculation or dry and spastic conditions. Symptoms of a yang deficiency may include erectile dysfunction as well as lack of sexual appetite or excitement. There are other imbalances that can cause sexual dysfunction.

Other types of alternative medicine, such as herbalism, regard sexual dysfunction as stemming from the same causes as those recognized by Western medicine. In such alternative approaches as **homeopathy**, sexual dysfunction is seen as an energy deficiency in the sexual organs or the glands that regulate these organs.

Diagnosis

In deciding whether sexual dysfunction is present, it is necessary to remember that each person has a different level of sexual interest. While some people may be interested in sex at almost any time, others have low or seemingly nonexistent levels of sexual interest. A sexual condition is classified as sexual dysfunction only when it is a source of personal or relationship distress instead of voluntary choice.

The first step in diagnosing a sexual dysfunction is usually discussing the problem with a doctor or an alternative practitioner, who will need to ask further questions so he or she can differentiate among the types of sexual dysfunction. The physician may also perform a physical exam of the genitals, and may order further medical tests, including measurement of hormone levels in the blood.

An expert in Chinese medicine will take the pulses at the wrist to assess the patient's overall health. According to Chinese thought, there are 12 pulses at the wrist, six on each wrist. The practitioner will ask questions that relate to yin and yang energy, such as whether the patient's hands and feet are cold or warm most of the time. An alternative practitioner is also likely to query the patient about his diet and any issues in his life that may be contributing to **stress**.

In allopathic medicine, men may be referred to a urologist, a specialist in diseases of the urinary and genital organs, and women may be referred to a gynecologist.

Treatment

A variety of alternative therapies can be useful in the treatment of sexual dysfunction. Counseling or **psychotherapy** is highly recommended to address any emotional or mental components of the disorder. Nutritional supplementation, as well as western, Chinese, or ayurvedic **botanical medicine**, can help resolve biochemical causes of sexual dysfunction.

Beneficial supplements and herbs include gingko biloba, which improves circulation to the genitals and has been shown to be effective in a number of studies.

If the cause is a psychological, emotional, or energy disorder, such adrenal tonics as **licorice**, **epimedium**, eucommia, and **cuscuta** can restore the patient's mood and increase sexual interest. These herbs increase the ability to adapt to physical and mental stress because they increase the power of the adrenal system, which secretes the brain chemical epinephrine. If the patient's reproductive organs are not producing enough of the hormones that regulate sex drive and function, vitex is also a good solution. When a patient lacks sexual drive, such tonics as deer antler can increase interest in sex.

One drug derived from herbal sources that is used in mainstream medicine to treat **impotence** in men is yohimbine, an alkaloid derived from the bark of the **yohimbe** or rauwolfia tree. Yohimbine is used to treat inadequate circulation in the arms and legs and to dilate the pupil of the eye as well as to treat impotence. It is available as a prescription medication under such brand names as Yocon and Yohimex. Yohimbine does not work for all men affected by impotence, but appears to have fewer side effects than sildenafil (Viagra).

Homeopathic treatment can be helpful by focusing on the energetic aspects of the disorder. A Chinese medicine practitioner might address sexual dysfunction by using **acupuncture**, in which hair-thin needles are used to stimulate the body's energy (or qi). According to ancient Chinese theory, the body has 12 meridians that correspond to various organs, their functions, and the patient's emotions. Acupuncture needles might be applied at points on these meridians that regulate the kidney, which forms the foundation for the reproductive system in **traditional Chinese medicine**, or to other meridians that have roles in sexual function.

Yoga and **meditation** provide needed mental and physical **relaxation** for conditions such as vaginismus. A yoga teacher may advise forward bends to calm the patient and yoga twists to help the body produce hormones that increase sexual drive and a feeling of well-being.

Relaxation therapy eases and relieves anxiety about dysfunction. Massage is extremely effective at reducing stress, especially if performed by the partner.

A massage therapist or aromatherapist can also provide sandalwood or jasmine oils to boost sexual drive. An aromatherapist usually prescribes singular scents or a mixture created with the person's preferences and his or her symptoms in mind.

Allopathic treatment

Allopathic treatments break down into two main categories: behavioral psychotherapy and physical treatment. Sex therapy, ideally provided by a member of the American Association of Sexual Educators, Counselors, and Therapists (AASECT), emphasizes correction of sexual misinformation, the importance of improved partner communication and honesty, anxiety reduction, sensual experience and pleasure, and interpersonal tolerance and acceptance. Sex therapists believe that many sexual disorders are rooted in learned patterns and values. These are termed psychogenic. An underlying assumption of sex therapy is that relatively short-term outpatient therapy can alleviate learned patterns, restrict symptoms, and allow a greater satisfaction with sexual experiences.

In some cases, a specific technique may be used during intercourse to correct a dysfunction. One of the most common is the "squeeze technique" to prevent premature ejaculation. When a man feels that an orgasm is imminent, he withdraws from his partner. Then, the man or his partner gently squeezes the head of the penis to halt the orgasm. After 20-30 seconds, the couple may resume intercourse. The couple may do this several times before the man proceeds to ejaculation.

In cases in which significant sexual dysfunction is linked to a broader emotional problem such as depression or **substance abuse**, intensive psychotherapy and/or medications may be appropriate. People who are taking such medications as fluoxetine (Prozac), paroxetine (Paxil), or reboxetine (Edronax) for depression, however, should be advised that sexual dysfunction in adults of either sex is a fairly common side effect of these medications.

In many cases, doctors prescribe medications to treat an underlying physical cause of sexual dysfunction. Possible medical treatments include:

- Clomipramine and fluoxetine for premature ejaculation.
- Papaverine and prostaglandin for erectile difficulties.
- Hormone replacement therapy or androgen therapy for female dysfunctions.
- Sildenafil (Viagra), a drug approved in 1998 as a treatment for impotence. As of 2002, however, sildenafil has been shown to have potentially serious side effects, including headaches, nausea, sudden changes in blood pressure, and eye disorders.

Expected results

There is no single cure for sexual dysfunction, but almost all of the individual conditions can be controlled. Most people who have a sexual dysfunction fare well once they get into a treatment program. Most

alternative therapies, however, take at least several weeks to take effect. If the patient doesn't see improvement in that time, he or she should consider trying another practitioner.

Prevention

It often helps to continue treatments, such as acupuncture and massage, after the initial problem is resolved. Doing so keeps sexual energy high and the genital organs and sex glands healthy. By continuing to use alternative therapies, the patient can help maintain sexual interest even when normal sexual doldrums occur. Continuing to take alternative medicines or treatment also ensures the problem won't return.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed., text revision. Wash ington, D.C.: American Psychiatric Association, 2000.

Masters, William H., Virginia E. Johnson, and Robert C. Kolodny. *Human Sexuality*. New York: HarperCollins, 1992.

Molony, David. *The American Association of Oriental Medicine's Complete Guide to Herbal Medicine*. New York: Berkley Books, 1998.

PERIODICALS

Guay, A. T., R. F. Spark, J. Jacobson, et al. "Yohimbine Treatment of Organic Erectile Dysfunction in a Dose Escalation Trial." *International Journal of Impotence Research* 14 (February 2002): 25 31.

Haberfellner, E. M. "Sexual Dysfunction Caused by Reboxetine." *Pharmacopsychiatry* 35 (March 2002): 77 78.

Hensley, P. L., and H. G. Nurnberg. "SSRI Sexual Dys function: A Female Perspective." *Journal of Sex and Marital Therapy* 28 (2002, Suppl. 1): 143 153.

Pomerantz, H. D., K. H. Smith, W. M. Hart, Jr., and R. A. Egan. "Sildenafil Associated Nonarteritic Anterior Ischemic Optic Neuropathy." *Ophthalmology* 109 (March 2002): 584 587.

Traish, A. M., N. Kim, K. Min, et al. "Androgens in Female Genital Sexual Arousal Function: A Biochemical Per spective." *Journal of Sex and Marital Therapy* 28 (2002, Suppl. 1): 233 244.

Wagstaff, A. J., S. M. Cheer, A. J. Matheson, et al. "Spot light on Paroxetine in Psychiatric Disorders in Adults." *CNS Drugs* 16 (2002): 425 434.

ORGANIZATIONS

American Academy of Clinical Sexologists. 1929 18th Street NW, Suite 1166, Washington, DC 20009. (202) 462 2122.

American Association for Marriage and Family Therapy. 1100 17th Street NW, 10th Floor, Washington, DC 20036 4601. (202) 452 0109.

American Association of Oriental Medicine. 909 22nd St. Sacramento, CA 95816. (916) 451 6950. www.aaom.org.

American Association of Sex Educators, Counselors & Therapists. P.O. Box 238, Mt. Vernon, IA 52314. www.aasect.org.

Yoga Research and Education Center. P.O. Box 1386, Lower Lake, CA 95457. (707) 928 9898. www.yrec.com.

Barbara Boughton
Rebecca J. Frey, PhD

Sexually transmitted diseases *see* **Chlamydia; Genital herpes; Genital warts; Gonorrhea; Syphilis**

Shamanism

Definition

A complex pattern of diverse rites and beliefs, shamanism is a tribal religion in societies without literary tradition. Healing is one function of the shaman and the most important along with prophecy. The shaman uses mystical powers to journey to other worlds or realities and communicate with spirits in order to bring about a balance between the physical and spiritual worlds.

Origins

Shamanism is the oldest form of human healing. It is a type of religious medicine that originated over 25,000 years ago in the Paleolithic hunting cultures of Siberia and Central Asia. The English word shaman is derived from the Siberian Tungus word "saman," which is defined as a technique of ecstasy. The shaman is considered a great master of trance and ecstasy. He or she is the dominating figure in certain indigenous populations.

Most early cultures' healing practices stem from a shamanic tradition. For instance, when visiting the sick, Egyptian magicians often brought a papyrus roll filled with incantations and amulets in order to drive out demons.

The shaman is often the religious leader or priest of the tribe. He is believed to have magical powers that can heal the sick. The shaman is called upon to mediate between the people of the community and the spirit world to cure disease, exorcize evil spirits, and to promote success in hunting and food production and to keep the tribal community in balance. Traditional shamanic rituals included singing, dancing, chanting,

Colorado or Tsçchila Indian Shaman performs a cleansing ceremony, spraying concoction of alcohol and medicinal herbs over his 'patient.' Santo Domingo de los Colorados, Coastal Ecuador, South America. *(© Danita Delimont / Alamy)*

drumming, storytelling, and healing. The shaman is a specialist in human souls. He is able to see them and know their form and destiny. The shaman controls the spirits. Rather than being possessed by them, he communicates with the dead, demons, and nature spirits.

The shaman's work is based on the belief that the soul can forsake the body even while a person is alive and can stray into other cosmic realms where it falls prey to demons and sorcerers. The shaman diagnoses the problem, then goes in search of the wandering soul and makes it return to the body.

Shamanism is still practiced all over the world, although each culture's shamanic tradition has evolved in different ways. **Native American medicine** men perform soul flights and vision quests to heal. North American Inuit shamans undertake undersea spirit journeys to ensure a plentiful supply of game. Tibetan shamans use a drum to help them in spirit flight and soul retrieval. Central and South American shamans often use hallucinogenic plants to invoke their shamanic journeys. Australian aborigine shamans believe that crystals can be inserted into the body for power. Some cultures have female as well as male shamans.

Benefits

Shamanism is based on the belief that the condition of the soul must be addressed in order for healing to occur. Relief of **pain**, **anxiety**, and **stress**, as well as spiritual and emotional healing, are common benefits of a shamanic healing.

Description

Shamans believe that there are realities that exist beyond the dimension that we experience on Earth. They believe that all creation is alive—rocks, plants, animals, trees, fish—and work regularly with these forces of nature.

The role of the shaman is to mediate between different realities to treat disease and create harmony between the physical and spiritual dimensions. Shamanism is a combination of "magic" and medicine. A shaman is a warrior who uses his power to combat

KEY TERMS

Peyote—The dried top of the mescal cactus, used by shamans in some Southwestern cultures to induce a trance state. Peyote contains a chemical called mescaline that produces hallucinations.

Psychosis—A severe mental disorder characterized by delusions, hallucinations, and other evidence of loss of contact with reality. Some psychiatrists regard shamanic experiences as evidence of psychosis.

Schizophrenia—A serious mental disorder characterized by brain abnormalities and various symptoms of psychosis. Some observers think that shamans are suffering from undiagnosed schizophrenia.

Shaman—Among certain tribal peoples, a man or woman who is thought to be an intermediary between natural and supernatural forces, and to have unusual abilities to heal illness or foretell the future.

disease, demons, and practitioners of black magic. They also perform rights to assure success in hunting and fishing, to protect the tribe's lands and increase and develop the family. Although shamans have traditionally been male, there are many female shamans in contemporary Asia and Africa.

Shamans can see and exorcize spirits, perceive when a person's soul has fled from the body, and return souls to their rightful owners. They specialize in soul healing, healing physical sickness, and delivering a deceased person's soul to the underworld of death. They also communicate with ancestral spirits, gods, and demons through ceremony, sacred dance, vision quests, by visiting places of power, and through dreams and out-of-body experiences.

The basis of a shaman's work stems from his or her mastery of the ecstasy technique, in which he or she enters an altered state of consciousness known as the trance state. During this state, the shaman's soul leaves his or her body to travel to nonphysical realities, in order to communicate with spirits and gain information for healing.

The state of ecstasy is brought about in several ways, depending upon the shaman's culture. Native American shamans use drumming, dancing, and chanting to enter the trance state. Some Central and South American shamans use peyote or other hallucinogenic plants to enter a state of altered consciousness.

During their spiritual journey, shamans may travel to heavens and hells, higher levels of existence, parallel physical worlds, or other regions of the world. The shaman is protected during his travels by spirit helpers and such animal guides as bears, wolves, stags, hares, and birds.

According to Central and North American shamanism, disease is caused when the soul strays or is stolen from the body. To bring about health a shaman goes in search of the spirit, captures it, and persuades it to return. Illness may also be caused when the body becomes possessed by evil spirits, or by a magical object such as a pebble or insect that has been telepathically implanted in the body by sorcerers of black magic. The shaman removes the item by sucking it out of the patient's body.

Shamans often wear ritual costumes such as feathers, masks, or animal skins. They may also use ritual objects, charms, and herbs.

Training and certification

Becoming a shaman is not an ordinary task that occurs overnight. Shamans go through strenuous training before they begin to practice as a shaman. They are usually chosen or "called" by the spirits. This call to become a shaman may involve a series of tests to prove intent and worth.

A personal crisis, severe trauma, near-death experience, lightning strike, or life-threatening illness may serve as the calling to become a shaman. Initiation may also occur though dreams or visions as the spirits are made known to the chosen one. This connection between a call to become a shaman and physical or emotional trauma is one reason why some historians and psychiatrists regard shamanism as evidence of mental illness. They see resemblances between the dreams, visions, and other unusual experiences reported by shamans and the delusions and hallucinations associated with **schizophrenia** and other psychotic disorders.

In many cultures, the shamanic tradition is passed from father to son, from mother to daughter, or to those outside the shaman's family who have answered the call. The teaching involves training by master shamans in the ecstatic trance; a thorough understanding of traditional shamanic techniques; the names and functions of spirits; and the mythology and genealogy of the clan. While in the apprentice stage, the shaman-to-be learns about the soul: the forces that can threaten it and where it may flee or be captured by evil spirits.

A shaman's initiation typically involves a visionary death or dismemberment of the body during the trance journey. By knowing death and returning from it, the shaman attains the secret of life and the power to heal. The shaman-in-training must also undertake a

training in which he faces and resolves his fears. After the initiation, the shaman is trained by a more experienced shaman until he has reached a level of mastery.

In modern times, shamanic knowledge is being shared with the general population. One does not have to belong to a native tribe to become a shaman. Carlos Casteneda, one of the most well-known writers of shamanism, studied under a Native American Yaqui shaman. Dr. Michael Harner, an anthropologist, is one of the world's leading authorities on shamanism and has even started a non-profit educational organization, The Foundation for Shamanic Studies. Modern shamanism is often practiced in groups and lodges and through workshops and classes. Shamanic training may be obtained through similar schools or psychological or spiritual teachers.

Several schools of shamanism are located in the United States:

- Dance of the Deer Foundation, Center for Shamanic Studies, P.O. Box 699, Soquel, CA 95073. (831)475-9560. http://www.shamanism.com
- The Foundation for Shamanic Studies, P.O. Box 1939, Mill Valley, CA 94942. (415) 380-8282.

Resources

BOOKS

Goldberg, Dr. Bruce. *Soul Healing*. Minneapolis, MN: Llewellyn Publications, 1997.

Harner, Michael. *The Way of the Shaman*. San Francisco, CA: Harper, 1990.

Mindell, Arnold. *The Shaman's Body*. San Francisco, CA: Harper, 1993.

Moorey, Teresa. *Shamanism: A Beginner's Guide*. London, UK: Hodder and Stoughton, 1997.

PERIODICALS

Polimeni, J., and J. P. Reiss. "How Shamanism and Group Selection May Reveal the Origins of Schizophrenia." *Medical Hypotheses* 58 (March 2002): 244 248.

Jennifer Wurges
Rebecca J. Frey, PhD

Shangri-la diet

Definition

The Shangri-la diet is not a diet in the usual sense of a set of meal plans or detailed instructions about calorie intake and **nutrition**. The book that was published in 2006, *The Shangri-la Diet*, is perhaps better described as a discussion of a psychological theory about human appetite than a diet book. The core of the author's theory is that people gain weight because they have been conditioned to have a strong association between food and flavor, which keeps the appetite demanding more of a specific source of calories in order to continue tasting the flavor. If a person can break the association between flavor and food intake, they can lose weight because they won't feel hungry as often or as intensely. The book suggests several ways in which this association can be broken, thus leading to lifelong reduction in calorie intake with relatively little physical or emotional distress. As one newspaper reporter describes the diet, " . . . it seems that you may eat whatever you wish under the [author's] plan, but you just won't want to." The diet has generated considerable controversy since its publication, not only in regard to its theory of appetite and weight control, but also about the role of expert review and clinical trials in evaluating new **diets**.

The name of the Shangri-la diet comes from a novel titled *Lost Horizon*, written in 1933 by James Hilton about a mythical paradise called Shangri-la, hidden from the world somewhere in the Himalayas and guided by the wisdom of a Tibetan lama. The word Shangri-la entered English common speech as a synonym for a utopia or Garden of Eden when Frank Capra directed a movie based on Hilton's novel in 1937. Seth Roberts, the author of *The Shangri-la Diet*, maintains that he chose the name of his diet because of its association with an earthly paradise. He told an interviewer in 2005, " [I picked the name] because it puts people at peace with food—like being in Shangri-la, a peaceful place. It reduces or eliminates food compulsions, such as eating between meals and eating late at night. It is also a kind of ideal diet, just as Shangri-la was a kind of ideal place."

Origins

Seth Roberts, the originator of the Shangri-la diet, is (as of 2007) a middle-aged (b. 1953) professor of psychology at the University of California, Berkeley; he is not a medical doctor or nutritionist. He has said in the course of several television interviews, including a November 2005 segment with Diane Sawyer on the ABC News program *Good Morning America*, that the Shangri-la diet emerged over the course of some years of self-experimentation coupled with a chance discovery during a visit to France in 2000. With regard to self-experimentation as such, the paper available on the official website of the Shangri-la diet is essentially a discussion of self-experimentation as a potentially

KEY TERMS

Anecdotal evidence—A category of medical or dietary evidence based on or consisting of individual reports, usually written by observers who are not doctors or scientists.

Association—In psychology, a connection between two ideas, actions, or psychological phenomena through learning or experience. The Shangri-la diet is based in part on the notion that humans eat more than they need to in the modern world because of a strong association between food flavors and calories.

Conditioning—In psychology, the process of acquiring, developing, or establishing new associations and responses in a person or animal. The author of the Shangri-la diet believes that modern food products condition people to make an association between the flavors in the foods and calorie intake.

Dietitian—A health care professional who specializes in individual or group nutritional planning, public education in nutrition, or research in food science. To be licensed as a registered dietitian (RD) in the United States, a person must complete a bachelor's degree in a nutrition-related field and pass a state licensing examination. Dietitians are also called nutritionists.

Glycemic index (GI)—A system devised at the University of Toronto in 1981 that ranks carbohydrates in individual foods on a gram-for-gram basis in regard to their effect on blood glucose levels in the first two hours after a meal. There are two commonly used GIs, one based on pure glucose as the reference standard and the other based on white bread.

Set point—In medicine, a term that refers to body temperature, body weight, or other measurements that a human or other organism tries to keep at a particular value. The Shangri-la diet is said to work by lowering the dieter's set point for body weight.

Shangri-la—A utopia; a mythical place in the Himalayas where life approaches perfection, depicted in a 1933 novel by James Hilton.

fruitful approach to generating topics for further research; it is not a report on the Shangri-la diet by itself.

According to this paper, which Roberts published in 2004, he experimented with his own body systems for over 10 years concerning other issues before focusing on weight control. He began with **acne** and then decided to study his long-standing problem with awakening too early in the morning and feeling tired most of the day. He states that he first noticed this problem in 1980. By experimenting, he noticed that he could improve the quality as well as the duration of his sleep by skipping breakfast, exposing himself to an hour of morning light, standing up for 8 hours a day, and "seeing faces on television in the morning." Roberts concluded from these apparently unrelated changes in food intake and other activities that human beings are still better suited to Stone Age life than to contemporary lifestyle patterns. Roberts believes that humans living in the Stone Age had most of their contact with other people in the morning rather than after dark, that they spent most of the day on their feet, and that the modern preference for watching late-night television creates a mismatch with inbred human sleep-wake patterns.

The hypothesis that there is a mismatch between human evolution and modern life then suggested itself to Roberts as a possible explanation for his difficulties in losing weight. He had already come to accept the so-called set point theory, first proposed in 1950, that weight in human adults is controlled by an internal set point that functions much like a thermostat in a heating system. According to the set point theory, whenever a person's amount of body fat drops below a specific set point, the person's body will eventually regain the fat through increasing appetite, lowering metabolism, or both. Roberts decided to test the set point theory by seeing whether changing his diet could change his body's set point. Over the years he had tried a series of diets—a sushi diet, a pasta diet, a diet that required the dieter to drink five quarts of water per day—but none had proved effective in bringing about permanent weight loss.

On a trip to France in 2000, however, Roberts had a chance discovery that he thinks enabled him to reset his body weight set point. He drank a number of French soft drinks with unfamiliar flavors and lost weight. He theorized that his body did not associate the strange flavors with calorie intake, and that the key to resetting the set point was to break the association that the mind makes between the taste of food and taking in calories. After some experimenting, he came up with the notion of ingesting a small amount of bland or flavorless calories in the form of either an unflavored solution of sugar and water (sweetness

has no taste as such) or flavorless liquid cooking oil (he tried canola oil and very light olive oil).

The connection that Roberts sees between human evolution and food flavors is as follows: he thinks that human metabolism essentially acquired its present pattern during the Stone Age, when the food supply was highly variable. When food was scarce, the metabolism of our Stone Age ancestors slowed down, lowering their set point to a lower weight and a more efficient metabolism with fewer hunger pangs. When food was once again available in large amounts, people actually got hungrier; they gorged on the food and fattened themselves in preparation for the next period of scarcity. This pattern, according to Roberts, indicates that the human body is programmed to crave more—not less—food when food is readily available so that it can store the extra calories in the form of fat to protect it during the next time of famine.

Roberts went further and hypothesized that this metabolic pattern is accompanied by an association that the brain makes between food flavor and calorie intake. When Stone Age people ate something they found tasty (during a period of abundance) and familiar (which meant that they had found by experience that the food nourished their bodies), their bodies demanded that they eat as much of the tasty food as possible in order to store the extra calories as fat. The problem with modern life in the developed countries is that the constant availability of affordable good-tasting food leads to rampant overeating that is no longer necessary as a protection against hard times, and that food advertising as well as food availability conditions people to associate food flavor with calorie consumption.

Description

The Shangri-la diet in its present form requires the dieter to take either a small quantity of sugar water or a bland oil (extra-light olive oil, canola oil, or highly refined walnut oil) twice or three times a day, at least an hour before or an hour after consuming anything with flavor (including toothpaste or mouthwash). Roberts recommends 1 to 2 tablespoons of oil per day, which comes to 120 to 240 calories. The sugar mixture that Roberts used while losing weight was about 6 tablespoons of fructose (about 275 calories) diluted in a quart of water. According to Roberts, the oil or sugar water gives the dieter some calories in a nutrient-dense substance without flavor, thus breaking the learned association between flavor and calories. In effect, breaking this learned association tricks the body into lowering its set point, suppressing appetite, and leading to weight loss without hunger cravings. Roberts suggests taking the doses of oil or sugar water first thing in the morning and just before bedtime, but says that dieters should feel free to experiment and take their doses at other times that may work better for them.

The dieter need not make any other changes in the types of food they prefer. Roberts does, however, suggest ways in which people using the Shangri-la diet can lower their set point even further:

- Avoid food commercials, cooking shows on television, and other visual stimuli related to food. Seeing images of food is thought to increase the appetite.
- Choose foods with a low glycemic index (GI). The glycemic index is a measurement system that evaluates the carbohydrates in specific foods for their effect on the body's blood sugar level within two hours after a meal. Foods with a low GI index are thought to satisfy hunger longer because they do not increase blood sugar levels as rapidly as foods with a high GI index.
- Eat very bland foods other than the doses of oil (sushi, boiled rice, egg whites, etc.) to help break the association between flavor and calorie intake.
- Practice "crazy spicing," which is Roberts's term for adding 10 to 20 spices chosen at random to one's food so that the original flavor is unrecognizable. As Roberts says, "No flavor recognition = no set point increase = lower set point = weight loss."

As of 2007, Roberts maintains that he has kept his weight at about 150 pounds by eating one 900-calorie meal per day, 150 calories of fruit sugar dissolved in water, and 2 pieces of fresh fruit (about 75 calories each).

Function

The function of the Shangri-la diet is to induce and maintain weight loss through an approach intended to reset the dieter's set point and improve control of appetite, rather than by eliminating specific food categories or restricting portion size.

Benefits

There is anecdotal evidence that the Shangri-la diet helps some people lose significant amounts of weight and maintain weight loss. Roberts, who claims to have lost 40 pounds on his diet and kept it off, maintains a website with a forum where people can post success stories.

Some specific benefits mentioned by people who have tried the Shangri-la diet:

- They can still have their favorite foods if they wish.
- The diet is easy to use because it doesn't require weighing and measuring foods or special cooking techniques.
- It can be readily combined with cooking for a family, eating out, or other activities that are often problematic for dieters; as one person remarked, "No one knows you're doing it."
- The oil or sugar water is inexpensive, making the Shangri-la diet one of the least stressful weight reduction regimens in terms of financial investment. An attorney who has successfully lost weight on the diet comments, " It is the cheapest diet I've ever been on. Five dollars worth of extra light (not extra virgin) olive oil from Costco or Sam's Club lasts you six months. I've probably eaten less than half the food I would have otherwise eaten in that time. Even if I bought a copy of the book every week . . . I would still come out ahead on what I spend on food."

Precautions

According to Roberts, diabetics should not use the sugar water option but take only oil if they follow the Shangri-la diet. In addition, people should not use strong-flavored oils, such as ordinary olive oil or **flaxseed** oil, because the flavors in those oils will prevent breaking the brain's association between flavor and calorie intake.

Roberts also warns that individual body chemistry seems to affect the time it takes the Shangri-la diet to have an effect on the dieter's appetite. Some people apparently feel a difference within a few hours of their first dose of flavorless oil, others take several days, and some may require three weeks to notice a change in appetite.

Risks

There do not seem to be any major risks to health associated with the Shangri-la diet, provided that the dieter consumes an appropriate balance of nutrients, vitamins, and minerals; and consults a physician beforehand to exclude the possibility of a previously undiagnosed serious health condition.

Research and general acceptance

One of the major criticisms of the Shangri-la diet is its lack of pre-publication clinical testing on a group of subjects. John Ford, an assistant professor of medicine who is highly skeptical of Roberts's claims, notes that Roberts, himself a scholar, should have had more academic integrity. In an online article published in May 2006, shortly after the first press run of Roberts's book, Ford said, " . . . the scientific method exists for a reason: to root out poor hypotheses and to direct research towards those more likely to be fruitful. If Roberts were truly interested in investigating his approach, he should have subjected it to the dispassionate rigor of clinical study and peer review. His hypothesis is clearly testable with a controlled trial by a careful scientist willing to be proven wrong if necessary. That hasn't happened. Presenting a highly speculative idea as proven science to an audience unlikely to appreciate the difference between an academic psychologist dabbling in this field and seasoned experts who have devoted their careers to it is misleading at best . . . ."

Ford goes on to point out that the published article that Roberts has posted on his website is not about the Shangri-la diet but rather a speculative essay about self-experimentation as a way to generate ideas for further exploration. Self-experimentation is not necessarily inappropriate as a technique in medicine or nutrition; a recent book on the history of medical self-experimentation devotes a full chapter to physicians who risked their lives testing the role of vitamins in preventing scurvy and other diseases by subjecting themselves to diets lacking these vitamins. The question, however, is whether the results of Roberts's self-experiment with weight control can be generalized to other overweight people. As of early 2007, no articles about the effectiveness of or risks associated with the Shangri-la diet have appeared in any peer-reviewed medical or nutrition journal. In addition, the diet has not been endorsed by the American Dietetic Association (ADA) or any other professional nutritionists' association. It has, however, been featured in such popular magazines as *Woman's World*.

One researcher in the field of appetite and taste, however, has been quoted as saying that Roberts's theory about the human mind's association of food flavor with calorie intake is open to question. Dr. Mark Friedman, a physiologist at the Monell Chemical Senses Center in Philadelphia, an independent institute that collaborates on research projects with the University of Pennsylvania, commented in an interview with the *Dallas Morning News* that "The idea that the taste of food can set food intake and the calories you eat over the long term is an idea that has no scientific evidence." Friedman allows that research done at Monell does indicate that people tend to like safe, familiar foods and thereby learn certain food preferences. "But that doesn't mean you'll overeat."

Resources

BOOKS

Altman, Lawrence K., MD. *Who Goes First? The Story of Self Experimentation in Medicine*, especially Chapter

11, "Dietary Deprivations." Berkeley, CA: University of California Press, 1998.

Roberts, Seth. *The Shangri la Diet: The No Hunger, Eat Anything, Weight Loss Plan*. New York: G.P. Putnam's Sons, 2006.

PERIODICALS

DelVecchio, Rick. "UC Professor's Book Touts Oil and Sugar Solution." *San Francisco Chronicle*, May 30, 2006. Avail able online at http://www.sfgate.com/cgi bin/article. cgi?f /c/a/2006/05/30/BAGGGJ48CR1.DTL (accessed March 11, 2007).

"Instant Will Power!" *Woman's World*, October 3, 2006. Available online in PDF format at http://www.sethro berts.net/reviews/2006 10 03_Womans_World.pdf (accessed March 11, 2007).

Pierce, Kim. "Can You Fool the Fat Off?" *Dallas Morning News*, May 30, 2006. Available online at http:// www.dallasnews.com/sharedcontent/dws/fea/healthy living2/stories/DN NH_shangrila_0530liv.ART0. State. Edition1.13515c13.html (accessed March 11, 2007).

VIDEO

Kapoor, Sarah. Mini documentary on the Shangri la diet. Canadian Broadcasting Company, aired on *CBC News: Sunday Night*, April 30, 2006. Available online at http:// www.youtube.com/watch?v hR33LNwgGIc (accessed March 11, 2007). Runs about 9 minutes.

OTHER

Ford, John, MD. "Troubles in Shangri La." *TCS Daily*, May 22, 2006. Available online at http://www.tcsdaily. com/Article.aspx?id 052206D (accessed March 11, 2007).

Marsh, Stephen B. "Seth Roberts's *Shangri la Diet* Reviewed." *CalorieLab Calorie Counter News*, April 9, 2006. Available online at http://calorielab.com/news/ 2006/04/09/seth roberts shangri la diet reviewed/ (accessed March 12, 2007).

"Oil and Water: Key to Weight Loss?" *ABC News Report*, November 14, 2005. Available online at http://abcnews. go.com/GMA/BeautySecrets/story?id 1310260 (accessed March 11, 2007).

Roberts, Seth, PhD. "Self Experimentation as a Source of New Ideas: Ten Examples about Sleep, Mood, Health, and Weight." *Behavioral and Brain Sciences* 27 (2004): 227 288. Available online in PDF format at http:// repositories.cdlib.org/postprints/117/ (accessed March 10, 2007).

ORGANIZATIONS

American Dietetic Association (ADA). 120 South Riverside Plaza, Suite 2000, Chicago, IL 60606 6995. Telephone: (800): 877 1600. Website: http://www.eatright.org.

Dietitians of Canada/Les diététistes du Canada (DC). 480 University Avenue, Suite 604, Toronto, Ontario, Can ada M5G 1V2. Telephone: (416) 596 0857. Website: http://www.dietitians.ca.

Monell Chemical Senses Center. 3500 Market Street, Phila delphia, PA 19104 3308. Telephone: (215) 898 6666. Website: http://www.monell.org/index.htm.

Rebecca J. Frey, PhD

Sheep sorrel

Description

Sheep sorrel (*Rumex acetosella*) is a tall herb that is found in grasslands, prairies, meadows, fields, pastures, and roadsides of Europe, Asia, and North America. This perennial plant from the buckwheat (Polygonaceae) family was originally from Eurasia, but is now naturalized throughout Canada and the United States. Sheep sorrel is also known as field sorrel, red top sorrel, sour grass, common sorrel, and dog eared sorrel. The plant is related to other highly acidic members of the *Rumex* genus, including French or garden sorrel (*Rumex acetosa*).

Sheep sorrel. *(© blickwinkel / Alamy)*

KEY TERMS

Astringent—A substance that causes tissues to contract.

Dermatitis—A condition where the skin is red and inflamed, often accompanied by pain and itching.

Diaphoretic—A substance that induces sweating.

Diuretic—A substance that promotes urination.

Infusion—An herbal tea created by steeping herbs in hot water. Generally, leaves and flowers are used in infusions.

Perennial—A plant that lives for many years; comes back yearly without replanting.

Sheep sorrel is considered a common weed in the United States. Its slim, reddish stems grow to a height of 4-24 in (10-60 cm). Narrow, arrow-shaped leaves that have a pungent lemon scent grow to 1-4 in (2-10 cm) long. The slender roots grow to a depth of 5 feet (1.5 m). Near the upper part of the stem are small, yellow or red flowers that bloom in the spring and summer, generally from April to September. The male plant has yellow flowers while the female plant has red flowers.

Sheep sorrel has antioxidant, diuretic, detoxifying, laxative, astringent, and diaphoretic properties. The herb is a rich source of vitamins and minerals. Vitamins B-complex, C, D, E, K, and P are included in sheep sorrel. It contains **sodium**, **calcium**, **sulfur**, **iron**, **magnesium**, chlorine, silicon, **copper**, **iodine**, **manganese**, **zinc**, and **beta carotene**. The silicon in sheep sorrel may help the nervous system. Other constituents of sheep sorrel are malic, oxalic, tannic, and tartaric acids; chlorophyll; rutins; polysaccharides; protein; and **carotenoids**.

The oxalic acid in sheep sorrel is the substance that gives the leaves a sour, lemony taste. Large intakes of sheep sorrel can be poisonous due to the oxalic acid content. Livestock that have eaten excessive quantities of sheep sorrel have been poisoned. It has also been reported that large consumption of sheep sorrel causes **dermatitis** in some animals. Too much oxalic acid can prevent the body from using important nutrients, especially calcium. When the plant is cooked, the oxalic acid content is reduced.

Origins

French sorrel has been used as a food for hundreds of years. Native Americans ate the leaves, stems, seeds, and roots, and seasoned their meats and bread with the herb. The Irish used French sorrel as an ingredient in soup and the French added the leaves to salads. In colonial times, sugar and vinegar were added to French sorrel leaves to create a sauce that was eaten over cold meat. A dark green, brown, or dark gray dye was made from the roots. Medicinally, sheep sorrel was used as a folk remedy to treat **cancer**.

General use

Today, French sorrel is still used as a food. The leaves are used as a thickener in soups, ground into a powder and made into noodles, or added to salads.

Sheep sorrel is gaining popularity as an anticancer agent and for its ability to break down and reduce tumors. A poultice made from sheep sorrel is reported to have a drawing effect on tumors or cysts. Sheep sorrel's rutins and polysaccharides act to prevent tumors and other cancerous growths. The beta carotene contained in sheep sorrel acts as an antioxidant, increasing the production of white blood cells and T-cells (cancer-killing cells). The chlorophyll in sheep sorrel acts to purify the liver, promote regeneration of tissue, decrease swelling of the pancreas, strengthen cell walls, cleanse the blood, and may increase resistance to x rays. The oxalic acid also has antitumor and anticancer properties.

Sheep sorrel is an ingredient in **essiac tea**, an herbal preparation that was adopted from an Ojibwa recipe and is used to treat a variety of cancers. The tea also contains rhubarb, **burdock root**, and **slippery elm**. Sheep sorrel has also been used to treat the side effects of chemotherapy.

Herbalists recommend sheep sorrel for treating mouth and throat ulcers, digestive disorders, **hemorrhoids**, loss of appetite, fevers, scurvy, and **infections**. The juice extracted from the fresh plant is used to treat urinary and kidney disease. Sheep sorrel can be applied externally as a topical wash for skin problems such as herpes, **eczema**, and itchy **rashes** including poison ivy and **hives**.

Preparations

All parts of sheep sorrel (leaves, flowers, roots, and stems) are used medicinally. The leaves and stems should be harvested in the spring or summer before the flowers form. The roots are harvested in the fall.

Small quantities of the leaves of sheep sorrel may be eaten in salads or boiled as a green vegetable. Sheep sorrel is also available in tincture, capsule, or tea form.

For the tincture, 30-120 drops may be diluted in a glass of water and drunk daily.

The leaves are brewed as a tea to treat **fever**, inflammation, and scurvy. A tea made from the roots is used for **diarrhea** and excessive menstrual bleeding. To create an infusion, the leaves and stems are steeped in hot water for five minutes, or the roots are steeped 10 minutes, and 2-3 cups can be drunk daily.

Precautions

Due to the high oxalic acid content, large doses of sheep sorrel can be toxic. Oxalic acid can cause **kidney stones**, irritate the kidneys, or worsen an existing kidney disorder. For these reasons, those with kidney problems or who are prone to kidney ailments should not use sheep sorrel.

When using the leaves as a food, eat small quantities, or cook them to reduce the oxalic content.

People with arthritis, rheumatism, **endometriosis**, **gout**, or kidney stones should use caution when taking sheep sorrel since it may aggravate their condition.

Sheep sorrel should not be used by children, infants, or pregnant or breast-feeding women.

Side effects

High doses of sheep sorrel may cause **nausea**, a tingling sensation of the tongue, or a severe **headache**.

Interactions

There are no known interactions.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Jennifer Wurges

Shepherd's purse

Description

Shepherd's purse is the plant *Capsella bursa-pastoris*. It is a member of the mustard family. Thought to have originated in Europe, shepherd's purse now grows wild around the world in temperate and subarctic regions; it is not found in the tropics.

Shepherd's purse plant, flowering. *(TH Foto-Werbung / Photo Researchers, Inc.)*

Shepherd's purse grows best in sunny locations with clay or sandy loam soil that hasn't been disturbed. Nevertheless, it is an adaptable plant and can survive in poor soils and partial shade. It is often found growing along roadsides, in the cracks of sidewalks, on farmland that is not in production, and along the edges of gardens. Shepherd's purse has moderate water requirements and can withstand short periods of drought. It reproduces only from seed, and the seeds will not germinate unless the soil is disturbed. In the United States, shepherd's purse is considered an invasive weed that takes over habitats and forces out native plants in Arizona, California, Hawaii, Maryland, Nevada, Utah, and Vermont.

Shepherd's purse can be either a hardy annual, completing its life cycle in one growing season, or a biennial, needing two seasons to grow, flower, and make seeds. The plant grows to a height of 4–20 inches (10–100 cm), with taller, larger plants being found in better soil. Lobed, lance-shaped leaves 1–2.5 inches (3–6 cm) across lie close to the ground and form a rosette around the base of the stem. Leaves on the stem are much smaller than those at the base. Small flowers are white to pinkish. Seed pods are triangular or heart-shaped and produce very tiny dark orangish seeds that are dispersed by the wind.

Shepherd's purse gets its name from the shape of its seed pouches, which resemble old-fashioned leather purses. The plant is known throughout the world by many names including shepherd's bag, shepherd's sprout, lady's purse, witches' pouches, rattle pouches, case-weed, pick-pocket, blindweed, pepper-and-salt, cocowort, poor man's parmacetti, sanguinary, St. James's weed, toywort, clappendpouche (Ireland), bourse de pasteur (France), and Hirtentasche (Germany).

General use

Shepherd's purse has two general uses, as food and as an herbal remedy. As food, shepherd's purse can be eaten either raw or cooked. All parts of the plant are safe to eat, but usually only tender young leaves that are picked before the plant flowers are eaten. Older leaves become tough, bitter, and unappetizing. The young leaves can be used raw in salad or cooked the same ways that mustard greens are cooked. The leaves are high in vitamin B_1, flavonoids, **antioxidants**, and **choline**. The leaves contain about 2.9% protein and 3.4% carbohydrate.

When bruised, shepherd's purse gives off an unpleasant odor, but the taste of the young leaves is not at all like this smell. When chickens feed on shepherd's purse, the yolk of their eggs becomes dark and stronger-tasting. Cattle who feed on shepherd's purse produce milk that has an unpleasant taste from the herb.

In the 21st century, shepherd's purse is not much used by professional herbalists, but it continues to be used as a home herbal remedy as it has been for thousands of years. For medicinal uses, fresh shepherd's purse is much preferred to dried material because the herb loses much of its potency when dried. The herb is common, so obtaining fresh material is not usually difficult. Shepherd's purse is used in both internal and external remedies.

Traditionally, shepherd's purse has been used primarily to treat a range of conditions, especially internal bleeding from the lungs, gastrointestinal tract, kidneys, and female reproductive system. It is said to be especially useful in treating heavy and prolonged menstrual bleeding (menorrhagia), non-menstrual bleeding and discharge from the uterus (for example, bleeding caused by **uterine fibroids**), and bleeding after **childbirth**. The herb is also used either alone or in combination with other herbs to treat **premenstrual syndrome** (PMS). It can also be effective in treating **nosebleeds**. Externally, juice from shepherd's purse is applied to skin **wounds** and **burns**. In **Traditional Chinese Medicine** and some European cultures, shepherd's purse is used to treat urinary tract **infections**. In homeopathic medicine, the herb is used to treat bleeding from the uterus and other internal organs.

In modern medical usage, the German Federal Health Agency's Commission E (established in 1978 to independently review and evaluate scientific literature and case studies pertaining to herb and plant medications) has approved the use of shepherd's purse for treatment of menstrual irregularities, nosebleeds, wounds, and burns. Controlled scientific research on the effects that shepherd's purse has on the cardiovascular system is mixed. The herb has been shown to increase the strength of heart contractions and to increase heart rate. However, some studies have found the herb increased blood pressure, while others found blood pressure decreased. One explanation for these contradictory findings is that shepherd's purse often is the host for two different species of fungi. In some of these studies, the fungi may have inadvertently contaminated the herb and altered its effects.

In animal studies, extracts of shepherd's purse have substantially inhibited the growth of solid tumors. Fumeric acid has been isolated from the extract and is thought to cause this inhibitory effect. However, as of 2008, this effect of shepherd's purse had not been studied in humans in a rigorous way.

Preparations

Fresh herb is always preferred over dried material. Shepherd's purse can be prepared as a tea and taken to relieve premenstrual symptoms or used externally. The tea is made by adding 3–5 g of drug to 150 mL (3/4 cup) of boiling water. The tea can be drunk several times a day. According to the German Commission E, the average daily medicinal dose of shepherd's purse is 10–15 g of drug. Shepherd's purse can also be prepared as a liquid extract. The liquid extract daily dosage is 5–8 g of drug.

Precautions

Pregnant women should not use shepherd's purse. The herb appears to increase uterine contractions and may increase the risk of miscarriage. Shepherd's purse also should not be used by women who are breastfeeding. Prolonged use of shepherd's purse may be inappropriate for people with **hypertension** (high blood pressure) or hypotension (low blood pressure).

In the United States, herbal remedies are considered dietary supplements, and are regulated under the 1994 Dietary Supplement Health and Education Act (DSHEA). At the time the act was passed, legislators felt that because many dietary supplements come from natural sources such as plants and have been used for hundreds of years by practitioners of complementary and alternative medicine, these products did not need to be as rigorously regulated as prescription and over-the-counter drugs. One result of this legislation is that the amount of active ingredient in herbal remedies such as shepherd's purse is not standardized. Since herbs are grown in varying environments, there is natural difference in their composition, so that it

KEY TERMS

Annual—A plant that completes its life cycle of growing leaves, blooming, and producing seeds in a single year or growing season.

Antioxidant—A molecule that prevents oxidation. In the body antioxidants attach to other molecules called free radicals and prevent the free radicals from causing damage to cell walls, DNA, and other parts of the cell.

Biennial—A plant that takes two years or two distinct growing seasons to complete its life cycle. In the first year it grows leaves only; in the second it flowers and produces seeds.

Choline—Choline is a nutrient required by the body. It does not meet the classic definition of a vitamin because the body makes some choline but not enough to support health. The remainder must be acquired through diet.

Flavonoids—A large class of antioxidants.

may be difficult for individuals to know the strength of herbal remedies.

Side effects

The entire shepherd's purse plant is edible. When used medicinally in the recommended dosage, no side effects have been observed. In studies using injected extract, large doses have been reported to cause racing heartbeat, uterine contractions, and abnormalities in blood pressure.

Interactions

There are no documented interactions between shepherd's purse and any pharmaceutical drugs or herbal remedies.

Resources

BOOKS

Blumenthal, Mark, ed. *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*. Boston: Integrative Medicine Communications, 1998.

Chevallier, Andrew. *Herbal Remedies*. New York: DK Publishing, 2007.

Foster, Steven and Rebecca Johnson. *National Geographic Desk Reference to Nature's Medicine*. Washington, DC: National Geographic Society, 2006.

PDR for Herbal Medicines, 4th ed. Montvale, NJ: Thompson Healthcare, 2007.

ORGANIZATIONS

Alternative Medicine Foundation. P. O. Box 60016, Potomac, MD 20859. (301) 340 1960. http://www.amfoundation.org.

Centre for International Ethnomedicinal Education and Research (CIEER). http://www.cieer.org.

OTHER

"Shepherd's Purse." *Botanical.com*. undated [cited January 31, 2008]. http://www.botanical.com/botanical/mgmh/s/shephe47.html .

"Shepherd's Purse." *Flora Health*. [cited January 31, 2008]. http://www.florahealth.com/flora/home/Canada/HealthInformation/Encyclopedias/Shepherd%60s Purse.htm.

"Shepherd's Purse." *kingdonPlantae.net*. undated [cited January 31, 2008]. http://www.kingdomplantae.net/shepherdsPurse.php.

"Shepherd's Purse: Capsella bursa pastoris (L.) Medik." *Montana.Plant Life*. undated [cited January 31, 2008]. http://montana.plant life.org/species/capse_bur.htm.

Tish Davidson, A. M.

Shiatsu

Definition

Shiatsu is a manipulative therapy developed in Japan and incorporating techniques of *anma* (Japanese traditional massage), **acupressure**, stretching, and Western massage. Shiatsu involves applying pressure to special points or areas on the body in order to maintain physical and mental well being, treat disease, or alleviate discomfort. This therapy is considered holistic because it attempts to treat the whole person instead of a specific medical complaint. All types of acupressure generally focus on the same pressure points and so-called energy pathways, but may differ in terms of massage technique. Shiatsu, which can be translated as finger pressure, has been described as needle-free acupuncture.

Origins

Shiatsu is an offshoot of anma that developed during the period after the Meiji Restoration in 1868. Traditional massage (anma) used during the age of shoguns was being criticized, and practitioners of *koho anma* (ancient way) displeased with it introduced new practices and new names for their therapies.

Shiatsu massage. *(© Stock Connection Distribution / Alamy)*

KEY TERMS

Acupressure—An ancient form of Asian healing massage that involves applying pressure to special points or areas on the body in order to maintain good health, cure disease, and restore vitality.

Analgesic—Pain reliever.

Osteoporosis—A disease of the bones due to deficiency of bone matrix, occurring most frequently in postmenopausal women.

Palpate—Feel.

During the twentieth century, shiatsu distinguished itself from anma through the merging of Western knowledge of anatomy, koho anma, *ampuku* (abdominal massage), acupressure, *Do-In* (breathing practices), and Buddhism. Based on the work of Tamai Tempaku, shiatsu established itself in Japan and worldwide. The Shiatsu Therapists Association was found in 1925 and clinics and schools followed. Students of Tempaku began teaching their own brand of shiatsu, creating branch disciplines. By 1955, the Japanese Ministry of Health and Welfare acknowledged shiatsu as a beneficial treatment and licensing was established for practitioners.

Benefits

Shiatsu has a strong reputation for reducing stress and relieving **nausea** and **vomiting**. Shiatsu is also believed to improve circulation and boost the immune system. Some people use it to treat diarrhea, **indigestion**, constipation, and other disorders of the gastrointestinal tract; menstrual and menopausal problems; chronic pain; migraine; arthritis; **toothache**; anxiety; and **depression**. Shiatsu can be used to relieve muscular **pain** or tension, especially neck and back pain. It also appears to have sedative effects and may alleviate insomnia. In a broader sense, shiatsu is believed to enhance physical vitality and emotional well being.

Description

Shiatsu and other forms of Japanese acupressure are based on the concept of *ki*, the Japanese term for the all-pervading energy that flows through everything in the universe. (This notion is borrowed from the Chinese, who refer to the omnipresent energy as qi or chi.) Ki tends to flow through the body along special energy pathways called meridians, each of which is associated with a vital organ. In Asian systems of traditional medicine, diseases are often believed to occur due to disruptions in the flow this energy through the body. These disruptions may stem from emotional factors, climate, or a host of other causes including **stress**, the presence of impurities in the body, and physical trauma.

The aim of shiatsu is to restore the proper flow of bodily energy by massaging the surface of the skin along the meridian lines. Pressure may also be applied to any of the 600 or so acupoints. Acupoints, which are supposedly located just under the skin along the meridians, are tiny energy structures that affect the flow of ki through the body. When ki either stagnates and becomes deflected or accumulates in excess along one of these channels, stimulation to the acupoints, which are sensitive to pressure, can unblock and regulate the ki flow through toning or sedating treatment.

Western medicine hasn't proven the existence of meridians and acupoints. However, in one study, two French medical doctors conducted an experiment at Necher Hospital in Paris to test validity of theory that energy is being transported along **acupuncture** meridians. They injected and traced radioactive isotopes with gamma-camera imaging. The meridians may actually correspond to nerve transmission lines. In this view, shiatsu and other forms of healing massage may trigger the emission of naturally occurring chemicals called neurotransmitters. Release of these chemical messengers may be responsible for some of the therapeutic effects associated with shiatsu, such as pain relief.

Preparations

People usually receive shiatsu therapy while lying on a floor mat or massage table or sitting up. The massage is performed through the clothing—preferably a thin garment made from natural fibers—and disrobing is not required. Pressure is often applied using the thumbs, though various other parts of the body may be employed, including fingertips, palms, knuckles, elbows, and knees—some therapists even use their feet. Shiatsu typically consists of sustained pressure (lasting up to 10 seconds at a time), squeezing, and stretching exercises. It may also involve gentle holding as well as rocking motions. A treatment session lasts anywhere from 30 to 90 minutes.

Before shiatsu treatment begins, the therapist usually performs a general health assessment. This involves taking a family medical history and discussing the physical and emotional health of the person seeking therapy. Typically, the practitioner also conducts a diagnostic examination by palpating the abdomen or back for any energy imbalances present in other parts of the body.

Precautions

While shiatsu is generally considered safe, there are a few precautions to consider. Because it may increase blood flow, this type of therapy is not recommended in people with bleeding problems, heart disease , or **cancer**. Massage therapy should always be used with caution in those with **osteoporosis**, fresh **wounds** or scar tissue, bone **fractures**, or inflammation.

Applying pressure to areas of the head is not recommended in people with **epilepsy** or high blood pressure, according to some practitioners of shiatsu.

Shiatsu is not considered effective in the treatment of fever, **burns**, and infectious diseases.

Shiatsu should not be performed right after a meal.

Side effects

When performed properly, shiatsu is not associated with any significant side effects. Some people may experience mild discomfort, which usually disappears during the course of the treatment session.

Research and general acceptance

Like many forms of massage, shiatsu is widely believed to have a relaxing effect on the body. There is also a significant amount of research suggesting that acupressure techniques can relieve nausea and vomiting associated with a variety of causes, including **pregnancy** and anesthetics and other drugs. In one study, published in the *Journal Of Nurse-midwifery* in 1989, acupressure was shown to significantly reduce the effects of nausea in 12 of 16 women suffering from morning sickness. Five days of this therapy also appeared to reduce anxiety and improve mood. Another investigation, published in the *British Journal Of Anaesthesia* in 1999, studied the effects of acupressure on nausea resulting from the use of anesthetics. Pressure applied to an acupoint on the inside of the wrist appeared to alleviate nausea in patients who received anesthetics during the course of laparoscopic surgery.

Shiatsu may also produce sedative and analgesic effects. The sedative powers of acupressure were investigated in a study published in the *Journals of Gerontology* in 1999, which involved over 80 elderly people who suffered from sleeping difficulties. Compared to the people in the control groups, the 28 participants who received acupressure were able to sleep better. They slept for longer periods of time and were less likely to wake up during the night. The researchers concluded that acupressure may improve the quality of sleep in older adults. The use of acupressure in postoperative pain was investigated in a study published in the *Clinical Journal Of Pain* in 1996. In this study, which involved 40 knee surgery patients, one group received acupressure (15 acupoints were stimulated) while the control group received sham acupressure. Within an hour of treatment, members of the acupressure group reported less pain than those in the control group. The pain-relieving effects associated with acupressure lasted for 24 hours.

Shiatsu may benefit **stroke** victims. The results of at least one study (which did not include a control group) suggest that shiatsu may be useful during stroke rehabilitation when combined with other treatments.

Training and certification

A qualified shiatsu therapist must have completed courses in this form of therapy and should be nationally certified or licensed by the state (most are certified by the American Oriental Bodywork Therapy Association). Asking a medical doctor for a recommendation is a great place to start. It can also be helpful to consult friends and family members who have tried shiatsu. There are several massage-related organizations that offer information on locating a qualified therapist. These include the National Certification Board for Therapeutic Massage and Bodywork, the American **Massage Therapy** Association, the International School of Shiatsu, and the American Oriental Bodywork Therapy Association.

Resources

BOOKS

Cook, Allan R. *Alternative Medicine Sourcebook*. Detroit: Omnigraphics, 1999.

PERIODICALS

Chen, M.L., L.C. Lin, S.C. Wu, et al. "The effectiveness of acupressure in improving the quality of sleep of insti tutionalized residents." *J Gerontol A Biol Sci Med Sci* (1999): M389 94.

Felhendler, D. and B. Lisander. "Pressure on acupoints decreases postoperative pain." *Clin J Pain* (1996): 326 329.

Harmon, D., J. Gardiner, R. Harrison, et al. "Acupressure and the prevention of nausea and vomiting after lapa roscopy." *Br J Anaesth* (1999): 387 390.

Hogg, P.K. "The effects of acupressure on the psychological and physiological rehabilitation of the stroke patient." *Dissertation Abstracts Int* (1986): 841.

Hyde, E. "Acupressure therapy for morning sickness. A con trolled clinical trial." *J Nurse Midwifery* (1989): 171 178.

ORGANIZATIONS

Acupressure Institute. 1533 Shattuck Avenue, Berkeley, CA 94709.

American Massage Therapy Association. 820 Davis Street, Suite 100, Evanston, IL.

American Oriental Bodywork Therapy Association. 50 Maple Place, Manhassett, NY 11030.

International School of Shiatsu. 10 South Clinton Street, Doylestown, PA 18901.

National Certification Board for Therapeutic Massage and Bodywork. 8201 Greensboro Drive, Suite 300, McLean, VA 22102.

OTHER

International School of Shiatsu. http://www.shiatsubo.com.

Medline. http://igm.nlm.nih.gov.

Greg Annussek

Shiitake mushroom

Description

Shiitake mushroom (*Lentinus edodes*) is a fungus native to Japan, China, and Korea. Now cultivated

Fresh shiitake mushrooms. *(Photo by Kelly Quin. Reproduced by permission.)*

Shiitake mushroom. *(© Runk/Schoenberger / Alamy)*

KEY TERMS

Fungus—A type of plant that lives by decomposing and absorbing the organic material in which it grows.

Lentinan—A compound found in shiitake mushrooms that helps to boost the immune system.

Nutraceutical—Any food or food ingredient that is thought to provide health benefits, including the prevention and treatment of disease. Shiitake is now considered an important nutraceutical.

Potentiation—A type of drug interaction in which one drug or herbal preparation intensifies or increases the effects of another.

worldwide, Japan is still the largest producer of shiitake mushrooms, producing 80% of the total supply. Used in Asian cuisine for over 2,000 years, cultivation of shiitake began almost 700 years ago in Japan. The Japanese consider the shiitake not only a flavorful food but also "the elixir of life." During the Ming Dynasty (1368–1644), the shiitake was reserved only for the emperor and his family and it became known as the emperor's food. The word shiitake comes from *shii* (a type of chestnut tree) and *take* (mushroom). Shiitake is an excellent source for **amino acids**; vegetable proteins; **iron**; **thiamine** (vitamin B_1); **riboflavin** (vitamin B_2); **niacin**; and vitamins B_6, B_{12}, and D_2. Shiitake is known as *hsaing ku* (fragrant mushroom) in China.

General use

Traditionally, shiitake was used medicinally for a number of conditions.

- colds and influenza
- headaches
- sexual dysfunction
- constipation
- measles
- hemorrhoids
- diabetes
- gout

Presently, shiitake has been shown to boost the immune system, act as an antiviral and antibacterial agent, and possibly shrink tumors. Since shiitake has been part of the Asian diet, particularly in Japanese cuisine, for hundreds of years, its health benefits have been documented. Most of the formal studies conducted have been in Japan; however Western interest in the mushroom as a possible treatment for **cancer** and HIV infection has encouraged researchers in the United States and elsewhere to begin formalized studies of its medicinal properties. A 1998 study done in San Francisco of lentinan, a glucan (complex sugar) found in shiitake, found that patients with HIV infection who were given lentinan together with a standard drug for **AIDS** maintained higher CD4 cell counts for longer periods of time than those who were given the standard drug alone.

The possible health benefits of lentinan have also led to agricultural experiments intended to raise the level of the compound in commercially grown shiitake. Researchers found that mushrooms grown on logs had higher levels of lentinan than mushrooms grown on other types of organic material.

Shiitake contains over 50 different enzymes, including pepsin and trypsin that help digestion and asparaginase that has been used to treat childhood **leukemia**. The mushroom also contains chitin, eritadenine, and lentinacin, all of which have been shown to lower serum **cholesterol**. Further studies completed in 2002 have confirmed the beneficial effects of shiitake in lowering serum cholesterol levels.

Perhaps shiitake's most beneficial ingredient is activated hexose-containing compound (also known as 1,3-beta glucan). Japanese studies of this compound have supported evidence that it has anti-cancer properties in humans as well as in animals. The compound is already produced by a private company as a nutritional supplement and is available in Europe, Japan, and the United States. It is also regularly used in hospitals in Asia and Japan in conjunction with allopathic treatments of several kinds of cancer. According to a Hokkaido University School of Medicine study of cancer patients taking the supplement on a daily basis, the

compound may slow tumor growth and decrease the side effects caused by allopathic cancer treatments. The University of California Davis School of Medicine is conducting the first human trial outside of Japan to determine the anti-tumor effects activated hexose-containing compound may have on cancer patients. The focus of the study will be on patients with prostrate cancer because the characteristic symptom of the cancer—elevated PSA levels in the blood—are easily detected and monitored for change.

Activated hexose-containing compound is isolated from partially grown mushroom spores that have undergone a treatment that releases the compound. It is not abundant in the mushrooms that are readily available in grocery stores, but the overall health benefits from shiitake mushrooms has been corroborated by research.

Preparations

Shiitake production in the United States has risen markedly since 1980. Since shiitake is now being marketed as a nutraceutical, or food that is thought to provide health benefits above and beyond its nutritional value, its production is expected to rise even further.

Shiitake mushrooms can be prepared and eaten in the same way the more common white mushrooms are, by grilling, sautéing, and stir-frying. Dried shiitake mushrooms are used in soups, stews, and sauces. Eat one to two fresh mushrooms or 1–2 tsp of dried shiitake daily.

Shiitake supplements are also available in gel-cap form, as well as powders, extracts, and tea, at health food stores. Shiitake is also an ingredient in compound formulas to boost the immune system. The newest product of this type is a mixture of dried shiitake, reishi, and **maitake** mushrooms that have been grown on a base of therapeutic herbs. Consumers who use these products should follow the recommended daily dosage on the label.

Injections of shiitake should be prescribed and monitored by a healthcare provider.

Precautions

Shiitake is nontoxic and safe to ingest.

Side effects

Large daily doses over a prolonged period of time can cause **diarrhea** in some users.

Interactions

Shiitake has been reported to interact supportively with didanosine (Videx), a drug given to treat HIV infection. Because shiitake can lower blood pressure, it should not be taken together with drugs given to control blood pressure (antihypertensives). For the same reason, it should be discontinued before any operation requiring general anesthesia.

Resources

BOOKS

Atkins, Robert C. M.D. *Dr. Atkins' Vita Nutrient Solution*. New York: Simon & Schuster, 1998.

Carper, Jean. *Food Your Miracle Medicine: How Food Can Prevent And Cure Over 100 Symptoms and Problems*. New York: HarperCollins, 1993.

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Harrar, Sari, and Sara Altshul O Donnell. *The Woman's Book of Healing Herbs*. Emmeus, PA: Rodale Press, 1999.

Mindell, Earl. *Earl Mindell's Herb Bible*. New York: Simon & Schuster, 1992.

PERIODICALS

Brauer, D., T. Kimmons, and M. Phillips. "Effects of Manage ment on the Yield and High Molecular Weight Polysac charide Content of Shiitake (*Lentinula edodes*) Mushrooms." *Journal of Agricultural and Food Chemistry* 50 (September 11, 2002): 5333 5337.

Fuchs, Nan Kathryn. "A Brand New Super Nutrient!" *Women's Health Letter* 8 (August 2002): 1 3.

Gordon, M., B. Bihari, E. Goosby, et al. "A Placebo Controlled Trial of the Immune Modulator, Lentinan, in HIV Positive Patients: A Phase I/II Trial." *Journal of Medicine* 29 (5 6): 305 330.

Shimada, Y., T. Morita, and K. Sugiyama. "Effects of *Len tinus edodes* on Fatty Acid and Molecular Species Pro files of Phosphatidylcholine in Rats Fed Different Levels of Corn Oil." *Bioscience, Biotechnology, and Biochemistry* 66 (August 2002): 1759 1763.

ORGANIZATIONS

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. www.aaom.org.

United States Department of Agriculture (USDA), Agricultural Research Service (ARS). 5601 Sunnyside Avenue, Belts ville, MD 20705. (301) 504 1651. www.ars.usda.gov.

Jacqueline L. Longe
Rebecca J. Frey, PhD

Shingles

Definition

Shingles, also called herpes zoster, gets its name from both the Latin and French words for belt or girdle and refers to girdle-like skin eruptions that

Shingles. *(© Medical-on-Line / Alamy)*

may occur on the trunk of the body. The virus that causes **chickenpox**, the *Varicella zoster* virus (VSV), can become dormant in nerve cells after an episode of chickenpox and later re-emerge as shingles.

Initially, red patches of rash develop into **blisters**. Because the virus travels along the nerve to the skin, it can damage the nerve and cause it to become inflamed. This condition can be very painful. If the **pain** persists long after the rash disappears, it is known as post-herpetic **neuralgia** (PHN).

Description

Any individual who has had chickenpox can develop shingles. Between 600,000 and one million Americans are diagnosed with shingles each year. Overall, approximately 20% of those who have had chickenpox as children develop shingles at some time in their lives. People of all ages—even children—can be affected, but the incidence increases with age. Newborns, bone marrow and other transplant recipients, and individuals with immune systems weakened by disease or drugs are also at increased risk. However, most individuals who develop shingles do not have any underlying malignancy or other immunosuppressive condition.

Causes and symptoms

Shingles erupts along the course of the affected nerve, producing lesions anywhere on the body. The condition may cause severe nerve pain. The most common areas to be affected are the face and trunk, which correspond to the areas where the chickenpox rash is most concentrated. There is usually a vague line from the spine along the path of the affected nerve on one side of the body.

The disease is caused by a reactivation of the chickenpox virus that has lain dormant in certain nerves following an episode of chickenpox. Exactly how or why this reactivation occurs is not clear. In 2002, clinicians pointed out that one of the causes of increasing cases of shingles was actually the success of chicken pox vaccinations. It is believed that the reactivation is triggered when the immune system becomes weakened as a result of age, **stress**, **fatigue**, certain medications, chemotherapy, or diseases such as

KEY TERMS

Acyclovir—An antiviral drug that is available under the trade name Zovirax, in oral, intravenous, and topical forms. The drug prevents the varicella zoster virus from replicating.

Corticosteroid—A steroid that has similar properties to the steroid hormone produced by the adrenal cortex. It is used to alter immune responses to shingles.

Famciclovir—An oral antiviral drug that is available under the trade name Famvir. The drug prevents the varicella zoster virus from replicating.

Post-herpetic neuralgia (PHN)—The term used to describe the pain after the rash associated with herpes zoster is gone.

Tzanck preparation—A procedure in which skin cells from a blister are stained and examined under the microscope. The presence of large skin cells with many cell centers or nuclei points to a diagnosis of herpes zoster when combined with results from a physical examination.

Valacyclovir—An oral antiviral drug that is available under the trade name Valtrex. The drug prevents the varicella zoster virus from replicating.

cancer or HIV. Furthermore, in persons with HIV, shingles can be an early sign that the immune system has deteriorated.

Early signs of shingles are often vague and can easily be mistaken for other illnesses. The condition may begin with **fever** and malaise (a vague feeling of weakness or discomfort). Within two to four days, severe pain, **itching**, and numbness/tingling (paresthesia) or extreme sensitivity to touch (hyperesthesia) can develop, usually on the trunk and occasionally on the arms and legs.

Pain may be continuous or intermittent, usually lasting one to three weeks. It may occur at the time of the eruption, but can precede the eruption by days, occasionally making the diagnosis difficult.

Signs and symptoms may include the following:

- itching, tingling, or severe burning pain
- red patches that develop into blisters
- grouped, dense, deep, small blisters that ooze and crust
- swollen lymph nodes

Diagnosis

Diagnosis usually is not possible until the skin lesions develop. Once they develop, however, the pattern and location of the blisters and the type of cell damage displayed are very characteristic of the disease. This allows an accurate diagnosis based primarily upon the physical examination. Although tests are rarely necessary, they may include the following:

- Viral culture of skin lesion.
- Microscopic examination using a Tzanck preparation. This involves staining a smear obtained from a blister. Cells infected with the herpes virus appear very large and contain many dark cell centers or nuclei.
- Complete blood count (CBC) may show an elevated white blood cell count (WBC), a nonspecific sign of infection.

Treatment

A person with shingles should immediately see a doctor or health practitioner. Although the condition generally clears up within three to five weeks, treatment can ease the painful symptoms. Alternative medicine remedies and therapies will not cure shingles, but they will provide pain relief, reduce inflammation, and speed recovery.

Herbal remedies

Many herbs can be used to treat shingles. Some remedies involve brewing tea and then consuming and/or applying it to the affected area. Herbs used to treat shingles include:

- Red pepper, also known as capsicum or cayenne, is so effective that it's an ingredient in commercial ointments approved by the U.S. Food and Drug Administration. Commercial preparations include Zostrix and Capzasin-P. Red pepper is hot, so the ointment should be applied only to healed blisters. Red pepper is useful for treating painful PHN.
- Topical applications of lemon balm, licorice, or peppermint may reduce pain and blistering. These herbs may be brewed as teas and then consumed and applied to the skin.
- Herbal antivirals, such as echinacea, can be effective in fighting infection and boosting the immune system.
- Calendula ointment or lotion works to counter the virus.
- Sedative herbs such as passionflower can be brewed for a tea. Such herbs can help with treatment of post-herpetic neuralgia.

- Vervain helps relieve pain and inflammation. St. John's wort, lavender, chamomile, and marjoram also help relieve inflammation.

Homeopathic remedies

A person with shingles should consult a homeopath for specific remedies and dosages. Homeopathic remedies include ranunculus, which is effective for shingles on the trunk. It is also taken for itching. A homeopath may recommend **rhus toxicodendron** for blisters and **arsenicum album** or hypericum for pain.

Traditional Chinese medicine

Practitioners of **traditional Chinese medicine** (TCM) recommend **acupressure** and **acupuncture** to alleviate pain. Acupuncture can help with post-herpetic neuralgia. In addition, a TCM practitioner may recommend herbal remedies such as Chinese gentian root, which is used to treat the liver. In addition, Chinese **skullcap** root is combined with water and used as a folk remedy for treating shingles in China. Also, certain herbal combinations can treat specific symptoms and contributing causes. For example, *Long Dan Xie Gan Tang* can quell the accumulation of damp, toxic heat in the liver. For damp, infected, painful eruptions on the torso, *Huang Qin Gao* can be applied to the surrounding area.

Diet and nutrition

To boost the immune system, supplement the diet with vitamin B during the first one or two days. Until health returns, continue to supplement with **vitamin B complex**, high levels of **vitamin C** with **bioflavonoids**, and **calcium**.

Food seasoned with red pepper (capsicum) may provide relief, as may foods containing the amino acid **lysine**. High-lysine foods include soybeans, black bean sprouts, lentils, **parsley**, and peas.

Home remedies

Cool, wet compresses may help reduce pain while blisters or crusting is present. Patients may be made more comfortable with the application of a cloth dipped in one-quarter cup (60 ml) of white vinegar mixed in two quarts (1.9 l) of lukewarm water. Compresses should be used twice daily for 10 minutes. When blisters dry up, the compresses may be discontinued.

Soothing treatments such as colloidal oatmeal baths, starch baths or lotions, and calamine lotion may help to relieve itching and discomfort.

When the crusts and scabs are separating, the skin may become dry, tight, and cracked. If that happens, a small amount of plain petroleum jelly can be applied to the area three or four times daily.

Ayurvedic medicine

Ayurveda is an Indian healing science that is more than 5,000 years old. Treatment is based on maintaining a balance between the body and the world. Treatment for shingles may include applying a **turmeric** paste to the skin.

Relaxation techniques

Relaxation techniques can be used to treat symptoms of shingles. Techniques such as **hypnotherapy** and **yoga** can help a person relax.

Flower remedies

Flower remedies are liquid concentrates made by soaking flowers in spring water. Also known as flower essences, 38 remedies were developed by homeopathic physician Edward Bach during the 1930s. A 39th combination formula, the **Rescue Remedy**, is taken to relieve stress. The remedy is taken by placing several drops under the tongue four times daily. Alternately, the drops may be added to a glass of water. The patient drinks the mixture throughout the day.

Reflexology

Reflexology is the manipulation of the foot to bring the body into balance. Reflex points on the foot correspond to parts of the body. These points can be treated by a reflexologist or at home by following instructions on a reflex chart.

Allopathic treatment

The antiviral drugs acyclovir, valacyclovir, and famciclovir can be used to treat shingles. These drugs may shorten the course of the illness. More rapid healing of the blisters results when drug therapy is started within 72 hours of the onset of the rash. In fact, the earlier the drugs are administered, the better, because early cases can sometimes be halted. If taken later, these drugs are less effective but may still lessen the pain. Antiviral drug treatment does not seem to reduce the incidence of post-herpetic neuralgia (PHN), but recent studies suggest famciclovir may cut the duration of PHN in half.

Side effects of typical oral doses of these antiviral drugs are minor with **headache** and **nausea** reported by 8–20% of patients. Severely immune-compromised individuals, such as those diagnosed with **AIDS**, may

require intravenous administration of antiviral drugs. Corticosteroids, such as prednisone, may be used to reduce inflammation but they interfere with the functioning of the immune system. Corticosteroids, in combination with antiviral therapy, are also used to reduce severe pain and to treat severe **infections**, such as those affecting the eyes.

After the blisters heal, some people continue to experience PHN for months or even years. This pain can be excruciating. Consequently, the doctor may prescribe tranquilizers, sedatives, or antidepressants to be taken at night. Attempts to treat PHN with the famciclovir have shown some promising results. When all else fails, severe pain may require a permanent nerve block.

Expected results

Shingles usually clears up within three to five weeks and rarely recurs. There have been reports that shingles cleared up several days after **licorice** ointment was applied to the skin or when the homeopathic remedy ranunculus was taken.

If the nerves that cause movement are affected, temporary or permanent nerve paralysis and/or tremors may occur. The elderly or debilitated patient may have a prolonged and difficult course and recovery. For them, the eruption is typically more extensive and inflammatory, occasionally resulting in blisters that bleed, areas where the skin actually dies, secondary bacterial infection, or extensive and permanent scarring.

Similarly, patients with compromised immune systems usually have more severe courses that are often prolonged for weeks to months. They develop shingles frequently and the infection can spread to the skin, lungs, liver, gastrointestinal tract, brain, or other vital organs.

Cases of chronic shingles have been reported in AIDS patients, especially when they have a decreased number of one particular kind of immune cell, called CD4 lymphocytes. Depletion of CD4 lymphocytes is associated with more severe, chronic, and recurrent varicella zoster virus infections. Lesions are typical at the onset but may turn into ulcers that do not heal. Herpes zoster can lead to potentially serious complications.

Many individuals continue to experience persistent pain long after the blisters heal. This post-herpatic neuralgia can be severe and debilitating. The incidence of post-herpetic neuralgia increases with age, and episodes in older individuals tend to be of longer duration. Most patients under 30 years of age experience no persistent pain. By age 40, the risk of prolonged pain lasting longer than one month increases to 33%. By age 70, the risk increases to 74%. The pain can adversely affect quality of life, but it usually diminishes over time.

Other complications include a secondary bacterial infection.

Prevention

Strengthening the immune system by making lifestyle changes is thought to help prevent the development of shingles. This includes eating a well-balanced diet rich in essential vitamins and minerals, getting enough sleep, exercising regularly, and reducing stress.

In 2002, reports from a large, five-year study showed that researchers might be nearing a workable vaccine for shingles. The vaccine is 10 times stronger than the chicken pox vaccine and similar in nature. Study results were planned for release in mid-2004.

Resources

BOOKS

Cummings, Stephen, and Dana Ullman. *Everybody's Guide to Homeopathic Medicines*. New York: Putnam, 1997.

Duke, James A. *The Green Pharmacy*. Emmaus, Pa.: Rodale Press, 1997.

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, Pa.: Rodale Press, 1995.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, Pa.: Rodale Press, 1996.

L'Orange, Darlena. *Herbal Healing Secrets of the Orient*. Paramus, NJ: Prentice Hall, 1998.

Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt, 1997.

Ullman, Dana. *The Consumer's Guide to Homeopathy*. New York: Putnam, 1995.

PERIODICALS

Landers, Susan J. "Rash of Pain: With an Increasingly Large Patient Population at Risk for Shingles, Researchers Focus on Uncovering New Ways to Prevent and Treat this Viral Response."*American Medical News*(April 1, 2002):32.

MacKenzie, Deborah. "The Hidden Catch: Although Chickenpox is Nasty, Vaccination Might Not be the Answer."*New Scientist*(May 4, 2002):7.

ORGANIZATIONS

Academy of Dermatology. 930 N. Meacham Road, P.O. Box 4014, Schaumberg, IL 60168 4014. (708) 330 0230. http://www.aad.org/zoster.html.

American Botanical Council. P.O. Box 201660, Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

MotherNature.com Health Encyclopedia. http://www.mothernature.com/ency.

Liz Swain
Teresa G. Odle

KEY TERMS

Myositis—Inflammation of the muscle.

Periosteum—Tissue covering the bone.

Periostitis—Inflammation of the tissue covering the bone.

Tendinitis—Inflammation of the tendon.

Tibia—One of the long bone of the lower leg.

Shin splints

Definition

Shin splints can be defined as an inflammation of the tissues in the lower leg causing **pain** with exercise. It is also referred to as medial tibial stress syndrome.

Description

Shin splints are an inflammation of the tendons, muscles, and periosteum most commonly seen in those who walk, jog, or run on hard, uneven surfaces. The resulting pain may indicate either anterior shin splints, with radiation down the front and lateral leg, or posterior shin splints, extending down the back and inner leg and ankle. Depending on the body tissues involved, shin splints may indicate myositis (an inflammation of the muscle), **tendinitis** (inflammation of the tendons), or periostitis (an inflammation of the tissue covering the bone).

Causes and symptoms

The inflammation is caused by an imbalance of the calf and shin muscles used to mobilize the forefoot with **exercise**. The associated pain in the lower leg usually worsens with exercise.

Diagnosis

The identification of shin splints is often made by the affected individual's observation of the symptoms. X rays of the lower extremity may be requested to prevent a misdiagnosis, when **stress** fractures are suspected.

Treatment

Exercise should not be resumed until it can be performed without pain. Switching from impact workouts to swimming or cycling will allow for healing to the inflamed areas. A gentle massage with lubricating oil will provide comfort and decrease swelling. An ice massage may also facilitate healing, using a circular movement over the affected area three to four times daily for 10-15 minutes. Some find heat more comforting and beneficial, applied via a heating pad or lamp, a hot shower, or whirlpool.

A well balanced, high protein diet, dietary antioxidants, and **essential fatty acids** may also promote healing. As activity level may be less than usual during the initial healing phase of shin splints, adequate fluid and fiber intake is vital to promote normal bowel function.

After at least a two-week rest period, a gradual resumption of exercise is recommended. Icing the legs for 5-10 minutes before stretching and after cool-down is recommended. Crisscross taping of the anterior leg maybe be helpful for the individual with anterior shin splints, as well as raising the heel portion of the shoe approximately one eighth of an inch. The individual with posterior shin splints should remember to hold the body erect, rather than leaning forward while running, and to avoid landing directly on the toes. An extra pair of socks for warmth while running is also recommended.

Allopathic treatment

For minor discomfort associated with shin splints, over-the-counter anti-inflammatory medications such as ibuprofen or aspirin may provide relief. If these are found to be ineffective for pain relief, prescription strength, nonsteriodal, anti-inflammatory drugs may be ordered by the physician. Physical therapy sessions for ice and/or heat application may also be helpful.

Expected results

A complete resolution of the pain associated with shin splints requires an adequate period of rest followed by a slow rehabilitation or gradual resumption of activity, ranging from two weeks to two months. Resuming activities too soon may result in a prolonged healing time and recurrence of symptoms. The change in gait and posture associated with shin splint pain may result in inflammatory or arthritic changes in the local joints, i.e. the ankle, knee, hip, or back.

Prevention

Those who exercise by running or doing high-impact aerobics should be sure to wear well-fitting shoes that offer adequate lateral and arch support, with cushioning for the ball and heel of the foot. Footwear should be re-evaluated for adequacy of support and cushioning about every six months. Warming up before and cooling down after the activity is vital, and shins should also be kept warm during exercise. Jogging on soft surfaces such as dirt or grass is preferred over hard or uneven surfaces.

Resources

BOOKS

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, Pennsylvania: Rodale press, Inc., 1995.

Mercier, Lonnie. *Practical Orthopedics*. St. Louis, Missouri: Mosby Year Book, Inc., 1995.

OTHER

Thriveonline. http://www.thriveonline.com/health/Library/sports.

Kathleen Wright

Shintaido

Definition

Shintaido is a non-combative form of **martial arts** designed to improve physical and mental health.

Origins

Although shintaido has its roots in the ancient and traditional Japanese martial arts, it includes elements of sword fencing, karate, and aikido. Hiroyuki Aoki, an actor, artist, and shotokai karate master, developed shintaido in Yokohama, Japan, in 1965. He formed *rakutenkai* or "meeting of people," a group of several dozen people, including martial arts instructors, artists, musicians, and actors, to create a new art form and health **exercise**. Translated from Japanese, shintaido means "new body way."

Benefits

Like many other martial arts, shintaido promotes a healthy mind and spirit as much as a healthy body. The benefits of practicing shintaido include:

- Enhancing physical health through a series of body movements, including warm-ups, vigorous exercises, fundamental movements, traditional movements, and exercises with a partner
- Eliminating stress and amplifying natural energies of the body and mind
- Developing *ki*, a Japanese word meaning internal spirit or vital energy
- Opening the mind and fostering a cheerful attitude
- Improving the ability to interact with other people
- Fostering love, peace, and magnanimity
- Increasing concentration
- Strengthening individuality and enhancing creativity

Description

The body movements in shintaido are influenced by traditional and contemporary aspects of Japanese culture, including dance, music, Noh theater, and abstract art. It involves a series of movements ranging from slow and meditative to rapid and energetic. One shintaido movement, *bojutsu*, involves using a six-foot staff, while another, *kenjutsu*, uses a wooden sword.

Most formal shintaido classes offered by schools sanctioned through the International Shintaido Federation or Shintaido of America are taught by an instructor and teaching assistant. The classes consist of wrap-ups, vigorous exercises, fundamental movements, partner practice, and traditional movements, called *kata*.

Preparations

No preparations are required to begin shintaido. It can be practiced by anyone, including children and the elderly.

Precautions

There are no precautions associated with learning shintaido.

Side effects

No serious adverse side effects had been reported from shintaido as of 2008. In rare cases, beginning students of the art may experience slight muscle or joint soreness if practice is overdone.

Research and general acceptance

Shintaido is almost universally accepted in Japan as beneficial as physical exercise, **stress** reduction, and as a tool for bringing mental clarity. It is generally accepted in western cultures, including medical science, as a legitimate and effective exercise for the mind and body. However, few, if any, controlled

KEY TERMS

Aikido—A Japanese martial art developed during the early twentieth century by Morihei Ueshiba. Literally translated, aikido means "the way of harmony with universal energy" or "the way of a loving spirit."

Karate—A native Okinawan fighting style brought to Japan in the early twentieth century.

Noh theater—A Japanese theatrical form developed in the fourteenth century, featuring masks, extravagant costumes, bare stages, and restrained movements.

scientific studies on measurable benefits of shintaido had been conducted in the United States as of the late 2000s.

Training and certification

Most shintaido classes are taught by trained and certified instructors. There are four levels of teachers: instructor, senior instructor, general instructor, and master instructor. Many qualified teachers in the United States are examined and certified by Shintaido of America or the International Shintaido Federation. During an examination, all levels of instructors are judged on technical expertise and leadership qualities. There are also specified years of practice required for each level and apprenticeship with a more advanced instructor.

Resources

ORGANIZATIONS

Shintaido of America, PO Box 1979, Novato, CA, 94948 1979, http://www.shintaido.org.

Ken R. Wells
Leslie Mertz, Ph.D.

Sick building syndrome

Definition

Sick building syndrome (SBS) is a term used to describe certain health effects people experience that may be related to poor air in buildings. The problems can be localized, for instance experienced by workers in only one section of an office or factory, or they may be widespread and experienced throughout an entire building. SBS has been reported in various settings such as hospitals, schools, industrial and art business, and care homes, or any building or home with off gassing carpets, paints, fumes, as well as buildings with ventilation problems and concentration of vapors, gases, solvents, other airborne agents toxic to the skin, lungs or nervous system. In fact, sick school syndrome is a condition related to poor ventilation in some of America's schools.

Microscope view of the black mold stachybotrys chartarum. This fungus is a mycotoxin producer and has been linked to sick building syndrome. *(MedicalRF.com / Alamy)*

Description

People who have SBS generally experience symptoms related to the eyes, nose, throat, and skin. They also may complain of overall symptoms such as feeling very tired. When caused by SBS, these symptoms have no other known cause or explanation. Other similar symptoms are related to SBS and may be confused with the syndrome. For instance, "building-related

illness" (BRI) is the term used for a diagnosed illness attributed to contaminants that can be identified in a building. Often, the contaminants come from the ventilation system. Legionnaire's disease is a well-known example of BRI. **Multiple chemical sensitivity** (MCS) is another closely related condition; however, it is not caused by SBS. People with MCS have high sensitivity or allergy to many chemicals and other substances in the environment. They may experience symptoms in many organs and systems of their bodies from low levels of exposure to chemicals.

Like MCS, SBS is largely a modern phenomenon, first recognized by the World Health Organization (WHO) as a medical condition in 1982. When building designers sought to save energy during the 1970s oil embargo, they began creating virtually airtight buildings. However, the new energy-efficient structures reduced ventilation, even to the point of reducing health and comfort for occupants. SBS has resulted in lost productivity among affected workers and increased costs for those who own and operate the buildings with poor air quality and other problems. An entire industry has developed around producing air filters and other products, as well as engineering and design consulting.

Causes and symptoms

People who complain of SBS report symptoms of acute discomfort such as eye, nose, and throat irritation, a dry **cough**, and **dizziness** or **nausea**. Many also report dry, itchy skin. Some will have difficulty concentrating, sensitivity to odors, and **fatigue**, headaches. While many of these symptoms are common to other conditions, their relation to time spent in a specific building suggests the possibility of SBS.

The specific causes of SBS are unknown, but several factors may contribute to the condition. The most notable factor is poor indoor air quality. If air is not properly ventilated, it may become too dry or too humid. Also, chemicals or biological contaminants (molds, pollen, viruses, etc.) may concentrate in the air. The World Health Organization (WHO) estimates that up to 30% of office buildings worldwide have significant indoor air quality problems. A 1995 study found that about one-half of schools in the United States had poor ventilation and sources of pollution inside the buildings.

More than 700,000 chemicals are in common use today. Chemical contaminants can enter indoor air from the outside or from the inside. For example, vehicle exhaust can enter a building through windows or through poorly located air intake vents. However, most chemical contaminants come from indoor sources. Commonly used materials for construction and cleaning emit byproducts that can cause acute health effects in people when concentrated at high levels. Even low or moderate levels of these contaminants can cause health effects in some people with certain sensitivities. Called volatile organic compounds (VOCs), the contaminants come from carpet glues, copy machines, manufactured wood products, cleaning agents, pesticides, and tobacco smoke. Formaldehyde is one of the common VOCs.

Radon, a radioactive **gas** that forms when radium breaks down in certain rock formations, can be found in homes in several states. It enters the home through foundation cracks. Radon is colorless and odorless and can go undetected, building up to dangerous levels that can lead to **lung cancer**.

Biological contaminants can enter a building's ventilation system. They breed in standing water from humidifiers, drain pans, or ducts. They also breed where water has collected on wet ceiling tiles, carpet, or insulation. Some biological compounds are pollen, bacteria, viruses, and molds.

Dust also has been found to contribute to SBS. Dust irritates the mucous membranes. A study showed that improved office cleaning reduced symptoms for at least two months after cleaning.

KEY TERMS

Formaldehyde—A chemical preservative used in many building materials such as adhesives, furnishings, and manufactured woods (plywood and particle board). It can cause eye, nose, and throat irritation and it has been listed as a cancer-causing agent.

Irradiation—The act of exposing something to ultraviolet rays or x rays.

Mucous membranes—The thin skin layers that line, lubricate and protect body passages and cavities such as the nose.

Volatile organic compounds—Compounds from common sources such as cleaning materials and furnishings that vaporize, or become a gas, at room temperature.

Diagnosis

Diagnosing SBS differs from diagnosing many other medical conditions. First, the diagnosis is made by patient history, physical and clinical finding. Rarely do laboratory, or imaging tests confirm abnormalities. Second, the diagnosis involves a thorough

review of the building and its occupants as much as an individual's symptoms. Finally, the medical community has debated for many years about whether or not SBS is a "real medical condition." Because many of the symptoms are self–reported and can't easily be measured and since some reported cases of sick buildings have shown no signs of chemicals or other problems, some professionals dispute the syndrome exists. In addition, there are people who are more sensitive to low levels of VOCs who may experience symptoms even though other people in the building experience no symptoms.

For these reasons, SBS often remains undiagnosed or misdiagnosed. Schools may blame other diseases such as winter flu outbreaks or perhaps assign a child's symptoms to a condition such as attention deficit hyperactivity disorder. When a patient goes to a physician with symptoms typical of SBS — **headache**, fatigue, dizziness, nausea, runny or stuffy nose, a dry cough, dry and itchy skin, itchy or watery eyes, and difficulty concentrating — a complete history is critical. If no other medical condition can explain these symptoms, the physician needs to ask questions that might lead to SBS. The trigger will come in questions involving time. For instance, if a child's symptoms worsen when he or she enters the school building, SBS is likely to blame. If an office worker didn't start having these symptoms until changing jobs or office locations, the office building could be the culprit.

To diagnose a "sick building," trained occupational health or industrial experts will perform a "walk-through" to survey building occupants for common SBS symptoms and to check the building for signs of problems. If a number of occupants have these symptoms and there are problems in the building such as overcrowding, poor cleaning, poor ventilation, or water damage, the surveyor may recommend work be done to improve the building's indoor air quality.

Treatment

No specific treatment has proven effective at eliminating SBS. Many experts agree that the best treatment for SBS is prevention — removing the contaminants or other identified sources that are causing SBS. Individuals with SBS may be encouraged to avoid the building that is making them sick. However, this is not always possible and can lead to isolation or job loss.

A person with suspected SBS may ask that a building be inspected for possible contaminants. A course of **detoxification** under the guidance of a qualified practitioner can be helpful. This includes stimulating lung, liver, kidney and skin expulsion and release of toxic compounds, some of which are stored in fat tissues. If the affected individual cannot leave the building or if the source is not removed, treating the symptoms of SBS may help ease some discomfort. In this case, it is wise to see an environmental medicine specialist and other providers who can help with detoxification and symptom relief (**acupuncture**, massage, etc.) However, these therapies should be coordinated by a physician, since treating multiple symptoms with multiple remedies may possibly create additional interactions. And even herbal remedies may interact with the various chemical substances that are producing the sensitivities; they should be started in small doses and recommended only by trained practitioners.

Some patients with MCS will test for **allergies** to determine the sources of their sensitivities; similar testing might prove helpful for SBS patients who do not know the exact source of their symptoms. Efforts to relieve **stress** also may help deal with or lessen SBS symptoms. **Aromatherapy**, **yoga**, **biofeedback**, and massage may be helpful.

Allopathic treatment

Again, tests have shown that among those with chemical sensitivities, avoiding chemicals has proven to be the most effective treatment. If the environmental problem is not corrected, the individual must decide how to best avoid the SBS source. Clinicians will aim their treatment at easing patients' symptoms while trying to help them avoid or adapt to triggers. Like many conditions that are difficult to pinpoint, physicians must listen respectfully to patients and should not prematurely label symptoms as psychological. Once SBS is suspected, the building that is likely the source of trouble should be evaluated and improvements made as needed.

Expected results

Avoiding the source of SBS or making necessary environmental improvements to the building should improve most symptoms of SBS in a short time. No permanent complications of SBS are known.

Prevention

Preventing SBS begins with the proper design and maintenance of buildings. In particular, attention should be paid to the heating, ventilation, and air conditioning (HVAC) systems. WHO has set guidelines for proper management of building ventilation

systems that include avoiding introduction of biological contaminants as well as conducting regular inspection and maintenance. In late 2003, a medical journal reported that use of ultraviolet light irradiation in cooling coils and drip pans could kill the germs that cause SBS. In addition, designing buildings to minimize introduction of contaminants or inspecting older buildings for possible VOCs and correcting potential problems can prevent SBS in building occupants. Education and communication are essential for effective air quality management in any building.

Resources

PERIODICALS

Anderson, Ashley. "Ultraviolet Light Reduces Sick Building Syndrome." *Supply House Times* (January 2004): 28 29.

Burge, P. S. "Sick Building Syndrome." *Occupational and Environmental Medicine* (February 2004): 185 191.

Henckel, Leslie. "IAQ FYI: Proactive Management Can Help to Clear Buildings of Indoor Air Quality Problems." *Journal of Property Management* (July August 2003): 48 52.

Sadovsky, Richard. "Assessing Patients with Medically Unknown Symptoms." *American Family Physician* (June 1, 2000): 3455.

Yurkovsky, Savely. "Multiple Chemical Sensitivity...From Treatments to Cure." *Townsend Letter for Doctors and Patients* (January 2001): 58.

ORGANIZATIONS

American Academy of Environmental Medicine. East Kel logg, Suite 625, Wichita, KS 67207. (316) 684 5500. http://www.aaem.com.

American Industrial Hygiene Association. 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031. (703) 849 8888. http://www.aiha.org.

Environmental Health Center, a Division of the National Safety Council. 1025 Connecticut Avenue, NW, Suite 1200, Washington, DC 20036. (202) 293 2270. http://www.nsc.org.

National Institute for Occupational Safety and Health, US Department of Health and Human Services. 4676 Columbia Parkway (Mail Drop R2), Cincinnati, OH 45226. http://www.cdc.gov/niosh/homepage.html.

OTHER

"Sick School Syndrome." KidsHealth for Parents and Nemours Foundation. 2004. [cited June 5, 2004]. http://www.kidshealth.org.

"Top Ten Tips for a Healthy Home." American Lung Association. 2004. [cited June 5, 2004]. http://www.lungusa.org/.

Teresa G. Odle

Sickle cell anemia

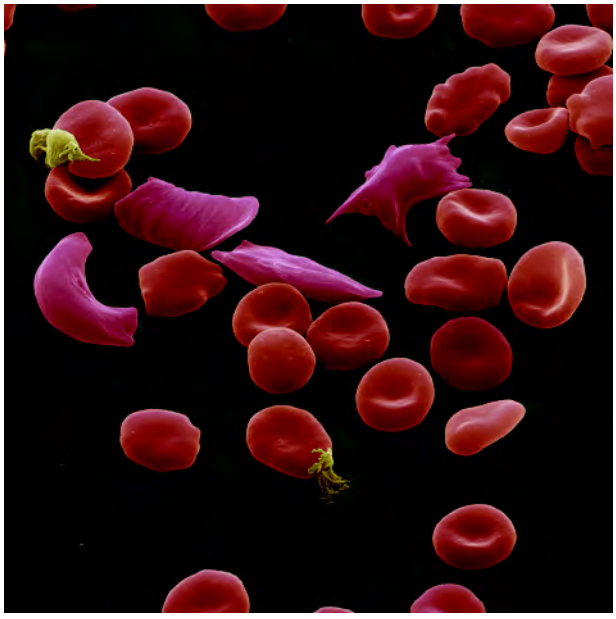
Definition

Sickle cell **anemia**, which is also known as meniscocytosis or sicklemia, is an inherited blood disorder that arises from a gene mutation. As a result, affected hemoglobin molecules have a tendency to stick to one another, forming abnormal strands of hemoglobin within the red blood cells. The cells that contain these strands become stiff and elongated—sickle-shaped.

Because sickle cell anemia is characterized by the rapid loss of red blood cells as they enter the circulation, it is classified as a hemolytic anemia, "hemolytic" referring to the destruction of the cell membrane of red blood cells resulting in the release of hemoglobin.

Description

Sickle-shaped cells die much more rapidly than normal red blood cells and the body cannot create replacements fast enough. Anemia develops due to the chronic shortage of red blood cells. Further complications arise because sickle cells do not fit well through small blood vessels, and can become trapped. The trapped sickle cells form blockages that prevent oxygenated blood from reaching associated tissues and



Sickle cells, crescent-shaped red blood cells that result from a change in the amino acid sequence of the cell's hemoglobin. *(Eye of Science / Photo Researchers, Inc.)*

organs. The damaged tissues and organs cause considerable **pain** and can lead to serious complications, including **stroke** and an impaired immune system. Sickle cell anemia primarily affects people with African, Mediterranean, Middle Eastern, and Indian ancestry. In the United States, one in 12 African Americans are carriers. An additional 72,000 Americans have sickle cell anemia, meaning they have inherited the trait from both parents. Among African Americans, approximately one in every 500 babies is diagnosed with sickle cell anemia. Hispanic Americans are also heavily affected; sickle cell anemia occurs in one of every 1,000-1,400 births. Worldwide, it has been estimated that 250,000 children are born each year with sickle cell anemia.

Hemoglobin structure

Normal hemoglobin is composed of a heme molecule and two pairs of proteins called globins. Humans have the genes to create six different types of globins—alpha, beta, gamma, delta, epsilon, and zeta—but do not use all of them at once. The type of genes expressed depends upon the stage of development: embryonic, fetal, or adult. Virtually all of the hemoglobin produced in humans from ages 2-3 months and onward contains a pair of alpha-globin and beta-globin molecules.

Sickle cell hemoglobin

A change, or mutation, in a gene can alter the formation or function of its product. In the case of sickle cell hemoglobin, the gene that carries the blueprint for beta-globin has a tiny alteration that makes it different from the normal gene. This mutation affects a single nucleic acid along the entire DNA strand that makes up the beta-globin gene. (Nucleic acids are the chemicals that make up deoxyribonucleic acid [DNA].) Specifically, the nucleic acid, adenine, is replaced by a different nucleic acid called thymine.

Because of this seemingly slight mutation, called a point mutation, the finished beta-globin molecule has a single amino acid substitution: valine occupies the spot normally taken by glutamic acid. (**Amino acids** are the building blocks of all proteins.) This substitution is incorporated into the beta-globin molecule—and eventually returning in a hemoglobin molecule—that does not function normally.

Normal hemoglobin, referred to as hemoglobin A, transports oxygen from the lungs to tissues throughout the body. In the smallest blood vessels, the hemoglobin exchanges the oxygen for carbon dioxide, which it carries back to the lungs for removal from the body. The defective hemoglobin, designated hemoglobin S, can also transport oxygen. However, once the oxygen is released, hemoglobin S molecules have an abnormal tendency to clump together. Aggregated hemoglobin molecules form strands within red blood cells, which then lose their usual shape and flexibility.

The rate at which hemoglobin S aggregation and cell sickling occur depends on many factors, such as the blood flow rate and the concentration of hemoglobin in the blood cells. If the blood flows at a normal rate, hemoglobin S is reoxygenated in the lungs before it has a chance to aggregate. The concentration of hemoglobin within red blood cells is influenced by an individual's hydration level—that is the amount of water contained in the cells. If a person becomes dehydrated, hemoglobin becomes more concentrated in the red blood cells. In this situation, hemoglobin S has a greater tendency to clump together and induce sickle cell formation.

Sickle cell anemia

Genes are inherited in pairs, one copy from each parent. Therefore, each person has two copies of the gene that makes beta-globin. As long as a person inherits one normal beta-globin gene, the body can produce sufficient quantities of normal beta-globin. A person who inherits a copy each of the normal and abnormal beta-globin genes is referred to as a carrier of the sickle cell trait. Generally, carriers do not have symptoms, but their red blood cells contain some hemoglobin S.

A child who inherits the sickle cell trait from both parents—a 25% possibility if both parents are carriers—will develop sickle cell anemia. These cells have a decreased life span in comparison to normal red blood cells. Normal red blood cells survive for approximately 120 days in the bloodstream; sickle cells last only 10-12 days. As a result, the bloodstream is chronically short of red blood cells and the affected individual develops anemia.

The sickle cells can create other complications. Due to their shape, they do not fit well through small blood vessels. As an aggravating factor, the outside surfaces of sickle cells may have altered chemical properties that increase the cell's "stickiness." These sticky sickle cells are more likely to adhere to the inside surfaces of small blood vessels, as well as to other blood cells. As a result of the sickle cells' shape and stickiness, blockages occasionally form in small blood vessels. Such blockages prevent oxygenated blood from reaching areas where it is needed, causing extreme pain, as well as organ and tissue damage.

KEY TERMS

Amino acid—A type of molecule used as a building block for protein construction.

Anemia—A condition in which the level of hemoglobin falls below normal values due to a shortage of mature red blood cells. Common symptoms include paleness, fatigue, and shortness of breath.

Bilirubin—A yellow pigment that is the end result of hemoglobin degradation. Bilirubin is cleared from the blood by action of liver enzymes and excreted from the body.

Bone marrow—A spongy tissue located in the hollow centers of certain bones, such as the skull and hip bones. Bone marrow is the site of blood cell generation.

Bone marrow transplantation—A medical procedure in which normal bone marrow is transferred from a healthy donor to an ailing recipient. An illness that prevents production of normal blood cells such as sickle cell anemia may be treated with a bone marrow transplant.

Gel electrophoresis—A laboratory test that separates molecules based on their size, shape, or electrical charge.

Globin—One of the component protein molecules found in hemoglobin. Normal adult hemoglobin has a pair each of alpha-globin and beta-globin molecules.

Heme—The iron-containing molecule in hemoglobin that serves as the site for oxygen binding.

Hemoglobin—The red pigment found within red blood cells that enables them to transport oxygen throughout the body. Hemoglobin is a large molecule composed of five component molecules: a heme molecule and two pairs of globin molecules.

Hemoglobin A—Normal adult hemoglobin which contains a heme molecule, two alpha-globin molecules, and two beta-globin molecules.

Hemoglobin S—Hemoglobin that is produced in association with the sickle cell trait; the beta-globin molecules of hemoglobin S are defective.

Hemolytic—Referring to the destruction of the cell membranes of red blood cells, resulting in the release of hemoglobin from the damaged cell.

Jaundice—A condition characterized by higher-than-normal levels of bilirubin in the bloodstream and an accompanying yellowing of the skin and eyes.

Meniscocytosis—Another word for sickle cell disease.

Mutation—A change in a gene's DNA. Whether a mutation is harmful is determined by the effect on the product for which the gene codes.

Nucleic acid—A type of chemical that is used as a component for building DNA. The nucleic acids found in DNA are adenine, thymine, guanine, and cytosine.

Red blood cell—Hemoglobin-containing blood cells that transport oxygen from the lungs to tissues. In the tissues, the red blood cells exchange their oxygen for carbon dioxide, which is brought back to the lungs to be exhaled.

The severity of the symptoms cannot be predicted based solely on the genetic inheritance. Some individuals with sickle cell anemia develop health- or life-threatening problems in infancy, but others may have only mild symptoms throughout their lives. For example, genetic factors, such as the continued production of fetal hemoglobin after birth, can modify the course of the disease. Fetal hemoglobin contains gamma-globin in place of beta-globin; if enough of it is produced, the potential interactions between hemoglobin S molecules are reduced.

Affected populations

Worldwide, millions of people carry the sickle cell trait. Individuals whose ancestors lived in sub-Saharan Africa, the Middle East, India, or the Mediterranean region are the most likely to have the trait. The areas of the world associated with the sickle cell trait are also strongly affected by **malaria**, a disease caused by blood-borne parasites transmitted through mosquito **bites**. According to a widely accepted theory, the genetic mutation associated with the sickle cell trait occurred thousands of years ago. Coincidentally, this mutation increased the likelihood that carriers would survive malaria outbreaks. Survivors then passed the mutation on to their offspring, and the trait became established throughout areas where malaria was common.

Causes and symptoms

Symptoms typically appear during the first year or two of life. However, some individuals do not develop

symptoms until adulthood and may not be aware that they have the genetic inheritance for sickle cell anemia.

Anemia

Sickle cells have a high turnover rate, and there is an ongoing deficit of red blood cells in the bloodstream. Common symptoms of anemia include **fatigue**, paleness, and shortness of breath. A particularly severe form of anemia—aplastic anemia—occurs following infection with parvovirus. Though temporary, parvovirus causes extensive destruction of the bone marrow, bringing production of new red blood cells to a halt. Bone marrow production resumes after 7–10 days, but given the short lives of sickle cells, even a brief shut-down in red blood cell production can cause a major decline in hemoglobin concentrations. This is called "aplastic crisis."

Painful crises

Painful crises, also known as vaso-occlusive crises, are a primary symptom of sickle cell anemia in children and adults. The pain may be caused by small blood vessel blockages that prevent oxygen from reaching tissues. An alternate explanation, particularly with regard to bone pain, is that blood is shunted away from the bone marrow but through some other mechanism than blockage by sickle cells.

These crises are unpredictable, and can affect any area of the body, although the chest, abdomen, and bones are frequently affected sites. There is some evidence that cold temperatures or infection can trigger a painful crisis, but most crises occur for unknown reasons. The frequency and duration of the pain can vary tremendously. Crises may be separated by more than a year or possibly only by weeks, and they can last from hours to weeks.

The hand-foot syndrome is a particular type of painful crisis, and is often the first sign of sickle cell anemia in an infant. Common symptoms include pain and swelling in the hands and feet, possibly accompanied by a **fever**. Hand-foot syndrome typically occurs only during the first four years of life, with the greatest incidence at one year.

Enlarged spleen and infections

Sickle cells can impede blood flow through the spleen and cause organ damage. In infants and young children, the spleen is usually enlarged. After repeated incidence of blood vessel blockage, the spleen usually atrophies by late childhood. Damage to the spleen can have a negative impact on the immune system, leaving individuals with sickle cell anemia more vulnerable to **infections**. Infants and young children are particularly prone to life-threatening infections.

Anemia can also impair the immune system, because stem cells—the precursors of all blood cells—are earmarked for red blood cell production rather than white blood cell production. White blood cells form the cornerstone of the immune system within the bloodstream.

Delayed growth

The energy demands of the bone marrow for red blood cell production compete with the demands of a growing body. Children with sickle cell anemia have delayed growth and reach puberty at a later age than normal. By early adulthood, they catch up on growth and attain normal height, but weight typically remains below average.

Stroke

Blockage of blood vessels in the brain can have particularly harsh consequences and can be fatal. When areas of the brain are deprived of oxygen, control of the associated functions may be lost. Sometimes this loss is permanent. Common stroke symptoms include weakness or numbness that affects one side of the body, sudden loss of vision, confusion, loss of speech or the ability to understand spoken words, and **dizziness**. Children between the ages of 1 and 15 have a 30% risk of suffering a stroke. Approximately two-thirds of the children who have a stroke will have at least one more; those who survive typically suffer severe learning disabilities. As of 2003, researchers are investigating various techniques for helping children with **memory loss** related to strokes caused by sickle cell disease.

Acute chest syndrome

Acute chest syndrome can occur at any age, and is caused by sickle cells blocking the small blood vessels of the lungs. This blockage is complicated by accompanying problems such as infection and pooling of blood in the lungs. Affected persons experience fever, **cough**, chest pain, and shortness of breath. Recurrent attacks can lead to permanent lung damage.

Other problems

Males with sickle cell anemia may experience a condition called priapism. (Priapism is characterized by a persistent and painful erection of the penis.) Due to blood vessel blockage by sickle cells, blood is trapped in the tissue of the penis. Damage to this tissue can result in permanent **impotence** in adults.

Both genders may experience kidney damage. The environment of the kidney is particularly conducive to sickle cell formation; even otherwise asymptomatic carriers may experience some level of kidney damage. Kidney damage is indicated by blood in the urine, incontinence, and enlarged kidneys.

Jaundice and an enlarged liver are also commonly associated with sickle cell anemia. Jaundice, indicated by a yellow tone in the skin and eyes, may occur if bilirubin levels increase. Bilirubin is the final product of hemoglobin degradation, and is typically removed from the bloodstream by the liver. Bilirubin levels often increase with high levels of red blood cell destruction, but jaundice can also be a sign of a poorly functioning liver.

Some individuals with sickle cell anemia may experience vision problems. The blood vessels that feed into the retina—the tissue at the back of the eyeball—may be blocked by sickle cells. New blood vessels can form around the blockages, but these vessels are typically weak or otherwise defective. Bleeding, scarring, and **retinal detachment** may eventually lead to blindness.

Diagnosis

Sickle cell anemia is suspected based on an individual's ethnic or racial background, and on the symptoms of anemia. A blood count reveals the anemia, and a sickle cell test reveals the presence of the sickle cell trait.

To confirm a diagnosis of the sickle cell trait or sickle cell anemia, another laboratory test called gel electrophoresis is performed. This test uses an electric field applied across a slab of gel-like material to separate protein molecules based on their size, shape, or electrical charge. Although hemoglobin S (sickle) and hemoglobin A (normal) differ by only one amino acid, they can be clearly separated using gel electrophoresis. If both types of hemoglobin are identified, the individual is a carrier of the sickle cell trait; if only hemoglobin S is present, the person most likely has sickle cell anemia.

The gel electrophoresis test is also used as a screening method for identifying the sickle cell trait in newborns. More than 40 states screen newborns in order to identify carriers and individuals who have inherited the trait from both parents.

Treatment

In general, treatment of sickle cell anemia relies on conventional medicine. However, alternative therapies may be useful in pain control.

Massage

The daily pain caused by sickle cell disease has been shown to be managed by massage. A pilot study whose results were published in 1999 indicated that those who received massage reported less perception of pain than those who were part of a **relaxation** control group during the research. Massage is recommended as a complementary treatment in the management of the chronic disease.

Pain diaries

A 2001 study revealed that diaries kept by children and adolescents could help the patients and their families better manage sickle cell pain from home. If children (of reading and writing age) can record pain episodes, they have better recall and provide improved documentation for physicians and parents so they can relate pain episodes to possible causes.

Acupuncture

Acupuncture may relieve some of the pain caused by sickle cell disease. For longer-lasting results, acupuncturists indicate that the treatment works with the body's subtle energies by manipulating the "chi" to remove blockages and allow the body to heal itself. Acupuncture uses extremely thin needles that are inserted into various areas of the body, with placement depending on the patient's condition, and each treatment usually takes 20-45 minutes.

Diet

While the pain of sickle cell disease ranges from acute to chronic, simple alterations to the diet are one way to help those who endure the illness. Foods like horseradish, cassava, yams, corn, bamboo shoots, sweet potatoes, and lima beans contain cyanogenic glucosides, or natural plant compounds that are recommended additions to the diet. These natural plant compounds interact with bacteria in the large intestine and aid the body in producing a type of hemoglobin that can effectively carry oxygen through blood cells—possibly leading to less pain.

Allopathic treatment

Early identification of sickle cell anemia can prevent many problems. The highest death rates occur during the first year of life due to infection, aplastic anemia, and acute chest syndrome. If anticipated, steps can be taken to avert these crises. With regard to long-term treatment, prevention of complications remains a main goal. Sickle cell anemia cannot be cured—other

than through a risky bone marrow transplant—but treatments are available for symptoms.

Pain management

Pain is one of the primary symptoms of sickle cell anemia, and controlling it is an important concern. The methods necessary for pain control are based on individual factors. Some people can gain adequate pain control through over-the-counter oral painkillers (analgesics), local application of heat, and rest. Others need stronger methods, which can include administration of narcotics.

Blood transfusions

Blood transfusions are usually not given on a regular basis but are used to treat painful crises, severe anemia, and other emergencies. In some cases, such as treating spleen enlargement or preventing stroke from recurring, blood transfusions are given as a preventative measure. Regular blood transfusions have the potential to decrease formation of hemoglobin S, and reduce associated symptoms.

Drugs

Infants are typically started on a course of penicillin that extends from infancy to age six. This treatment is meant to ward off potentially fatal infections. Infections at any age are treated aggressively with antibiotics. Vaccines for common infections, such as pneumococcal **pneumonia**, are administered when possible.

Emphasis is being placed on developing drugs that treat sickle cell anemia directly. The most promising of these drugs in the late 1990s is hydroxyurea, a drug that was originally designed for anticancer treatment. Hydroxyurea has been shown to reduce the frequency of painful crises and acute chest syndrome in adults, and to lessen the need for blood transfusions. Hydroxyurea seems to work by inducing a higher production of fetal hemoglobin. The major side effects of the drug include decreased production of platelets, red blood cells, and certain white blood cells. The effects of long-term hydroxyurea treatment are unknown; however, a nine-year follow-up study of 299 adults with frequent painful crises reported in 2003 that taking hydroxyurea was associated with a 40% reduction in mortality.

Bone marrow transplantation

Bone marrow transplantation has been shown to cure sickle cell anemia in severely affected children. Indications for a bone marrow transplant are stroke, recurrent acute chest syndrome, and chronic unrelieved pain. Bone marrow transplants tend to be the most successful in children; adults have a higher rate of transplant rejection and other complications.

Gene research

Replacing the gene that produces the defective hemoglobin in sickle cell disease patients with one that makes normal hemoglobin may be a possible treatment due to recent research. According to a 1998 report in *Science*, researchers studied the blood cells from people who carry the sickle cell gene. By using an enzyme called a ribosome, the study was able to alter sickle cells into normal cells. The ribosome cut out the mutated instructions in the cells' genetic pattern and replaced them with the correct instructions. Researchers hope that this will allow the cells to make normal hemoglobin— leading to the ultimate treatment for those with sickle cell disease.

In late 2001, genetic scientists reported that they had designed a gene that might lead to a future treatment of sickle cell anemia. Although the gene had not tested in humans, early results showed that the injected gene protected cells from sickling. As of 2003, experiments in gene therapy for sickle cell disease have been carried out in mice, using lentiviral vectors to transfer the corrective gene into the mouse's stem cells. This technique, however, has not yet been attempted in human subjects as of late 2003.

Expected results

Several factors aside from genetic inheritance determine the prognosis for affected individuals. Therefore, predicting the course of the disorder based solely on genes is not possible. In general, given proper medical care, persons with sickle cell anemia are in fairly good health most of the time. The life expectancy for these individuals has steadily increased over the last 30 years, and many are now surviving past the age of 50. In the United States, the average life expectancy for men with sickle cell anemia is 42 years; for women, it is 48 years. The most common causes of death are infections, lung disease, the blocking of a blood vessel supplying a vital organ, and kidney failure. Pregnant women with sickle cell disease are particularly vulnerable to infection, most often pneumonia or urinary tract infections.

Prevention

The sickle cell trait is a genetically linked, inherited condition. Inheritance cannot be prevented, but it may be predicted. Screening is recommended for individuals in high-risk populations; in the United States, African Americans, and Hispanic Americans have the highest risk of being carriers.

Screening at birth offers the opportunity for early intervention; more than 40 states include sickle cell screening as part of the usual battery of blood tests done for newborns. Pregnant women and couples planning to have children may also wish to be screened to determine their carrier status. Carriers have a 50% chance of passing the trait to their offspring. Children born to two carriers have a 25% chance of inheriting the trait from both parents and having sickle cell anemia. Carriers may consider genetic counseling to assess any risks to their offspring. The sickle cell trait can also be identified through prenatal testing, specifically through use of amniotic fluid testing or chorionic villus sampling.

By maintaining a good diet, staying well hydrated with plenty of fluids, exercising regularly, and getting enough sleep, those with sickle cell disease may help their bodies remain strong and ward off fatigue and dehydration.

Resources

BOOKS

"Anemias Caused by Excessive Hemolysis: Sickle Cell Dis eases." Section 11, Chapter 127 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Beutler, Ernest. *The Sickle Cell Diseases and Related Disor ders*. Williams Hematology, edited by Ernest Beutler, et al. 5th ed. New York: McGraw Hill,1995.

Bloom, Miriam. *Understanding Sickle Cell Disease*. Jackson, MS: University Press of Mississippi, 1995.

The Editors of Time Life Books. *Sickle Cell Anemia*. The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments, Richmond, VA: Time Life Inc., 1996.

Embury, Stephen H., et al., eds. *Sickle Cell Disease: Basic Principles and Clinical Practice*. New York: Raven Press, 1994.

"Pregnancy Complicated by Disease: Hemoglobinopa thies." Section 18, Chapter 251 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

PERIODICALS

Davies, S. C., and A. Gilmore. "The Role of Hydroxyurea in the Management of Sickle Cell Disease." *Blood Reviews* 17 (June 2003): 99 109.

Egbert Maikler, Virginia, et al."Children's and Adolescents' Use of Diaries for Sickle Cell Pain." *Journal of the Society of Pediatric Nurses* 6. no. 4 (October Decem ber 2001): 161 169.

Harris, Leslie. "Living Well with Sickle Cell." *Essence* (Sep tember 1999): 58.

Mayo Foundation for Medical Education and Research. http://www.mayohealth.org.

Nienhuis,A. W., H. Hanawa, N. Sawai, et al. "Development of Gene Therapy for Hemoglobin Disorders." *Annals of the New York Academy of Science* 996 (May 2003): 101 111.

Seppa, N. "Gene Therapy for Sickle cell Disease?." *Science News* 160, no. 24 (December 15, 2001): 372.

"Sickle Cell Pain Relieved by Massage." *Massage Magazine* (June 30, 1999): 52.

Steinberg, M. H., F. Barton, O. Castro, et al. "Effect of Hydroxyurea on Mortality and Morbidity in Adult Sickle Cell Anemia: Risks and Benefits up to 9 Years of Treatment." *Journal of the American Medical Associa tion* 289 (April 2, 2003): 1645 1651.

Winrow, N., and E. R. Melhem. "Sickle Cell Disease and Stroke in a Pediatric Population. Evidence Based Diagnostic Evaluation." *Neuroimaging Clinics of North America* 13 (May 2003): 185 196.

Yerys, B. E., D. A. White, C. F. Salorio, et al. "Memory Strategy Training in Children with Cerebral Infarcts Related to Sickle Cell Disease." *Journal of Pediatric Hematology and Oncology* 25 (June 2003): 495 498.

ORGANIZATIONS

Sickle Cell Disease Association of America. 200 Corporate Point, Suite 495, Culver City, CA 90230 7633.(310) 216 6363. (800) 421 8453. http://sicklecelldisease.org/.

Sickle Cell Disease Program, Division of Blood Diseases and Resources. National Heart, Lung, and Blood Institute. II Rockledge Centre, 6701 Rockledge Dr. MSC 7950, Bethesda, MD 20892 7950. (301) 435 0055.

Beth Kapes
Teresa Norris
Rebecca J. Frey, PhD

Silica

Description

Silica, sometimes called silicea terra or abbreviated as sil., is a homeopathic remedy. Silica is a mineral and is prepared from silicon dioxide found in flint, quartz, sandstone, and many other common rocks.

General use

Homeopathic medicine operates on the principle that like heals like, which means that a disease can be cured by treating it with products that produce the same symptoms as the disease. These products follow another homeopathic law, the law of infinitesimals. In opposition to traditional medicine, the law of infinitesimals states that the *lower* a dose of curative, the more effective it is. To achieve a very low dose, the curative is

Silica gel. *(© Pablo Paul / Alamy)*

diluted many, many times until only a tiny amount remains in a huge amount of the diluting liquid.

In homeopathic terms, remedies are proved by experimentation and reports made by famous homeopathic practitioners. Silica was proved as a remedy by the German founder of **homeopathy**, Dr. Samuel Hahnemann (1775–1843).

In homeopathy, silica is often used to treat symptoms of chronic diseases where there is general weakness and a lack of either physical or emotional strength. The rocks silica comes from are hard and compact. Silica is used to strengthen many parts of the body and impart to them silica's hard, dense, strong characteristics.

Silica is used to treat conditions associated with frequent and recurrent illnesses that occur because of a weakened immune system. These include frequent colds, flu, and chronic ear **infections** (especially those with a thick, yellow discharge or fluid in the middle ear).

Silica is also useful in expelling material from the body. It is used to remove splinters, bits of embedded glass, and other foreign irritants. It also aids in the elimination of stools from the rectum.

Certain skin and bone complaints can also be treated with silica. These include **fractures** that are slow to heal, rough or peeling lips, **acne**, weak nails, and ingrown toenails. Other ailments for which silica is considered an appropriate homeopathic remedy are migraines that begin in the back of the head and extend to the eyes, heavy sweating around the head and neck, **mumps**, dental abscesses, vaginal cysts, mastitis in breast-feeding women, and general low stamina.

One diagnostic tool in homeopathy is to observe when symptoms improve or worsen as a clue to which remedy to use.

Symptoms benefiting from silica worsen:

- in cold damp weather
- in the morning
- after getting feet wet
- at the time of the new moon
- if sweating is suppressed
- from washing or swimming
- from lying on the left side

Symptoms improve:

- in hot, humid weather
- with warmth
- with wrapping the head

Homeopathy also ascribes certain personality types to certain remedies. The silica personality is said to be chronically exhausted and lacking in stamina. These people are happy to sit and take no action. The silica personality type feels cold intensely. These people are often intellectually bright but lack confidence. They obsess about small details to the point of exhaustion because they fear failure and being hurt. They tend to be shy and have good manners, but are also willful to the point of resenting any outside interference.

Preparations

In preparing homeopathic remedies, the remedy material is finely ground then prepared by extensive dilutions. In the early days of homeopathy, silica was prepared from powdered rock. In the 2000s, most silica is manufactured chemically.

There are two homeopathic dilution scales: the decimal (x) scale with a dilution of 1:10 and the centesimal (c) scale with a dilution of 1:100. Once the mixture is diluted, shaken, strained, then rediluted many times to reach the desired degree of potency, the final mixture is added to lactose (a type of sugar) tablets or pellets. These are then stored away from light. Silica is available commercially in tablets in many different strengths. Dosage depends on the symptoms being treated.

Homeopathic and orthodox medical practitioners agree that by the time the initial remedy solution is diluted to strengths used in homeopathic healing, it is likely that very few molecules of the original remedy remain. Homeopaths, however, believe that these remedies continue to work through an effect called

KEY TERMS

Mastitis—Inflammation of the breast.

potentization that has not yet been explained by mainstream scientists.

Precautions

Homeopaths recommend that anyone with implants or artificial body components avoid silica because of its tendency to cause foreign materials to be expelled from the body.

Side effects

When taken in the recommended dilute form, no side effects have been reported.

Interactions

Studies on interactions between silica and conventional pharmaceuticals had not been found as of 2008.

Resources

BOOKS

Feingold, Ellen. *The Complete Self Care Guide to Homeo pathy, Herbal Remedies, & Nutritional Supplements*. Albany, NY: Whitston, 2008.

Hayfield, Robyn. *Simple Homeopathy: An Easy to follow Guide to Using Homeopathic Remedies to Heal Common Ailments, with Expert Safe Advice and 100 Colour Pho tographs*. London: Southwater, 2008.

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org/.

Tish Davidson
David Edward Newton, Ed.D.

Silymarin *see* **Milk thistle**

Sinus infection

Definition

Sinusitis, or sinus infection, refers to an inflammation of the sinuses, the airspaces within the bones of the face, due to an infection within these spaces.

Description

The sinuses are paired air pockets located within the bones of the face. They are:

- The frontal sinuses. Located above the eyes, in the center region of each eyebrow.
- The maxillary sinuses. Located within the cheekbones, just to either side of the nose.
- The ethmoid sinuses. Located between the eyes, just behind the bridge of the nose.
- The sphenoid sinuses. Located just behind the ethmoid sinuses, and behind the eyes.

The sinuses are connected with the nose. They are lined with the same kind of skin found elsewhere within the respiratory tract. This skin has tiny little hairs projecting from it, called cilia. The cilia beat constantly, to help move the mucus produced in the sinuses into the respiratory tract. The action sweeps mucus along the respiratory tract and helps to clear the tract of debris or any organisms which may be present. When the lining of the sinuses swells, the swelling interferes with the normal flow of mucus. Trapped mucus can then fill the sinuses, causing an uncomfortable sensation of pressure and providing an excellent environment for the growth of infection-causing bacteria.

Causes and symptoms

Although swelling from **allergies** can mimic the symptoms of pressure, **pain**, and congestion, allergies can set the stage for a bacterial infection. Bacteria are the most common cause of sinus infection, however, recent research has suggested that fungi is the most common cause. *Streptococcus pneumoniae* causes about 33% of all cases, while *Haemophilus influenzae* causes about 25% of all cases. Twenty percent of sinus **infections** in children may be caused by *Moraxella catarrhalis*. In people with weakened immune systems (including patients with diabetes; acquired immunodeficiency syndrome or **AIDS**; and patients who are taking medications that lower their immune resistance, such as **cancer** and transplant patients), sinus infections may be caused by fungi such as *Aspergillus*, *Candida*, or Mucorales. Additionally, those repeatedly on antibiotics may be predisposed to sinus infections.

Acute sinus infections usually follow some type of upper respiratory tract infection or cold. Instead of ending, the cold seems to linger, with constant or even worsening congestion. Drainage from the nose often changes from a clear color to a thicker, yellowish-green. There may be **fever**. **Headache** and pain over the affected sinuses may occur, as well as a feeling of pressure which may worsen when the patient bends

KEY TERMS

Cilia—Tiny, hair-like projections from a cell. Within the respiratory tract, the cilia act to move mucus along, in an effort to continually flush out and clean the respiratory tract.

over. There may be pain in the jaw or teeth. Some children, in particular, get upset stomachs from the infected drainage going down the back of their throats, and into their stomachs. Some patients develop a **cough**. In recent years, however, physicians have cautioned patients not to assume that the colored mucus or pain automatically means a bacterial infection. It may be of viral origin, and patients can avoid overusing antibiotics with proper diagnosis.

Diagnosis

Medical practitioners have differing levels of trust of certain basic examinations commonly conducted in the office. For example, tapping over the sinuses may cause pain in patients with sinus infection, but it may not. A procedure called sinus transillumination may, or may not, also be helpful. Using a flashlight pressed up against the skin of the cheek, the practitioner will look in the patient's open mouth. When the sinuses are full of air (under normal conditions), the light will project through the sinus, and will be visible on the roof of the mouth as a lit-up, reddened area. When the sinuses are full of mucus, the light will be stopped. While this simple test can be helpful, it is certainly not a completely reliable way to diagnose or rule out the diagnosis of a sinus infection.

X-ray pictures and CT scans of the sinuses are helpful for both acute and chronic sinus infections. Those experiencing chronic sinus infections may need a procedure with a scope to see if any kind of anatomic obstruction is causing their illness. For example, the septum (the cartilage that separates the two nasal cavities from each other) may be slightly displaced, called a deviated septum. This can result in chronic obstruction, setting the person up for the recurrent development of infection.

Treatment

A 2001 telephone survey in northern California revealed that use of alternative treatments for rhinosinusitis and **asthma** is common in the population, with 52% reporting use of alternative treatment in the past 12 months to teat breathing or nasal symptoms. Of these, most used herbal treatments, primarily ephedra-containing products.

Chronic sinus inflammation often is associated with food allergies. An elimination/challenge diet is recommended to identify and eliminate allergenic foods. Irrigating the sinuses with a salt water solution is often recommended for sinusitis and allergies, in order to clear the nasal passages of mucus. Another solution for nasal lavage, or washing, utilizes powdered **goldenseal** (*Hydrastis canadensis*) added to the salt water solution. Other herbal treatments, taken internally, include a mixture made of **eyebright** (*Euphrasia officinalis*), goldenseal, **yarrow** (*Achillea millefolium*), horseradish, and **ephedra** (*Ephedra sinica*), or, when infection is present, a mixture made of **echinacea** (*Echinacea*), wild indigo, and poke root (*Phytolacca decandra-Americana*).

Homeopathic practitioners find a number of remedies useful for treating sinusitis. Among those they recommend are: **Arsenicum album**, Kalium bichromium, Nux vomica, Mercurius iodatus, and **silica**. Andrographic paniculata, commonly known as Kalmegh, is recommended for fighting winter infections and sinus infection. It is usually combines with Echinacea.

Acupuncture has been used to treat sinus inflammation, as have a variety of dietary supplements, including vitamins A, C, and E, and the mineral **zinc**. Contrast **hydrotherapy** (hot and cold compresses, alternating 3 minutes hot, 30 seconds cold, repeated 3 times always ending with cold) applied directly over the sinuses can relieve pressure and enhance healing. A direct inhalation of an essential oil solution using a combination of two cups of water and two drops of a mixture of **thyme**, **rosemary**, or **lavenderessential oils** can help open the sinuses and kill bacteria that cause infection.

Allopathic treatment

Antibiotic medications are often used to treat acute sinus infection, once it has been diagnosed as a bacterial infection. Suitable antibiotics include sulfa drugs, amoxicillin, and a variety of cephalosporins. These medications are usually given for about two weeks, but may be given for even longer periods of time. A 2001 study found that the type of antibiotic used for mild to moderate sinus infection did not seem to matter. In other words, any one of about 16 antibiotics stopped the infection, so cost could help physicians determine the best therapy. Also, the study suggests that physicians might sometimes delay antibiotics in patients with milder symptoms and prescribe them only when moderately severe symptoms last seven days or more or severe symptoms occur.

Decongestants, or the short-term use of decongestant nose sprays, can be useful. Acetaminophen and ibuprofen can decrease the associated pain and headache. Also, running a humidifier can prevent mucus within the nasal passages from uncomfortably drying out, and can help soothe an accompanying **sore throat** or cough.

Chronic sinus infections are often treated initially with antibiotics. Steroid nasal sprays may be used to decrease swelling in the nasal passages. If an anatomic reason is found for chronic infections, it may require corrective surgery. If a surgical procedure is necessary, samples are usually taken at the same time to allow identification of any organisms present which may be causing infection.

Fungal sinus infection may require surgery to clean out the sinuses. Then, a relatively long course of a very strong antifungal medication called amphotericin B is given intravenously through a needle in the vein. This type of infection also can be treated with **botanical medicine**.

Expected results

Prognosis for sinus infections is usually excellent, although some individuals may find that they are particularly prone to contracting such infections after a cold. Fungal sinus infection, however, has a relatively high death rate.

Prevention

Prevention involves the usual standards of good hygiene to cut down on the number of colds an individual catches. Avoiding exposure to cigarette smoke, identifying and treating allergies, and avoiding deep dives into swimming pools or other aquatic areas may help prevent sinus infections. Prevention may include avoiding dairy products and/or wheat products. During the winter, it is a good idea to use a humidifier, as dry nasal passages may crack, allowing bacteria to enter. When allergies are diagnosed, a number of nasal sprays are available to try to prevent inflammation within the nasal passageways, thus allowing the normal flow of mucus. A 2003 report from Sweden recommended regular humming. It appears that when people hum, they exhale about 15 times more air and potentially harmful microbes from nasal passages.

Resources

BOOKS

Durand, Marlene, et al. *Infections of the Upper Respiratory Tract*. Harrison's Principles of Internal Medicine, 14th ed., edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Ray, C. George. "Eye, Ear, and Sinus Infections." In *Sherris Medical Microbiology: An Introduction to Infectious Diseases,* edited by Kenneth J. Ryan. Norwalk, CT: Appleton and Lange, 1994.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases*. New York: John Wiley and Sons, 1995.

PERIODICALS

Blanc, Paul D., et al. "Alternative Therapies Among Adults with a Reported Diagnosis of Asthma or Rhinosinusi tis: Data from a Population Based Survey." *Chest* (November 2001): 1461.

Bone, Kerry. "Andrographis for Colds and Sinus Infection." *Townsend Letter for Doctors and Patients* (January 2003):36 44.

Kaliner, Michael A. "The Signs of Sinusitis." *Discover* 19 (March 1998): S16+.

O'Brien, Katherine L., et al. "Acute Sinusitis: Principles of Judicious Use of Antimicrobial Agents." *Pediatrics* 101 (January 1998): 174+.

Piccirillo, Jay F., et al. "Impact of First Line vs. Second Line Antibiotics for the Treatment of Acute Uncomplicated Sinusitis." *JAMA, The Journal of the American Medical Association* (October 17, 2001): 1849.

"Save Your Schnozz: Hum a Few Bars." *Bicycling* (November 2002):24.

"Sinus Infection Detection." *Harvard Health Letter* (December 2003):

William, J.W., et al. "Clinical Evaluation for Sinusitis: Making the Diagnosis by History and Physical Exami nation." *Annals of Internal Medicine* 117 (1992): 705+.

ORGANIZATION

American Academy of Otolaryngology Head and Neck Surgery, Inc. 1 Prince Street, Alexandria, VA 22314 3357. (703) 836 4444.

Kathleen D. Wright
Teresa G. Odle

Sinusitis *see* **Sinus infection**

Sjögren's syndrome

Definition

Sjögren's syndrome is an autoimmune disorder in which the mouth and eyes become extremely dry. Sjögren's syndrome is often associated with other autoimmune disorders.

Description

Like other autoimmune disorders, Sjögren's syndrome occurs when the body's immune system mistakenly considers parts of the body as foreign invaders. People with this disease have abnormal proteins in their blood, suggesting that their immune system is reacting against their own tissue. While the immune cells should attack and kill invaders like bacteria, viruses, and fungi, these cells should not attack the body itself. In autoimmune disorders, however, cells called antibodies see tissues of the body as foreign, and help to start a chain of events that results in damage and destruction of those tissues.

There are three types of Sjögren's syndrome. Primary Sjögren's syndrome occurs by itself, with no other associated disorders. Secondary Sjögren's syndrome occurs along with other autoimmune disorders, like **systemic lupus erythematosusrheumatoid arthritis**, scleroderma, vasculitis, or polymyositis. When the disorder is limited to involvement of the eyes, with no other organ or tissue involvement evident, it is called sicca complex.

Women are about 10 times more likely to suffer from Sjögren's syndrome than are men. It affects all age groups, although most patients are diagnosed when they are between 45 and 55 years old. Sjögren's syndrome is commonly associated with other autoimmune disorders. In fact, 30% of patients with certain autoimmune disorders will also have Sjögren's syndrome.

Causes and symptoms

The cause of Sjögren's syndrome has not been clearly defined, but several causes are suspected. For instance, genetic factors play a role, in that the syndrome sometimes runs in families. In fact, autoimmune diseases in general tend to occur in families with certain genetic characteristics. In late 2001, researchers announced discovery of the genetic markers that predict increased risk of many autoimmune disorders like rheumatoid arthritis, **multiple sclerosis** and lupus.

Other potential causes include hormonal factors (since there are more women than men with the disease) and viral factors. The viral theory suggests that the immune system is activated in response to a viral invader, but then fails to turn itself off. Some other immune malfunction then causes the overly active immune system to begin attacking the body's own tissues. Sjögren's syndrome is thought to be a result of several factors including genetic, immunologic, hormonal, and possibly infectious.

KEY TERMS

Autoimmune disorder—A disorder in which the body's immune cells mistake the body's own tissues as foreign invaders; the immune cells then work to destroy tissues in the body.

Cornea—A transparent structure of the eye over the iris and pupil; light must pass through the cornea to make vision possible.

Immune system—The complex network of organs and blood cells that protect the body from foreign invaders, like bacteria, viruses, and fungi.

The main problem in Sjögren's syndrome is dryness. The salivary glands and secretory glands (mucous/liquid) are often attacked and slowly destroyed, leaving the mouth extremely dry and sticky feeling. Swallowing and talking become difficult. Normally, the saliva washes the teeth clean. Saliva cannot perform this function in Sjögren's syndrome, so the teeth develop many cavities and decay quickly. The parotid glands produce the majority of the mouth's saliva. These glands are located over the jaw bones, behind the area of the cheeks and in front of the ears, and may become significantly enlarged in Sjögren's syndrome.

The eyes also become extremely dry as the tear glands (called lacrimal glands) are slowly destroyed. Eye symptoms include **itching**, burning, redness, increased sensitivity to light, and thick secretions gathering at the eye corners closest to the nose. The cornea may have small irritated pits in its surface (ulcerations).

Destruction of secretion glands in other areas of the body may cause a variety of symptoms. In the nose, dryness may result in **nosebleeds**. In the rest of the respiratory tract, the rates of **ear infection**, hoarseness, **bronchitis**, and **pneumonia** may increase. Vaginal dryness can be quite uncomfortable. Rarely, the pancreas may slow production of enzymes critical for digestion. The kidney may malfunction. About 33% of all patients with Sjögren's syndrome have other symptoms unrelated to gland destruction. These symptoms include **fatigue**, decreased energy, fevers, muscle aches and pains, and joint **pain**.

Patients who also have other autoimmune diseases will suffer from the symptoms specific to those conditions. A rare but serious complication of Sjögren's syndrome is inflammation of the blood vessels (vasculitis), which can damage tissues supplied by these blood vessels.

Diagnosis

Diagnosis of Sjögren's syndrome is based on the patient having at least three consecutive months of bothersome eye and/or mouth dryness. A variety of tests can then be done to determine the quantity of tears produced, the quantity of saliva produced, and the presence or absence of antibodies that could be involved in the destruction of glands.

Treatment

There is no cure for Sjögren's syndrome. Instead, treatment usually attempts to reduce the discomfort and complications associated with dryness of the eyes and mouth (and other areas). Artificial tears are available, and may need to be used up to every 30 minutes. By using these types of products, the patient is more comfortable and avoids the complications associated with eyes that are overly dry. **Dry mouth** is treated by sipping fluids slowly but constantly throughout the day. Sugarless chewing gum can also be helpful. An artificial saliva is available for use as a mouthwash. Careful dental hygiene is important in order to avoid tooth decay, and it is wise for patients to decrease sugar intake.

Allopathic treatment

Vaginal dryness can be treated with certain gel preparations. Steroid or immunosuppressive medications may be required when other symptoms of autoimmune disorders complicate Sjögren's syndrome. However, these medications should be avoided when possible because they may thin the cornea and make it even more susceptible to injury.

Expected results

The prognosis for patients with primary Sjögren's syndrome is particularly good. Although the condition is quite annoying, serious complications rarely occur. The prognosis for patients with secondary Sjögren's syndrome varies, since it depends on the prognosis for the accompanying autoimmune disorder.

Prevention

Since the cause of Sjögren's syndrome is unknown, there are no known ways to prevent this syndrome.

Resources

BOOKS

Aaseng, Nathan. *Autoimmune Diseases*. New York: F. Watts, 1995.

Koopman, D. *Arthritis and Allied Conditions*. New York: Williams and Wilkins, 1997.

Moutsopoulos, Haralampos M. "Sjögren's Syndrome." In *Harrison's Principles of Internal Medicine,* edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Talal, N., et al. *Sjögren's syndrome: Clinical and Immuno logical Aspects*. Berlin: Springer, 1987.

PERIODICALS

Moran, M. "Autoimmune Diseases Could Share Common Genetic Etiology."*American Medical News*.44; no. 38: (October 8, 2001):38.

Moutsopoulos, H. M., and P. G. Vlachoyiannopoulos. "What Would I Do If I Had Sjögren's syndrome?" *Rheumatology Review* 2 (1993): 17+.

Moutsopoulos, H. M., and P. Youinou. "New Develop ments in Sjögren's syndrome." *Current Opinion in Rheumatology* 3 (1991): 815+.

ORGANIZATIONS

National Institute of Arthritis & Skin Diseases. Building 31, Room 4C05, Bethesda, MD 20892 2350. (301) 496 8188. http://nih.gov/niams.

National Organization for Rare Disorders (NORD). P.O. Box 8923, New Fairfield, CT 06812 2510. (203) 746 6518 (800) 999 6673.

National Sjögren's Syndrome Association. 5815 N. Black Canyon Highway, #103, Phoenix, AZ 85015 2200. (602) 443 9844.

Kim Sharp
Teresa Norris

Skin cancer

Definition

Skin **cancer** is a malignant growth of the external surface or epithelial layer of the skin.

Description

Skin cancer is the growth of abnormal cells capable of invading and destroying other associated skin cells. Skin cancer is often subdivided into either melanoma or non-melanoma. Melanoma is a dark-pigmented, usually malignant, tumor arising from a skin cell capable of making the pigment melanin (a melanocyte). Melanoma can spread throughout the body via the bloodstream or lymphatic system. Non-melanoma skin cancer most often originates from the external skin surface as a squamous cell carcinoma or a basal cell carcinoma.

The cells of a cancerous growth originate from a single cell that reproduces uncontrollably, resulting in

KEY TERMS

Autoimmune—Pertaining to an immune response by the body against one of its own tissues or types of cells.

Curettage—The removal of tissue or growths by scraping with a curette.

Dermatologist—A physician specializing in the branch of medicine concerned with skin.

Electrodesiccation —To make dry, dull, or lifeless with the use of electrical current.

Lesion—An area of skin that has been infected or diseased.

Topical—Referring to a medication or other preparation applied to the skin or the outside of the body.

the formation of a tumor. Exposure to sunlight is documented as the main cause of almost 800,000 cases of skin cancer diagnosed each year in the United States. The incidence increases for those living where direct sunshine is plentiful, such as in regions near the equator.

Basal cell carcinoma affects the skin's basal layer and has the potential to grow progressively larger in size, although it rarely spreads to distant areas (metastasizes). Basal cell carcinoma accounts for 80% of skin cancers (excluding melanoma), whereas squamous cell cancer makes up about 20%. Squamous cell carcinoma is a malignant growth of the external surface of the skin. Squamous cell cancers metastasize at a rate of 2–6%, with up to 10% of lesions affecting the ear and lip.

Causes and symptoms

Cumulative sun exposure is considered a significant risk factor for non-melanoma skin cancer. High incidence has been noted in individuals with freckles, light hair, and light complexion; in individuals with darker skin, the palms, soles, mucous membranes, and other areas of light pigmentation are the most common sites for melanomas.

Pre-existing moles can change into melanomas, and should be observed for any particular change in appearance, specifically the classic *ABCD* appearance, where asymmetrical borders, colors, and diameter are observed. Lesions typically are circular with irregular or *asymmetrical borders*. Melanomas typically have a combination of *colors*, including tan, brown, black, or gray; there may also be a dull pink or rose pigmentation within a small area of the lesion. The *diameter* of a malignant melanoma is typically greater than that of a pencil eraser.

There is evidence suggesting that early intense sun exposure causing blistering **sunburn** in childhood may also play an important role in the cause of non-melanoma skin cancer. Basal cell carcinoma most frequently affects the skin of face, with the next most common sites being the ears, the backs of the hands, the shoulders, and the arms. It is prevalent in both sexes, and most commonly occurs in people over the age of 40.

Basal cell carcinoma usually appears as a small skin lesion that persists for at least three weeks. This form of non-melanoma looks flat and waxy, with the edges of the lesion translucent and rounded. The edges also contain small, fresh blood vessels. An ulcer found in the center gives the lesion a dimpled appearance. Basal cell carcinoma lesions vary from 4–6 mm in size, but can slowly grow larger if left untreated.

Squamous cell carcinoma also involves skin exposed to the sun, such as the face, ears, hands, or arms. This form of non-melanoma also is most common among people over the age of 40. Squamous cell carcinoma presents itself as a small, scaling, raised bump on the skin with a crusting ulcer in the center, but without **itching**.

Basal cell and squamous cell carcinomas can grow more easily when people have a suppressed immune system because they are taking immunosuppressive drugs or are exposed to radiation. Some people must take immunosuppressive drugs to prevent the rejection of a transplanted organ or because they have a disease in which the immune system attacks the body's own tissues, referred to as autoimmune illnesses; others may need radiation therapy to treat another form of cancer. Because of this, all people taking these immunosuppressive drugs or receiving radiation treatments should undergo complete skin examination at regular intervals. If proper treatment is delayed and the tumor continues to grow, the tumor cells can spread, or metastasize, to other muscles, bones, nerves, and possibly to the brain.

About 1–2% of all skin cancers develop within burn scars; squamous cell carcinomas account for about 95% of these cancers, with 3% being basal cell carcinomas and the remainder malignant melanomas.

Diagnosis

To diagnose skin cancer, doctors must carefully examine the lesion and ask the patient about how long it has been there, whether it itches or bleeds, and other questions about the patient's medical history. If skin

cancer cannot be ruled out, a biopsy is performed, where a sample of the tissue is removed and examined under a microscope. A definitive diagnosis of melanoma, squamous, or basal cell cancer can only be made with microscopic examination of the tumor cells. Once skin cancer has been diagnosed, the stage of the disease's development is determined. The information from the biopsy and staging allows the physician and patient to plan for treatment and possible surgical intervention.

Treatment

Alternative medicine aims to prevent, rather than treat, skin cancer. Vitamins have been shown to prevent sunburn and, possibly, skin cancer. Some dermatologists have suggested that taking antioxidant vitamins E and C by mouth may help prevent sunburn. In one particular study, men and women took these vitamins for eight days prior to being exposed to ultraviolet light. The researchers found that those who consumed vitamins required about 20% more ultraviolet light to induce sunburn than did people who did not take vitamins. This is the first study that indicates the oral use of vitamins E and C increases resistance to sunburn. These **antioxidants** are thought to reduce the risk of skin cancer, and are expected to provide protection from the sun even if taken in lower doses. Other antioxidant nutrients, including **beta carotene**, **selenium**, **zinc**, and the bioflavonoid **quercetin**, may also help prevent skin cancer, as may such antioxidant herbs as **bilberry** (*Vaccinium myrtillus*), **hawthorn** (*Crataegus laevigata*), **turmeric** (*Curcuma longa*), and ginkgo (*Ginkgo biloba*).

A team of researchers at Duke University reported in 2003 that topical application of a combination of 15% **vitamin C** and 1% **vitamin E** over a four-day period offered significant protection against sunburn. The researchers suggest that this combination may protect skin against **aging** caused by sunlight as well.

Another antioxidant that appears to counter the effects of severe sun exposure is superoxide dismutase, or SOD. SOD must be given in injectable form, however, because it is destroyed in the digestive tract.

As of 2003, researchers are also looking at botanical compounds that could be added to skin care products applied externally to lower the risk of skin cancer. Several botanical compounds have been tested on animals and found to be effective in preventing skin cancer, but further research needs to be done in human subjects.

Allopathic treatment

A wide surgical removal of the melanoma and surrounding tissue is usually necessary. This may also include removal of affected lymph nodes, usually followed by skin grafting, which is a process where a piece of skin that is taken from a donor area replaces the skin removed.

Since the early 1990s, some melanomas have been treated with chemotherapy (usually carmustine or lomustine); other biological therapies are also being used as of 2003.

A variety of treatment options are available for those diagnosed with non-melanoma skin cancer. Some carcinomas can be removed by cryosurgery, the process of freezing with liquid nitrogen. Uncomplicated and previously untreated basal cell carcinoma of the torso and arms is often treated with curettage and electrodesiccation, which is the scraping of the lesion and the destruction of any remaining malignant cells with an electrical current. Moh's surgery, or removal of a lesion layer-by-layer down to normal margins, is an effective treatment for both basal and squamous cell carcinoma. Radiation therapy is best reserved for older, debilitated patients, or when the tumor is considered inoperable. Laser therapy is sometimes useful in specific cases; however, this form of treatment is not widely used to treat skin cancer.

Expected results

Both squamous and basal cell carcinoma are curable with appropriate treatment. Early detection remains critical for a positive prognosis.

Prevention

Avoiding exposure to the sun reduces the incidence of non-melanoma skin cancer. Sunscreen with a sun-protective factor (SPF) of 15 or higher is helpful in prevention, along with a hat and clothing to shield the skin from sun damage. Individuals who are physically active while exposed to sunlight should consider using waterproof sunscreen, or reapply it. There are many different brands of sunscreen for those with certain skin **allergies**. People should examine their skin monthly for unusual lesions, especially if previous skin cancers have been experienced.

Advances in photographic technique have now made it easier to track the development of moles with the help of whole-body photographs. A growing number of hospitals are offering these photographs as part of outpatient mole-monitoring services.

Resources

BOOKS

Chandrasoma, Parakrama, and Clive R. Taylor. *Concise Pathology*. East Norwalk, CT: Appleton and Lange, 1991.

Copstead, Lee Ellen C. "Alterations in the Integument." In *Perspectives on Pathophysiology*. Copstead. Philadel phia: W.B. Saunders, 1994.

"Dermatologic Disorders: Malignant Tumors." Section 10, Chapter 126 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

"Dermatologic Disorders: Reactions to Sunlight." Section 10, Chapter 119 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Food for Thought. New York: Simon & Schus ter, 2002.

PERIODICALS

Bray, C. "The Development of an Improved Method of Photography for Mole Monitoring at the University Hospital of North Durham." *Journal of Audiovisual Media in Medicine* 26 (June 2003): 60 66.

Brown, C. K., and J. M. Kirkwood. "Medical Management of Melanoma." *Surgical Clinics of North America* 83 (April 2003): 283 322.

F'guyer, S., F. Afaq, and H. Mukhtar. "Photochemopre vention of Skin Cancer by Botanical Agents." *Photo dermatology, Photoimmunology and Photomedicine* 19 (April 2003): 56 72.

Jellouli Elloumi, A., L. Kochbati, S. Dhraief, et al. "Cancers Arising from Burn Scars: 62 Cases." [in French] *Annales de dermatologie et de venereologie* 130 (April 2003): 413 416.

Lin, J. Y., M. A. Selim, C. R. Shea, et al. "UV Photopro tection by Combination Topical Antioxidants Vitamin C and Vitamin E." *Journal of the American Academy of Dermatology* 48 (June 2003): 866 874.

ORGANIZATIONS

American Academy of Dermatology. 930 N. Meacham Road, Schaumburg, IL 60173. (847) 330 0230 or (888) 462 DERM (227 3376).

American Cancer Society. 1599 Clifton Road NE, Atlanta, GA 30329. (800) ACS 2345.

Centers for Disease Control and Prevention (CDC) Cancer Prevention and Control Program. 4770 Buford High way, NE, MS K64, Atlanta, GA 30341. (888) 842 6355. http://www.cdc.gov/cancer/comments.htm.

National Cancer Institute (NCI). NCI Public Inquiries Office, Suite 3036A, 6116 Executive Boulevard, MSC8332, Bethesda, MD 20892 8322. (800) 4 CAN CER or (800) 332 8615 (TTY). http://www.nci.nih.gov.

Kathleen Wright
Rebecca J. Frey, PhD

Skullcap

Description

Skullcap is a name that refers to any of the dozens of species (*Scutellaria*) of the mint family Lamiaceae. The plant's name refers to the helmet-shaped calyx on the outer whorl of the plant's tiny flowers. The flowers range in color from blue to pink. In herbal medicine, the name skullcap refers to *Scutellaria lateriflora*, a perennial herb native to North America and cultivated in Europe. The leaves, flowers, and stems are used as herbal remedies. Skullcap is also known as scullcap, American skullcap, Western skullcap, European skullcap, blue skullcap, greater skullcap, hoodwort or hoodwart, blue pimpernel, Quaker bonnet, helmet flower, hooded willow herb, side-flowering skullcap, mad-dog weed, and mad weed.

Chinese skullcap (*Scutellaria baicalensis*) is a related species. The species *Scutellaria baicalensis Georgi* is native to eastern Asia, and the skinless yellow root of this plant is used in traditional Chinese medicine (TCM). Its Chinese name is *huang qin*. Chinese skullcap is sometimes called baikal, baical skullcap root, scute, and scutellaria. Another species used in Chinese medicine is *Scutellaria barbata*, whose Chinese name is *ban zhi lian*.

General use

Skullcap was once called mad-dog weed because of its use during the eighteenth century to treat **rabies**. In addition, Native Americans used skullcap as a sedative, tranquilizer, and a digestive aid. Other cultures have used it as a sedative and to lower fevers.

In contemporary practice, both common skullcap and Chinese skullcap are used as remedies for **anxiety**, nervous tension, pre-menstrual syndrome (PMS), **insomnia**, **stress** headaches, **muscle spasms**, seizures, and **epilepsy**. In addition, each herb is used for a variety of other conditions, and even in these conditions they are used differently.

Skullcap

Skullcap (*Scutellaria lateriflora*) is currently known best as a herbal sedative. By reducing tension, skullcap may contribute to lower blood pressure. Skullcap is also used as a remedy for exhaustion, convulsions, menstrual cramps, and as a treatment for withdrawal from alcohol and tobacco. The herb may be taken as a bitter tonic to boost digestion. Skullcap is also sometimes used as a remedy for hiccups, hangovers, and **asthma**.

KEY TERMS

Adulterant—A substance that makes something impure or inferior.

Baicalein—A compound found in skullcap that appears to be a cancer chemopreventive.

Barbiturate—Any of an older group of sedatives derived from barbituric acid. Barbiturates were frequently prescribed in the 1950s and 1960s as sleeping pills.

Benzodiazepine—Any of a group of minor tranquilizers given to relieve anxiety; they produce sedation and muscle relaxation.

Decoction—A method for releasing the herbal essence of bark or roots by boiling or simmering them in a non-aluminum pan.

Flavone—A colorless crystalline compound found in skullcap and other plants that is the parent substance of a group of yellow plant pigments.

Germander—A plant, *Teucrium chamaedrys*, that belongs to the mint family and may have been used to adulterate skullcap products reported to cause liver damage.

Infusion—A method for releasing the herbal essence of herbal leaves and flowers by pouring boiling water over the plant matter and allowing it to steep.

Pharmacognosist—A person involved in pharmacognosy, the science concerned with the medical products of plants in their natural state.

Sedative—A preparation or medication given to calm or soothe.

Tincture—A method of preserving herbs in a solution of alcohol or water.

Chinese skullcap

In **traditional Chinese medicine**, baical skullcap (*Scutellaria baicalensis*) is prescribed for irritability, dysentery, **diarrhea**, **infections** accompanied by **fever**, hay fever, urinary tract infections, **gout**, jaundice, potential miscarriages, nosebleed, abdominal **pain**, and redness in the eyes or face. The herb is used for **hepatitis** and has been said to improve liver function. The root of baical skullcap is also given in formulas together with other herbs for vaginal bleeding, blood in the stool, and coughing or vomiting blood. Chinese skullcap is frequently among the ingredients in herbal compounds used for disorders involving high cholesterol and triglycerides, high blood pressure, allergic diseases, and inflammatory skin conditions.

As of the late 1990s, research in countries including China indicated that Chinese skullcap showed "promise" in treating allergies, **cancer**, and as an aspirin-like anti-inflammatory remedy. Research at that time also indicated that the herb might be used in the future to prevent strokes and heart disease . A team of researchers in Hong Kong reported in 2002 that baicalein, a flavonoid derived from skullcap, appears to have chemoprotective effects against cancer.

Another recent discovery is that a group of flavones in skullcap appear to protect nerve cells against the damage caused by oxidation. This finding may have potential applications in treating **Alzheimer's disease**.

Preparations

Skullcap (*scutellaria lateriflora*) and Chinese skullcap (*scutellaria baicalensis*) are both taken internally. Skullcap is generally sold commercially as a liquid extract, as a tea, in dried form, and in capsules. The leaves and flowers are used as remedies for such conditions as insomnia. In the United States, "blue skullcap" refers to scutellaria that is frequently harvested without determining the species, according to *Tyler's Honest Herbal*. Tyler, a respected pharmacognosist, wrote that "pink scullcap" is an adulterant with pink flowers. It costs the manufacturer less than blue skullcap.

Chinese skullcap root is sold usually in bulk or capsule form, the capsules usually containing other herbs. Both Chinese skullcap and common skullcap have a bitter taste, and there are customary dosages for both herbs.

Skullcap dosages

Skullcap tea can be purchased commercially or brewed at home for conditions including anxiety, tension, and PMS. Skullcap preparations include:

- A tea prepared by pouring 1 cup (250 ml) of boiling water over 1–2 tsp. (5–10 g) of dried leaves. The mixture is covered and steeped for 10–15 minutes. From two to three cups of tea may be consumed daily.
- A liquid tincture that can be taken three times daily. The tincture, 1/2–1 tsp (2–4 ml) of solution, is added to an 8 oz (250 ml) glass of warm water. Skullcap tincture can be purchased over the counter, or made at home by mixing the herb with water or alcohol in a ratio of 1:5 or 1:10.
- To ease insomnia, skullcap leaves can be placed inside a dream pillow. Also known as a sleep pillow, it can be made by sewing together two 8-in (20.3-cm) pieces of fabric. The dream pillow is placed under the bed pillow.

Chinese skullcap dosages

Chinese skullcap tea is prepared by adding 1–3 tsp (5–15 g) of the powdered root to 1 cup (250 ml) of boiling water. The mixture is covered and steeped for 10–20 minutes. From three to four cups may be consumed daily.

Baikal skullcap is also available in capsule form. Three capsules of the standard dosage may be taken for treatment of liver ailments and chronic inflammatory conditions.

The root of Chinese skullcap is usually decocted, but it may be fried dry and consumed for conditions such as diarrhea and urinary tract infections. The root can be cooked in wine to treat upper respiratory infections and redness in the face and eyes. A practitioner of traditional Chinese medicine can provide information about specific dosages.

Skullcap combinations

Skullcap may be combined with other herbs such as oats or **St. John's wort**. It works well in combination with such sedative herbs as **valerian**, passionflower, and **black cohosh**. Skullcap is included among the herbal ingredients in a tincture that people take to quit smoking. Other herbs in this tincture include **mullein**, St. John's wort, and **licorice**.

Precautions

Before beginning herbal treatment, people should consult a physician, practitioner, or herbalist. This precaution is especially important when taking skullcap or Chinese skullcap because there is disagreement among health care professionals about whether these herbs are safe to use. Advocates of both remedies state that research conducted in China and Russia proves that skullcap is safe and effective. Although the United States Food and Drug Administration does not subject herbal preparations (which are regarded as dietary supplements) to the same types of regulatory procedures as prescription drugs, it does monitor reports of adverse interactions to herbal products. Between 1996, when the FDA's MedWatch program began, and January 2003, there have been no reports or alerts for American consumers regarding products contaiing skullcap. There have, however, been reports of liver toxicity from products containing skullcap in the Netherlands and Norway in the early 1990s. Until more is known, some experts advise that skullcap should be avoided on the grounds that it can cause liver damage.

That is also the position of Hepatitis Foundation International, which rates skullcap as toxic to the liver. That position that had not changed by May of 2000. It is also possible, however, that skullcap may have been mistakenly identified as dangerous. Tyler was among the herbal experts who pointed out that germander, a herb that causes liver damage, was found in the skullcap products taken by people who experienced liver damage. In addition, some supporters of skullcap maintain that prejudice against the herb stems from its previous use as a rabies treatment.

Skullcap is safe for adults when taken in proper dosages.

Skullcap advocates state that the herb can be used safely for relieving conditions such as PMS. Some experts, however, recommend medical supervision when taking skullcap for medicinal purposes. That precaution is particularly important for pregnant women and those who are lactating. Skullcap may cause drowsiness, so the person taking it should not drive or operate heavy equipment.

Chinese skullcap should not be taken when a person has diarrhea or a deficiency of heat in the lungs.

Side effects

Possible side effects include diarrhea, an upset stomach, and drowsiness. If the first two conditions occur, the person should reduce the dosage of skullcap or stop taking it. In addition, large amounts of the tincture may cause giddiness, twitching, confusion, erratic pulse, and seizures.

Interactions

In traditional Chinese medicine, Chinese skullcap is said to offset the effects of some Chinese remedies. For this reason, it is important that persons using Chinese skullcap consult a traditional practitioner, as Chinese skullcap is usually given in combinations of herbs that are specific to each symptom.

With regard to standard prescription medications, people who are taking antihistamines, barbiturates, benzodiazepines, or sedative medications should not use skullcap because it will intensify their effects on the central nervous system, particularly drowsiness.

People who are taking skullcap should discontinue its use two weeks before any surgical procedure requiring general anesthesia, as skullcap interacts with anesthetics to lower blood pressure. For the same reason, skullcap should not be used by persons who are taking drugs to control high blood pressure (antihypertensives).

Skullcap also interferes with the body's absorption of **iron** and other minerals; persons who are

taking mineral supplements should therefore use skullcap with caution.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.
Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996
L'Orange, Darlena. *Herbal Healing Secrets of the Orient*. Paramus, NJ: Prentice Hall, 1998.
PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company, 1998.
Reid, Daniel. *Chinese Herbal Medicine*. Boston: Shambhala, 1996.
Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.
Tyler, Varro and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

PERIODICALS

Chan, H. Y., Z. Y. Chen, D. S. Tsang, and L. K. Leung. "Baicalein Inhibits DMBA DNA Adduct Formation by Modulating CYP1A1 and CYP1B1 Activities." *Biomedicine and Pharmacotherapy* 56 (August 2002): 269 275.
Choi, J., C. C. Conrad, C. A. Malakowsky, et al. "Flavones from *Scutellaria baicalensis Georgi* Attenuate Apopto sis and Protein Oxidation in Neuronal Cell Lines." *Biochimica et Biophysica Acta* 1571 (July 3, 2002): 201 210.
Xie, L. H., X. Wang, P. Basnet, et al. "Evaluation of Var iation of Acteoside and Three Major Flavonoids in Wild and Cultivated *Scutellaria baicalensis* Roots by Micellar Electrokinetic Chromatography." *Chemical and Pharmaceutical Bulletin (Tokyo)* 50 (July 2002): 896 899.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660. Austin TX, 78720.(512) 331 8868.
Herb Research Foundation. 1007 Pearl St., Suite 200. Boulder, CO 80302. (303) 449 2265. www.herbs.org.

Liz Swain
Rebecca J. Frey, PhD

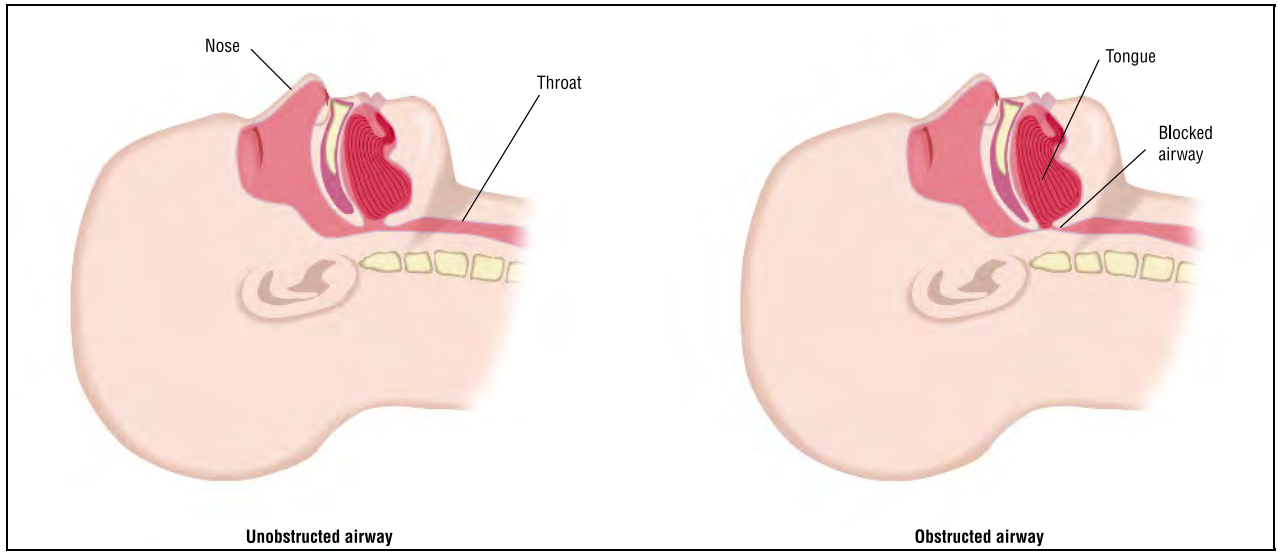
Sleep apnea

Definition

Sleep apnea is a condition in which breathing stops for more than ten seconds during sleep. Sleep apnea is a major, though often unrecognized, cause of daytime sleepiness. It can have serious negative effects on a person's quality of life and is thought to be considerably underdiagnosed in the United States.

Description

A sleeping person normally breathes continuously and without interruption throughout the night. Individuals with sleep apnea, however, have frequent episodes (up to 400–500 per night) in which they stop breathing. This interruption of breathing is called



Sleep apnea is caused when the airway of the sleeping person becomes obstructed. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

apnea. Breathing usually stops for about 30 seconds then the person usually startles awake with a loud snort and begins to breathe again, gradually falling back to sleep.

There are two forms of sleep apnea. In *obstructive sleep apnea* (OSA), breathing stops because tissue in the throat closes off the airway. In *central sleep apnea,* (CSA), the brain centers responsible for breathing fail to send messages to the breathing muscles. OSA is much more common than CSA. It is thought that about 1–10% of adults are affected by OSA; only about one tenth of that number has CSA. OSA can affect people of any age and of either sex, but it is most common in middle-aged, somewhat overweight men, especially those who use alcohol.

Causes and symptoms

Obstructive sleep apnea

Obstructive sleep apnea occurs when part of the airway is closed off (usually at the back of the throat) while a person is trying to inhale during sleep. People whose airways are slightly narrower than average are more likely to be affected by OSA. **Obesity**, especially obesity in the neck, can increase the risk of developing OSA because the fat tissue tends to narrow the airway. In some people, the airway is blocked by enlarged tonsils, an enlarged tongue, jaw deformities, or growths in the neck that compress the airway. Blocked nasal passages may also play a part in some people's apnea.

When people begin to inhale, expansion of the lungs lowers the air pressure inside the airway. If the muscles that keep the airway open are not working hard enough, the airway narrows and may collapse, shutting off the supply of air to the lungs. OSA occurs during sleep because the neck muscles that keep the airway open are not as active then. Congestion in the nose can make collapse more likely, since the extra effort needed to inhale will lower the pressure in the airway even more. Drinking alcohol or taking tranquilizers in the evening worsens this situation because these cause the neck muscles to relax. These drugs also lower the respiratory drive in the nervous system, reducing breathing rate and strength.

People with OSA almost always snore heavily because the same narrowing of the airway that causes **snoring** can also cause OSA. Snoring may actually help cause OSA as well because the vibration of the throat tissues can cause them to swell. However, most people who snore do not go on to develop OSA.

Other risk factors for developing OSA include male sex, **pregnancy**, a family history of the disorder, and **smoking**. With regard to gender, it has been found that male sex hormones sometimes cause changes in the size or structure of the upper airway. The weight gain that accompanies pregnancy can affect a woman's breathing patterns during sleep, particularly during the third trimester. With regard to family history, OSA is known to run in families even though no gene or genes associated with the disorder had been identified as of 2002. Smoking increases the risk of developing OSA because it causes inflammation, swelling, and narrowing of the upper airway.

Some patients being treated for head and neck **cancer** develop OSA as a result of physical changes in the muscles and other tissues of the neck and throat. Doctors recommend prompt treatment of the OSA to improve the patient's quality of life.

Central sleep apnea

In central sleep apnea, the airway remains open, but the nerve signals controlling the respiratory muscles are not regulated properly. This loss of regulation can cause wide fluctuations in the level of carbon dioxide (CO_2) in the blood. Normal activity in the body produces CO_2, which is brought by the blood to the lungs for exhalation. When the blood level of CO_2 rises, brain centers respond by increasing the rate of respiration, clearing the CO_2. As blood levels fall again, respiration slows down. Normally, this interaction of CO_2 and breathing rate maintains the CO_2 level within very narrow limits. CSA can occur when the regulation system becomes insensitive to CO_2 levels, allowing wide fluctuations in both CO_2 levels and breathing rates. High CO_2 levels cause very rapid breathing (hyperventilation), which then lowers CO_2 so much that breathing becomes very slow or even stops. CSA occurs during sleep because when a person is awake, breathing is usually stimulated by other signals, including conscious awareness of breathing rate.

A combination of the two forms is also possible and is called mixed sleep apnea. Mixed sleep apnea episodes usually begin with a reduced central respiratory drive, followed by obstruction.

OSA and CSA cause similar symptoms. The most common symptoms are:

- daytime sleepiness
- morning headaches
- a feeling that sleep is not restful
- disorientation upon waking
- memory loss and difficulty paying attention

- poor judgment
- personality changes

Sleepiness is caused not only by the frequent interruption of sleep, but by the inability to enter long periods of deep sleep, during which the body performs numerous restorative functions. OSA is one of the leading causes of daytime sleepiness and is a major risk factor for motor vehicle accidents. Headaches and disorientation are caused by low oxygen levels during sleep, from the lack of regular breathing.

Other symptoms of sleep apnea may be **sexual dysfunction**, loss of concentration, **memory loss**, intellectual impairment, and behavioral changes including **anxiety** and **depression**.

Sleep apnea is also associated with night sweats and nocturia, or increased frequency of urination at night. **Bedwetting** in children is linked to sleep apnea.

Sleep apnea can cause serious changes in the cardiovascular system. Daytime **hypertension** (high blood pressure) is common. An increase in the number of red blood cells (polycythemia) is possible, as is an enlarged left ventricle of the heart (cor pulmonale), and left ventricular failure. In some people, sleep apnea causes life-threatening changes in the rhythm of the heart, including heartbeat slowing (bradycardia), racing (tachycardia), and other types of "arrhythmias." Sudden death may occur from such arrhythmias. Patients with the Pickwickian syndrome (named after a Charles Dickens character) are obese and sleepy, with right heart failure, pulmonary hypertension, and chronic daytime low blood oxygen (hypoxemia) and increased blood CO_2 (hypercapnia).

A study presented at the 2007 meeting of the American Thoracic Society found an association between sleep apnea, gestational diabetes, and high blood pressure associated with pregnancy.

Diagnosis

Excessive daytime sleepiness is the complaint that usually brings a person to see the doctor. A careful medical history includes questions about alcohol, tobacco, or tranquilizer use; family history; snoring (often reported by the person's partner); and morning headaches or disorientation. A physical examination includes examination of the mouth, nose, and throat to look for narrowing or obstruction, or unusual size or shape of the tonsils or adenoids. Blood pressure is also measured. Measuring heart rate or blood levels of oxygen and CO_2 during the daytime is not usually be done, since these are abnormal only at night in most patients.

In some cases the person's dentist may suggest the diagnosis of OSA on the basis of a dental checkup or evaluation of the patient for oral surgery.

Confirmation of the diagnosis usually requires making measurements while the person sleeps. These tests are called a polysomnography study and are conducted during an overnight stay in a specialized sleep laboratory. Important parts of the polysomnography study include measurements of the following:

- heart rate
- airflow at the mouth and nose
- respiratory effort
- sleep stage (i.e., light sleep, deep sleep, dream sleep)
- oxygen level in the blood, using a noninvasive probe (ear oximetry)

Simplified studies done overnight at home are also possible and may be appropriate for people whose profile strongly suggests the presence of obstructive sleep apnea; that is, middle-aged, somewhat overweight men, who snore and have high blood pressure. The home-based study usually includes ear oximetry and cardiac measurements. If these measurements support the diagnosis of OSA, initial treatment is usually suggested without polysomnography. Home-based measurements are not used to rule out OSA, however, and if the measurements do not support the OSA diagnosis, polysomnography may be needed to define the problem further.

Treatment

Treatment of obstructive sleep apnea begins with reducing the use of alcohol or tranquilizers in the evening, if these have been contributing to the problem. Quitting smoking is recommended for a number of health concerns in addition to OSA. Weight loss is also effective, but if the weight returns, as it often does, so does the apnea. Changing sleeping position may be effective. Snoring and sleep apnea are both most common when individuals sleep on their backs. Turning to sleep on the side may be enough to clear up the symptoms. Raising the head of the bed may also help.

There are few reports of OSA being treated by alternative and complementary approaches. In 2002, however, some Japanese researchers reported on the case of a 44-year-old male who was successfully treated for OSA by taking a Kampo extract, or traditional Japanese herbal formulation.

Allopathic treatment

Opening of the nasal passages can provide some relief for sleep apnea sufferers. There are a variety of

nasal devices such as clips, tapes, or holders which may help, though discomfort may limit their use. Nasal decongestants may be useful but should not be taken for sleep apnea without the consent of the treating physician. Supplemental nighttime oxygen can be useful for some people with either central or obstructive sleep apnea. Tricyclic antidepressant drugs such as protriptyline (Vivactil) may help by increasing the muscle tone of the upper airway muscles, but their side effects may severely limit their usefulness.

For moderate to severe sleep apnea, the most successful treatment is nighttime use of a ventilator, called a CPAP machine. CPAP (continuous positive airway pressure) blows air into the airway continuously, preventing its collapse. CPAP requires the use of a nasal mask. The appropriate pressure setting for the CPAP machine is determined by polysomnography in the sleep lab. Its effects are dramatic; daytime sleepiness usually disappears within one to two days after treatment begins. CPAP is used to treat both obstructive and central sleep apnea.

CPAP is tolerated well by about two-thirds of patients who try it. Bilevel positive airway pressure (BiPAP) is an alternative form of ventilation. With BiPAP, the ventilator reduces the air pressure when the person exhales. This is more comfortable for some. In a study released in 2005, researchers found that sleep apnea may damage the functioning of the heart's left ventricle. Researchers concluded that CPAP may help avoid the progression of the damage and may reverse damage already inflicted. In another study, conducted at the Cleveland Clinic and released in 2007, researchers found that while CPAP effectively enhances sleep and lessens daytime sleepiness, its effects on cardiovascular risk remain uncertain.

Another approach to treating OSA involves the use of oral appliances intended to improve breathing either by holding the tongue in place or by pushing the lower jaw forward during sleep to increase the air volume in the upper airway. The first type of oral appliance is known as a tongue retaining device (TRD). The second type is variously called an oral protrusive device (OPD) or mandibular advancement splint (MAS) because it holds the mandible, or lower jaw, forward during sleep. These oral devices appear to work best for patients with mild-to-moderate OSA and in some cases can postpone or prevent the need for surgery. Their rate of patient compliance is about 50%; most patients who stop using oral appliances do so because their teeth are in poor condition. TRDs and OPDs can be fitted by dentists; however, most dentists work together with the patient's physician following a polysomnogram rather than prescribing the device by themselves.

KEY TERMS

Continuous positive airway pressure (CPAP)—A ventilation system that blows a gentle stream of air into the nose to keep the airway open.

Genioplasty—An operation performed to reshape the chin. Genioplasties are often done to treat OSA because the procedure changes the structure of the patient's upper airway.

Mandible—The lower jaw. One type of oral appliance used to treat OSA pushes the mandible forward in order to ease breathing during sleep.

Nocturia—Excessive need to urinate at night. Nocturia is a symptom of OSA and often increases the patient's daytime sleepiness.

Polysomnography—A group of tests administered to analyze heart, blood, and breathing patterns during sleep.

Tracheotomy—A surgical procedure in which a small hole is cut into the trachea, or windpipe, below the level of the vocal cords.

Uvulopalatopharyngoplasty (UPPP)—An operation to remove excess tissue at the back of the throat to prevent it from closing off the airway during sleep.

Surgery can be used to correct obstructions in the airway. The most common surgery is uvulopalatopharngyoplasty (UPPP). This surgery removes tissue from the rear of the mouth and top of the throat. The tissues removed include parts of the uvula (the flap of tissue that hangs down at the back of the mouth), the soft palate, and the pharynx. Tonsils and adenoids are usually removed as well. This operation significantly improves sleep apnea in slightly more than half of all cases. Subsequently, oral surgeons have performed region-specific surgery for OSA, which grew out of the recognition that obstructions may exist in more than one level of the patient's upper airway. Region-specific surgery has a cure rate of over 90%, though it may involve more than one surgery.

A modified tracheotomy may also be performed to treat OSA. This procedure involves the surgical placement of a tiny breathing tube that fits in a 2 mm incision in the throat.

Reconstructive surgery is possible for those whose OSA is due to constriction of the airway by lower jaw deformities. Genioplasty, which is a procedure that

plastic surgeons usually perform to reshape a patient's chin to improve his or her appearance, is performed to reshape the upper airway in patients with OSA.

Expected results

Appropriate treatment enables most people with sleep apnea to be treated successfully, although it may take some time to determine the most effective and least intrusive treatment. In many cases consultation and cooperation between the person's physician and dentist work to identify the best treatment option. Polysomnography testing is usually required after beginning a treatment to determine how effective it has been.

Prevention

For people who snore frequently, weight control, smoking cessation, avoidance of evening alcohol or tranquilizers, and adjustment of sleeping position may help reduce the risk of developing obstructive sleep apnea.

Resources

PERIODICALS

Arias, Miguel, et al. "Obstructive Sleep Apnea Syndrome Affects Left Ventricular Diastolic Function: Effects of Nasal Continuous Positive Airway Pressure in Men." *Circulation* 112 (July 11, 2005): 375 383.

Krieger, S., and S. M. Caples. "Obstructive Sleep Apnea and Cardiovascular Disease: Implications for Clinical Practice." *Cleveland Clinic Journal of Medicine* 74, no. 12 (December 2007): 853 856.

OTHER

"Considering Surgery for Snoring?" American Sleep Apnea Association (ASAA). http://www.sleepapnea.org/resources/pubs/snoring.html (February 29, 2008).

"Sleep Apnea Associated with Pregnancy induced Diabetes, High Blood Pressure." University of Medicine and Dentistry of New Jersey (May 23, 2007). http://www.umdnj.edu/about/news_events/releases/07/r052307_Sleep_Apnea.htm (February 29, 2008).

ORGANIZATIONS

American Academy of Otolaryngology, Head and Neck Surgery, Inc, One Prince Street, Alexandria, VA, 22314 3357, (703) 836 4444, http://www.entnet.org.

American Dental Association, 211 E. Chicago Ave., Chi cago, IL, 60611, (312) 440 2500, http://www.ada.org.

American Sleep Apnea Association, 1424 K St. NW, Suite 302, Washington, DC, 20005, (202) 293 3650, http://www.sleepapnea.org.

Canadian Coordinating Office for Health Technology Assessment, 600 865 Carling Ave., OttawaON, K1S5S8, Canada., (613) 226 2553, http://www.ccohta.ca/pubs/english/sleep/treatment.

National Sleep Foundation, 1522 K Street NW, Suite 500, Washington, DC, 20005, (202) 347 3471, http://www.sleepfoundation.org.

Paula Ford-Martin
Rebecca J. Frey, PhD
Rhonda Cloos, RN

Sleep disorders

Definition

Sleep disorders are a group of syndromes characterized by disturbances in the amount, quality, or timing of sleep, or in behaviors or physiological conditions associated with sleep.

Description

An estimated 70 million Americans suffer from sleep disorders, according to the National Institutes of Health. Sleep problems include **insomnia**, **narcolepsy**, **sleep apnea**, restless legs syndrome, and periodic limb movement disorder. Although sleep is a basic behavior in all animals, its function in maintaining health is not completely understood. Between 1975 and 2005, however, researchers have learned about the cyclical patterns of different types of sleep and their relationships to breathing, heart rate, brain waves, and other physical functions.

There are five stages of human sleep. Four stages are characterized by non-rapid eye movement (NREM) sleep, with unique brain wave patterns and physical changes. Dreaming occurs in the fifth stage during rapid eye movement (REM) sleep.

- Stage 1 NREM sleep. This stage occurs while a person is falling asleep and represents about 5% of a normal adult's sleep time.
- Stage 2 NREM sleep. This stage marks the beginning of "true" sleep. About 50% of sleep time is stage 2 NREM sleep.
- Stages 3 and 4 NREM sleep. Also called delta or slow wave sleep, these are the deepest levels of human sleep and represent 10–20% of sleep time. They usually occur during the first 30 to 50% of the sleeping period.
- REM sleep. This stage accounts for 20 to 25% of total sleep time. It usually begins about 90 minutes after the person falls asleep, an important measure called REM latency. REM sleep alternates with NREM sleep about every hour and a half throughout

the night. REM periods increase in length over the course of the night.

The average length of nighttime sleep varies among people. Most adults sleep between seven and nine hours a night.

Sleep disorders are classified according to their causes. Primary sleep disorders are distinguished from those that are not caused by other mental disorders, prescription medications, **substance abuse**, or medical conditions. The two major categories of primary sleep disorders are the dyssomnias and the parasomnias.

Dyssomnias

Dyssomnias are primary sleep disorders in which the patient suffers from changes in the amount, restfulness, and timing of sleep. The most important dyssomnia is primary insomnia, which is defined as difficulty in falling asleep or remaining asleep that lasts for at least one month. It is estimated that 35% of adults in the United States experience insomnia during any given year. Primary insomnia usually begins during young adulthood or middle age.

Hypersomnia is a condition marked by excessive sleepiness during normal waking hours. Individuals have either lengthy episodes of daytime sleep or episodes of daytime sleep on a daily basis even though they are sleeping normally at night. The number of people with primary hypersomnia is unknown, although 5 to 10% of patients in sleep disorder clinics have the disorder. Primary hypersomnia usually affects young adults between the ages of 15 and 30.

Nocturnal myoclonus and restless legs syndrome (RLS) can cause either insomnia or hypersomnia in adults. Individuals with nocturnal myoclonus, also called periodic limb movement disorder (PLMD), awaken because of cramps or twitches in the calves and feel sleepy the next day. RLS patients have a crawly or aching feeling in their calves that can be relieved by moving or rubbing the legs. RLS often prevents individuals from falling asleep until the early hours of the morning.

Narcolepsy is a dyssomnia characterized by recurrent "sleep attacks" (abrupt loss of consciousness) lasting 10 to 20 minutes. Individuals feel refreshed by the sleep, but typically feel sleepy again several hours later. Narcolepsy has three major symptoms in addition to sleep attacks: cataplexy (sudden loss of muscle tone and stability), hallucinations, and sleep paralysis. About 40% of individuals with narcolepsy have or have had another mental disorder. Although narcolepsy is considered an adult disorder, it has been reported in children as young as three years of age. Almost 18% of patients with narcolepsy are 10 years old or younger. It is estimated that 0.02 to 0.16% of the general population suffers from narcolepsy.

Breathing-related sleep disorders are syndromes in which individuals' sleep is interrupted by problems with their breathing. There are three types of breathing-related sleep disorders:

- Obstructive sleep apnea syndrome is the most common form, marked by episodes of blockage in the upper airway during sleep. It is found primarily in obese people. Patients with this disorder typically alternate between periods of snoring or gasping (when their airway is partly open) and periods of silence (when their airway is blocked). Very loud snoring is characteristic of this disorder.
- Central sleep apnea syndrome is primarily found in elderly patients with heart or neurological conditions that affect their ability to breathe properly.
- Central alveolar hyperventilation syndrome is found most often in extremely obese people. The patient's airway is not blocked, but his or her blood oxygen level is too low.
- Mixed-type sleep apnea syndrome combines symptoms of both obstructive and central sleep apnea.

Circadian rhythm sleep disorders are dyssomnias resulting from a discrepancy between the person's daily sleep/wake patterns and the demands of social activities, shift work, or travel. There are three circadian rhythm sleep disorder causes: delayed sleep phase (going to bed and arising later than most people); **jet lag** (traveling to a new time zone); and shift work.

Parasomnias

Parasomnias are primary sleep disorders in which the patient's behavior is affected by specific sleep stages or transitions between sleeping and waking.

Nightmare disorder is a parasomnia in which the patient is repeatedly awakened by frightening dreams. Approximately 10 to 50% of children between three and five years old have nightmares. They occur during REM sleep, usually in the second half of the night.

Sleep terror disorder is a parasomnia in which the patient awakens screaming or crying. Unlike nightmares, sleep terrors typically occur in stage 3 or stage 4 NREM sleep during the first third of the night. The patient may be confused or disoriented for several minutes and may not remember the episode the next morning. Sleep terror disorder is most common in children 4 to 12 years of age. It affects about 3% of children and less than 1% of adults.

Sleepwalking disorder (somnambulism) occurs when the patient is capable of complex movements during sleep, including walking. Sleepwalking occurs during stage 3 and stage 4 NREM sleep during the first part of the night. In addition to walking around, patients with sleepwalking disorder have been reported to eat, use the bathroom, unlock doors, or talk to others. It is estimated that 10 to 30% of children have at least one episode of sleepwalking. However, only 1 to 5% meet the criteria for sleepwalking disorder. The disorder is most common in children 8 to 12 years of age.

Sleep disorders related to other conditions

Substances, living situations, and physical or mental disorders that can cause sleep disorders include:

- Mental disorders, especially depression or one of the anxiety disorders, can cause sleep disturbances. Psychiatric disorders are the most common cause of chronic insomnia.
- Medical conditions such as Parkinson's disease, Huntington's disease, viral encephalitis, brain disease, and thyroid disease may cause sleep disorders.
- Such substances as drugs, alcohol, and caffeine frequently produce disturbances in sleep patterns.
- Emotional stress and hormone imbalances can also cause sleep problems.
- Job-related stress is a common factor in sleep disorders. Police officers, firefighters, and other emergency workers have a higher-than-average rate of sleep disorders.
- Sleeping arrangements can be a factor. People who must share a bedroom with someone who snores heavily sometimes develop sleep disorders. In addition, research has shown that having small children sleeping in the same bed as their parents is stressful for the children and contributes to sleep disorders.
- Such prescription medications as antihistamines, corticosteroids, asthma medicines, and drugs that affect the central nervous system can affect sleep patterns.

Causes and symptoms

The causes of sleep disorders have already been discussed with respect to the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* classification of these disorders.

The most important symptoms of sleep disorders are insomnia and sleepiness during waking hours. Insomnia is the more common of the two symptoms and encompasses the inability to fall asleep at bedtime, repeated awakening during the night, and/or inability to go back to sleep once awakened.

Sleep disorders can have a number of negative health consequences in addition to general feelings of tiredness. Studies have shown that people with sleep disorders are at increased risk of having serious motor vehicle accidents and fatal workplace accidents.

Diagnosis

Diagnosis of sleep disorders usually requires a psychological history as well as a medical history. With the exception of sleep apnea syndromes, physical examinations are not usually revealing. The doctor may also talk to other family members in order to obtain information about the patient's symptoms. Psychological tests or inventories are used because insomnia is frequently associated with mood or affective disorders.

Patients may be asked to keep a sleep diary for one to two weeks to evaluate the sleep disturbance. Medications taken, the length of time spent in bed, and the quality of sleep are recorded.

If breathing-related sleep disorders, myoclonus, or narcolepsy are suspected, the patient may be tested in a sleep laboratory or at home with portable instruments. Polysomnography records physiological functions which can be used to help diagnose sleep disorders as well as conduct research into sleep.

Treatment

General recommendations

General recommendations for getting more restful sleep include:

- Waiting until one feels sleepy before going to bed.
- Not using the bedroom for work, reading, or watching television.
- Arising at the same time every morning.
- Avoiding smoking and drinking caffeinated liquids.
- Limiting fluids after dinner and avoiding alcohol.
- Avoiding high-sugar or high-calorie snacks at bedtime.
- Avoiding highly stimulating activities before bed, such as watching a frightening movie, playing competitive computer games, and exercise.
- Avoiding tossing and turning in bed. Instead, the patient should get up and listen to relaxing music or read.

Herbal remedies

Herbal remedies that are helpful in relieving insomnia include:

- Bach Rescue Sleep, a formula of the flower essences of rock rose, impatiens, clematis, star of Bethlehem, cherry plum, and white chestnut: calms the mind, pacifies anxiety, and stills repetitive thoughts
- catnip (*Nepeta cataria*): poor sleep
- chamomile (*Matricaria recutita*): anxiety
- chrysanthemum (*chrysanthemum morifolium*): insomnia
- hops (*Humulus lupulus*): overactive mind
- lime blossom (*Tilia cordata*): anxiety
- linden (*Tilia* species): anxiety
- oats (*Avena sativa*): poor sleep and nervous exhaustion
- passionflower (*Passiflora incarnata*): anxiety and muscle cramps
- skullcap (*Scutellaria lateriflora*): nervous tension
- squawvine (*Mitchella repens*): insomnia
- St. John's wort (*Hypericum perforatum*): depression
- valerian (*Valeriana officinalis*): anxiety
- vervain (*Verbena officinalis*): nervous tension, sleep apnea

According to *Prevention* magazine, insomnia is the sixth most common condition treated with herbal formulas in the United States; it accounts for 18% of all use of herbal preparations. Some herbs used for insomnia are safer than others. Persons who are using alternative remedies, whether to treat insomnia or other conditions, should always tell their doctor what they are taking, how much, and how often. This warning is important because some herbal preparations that are safe in themselves can interact with prescription medications.

Dietary supplements and modifications

Some naturopaths recommend Vitamins B_6, B_{12}, and D for the relief of insomnia. **Calcium** and **magnesium** are natural sedatives, which helps to explain the traditional folk recommendation of drinking a glass of warm milk at bedtime. Tryptophan may relieve insomnia; as turkey is high in tryptophan, a turkey sandwich as a bedtime snack may be helpful. **Melatonin** is widely used to induce sleep although adequate studies of its effectiveness were lacking as of 2008.

Other treatments

A wide variety of other alternative treatments that may be helpful in treating sleep disorders include:

- Acupressure. The pressure points on both heels, the base of the skull, between the eyebrows, and on the inside of the wrists can be used to relieve insomnia.
- Acupuncture. The specific treatment for insomnia depends upon the cause.
- Aromatherapy. The use of essential oils of bergamot, lavender, basil, chamomile, neroli, marjoram, or rose promotes relaxation.
- Ayurvedic medicine. Ayurvedic remedies for insomnia include scalp and soles massage with sesame, brahmi, or jatamamsi oils, a warm bath, or a nutmeg ghee paste applied to the forehead and around the eyes. Nightmares are treated with scalp and soles massage with brahmi or bhringaraj oils, tranquility tea (jatamamsi, brahmi, ginkgo, and licorice root), and yoga. Sleep apnea is treated by changing sleep positions, humidifying the air, and nasya (nose drops) with warm brahmi ghee.
- Biofeedback. This technique can promote relaxation.
- Chinese medicine. Practitioners of traditional Chinese medicine usually treat insomnia as a symptom of excess yang energy. Either magnetite or "dragon bones" is recommended for insomnia associated with hysteria or fear.
- Chiropractic. Spinal manipulation can reduce stress upon the nervous system, thus allowing relaxation.
- Colored light therapy. Treatment with true green light can balance the nervous system and may relieve insomnia.
- Homeopathy. Homeopathic remedies are chosen according to the specific causes of insomnia. They may include: *Nux vomica* (alcohol or substance-related sleeplessness), *Ignatia* (emotional upset), *Arsenicum* (anxiety), *Passiflora* (mental stress, aches, and pains), and *Lycopodium* (talking and laughing during sleep).
- Light/dark therapy involves making the bedroom very dark at night and exposing the patient to early morning sunlight (or a light box).
- Low-energy emission therapy (LEET) is a clinically proven treatment for chronic insomnia. LEET treatment involves delivering electromagnetic fields through a mouthpiece.
- Massage. Therapeutic massage can relieve the muscular tension associated with chronic insomnia.
- Meditation. Regular meditation practice can counteract emotional stress.
- Reflexology. The use of the reflexology points for the diaphragm, pancreas, ovary/testicle, pituitary,

parathyroid, thyroid, and adrenal gland helps to relieve insomnia.

- Visualization may help to promote relaxation.
- Yoga can promote relaxation by releasing muscular tension.

Allopathic treatment

Treatment for a sleep disorder depends on its cause. In some cases, rearrangement of the bedroom or changes in sleeping arrangements may be all that is needed. Sedative or hypnotic medications are generally recommended only for insomnia related to a temporary **stress** because of the potential for addiction or overdose. Trazodone, a sedating antidepressant, is often used for chronic insomnia that does not respond to other treatments. Hypnotic agents include lorazepam, temazepam, and zolpidem. Other common prescription sleep aid drugs are zolpidem (Ambien, Ambien CR) and eszopiclone (Lunesta), both non-narcotic sedatives. In most cases, Ambien and Lunesta do not cause next-day grogginess.

Bright-light therapy, which was originally introduced as a treatment for **seasonal affective disorder**, was being tried in 2008 as a treatment for insomnia in elderly adults. Although it has not been recognized by the U.S. Food and Drug Administration (FDA) as of 2008, this form of treatment does appear to benefit many patients. It is also used to treat circadian rhythm disorders, including shift-work sleep disorder. In addition, it does not involve medications, which are more likely to produce side effects in the elderly than in younger patients.

Narcolepsy is treated with such stimulants as dextroamphetamine sulfate, methylphenidate, or modafinil (Provigil). Periodic limb movement disorder (PLMD) and restless legs syndrome (RLS) have been successfully treated with three classes of drugs: benzodiazepines, Parkinson drugs, and narcotics. Clonazepam is the most commonly employed benzodiazepine treatment. Another prescription drug for PLMD and RLS is ropinirole (Requip).

Children with sleep terror disorder or sleepwalking are usually treated with benzodiazepines. Children with nightmare disorder may benefit from limits on violent or frightening television programs or movies.

Psychotherapy is recommended for patients with sleep disorders associated with other mental disorders.

Patients with sleep apnea or hypopnea are encouraged to stop **smoking**, avoid alcohol or drugs of abuse, and lose weight to improve the stability of the upper airway. In children and adolescents, removal of the tonsils and adenoids is a fairly common and successful treatment for sleep apnea. Most sleep apnea patients are treated with continuous positive airway pressure (CPAP). Sometimes an oral prosthesis is used for mild sleep apnea.

KEY TERMS

Apnea—The temporary absence of breathing.

Cataplexy—Sudden loss of muscle tone, often causing a person to fall.

Circadian rhythm—Any body rhythm that recurs in 24-hour cycles such as the sleep-wake cycle.

Dyssomnia—A primary sleep disorder in which the patient suffers from changes in the quantity, quality, or timing of sleep.

Hypersomnia—An abnormal increase of 25% or more in time spent sleeping.

Hypopnea—Shallow or excessively slow breathing usually caused by partial closure of the upper airway during sleep.

Narcolepsy—A lifelong sleep disorder marked by four symptoms: sudden brief sleep attacks, cataplexy, temporary paralysis, and hallucinations.

Nocturnal myoclonus—A disorder in which the patient is awakened repeatedly during the night by cramps or twitches in the calf muscles; also called periodic limb movement disorder (PLMD).

Parasomnia—A primary sleep disorder in which the person's physiology or behaviors are affected by sleep, the sleep stage, or the transition from sleeping to waking.

Polysomnography—Laboratory measurement of a patient's basic physiological processes during sleep.

Restless legs syndrome (RLS)—A disorder in which the patient experiences crawling, aching, or other disagreeable sensations in the calves that can be relieved by movement.

Sleep latency—The amount of time that it takes a person to fall asleep.

Expected results

The prognosis depends on the specific disorder. Natural remedies often require several weeks to have noticeable effects. Children usually outgrow sleep disorders. Narcolepsy, however, is a lifelong disorder.

Resources

BOOKS

Epstein, Lawrence, and Steven Mardon. *The Harvard Medical School Guide to a Good Night's Sleep*. New York: McGraw Hill, 2006.

Krugman, Michael. *The Insomnia Solution: The Natural, Drug Free Way to a Good Night's Sleep*. New York: Grand Central, 2005.

Linardakis, Nikos. *Ten Natural Ways to a Good Night's Sleep*. Layton, UT: Gibbs Smith, 2007.

Ross, Herbert. *Alternative Medicine Magazine's Definitive Guide to Sleep Disorders: 7 Smart Ways to Help You Get a Good Night's Rest*. San Francisco: Celestial Arts, 2007.

Van Houten, Peter. *Yoga Therapy for Overcoming Insomnia*. Nevada City, CA: Crystal Clarity, 2005.

PERIODICALS

Doheny, Kathleen. "Nine Natural Sleep Solutions: Every day's A Dream After A Good Night's Rest, So Follow These Along Free Paths to Superior Slumber." *Natural Health* (April 2006): 74(6).

Feather, Kathryn. "Snooze or Lose: If You Are One of the 40 Million People in the U.S. Suffering from Sleep Problems Each Year, You Might Have a Sleep Disorder. You Don't Have to Suffer Through a Lifetime of Restlessness Most Disorders Can Be Treated with a Few Simple Lifestyle Adjustments." *To Your Health* (February 2008): 20(4).

Lindsey, Robert L. "Wide Awake for Bedtime: Overstimulated by Popular Media and Caffeine, Today's Children Are Not Getting the Rest that They Need." *Sleep Review* (March 2008): 34(2).

Odell, Rachel. "Natural Sleep Aids." *Delicious Living* (August 2007): 16.

Robertshawe, Penny. "Massage Improves Sleep in Infants with Low Birth Weight." *Journal of the Australian Traditional Medicine Society* (March 2007): 33.

Valenza, Tor. "Shifting into the Light: Light Therapy Can Be a Simple Solution for Circadian Rhythm Disorders." *Sleep Review* (November 2007): 50(2).

Wolkove, Norman, O. Elkholy, M. Baltzan and M. Palayew. "Sleep and Aging: Sleep Disorders Commonly Found in Older People." *Canadian Medical Association Journal* (April 24, 2007): 1299(6).

ORGANIZATIONS

American Academy of Sleep Medicine, One Westbrook Corporate Center, Suite 920, Westchester, IL, 60154, (708) 492 0930, http://www.aasmnet.org.

National Sleep Foundation, 1522 K St. NW, Suite 500, Washington, DC, 20005, (202) 347 3471, http://www.sleepfoundation.org.

Belinda Rowland
Ken R. Wells

Slippery elm

Description

Slippery elm (*Ulmus rubra*), known variously as Indian elm, sweet elm, red elm, and moose elm, is a deciduous tree native to North America, particularly the eastern and central United States and eastern Canada. Slippery elm is smaller in stature than other members of the Ulmaceae, or elm, family. There are about twenty species of elm. The slippery elm can grow 50-60 ft (15-18 m) in height with a trunk measuring one to four feet in diameter. Its exterior bark is dark brown, rough, and fissured. The mucilaginous inner bark is white with a distinctive scent. The tree flowers in early spring before it comes into leaf. Flowers bloom in dense and inconspicuous clusters at the tips of the branches that spread out into an open crown. The stigmas of the blossoms are bright red. The downy leaf buds are rust colored with orange tips. The alternate leaves are dark-green, hairy, and abrasive on top, and a lighter green, hairy, and less abrasive on the underside. Leaves are 4-7 in (10-18 cm) long and oblong to ovate with irregularly toothed margins. The seeds are contained in flat, round, paper-thin fruits and grow in clusters.

The slippery elm is a rare or threatened species in some parts of the United States, particularly in the northeastern U.S. where Dutch elm disease has devastated the elm forests. Its usual habitat is along stream banks and in woods. Harvesting the medicinally valuable and nutritious inner rind involves stripping the tree of large segments of the outer bark. This often results in the death of the tree, further diminishing its presence in the wild forests. Planting additional trees to replace those harvested is vital to the preservation this beneficial native American tree. The National Center for the Preservation of Medicinal Herbs lists slippery elm as one of the "at-risk botanicals."

Native American herbalists included the mucilaginous inner bark in their medicine bags, and found numerous other uses for the pliable slippery elm bark, including using the fiber for making canoes and baskets. Native American herbalists shared their herbal knowledge with the early colonists who came to rely on the slippery elm as one of their most valued home remedies. Midwives used slippery elm as a birth aid because its lubricant properties eased labor. Early settlers called the inner bark of the tree "slippery-elm food." The boiled bark was an important survival food for both the Native Americans and the colonists during times of famine. George Washington and his troops are believed to have subsisted for several days

Slippery elm (Ulmus rubra). *(Organics image library / Alamy)*

on gruel made from slippery elm bark during the cold winter at Valley Forge, Pennsylvania. A poultice of the inner bark was a field dressing for gunshot wounds during the Revolutionary War.

General use

The dried inner bark of the slippery elm, known as the bast, is a calcium-rich, nutritive substance containing **bioflavonoids**, a high amount of mucilage, starch, a small quantity of tannins, and **vitamin E**. Slippery elm in various preparations acts as a demulcent, emollient, expectorant, diuretic, and is a soothing and nutritive tonic benefiting the adrenal glands, the respiratory system, and the gastrointestinal tract. The inner bark, taken as an infusion or syrup, has been used to treat **sore throat**, **laryngitis**, **bronchitis**, and stomach or duodenal ulcers. Slippery elm is a healing remedy once widely used to treat consumption, known now as **tuberculosis**, and typhoid fever. The mucilaginous substance in the inner bark is soothing to irritated tissues in the lungs, intestines, colon and urinary tract, and may be helpful in the treatment of **Crohn's disease**, an inflammation of the walls of the small intestines and colon. Slippery elm helps to draw out toxins from the body and assists the body in expelling mucus. It is beneficial externally in poultice form. When the inner bark is mixed with water, the soothing and emollient substance can be applied to the skin as a healing salve for numerous skin problems. It can be used for diaper rash , bed sores, **abscess**, burns, scalds, **infections**, and **boils**.

Slippery elm may be combined with other soothing herbs, such as **echinacea**, goldenseal, and **comfrey**, in a salve preparation to soothe and bring healing to inflamed and infected skin. A gruel or paste of slippery elm mixed with water is useful as a nutritive food for invalids who may be unable to keep down regular food. When an infusion of ginseng is used in place of the water, the tonic effect of this herbal food will be enhanced. Slippery elm was listed in the *U.S. Pharmacopoeia* and the *National Formulary* from 1820

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue.

Mucilaginous—Having a moist, soft, and sticky quality. The inner rind of slippery elm bark is an example of a mucilaginous plant product.

Poultice—A soft moist mass of cloth, often stuffed with herbs, applied warm as a treatment for wounds or injuries.

until 1960. The Food and Drug Administration has listed slippery elm as a safe and effective remedy for soothing throat and respiratory inflammations and as a digestive aid.

More recently, slippery elm has been studied as a possible antioxidant. **Antioxidants** are compounds that counteract **aging** and other destructive effects of oxidation in living tissue. One group of Korean researchers found that slippery elm extract inactivates peroxynitrite, an oxidizing compound that causes cell death. British researchers have also studied the antioxidant effects of slippery elm, which they think explains its effectiveness as a treatment for irritable bowel disease (IBD).

Preparations

Maude Grieve recommended in her 1931 book, *A Modern Herbal*, that only 10-year-old bark should be harvested. She listed numerous recipes for medicinal preparations using slippery elm bark in combination with other healing herbs for specific applications for many illnesses. The most common commercially available slippery elm products on the market today are in the form of throat lozenges and teas.

Powdered bark: Euell Gibbons, an American herbalist, suggested a way to prepare slippery elm for storage or use. Separate the inner rind from the outer bark and place the strips on an oven shelf at a very low temperature. Leave the door slightly ajar. When the inner rind is brittle, cut in to small pieces across the grain and put it through a food processor, one cupful at a time. Coarser material is useful in preparing a poultice. The finer powder is used for decoctions, syrup, or slippery elm "gruel."

Slippery elm "gruel": Slowly add fresh, cold water, a little at a time, to the finely powdered bark. Stir until the mixture reaches the consistency of a thick porridge. Sweeten with honey, and add cinnamon and **ginger** to taste. Refrigerate unused portions. Milk may also be used in place of water.

Infusion: Bring one pint of fresh, unchlorinated water just to the point of a boil. Pour over one ounce of the powdered slippery elm bark. Steep until the mixture is cool. Add lemon and honey to taste. Drink freely throughout the day.

Precautions

Use care when purchasing slippery elm products. Avoid those that are wildcrafted (harvested in the wild) to minimize depletion of this endangered American native tree.

Side effects

No known side effects have been reported.

Interactions

As of 2002, slippery elm has not been reported to interact with any prescription medications. it is best to take slippery elm several hours before or after other herbs or medications because of possible interference with speed of absorption.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. New York: Dell Books, 1995.

Medical Economics Company. *PDR for Herbal Medicines,* 1st ed. Montvale, NJ: Medical Economics Company, 1998.

Tierra, Lesley. *The Herbs of Life, Health & Healing Using Western & Chinese Techniques*. Santa Cruz, CA: The Crossing Press, 1997.

Tyler, Varro E., ed. *Prevention's 200 Herbal Remedies*. Emmaus, PA: Rodale Press, Inc., 1997.

PERIODICALS

Choi, H. R., J. Choi, Y. N. Han, et al. "Peroxynitrite Scav enging Activity of Herb Extracts." *Phytotherapy Research* 16 (June 2002): 364 367.

Langmead, L., C. Dawson, C. Hawkins, et al. "Antioxidant Effects of Herbal Therapies Used by Patients with Inflammatory Bowel Disease: An In Vitro Study." *Ali mentary Pharmacological Therapy* 16 (February 2002): 197 205.

ORGANIZATIONS

American Herbalists Guild. 1931 Gaddis Road, Canton, GA 30115. (770) 751 6021. www.americanherbalistsguild.com.

OTHER

Grieve, Mrs. M. "Elm, Slippery." *A Modern Herbal*. http://botanical.com/botanical/mgmh/e/elmsli09.html.

"Slippery Elm." http://www.mothernature.com/ency/Herb/Slippery_Elm.asp.

Clare Hanrahan
Rebecca J. Frey, PhD

Smoking

Definition

Smoking is the inhalation of the smoke of burning tobacco that is encased in cigarettes, pipes, and cigars. Casual smoking is the act of smoking only occasionally, usually in a social situation or to relieve **stress**. A smoking habit is a physical addiction to tobacco products. Many health experts now regard habitual smoking as a psychological addiction, too, and one with serious health consequences.

Description

The U.S. Food and Drug Administration (FDA) has asserted that cigarettes and smokeless tobacco should be considered nicotine delivery devices. Nicotine, the active ingredient in tobacco, is inhaled into the lungs, where most of it stays. The rest passes into the bloodstream, reaching the brain in about ten seconds and dispersing throughout the body in about 20 seconds.

Depending on the circumstances and the amount consumed, nicotine can act as either a stimulant or tranquilizer, which explains why some people report that smoking gives them energy and stimulates their mental activity, while others note that smoking relieves **anxiety** and relaxes them. The initial "kick" results in part from the drug's stimulation of the adrenal glands and resulting release of epinephrine into the blood. Epinephrine causes several physiological changes. It temporarily narrows the arteries, raises the blood pressure, raises the levels of fat in the blood, and increases the heart rate and flow of blood from the heart. Some researchers think epinephrine contributes to smokers' increased risk of high blood pressure.

Therapies for treating symptoms of smoking cessation

Treatment	Description	Symptom treated
Lobelia	Used as a nicotine substitute, it can bolster the nervous system, and can also be used as a physical relaxant	Withdrawal and craving
Wild oats or kava kava	Relaxant	Withdrawal
Licorice	Can be chewed to help withdrawal	Oral fixation
Hawthorn, gingko biloba, and bilberry	All contain bioflavonoids that can help repair free radical damage	Damage to lungs and cardiovascular system
Acupuncture	Stimulation of points in ears and feet helps cessation	Addiction and withdrawal
Vitamin C	Antioxidant that helps fight infection	Boosts immune system
Vitamin B_{12}	Helps protect body from disease	Smoking-induced cancers
Omega-3 fatty acids	Helps protect body from disease	Smoking-related illness, such as emphysema, and depression

(Illustration by Corey Light. Cengage Learning, Gale)

Nicotine, by itself, increases the risk of **heart disease**. However, when individuals smoke, they ingest much more than nicotine. Smoke from a cigarette, pipe, or cigar is made up of many additional toxic chemicals, including tar and carbon monoxide. Tar is a sticky substance that forms deposits in the lungs, causing **lung cancer** and respiratory distress. Carbon monoxide limits the amount of oxygen that the red blood cells can convey throughout the body. Also, it may damage the inner walls of the arteries, which allows fat to build up in them.

Besides tar, nicotine, and carbon monoxide, tobacco smoke contains about 4,000 different chemicals. More than 200 of these chemicals are known to be toxic. Nonsmokers who are exposed to tobacco smoke also take in these toxic chemicals. They inhale the smoke exhaled by the smoker as well as the more toxic *sidestream* smoke—the smoke from the end of the burning cigarette, cigar, or pipe.

Sidestream smoke is actually more toxic than exhaled smoke. When individuals smoke, they inhale and then breathe out, leaving harmful deposits inside the body. But because lungs partially cleanse the smoke, exhaled smoke contains fewer poisonous chemicals. Thus, exposure to tobacco smoke is dangerous even for a nonsmoker, and smoke from a burning cigarette is more dangerous to the nonsmoker than exhaled smoke is.

Causes and symptoms

No one starts smoking to become addicted to nicotine. As of 2008, it was not known how much nicotine may be consumed before the body becomes addicted. However, once smoking becomes a habit, the smoker faces a lifetime of health risks associated with an addiction that has been shown to be stronger than alcohol addiction and at least as strong as narcotics addiction.

About 70% of smokers in the United States would like to quit; in any given year, however, only about 3.6% of the country's 47 million smokers quit successfully. The American Heart Association (AHA) estimates there are 26 million adult males and 21 million adult females in the United States who smoke. Additionally, the American Lung Association (ALA) estimates 4.5 million Americans under the age of 18 smoke. Worldwide, there are 1.3 billion smokers, according to the World Health Organization (WHO). About 5.4 million people worldwide die each year from smoking-related causes, WHO estimates. In China, WHO reports there are 300 million smokers, of which about 1.1 million die each year from smoking-related diseases.

Researchers suspect that genetic factors contribute substantially to developing a smoking habit. Several twin studies have led to estimates of 46 to 84% heritability for smoking. It is thought that some genetic variations affect the speed of nicotine metabolism in the body and the activity level of nicotinic receptors in the brain.

Smoking risks

Smoking is recognized as the leading preventable cause of death, causing or contributing to the deaths of approximately 440,000 Americans each year. Anyone with a smoking habit has an increased chance of lung, cervical, and other types of **cancer**; respiratory diseases such as **emphysema**, **asthma**, and chronic **bronchitis**; and cardiovascular disease, such as **heart attack**, high blood pressure, **stroke**, and **atherosclerosis** (narrowing and hardening of the arteries). The risk of stroke is especially high in female smokers who take birth control pills.

Smoking can damage fertility, making it harder to conceive, and it can interfere with the growth of the fetus during **pregnancy**. It accounts for an estimated 14% of premature births and 10% of infant deaths. There is some evidence that smoking may cause **impotence** in some men.

Because smoking affects so many of the body's systems, smokers often have vitamin deficiencies and suffer oxidative damage caused by free radicals. Free radicals are molecules that steal electrons from other molecules, turning the other molecules into free radicals and destabilizing the molecules in the body's cells.

Smoking is recognized as one of several factors that might be related to a higher risk of hip **fractures** in older adults.

Studies reveal that increased smoking correlates with increased likliness for illnesses such as cancer, chronic bronchitis, and emphysema. But even smokers who indulge in the habit only occasionally are more prone to these diseases.

Some brands of cigarettes are advertised as "low tar," but no cigarette is truly safe. If smokers switch to low-tar cigarettes, they are likely to inhale longer and more deeply to get the chemicals their body craves. Smokers have to quit the habit entirely in order to improve their health and decrease the chance of disease.

Though some people believe chewing tobacco is safer, it also carries health risks. People who chew tobacco have an increased risk of heart disease and mouth and throat cancer. Pipe and cigar smokers have

increased health risks as well, even though these smokers generally do not inhale as deeply as cigarette smokers do. These groups have not been studied as extensively as cigarette smokers, but there is evidence that they may be at a slightly lower risk of cardiovascular problems but a higher risk of cancer and various types of circulatory conditions.

Research reveals that passive smokers, or those who unavoidably breathe in secondhand tobacco smoke, have an increased chance of many health problems such as lung cancer, ischemic heart disease, and asthma; and in children, sudden infant death syndrome. Several studies in Europe and the United States have found that people who were exposed to secondhand tobacco smoke (ETS) as children were both more likely to develop asthma as adults and to become smokers themselves. The American Academy of Allergy, Asthma, and Immunology (AAAAI) reports that many parents cut down on or give up smoking when they recognized the damage that smoking causes to their children's lungs. A study of secondhand smoke in the workplace conducted by the European Union found that it can affect workers as severely as smoke in the home can affect children. The study noted that workers exposed to secondhand smoke from their colleagues had significantly higher rates of asthma and upper respiratory **infections** than those who were employed in smoke-free workplaces.

Smokers' symptoms

Smokers are likely to exhibit a variety of symptoms that reveal the damage caused by smoking. A nagging morning **cough** may be one sign of a tobacco habit. Other symptoms include shortness of breath, **wheezing**, and frequent occurrences of respiratory illness, such as bronchitis. Smoking also increases **fatigue** and decreases the smoker's sense of smell and taste. Smokers are more likely to develop poor circulation, with cold hands and feet and premature wrinkles.

Sometimes the illnesses that result from smoking come on silently with little warning. For instance, coronary artery disease may exhibit few or no symptoms. At other times, there will be warning signs, such as bloody discharge from a woman's vagina, a sign of cancer of the cervix. Another warning sign is a hacking cough, worse than the usual smoker's cough, that brings up phlegm (mucus) or blood, a sign of lung cancer.

Withdrawal symptoms

Individuals who try to quit may expect one or more of these withdrawal symptoms: **nausea**, **constipation** or **diarrhea**, drowsiness, loss of concentration, **insomnia**, **headache**, nausea, and irritability.

Diagnosis

It is not easy to quit smoking. That is why it may be wise for a smoker to turn to his physician for help. For the greatest success in quitting and to receive help with withdrawal symptoms, smokers should talk over a treatment plan with their doctor or alternative practitioner. Smokers should have a general physical examination to gauge their general health and uncover any deficiencies. They should also have a thorough evaluation for some of the serious diseases that smoking can cause.

Treatment

There are a wide range of alternative treatments that can help a smoker quit the habit, including **hypnotherapy**, herbs, **acupuncture**, and **meditation**. For example, a controlled trial demonstrated that self-massage can help smokers crave less intensely, smoke fewer cigarettes, and in some cases completely give up cigarettes.

Hypnotherapy

Hypnotherapy helps the smoker achieve a trance-like state, during which the deepest levels of the mind are accessed. A session with a hypnotherapist may begin with a discussion of whether the smoker really wants to and truly has the motivation to stop smoking. The therapist will explain how hypnosis can reduce the stress-related symptoms that sometimes come with kicking the habit.

Often the therapist will discuss the dangers of smoking with the patient and begin to reframe the patient's thinking about smoking. Many smokers are convinced they cannot quit, and the therapist can help persuade them that they can change this behavior. These suggestions are then repeated while the smoker is under hypnosis. The therapist may also suggest while the smoker is under hypnosis that his feelings of worry, anxiety, and irritability will decrease.

In a review of 17 studies of the effectiveness of hypnotherapy, the percentage of people treated by hypnosis who still were not smoking after six months ranged from 4% to 8%. In programs that included several hours of treatment, intense interpersonal interaction, individualized suggestions, and follow-up treatment, success rates were above 50%.

Aromatherapy

One study demonstrated that inhaling the vapor from black pepper extract can reduce symptoms associated with smoking withdrawal. Other **essential oils** can be used for relieving the anxiety a smoker often experiences while quitting.

Herbs

A variety of herbs can help smokers reduce their cravings for nicotine, calm their irritability, and even reverse the oxidative cellular damage done by smoking. **Lobelia**, sometimes called Indian tobacco, has historically been used as a substitute for tobacco. It contains a substance called lobeline, which decreases the craving for nicotine by bolstering the nervous system and calming the smoker. In high doses, lobelia can cause **vomiting**, but the average dose—about 10 drops per day—should pose no problems.

Herbs that can help relax a smoker during withdrawal include wild oats and **kava kava**.

To reduce the oral fixation supplied by a nicotine habit, a smoker can chew on **licorice** root, the plant, not the candy. Licorice is good for the liver, which is a major player in the body's **detoxification** process. Licorice also acts as a tonic for the adrenal system, which helps reduce stress. And there is an added benefit: If a smoker tries to light up after chewing on licorice root, the cigarette tastes like burned cardboard.

Other botanicals that can help repair free-radical damage to the lungs and cardiovascular system are those high in flavonoids, such as **hawthorn**, gingko biloba, and **bilberry**, as well as **antioxidants** such as **vitamin A**, **vitamin C**, **zinc**, and **selenium**.

Acupuncture

This ancient Chinese method of healing is used commonly to help beat addictions, including smoking. The acupuncturist uses hair-thin needles to stimulate the body's *qi*, or healthy energy. Acupuncture is a sophisticated treatment system based on revitalizing qi, which is believed to flow through the body in defined pathways called meridians. When a patient suffers from an addiction such as smoking, qi is not flowing smoothly or gets stuck, the theory asserts.

Points in the ear and feet are stimulated to help the smoker overcome the addiction. Often the acupuncturist will recommend keeping the needles in for five to seven days to calm the smoker and keep the person balanced.

Vitamins

Smoking seriously depletes vitamin C in the body and leaves it more susceptible to infections. Vitamin C can prevent or reduce free-radical damage by acting as an antioxidant in the lungs. Smokers need a higher dosage of vitamin C than nonsmokers. Fish in the diet supplies **Omega-3 fatty acids**, which are associated with a reduced risk of chronic obstructive pulmonary disease (emphysema or chronic bronchitis) in smokers. Omega-3 fats also provide cardiovascular benefits as well as an anti-depressive effect. Vitamin therapy does not reduce craving, but it can help beat some of the damage created by smoking. **Vitamin B_{12}** and **folic acid** may help protect against smoking-induced cancer. However, three clinical studies in the early 2000s reported that **beta carotene** (vitamin A), by itself, increased the risk of lung cancer in smokers. Hence, people who smoke or who have recently quit smoking were advised to avoid taking beta carotene supplements. The three studies were the Finnish Alpha-Tocopherol, Beta-Carotene Cancer Prevention study; the American Beta-Carotene and Retinol Efficacy Study; and the French E3N study. A 2004 study conducted by Yale University School of Medicine researchers found that smokers who took beta carotene in combination with other antioxidants had a 16% lower risk of lung cancer than those who took no supplements. The antioxidants used in the Yale study included those in the carotenoid and flavonoid nutrient groups along with selenium and **vitamin E**.

Allopathic treatment

Research shows that most smokers who want to quit benefit from the support of other people. It helps to quit with a friend or to join a group such as those organized by the American Cancer Society. These groups provide support and teach behavior modification methods that can help smokers quit. The smokers' physician can often refer them to such groups.

Other alternatives to help with the withdrawal symptoms include nicotine replacement therapy (NRT) in the form of gum, patches, nasal sprays, and oral inhalers. These are available by prescription or over the counter. A physician can provide advice on how to use them. They slowly release a small amount of nicotine into the bloodstream, satisfying the smoker's physical craving. Over time, the amount of gum the smoker chews is decreased and the amount of time between applying the patches is increased. This strategy helps wean smokers from nicotine slowly, eventually beating their addiction to the drug. But there is one important caution: If the smoker lights up while

taking a nicotine replacement, a nicotine overdose may cause serious health problems.

The prescription drug bupropion hydrochloride (Zyban) has shown some success in helping smokers quit. This drug contains no nicotine and was originally developed as an antidepressant. It is not known exactly how bupropion works to suppress the desire for nicotine. Its most common side effect is insomnia, which can also result from nicotine withdrawal.

As of early 2008, the final stages of clinical studies were being conducted on a vaccine to prevent nicotine addiction. The vaccine NicVAX is designed to immunize smokers against the nicotine rush that fuels their addiction. Two similar vaccines were in midstage testing: TA-Nic, by Bermuda-based Celtic Pharmaceuticals, and NicQb, developed by Cytos Biotechnology AG who sold the rights to the experimental vaccine to Switzerland-based Novartis AG. As of March 2008, it was not known when any of the vaccines would be ready to submit to the FDA for approval.

Expected results

Research on smoking shows that most smokers desire to quit. But smoking is so addictive that fewer than 20% of the people who try ever successfully break the habit. Still, many people attempt to quit smoking over and over again, despite the difficulties, the cravings and withdrawal symptoms, such as irritability and restlessness.

For those who do quit, the rewards of better health are well worth the effort. The good news is that once a smoker quits the health effects are immediate and dramatic. After the first day, oxygen and carbon monoxide levels in the blood return to normal. At two days, nerve endings begin to grow back and the senses of taste and smell revive. Within two weeks to three months, circulation and breathing improve. After one year of not smoking, the risk of heart disease is reduced by 50%. After 15 years of abstinence, the risks of health problems from smoking virtually vanish. A smoker who quits for good often feels a lot better too, with less fatigue and fewer respiratory illnesses.

Prevention

Experts suggest the following for smokers who want to break their habit:

- Have a plan and set a definite quit date.
- Get rid of all the cigarettes and ashtrays at home or at work.
- Do not allow others to smoke in the house.
- Tell friends and neighbors that you are quitting. Doing so helps make quitting a matter of pride.
- Chew sugarless gum or eat sugar-free hard candy to redirect the oral fixation that comes with smoking. This will prevent weight gain, too.

KEY TERMS

Antioxidant—Any substance that reduces the damage caused by oxidation, such as the harm caused by free radicals.

Chronic bronchitis—A smoking-related respiratory illness in which the membranes that line the bronchi, or the lung's air passages, narrow over time. Symptoms include a morning cough that brings up phlegm, breathlessness, and wheezing.

Cytochrome—A substance that contains iron and acts as a hydrogen carrier for the eventual release of energy in aerobic respiration.

Emphysema—An incurable, smoking-related disease, in which the air sacs at the end of the lung's bronchi become weak and inefficient. People with emphysema often first notice shortness of breath, repeated wheezing and coughing that brings up phlegm (mucus).

Epinephrine—A nervous system hormone stimulated by the nicotine in tobacco. It increases heart rate and may raise smokers' blood pressure.

Flavonoid—A food chemical that helps to limit oxidative damage to the body's cells and protects against heart disease and cancer.

Free radical—An unstable molecule that causes oxidative damage by stealing electrons from surrounding molecules, thereby disrupting activity in the body's cells.

Nicotine—The addictive ingredient of tobacco; it acts on the nervous system and is stimulating and calming.

Nicotine replacement therapy (NRT)—A method of weaning a smoker from both nicotine and the oral fixation that accompanies a smoking habit by giving the smoker smaller and smaller doses of nicotine in the form of a patch or gum.

Passive smoking—A person's having to breathe in smoke from someone else's cigarette or pipe. Other terms for passive smoking are exposure to secondhand smoke or exposure to environmental tobacco smoke (ETS).

Sidestream smoke—The smoke that is emitted from the burning end of a cigarette or cigar or that comes from the end of a pipe. Along with exhaled smoke, it is a constituent of secondhand smoke.

- Eat as much as you want, but only low-calorie foods and drinks. Drink plenty of water. This may help with the feelings of tension and restlessness that quitting can bring. After eight weeks, individuals lose their craving for tobacco, so it is safe then to return to usual eating habits.
- Stay away from social situations that prompt one to smoke. Dine in the nonsmoking section of restaurants.
- Spend the money saved from not smoking on an occasional treat.

Resources

BOOKS

Botsford, David. *Hypnosis for Smoking Cessation: A NLP and Hypnotherapy Practitioner's Manual*. Bethel, CT: Crown House Publishing, 2007.

Denelsky, Garland Y. *Stop Smoking Now! A Cleveland Clinic Guide*. Cleveland, OH: Cleveland Clinic Press, 2007.

Miller, Barbara. *How to Quit Smoking Even If You Don't Want To*. Oxford, UK: Trafford, 2007.

Perkins, Kenneth A., et al. *Cognitive Behavioral Therapy for Smoking Cessation: A Practical Guidebook to the Most Effective Treatments*. London: Routledge, 2007.

Wauters, Ambika. *The Homeopathy Bible: The Definitive Guide to Remedies*. New York: Sterling, 2007.

PERIODICALS

Dembrow, Myra. "How to Help Patients Stop the Smoking Habit: Chewing Tobacco Should Not Be An Alterna tive, New Research Confirms. An Expert from the CDC Tells What to Recommend Or Prescribe Instead." *Clinical Advisor* (January 2008): 45(2).

Geddes, Linda. "Teenage Smokers Face Badly Wired Brains." *New Scientist* (January 5, 2008): 10.

Hindo, Brian. "An Antismoking 'Call to Action': A New World Health Organization Study Calls for Regulation, Education, and Taxation to Combat Rising Smoking Rates in the Developing World." *Business Week Online* (February 8, 2008): N/A.

Vastag, Brian. "Smoking Ups Risk for Type 2 Diabetes." *Science News* (January 12, 2008): 29.

Wendling, Patrice. "Lung Damage from Secondhand Smoke Exposed." *Family Practice News* (January 1, 2008): 36.

Wendling, Patrice. "Reasons for Quitting Found to Vary According to Smoker's Age." *Skin & Allergy News* (February 2008): 66.

ORGANIZATIONS

American Association of Acupuncture and Oriental Medi cine, PO Box 162340, Sacramento, CA, 95816, (866) 455 7999, http://www.aaaomonline.org.

American Cancer Society, 1599 Clifton Rd. NE, Atlanta, GA, 30329, (800) 227 2345, http://www.cancer.org.

American Lung Association, 61 Broadway, 6th Floor, New York, NY, 10006, (800) 548 8252, http:// www.lungusa.org.

Canadian Cancer Society, 10 Alcorn Ave., Suite 200, Tor onto, ON, M4V 3B1, Canada, (888) 939 3333, http:// www.cancer.ca.

Barbara Boughton
Ken R. Wells

SMT *see* **Spinal manipulative therapy**

Sneezing

Definition

Sneezing, also known as sternutation, is the response of the mucous membrane of the nose to an irritant, or to a foreign body that causes allergy in a hypersensitive person.

Description

A sneeze is an involuntary, explosive burst of air from the nose and mouth that removes offending material from the nasal passages.

Causes and symptoms

Sneezing can occur from a number of causes, or may itself be a symptom of an underlying condition, most likely an allergy or **common cold**. Sneezing may simply be triggered by a small foreign object or substance in the nose, including particles of pepper, smoke, irritating chemical fumes, or gases. It may also be a symptom of a common cold, upper respiratory tract infection, **hay fever**, or other **allergies** to pollen, dust, dust mites, mold, dander, grass, or other substances. Additional potential causes of sneezing include withdrawal from opiate drugs, inhaling corticosteroids, **whooping cough**, or anaphylaxis. Many people sneeze when they step outdoors into bright sunlight. Others report sneezing whenever they tweeze their eyebrows.

In a January, 2000 paper in the journal *Neurology*, Dr. Mark Hersch of Australia's New South Wales University reported that some **stroke** patients find themselves temporarily unable to sneeze, leading to speculation that a "sneeze center" may exist in the medulla of the brainstem.

Diagnosis

An attempt to determine the cause of sneezing is likely to include an examination of the upper respiratory tract. A doctor might perform skin tests to

uncover any allergies, or antibody tests. In some cases, x rays are also useful.

Treatment

Herbs and supplements

Echinacea, Yin Chiao Chieh Tu Pien (a Chinese over-the-counter formulation), **zinc**, and **vitamin C** are all potentially useful against sneezing and other cold symptoms. Stinging **nettle** (*Urtica dioica*) and **red clover** (*Trifolium pratense*) may be used for allergies.

Homeopathy and acupuncture

Either of these disciplines may offer individualized relief. A local practitioner should be consulted. Homeopathic remedies may include *Allium cepa*, *Sabadilla*, ***Nux vomica***, *Euphrasia*, ***Natrum muriaticum***, and others.

Acupressure

Acupressure points that may be effective against sneezing include Large Intestine 4 (between the thumb and the index finger), Governing Vessel 26 (on the upper lip), and Triple Warmer 5 (on the forearm).

Relaxation

Some hay **fever** sufferers report benefits from hot baths, massage, and other **relaxation** therapies.

Allopathic treatment

This most commonly consists of over-the-counter antihistamines. Although these drugs often result in drowsiness, newer versions including Allegra and Claritin do not cause that problem.

Other treatment options may include an allergen-free diet, or a series of allergy shots, injecting increased amounts of an allergen to desensitize the body.

Expected results

Most commonly, sneezing is a mild and temporary problem. In those cases in which medical intervention is needed, the results are usually favorable, although allergy patients sometimes develop **asthma**.

Prevention

With allergies, the best way to prevent sneezing is to avoid exposure to allergens, the substances that provoke allergic attacks. Depending on the substance, this can be done by timely replacement of furnace filters, removing animals from the house, or even getting out of town during particularly sensitive seasons.

Handwashing and careful hygiene are good ways to avoid common colds and other **infections**.

Resources

ORGANIZATIONS

National Institute of Allergies and Infectious Diseases. 9000 Rockville Pike, Building 31, Room 7A 03, Bethesda, MD, 20205. (800) 644 6627. http://www.niaid.nih.gov/.

David Helwig

Snoring

Definition

Snoring is a sound generated during sleep by vibration of loose tissue in the upper airway.

Description

Snoring is one symptom of a group of disorders known as sleep-disordered breathing. It occurs when the soft palate, uvula, tongue, tonsils, and/or muscles in the back of the throat rub against each other and generate a vibrating sound during sleep. Twenty percent of all adults are chronic snorers, and 45% of normal adults snore occasionally. As people grow older, their chance of snoring increases. Approximately half of all individuals over 60 snore regularly.

In some cases, snoring is a symptom of a more serious disorder called obstructive **sleep apnea** (OSA). OSA occurs when part of the airway is closed off (usually at the back of the throat) while a person is trying to inhale during sleep, and breathing stops for more than 10 seconds before resuming again. These breathless episodes can occur as many as several hundred times a night.

People with OSA almost always snore heavily, because the same narrowing of the airway that causes snoring can also cause OSA. Snoring may actually contribute to OSA as well, because the vibration of the throat tissues that occurs in snoring can cause the tissue to swell.

Snoring is associated with physical problems as well as social **stress**. People who do not suffer from OSA may be diagnosed with socially unacceptable snoring (SUS), which refers to snoring that is loud enough to prevent the sleeper's bed partner or roommate from sleeping. SUS is a factor in the breakup of some marriages and other long-term relationships. Moreover, a study published in 2002 indicates that people who snore are at

KEY TERMS

Ablation—The removal of abnormal tissue growths by surgery.

Cauterize—To seal tissue or blood vessels using a heat or electrical source.

Continuous positive airway pressure (CPAP)—A ventilation device that blows a gentle stream of air into the nose during sleep to keep the airway open.

Deviated septum—A hole or perforation in the septum, the wall that divides the two nasal cavities.

Endoscope—A slender optical instrument that allows a doctor to examine the inside of the throat or other hollow organ. Sleep endoscopy is a technique that allows the doctor to detect previously unsuspected obstructions in the patient's nose and throat.

Obstructive sleep apnea (OSA)—A potentially life-threatening condition characterized by episodes of breathing cessation during sleep alternating with snoring or disordered breathing. The low levels of oxygen in the blood of patients with OSA may eventually cause heart problems or stroke.

Polysomnography—A technique for diagnosing sleep disorders with the use of a machine that records the pulse, breathing rate and other variables while the patient sleeps.

Soft palate—The structure at the roof of the mouth that separates the mouth and the pharynx.

increased risk of developing type 2 diabetes. Snoring appears to be a risk factor that is independent of body weight or a family history of diabetes.

Causes and symptoms

There are several major causes of snoring, including:

- Excessively relaxed throat muscles. Alcohol, drugs, and sedatives can cause the throat muscles to become lax, and/or the tongue to pull back into the airway.
- Large uvula. The piece of tissue that hangs from the back of the throat is called the uvula. Individuals with a large or longer than average uvula can suffer from snoring when the uvula vibrates in the airway.
- Large tonsils and/or adenoids. The tonsils (tissue at the back of either side of the throat) can also vibrate if they are larger than normal, as can the adenoids.
- Excessive weight. Overweight people are more likely to snore. Their snoring is frequently caused by the extra throat and neck tissue they are carrying around.
- Nasal congestion. Colds and allergies can plug the nose, creating a vacuum in the throat that results in snoring as airflow increases.
- Cysts and tumors. Cysts and/or tumors of the throat can trigger snoring.
- Structural problems of the nose. A deviated septum or other nasal problems can also cause snoring.

Diagnosis

A patient interview, and possibly an interview with the patient's spouse or anyone else in the household who has witnessed the snoring, is usually enough for a diagnosis of snoring. A medical history that includes questions about alcohol or tranquilizer use; past ear, nose, and throat problems; and the pattern and degree of snoring will be completed, and a physical examination will be performed to determine the cause of the problem. This will typically include examination of the throat to look for narrowing, obstruction, or malformations.

In some cases the patient may be referred to a dentist or orthodontist for evaluation of the jaw structure and dentition.

In addition, the patient may be examined by sleep endoscopy. In this procedure, the patient is given a medication (midazolam) to induce sleep. His or her throat and nasal passages are then examined with a flexible laryngoscope. In many cases, sleep endoscopy reveals obstructions that are not apparent during a standard physical examination of the throat. Many patients are found to have obstructions at more than one level in their breathing passages.

If the snoring is suspected to be a symptom of a more serious disorder such as obstructive sleep apnea, the patient will require further testing. This testing is called a polysomnography study, and is conducted during an overnight stay in a specialized sleep laboratory. The polysomnography study includes measurements of heart rate, airflow at the mouth and nose, respiratory effort, sleep stage (light sleep, deep sleep, dream sleep, etc.), and oxygen level in the blood.

Treatment

There are a number of remedies for snoring, but few are proven clinically effective. Popular treatments include:

- Mechanical devices. Many splints, braces, and other devices are available which reposition the nose, jaw, and/or mouth in order to clear the airways. Other devices are designed to wake an individual when

snoring occurs. Patients should consult a dentist or orthodontist about these devices, as most require custom fitting. In addition, persons with certain types of gum disease or dental problems should not be fitted with oral appliances to stop snoring.

- Nasal strips. Nasal strips that attach like an adhesive bandage to the bridge of the nose are available at most drugstores, and can help stop snoring in some individuals by opening the nasal passages.
- Continuous positive airway pressure (CPAP). Some chronic snorers find relief by sleeping with a nasal mask that provides air pressure to the throat.
- Decongestants. Snoring caused by nasal congestion may be successfully treated with decongestants. Some effective herbal remedies which clear the nasal passages include golden rod (*Solidago virgauria*) and golden seal (*Hydrastis canadensis*). Steam inhalation of essential oils of eucalyptus blue gum (*Eucalyptus globulus*) or peppermint (*Mentha x piperata*) can also relieve congestion.
- Weight loss. Snoring thought to be caused by excessive weight may be curtailed by a sensible weight loss and exercise program.
- Sleep position. Snoring usually worsens when an individual sleeps on his or her back, so sleeping on one's side may alleviate the problem. Those who have difficulty staying in a side sleeping position may find sleeping with pillows behind them helps them maintain the position longer. Other devices include a new vest designed to prevent the sleeper from lying on his or her back.
- Bed adjustments. For some people, raising the head of the bed solves their snoring problem. A slight incline can prevent the tongue from retracting into the back of the throat. Bricks, wooden blocks, or specially designed wedges can be used to elevate the head of the bed approximately 4–6 in.

Alternative treatments that have been reported to be effective for patients whose snoring is caused by colds or **allergies** include **acupuncture**, **homeopathy**, and **aromatherapy** treatments. Aromatherapy treatments for snoring typically make use of marjoram oil, which is thought to be particularly effective in clearing the nasal passages.

Allopathic treatment

Several surgical procedures are available for treating chronic snoring. These include:

- Uvulopalathopharyngoplasty (UPPP), a surgical procedure which involves removing excess throat tissues (e.g., tonsils, parts of the soft palate) to expand the airway. The success rate of UPPP is about 53% after five years. The success of the surgery is related to the patient's body mass before the operation.
- Laser-assisted uvulopalatoplasty (LAUP) uses a surgical laser to remove part of the uvula and palate. Its chief drawback is a period of discomfort that lasts for about a week following surgery.
- Palatal stiffening is a minimally invasive surgical technique in which a laser or a cauterizer is used to produce scar tissue in the soft palate in order to stop the vibrations that produce snoring.
- Radiofrequency ablation is another technique that uses scarring to shrink the uvula and/or soft palate. A needle electrode is used to shrink and scar the mouth and throat tissues. Like other surgical treatments for snoring, radiofrequency ablation has a relapse rate over the long term. One of its advantages, however, is that it is less painful than other surgical treatments.

Prevention

Adults with a history of snoring may be able to prevent snoring episodes with the following measures:

- Avoid alcohol and sedatives before bedtime.
- Remove allergens from the bedroom.
- Use a decongestant before bed.
- Sleep on the side of the body, not the back.

Resources

BOOKS

"Disorders of the Oral Region." Section 9, Chapter 105 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laborato ries, 1999.

Pascualy, Ralph A. and Sally Warren Soest. *Snoring and Sleep Apnea: Personal and Family Guide to Diagnosis and Treatment*. New York: Demos Medical Publishing, 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I, Chapter 5, "Acupuncture," and Chapter 8, "Homeopathy." New York: Simon & Schuster, 2002.

Price, Shirley. *Practical Aromatherapy*, 3rd ed. London, UK: Thorsons, 1994.

"Sleep Disorders." Section 14, Chapter 173 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Al Delaimy, W. K., J. E. Manson, W. C. Willett, et al. "Snoring as a Risk Factor for Type II Diabetes Melli tus: A Prospective Study." *American Journal of Epi demiology* 155 (March 1, 2002): 394 395.

Ayappa, I., and D. M. Rapoport. "The Upper Airway in Sleep: Physiology of the Pharynx." *Sleep Medicine Reviews* 7 (February 2003): 3 7.

Blumen, M. B., S. Dahan, I. Wagner, et al. "Radiofrequency Versus LAUP for the Treatment of Snoring." *Otolar yngology and Head and Neck Surgery* 126 (January 2002): 67 73.

Ellis, S. G., N. W. Craik, R. F. Deans, and C. D. Hanning. "Dental Appliances for Snoring and Obstructive Sleep Apnoea: Construction Aspects for General Dental Practitioners." *Dental Update* 30 (January February 2003): 16 22, 24 26.

Hassid, S., A. H. Afrapoli, C. Decaesteker, and G. Chou fani. "UPPP for Snoring: Long Term Results and Patient Satisfaction." *Acta Otorhinolaryngologica Belgica* 56 (2002): 157 162.

Hessel, N. S., and N. de Vries. "Diagnostic Work Up of Socially Unacceptable Snoring. II. Sleep Endoscopy." *European Archives of Otorhinolaryngology* 259 (March 2002): 158 161.

Maurer, J. T., B. A. Stuck, G. Hein, et al. "Treatment of Obstructive Sleep Apnea with a New Vest Prevent ing the Supine Position." [in German] *Deutsche medizinische Wochenschrift* 128 (January 17, 2003): 71 75.

Nakano, H., T. Ikeda, M. Hayashi, et al. "Effects of Body Position on Snoring in Apneic and Nonapneic Snor ers." *Sleep* 26 (March 15, 2003): 169 172.

Remacle, M., E. Jouzdani, G. Lawson, and J. Jamart. "Laser Assisted Surgery Addressing Snoring Long Term Outcome Comparing CO_2 Laser vs. CO_2 Laser Combined with Diode Laser." *Acta Otorhinolaryngo logica Belgica* 56 (2002): 177 182.

Stevenson, J. E. "Diagnosis of Sleep Apnea." *Wisconsin Medical Journal* 102 (2003): 25 27, 46.

Trotter, M. I., A. R. D'Souza, and D. W. Morgan. "Medium Term Outcome of Palatal Surgery for Snor ing Using the Somnus Unit." *Journal of Laryngology and Otology* 116 (February 2002): 116 118.

ORGANIZATIONS

American Academy of Otolaryngology, Head and Neck Surgery, Inc. One Prince Street, Alexandria, VA 22314 3357. (703) 836 4444. http://www.entnet.org.

American Academy of Sleep Medicine (AASM). One West brook Corporate Center, Suite 920, Westchester, IL 60154. (708) 492 0930. http://www.aasmnet.org.

American Dental Association. 211 East Chicago Avenue, Chicago, IL 60611. (312) 440 2500. http://www.ada. org.

American Sleep Apnea Association. *Wake Up Call: The Wellness Letter for Snoring and Apnea*. 1424 K Street NW, Suite 302, Washington, DC 20005. (202) 293 3650. http://www.sleepapnea.org.

National Sleep Foundation. 1522 K Street, NW, Suite 500, Washington, DC 20005. http://www.sleepfoundation. org.

OTHER

American Sleep Apnea Association (ASAA). *Considering Surgery for Snoring?* http://www.sleepapnea.org/ snoring.html.

National Heart, Lung, and Blood Institute (NHLBI). *Facts About Sleep Apnea*. NIH Publication No. 95 3798. http://www.nhlbi.nih.gov/health/public/sleep/ sleepapn.htm.

Paula Ford-Martin
Rebecca J. Frey, PhD

Sodium

Description

Sodium is a chemical element with atomic number 11 and atomic mass 22.98977. Its chemical symbol is Na, which comes from its Latin name, natrium. The best known compound of sodium is sodium chloride, also known as table salt. In the fields of medicine, health, and **nutrition**, the term sodium often refers to

Sea salt in pestle and mortar. *(© foodfolio / Alamy)*

Recommended dietary allowance of sodium

Age	mg/day
Children 0-6 mos.	120
Children 7-12 mos.	370
Children 1-3 yrs.	1,000
Children 4-8 yrs.	1,200
Children 9-13 yrs.	1,500
Adolescents 14-18 yrs.	1,500
Adults 19-50 yrs.	1,500
Adults 51-70 yrs.	1,300
Adults ≥ 71 yrs.	1,200
Pregnant women	1,500
Breastfeeding women	1.500

Foods that contain sodium

	mg
Table salt, 1 tsp.	2,300
Dill pickle, 1 large	1,731
Chicken noodle soup, canned, 1 cup	850-1,100
Ham, 3 oz.	1,000
Sauerkraut, 1/2 cup	780
Pretzels, 1 oz.	500
Turkey breast, deli, 1 oz.	335
Soy sauce, 1 tsp.	304
Potato chips, 1 oz.	165-185

mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

sodium ions (Na^+), of which sodium chloride and many sodium compounds are made. Sodium is one of the minerals that the body needs in relatively large quantities. Humankind's taste for sodium reaches far back into the distant past, probably to the dawn of the human species. Much like in modern times, sodium was popular in antiquity as a food preservative and an ingredient in snacks. In some ancient societies, sodium chloride was even used as a form of currency.

In the 21st century, however, most Americans and other Westerners consume far too much sodium, and it is easy to see why. One obvious culprit is table salt, which has high sodium content. The mineral is also found in many favorite U.S. foods (or the chemicals used to preserve those foods). Sodium can be found in potato chips and a variety of other snacks, processed foods, meat, fish, butter and margarine, soft drinks, dairy products, canned vegetables, and bread, just to name a few sources. A single slice of pizza can supply the body with all the sodium it needs for one day (about 500 mg), while a teaspoon of table salt contains four times that amount.

A certain intake of sodium is essential to life. The mineral is a vital component of all bodily fluids, including blood and sweat. Often working in combination with other minerals such as **potassium**, sodium helps to manage the distribution and pH balance of these fluids inside the body and plays an important role in blood pressure regulation. Sodium is referred to as an electrolyte because it has a weak electrical charge when dissolved in bodily fluids. Due to this charge, sufficient amounts of the mineral are necessary for the normal functioning of nerve transmissions and muscle contractions. Sodium also helps the body to retain water and prevent dehydration, and it may have some activity as an antibacterial agent.

The important benefits associated with sodium become apparent in cases of sodium deficiency, which is relatively uncommon. Sodium deficiency is most likely to occur in cases of starvation, **diarrhea**, intense sweating, or other conditions that cause rapid loss of water and the sodium ions it contains from the body. People who suffer from low sodium levels may experience a wide range of bothersome or serious health problems, including digestive disorders, muscle twitching or weakness, **memory loss**, **fatigue**, and lack of concentration or appetite. Arthritis may also develop. These problems usually occur when fluids that belong in the bloodstream take a wrong turn and enter cells.

General use

Most Americans consume from 3,000 mg to 20,000 mg of sodium a day. These amounts are much more than the body needs to function at an optimal level. Many nutrition experts have been concerned about the rise in sodium intake in the general population since about the 1970s. Much of this increase is due to the popularity of fast foods and salty snacks, including the sale of high-sodium snack foods in school cafeterias and vending machines. The increased popularity of processed foods, almost all of which contain significant amounts of sodium, is another factor in this increase.

While sodium deficiencies are rare, supplements may be required in people with certain medical conditions such as Addison's disease, adrenal gland tumors, kidney disease, or low blood pressure. More sodium may also be needed by those who experience severe dehydration or by people who take diuretic drugs.

Although taking extra amounts of sodium is not known to improve health or cure disease, the mineral may have some therapeutic value when used externally. A number of medical studies suggest that

soaking in water from the Dead Sea may be beneficial in the treatment of various diseases such as **rheumatoid arthritis**, psoriatic arthritis, and **osteoarthritis** of the knees. Located in the Dead Sea Rift, directly south of the Sea of Galilee and between the West Bank and Isreal to the west and Jordan to the east, the Dead Sea is many times saltier than ocean water and rich in other minerals such as **magnesium**, potassium, and **calcium**. The use of mineral waters, such as those that make up the Dead Sea, to cure disease has a very long history. In many parts of the world bathing in saltwater at spas or baths with mineral waters has been a tradition for centuries.

Sodium is used by some people as a germ killer. Some people use solutions containing sodium compounds as an antibacterial mouthwash to combat microorganisms that cause **sore throat** or inflamed gums. Plain saltwater soaks have also been recommended as a remedy for sweaty feet. Salt is believed to have a drying effect by soaking up excess perspiration. In ages past, saltwater soaks were used to relieve sore or aching muscles.

Preparations

In the late 1990s the National Academy of Sciences established the recommended daily allowance (RDA) of sodium as between 1,100 and 3,300 milligrams.

To prepare a sodium mouthwash, a person mixes 1 tsp of table salt with a glass of warm water. The solution should be swished around in the mouth for about a minute, and then spit out. The solution should not be swallowed, as it contains about 2,000 mg of sodium.

Sodium is available in tablet form, but supplements should be taken only under the supervision of a doctor. As mentioned above, most people already get far too much sodium in their **diets**.

A trip to the Dead Sea is not necessary in order to enjoy its potential benefits. Dead Sea bath salts can be purchased.

Precautions

People who wish to take sodium supplements or increase their sodium intake should talk to a doctor first if they have high blood pressure (or a family history of the disease), congestive heart failure (or other forms of heart or blood vessel disease), hepatic **cirrhosis**, **edema**, **epilepsy**, kidney disease, or bleeding problems.

Studies investigating the role of sodium in the development of high blood pressure have produced mixed results. However, sodium is widely believed to contribute to the development of the disease in susceptible people. For this reason, most doctors and major health organizations around the world recommend a diet low in sodium. Eating a low-sodium diet may actually help to lower blood pressure, especially when that diet includes sufficient amounts of potassium.

A 20-year-long follow-up study to the National Health and Nutrition Examination Survey that was conducted between 1971 and 1975 reported in 2002 that high levels of sodium in the diet are an independent risk factor for congestive heart failure (CHF) in overweight adults. The authors of the study suggested that lowering the rate of sodium intake may play an important role in lowering the risk of CHF in overweight populations as well as individuals.

Another good reason for limiting one's intake of sodium is the link between high levels of dietary sodium and an increased risk of stomach **cancer**. This risk is increased if a person's diet is also low in fresh fruits and vegetables.

Apart from an increase in blood pressure, high levels of sodium may cause confusion, **anxiety**, edema, **nausea**, **vomiting**, restlessness, weakness, and loss of potassium and calcium.

People who are concerned about consuming too much sodium should try to keep their sodium intake below 2,300 mg per day, the level recommended by the U.S. Department of Health and Human Services and the U.S. Department of Agriculture in their 2005 *Dietary Guidelines for Americans*. Ways to reduce sodium intake include the following:

- Reading the Nutrition Facts labels on processed food items. The amount of sodium in a specific processed food, such as cake mix or canned soup, can vary widely from brand to brand.
- Retraining the taste buds. A taste for salt is acquired. A gradual decrease in the use of salt to season foods gives the taste buds time to adjust.
- Using other spices and herbs to season food.
- Cooking from scratch rather than using processed foods.
- Substituting fresh fruits and vegetables for salty snack foods.
- Tasting food at the table before adding salt. Many people salt their food automatically before eating it, which often adds unnecessary sodium to the daily intake.
- Choosing foods that are labeled low sodium or sodium free.
- Watching the sodium content of over-the-counter medications, and asking a pharmacist for information about the sodium content of prescription drugs.

KEY TERMS

Calcium—A mineral necessary for strong bones and the proper functioning of organs and muscles.

Diuretic—An agent that increases the production of urine.

Edema—Abnormal swelling of tissue due to fluid buildup. Edema, which typically occurs in the legs, liver, and lungs, is often a complication of heart or kidney problems.

Electrolytes—Substances in the blood, such as sodium and potassium, that help to regulate fluid balance in the body.

Restricting sodium intake is not usually recommended for women who are pregnant or breast-feeding.

Side effects

Dietary sodium is not associated with any bothersome or significant short-term side effects. In some people, however, salt tablets may cause upset stomach or affect kidney function.

Interactions

Excess intake of sodium may promote the loss of calcium and potassium from the body. In addition, sodium in the diet should be restricted for such medications as antihypertensives (drugs to control blood pressure) and anticoagulants (blood thinners) to be fully effective.

Resources

BOOKS

Haas, Elson M., and Buck Levin. *Staying Healthy with Nutrition, 21st Century Edition: The Complete Guide to Diet & Nutritional Medicine*. Berkeley, CA: Celestial Arts, 2006.

James, Shelly Vaughan, and Heidi McIndoo. *The Complete Idiot's Guide to Low Sodium Meals*. New York: Alpha Publishing Group, 2006.

Mostyn, Bobbie. *Pocket Guide to Low Sodium Foods,* 2nd ed. Olympia, WA: InData Publishing Group, 2006.

PERIODICALS

Derbyshire, E., and G. J. Davies. "Sodium: Can Infants Consume Too Much?" *Nutrition & Food Science* (June 2007): 400 405.

Ferrara, L. A., et al. "Fast Food Versus Slow Food and Hypertension Control." *Current Hypertension Reviews* (February 2008): 30 35.

O'Toole, Terrence P., et al. "Nutrition Services and Foods and Beverages Available at School: Results from the School Health Policies and Programs Study 2006." *Journal of School Health* (October 2007): 500 521.

Savage, L. C., and R. K. Johnson. "Labelling in Restau rants: Will It Make a Difference?" *Nutrition Bulletin* (December 2006): 332 338.

ORGANIZATIONS

American Heart Association, 7272 Greenville Ave., Dallas, TX, 75231, http://www.americanheart.org/.

Greg Annussek
Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Somatics

Definition

Somatics, from *soma*, a Greek word for living body, is a **movement therapy** that employs mind-body training to manage muscular **pain** and spasticity, improve balance and posture, and increase ease of motion. It presents an alternative to treatment by **osteopathy**, physical therapy, chiropractics, and/or **massage therapy**.

Origins

Somatic therapy was developed by Thomas Hanna in 1976. Hanna was a follower of Moshe **Feldenkrais**, a twentieth-century physicist whose self-named method is based on the philosophy that all movement, thought, speech, and feelings are a reflection of one's self-image. The Feldenkrais method is practiced in group sessions called Awareness Through Movement and in individual sessions called Functional Integration. Hanna, a former philosophy professor by training, became a Functional Integrationist. He also subscribed to the teachings of Hans Selye, a medical researcher who taught that physiological diseases have their origins in psychological causes, especially the presence of **stress**.

In creating what he called Hanna Somatic Education, Hanna hypothesized that the body's sensory-motor system responds to the stresses and traumas of daily life with specific muscular reflexes that become involuntary and habitual contractions. These contractions cause stiffness and soreness. Eventually, the individual suffers from sensory-motor amnesia (SMA), a loss of how muscles feel and how to control them.

KEY TERMS

Adhesive capsulitis—Adhesions and inflammation in the shoulder capsule that restrict movement.

Kinesiology—The study of the principles of mechanics and anatomy in relation to human movement.

Sacro-iliac—The joint at which the upper hip bone joins the backbone to the pelvis.

Sciatica—Pain along one of the two sciatic nerves that run from the pelvic area down the backs of the thighs to the feet.

Scoliosis—A lateral curvature of the spine.

Spinal stenosis—Pain and tension in the spine due to abnormal constriction.

Thoracic outlet syndrome—Spasticity of the muscles of the upper back, neck, and/or shoulders.

TMJ syndrome—Tightness and pain in the jaw and neck muscles.

Benefits

Practitioners believe that by re-educating the muscular system, somatic therapy can cure or relieve a variety of complaints including but not limited to adhesive capsulitis, arthritis, back pain, balance problems, dislocation of joints, displaced patella, **dizziness**, foot pain, frequent urination, hamstring pulls, headaches, joint pain, **obesity**, sacroiliac pain, **sciatica**, **scoliosis**, shoulder tightness and pain, spinal stenosis, **temporomandibular joint syndrome** (TMJ), thoracic outlet syndrome, uneven leg length, and whiplash. Somatic education is also taught to combat the decreased ease of motion associated with **aging**.

Description

Hanna named three reflexes that lead to SMA. The red light reflex (startle response) is a withdrawal response in the abdominal muscles in which the body curves in on itself in response to distress. The green light reflex (Landau arousal response) involves the back muscles and the action response in which the body is constantly thrusting forward in response to daily responsibilities. The trauma reflex occurs when the body suffers an injury.

Hanna theorized that because these reflexes are learned, they can be unlearned. To that end, he developed a series of exercises. During somatic education sessions, the individual is taught to release the chronic tension-holding patterns.

Somatic exercises are slow-motion movements performed in prone or sitting positions. During the various movements, the individual is instructed to be aware of the way his or her muscles feel at each step. Deep breathing techniques are also used at various stages.

The goal of the therapy is to teach the individual the ability to control muscle problems. Relief should occur within two to eight sessions. The effects are cumulative, increasing as flexibility and ease of movement improve. As the body gives up restricted physical patterns, it also tends to release rigid psychological habits.

After the education sessions, the individual is encouraged to continue the exercises on his or her own. Sessions can range from as little as 15 minutes per day to as long as three to four hours.

Sessions can cost between $50 and $175 each, depending on the practitioner's level of experience. Insurance coverage varies with the carrier but is more likely if a physician prescribes somatic therapy.

Gradual movement and awareness of the body are emphasized throughout Hanna Somatic Education.

- Always move slowly, gently, and without forcing the movement.
- Always focus your attention on the internal sensations of the movement.

Preparations

The exercises should be performed in a comfortable and quiet setting. Clothing should be loose and allow for easy movement. A floor mat or other comfortable surface is recommended.

Precautions

Before embarking on any type of therapy to relieve pain, a physician should be consulted. Severe pain in any part of the body could indicate serious disease or injury.

Side effects

There are no known adverse side effects to somatic therapy.

Research and general acceptance

The bulk of the research into the effects of somatic therapy has been conducted within the discipline itself. Not surprisingly, these studies show positive results across the board. Somatic education is a slow-growing field; there are currently less than 100 certified practitioners worldwide.

However, the scientific medical profession has conducted studies on the effects of various types of **exercise** on chronic musculoskeletal pain. Although

results are inconclusive, findings show that pain is minimized somewhat during the period in which the exercise is undertaken. In addition, preliminary research points to a possible link between muscles, memory, and emotion.

Training and certification

The Novato Institute for Somatic Research and Training, which Hanna founded in 1976 conducts a three-year training program that covers studies in anatomy, functional and structural kinesiology, physical evaluation, neurophysiology, and practical methods. Applicants must pass three annual exams in order to be certified. Admittance to the program is usually limited to individuals with training in related fields, particularly physicians, chiropractors, physical therapists, and certified massage therapists.

Resources

BOOKS

Credit, Larry P., Sharon G. Hartunian, and Margaret J. Nowak. *The Feldenkrais Method in Your Guide to Complementary Medicine*. Garden City, New Jersey: Avery Publishing Group, 1998.

Hanna, Thomas. *Somatics*. Reading, Massachusetts: Addison Wesley, 1988.

ORGANIZATIONS

Novato Institute for Research & Training. 1516 W. Grant Avenue, Suite 212, Novato, California 94945. 415 897 0336. http://www.somatics.com/.

Mary McNulty

Sore throat

Definition

Sore throat, also called pharyngitis, is a painful inflammation of the back of the throat. It is a symptom of many conditions, but most often is associated with colds or **influenza**. Sore throat may be caused by either viral or bacterial **infections** or environmental conditions. Most sore throats heal without complications, but they should not be ignored because some develop into serious illnesses.

Description

Almost everyone gets a sore throat at one time or another, although children in child care or grade school have them more often than adolescents and adults. Sore throats are most common during the winter months when upper respiratory infections (colds) and influenza are more frequent.

Sore throats can be either acute or chronic. Acute sore throats are the more common. They may appear suddenly and last approximately three to about seven days. A chronic sore throat that is still present after three weeks may be a symptom of an unresolved underlying condition or disease, such as a **sinus infection** or **mononucleosis**.

KEY TERMS

Antigen—A foreign protein to which the body reacts by making antibodies

Conjunctivitis—An inflammation of the membrane surrounding the eye. Conjunctivitis is sometimes called "pinkeye."

Lymphocyte—A type of white blood cell. Lymphocytes play an important role in fighting disease.

Pharynx—The part of the throat that lies between the mouth and the larynx or voice box.

Toxin—A poison. In the case of scarlet fever, the toxin is secreted as a byproduct of the growth of the streptococcus bacteria and causes a rash.

Causes and symptoms

Sore throats have many different causes, and may or may not be accompanied by cold symptoms, **fever**, or swollen lymph glands. Proper treatment depends on identifying the cause.

Viral sore throat

Viruses cause 90–95% of all sore throats. Cold and flu viruses are the main culprits. These viruses cause an inflammation in the throat and occasionally the tonsils (**tonsillitis**). Cold symptoms usually accompany a viral sore throat. These can include a runny nose, **cough**, congestion, hoarseness, **conjunctivitis**, fever, and swollen lymph nodes in the neck. The level of throat **pain** varies from uncomfortable to excruciating, when it is painful for the patient to eat, breathe, swallow, or speak.

Another group of viruses that cause sore throat are the adenoviruses. These may also cause infections of the lungs and ears. In addition to a sore throat, symptoms that accompany an adenovirus infection may include cough, runny nose, white bumps on the tonsils and throat, mild **diarrhea**, **vomiting**, and a rash. The sore throat lasts about one week.

A third type of virus that can cause severe sore throat is the coxsackie virus. It can cause a disease called herpangina. Although anyone can get herpangina, it is most common in children up to age 10 and is more prevalent in the summer or early autumn. Herpangina is sometimes called summer sore throat.

Three to six days after being exposed to the virus, an infected person develops a sudden sore throat that is usually accompanied by a fever usually between 102–104°F (38.9–40°C). Tiny grayish-white **blisters** form on the throat and in the mouth. These fester and become small ulcers. Throat pain is often severe, interfering with swallowing. Children may easily become dehydrated if they are reluctant to eat or drink because of the pain. In addition, people with herpangina may vomit, have abdominal pain, and generally feel ill and miserable.

Another common cause of a viral sore throat is mononucleosis. Mononucleosis occurs when the Epstein-Barr virus infects one specific type of lymphocyte. The infection may spread to the lymphatic system, respiratory system, liver, spleen, and throat. Symptoms appear 30–50 days after exposure.

Mononucleosis, sometimes called the kissing disease, is extremely common in young adults. It is estimated that by the age of 35–40, 80–95% of Americans will have had mononucleosis. Often, symptoms are mild, especially in young children, and are diagnosed as a cold. Since symptoms are more severe in adolescents and adults, more cases are diagnosed as mononucleosis in this age group. One of the main symptoms of mononucleosis is a severe sore throat.

Although a runny nose and cough are much more likely to accompany a sore throat caused by a virus than one caused by a bacteria, there is no absolute way to tell what is causing the sore throat without a laboratory test. Viral sore throats are contagious and are passed directly from person to person by coughing and **sneezing**.

Bacterial sore throat

From 5–10% of sore throats are caused by bacteria. The most common bacterial sore throat results from an infection by group A *Streptococcus*. This type of infection is commonly called **strep throat**, or GABHS pharyngitis. The acronym stands for "Group A beta-hemolytic streptococci." Anyone can get strep throat, but it is most common in school age children. Since there is a low risk of strep throat invading and damaging heart valves (**rheumatic fever**), it is important to see a doctor who may prescribe antibiotics to eliminate the risk.

Pharyngeal **gonorrhea**, a sexually transmitted bacterial disease, causes a severe sore throat. Gonorrhea in the throat is transmitted by having oral sex with an infected person.

Noninfectious sore throat

Not all sore throats are caused by infection. Postnasal drip from **allergies** and airborne irritants can cause sore throat. It can be caused by **hay fever** and other allergies that irritate the sinuses. Environmental and other conditions, such as heavy **smoking** or breathing secondhand smoke, breathing polluted air or chemical fumes, or swallowing substances that burn or scratch the throat can also cause pharyngitis. Dry air, like that in airplanes or from forced hot air furnaces, can make the throat sore. People who breathe through their mouths at night because of nasal congestion often get sore throats that improve as the day progresses. Sore throat caused by environmental conditions is not contagious.

Diagnosis

It is easy for people to tell if they have a sore throat, but difficult to diagnose its cause without seeing a doctor and laboratory tests. Most sore throats are minor and heal without any complications. A small number of bacterial sore throats develop into serious diseases. It is advisable to see a doctor if a sore throat lasts more than a few days or is accompanied by fever, **nausea**, or abdominal pain.

Diagnosis of a sore throat by a doctor begins with a physical examination of the throat and chest. The doctor will also look for signs of other illness, such as a sinus infection or **bronchitis**. Since both bacterial and viral sore throats are contagious and pass easily from person to person, the doctor will seek information about whether the patient has been around other people with flu, sore throat, colds, or strep throat. If it appears that the patient may have strep throat, the doctor will do laboratory tests.

One test that doctors are using more often in diagnosing a sore throat is the rapid antigen test. While a throat culture may require 2 days for the laboratory to identify the causative organism, a rapid antigen test gives results in a few hours.

If mononucleosis is suspected, the doctor may do a mono spot test to look for antibodies indicating the presence of the Epstein-Barr virus. The test in inexpensive, takes only a few minutes, and can be done in a physician's office. An inexpensive blood test can also determine the presence of antibodies to the mononucleosis virus.

Treatment

Effective treatment varies depending on the cause of the sore throat. As frustrating as it may be to the patient, viral sore throat is best left to run its course without drug treatment. Antibiotics have no effect on a viral sore throat. They do not shorten the length of the illness, nor do they lessen the symptoms.

Treatment uses anti-viral plants and herbs and vitamins to boost immunity and speed recovery.

- Aromatherapists recommend inhaling the fragrances of essential oils of lavender (Lavandula officinalis), thyme (*Thymus vulgaris*), eucalyptus (*Eycalyptus globulus*), sage (*Salvia officinalis*), and sandalwood.
- Ayurvedic practitioners suggest gargling with a mixture of water, salt, and turmeric (*Curcuma longa*) powder or astringents such as alum, sumac, sage, and bayberry (*Myrica* spp.).
- Herbalists recommend taking osha root (*Ligusticum porteri*)internally for infection or drinking ginger (*Zingiber officinale*) or slippery elm (*Ulmus fulva*) tea for pain.
- Homeopaths may treat sore throats with superdilute solutions (*Lachesis*, *Belladonna*, *Phytolacca*), yellow jasmine (*Gelsemium*), or mercury.
- Nutritional recommendations include zinc lozenges every two hours along with vitamin C with bioflavonoids, vitamin A, and beta-carotene supplements.

In the case of chronic sore throat, it is necessary to treat the underlying disease to heal the sore throat. If a sore throat is caused by environmental factors, the aggravating stimulus should be eliminated from the sufferer's environment. In the case of chronic sore throat in a child, the doctor may recommend a tonsillectomy (surgical removal of the tonsils).

Home care for sore throat

Regardless of the cause of a sore throat, there are some home care steps that people can take to ease their discomfort. These include:

- Gargling with warm double strength tea or warm salt water made by adding one teaspoon of salt to 8 oz of water.
- Drinking plenty of fluids, but avoiding acid juices like orange juice, which can irritate the throat. Sucking on popsicles is a good way to get fluids into children.
- Eating soft, nutritious foods like noodle soup and avoiding spicy foods.
- Refraining from smoking.
- Resting until the fever is gone, then resuming strenuous activities gradually.
- A room humidifier may make sore throat sufferers more comfortable.
- Antiseptic lozenges and sprays may aggravate the sore throat rather than improve it.

Allopathic treatment

Sore throat caused by a streptococci or another bacteria must be treated with antibiotics. Penicillin is the preferred medication. Oral penicillin must be taken for 10 days. Patients need to take the entire amount of antibiotic prescribed, even after symptoms of the sore throat improve. Stopping the antibiotic early can lead to a return of the sore throat. Sometimes a single injection of long-acting penicillin G is given instead of 10 days of oral treatment. These medications generally cost under $15.

Because mononucleosis is caused by a virus, there is no specific drug treatment available. Rest, a healthy diet, plenty of fluids, limiting heavy **exercise** and competitive sports, and treatment of aches with acetaminophen (Datril, Tylenol, Panadol) or ibuprofen (Advil, Nuprin, Motrin, Medipren) are the prescribed treatments. Nearly 90% of mononucleosis infections are mild. The infected person does not normally get the disease again.

Aspirin should not be given to children because of its association with increased risk for Reye's Syndrome, a serious disease.

Expected results

Sore throat caused by a viral infection generally clears up on its own within one week with no complications. The exception is mononucleosis. Ninety percent of cases of mononucleosis clear up without medical intervention or complications, so long as dehydration does not occur. In young children the symptoms may last only a week, but in adolescents the symptoms last longer. Adults over age 30 have the most severe and long lasting symptoms. Adults may take up to six months to recover. In all age groups **fatigue** and weakness may continue for up to six weeks after other symptoms disappear.

In rare cases of mononucleosis, breathing may be obstructed because of swollen tonsils, adenoids, and lymph glands. If this happens, the patient should immediately seek emergency medical care.

Patients with bacterial sore throat begin feeling better about 24 hours after starting antibiotics. Untreated strep throat has the potential to cause **scarlet fever**, kidney damage, or rheumatic fever. Scarlet fever causes

a rash, and can cause high fever and convulsions. Rheumatic fever causes inflammation of the heart and damage to the heart valves. Taking antibiotics within the first week of a strep infection will prevent these complications. People with strep throat remain contagious until after they have been taking antibiotics for 24 hours.

Prevention

There is no way to prevent a sore throat; however, the risk of getting one or passing one on to another person can be minimized by:

- Washing hands with warm water and soap frequently.
- Maintaining a balanced life with adequate sleep, nutrition, and personal fulfillment.
- Avoiding close contact with someone who has a sore throat.
- Not sharing food and eating utensils with anyone.
- Not smoking.
- Optimizing immune system by exercising and eating immune-boosting foods, such as carrots, yams, shiitake mushrooms, etc.
- Staying out of polluted air.

Resources

BOOK

Berkow, Robert. *The Merck Manual of Diagnosis and Ther apy* Rahway, NJ: Merck Research Laboratories, 1992.

PERIODICALS

Larkin, Marilynn. "A Single, Rapid Test Suffices for Phar yngitis Diagnosis in High Risk Patients." *Lancet* 358 (December 8, 2001): 1969.

National Institute of Allergy and Infectious Diseases. *Infec tious Mononucleosis Fact Sheet* http://www.niaid.nih.gov/factsheets/infmono.htm (September 1997).

Kathleen Wright
Rebecca J. Frey, PhD

Soul revival *see* **Shamanism**

Sound therapy

Definition

Sound therapy refers to a range of therapies in which sound is used to treat physical and mental conditions. One of these therapies is **music therapy**, which can involve a person listening to music for conditions such as **stress** and muscle tension.

Music is one component of this therapy. Others use sound wave vibrations to treat physical and mental conditions. In general, this therapy is based on the theory that all of life vibrates, including people's bodies. When a person's healthy resonant frequency is out of balance, physical and emotional health is affected.

Treatment by sound waves is believed to restore that healthy balance to the body. Healing is done by transmitting beneficial sound to the affected area. The healing sound may be produced by a voice or an instrument such as electronic equipment, chanting bowls, or tuning forks.

Origins

Indigenous societies around the world have traditionally used sound in healing ceremonies, including drumming, hand-clapping, singing, dancing, and pulsating. The broad spectrum of sound therapy includes chanting, an activity long connected to healing and religion, and sounds of nature. Different sounds have elicited a variety of emotional responses and altered mental and physical states in people. One recent brain-imaging study found that spine-tingling music "lights up" the same parts of the brain that are stimulated by food, sex, and certain types of drugs.

For example, the chimes of a church bell pealed for such happy occasions as weddings and harvest festivals, and tolled slowly to announce a death. The connection between sound and healing was chronicled in 1896 when American physicians discovered that certain types of music improved thought processes and spurred blood flow. More advances in sound therapy came after World War II. Music therapy began in the 1940s, when it was used as part of rehabilitation treatment for soldiers.

During the 1950s and 1960s, sound wave therapy developed in Europe. British osteopath Peter Manners developed a machine that treated patients with healing vibrations. The machine is placed on the area to be treated and a frequency is set to match the cells of a healthy body. Advocates believe that the treatment makes the body's cells vibrate at a healthy resonance.

By the 1990s, Manners had developed a computerized system with about 800 frequencies used to treat a range of conditions. Similar therapies are also known by names such as bioresonance and vibrational therapy. This therapy is used to treat such conditions as **cancer**.

After Manners developed cymatics, two ear specialists in France developed therapies that focus on listening. Dr. Alfred Tomatis' Tomatis method and Dr. Guy Berard's **auditory integration training**

A practitioner of Tibetan sound therapy with patient. In this therapy, metal bowls are struck to produce specific sounds that are said to resonate in the body. *(© Photo Researchers, Inc. Reproduced by permission.)*

involve the patient listening to sounds through headphones. Currently, the Tomatis method is used to treat conditions ranging from learning disabilities to **anxiety** in both children and adults.

From the 1960s on, interest in alternative medicine and New Age healing has led to a wide variety of sound healing therapies. These range from the ancient practice of chanting and the use of singing bowls to vibro-acoustic furniture. A person sits or lies on a chair or bed and music is directed into the body. Benefits are said to include lowered blood pressure.

Benefits

Sound therapy focuses on balancing energy to treat a condition. Advocates maintain that sound therapy is effective in treating such conditions as stress, anxiety, high blood pressure, **depression**, and **autism**. Chanting and overtone chanting are used in therapy with Alzheimer's patients. This form of sound therapy is said to help with memory function. Some researchers think that music memories may outlast some other types of memories because music involves many parts of the brain.

A newer form of sound therapy that is used with Alzheimer's patients is called multisensory or Snoezelen therapy. The name "Snoezelen" comes from two Dutch words that mean "to sniff" and "to doze." It was originally developed to treat disabled children by stimulating all the senses. Snoezelen therapy takes place in specially constructed rooms in which patients can, for example, produce music simply by walking in front of a sound beam. The sound beam, which looks like a microphone, "translates" the patient's movements into music. Other Snoezelen devices include fiber-optic cables that glow when patients wrap them around their bodies, and a chair that vibrates as it plays music through internal speakers. In this way, even deaf patients can "feel" the music as it plays. Snoezelen therapy has been found to reduce **pain** in Alzheimer's patients without the need for extra medication.

Physical conditions treated by sound therapy include pain during labor, muscle and joint pain like arthritis, back pain, sports injuries, soft tissue damage, and cancer.

The Tomatis method is used for conditions including **dyslexia**, attention deficit hyperactivity disorder (ADHD), Down syndrome, **chronic fatigue**

Practitioner using singing bowls to relax and heal patient during sound therapy. *(Mauritius, GMBH / Phototake, Reproduced by permission.)*

syndrome, autism, depression, and behavioral problems. The method, also known as listening therapy, is used to help older people with coordination and motor problems. Furthermore, performers take the therapy to refine their skills.

Description

The spectrum of sound therapy is so broad that a person has many choices about the type of treatment and its cost. Some therapies can be done at home; others require a practitioner or therapist to perform the therapy or to provide initial instruction. As of 2002, most health plans did not cover the cost of any form of sound therapy, including music therapy. However, some sound therapies may be part of integrative treatment for a condition.

Chanting and toning

Chanting and toning are among the complementary therapies offered through the integrative medicine program at Memorial Sloan-Kettering Cancer Center in New York City. The program, which opened in April 1999, is one example of how the traditional medical community is incorporating alternative therapies into treatment.

People learn to reach a meditative state by producing a "pure" sound such as a drawn-out vowel. The chanting is said to produce a state of well-being in mind and body. The cost of therapy will vary since a person could take a class or workshop or opt for longer therapy. Treatment could involve weekly hour-long sessions over a period of several months.

Toning refers to using the voice to let out pain or stress. Sound healers point out that people do this naturally when they cry out or sigh. In toning therapy, a healer will help the patient learn healing sounds. Overtoning involves the therapist using his or her voice to assess a client's condition from the feet to the head. The therapist then treats the person by projecting healing sounds or "overtones."

Sounding, also known as toning, strives to improve vocal and listening abilities for emotional release and better communication. It was developed by Don Campbell, who established the Institute for Music, Health, and Education in Boulder, Colorado, in 1988. The discipline is being used in hospitals, schools, and educational centers to release stress. Toning or sounding is the way to massage the body from the inside out.

The Tomatis method

The Tomatis method involves the client using special headphones with bone and air conduction to listen to electronically recorded music frequencies. These are believed to open the brain to greater frequencies of sound. As of 2002, there were more than 250 Tomatis centers located around the world.

Furthermore, the Mozart Center in northern California began offering home treatment in the late 1990s. Treatment for the three-phase program cost $3,210 in mid-2000. Therapy lasted about three months and started with initial testing and instruction about how to use equipment.

The client used the equipment for two hours per day for 15 days. A diary was kept during that time, and a practitioner made weekly check-up calls. A month after therapy started, the practitioner returned to the home and reinstalled the equipment. The two-hour daily therapy continued for 10 days, along with the diary entries. The third phase of therapy continued six weeks later with 10 days of therapy and diary-keeping.

Vibrational therapy

Sound therapies like cymatics have been compared to **acupressure**. An instrument is placed on a point of the body and beneficial sound is directed at that point. The sound directed through the skin is believed to establish healthy resonance in unhealthy tissue.

Other forms of sound therapy

The spectrum of sound therapy includes such other treatments as:

- Audiotapes with special frequencies or music are designed for conditions ranging from AIDS to weight problems. Costs will vary. Some recordings are said to target both the emotional and physical aspects of these conditions.
- Tuning forks are used to give the person resonance. This is said to help the person relax and give balance. Costs vary.
- Hemi-sync therapy involves listening to synthesized sounds to balance both hemispheres of the brain. This is said to produce an altered state of consciousness.
- Adaptation of age-old instruments such as the Tibetan singing bowls. Sound from these bowls can be used in conjunction with chanting or meditation. Tibetan monks used bronze bowls.

Preparations

Pre-treatment preparation varies with the type of therapy to be undertaken. Some therapies such as the Tomatis method require an assessment and then treatment is administered. Other therapies can be taught by therapists and done at home. Some therapies require little or no training. Equipment such as audiotapes and chanting bowls can be purchased and used with minimal instruction.

Furthermore, organizations like the Sound Healers Association can provide information about training in other types of sound therapy. In addition, some companies sell equipment such as bioresonance machines.

Precautions

Although treatments like the Tomatis method and cymatics require training in those therapies, there are no certification programs for practitioners of other therapies.

While there is no danger from such therapies as chanting, other forms of sound therapy should not be undertaken until a doctor or health practitioner is consulted. People with pacemakers should not do cymatics.

Side effects

Sound therapy has produced no known side effects or complications.

Research and general acceptance

Sound therapy is so diverse that the amount of research and general acceptance in the United States is varied. Music therapy has been accepted within the traditional medical community. Other therapies such

as chanting and toning have been integrated into traditional treatment of cancer. Furthermore, some studies indicated that auditory integration training and the Tomatis method could be used for behavioral problems.

Much of the medical community remains dubious about the healing effects of treating patients' unhealthy cells with sound waves. Although a clinic or center may provide testimonials from cured patients, there has been no scientific research to prove this.

While the traditional medical community remains skeptical about some aspects of sound therapy, treatment has been undertaken by people around the world. Therapies are available in areas including North America, Europe, and Japan.

Training and certification

Unlike music therapy, in which the therapist must have a degree and pass a national board certification examination, there are no licensing and training requirements for sound therapists. However, some disciplines may require training in their therapies. The directors of Tomatis Centers are certified specialists in fields including music, speech therapy, and psychology. Furthermore, the Sound Healers Association provides training and sells a national directory of sound healers and other sound therapy items such as books and tapes.

Resources

BOOKS

Albright, Peter. *The Complete Book of Complementary Therapies*. Allentown, PA: People's Medical Society, 1997.

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Nash, Barbara. *From Acupuncture to Zen: An Encyclopedia of Natural Therapies*. Alameda, CA: Hunter House, 1996.

Ortiz, John M. *The Tao of Music, Sound Psychology: Using Music to Change Your Life*. Samuel Weiser Inc., 1997.

Time Life Books Editors. *The Alternative Advisor*. Alexandria, VA: Time Life Books, 1997.

PERIODICALS

"Brain Health Music and the Mind." *Harvard Health Letter* 27 (December 2001): np.

Green, Chris. "Light, Sound Prescribed for Pain Relief." *Capper's* 123 (October 16, 2001): 12.

ORGANIZATIONS

Memorial Sloan Kettering Cancer Center. 1275 York Ave. 68th St., New York, NY 10021. (212) 639 2000. http://www.mskcc.org.

Mozart Center (Tomatis method). P.O. Box 76, Jenner, CA 95450. (707) 632 6976. http://www.mozartcenter.com.

Sound Healers Association. P.O. Box 2240, Boulder CO, 80306. (303) 443 8181. http://www.healingsounds.com/sha/sha about.asp.

Telesound LTD. 31 Hall Green , Malvern, Worcestershire , UK, WR14 3QY. (0)1684 572506. E mail: sales@telesound.co.uk. http://www.telesound.co.uk.

The Tomatis Method. http://www.tomatis.com.

Liz Swain
Rebecca J. Frey, PhD

South Beach diet

Definition

The South Beach diet is a three-phase, carbohydrate-restrictive diet. It emphasizes foods that are low on the glycemic index (GI) and low in saturated fat, such as lean meats, vegetables, cheeses, nuts, and eggs. Unlike other carbohydrate-restrictive **diets**, such as the Atkins and Zone diets, the South Beach diet promotes "good" carbohydrates, such as whole grains and fruit.

Origins

Arthur Agatston, the originator of the South Beach Diet, is a medical doctor. He has a cardiology practice that emphasizes disease prevention and is an associate professor at the University of Miami Miller School of Medicine in Miami, Florida.

Dr. Agatston first developed the South Beach Diet for his obese cardiac patients who were having trouble staying on the standard low-fat diet recommended by the American Heart Association. After these patients had success with his diet, Agatston began promoting the diet to the public, shifting the emphasis away from heart health and toward rapid weight loss. In 2003, he published *The South Beach Diet: The Delicious, Doctor-*

South Beach Diet products

Product	Calories per serving
Frozen entrees	360 or less
Frozen pizzas	330–350
Wrap sandwich kits	250 or less
Frozen breakfast wraps	200 or less
Cereal	110–210
Cereal bars	140
Meal replacement bars	210–220
Snack bars	100
Cookies and crackers	100 or less
Dressings	50–70
Steak sauce	5

(Illustration by GGS Information Services. Cengage Learning, Gale)

Foods permitted in phase 1 of the South Beach Diet

Meat
- Veal and lean cuts of beef; low fat or fat free lunch meat

Poultry
- Skinless chicken
- Turkey breast
- Cornish hen

Seafood
- Any kind of fish or shellfish

Cheese
- Low fat and fat free only, excluding any type of cream cheese, except dairy-free cream cheese substitute

Tofu
- Soft low-fat or calorie reduced only

Eggs
- Whole eggs, egg substitute, egg whites

Vegetables
- Non-starchy, such as salad vegetables, excluding tomato, artichoke, asparagus, broccoli, cauliflower, collard greens, eggplant, mushrooms, turnips, and zucchini

Fats
- Olive oil
- Canola oil

Spices
- Any seasoning that does not contain sugar

Artificial sweetened treats and artificial sweetener
- Sugar free only and limited in amounts

(Illustration by Corey Light. Cengage Learning, Gale)

designed, Foolproof Plan for Fast and Healthy Weight Loss.. The book has sold more than a million copies since its publication, and remained on the *New York Times* bestseller list for over a year. Television coverage boosted the popularity of the South Beach Diet further, and in 2004, Kraft Foods entered into an agreement that allowed it to use the South Beach Diet name on line of foods that were nutritionally compatible with the diet.

Benefits

According to Agatston, benefits of the South Beach Diet include:

- rapid weight loss followed by lifetime weight control
- loss of weight from the belly region
- fewer hunger pangs because of slower carbohydrate breakdown and frequent small meals
- a heart-healthy approach to fats
- decreased risk of developing cardiovascular disease.

The initial rapid and significant weight loss is reported to be 8–13 lb(4–6 kg) in the first two weeks. After the first two weeks, weight loss continues at a slower rate, averaging 1–2 lb (0.4–1 kg) weekly. In addition to weight loss, the diet can reduce **cholesterol** and insulin levels, thus reducing the risk of diabetes and **heart disease**. Some people report that the diet is easy to follow because it is designed to eliminate cravings and has more flexible food options after the first two weeks.

Description

In his book, *The South Beach Diet*, Dr. Agatston states that "this diet is not low-carb. Nor is it low-fat." Instead, the diet focuses on eating the "good" carbohydrates (fruits, vegetables, and whole grains) and "good" fats (olive oil and nuts) rather than eliminating them from the diet entirely.

Dr. Agatston based the core of his dietary plan around the glycemic index (GI). The glycemic index compares foods on a scale of 1–100 for how much they increase the level of glucose (sugar) in the blood. When people eat, the level of glucose in their blood increases. How much it increases depends on the foods they eat. "Good" foods with a low glycemic index (below 50) raise blood sugar less than "bad" foods with a high glycemic index (above 50 or above 65 depending on which authority is consulted). When blood glucose levels increase, cells in the pancreas release the hormone insulin. This signals cells in the body to convert some of the glucose into a compound called glycogen that is stored in the liver and muscles and to convert some into fat, stored in fat cells. When blood glucose levels go down, different cells in the pancreas release the hormone glucagon. Glucagon signals cells in the liver and muscle to release glycogen, which is converted back into

glucose and is burned by the body. If glucose levels continue to be low, fat is also burned for energy.

When people eat foods that contain a lot of sugar or carbohydrates that break down rapidly in the body into glucose (the "bad" carbohydrates of the South Beach Diet) their insulin level spikes. When people eat carbohydrates that break down more slowly into glucose (the "good" carbohydrates of the South Beach Diet), their insulin level rises more slowly and does not reach as high a level. When someone eats too many sugary foods too often, they secrete a lot of insulin, and eventually cells in the body may become insulin resistant, which can lead to **atherosclerosis** and diabetes. According to Dr. Agaston, eating these low-GI foods reduces the risk of **insulin resistance**, and can even eliminate the body's craving for high-GI foods.

The South Beach diet consists of three phases. Phase one is the strictest part of the diet and lasts for two weeks. The purpose of Phase one is to banish the dieter's cravings for high-GI foods such as bread, rice, potatoes, pasta, and sugar. Alcohol, fruits, cereal, and such vegetables as carrots and corn are also restricted during phase one. Instead, protein-rich foods are emphasized, such as lean meat, fish, eggs, cheese and nuts. Some types of vegetables are also encouraged. Coffee and tea are allowed during this phase of the diet. Three regular-sized meals are eaten each day, supplemented by mid-morning and mid-afternoon snacks as well as dessert. During this period, the body chemistry is believed to change dramatically until cravings for high-GI foods are eliminated and insulin resistance is improved/lowered. In addition, rapid weight loss is typically experienced. The total calorie intake during phase 1 is usually between 1,200 and 1,400 per day.

Phase two reintroduces several of the restricted foods and encourages eating from all the dietary food groups, the expected result being that the body will neither crave high-GI foods nor store food as excess fat to the same degree. Such high-fiber carbohydrates as whole-wheat pasta and bread and most fruits are now permitted. Moderation remains the key to success for this phase and low-GI foods are strongly encouraged. Phase two continues until the dieter reaches his or her ideal weight, with weight loss ideally averaging one to two pounds per week.

Phase three, the ultimate goal, focuses solely on weight maintenance. Having reached the ideal weight, the diet now becomes a lifestyle from this point forward. Basic dietary techniques are still maintained. Only the high-GI foods and "bad" fats from the previous two phases continue to be restricted. Altered body chemistry will promote long-term cardiovascular health and reduce the risk of diabetes. Should weight gain occur, phase one of South Beach diet is reintroduced and the diet is begun again.

Preparations

There are no initial preparations required for the South Beach diet. However, as with all diets, dieters should consult with a physician before beginning the diet. Blood testing for insulin, glucose, and cholesterol levels is suggested. It is especially important for dieters taking medications for medical conditions such as heart disease to consult a physician before going on the South Beach diet. Similarly, diabetics on insulin or other medications are advised to have a doctor monitor their blood sugar regularly and determine if they are at risk of kidney impairment while on the diet. It is also recommended that a registered dietitian be consulted to determine the dietary needs of certain medical conditions, such as **pregnancy**.

Precautions

The South Beach diet is not recommended for people suffering from or at risk for kidney problems. The diet's high protein content can place increased strain on the kidneys, possibly causing long-term damage as well as **kidney stones** and bone loss. Additionally, the possibility of ketosis-induced dehydration during phase one can increase the risk of further kidney impairment. Dehydration occurs when the body experiences water loss with accompanying loss of important blood salts like **potassium** and **sodium**. Ketosis occurs when carbohydrates are not available and the body **burns** an excessive amount of fat, during which some ketones, or fat fragments, are excreted. The restrictive nature of phase one may also induce mineral and vitamin deficiencies. Remaining in phase one of the diet for longer than two weeks greatly increases the risk of losing bone and muscle mass. Dieters should remain in phase one for no longer than three or four weeks.

Some **nutrition** professionals express concerned that the South Beach diet menus, provided in the book, lack important nutritional information and detailed portion sizes as well as specific substitutes for foods the dieter cannot or will not eat. They suggest that these aspects, combined with the restrictive nature of the diet, can make sticking with the South Beach diet on a long-term basis difficult for some people. Additional objections include that limiting milk may lead to **calcium** deficiency and limiting and whole grains even in the maintenance phase may lead to deficiencies in dietary fiber and B-complex

vitamins. Also, some nutrition professionals assert that the diet does not emphasize an **exercise** regimen and that exercise is vitally important to avoid the loss of muscle and bone mass, especially during phase one of the diet.

Side effects

Despite Dr. Agatston's claims to the contrary, the South Beach diet is both a low carbohydrate and a low fat diet. For this reason, one main concern regarding the diet is the risk of ketosis, especially during phase one. Ketosis can cause such symptoms as dehydration, **dizziness**, heart palpitations, **fatigue**, lightheadedness, and irritability. **Hypoglycemia**, low blood sugar, headaches, and excessive fluid loss are also commonly associated with this diet. Cramping and tired muscles can be caused by salt depletion. Kidney function can be impaired, especially by the diet's high protein requirement, possibly leading to serious health issues. These side effects typically lessen or fade at the beginning of phase two when a more balanced diet is undertaken.

Research and general acceptance

The South Beach Diet is relatively new, and no independent scholarly research has been done on it. A few small studies that report decreased blood fats and similar heart-protective effects have been sponsored by organizations with South Beach Diet affiliations. However, nutritionists are in general agreement that replacing saturated fats with unsaturated fats in the diet is a healthy choice. The South Beach diet contains all the major food groups, promotes ingestion of "good" fats for maintaining heart health, and it is flexible enough to accommodate most dietary needs.

However, many clinicians and dietitians agree that the rapid initial weight loss results mostly from water weight loss. Much of this weight can return once the dieter rehydrates. Another important criticism by medical and nutritional professionals is the lack of evidence to support Dr. Agatston's claims connecting the consumption of low-GI foods and weight loss. They assert that at this time, there is no scientific proof that eating low-GI foods will have any more weight loss effect than eating a normal, calorie-reduced diet that includes carbohydrates; that Dr. Agatston also fails to take into account the interaction of different foods when eaten together, which can dramatically alter glucose metabolism; and that this means that utilizing the Glycemic Index as a gauge for what foods to eat is not only confusing but also slightly misleading.

KEY TERMS

Atherosclerosis—The process in which deposits of fatty substances, such as cholesterol, build up in the inner lining of an artery.

Carbohydrates—Neutral compounds of carbon, hydrogen, and oxygen found in sugar, starches, and cellulose.

Glycemic index (GI)—A numeric scale for measuring the level and speed of blood glucose increase that carbohydrate-containing food creates upon consumption.

Insulin—The hormone responsible for converting, in the blood, incoming nutrients into cells.

Insulin resistance—A metabolic state where the body's cells fail to respond properly to insulin, thus allowing high blood glucose levels to remain in the blood stream longer. This can produce hyperglycemia, diabetes, and other complications including high-blood pressure and elevated fat levels in the blood.

Ketosis—An abnormal increase in ketones (fat fragments) in the body, usually found in people with uncontrolled diabetes mellitus. Can cause serious side effects, including bad breath, dehydration, and kidney stones.

Resources

BOOKS

Agatston, Arthur. *The South Beach Diet: The Delicious, Doctor designed, Foolproof Plan for Fast and Healthy Weight Loss*. New York: Rodale Press, 2003.

Agatston, Arthur. *The South Beach Heart Program: The 4 Step Plan That Can Save Your Life*. Emmaus, PA: Rodale, 2006.

Scales, Mary Josephine. *Diets in a Nutshell: A Definitive Guide on Diets from A to Z*. Clifton, VA: Apex Pub lishers, 2005.

PERIODICALS

Abel, Lee. "Somewhere on South Beach." *The Journal of the Arkansas Medical Journal*. (February, 2004): 255 256.

Center for Science in the Public Interest. "Weighing the Diet Books (Cover Story)." *Nutrition Action Healthletter*. (January/February, 2004):3 8.

Goodnough, Abby. "New Doctor, New Diet, but Still No Cookies." *New York Times*. (October 7, 2003): F1.

Harvard Medical School. "Sizing up South Beach." *Harvard Health Letter*. (November, 2003): 5.

Schnirring, Lisa. "The South Beach Diet." *Physician & Sports Medicine*. (January, 2004): 9 10.

OTHER

Keefe, Sarah. "The Lowdown on the South Beach Diet." http://www.askmen.com/sports/foodcourt_100/102_eating_well.html. [cited May 22, 2004]

"The South Beach Diet." http://www.dietsurf.com/diet/south_beach_diet.htm.

"The South Beach Diet." South Beach Diet Online. http://www.southbeachdiet.com.

ORGANIZATIONS

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, Illinois, 60606 6995, (800) 877 1600, http://www.eatright.org.

Lee Ann Paradise

Fresh soy beans. *(© foodfolio / Alamy)*

Soy protein

Description

Soy protein is derived from the soya bean (*Glycine max*), which has been cultivated in Asia for centuries but only in the late twentieth century began to attain wide acceptance in the United States. In the natural product industry, soy has been a staple for years. In fact, soy protein is recognized as a dietary ingredient that has tremendous potential benefit.

General use

Soy protein is used in many forms for its health benefits, and claims of its benefits were substantiated beginning about 1985. More than 40 studies were conducted to gather human clinical data, which proved that soy helps to reduce the risk of **heart disease**, the number one killer in the United States. In October 1999, the United States Food and Drug Administration (FDA) allowed soy product manufacturers to claim that eating soy as a part of a low fat, low **cholesterol** diet may reduce the risk of coronary (heart) disease. The FDA recommends .9 oz (25 g) of soy protein per day.

The benefits of soy primarily come from its isoflavone content. Isoflavones are a type of antioxidant that combats cell damage. Genistein and daidzein, the isoflavones present in soy protein, possess antioxidant properties that protect LDL cholesterol from oxidation and are linked to the reduction of cholesterol. Studies have shown that soy protein reduced total cholesterol by 9.3% and lowered LDL (or so-called bad) cholesterol by almost 13%. Soy also raised HDL (or so-called good) cholesterol in the blood by over 2%. This is due to the structure of the amino acid in soy protein. Soy protein differs from meat protein and changes the way the liver creates and metabolizes cholesterol. Since high cholesterol levels are a major risk factor for the development of heart disease, the benefit of soy in reducing that health problem could be significant for a large segment of the population.

Soy also contains phytoestrogens (plant hormones) that mimic estrogen. This fact encourages promoters to tout the benefits of soy for relief of the symptoms of **menopause**. Studies show that eating 20 grams of soy daily for six weeks helps reduce **hot flashes** and other symptoms. Supporters also claim that soy may lower the risk of **osteoporosis**, Alzheimer's disease, **cancer**, and kidney disease. Unlike the claim for lowering cholesterol, none of these has been conclusively proven, nor has soy received FDA approval for these uses. Because of the potential estrogenic effects of soy proteins, the British Dietetic Association has recommended that soy-based infant formulas be used with extreme caution. They warn: "Dietitians should discourage the use of soya protein in children with atopy or cow's milk allergy in the first six months of life to avoid sensitization to soya protein and exposure to phytoestrogens while organ systems remain at their most vulnerable. This would include soy infant formula and soya products such as desserts, etc." Note that this warning is limited to soy protein and does not apply to other soybean products such as soy *lecithin*, which has been used as a cholesterol lowering agent. The United States FDA and the German Commission E have placed no limits on the use of this soy product and consider it safe, even for nursing mothers. In 2006, a panel of scientists was convened by the National Institutes of Health to look at scientific research regarding the safety of soy infant formula and genistein. The panel concluded there was

little or no evidence that genistein in infant soy formulas was unsafe. It also concluded that there is no evidence that soy formula leads to developmental or reproductive problems.

Cancer

In 2006 and 2007, two clinical studies indicated that soy consumption may reduce the risk of getting prostate and **breast cancer**. Researchers who studied more than 43,500 Japanese men aged 45–74 for 10 years reported in 2007 that those who consumed the highest amounts of soy products had a significantly decreased risk of getting **prostate cancer**. In 2006, researchers from the National Cancer Institute, part of the National Institutes of Health, reported that children, teens, and adults who consumed soy products had a decreased risk for breast cancer. The strongest effect was when soy consumption began in childhood, the researchers reported. The study of 1,500 Asian American women in Hawaii and California was conducted by university scientists in the two states. It showed that females who ate the most soy-based products during the ages of 5–11 reduced their risk of breast cancer by 58% compared to females who ate the least amount of soy products. The risk reduction in females aged 12 and older was 25%. Women who had the highest intake of soy consumed two servings of soy-based products per week compared to one serving per month in the group with the lowest intake. A difference in soy consumption is believed to explain why women in China and Japan have significantly lower rates of breast cancer than women in North America and Europe.

Preparations

Soy is available in a number of forms and is found in many foods:

- Tofu is soy bean curd. It can be used as a meat substitute in many dishes.
- Soy milk is a beverage that can replace cow's milk.
- Soy burgers are specially processed meat substitutes that use a base of soy protein. They may also contain vegetables, cheese, and spices to enhance flavor, but the primary base is usually soy. Some of these products may have a high salt content.
- Soy protein powders are used by mixing them into foods and beverages.
- Other processed soy products include soy dogs; soy corn dogs; soy imitation chicken patties, strips, and nuggets; and soy imitation sausage, turkey, ham, bologna, hamburger, steak, and bacon products.

KEY TERMS

Atopy—An allergy that is related to a genetic predisposition.

Fibrocystic disease—A common condition in middle-aged women, characterized by the growth of one or more cysts in the breasts. Cysts are small inclusions filled with fluid. These are harmless but may cause pain and tenderness.

Protein—A complex molecule that contains carbon, hydrogen, oxygen, nitrogen, and usually sulfur, which forms an amino acid chain. Proteins are essential for tissue growth and repair.

Soybean—The seed of the plant *Glycine max*.

It is important for consumers to realize that the FDA has only approved the cholesterol-lowering claim for products containing soy protein. Products that are labeled soy in general, or isoflavone tablets, cannot make this claim. There is not enough evidence to support claims that soy isoflavones alone lower blood lipid levels or reduce the risk of heart disease. Research has indicated that isoflavones must be present along with soy protein for the cholesterol lowering effect to take place. In addition, soy products must adhere to strict guidelines in order to make the claim that they are beneficial to a person's health. One serving of a product must contain at least 6.25 grams of soy protein, no more than 20 mg of cholesterol, less than 1 gram of saturated fat, no more than 3 grams of total fat, and no more than 480 milligrams of **sodium**.

Precautions

Some soy products may not meet the standards for the FDA's health claim because they are too low in soy protein or too high in saturated fat.

Some researchers warn that adding isoflavones to the diet of postmenopausal women may put them at risk for breast cancer. Researchers distinguish between soy protein and isoflavones and warn that taking isoflavone supplements could result in overdose. A maximum safe level of isoflavones had not been established as of 2008. In one study, 64 postmenopausal women who took soy protein supplements for one year showed a reduction in breast tenderness and *fibrocystic disease*.

Side effects

There is no concrete evidence of negative effects from incorporating additional food-based sources of soy protein into the diet. Soy **allergies**, however, are fairly common.

Resources

BOOKS

Babaknia, Ari. *Soy: The Right Protein*. Santa Ana, CA: Metro Digital Publishing, 2005.

Hoogenkamp, Henk W. *Soy Protein and Formulated Meat Products*. Wallingford, Oxfordshire, U.K.: CABI Pub lishing, 2005.

Sugano, Michihiro, ed. *Soy in Health and Disease Preven tion*. Boca Raton, FL: CRC Press, 2005.

PERIODICALS

Hudson, Tori. "Soy and Cholesterol." *Townsend Letter: The Examiner of Alternative Medicine* (August/September 2006): 152(3).

Johnson, Kevin, et al. "Effects of Soy Protein Based For mula in Full Term Infants." *American Family Physician* (January 1, 2008): 87.

Kalman, Douglas, et al. "Effect of Protein Source and Resistance Training on Body Composition and Sex Hormones." *Journal of the International Society of Sports Nutrition* (July 23, 2007): 4.

Mangels, Reed. "Expert Panel Evaluates Soy Safety." *Veg etarian Journal* (July/August 2006): 16.

Stoppani, Jim. "The Secret of Soy: Attention: A Valuable Bodybuilding Nutrient Has Gotten a Bad Rap Here, We Set the Record Straight on Soy Protein." *Flex*(No vember 2007): 270(5).

Theodore, Sarah. "Soy Gets Specific: Niche Markets Create New Opportunities for Soy Products." *Beverage Indus try* (December 2006): 27(4).

ORGANIZATIONS

American Dietetic Association, 120 S. Riverside Plaza, Suite 2000, Chicago, IL, 60606, (800) 877 1600, http:// www.eatright.org.

Dieticians of Canada, 480 University Ave., Suite 604, Tor onto, ON, M5G 1V2, Canada, (416) 596 0857, http:// www.dieticians.ca.

Soyfoods Association of North America, 1050 Seventeenth St. NW, Suite 600, Washington, DC, 20036, (292) 659 3520, http://www.soyfoods.org.

Vegetarian Resources Group, PO Box 1463, Baltimore, MD, 21203, (410) 366 8343, http://www.vrg.org.

Amy Cooper
Ken R. Wells

Spastic colitis *see* **Irritable bowel syndrome**

Spearmint

Description

Spearmint, *Mentha spicata* (sometimes referred to *M. viridis* and *M. crispa*), is a Mediterranean native known from ancient times as an herb of hospitality. In the symbolism of plants, spearmint conveys wisdom. Common names for this aromatic herb include garden mint, lamb's mint, Our Lady's mint, spire mint, and **sage** of Bethlehem. The Romans brought mints to Britain, and English colonists brought spearmint and other mints to their settlements in North America.

Spearmint. *(© Arco Images / Alamy)*

Spearmint is one of at least thirty species in the extensive Lamiaceae, or mint, family. Only the members of the *Mentha* genus, however, are considered "true mints." Mints interbreed quite easily. There are hundreds of hybrids and varieties in this sprawling genus of aromatic herbs, and many have naturalized throughout North America.

A mint used in Chinese medicine is *M. arvensis*, commonly known as field mint or wild mint. The name in China for this highly variable species is *bo he*. This lilac-blossomed herb is used as a cooling remedy in the treatment of **influenza**, **sore throat**, inflammations of the eyes, and head colds. *M. arvensis* is widely prescribed by Chinese herbalists as a carminative (medication given to expel **gas** from the digestive tract) and stomachic (medication given to improve digestive functions). It is also effective in relieving some types of **headache**. In general, field mint is said to be helpful in stimulating movement of the *qi* or life energy that may become stagnated in the liver.

Some herbalists categorize *M. arvensis* and *M. canadensis* as wild mint, a native American species. The species *M. arvensis* var. *piperescens* is known as Japanese mint. It is widely cultivated as a primary commercial source of menthol.

Mints are hardy perennials which spread by underground runners. They may become troublesome weeds

KEY TERMS

Carminative—Any medication or preparation given to expel gas from the digestive tract.

Carvone—The chemical compound that gives spearmint its characteristic flavor. Carvone is a pale yellow or colorless liquid when extracted from the plant.

Decoction—A herbal extract obtained by boiling parts of the plant in water or alcohol.

Stomachic—A medication or herbal preparation given to improve the functioning of the digestive system.

Volatile oil—The essential oil of a plant, usually extracted by steam distillation. The oil is called "volatile" because it evaporates at room temperature.

in the garden if not tended and controlled. Mints thrive in semi-shade and rich, moist soil. All mints have a square stem, with simple leaves growing in opposite pairs. Spearmint leaves are about two inches long, bright green, oblong or lance-shaped, veined and somewhat wrinkled, with unevenly toothed margins. The upper leaves are sessile, and the lower leaves have a short stalk. The herb is unbranched and grows in thick clumps in moist areas along roadsides, near streams, and in low meadows and pastures where it may reach a height of two to three feet. The flowers form in a cluster in the leaf axils at the tip of the purple or green stem, tapering nearly to a point. One or more flowering stems flank the central spike. Blossoms are a pale to deep violet color and bloom in July and August. The small, tubular flowers each have two long and two short stamens. The brown seeds are tiny and round.

Spearmint contains volatile oil, the flavonoid thymonin, caffeic acid derivatives, rosmaric acid, carvone, and limonene. Spearmint's distinctive, pungent aroma is attributed to the primary constituent of the volatile oil, the chemical carvone.

According to the United States Department of Agriculture (USDA), spearmint is regarded as an invasive weed only in Tennessee and other parts of the South. In the northern Plains states and parts of the Midwest, however, spearmint is raised as a cash crop; it is presently on the list of the 50 top cash crops in the United States. Researchers in Montana are studying spearmint, hoping to discover why it resists a plant disease known as verticillium wilt when **peppermint** is not resistant.

History

Like most medicinal herbs, the mints have found a place in ancient myth and legend. The generic name *Mentha* is derived from the story of the goddess Persephone, who was jealous of Pluto's love for the nymph Minthe, and transformed her rival into a common garden plant. The god Pluto, unable to retrieve the lovely Minthe, assured that her fragrance would waft on the garden breezes, releasing more of the pleasant aroma each time it was trod upon.

In the first century A.D., the naturalist Pliny suggested that students wrap a braid of mint around their heads to bring delight to the soul, thus benefiting the mind and enhancing their scholarship. Aristotle forbade mints to be used by soldiers prior to battle because he believed that the qualities of this herb might diminish their willingness to fight. The smell of "Spere Mynte," according to the herbalist John Gerard writing in 1568, "rejoiceth the heart of man." Mints were commonly used as strewing herbs, both for their fragrance and because they repel mice. Sprigs of fresh mint were also put in grain storage sacks to repel rodents. The steam vapor of infused mint was used to freshen the air in a sickroom. Mints were also used to scent bath water and to "strengthen the nerves and sinews," according to the herbalist Parkinson. Mints were used to whiten the teeth and in a wash to ease irritation of chapped hands. In the Middle Ages, when the **bites** of mad dogs must have been a common complaint, mints, particularly spearmint and peppermint, were among the many herbs recommended to treat the wounds. The mints were mixed with salt and applied directly to the bite. Mints were mentioned in the Bible as herbs the Pharisees used for tithing. Mints were a highly valued medium of exchange in those times. Refreshing mint teas were a popular drink during the time of the American Revolution because they were not taxed by the English; in fact, spearmint was an important cash crop in Connecticut at the time of the Revolution. The aromatic tea also enjoyed popularity during the Civil War when imported black teas were less available.

General use

The various mint species have many common chemical properties and beneficial actions. The fresh or dried leaves and the volatile oil, extracted by steam distillation, are the medicinally useful parts. Spearmint is slightly less medicinally potent than peppermint *M. piperita*, a popular and well-known hybrid of spearmint and water mint *M. aquatica*. Spearmint is used similarly to peppermint in medicinal preparations. These mints are particularly beneficial in relieving digestive

disorders, **colic**, and flatulence due to their carminative and antispasmodic actions, and may be helpful in the treatment of **irritable bowel syndrome**. Spearmint may also relieve **motion sickness**, **hiccups**, and **nausea**. The milder spearmint is a safe remedy when prepared as an infusion for children. Spearmint is diuretic and has been used to treat cases of suppressed or painful urination. It is high in vitamins A and C, and has been employed both to prevent and cure scurvy, to improve eyesight and reduce **night blindness**, and to bring a sparkle to dull eyes and a gloss to the hair. A vinegar decoction of spearmint applied as a hair rinse has been used to treat head sores. Spearmint is commonly used in culinary preparations, to season meat, fish, and vegetable dishes. Mints are also used to flavor candy, toothpaste, antacid medicines, chewing gum, shaving cream, liqueurs, and even cigarettes. Spearmint is the preferred herb used to prepare the traditional drink of the American South, the mint julep.

Recent research indicates that spearmint may have useful antibactericidal properties in addition to its traditional uses as a digestive aid. A group of Japanese researchers reported in 2001 that essential oil of spearmint showed significant bactericidal activity against such disease agents as *Staphylococcus aureus*, *Escherichia coli*, and *Helicobacter pylori*.

Spearmint is also being studied for its effectiveness in counteracting the damaging effects of oxidation in human and animal tissue. It has already been shown in animal studies to offer some protection against the growth of certain types of tumors.

Preparations

Spearmint should be harvested on a dry day, after the dew has evaporated and before the sun robs the plant of its volatile oil. The plant should just be coming into bloom. Stalks are cut a few inches from the ground, and any insect-damaged or brown leaves should be trimmed from the stem. The stalks should be tied in bundles and hung to dry in a warm, airy room out of direct sunlight. After the herb is crisply dry, the leaves are removed from the stems. The discarded stems may be added to a compost pile. The dried leaf is stored in clearly labeled, tightly sealed, dark-glass containers.

Infusion: Place 6 tbsp of fresh mint leaves in a warmed glass container. Bring 2.5 cups of fresh, non-chlorinated water to the boiling point, and add it to the herbs. Cover and infuse the tea for about five minutes. Strain and sweeten to taste. Mints may also be infused with warm milk for easing abdominal **pain**. The prepared tea will store for about two days in the refrigerator in a sealed container. Drink three cups a day. Spearmint combines well with white **horehound** (*Marrubium vulgare*) in infusions for feverish children. The infusion of spearmint may also be used as a gargle to soothe the throat and freshen the breath.

Tincture: Combine four ounces of finely-cut fresh, or powdered dry herb with one pint of brandy, gin, or vodka, in a glass container. The alcohol should be enough to cover the plant parts. Place the mixture away from light for about two weeks, shaking several times each day. Strain and store in a tightly capped, dark glass bottle. A standard dose is 10 to 30 drops of the tincture three times a day.

Essential oil: The essential oil is obtained by steam distillation of the fresh, flowering tops of the mint. A few drops on a sugar cube are a safe dosage several times a day. A few drops of oil added to water and applied externally will relieve **itching**, burns, insect bites, **scabies**, and other skin irritations. The essential oil may also be diluted with almond or sunflower oil for massage.

Precautions

Spearmint is a mild herb and generally considered safe. Some herbalists counsel against administering mint tea to young children, infants, and pregnant women. People with **hiatal hernia** or having an acute gallstone attack should not use spearmint.

Side effects

When spearmint is taken internally at normal dose levels, there are no side effects. The plant has, however, been reported to cause an allergic skin rash in some susceptible people.

Interactions

Preparations containing spearmint are believed to interfere with the beneficial action of homeopathic remedies when taken in close proximity. On the other hand, homeopaths in the United States disagree as of 2002 as to whether spearmint can antidote a remedy. Many maintain that if the remedy has been properly selected by the practitioner, there will be no interference from mint-flavored products.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, 1997.

PDR for Herbal Medicines, 1st ed. Montvale, NJ: Medical Economics Company, 1998.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Homeopathy. New York: Simon & Schuster, 2002.

Reid, Daniel. *Chinese Herbal Medicine*. Boston, MA: Shambhala, 1996.

Tyler, Varro E., ed. *Prevention's 200 Herbal Remedies*. Emmaus, PA: Rodale Press, Inc., 1997.

PERIODICALS

Bonamonte, D., L. Mundo, M. Daddabbo, and C. Foti. "Allergic Contact Dermatitis from *Mentha spicata* (Spearmint)." *Contact Dermatitis* 45 (November 2001): 298.

Imai, H., K. Osawa, H. Yasuda, et al. "Inhibition by the Essential Oils of Peppermint and Spearmint of the Growth of Pathogenic Bacteria." *Microbios* 106 (2001) (Supllement 1): 31 39.

Saleem, M., A. Alam, and S. Sultana. "Attenuation of Ben zoyl Peroxide Mediated Cutaneous Oxidative Stress and Hyperproliferative Response by the Prophylactic Treat ment of Mice with Spearmint (*Mentha spicata*)." *Food Chemistry and Toxicology* 38 (October 2000): 939 948.

ORGANIZATIONS

Institute of Traditional Medicine. 2017 SE Hawthorne Blvd., Portland, OR 97214. (503) 233 4907. www.itmonline.org.

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790.

United States Department of Agriculture. Washington, DC 20250. www.usda.gov.

OTHER

"*Mentha arvensis Linn*." www.modern natural.com/mentha_arvensis.htm.

Taylor, Suzi. "Young Scientists Wage War on Wilt." *Mon tana State University News*, May 24, 2002. www.montana.edu.

Clare Hanrahan
Rebecca J. Frey, PhD

Spinal manipulative therapy

Definition

Spinal manipulative therapies are those that a therapist will work on the human skeleton, particularly the spinal area, to relieve muscular or skeletal **pain**, relieve tension, improve the mobility of joints and, in the case of the oriental therapies, to "unblock energy channels." The idea behind spinal manipulation is that when the vertebrae are subluxated (misaligned), the resulting pressure on nerves can influence negatively organ system function and general health, in addition to interrupting proper joint motion.

KEY TERMS

Neuralgia—Severe nerve pain.

Osteopathic manipulative treatment (OMT)—A collective term that refers to the variety of hands-on manipulative techniques practiced by osteopaths to diagnose and prevent disorders as well as to treat them.

Sciatica—Pain along the course of the sciatic nerve, running from pelvis down the back of leg to the foot caused by a compression or irritation of the fifth lumbar spinal root.

Tinnitus—Ringing or other noises in the ears, sometimes caused by skeletal misalignment.

Origins

Forms of manipulative therapy have been used for thousand of years in Asia. The nineteenth century, however, saw the introduction of many new forms of manipulative therapy in the West. The best known and most widely used of these approaches are **osteopathy** and **chiropractic**. Most areas and societies have some tradition of manipulation or massage and osseous adjustments.

Benefits

Osteopathy and chiropractic in particular have been used to relieve spinal pain and immobility. Both of these therapies can be used in cases of a "slipped disk," and are also used after accidents or surgery to restore mobility. Osteopathy and chiropractic can treat problems of the bones, muscles, joints, or ligaments. They have been used in the treatment of headaches of nervous origin, and even **osteoarthritis**. Athletes and dancers commonly seek osteopathic or chiropractic treatment for sports or occupational injuries to restore function.

Description

A common practice among the spinal manipulative therapies is that the therapist will generally work on patients while they are lying on a special treatment couch adjusted to the height of the practitioner. The therapies vary from light touching to fairly vigorous manipulation.

The cost of treatment across the various disciplines varies a great deal according to the practitioner's level of qualification, the area of competence, and other factors.

Osteopathy

Osteopathy was founded by an American doctor, Andrew Taylor Still. He applied his engineering study and detailed knowledge of human anatomy to the treatment of the human body. He deduced that since misalignment of the skeleton could cause illness, manipulation could theoretically restore good health. The manipulative techniques that Still recommended are commonly referred to as Osteopathic Manipulative Treatment (OMT). OMT is a form of noninvasive, "hands-on" care used for prevention, diagnosis, and treatment to reduce pain and restore motion, as well as help the body heal itself. OMT may be used to facilitate the movement of body fluids and normal tissue functioning, and release painful joints or dysfunctional areas. These therapies take different forms depending on patient needs. In addition to OMT, Dr. Still emphasized the importance that a nutritious diet and overall physical fitness play in maintaining good health. Osteopathy is now widely accepted by the allopathic medical profession, to the extent that they often refer patients to an osteopath. In fact, as of 2002, osteopaths were the fastest growing segment of the total population of physicians and surgeons in the United States.

Chiropractic

Chiropractic was developed by a "magnetic healer," Daniel David Palmer, who founded the Palmer School of Chiropractic. This therapy aims to treat pain and other disorders caused by misalignment of the skeleton with manipulation. Upon consultation with a chiropractor, the patient will be asked for a detailed medical history. The chiropractor may take a set of x rays to obtain a more accurate picture of the condition of the patient's spine. The consultant will decide what form the treatment should take, and treatment will begin on a subsequent visit.

Conditions that may benefit from manipulative treatment:

- whiplash injuries
- immobility of the spine due to arthritis
- strain injuries
- immobility due to previous injuries
- muscular problems
- sciatica
- poor posture
- tinnitus
- neuralgia
- partial paralysis due to stroke
- cerebral palsy

Preparations

Generally, no special preparation is required prior to treatment with the various kinds of spinal manipulative therapy, but some practitioners insist on x rays before treatment.

Precautions

The licensing credentials of spinal manipulation practitioners should always be checked. They should also be given any information regarding the health of the patient that may be relevant or affect treatment.

Side effects

In the presence of serious spinal problems, damage could result if the practitioner is not properly qualified. A registered practitioner should always be consulted, and should be made aware of all relevant patient information.

Research and general acceptance

Osteopathy and chiropractic are now well accepted as options for the treatment of back pain and many types of sports injuries. The field of sports medicine has found particular benefit in osteopathic practitioners because of their emphasis on the musculoskeletal system, manipulation, diet, **exercise**, and fitness. Many professional sports team physicians, Olympic physicians, and personal sports medicine physicians are osteopathy physicians (DOs).

Training and certification

Osteopathy

Fully qualified osteopaths undergo four years of post-collegiate training in a college of osteopathy. They must pass state licensing examinations, and are entitled to use MRO (Member of the Register of Osteopaths) after their name. A DO is one of only two types of qualified physician in the United States, the other being an MD (allopathic physician). DOs are qualified to practice surgery, prescribe medications, and offer the same health care services that their allopathic counterparts are. The chief difference between the two groups of physicians is that MDs are more likely to enter specialized branches of medicine, while most DOs enter primary care practice.

Many aspects of traditional osteopathic philosophy, such as advice about diet and **smoking**, have entered mainstream medicine to the point that the

lines between DOs and MDs are blurring. In addition, the dedication of osteopaths to **holistic medicine** and primary care has been a great benefit to rural areas of the United States that are often understaffed by mainstream practitioners.

Chiropractic

Chiropractors are required to take two years of college with a relevant biological curriculum, and four years of resident study that must include supervised clinical experience. A further two years of practical or clinical studies is required, which must include diagnosis and disease treatment.

The Council on Chiropractic Education (CCE) and its Commission on Accreditation is an autonomous national organization recognized by the United States Department of Education as the authority on the quality of training offered by colleges of chiropractic.

Resources

BOOKS

Shealy, Norman C. *Alternative Medicine, An Illustrated Encyclopedia of Natural Healing*. Element Books, 1996.

PERIODICALS

"Osteopathic Manipulative Treatment May Benefit Patients." *Health & Medicine Week* (October 8, 2001).

Shepard, Scott. "Health Philosophies on Common Ground." *Cincinnati Business Courier* 18 (November 9, 2001): 38.

ORGANIZATIONS

American Association of Colleges of Osteopathic Medicine. 5550 Friendship Blvd., Suite 310, Chevy Chase, MD 20815 7231. (301) 968 4100. http://www.aacom.org.

The American Chiropractic Association. 1701 Clarendon Blvd, Arlington, VA 22209. (800) 986 4636. Member info@amerchiro.org. http://www.amerchiro.org

American College of Chiropractic Consultants (ACCC). 28 E. Jackson Bldg., 10th Fl., Suite 1020 Chicago, IL 60604. http://www.accc chiro.com.

American Osteopathic Association. 142 East Ontario Street, Chicago, IL 60611 (800) 621 1773. msc@aoa net.org. http://www.aoa net.org.

American Osteopathic Board of Neuromusculoskeletal Medicine. 3500 DePauw Boulevard, Suite 1080, Indi anapolis, IN 46268 1136.

The General Council and Register of Osteopaths. 56 Lon don Street, Reading, Berkshire RG1 4SQ, United Kingdom.

Patricia Skinner
Rebecca J. Frey, PhD

Spirulina

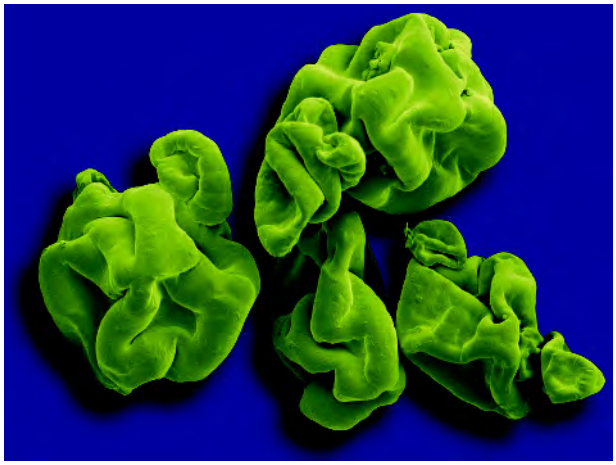
Description

Spirulina is a genus of blue-green algae used as a nutritional supplement. Blue-green algae, microscopic fresh-water organisms, are also known as cyanobacteria. Their color is derived from the green pigment of chlorophyll, and the blue from a protein called phycocyanin. The species most commonly recommended for use as a nutritional supplement are *Spirulina maxima* and *Spirulina platensis*. These occur naturally in warm, alkaline, salty, brackish lakes, but are also commonly grown by aquaculture and harvested for commercial use. Spirulina contains many nutrients, including B vitamins, beta-carotene, gamma-linolenic acid, **iron**, **calcium**, **magnesium**, **manganese**, **potassium**, **selenium**, **zinc**, **bioflavonoids**, and protein.

Spirulina is composed of about 65% protein. These proteins are complete, in that they contain all essential **amino acids**, plus some nonessential ones. In that regard, it is similar to animal protein, but does not contain saturated fats, or residues of hormones or antibiotics that are in some meats. Since spirulina is normally taken in small amounts, the quantity of dietary protein supplied for the average, reasonably well-nourished person would not be significant. However, it is a good source of trace minerals, some vitamins, bioflavonoids, and other phytochemicals. It also has high digestibility and bioavailability of nutrients.

General use

Spirulina has been used as a source of protein and nutrients, particularly beta-carotene, by the World



Spirulina is a genus of blue-green algae used as a nutritional supplement. *(© Medical-on-Line / Alamy)*

KEY TERMS

Algae (sing., alga)—Any of numerous groups of one-celled organisms containing chlorophyll. Spirulina is a blue-green alga.

Neuropathy—Condition of weakness affecting the nervous system.

Phenylalanine—An essential amino acid that cannot be consumed by people with a metabolic disease known as phenylketonuria (PKU).

Phycocyanin—A protein found in spirulina that gives the alga its blue color. Phycocyanin has anti-inflammatory effects.

Phytochemicals—Nutritional substances contained in plants.

Health Organization (WHO) to feed malnourished Indian children. The program resulted in a decrease of a type of blindness that results from inadequate dietary **vitamin A**. The dose used in this year-long study was 1 gram per day.

There is a high **vitamin B_{12}** content in spirulina. For this reason, it has often been recommended as a supplemental source of the vitamin for vegans and other strict vegetarians, who are unlikely to have adequate dietary vitamin B_{12}. Unfortunately, spirulina is not an effective source of the usable vitamin. Much of the vitamin B_{12} is in the form of analogs that are unusable for humans, and may even block the active forms of vitamin B_{12} consumed from other sources.

Gamma linolenic acid (GLA) is present in significant amounts in a small percent of spirulina species. This essential fatty acid can be used in the body to form products that are anti-inflammatory and anti-proliferative. It is potentially useful for individuals with **rheumatoid arthritis** and diabetic neuropathy. It may also play a role in lowering plasma triglycerides and increasing HDL **cholesterol**.

Spirulina is a good source of available iron and zinc. A study done in rats found that those consuming spirulina had equivalent or better absorption than those given a ferrous sulfate iron supplement. A small human study of iron-deficient women had good response to iron supplementation with spirulina, although the amounts used were large (4 grams after each meal). Similarly, a study of zinc deficient children found that those taking spirulina had a superior response to those taking zinc sulfate, and had fewer side effects.

In addition to serving as a source of nutrients itself, spirulina has been used in the manufacture of fermented dairy products to guarantee the survival of the bacteria used to ferment the milk.

A stronger immune system is one claim made by boosters of spirulina. A number of animal studies appear to support stimulation of both antibody and cellular types of immunity. Immune function was markedly improved in children living in the areas surrounding Chernobyl. The measurements were made after 45 days, with each child consuming 5 grams of spirulina per day.

The growth of beneficial intestinal bacteria, including lactobacillus, appears to be stimulated by the consumption of spirulina, based on a study of rats who consumed it as 5% of their **diets**. The absorption of vitamin B_1 was also improved.

Cholesterol, serum lipids, and low-density lipoprotein (LDL) cholesterol may be lowered by a small, but significant, percentage by the consumption of spirulina. One study group of men with high cholesterol took 4.2 grams per day of spirulina, and experienced a 4.5% decrease in cholesterol after one month.

Spirulina is also thought to be helpful in the treatment of oral leukoplakia, a precancerous condition that is manifested as white patches in the mouth. It improves experimentally induced oral carcinoma (**cancer** in the mouth) as supported by studies done in animals.

The evidence for the ability of spirulina to promote weight loss is not very strong. Results have been mixed, and the phenylalanine content does not appear to be an appetite suppressant as is sometimes claimed. Whether other components of the algae are beneficial for weight loss is uncertain and unproven.

Spirulina has been recommended to alleviate the symptoms of **attention-deficit hyperactivity disorder** (ADHD), although evidence for this indication is lacking.

Spirulina has the highest concentration of evercetin found in a natural source. It is a potent antioxidant and anti-inflammatory compound that can be used to alleviate the symptoms of sinusitis and **asthma**. Phycocyanin, the protein that gives spirulina its blue color, has also been shown to relieve inflammation associated with arthritis and various **allergies**.

One recommended dose is 3–5 grams per day, but the amount used may depend on the product, the individual using it, and the indication for which it is being taken.

Preparations

Spirulina supplements are available in powder, flake, capsule, and tablet form. These supplements are generally expensive, and have a strong flavor that many people find unpleasant.

Precautions

Because spirulina is sensitive to pollutants in sea water, it can be used as a biosensor to measure the toxicity of a given body of water. Unfortunately, this sensitivity means that spirulina grown in water contaminated with heavy metals can concentrate these toxic substances. Mercury levels are of particular concern. Infectious organisms may also be present and contaminate harvested algae, so reputable sources of spirulina should be used.

Phenylketonurics should avoid spirulina due to the potential content of phenylalanine.

A number of varieties of blue-green algae, including *Aphanizomenon flos-quae* and *Anabaena*, have been found to sometimes produce toxins that may affect the nervous system or the liver.

Side effects

The potential side effects of spirulina are primarily gastrointestinal, and include **diarrhea**, **nausea**, and **vomiting**. Allergic reactions occur rarely, but can cause **insomnia** and **anxiety**.

Interactions

No interactions of spirulina with foods, conventional medications, or herbs have been documented as of 2002.

Resources

BOOKS

Bratman, Steven and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & supplements: the complete guide*. Arizona: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. California: Therapeutic Research Faculty, 1999.

PERIODICALS

Remirez, D., R. Gonzalez, N. Merino, et al. "Inhibitory Effects of Spirulina in Zymosan Induced Arthritis in Mice." *Mediators of Inflammation* 11 (April 2002): 75 79.

Remirez, D., N. Ledon, and R. Gonzalez. "Role of Histamine in the Inhibitory Effects of Phycocyanin in Experimental Models of Allergic Inflammatory Response." *Mediators of Inflammation* 11 (April 2002): 81 85.

Tonnina, D., et al. "Integral Toxicity Test of Sea Waters by an Algal Biosensor." *Annali di Chimica (Rome)* 92 (April 2002): 477 484.

Varga, L., J. Szigeti, R. Kovacs, et al. "Influence of a *Spirulina platensis* Biomass on the Microflora of Fermented ABT Milks During Storage (R1)." *Journal of Dairy Science* 85 (May 2002): 1031 1038.

OTHER

EarthNet. *EarthNet Scientific Health Library*. http://www.spirulina.com/SPLAbstracts1.html (2000).

Earthrise. *Spirulina Library Abstracts and Summaries*. http://www.earthrise.com/ERLibAbstracts2.html (2000).

Mayo Clinic. *Mayo Clinic: Blue green algae*. http://www.mayohealth.org/mayo/askdiet/htm/new/qd970618.htm (1997).

Judith Turner
Rebecca J. Frey, PhD

Sports massage

Definition

Sports massage is a form of bodywork geared toward participants in athletics. It is used to help prevent injuries, to prepare the body for athletic activity and maintain it in optimal condition, and to help athletes recover from workouts and injuries. Sports massage has three basic forms: pre-event massage, post-event massage, and maintenance massage.

Origins

Sports massage has antecedents in earlier periods of history. The ancient Greeks and Romans combined massage and **exercise** in their athletic training. Various Asian cultures also developed forms of massage for dancers and for students of **martial arts**. As a formal practice, however, sports massage began in the Soviet Union and Communist bloc countries in the 1960s. Soviet teams were the first to have a massage therapist travel with them and work on their athletes on a regular and ongoing basis. Through sports and cultural exchanges, the concept of sports massage moved to Europe and the United States in the 1970s. Over time the benefits of sports massage became accepted, and sports massage became a part of the training regimen, first of professional athletes, then of college and amateur athletes. Today sports massage is recognized as a specialty by the American **Massage Therapy** Association.

Sports trainer giving athlete massage. *(© Paul Paris / Alamy)*

KEY TERMS

Aneurysm—A sac or weak spot formed by the stretching of the wall of an artery.

Cupping—A type of percussion stroke in which the massage therapist strikes or thumps the muscles with cupped hands.

Effleurage—A massage technique that involves light stroking with the palms or thumbs.

Petrissage—A massage technique in which the therapist kneads the muscles with both hands.

Phlebitis—Inflammation of a vein, often accompanied by swelling and the formation of blood clots.

Benefits

Sports massage is a generic term for three different types of massage associated with athletic performance. Each type of massage has its own benefits and uses different techniques.

Pre-event sports massage is done to help prevent serious athletic injury. It helps to warm up the muscles, stretching them and making them flexible for optimal athletic performance. A pre-event massage stimulates the flow of blood and nutrients to the muscles, reduces muscle tension, loosens the muscles, and produces a feeling of psychological readiness.

Whenever athletes exercise heavily, their muscles suffer microtraumas. Small amounts of swelling occur in the muscle because of tiny tears. Post-event sports massage helps reduce the swelling caused by microtraumas; loosens tired, stiff muscles; helps maintain flexibility; promotes blood flow to the muscle to remove lactic acid and waste build-up; and reduces cramping. In addition, post-event massage helps speed the athlete's recovery time and alleviates pulls, **strains**, and soreness.

Maintenance sports massage is done at least once a week as a regular part of athletic training programs, although professional athletes who have their own massage therapists may have maintenance massage daily. Maintenance massage increases the flow of blood and nutrients to the muscles. It also keeps the tissues loose so that different layers of muscle slide easily over each other. Maintenance sports massage also helps reduce the development of scar tissue while increasing flexibility and range of motion.

The goal of all sports massage is to maximize athletic performance. Athletes in different sports will concentrate the massage on different parts of the body.

Conditions that generally respond well to massage as a complementary therapy include:

- muscle pain and stiffness
- muscle strain
- edema (swelling)
- muscle soreness
- muscle sprains
- muscle tension
- sore spots
- repetitive strain injuries
- tendinitis

Massage can help these conditions, but it should never be used to replace skilled medical care.

Description

Each type of sports massage uses different massage techniques. Effleurage is a light stroking that can

be performed with the palms or the thumbs. The pressure and speed is varied depending on the muscle and the desired result. Effleurage increases blood flow to the muscle. Petrissage is a form of two-handed kneading in which both hands pick up the muscle and compress it. This technique loosens tight bunches of muscles. Percussive strokes are blows or strikes on the muscle, often performed with the little fingers. They are used to tone the muscles. **Cupping** involves percussing or striking the muscles with cupped hands. It stimulates the skin and causes muscle contractions that help tone the muscles. There are variations on all these strokes, such as deep cross-fiber friction to separate muscle fibers and break down scar tissue, and jostling to relieve muscle tension. A good sports massage therapist will combine techniques to achieve the maximum desired result. Sports massage sessions generally last 30-60 minutes.

Pre-event massage is given shortly before an athlete competes. It consists mainly of brisk effleurage to stimulate and warm the muscles and petrissage to help muscles move fluidly and to reduce muscle tension. Effleurage is generally a relaxing **stroke**, but when done briskly it is stimulating. As the massage progresses, the pressure increases as the massage therapist uses percussive strokes and cupping to stimulate the muscles to contract and flex. The part of the body being massaged varies from sport to sport, although leg and back muscles are common targets for this type of massage.

Post-event massage is usually given 1–2 hours after the competition is over in order to give dilated blood vessels a chance to return to their normal condition. Post-event massage is light and gentle in order not to damage already stressed muscles. The goal is to speed up removal of toxic waste products and reduce swelling. Very light effleurage will decrease swelling while light petrissage will help clear away toxins and relieve tense, stiff muscles. Post-event massage can be self-administered on some parts of the body such as the legs.

Maintenance massage is performed at least once a week while the athlete is in training. It is frequently administered to the back and legs. Deep effleurage and petrissage are used to relax and tone knotted muscles.

Preparations

No special preparations are needed to participate in a sports massage. Athletes should wait 1–2 hours after competing before having a post-event massage.

Precautions

Massage may be an appropriate technique for helping certain sports injuries, especially muscle injuries, to heal. When treating an injury, however, it is best to seek advice from a qualified sports therapist or a specialist in sports medicine before performing any massage. Certain ligament and joint injuries that need immobilization and expert attention may be aggravated by massage.

People who suffer from the following conditions or disorders should consult a physician before participating in a sports massage: acute infectious disease; aneurysm; heavy bruising; **cancer**; hernia; high blood pressure; inflammation due to tissue damage; **osteoporosis**; **phlebitis**; **varicose veins**; and certain skin conditions. Individuals who are intoxicated are not good candidates for sports massage.

Side effects

Sports massage is safe and effective. When given correctly, there are no undesirable side effects.

Research and general acceptance

Sports massage has become an established and accepted practice. Various studies done in both the United States and Europe have shown that when properly used, massage will produce greater blood flow to the muscles and better athletic performance. The practice of sports massage is not considered controversial.

Training and certification

Accredited sports massage therapists must first complete a course in general massage from a school accredited by the American Massage Therapy Association/Commission on Massage Training Accreditation/Approval (AMTA/COMTAA) or their State Board of Education. They must then complete an additional training program approved by the AMTA National Sports Massage Certification Program. Many sports massage practitioners also complete the National Certification Examination for Therapeutic Massage and Bodywork.

Resources

BOOKS

Cassar, Mario Paul. *Massage Made Easy*. Allentown, PA: People's Medical Society, 1995.

Johnson, Joan. *The Healing Art of Sports Massage*. Emmaus, PA: Rodale Press, 1995.

ORGANIZATIONS

American Massage Therapy Association. 820 Davis Street, Suite 100. Evanston, IL 60201. (847) 864 0123.

National Certification Board for Therapeutic Massage and Bodywork. 8201 Greensboro Drive, Suite 300. McLean, VA 22102. (703) 610 9015.

Tish Davidson

Sprains & strains

Definition

Sprain refers to damage or tearing of ligaments or a joint capsule. Strain refers to damage or tearing of a muscle.

Description

When excessive force is applied to a joint, the ligaments that hold the bones together may be torn or damaged. This results in a sprain, and its seriousness depends on how badly the ligaments are torn. Any ligament can be sprained, but the most frequently injured ligaments are at the ankle, knee, and finger joints.

Strains are tears in the muscle. Sometimes called pulled muscles, they usually occur because a muscle lacks the flexibility, strength, or endurance to perform a certain activity. The majority of strains occur where the muscle meets the tendon, although they may occur in the middle of the muscle belly, as well.

Children under age eight are less likely to have sprains than are older people. Children's ligaments are tighter, and their bones are more apt to break before a ligament tears. People who are active in sports suffer more strains and sprains than less active people. Repeated sprains in the same joint make the joint less stable and more prone to future sprains. Muscle strains are also more likely to occur in muscles that have been previously injured.

Causes and symptoms

There are three grades of sprains. Grade I sprains are mild injuries where there is a stretching or mild tearing of the ligament, yet no joint function is lost. However, there may be tenderness and slight swelling.

Grade II sprains are caused by a partial tear in the ligament. These sprains are characterized by obvious swelling, localized tenderness, **pain**, joint laxity, difficulty bearing weight if the injury is to a lower extremity, and reduced function of the joint.

Severe ankle sprain. Complete rupture of Achilles tendon. *(James Cavallini / Photo Researchers, Inc.)*

Grade III, or third degree, sprains are caused by complete tearing of the ligament where there is severe pain, loss of joint function, widespread swelling, and the inability to bear weight if in the lower extremity. While a Grade III sprain may be very painful when it occurs, it is sometimes not painful after the injury because the ligament fibers have been completely torn and nothing is pulling on them. If this is true, the injury will be accompanied by a significant loss in joint stability.

Strains, like sprains, are also graded in three different categories. Grade I strains are considered mild. They are categorized by some localized swelling with no significant disruption of the muscle tendon unit. Stretching or contraction of the muscle may be painful.

Grade II strains indicate some disruption of the muscle tendon unit. They will often show a loss of strength and limitation in active motion, but the muscle has not been completely disrupted.

KEY TERMS

Ligament—Tough, fibrous connective tissue that holds bones together at joints.

Moxibustion—A treatment where crushed leaves of the plant vulgaris are formed into a cigar-like form that is lit and held directly over the skin of the area being treated.

Grade III, or third degree, strains indicate a complete rupture in the muscle tendon unit. This injury is likely to be very painful and often the individual will report hearing a loud pop or snap when the injury occurred. The site of injury is often quite visible and there will be a significant defect in the muscle that can be felt with the fingers. A Grade III muscle strain will often have very serious bruising with it as well.

Diagnosis

Grade I sprains and strains are usually self-diagnosed. Grade II and III sprains are often seen by a physician who may x ray the area to differentiate between a sprain and other serious joint injuries. Since muscles don't show up on x ray, Grade II and III muscle strains are usually diagnosed by physical examination.

Treatment

While the primary problem with sprains and strains is a torn or damaged ligament or muscle fiber, additional complications may develop as a result of swelling and immobilization of the injured area. In order to prevent these complications from worsening, alternative practitioners endorse RICE: Rest, Ice for 48 hours, Compression (wrapping in an elastic bandage), and Elevation of the sprain or strain above the level of the heart.

Nutritional therapists recommend **vitamin C** and **bioflavonoids** to supplement a diet high in whole grains, fresh fruits, and vegetables. Anti-inflammatories, such as **bromelain** (a proteolytic enzyme from pineapples) and **turmeric** (*Curcuma longa*), may also be helpful. The homeopathic remedy *Arnica* (*Arnica montana*) may be used initially for a few days, followed by Rhus tox (*Rhus toxicodendron*) for joint-related injuries or *Ruta rutagraveolens* for muscle-related injuries. **Arnica** gel or ointment, such as *Traumeel*, or a homeopathic combination of arnica and other remedies, has also been found effective with certain joint sprains.

Traditional Chinese medicine has been effectively used to treat soft tissue injuries like sprains and strains. **Acupuncture** is used to treat pain and speed the healing process in the damaged tissues by moving blocked energy from the area. The radiant heat of **moxibustion** may also be used to improve the healing response in the damaged tissues.

Specialized forms of massage and soft tissue manipulation may be used by a variety of practitioners. Massage has significant effects in enhancing local circulation, promoting earlier mobility, and speeding the healing response in the damaged tissue. It will most often be used in combination with other approaches including stretching and range of motion exercises.

Allopathic treatment

Grade I sprains and strains can be treated at home. Basic first aid for sprains consists of RICE (Rest, Ice, Compression, and Elevation). Over-the-counter pain medication such as acetaminophen (Tylenol) or ibuprofen (Motrin) can be taken for pain.

People with grade II sprains or strains may often be referred to physical therapy. Crutches or splints may be used during the healing process to help maintain stability. Surgery may be required for Grade III sprains or strains as a greater amount of damage will often prevent adequate healing without surgery.

Expected results

Moderate sprains and strains heal within two to four weeks, but it can take months to recover from severe injuries. Until recently, tearing the ligaments of the knee meant the end to an athlete's career. Improved surgical and rehabilitative techniques now offer the possibility of complete recovery. However, once a ligament has been sprained, it may not be as strong as it was before. A muscle that has been strained is also more susceptible to re-injury.

Prevention

Sprains and strains can be prevented by warming up before exercising, using proper form when performing activities and conditioning, being careful not to **exercise** past the point of **fatigue**, and taping or bracing certain joints to protect from injury.

Resources

BOOKS

Benjamin, Ben. *Listen to Your Pain*. New York: Penguin, 1984.

Burton Goldberg Group. "Sprains." In *Alternative Medicine: The Definitive Guide,* edited by James Strohecker. Puyallup, WA: Future Medicine Publishing, 1994.
Corrigan, Brian, and G.D. Maitland. *Musculoskeletal & Sports Injuries*. Oxford: Butterworth Heinemann, 1994.
Pelletier, Kenneth R. *The Best Alternative Medicine*. New York: Simon & Schuster, 2000.
"Sprains and strains." In *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life Books, 1996.

PERIODICALS

Wexler, Randall K. "The Injured Ankle." *American Family Physician* 57 (February 1, 1998): 474.

Whitney Lowe

Sprue *see* **Celiac disease**

Squaw root *see* **Black cohosh**

Squawvine

Description

Squawvine (*Mitchella repens*) is a plant that is native to North America. It is an evergreen herb belonging to the madder or Rubiaceae family. It grows in the forests and woodlands of the eastern United States and Canada. Squawvine is usually found at the base of trees and stumps. Although squawvine grows year round, herbalists recommend collecting the herb when the plant flowers during the months of April through June.

Squawvine's name refers to its use by Native American women as a remedy for a range of conditions. Squawvine is also referred to as "partridge berry" because some people consider the other name to be insulting to Native American women. Squawvine is also known as squaw vine, squaw berry, checkerberry, deerberry, winter clover, twinberry, and hive vine.

General use

Squawvine's name stems from its use by Native American women for conditions related to childbearing. The plant was used to ease menstrual cramps, strengthen the uterus for **childbirth**, and prevent miscarriage. During the final 2 to 4 weeks of a Native American woman's pregnancy, she drank tea made from squawvine leaves so that childbirth was less painful. The herb was said to regulate contractions so that the baby was delivered safely, easily, and quickly. After the baby was born, the Native American mother who nursed her child would put a squawvine solution on her nipples to relieve the soreness.

In folk medicine, squawvine continued to be a remedy for women's disorders. In addition to conditions related to childbirth, the herb was used to treat postpartum **depression**, irregular menstruation, and bleeding. In addition to treating internal ailments, a squawvine wash was said to provide relief to sore eyes. Squawvine is still used in folk medicine to treat conditions including anxiety, **hemorrhoids**, insomnia, **muscle spasms**, **edema**, gravel, and inflammation.

Current uses of squawvine

Squawvine is used in alternative medicine to tone the uterine lining and prepare a woman's body for childbirth. The herb is taken for painful menstruation and to tone the prostate. It is also said to help promote fertility and to increase the flow of mother's milk.

Furthermore, squawvine is recognized by practitioners of alternative medicine for its effectiveness as a diuretic. It is used to treat such urinary conditions as suppression of urine. Squawvine is also a remedy for **diarrhea**, shrinking tissues, muscle spasms, and nerves.

Squawvine is still used as an eye wash. It is also used as a skin wash and to treat **colitis**.

Preparations

Squawvine is available in various forms. Commercial preparations include tinctures, extracts and powdered herb.

Squawvine tea, which is also known as an infusion, is made by pouring 1 cup (240 ml) of boiling water over 1 tsp (1.5 g) of the dried herb. The mixture is steeped for 10 to 15 minutes and then strained. Squawvine tea may be taken up to three times a day. Women seeking relief for difficult or painful menstruation can combine squawvine with cramp bark and pasque flower.

KEY TERMS

Decoction—A herbal extract produced by mixing a herb with cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water.

Tincture—A liquid extract of a herb prepared by steeping the herb in an alcohol and water mixture.

Squawvine tincture can be used in an infusion. The dosage is 1–2mL in 1 cup (240 ml) of boiling water. The tincture dosage can be taken three times a day.

Use in pregnancy and lactation

Pregnant women should not take squawvine during the first two trimesters of **pregnancy**. Some herbalists, however, recommend taking the herb during the eighth and ninth month to make labor easier. During those months, squawvine can be taken once or twice daily. It can be combined with raspberry leaves in this remedy to prepare for childbirth.

Nursing mothers with sore nipples can try a nineteenth-century folk remedy. A squawvine ointment is prepared by first making a decoction. A non-aluminum pan is used to boil 2 oz. (2 ml) of the powdered herb and 1 pint (470 ml) of water. The mixture is simmered for 10 minutes. It is then strained and the juice is squeezed out. The liquid is measured and an equal amount of cream is added to it. This mixture is boiled until it reaches a soft, ointment-like consistency. It is cooled and can be applied to the nipples after the baby has finished nursing.

Precautions

Some herbal remedies have been studied in Europe, but no information was available about the safety of squawvine as of June 2000. Squawvine is believed to be safe when taken in recommended dosages for a short time. There should be no problems when this remedy is used by people beyond childhood and those who are above age 45. Some of the assessment that squawvine is a safe remedy, however, is based on the fact that no problems had been reported when squawvine was used by people including pregnant women and nursing mothers.

Squawvine is an herbal remedy and not regulated by the U.S. Food and Drug Administration (FDA). The regulation process involves research into whether the remedy is safe to use. In addition, the effectiveness of squawvine for its traditional uses in childbirth and during lactation has not been clinically tested.

People should consult a doctor or health care practitioner before taking squawvine. The patient should inform the doctor about other medications or herbs that he or she takes. Once treatment with squawvine begins, people should see their doctors if their conditions haven't improved within two weeks.

Opinion is divided about whether squawvine is safe for women to use. On one side are those who caution that squawvine should be avoided by women who are currently pregnant or are planning to conceive within the short term. Herbalists advise that it should not be taken during the first two trimesters of pregnancy. Furthermore, squawvine and other herbal remedies should not be given to children under the age of two.

Side effects

There are no known side effects from using squawvine. Little research has been done, however, on its safety.

Interactions

No interactions have been reported between squawvine and other herbs or medications. Before using this herb as a remedy, however, a person should first consult with a doctor or health practitioner to discuss potential interactions.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear, with Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660. Austin TX, 78720. (512) 331 8868.

Herb Research Foundation. 1007 Pearl St., Suite 200. Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

Liz Swain

St. John's wort

Description

Hypericum perforatum is the most medicinally important species of the Hypericum genus, commonly known as St. John's wort or Klamath weed. There are as many as 400 species in the genus, which belongs to the Clusiaceae family. Native to Europe, St. John's wort is found throughout the world. It thrives in sunny fields, open woods, and gravelly roadsides. Early colonists brought this plant to North America,

St. John's Wort. *(© Arco Images / Alamy)*

and it has become naturalized in the eastern United States and California, as well as in Australia, New Zealand, eastern Asia, and South America. St. John's wort has long been one of the most commonly used herbs in the United States, especially among women. The popular use of the herb declined in the late 1990s, though, due in part to research reports that the hypericum in the plant may be less effective in treating **depression** than previously claimed.

The entire plant, particularly its round black seeds, exudes a slight turpentine-like odor. The woody-branched root spreads from the base with runners that produce numerous stalks. The simple dark green leaves are veined and grow in opposite, oblong, or oval pairs on round branching stalks that reach as high as 3 ft (91.4 cm). Tiny holes, visible when the leaf is held to the light, are actually transparent oil glands containing a chemical known as hypericin. These characteristic holes inspired the species name, Perforatum, which is the Latin word for perforated. The bright yellow star-shaped flowers, often clustered in groups of three, have five petals. Black dots along the margins of the blossom contain more hypericin. The flowers bloom in branching flat-topped clusters atop the stalks, around the time of the summer solstice. St. John's wort, sometimes called devil's flight or grace of God, was believed to contain magical properties that ward off evil spirits. Its generic name, Hypericum, is derived from a Greek word meaning "over an apparition." The herb was traditionally gathered on midsummer's eve, June 23. This date was later celebrated by Christians as the eve of the feast day of St. John the Baptist. This folk custom gave the plant its popular name. The Anglo-Saxon word wort means medicinal herb.

General use

St. John's wort has been known for its beneficial properties as far back as Roman times. On the battlefield, it was a valued remedy that promoted healing from trauma and inflammation. The herb is regarded as a vulnerary, an agent that can speed the healing of **wounds**, **bruises**, ulcers, and **burns**. It is also popularly used as a nervine for its calming effect, easing tension and **anxiety**, relieving mild depression, and soothing women's mood swings during **menopause**. The bittersweet herb is licensed in Germany for use in mild depression, anxiety, and sleeplessness. It is said to be helpful in nerve injury and trauma and was used in the past to speed healing after brain surgery. Its antispasmodic properties were thought to ease uterine cramping and menstrual difficulties. St. John's wort may also be used as an expectorant.

Laboratory and animal studies have demonstrated that the hypericin in St. John's wort possesses antiviral properties. The herb is said to be effective against **influenza**, herpes simplex types I and II, and other viruses. The light-sensitive properties of hypericin have been useful diagnostically in detecting the presence of certain cancers. An infusion of the plant, taken as a tea, has been helpful in treating **bedwetting** in children. The oil has been used internally to treat **colic**, intestinal **worms**, and abdominal **pain**. The plant's medicinal parts are its fresh leaves and flowers. This herbal remedy has been extensively tested in West Germany and is dispensed throughout Germany as a popular medicine called *Johanniskraut*. Commercially prepared extracts are commonly standardized to contain 0.3% hypericin.

Clinical studies

In contrast to early European reports made in the 1980s, subsequent clinical studies tended to undermine the claims made for St. John's wort as a possible treatment for HIV infection and major depression. As of 2002, health care professionals and regulatory agencies in Europe were advised to warn **AIDS** patients that

St. John's wort decreases the effectiveness of drugs known as HIV protease inhibitors.

In 2005, the British Journal of Psychiatry reported on a systematic review of 37 previous scientific studies. The studies compared the clinical benefits to adults with depressive disorders of hypericum in St. John's wort and either a placebo or a standard antidepressant. The researchers reviewing the studies concluded that the evidence regarding the clinical effectiveness of hypericum extract was "inconsistent and confusing." Some of the trials suggested that St. John's wort extract had "minimal beneficial effects" in treating major depression, while other trials suggested "similar beneficial effects" when using either a standard antidepressant or the hypericum extract of St. John's wort.

In a placebo-controlled study reported in 2005 in the Journal of Clinical Psychopharmacology researchers gave dosages of either St. John's wort extract, fluoxetine (Prozac), or a sugar pill to 135 depressed patients over a three-month period. They found that the herbal extract of St. John's wort was more effective than the pharmaceutical fluoxetine but was not statistically more effective than the placebo sugar pill.

Preparations

An oil extract can be purchased commercially or prepared by combining fresh St. John's wort flowers and leaves in a glass jar with sunflower or olive oil. The container should be sealed with an airtight lid and placed on a sunny windowsill for four to six weeks. It should be shaken daily. When the oil absorbs the red pigment, the mixture is strained through muslin or cheesecloth and stored in a dark container. The medicinal oil maintains its potency for two years or more. The oil of St. John's wort has been known in folk culture as Oil of Jesus. This oil forms a rub used for painful joints, **varicose veins**, muscle strain, arthritis, and rheumatism. Placed in a compress, it can help to heal wounds and inflammation, and relieve the pain of deep bruising.

An infusion is made by pouring one pint of boiling water over 1 oz (28 g) of dried herb, or 2 oz (57 g) of fresh, minced flower and leaf. It is steeped in a glass or enamel pot for five to 10 minutes, then strained and covered. The tea should be consumed while it is warm. A general dose is one cup, up to three times daily.

To prepare a capsule, the leaves and flowers are dried and ground with a mortar and pestle into a fine powder. The mixture is then placed in gelatin capsules. The potency of the herb varies with the soil, climate, and harvesting conditions of the plant. A standardized extract of 0.3% hypericin extract, commercially prepared from a reputable source, is more likely to yield reliable results. Standard dosage is up to three 300 mg capsules of 0.3% standardized extract daily.

A tincture is prepared by combining one part fresh herb to three parts alcohol (50% alcohol/water solution) in a glass container. The mixture is placed in a dark place and shaken daily for two weeks. Then it is strained through muslin or cheesecloth and stored in a dark bottle. The tincture should maintain potency for two years. Standard dosage, unless otherwise prescribed, is 0.24–1 tsp added to 8 oz (227 g) of water, up to three times daily.

A salve can be made by warming 2 oz (57 g) of prepared oil extract in a double boiler. Once warmed, 1 oz (28 g) of grated beeswax is added and mixed until melted. The mixture is poured into a glass jar and allowed to cool. The salve can be stored for up to one year. The remedy keeps best if refrigerated after preparation. The salve is useful in treating burns, wounds, and soothing painful muscles. It is also a good skin softener. St. John's wort salve may be prepared in combination with **calendula** extract (*Calendula officinalis*) for application on bruises.

Precautions

There are a number of important precautions to observe in using St. John's Wort. Pregnant or lactating women should not use the herb at all. Animal studies have linked St. John's wort to lower birth weight, and there are studies showing that breastfed infants whose mothers are using St. John's wort may experience drowsiness or colic. Persons taking prescription antidepressants of any kind should not use St. John's wort at the same time, as the herb may precipitate a health crisis known as serotonin syndrome. Serotonin syndrome is potentially life threatening; it is characterized by changes in level of consciousness, behavior, and neuromotor functioning as a result of increased levels of the neurotransmitter serotonin in the central nervous system. Drug interactions are the most common cause of serotonin syndrome. Several cases of serotonin syndrome have been reported in patients who were taking St. John's Wort by itself or in combination with SSRIs, fenfluramine (Pondimin), or nefazodone (Serzone). Persons using the herb should discontinue it a minimum of two weeks prior to any surgery requiring general anesthesia, as it interacts with a number of intravenous and inhaled anesthetics.

It is also important for persons using St. John's Wort to purchase the herb from a reputable source, as the quality of herbal products sold in the United States and Canada varies widely. One study of 10 popular

herb samples, including St. John's wort, reported in 2003 that each herb had "a large range in label ingredients and recommended daily dose (RDD) across available products." The researchers recommended that physicians and consumers pay very close attention to labels on over-the-counter (OTC) herbal products.

In addition to the herb's potential risks to humans, it can be toxic to livestock. Toxic effects in cattle include reports of **edema** of the ears, eyelids, and the face due to photosensitization after the animal eats the herb. Exposure to sunlight activates the hypericin in the plant. Adverse effects have been reported in horses, sheep, and swine, including a staggering gait and blistering or peeling of the skin. Smaller animals, such as rabbits, suffer severe side effects from accidental ingestion of St. John's wort. The Veterinary **Botanical Medicine** Association (VBMA), which was founded in 2002 as an offshoot of the American Veterinary Medical Association (AVMA), offers a page on its Web site for reporting adverse effects of St. John's wort or any other herb in cats, dogs, or other animals.

Side effects

When used either internally or externally, the herb may cause photodermatitis in humans with fair or sensitive skin, following exposure to sunlight or other sources of ultraviolet light. There have also been some case reports of side effects in breast-feeding women taking hypericum extract. Changes in the nutritional quality and flavor of the milk, as well as reduction or cessation of lactation, have been reported. In addition, St. John's wort has been known to cause headaches, stiff neck, **nausea** or **vomiting**, and high blood pressure in susceptible individuals.

Interactions

There is consistent evidence that St. John's wort has a number of problematic interactions with many drugs. It has been reported to interact with amphetamines, **asthma** inhalants, decongestants, diet pills, narcotics, tryptophan and tyrosine (**amino acids**), as well as antidepressant medications and certain foods. It has also been reported to interfere with the effectiveness of birth control pills as well as with indinavir (Crixivan) and other AIDS medications. Moreover, anesthesiologists have reported that the herb increases bleeding time in patients under general anesthesia. Patients should always consult a mainstream health practitioner before using St. John's wort and should discontinue taking it at least two weeks prior to major surgery. As of 2008, additional studies were underway to examine the interactions of St. John's wort with the absorption, metabolism, and elimination of various types of prescription medications.

KEY TERMS

Antispasmodic—A drug or medication given to relieve mild intestinal cramping or muscle spasms.

Expectorant—A medication or preparation that encourages the discharge of mucus from the respiratory system.

Nervine—A medication or preparation given to calm the nervous system.

Neurotransmitter—Any of several compounds produced in the body that relay nerve impulses from one nerve cell to another. St. John's wort has been reported to affect the balance of neurotransmitters in the brain.

Serotonin syndrome—A potentially life-threatening reaction to increased levels of the neurotransmitter serotonin in the central nervous system, most often as a result of drug interactions. St. John's wort has been implicated in several cases of serotonin syndrome.

Vulnerary—A medication or preparation used to heal wounds, bruises, sprains, and ulcers.

Resources

BOOKS

Muller, W. E., ed. *St. John's Wort and Its Active Principles in Depression and Anxiety (Milestones in Drug Therapy)* Basel, Switzerland: Birkhauser, 2005.

PERIODICALS

Fava, M., et al. "A Double Blind, Randomized Trial of St. John's Wort, Fluoxetine, and Placebo in Major Depressive Disorder." *Journal of Clinical Psychophar macology* 25, no. 5 (October 2005): 441 47.

Linde, K., et al. "St. John's Wort for Depression." *Cochrane Database System Review* (April 18, 2005): 2: CD000448.

S. R. "St. John's Wort Caution Urged." *Fit Pregnancy* 13, no. 7. (February/March 2007).

ORGANIZATIONS

American Botanical Council, PO Box 144345, Austin, TX, 78714 4345, (512) 926 4900, http://abc.herbalgram.org.

Food and Drug Administration (FDA), 5600 Fishers Lane, Rockville, MD, 20857, (888) 463 6332, http://www.fda.gov.

Herb Research Foundation, 1007 Pearl St., Suite 200, Boulder, CO, 80302, (303) 449 2265, http://www.herbs.org.

National Center for Complementary and Alternative Med icine (NCCAM) Clearinghouse, PO Box 7923,

Gaithersburg, MD, 20898 7923, (888) 644 6226, http://nccam.nih.gov.
Veterinary Botanical Medicine Association (VBMA). c/o Susan G. Wynn, DVM, , 334 Knollwood Lane, Woodstock, GA, 30188, s.wynn@vbma.org., http://www.vbma.org.

Clare Hanrahan

Staphylococcal infections

Definition

Staphylococcal (staph) **infections** are communicable infections caused by staph organisms and often characterized by the formation of abscesses. They are the leading cause of primary infections originating in hospitals (nosocomial infections) in the United States.

Description

Classified since the early twentieth century as among the deadliest of all disease-causing organisms, staph exists on the skin or inside the nostrils of 20–30% of healthy people. It is sometimes found in breast tissue, the mouth, and the genital, urinary, and upper respiratory tracts.

Although staph bacteria are usually harmless, when injury or a break in the skin enables the organisms to invade the body and overcome the body's natural defenses, consequences can range from minor discomfort to death. Infection is most apt to occur in:

- Newborns (especially those born prematurely).
- Women who are breast-feeding.
- Persons whose immune systems have been undermined by radiation treatments, chemotherapy, HIV, or medication.
- Intravenous drug users.
- Those with surgical incisions, skin disorders, and serious illness like cancer, diabetes, and lung disease.
- The elderly, particularly those who are confined to nursing homes.

Types of infections

Staph skin infections often produce pus-filled pockets (abscesses) located just beneath the surface of the skin or deep within the body. Risk of infection is greatest among the very young and the very old.

Patient with staphylococcal orbital cellulitis. *(Science Source / Photo Researchers, Inc.)*

A localized staph infection is confined to a ring of dead and dying white blood cells and bacteria. The skin above it feels warm to the touch. Most of these abscesses eventually burst, and pus leaking onto the skin can cause new infections.

A small fraction of localized staph infections enter the bloodstream and spread through the body. In children, these systemic (affecting the whole body) or disseminated infections frequently affect the ends of the long bones of the arms or legs, causing a bone infection called osteomyelitis. When adults develop invasive staph infections, bacteria are most apt to cause abscesses of the brain, heart, kidneys, liver, lungs, or spleen.

KEY TERMS

Abscess—A localized accumulation of pus in a body tissue.

Bacteremia—The presence of bacteria in the bloodstream.

Endocarditis—Inflammation of the lining of the heart, and/or the heart valves, caused by infection.

Fluoroquinolones—A group of newer antibiotics that are used to treat penicillin-resistant staphylococcal infections.

Nosocomial—Contracted in a hospital. Staph infections are the most common type of nosocomial infections.

Superantigen—A type of bacterial toxin that triggers abnormal activation of T-cells, which regulate the body's response to infected or malignant cells. *S. aureus* is responsible for the production of a number of different superantigens.

TOXIC SHOCK. **Toxic shock syndrome** is a life-threatening infection characterized by severe **headache**, **sore throat**, **fever** as high as 105°F (40.6°C), and a sunburn-like rash that spreads from the face to the rest of the body. Symptoms appear suddenly; they also include dehydration and watery **diarrhea**.

Inadequate blood flow to peripheral parts of the body (shock) and loss of consciousness occur within the first 48 hours. Between the third and seventh day of illness, skin peels from the palms of the hands, soles of the feet, and other parts of the body. Kidney, liver, and muscle damage often occur.

SCALDED SKIN SYNDROME. Rare in adults and most common in newborns and other children under the age of five, scalded skin syndrome originates with a localized skin infection. A mild fever and/or an increase in the number of infection-fighting white blood cells may occur.

A bright red rash spreads from the face to other parts of the body and eventually forms scales. Large, soft **blisters** develop at the site of infection and elsewhere. When they burst, they expose inflamed skin that looks as if it had been burned.

MISCELLANEOUS INFECTIONS. *Staphylococcus aureus* can also cause:

- arthritis
- bacteria in the bloodstream (bacteremia)
- pockets of infection and pus under the skin (carbuncles)
- tissue inflammation that spreads below the skin, causing pain and swelling (cellulitis)
- inflammation of the valves and walls of the heart(endocarditis)
- inflammation of tissue that enclosed and protects the spinal cord and brain (meningitis)
- inflammation of bone and bone marrow (osteomyelitis).
- pneumonia

Types of staph infections

STAPHYLOCOCCUS AUREUS. Named for the golden color of the bacterium when grown under laboratory conditions, *S. aureus* is a hardy organism that can survive in extreme temperatures or other inhospitable circumstances. About 70–90% of the population carry this strain of staph in the nostrils at some time. Although present on the skin of only 5–20% of healthy people, as many as 40% carry it elsewhere, such as in the throat, vagina, or rectum, for varying periods of time, from hours to years, without developing symptoms or becoming ill.

S. aureus flourishes in hospitals, where it infects healthcare personnel and patients who have had surgery; who have acute **dermatitis**, insulin-dependent diabetes, or dialysis-dependent kidney disease; or who receive frequent allergy-desensitization injections. Staph bacteria can also contaminate bedclothes, catheters, and other objects. In many cases, staph contamination in hospitals is made worse by overprescribing and misuse of antibiotics. The result is the emergence of **strains** of *S. aureus* that are resistant to antibiotics.

S. aureus causes a variety of infections. **Boils** and inflammation of the skin surrounding a hair shaft (folliculitis) are the most common. Toxic shock (TSS) and scalded skin syndrome (SSS) are among the most serious. *S. aureus* is also emerging as a leading cause of infective endocarditis and of a higher mortality rate from this disorder.

Together with *S. pyogenes*, *S. aureus* is known to be a major producer of superantigens, which are bacterial exotoxins that trigger abnormal and excessive activation of T-cells. T cells are produced in the thymus gland and regulate the human immune system's response to infection. Superantigens are being studied intensively for their roles in causing disease. Staphylococci are responsible for at least 19 different superantigens.

S. EPIDERMIDIS. Capable of clinging to tubing (as in that used for intravenous feeding, etc.), prosthetic devices, and other non-living surfaces, *S. epidermidis*

is the organism that most often contaminates devices that provide direct access to the bloodstream.

The primary cause of bacteremia in hospital patients, this strain of staph is most likely to infect **cancer** patients, whose immune systems have been compromised, and high-risk newborns receiving intravenous supplements.

S. epidermidis also accounts for two of every five cases of prosthetic valve endocarditis. Prosthetic valve endocarditis is endocarditis as a complication of the implantation of an artificial valve in the heart. Although contamination usually occurs during surgery, symptoms of infection may not become evident until a year after the operation. More than half of the patients who develop prosthetic valve endocarditis die.

STAPHYLOCOCCUS SAPROPHYTICUS. Existing within and around the tube-like structure that carries urine from the bladder (urethra) of about 5% of healthy males and females, *S. saprophyticus* is the second most common cause of unobstructed urinary tract infections (UTIs) in sexually active young women. This strain of staph is responsible for 10-20% of infections affecting healthy outpatients.

Causes and symptoms

Staph bacteria can spread through the air, but infection is almost always the result of direct contact with open sores or body fluids contaminated by these organisms.

Warning signs

Common symptoms of staph infection include:

- Pain or swelling around a cut, or an area of skin that has been scraped.
- Boils or other skin abscesses.
- Blistering, peeling, or scaling of the skin. This is most common in infants and young children.
- Enlarged lymph nodes in the neck, armpits, or groin.

A family physician should be notified whenever:

- A boil or carbuncle appears on any part of the face or spine. Staph infections affecting these areas can spread to the brain or spinal cord.
- A boil becomes very sore. Usually a sign that infection has spread, this condition may be accompanied by fever, chills, and red streaks radiating from the site of the original infection.
- Boils that develop repeatedly. This type of recurrent infection could be a symptom of diabetes.

Diagnosis

Blood tests that show unusually high concentrations of white blood cells can suggest staph infection, but diagnosis is based on laboratory analysis of material removed from pus-filled sores, and on analysis of normally uninfected body fluids, such as blood and urine. Also, x rays can enable doctors to locate internal abscesses and estimate the severity of infection. Needle biopsy (removing tissue with a needle, then examining it under a microscope) may be used to assess bone involvement.

Treatment

Superficial staph infections can generally be cured by keeping the area clean and antiseptic and applying warm, moist compresses to the affected area for 20 to 30 minutes three or four times a day.

Among the therapies believed to be helpful for the person with a staph infection are **yoga** (to stimulate the immune system and promote **relaxation**), **acupuncture** (to draw heat away from the infection), and herbal remedies. Herbs that may help the body overcome, or withstand, staph infection include:

- Garlic (*Allium sativum*). This herb is believed to have antibacterial properties. Herbalists recommend consuming three garlic cloves or three garlic oil capsules a day, starting when symptoms of infection first appear.
- Cleavers (*Galium aparine*). This anti-inflammatory herb is believed to support the lymphatic system. It may be taken internally to help heal staph abscesses and reduce swelling of the lymph nodes. A cleavers compress can also be applied directly to a skin infection.
- Goldenseal (*Hydrastis canadensis*). Another herb believed to fight infection and reduce inflammation, goldenseal may be taken internally when symptoms of infection first appear. Skin infections can be treated by making a paste of water and powdered goldenseal root and applying it directly to the affected area. The preparation should be covered with a clean bandage and left in place overnight.
- Echinacea (*Echinacea* spp.). Taken internally, this herb is believed to have antibiotic properties and is also thought to strengthen the immune system.
- Thyme (*Thymus vulgaris*), lavender (*Lavandula officinalis*), or bergamot (*Citrus bergamot*) oils. These oils are believed to have antibacterial properties and may help to prevent the scarring that may result from skin infections. A few drops of these oils are

added to water and then a compress soaked in the water is applied to the affected area.

- Tea tree oil (*Melaleuca* spp., or ylang ylang). Another infection-fighting herb, this oil can be applied directly to a boil or other skin infection.

Allopathic treatment

Severe or recurrent infections may require a seven- to 10-day course of treatment with penicillin or other oral antibiotics. The location of the infection and the identity of the causal bacterium determines which of several effective medications should be prescribed. In recent years, doctors have turned to such newer medications as vancomycin or the fluoroquinolones to treat staph infections because strains of *S. aureus* have emerged that are resistant to penicillin and the older antibiotics.

In case of a more serious infection, antibiotics may be administered intravenously for as long as six weeks. Intravenous antibiotics are also used to treat staph infections around the eyes or on other parts of the face.

Surgery may be required to drain or remove abscesses that form on internal organs, or on shunts or other devices implanted inside the body.

Expected results

Most healthy people who develop staph infections recover fully within a short time. Others develop repeated infections. Some become seriously ill, requiring long-term therapy or emergency care. A small percentage die.

Prevention

Healthcare providers and patients should always wash their hands thoroughly with warm water and soap after treating a staph infection or touching an open wound or the pus it produces. Pus that oozes onto the skin from the site of an infection should be removed immediately. This affected area should then be cleansed with antiseptic or with antibacterial soap.

To prevent infection from spreading from one part of the body to another, it is important to shower rather than bathe during the healing process. Because staph infection is easily transmitted from one member of a household to others, towels, washcloths, and bed linens used by someone with a staph infection should not be used by anyone else. They should be changed daily until symptoms disappear, and laundered separately in hot water with bleach.

Children should frequently be reminded not to share:

- brushes, combs, or hair accessories
- caps
- clothing
- sleeping bags
- sports equipment
- other personal items

A diet rich in green, yellow, and orange vegetables can bolster natural immunity. A doctor or nutritionist may recommend vitamins or mineral supplements to compensate for specific dietary deficiencies. Drinking eight to 10 glasses of water a day can help flush disease-causing organisms from the body.

Because some strains of staph bacteria are known to contaminate artificial limbs, prosthetic devices implanted within the body, and tubes used to administer medication or drain fluids from the body, catheters and other devices should be removed on a regular basis, if possible, and examined for microscopic signs of staph. Symptoms may not become evident until many months after contamination has occurred, so this practice should be followed even with patients who show no sign of infection.

A vaccine against *S. aureus* was developed in the late 1990s for use with patients with low resistance to infection. A trial of the vaccine in hemodialysis patients indicates that it offers partial protection against bacteremia for about 40 weeks.

Resources

BOOKS

Bennett, J. Claude, and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia, PA: W. B. Saunders Company, 1996.

Civetta, Joseph M., et al, eds. *Critical Care*. Philadelphia, PA: Lippincott Raven Publishers, 1997.

Fauci, Anthony, et al, eds. *Harrison's Principles of Internal Medicine*. New York, NY: McGraw Hill, Inc., 1998.

PERIODICALS

Al Ghamdi, S., M. Gedebou, and N. E. Bilal. "Nosocomial Infections and Misuse of Antibiotics in a Provincial Community Hospital, Saudi Arabia." *Journal of Hos pital Infection* 50 (February 2002): 115 121.

Amir, L. "Breastfeeding and *Staphylococcus aureus*: Three Case Reports." *Breastfeeding Review* 10 (March 2002): 15 18.

Bradley, S. F. "*Staphylococcus aureus* Infections and Anti biotic Resistance in Older Adults." *Clinical Infectious Diseases* 34 (January 15, 2002): 211 216.

Cabell, C. H., J. G. Jollis, G. E. Peterson, et al. "Changing Patient Characteristics and the Effect on Mortality in Endocarditis." *Archives of Internal Medicine* 162 (Jan uary 14, 2002): 90 94.

Llewelyn, M., and J. Cohen. "Superantigens: Microbial Agents That Corrupt Immunity." *Lancet Infectious Diseases* 2 (March 2002): 156 162.

Shinefeld, H., S. Black, A. Fattom et al. "Use of a *Staph ylococcus aureus* Conjugate Vaccine in Patients

Receiving Hemodialysis." *New England Journal of Medicine* 346 (February 14, 2002): 491 496.

Paula Ford-Martin
Rebecca J. Frey, PhD

Stevia

Definition

Stevia is a genus of plants belonging to the Asteraceae (sunflower) family, tribe Eupatoriae. It consists of 150–300 species, perhaps the best known and most commercially important of which is *S. rebaudiana* Bertoni. In the United States and other English–speaking countries, the plant is also known as candy leaf, sweet honey leaf, sweetleaf, sugarleaf, or, simply, stevia. In Europe, the plant is often classified as *Eupatorium rebaudianum*.

Description

Stevia is native to the New World, with its natural distribution ranging from northeastern Paraguay through southeastern Brazil, Mexico, and Central America, into the southern United States. It is now cultivated in many other parts of the world, including Japan, China, Malaysia, South Korea, and parts of Europe. Stevia is a perennial bush that grows to a height of about 25 to 40 inches. It has long, lance–shaped leaves with finely serrated edges. Small white flowers grow in clusters at the end of stems. The only part of the plant used for medicinal or food purposes is the leaves.

S. rebaudiana is valued for its sweet taste, which is said to be about 300 times as intense as that of sucrose, common table sugar. Sweetness is not a universal characteristic of all stevia species; in fact, only a handful of species exhibit this property, with its being most prominent in *S. rebaudiana*. Early European visitors to South America returned with stories of a wonderful plant, one leaf of which was sufficient to sweeten a large jar of bitter tea.

The Guarani indians of Paraguay and Brazil are said to have used stevia leaves for centuries as a sweetener and a treatment for a variety of medical problems. They added stevia leaves (which they called "kaa he–he", or "sweet her") to the bitter mate tea they drank or simply chewed the leaves to enjoy their unusually sweet taste. They also used the plant to treat **obesity**, **hypertension**, heart problems, **heartburn**, diabetes, dental caries (cavities), **infections**, **fatigue**, and **depression**.

Stevia was introduced to the modern world in 1887 when Dr. Moises Santiago Bertoni, director of the College of Agriculture in Asuncion, Paraguay, was told by his guides about a "very strange plant" during an expedition in eastern Paraguay. It was more than a decade, however, before Bertoni actually received proof of the plant's existence, in the form of a packet of dried stevia leaves. When he first wrote about his discovery in December 1905, he suggested the name *Stevia rebaudiana* for the species. The name was intended to honor Paraguayan chemist Ovidio Rebaudi, who conducted the first analysis of the chemical content of stevia leaves. The variety most commonly used in modern applications is designated as *S. rebaudiana* Bertoni.

Chemists have now identified more than 100 chemical constituents in stevia, many of which are responsible for the plant's intensely sweet taste. They include a group of diterpene glycosides, hydrocarbons produced by plants to which are attached glucose–like constituents. The most common diterpene glycosides found in stevia leaves, which give them their intense sweetness, are stevioside (which has 250–300 the sweetness of sucrose), rebaudioside A (350–450 the sweetness of sugar), rebaudioside C (40–60 the sweetness of sugar), and dulcoside A (30 the sweetness of sugar).

Uses

Proponents of stevia have suggested a number of possible medicinal uses for the herb, including as a treatment for headaches, sinus congestion, rheumatism, diabetes, **food poisoning**, **allergies**, cold and flu, fatigue, **pain**, **acne**, **eczema**, **burns**, cold sores, **psoriasis**, **dandruff**, regulation of blood pressure, digestive disorders, muscular problems, nervous disorders, fluid imbalance, and improper glucose balance in the blood.

By far the most important modern application of stevia, however, is as an artificial sweetener. As concern about the possible health effects of sucrose (common table sugar) have grown over the decades, more and more people have looked to artificial sweeteners in planning their **diets**. In response to this concern, food manufacturers have developed a number of synthetic sweeteners, such as cyclamate, saccharin, aspartame, sucralose, acesulfame **potassium**, alitame, and neotame. The problem is that at least some level of health risk appears to be associated with the use of most of these new products. Some have actually been banned in the United States at one time or another in their history. Stevia appears to be somewhat different from other artificial sweeteners, first because it is not artificial, but a natural product, and second because research has shown that it appears to have no harmful effects on humans. Indeed, evidence exists to suggest that stevia may actually enhance glucose tolerance in humans, making it a logical choice as a sweetener for

diabetics. The herb is now widely used as a sweetener in most parts of east Asia, especially in Japan, where it accounts for more than half of the sweetener market, as of 2008. It is also popular as a sweetener throughout South America and the Caribbean.

The use of stevia as a sweetener in North America and Europe has been the subject of considerable controversy since at least the mid–1980s. Agencies responsible for assessing food safety in the European Union, the United Kingdom, and the United States have all expressed concern about the lack of adequate studies on the safety of stevia as a food additive. All three governmental bodies have issued restrictions on the use of stevia and stevia products as food additives. In 1991, the U.S. Food and Drug Administration (FDA) issued a statement calling stevia an unsafe food additive and prohibiting its important into the United States. The FDA's decision has become the focus of an ongoing controversy about the legal status of stevia in the United States. Some people have argued that the decision was based not on scientific evidence, but on political factors, namely efforts to protect the artificial sweetener industry. In 1993, Senator John Kyl of Arizona wrote FDA commissioner David Kessler complaining that the agency's action was "a restraint of trade to benefit the artificial sweetener industry."

Stevia's status in Europe and North America has evolved over time, however. A review by the World Health Organization (WHO) in 2006 of animal and human studies on stevia, for example, found that stevioside and rebaudioside A appear to have no harmful effects in experimental animals or humans and toxic effects observed *in vitro* for steviol (a metabolic product of stevia components) do not appear to be expressed *in vivo*. In the United States, stevia's status assumed a new aspect with the 1994 passage of the Dietary Supplement Health and Education Act. That act redefined the regulatory status of foods, food supplements, and dietary supplements, removing regulatory authority over the last of these from the FDA. Thus, in the United States today, stevia can not be advertised or sold as a food or a food additive, although it can be advertised and sold as a dietary supplement.

Side Effects

There are no reports of side effects from using stevia at the amounts normally used for sweetening purposes. Unusually high concentrations of stevia may be associated with **hypoglycemia** (low blood sugar levels) and hypotension (reduced blood pressure). Some studies have shown that experimental animals fed very large doses of chemical extracts of stevia over long periods of time have developed health problems. But the significance of these studies for much smaller amounts of the product in the human diet has not yet been assessed.

KEY TERMS

Dietary supplement—A product that is believed to have some salubrious effect on human health, whether scientific evidence for that effect exists or not. Dietary supplements are not regulated by the FDA.

Diterpene—An organic compound that contains only carbon and hydrogen arranged in a characteristic molecular structure; found commonly in plants and trees

Food additive—A chemical added to food to enhance its flavor, color, appearance, shelf life, or some other quality. Food additives are regulated by the U.S. Food and Drug Administration (FDA).

Glycoside—A sugar like compound with a molecular structure resembling that of glucose.

In vitro—Literally, "in glass," referring to laboratory experiments that do not make use of living organisms.

In vivo—Literally, "in life," referring to laboratory experiments that make use of living organisms.

Potentiation—The tendency for a substance or treatment to increase the effectiveness of some other substance or treatment.

Interactions

In quantities significantly greater than those used for normal sweetening purposes, stevia may potentiate antihypertensive and antidiabetic medications. There is no evidence for interactions between stevia and drugs or herbs at the concentrations normally consumed by humans for sweetening purposes.

Resources

BOOKS

Elkins, Rita. *Stevia: Nature's Sweetener*. Chapmanville, W.Va.: Woodland Press, 2007.

Kinghorn, A. Douglas. *Stevia: The Genus Stevia*. London: Taylor & Francis, 2007.

May, James A. *The Miracle Of Stevia: Discover the Healing Power of Nature's Herbal Sweetener*. New York: Ken sington Publishing Company, 2003.

Stevia: A Medical Dictionary, Bibliography, And Annotated Research Guide To Internet References. San Diego: ICON Health Publications, 2004.

PERIODICALS

Ferri, Leticia A. F. "Investigation of the Antihypertensive Effect of Oral Crude Stevioside in Patients with Mild Essential Hypertension." *Phytotherapy Research* (Sep tember 2006): 732 736.

Geuns, Jan M. C. "Stevioside." *Phytochemistry* (November 2003): 913 921.

Gregerson, S., et al. "Antihyperglycemic Effects of Stevio side in Type 2 Diabetic Subjects." *Metabolism* (January 2004): 73 76.

Kovylyaeva, G., at al. "Glycosides from Stevia Rebaudi ana." *Chemistry of Natural Compounds* (January 2007): 81 85.

Matsukubo, Takashi T, and Ichiro I. Takazoe. "Sucrose Substitutes and Their Role in Caries Prevention." *International Dental Journal* (June 2006): 119 130.

Sapna, Soni, et al. "Pharmacognostic and Phytochemical Investigation of Stevia Rebaudiana." *Pharmacognosy Magazine* (January March 2008): 89 94.

OTHER

Al Achi, Antoine, and Robert Greenwood. "Stevia: A Plant for Sweetness?." http://www.uspharmacist.com/old format.asp?url newlook/files/Comp/stevia2.html& pub_id 8&article_id 634 (February 29, 2008).

European Commission, Scientific Committee on Food. "Opinion on Stevia Rebaudiana Bertoni Plants and Leaves." http://www.food.gov.uk/multimedia/pdfs/ stevioside.pdf (February 29, 2008).

Herbs Are Special. "Stevia." http://www.herbsarespecial. com.au/free herb information/stevia.html (February 29, 2008).

Raintree Nutrition Tropical Plant Database. "Stevia." http:// www.rain tree.com/stevia.htm (February 29, 2008).

Stevia.Net. "A Tale of Incredible Sweetness and Intrigue." http://www.stevia.net/ (February 29, 2008).

David Edward Newton, Ed.D.

Sties

Definition

Also known as a external hordeolum, a stye is an infection or small **abscess** formation within the hair follicle glands on the free edge of the eyelid. These sebaceous glands are also known as Zeis's or Moll's glands.

Stye on a patient's eyelid. *(ISM/Phototake, Reproduced by permission.)*

KEY TERMS

Blepharitis—An inflammation of the eyelid.

Hordeolum—The medical term for stye; an infection or small abscess formation in the hair follicle glands of the eyelids.

Sebaceous glands—The oil- or grease-producing glands of the body.

Description

A stye may develop on or under the eyelid with an eyelash within a yellow point. The area becomes red, warm, swollen, and painful. It may also cause blepharitis, an inflammation of the eyelid.

Causes and symptoms

A stye is caused by staphylococcal or other bacterial infection of the sebaceous gland. This infection may be only on the eyelid, or may also be present elsewhere in the body. The presence of a stye may be a sign of the need for glasses, or indicate declining overall health status.

In addition to localized redness, **pain** and swelling, the affected eye may be sensitive to bright light. The individual with a stye may complain of a gritty sensation in the affected eye, and notice that the eye has increased tearing. Once the abscess drains, localized pain and other symptoms quickly resolve.

Diagnosis

Individuals can usually identify a stye from its accompanying symptoms. A laboratory culture of the drainage from the stye may be done to determine the causative organism, allowing identification of the appropriate topical antibiotic drop, ointment or cream, if necessary, to prevent bacterial infection of the rest of the eye.

Treatment

Application of a warm-water compress for 15–20 minutes several times daily will help bring the stye to a point. Most sties drain spontaneously, or with gentle removal of the affected eyelash. The affected individual should avoid hand-to-eye contact, and wash hands frequently, drying thoroughly with clean towels.

A somewhat unusual local treatment that was recommended by a pediatric ophthalmologist for sties that will not drain after several days of warm-water compresses is the application of a hot potato. The hot potato holds heat longer than a washcloth.

Because a stye may also be the result of overall poor health, intake of a well-balanced diet and other measures to strengthen the immune system are helpful in healing and preventing recurrences. Foods rich in **beta carotene**, along with **vitamin C** and A are beneficial in early stages of bacterial infection; herbal remedies include **garlic**, **echinacea**, **goldenseal**, **calendula**, and **tea tree oil**. Focus on a healthy lifestyle will also include getting enough rest, exercising regularly, and limiting negative **stress**. **Yoga**, **meditation**, and **guided imagery** may be helpful for stress reduction and **relaxation**. Eye irritation from **smoking** or other chemical or environmental factors should be avoided.

Allopathic treatment

Self-care is often adequate in resolving a stye; however, surgical incision and drainage of the abscess may occasionally be necessary. While oral or injectable antibiotics are not usually needed, antibiotic drops, ointments or creams may be prescribed to hasten healing and prevent spread of the infection. A physician should also be consulted for any notable change in vision or pain in the eye.

Expected results

A stye usually resolves completely within five to seven days after it has drained. Even with treatment, recurrence is not uncommon, especially in children. Patients with seborrheic blepharitis (nonulcerated inflammation of the eyelid) are also more likely to develop recurrent sties.

Prevention

Measures to improve overall health and strengthen the immune status will help prevent complications and recurrence. Crowded or unsanitary living conditions will predispose individuals to illnesses that can lower resistance to **infections**. Frequent exposure to dust and other chemical/environmental factors will irritate the eyes and can increase the risk of stye formation.

Resources

BOOKS

Dillard, James, and Terra Ziporyn. *Alternative Medicine for Dummies*. Foster City, CA: IDG Books Worldwide, Inc., 1998.

PERIODICALS

Giusti, Robert. "Don't Pass This Hot Potato." *Contemporary Pediatrics* 18 (November 2001): 116.

Skorin Jr., Leonid. "Eyelid Swelling: What's the Underlying Cause?" *Consultant* 41 (October 2001): 1624 1630.

OTHER

Thrive Online. http://www.thriveonline.com/health/Library.

Kathleen Wright
Rebecca J. Frey, PhD

Stiff neck *see* **Neck pain**
Stinging nettle *see* **Nettle**

Stomachaches

Definition

Stomachache is **pain** or discomfort in the stomach that is a symptom of many different gastrointestinal diseases or conditions.

Description

Stomachache, also called dyspepsia, is a symptom of an underlying disease or condition of the gastrointestinal system. Stomachache is defined as pain or discomfort in the upper abdomen. Discomfort refers to any negative feeling including fullness, bloating, or early satiety (quenched thirst or appetite).

Dyspepsia accounts for 2–5% of all visits to a physician. Unfortunately, no cause is found for 30–60% of patients with dyspepsia. When no cause is found, the disorder is termed nonulcer dyspepsia. Several factors may lead to nonulcer dyspepsia. Delayed emptying of the stomach contents and stomach and intestinal rhythmic movement (motility) disorders can lead to dyspepsia. Some persons have lower sensory thresholds for stomach distension and more readily experience stomachache. Abnormal release of stomach acids may also be associated with dyspepsia.

Studies performed around the world have determined that between 7–41% of the population suffer from dyspepsia. This wide variation is most likely due to differences in study methods, not differences in the prevalence of dyspepsia.

Causes and symptoms

The occasional stomachache is usually caused by overeating, stomach **gas**, eating foods that do not agree with a person's digestive system, drinking too much alcohol, **food poisoning**, or gastrointestinal infection. **Obesity** places extra pressure on the stomach that can cause pain. **Smoking** increases stomach acid production and relaxes the valve between the stomach and the esophagus, both of which can cause stomach pain.

KEY TERMS

Dysmotility—Abnormally slow or fast rhythmic movement of the stomach or intestine.

Dyspepsia—Recurrent or persistent pain in the upper abdomen.

Gastrointestinal—Pertaining to the stomach and intestine.

Because there are many causes of dyspepsia, physicians try to fit each case into one of five categories based upon the set of symptoms. Nonulcer dyspepsia refers to long-term or recurrent pain in the upper abdomen that has no identified structural cause. Ulcer-like dyspepsia refers to abdominal pain with three or more of the following symptoms: well-localized pain, pain relieved by eating, pain relieved by antacids, pain occurring when hungry, pain that disrupts sleep, or pain that comes and goes for at least two week intervals. Dysmotility-like dyspepsia refers to upper abdominal discomfort, not pain, with three or more of the following: early satiety, **nausea**, fullness after eating, recurrent retching or **vomiting**, bloating, or abdominal discomfort worsened by food. Reflux-like dyspepsia is stomach pain accompanied by **heartburn**. Nonspecific dyspepsia refers to patients whose symptoms do not fit into the other categories.

Specific causes of stomachaches include:

- Biliary tract disease, disorders of the gallbladder, bile, and bile ducts. Biliary pain is a severe, persistent pain in the upper middle or upper right region of the abdomen.
- Drug-induced dyspepsia, which may be caused by digitalis, theophylline, antibiotics, and iron or potassium supplements.
- Dysmotility disorders, gastrointestinal motility that is either too fast or too slow, and may lead to abdominal pain.
- Gastric cancer, although a rare cause of stomachache, needs to be considered in the diagnosis of stomachache because of the seriousness of the disease.
- Gastroesophageal reflux, causes a burning pain or discomfort that travels up to the throat. This common disorder affects up to 50% of adults.

- Irritable bowel syndrome, a chronic disease characterized by abdominal pain and changes in bowel functioning (diarrhea and/or constipation).
- Pancreatic disease, including pancreatitis (inflammation of the pancreas) and pancreatic cancer, can cause severe, persistent pain that may travel to the back.
- Peptic ulcer, refers to any ulcer (a defect or hole) of the upper digestive tract.
- Psychiatric disease, such as depression, panic disorder, and eating disorders, can lead to stomach pains.
- Other disorders. Stomachaches may be caused by diabetes mellitus, hypothyroidism, hypercalcemia, ischemic heart disease, intestinal angina, certain cancers, Crohn's disease, tuberculosis, and syphilis. In addition, abdominal muscle strain, myositis, and nerve entrapment can cause abdominal pain which could be confused with dyspepsia.

Stomachache is a discomfort or pain in the upper abdomen. The patient may experience other symptoms as well, depending upon the cause of the stomachache. Stomachache must be experienced for three months to be considered chronic (long-term). Persons who experience recurrent vomiting, weight loss, dysphagia (swallowing difficulty), or bleeding should seek prompt medical attention.

Diagnosis

Stomachache may be diagnosed by an internal medicine specialist or a gastroenterologist. Because diagnosing dyspepsia can be time consuming and expensive, all attempts are made to first rule out a structural cause of the pain to prevent the use of unnecessary tests. The diagnostic process would include a thorough medical history and physical examination.

The presence of *Helicobacter pylori*, a common cause of ulcer, in the stomach would be determined. There is a higher risk for structural disease in persons older than 45 years, therefore, these persons would undergo upper gastrointestinal endoscopy (upper GI). Endoscopy is the use of a wand-like camera to visualize internal organs, including the stomach and intestinal tract.

If ulcer has been ruled out, then an upper GI (an x-ray study of the upper GI tract) and several blood tests would be performed. Ultrasound (visualization of internal organs using sound waves) may be performed to view the liver, pancreas, and gall bladder. More specific tests which may be conducted include lactose tolerance test, stomach emptying study, gastroduodenal manometry (measures pressure and motility of the stomach and small intestine), electrogastrography (measures electrical activity of the stomach), and a esophageal pH testing (measures the pH in the pipe running from the throat to the stomach).

Treatment

Alternative remedies can be effective in treating stomachache and associated digestive symptoms. Persons who experience chronic, unexplained stomach pain should consult a physician.

Herbals

The following herbal remedies help treat stomachaches:

- agave (*Agave americana*) tincture
- asafoetida (*Ferula asafoetida*) tincture
- cumin (*Cumin cyminum*) seed poultice

When gas is the reason for discomfort, these herbals can be used:

- angelica (*Angelica archangelica*) infusion
- anise (*Pimpinella anisum*) infusion
- catnip (*Nepata cataria*) tea
- oatstraw (*Avena sativa*) tea

Indigestion accompanied by gas or due to increased stomach acid production can be soothed by the following herbals:

- arrowroot (*Maranta arundinacea*) infusion
- calendula (*Calendula officinalis*) and comfrey root tea
- cardamon (*Elettaria cardamomum*) powder
- fennel (*Foeniculum vulgare*) infusion
- galbanum (*Ferula gummosa*) infusion: acid indigestion
- iceland moss (*Cetraria islandica*) infusion
- marsh mallow (*Althaea officinalis*) tea
- meadowsweet (*Filipendula ulmaria*) tea
- slippery elm (*Ulmus fulva*) powder or tea

Other disorders causing stomach pain and discomfort can be relieved with these herbals:

- asian red ginseng (*Panax ginseng*) tea or tincture: stomach pain and bloating
- chamomile (*Chamomilla recutita*) tea: upset stomach, gas, and stomach spasm
- crab apple (flower remedy): stomachaches caused by bad food
- crampbark (*Viburnum opulus*) infusion: stomach spasm
- dandelion (*Taraxacum officinale*) root tea or tincture: heartburn, stomachache, and gas
- elderberry (*Sambucus nigra*) tea: stomach pain
- ginger (*Zingiber officinale*) raw or tea

- lemon balm (*Melissa officinalis*) tea: stomach spasm, gas, and bloating
- licorice (*Glycyrrhiza glabra*) root tea or tincture: heartburn and acid reflux
- peppermint (*Mentha piperita*) tea: upset stomach, gas, and stomach spasm
- thyme (*Thymus vulgaris*) tea: upset stomach

Homeopathy

Homeopathic remedies are chosen based upon the specific set of symptoms displayed by the patient. **Bryonia** is indicated for stomach pain that is worsened by motion. Colocynthis or Magnesia phosphorica is recommended for pain that is relieved by doubling up. Cuprum is indicated for violent, cramping pain. Dioscorea is chosen for pain that is lessened by standing up and worsened by doubling up. **Lycopodium** is indicated for persons who get bloated after eating or whose pain is worsened by pressure. Magnesia phosphorica is recommended for pain that is relieved by pressure. Nux vomica is indicated for stomach pain that occurs after eating rich or spicy foods or too much alcohol. **Pulsatilla** is chosen for persons who experience digestive symptoms after eating fatty foods.

Chinese medicine

Traditional Chinese medicine (TCM) treats stomachaches with **acupuncture**, ear acupuncture, **cupping**, herbs, and patent medicines. Common syndromes that cause abdominal pain include: Damp-heat stagnation, retention of cold, retention of food, deficiency and coldness of Zang Fu, and stagnation of qi and blood.

Abdominal pain caused by deficiency and cold is treated with Fu Zi Li Zhong Wan (prepared **Aconite** pill to regulate the middle). Abdominal pain caused by cold is treated with Liang Fu Wan (Galagal and **Cyperus** pill). All causes of abdominal pain (except damp-heat) may be treated with a mixture of Yan Hu Suo (*Rhizoma corydalis*), Chen Xiang (*Lignum aquilariae resinatum*), and Rou Gui (*Cortex cinnamomi*).

Ayurveda

Ayurvedic practitioners believe that indigestion is due to weak or insufficient agni (digestive fire). To enhance digestion, the patient can take fresh **ginger**; a mixture of **garlic** powder (one quarter teaspoon), trikatu (one half teaspoon), and rock salt (pinch); or a mixture of garlic (one clove), cumin powder (one quarter teaspoon), rocksalt (pinch), trikatu (pinch), and lime juice (one teaspoon) before meals. Bay leaf tea drunk after meals can enliven agni. Digestion may be enhanced with Shatavari or Teak tree (*Tectona grandis*) wood or bark.

Chronic indigestion and stomachaches may be relieved by taking a mixture of trikatu (one part), chitrak (two parts), and kutki (one part) with honey and ginger juice before meals. Common stomachaches may be relieved by taking a shankavati or lasunadivati pill twice daily; ajwan (one half teaspoon) and baking soda (one quarter teaspoon) in water; a mixture of cumin powder (one third teaspoon), asafetida (pinch), and rock salt (pinch) in water; or chewing one half teaspoon of roasted **fennel**, cumin, and coriander seeds.

Other treatments

Other treatments for stomachaches are:

- Acupressure. Pressing both Sp 16 points (located below the bottom of the rib cage) can relieve stomachaches.
- Aromatherapy. Sucking on a sugar cube containing one drop of the essential oil of peppermint can ease stomachaches. Taking honey containing one drop of essential oil of tarragon, marjoram, or rosemary reduces digestive tract spasms.
- Hydrotherapy. Stomachache can be relieved by drinking water containing activated charcoal powder. A hot water bottle or hot compress placed over the abdomen can help relieve stomach pains.
- Juice therapy. Digestion can be improved and gas dispelled by drinking fresh apple juice with mint, fennel, and ginger.

Allopathic treatment

Stomachaches may be treated with over the counter antacids (Tums, Pepto-Bismol) and antigas products (Gas-X). An *H. pylori* infection is treated with a combination of tetracycline, bismuth subsalicylate (Pepto-Bismol), and metronidazole (Metizol). Non-ulcer dyspepsia may be treated with the proton pump inhibitors omeprazole (Prilosec) and lansoprazole (Prevacid); the H_2 receptor antagonists ranitidine (Zantac), cimetidine (Tagamet), famotidine (Pepcid), and nizatidine (Axid); or the prokinetic drug cisapride.

Stomachaches that are caused by diseases such as **cancer**, diabetes, **pancreatitis**, etc. would be treated using the specific medications and procedures recommended for the particular disease.

Expected results

Stomachaches may resolve spontaneously. Medical treatment of stomachaches can relieve symptoms temporarily but a cure is not expected.

Prevention

Common stomachaches can be prevented by avoiding the following: overeating, excessive alcohol consumption, problem foods, and smoking. Stomachaches may be prevented by enhancing digestion by taking fresh ginger or Draksha (Ayurvedic herbal wine) before meals. Ginger or bay leaf tea or lassi (yogurt with cumin and ginger powders in water) taken after meals can aid digestion and prevent stomachaches. Drinking warm drinks during meals aids digestion as does chewing food thoroughly. Persons should only eat when hungry and leave space in the stomach for proper digestion. Obesity can increase problems like reflux, and a 2001 study found a strong connection between obesity and severity of reflux.

Resources

BOOKS

Reichenberg Ullman, Judyth, and Robert Ullman. *Homeopathic Self Care: The Quick and Easy Guide for the Whole Family*. Rockland, CA: Prima Publishing, 1997.

Talley, Nicholas J., and Gerald Holtmann. "Approach to the Patient With Dyspepsia and Related Functional Gastrointestinal Complaints." *Textbook of Gastroenterology*. 3rd ed. Edited by Tadataka Yamada, et al. Philadelphia: Lippincott Williams & Wilkins, 1999.

Ying, Zhou Zhong, and Jin Hui De. "Abdominal Pain." *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Cavalli, Ellen. "Relief for Holiday Pigouts." *Vegetarian Times* (November 1999): 94+.

"Fast Lives Bring on the Burn." *Chemist and Druggist* (November 10, 2001): 37.

Levine, Beth. "How to Treat Any Kind of Tummyache." *Redbook* 190 (April 1998): 145+.

Sullivan, Karin Horgan. "Oh, What a Relief it is: Herbs to Soothe an Upset Stomach." *Vegetarian Times* (November 1996): 94+.

Wajed, Shahjehan A. "Elevated Body Mass Disrupts the Barrier to Gastroesophageal Reflux." *The Journal of the American Medical Association* (December 5, 2001): 2650.

ORGANIZATIONS

The American Gastroenterological Association (AGA). 7910 Woodmont Ave., 7th Floor, Bethesda, MD 20814. (310) 654 2055. http://www.gastro.org/index.html.

Belinda Rowland
Teresa Norris

Stomatitis *see* **Cantharis**

Stone massage

Definition

Stone massage is a form of bodywork that involves the application of heated or cooled stones (thermotherapy) to the body during deep tissue massage.

Origins

The use of materials of different temperatures on the body to bring about healing is an ancient technique. Stones have been used in many cultures, such as in the Native American sweat lodge, to adjust the temperature of the healing environment. Traditional **lomilomi** (Hawaiian massage) goes further and applies heated stones directly to the body.

Although stones have been used for many years as an adjunct to bodywork, their use was formalized in 1993 by Mary Nelson-Hannigan of Tucson, Arizona. Nelson-Hannigan developed a form of massage using a system of 54 hot stones, 18 frozen stones, and one room-temperature stone, which she calls LaStone Therapy. In addition to the use of stones as an extension of the therapist's hands in deep tissue massage, LaStone Therapy involves a spiritual element that opens energy channels (chakras) in the body, unblocks memories, and brings about spiritual healing.

Benefits

Stone therapy has benefits for both the client and the massage therapist. For the client the application of heat and cold on the body:

- Stimulates the circulatory system and promotes self-healing.
- Softens and relaxes the muscles.
- Helps to release toxins from the muscles.
- Induces a state of deep relaxation that washes away stress.
- Helps relieve pain and muscle spasms.
- Creates a feeling of peacefulness and spiritual well-being.

Stone therapy also benefits the massage therapist. It reduces **stress** and strain on the therapist's hands, wrists, and arms so that the therapist can work longer and more efficiently. The stones do the heavy work, so that the possibility of repetitive stress injuries to the therapist's thumbs and wrists is decreased.

KEY TERMS

Chakras—The energy centers located at points along the body, usually identified as seven in number in yoga and other Eastern healing therapies. Stone massage works to open the chakras, as well as relax the physical body.

Description

In many ways a stone massage session is similar to any other type of massage. The stones are heated (usually to about 130°F or 34°C) or frozen prior to the client's arrival. Massage oil is spread on the client's back and legs. The stones are then worked over the body. The client turns over and the process is repeated on the arms, hands, and fingers. The final parts to be massaged are the neck, head, and face.

Preparations

The client needs no special preparation before receiving a stone massage. The therapist prepares the stones in advance and maintains them at the proper temperatures.

Precautions

No special precautions are necessary in having a stone massage session. This type of massage is suitable for almost everyone.

Side effects

Generally a stone massage produces only the positive side effects of a feeling of peacefulness and spiritual renewal. No negative side effects have been reported.

Research and general acceptance

The use of stones to alter body temperature has been used for centuries. Little modern research has been done on its effectiveness, although it is a generally accepted technique.

Training and certification

LaStone Therapy offers its own certification for people already trained as massage therapists who complete specific courses in LaStone Therapy. Many of these courses are recognized for credit by the American **Massage Therapy** Association, the International Myomassethics Federation, Inc., the National Certification Board For Therapeutic Massage & Bodywork, and the Associated Bodywork and Massage Professionals.

Resources

ORGANIZATIONS

American Massage Therapy Association. 820 Davis Street, Suite 100. Evanston, IL 60201. (847) 864 0123.

LaStone Therapy. 2919 E. Broadway Blvd., Suite 224. Tucson, AZ 85716. (520) 319 6414. http://www.lastonetherapy.com.

OTHER

Alaska Wellness. http://www.alaskawellness.com *The Original Hot Stone Massage*.

Tish Davidson

Strep throat

Definition

Streptococcal **sore throat**, or strep throat as it is more commonly called, is an infection of the mucous membranes lining the pharynx (throat). Sometimes the tonsils are also infected (**tonsillitis**). The disease is caused by group A *Streptococcus* bacteria. Untreated strep throat may develop into **rheumatic fever** or other serious conditions.

Description

Strep throat occurs most frequently from November to April. The disease passes directly from person to person by coughing, **sneezing**, and close contact. Very occasionally the disease is passed through food, when a food handler infected with strep bacteria accidentally contaminates food by coughing or sneezing. Statistically, if someone in the household is infected, one out of every four other household members is likely to get strep throat within two to seven days.

Although anyone can get strep throat, it primarily affects children, especially those between the ages of five and 15. Adults whose immune systems have been weakened by **stress** or other **infections** are also at risk, as are people who smoke, who are fatigued, highly stressed, or who live in damp, crowded conditions. Children under age two and adults who are not around children are less likely to get the disease; their sore throats are usually caused by viruses, not strep bacteria.

Strep throat. *(© Scott Camazine / Alamy)*

Most sore throats are caused by viruses. Bacteria infections are responsible for only about 10%–15% of cases. In the northern hemisphere, Strep throat occurs most frequently from November to April. The disease passes directly from person to person by coughing, sneezing, and close contact. Very occasionally the disease is passed through food, when a food handler infected with strep bacteria accidentally contaminates food by coughing or sneezing. Statistically, if someone in the household is infected, one out of every four other household members is likely to get strep throat within two to seven days.

Many people have some form of strep bacteria in their body at some point during their lives. The bacteria can survive in the lining of the throat or nose for years without producing symptoms. A person who hosts bacteria without showing signs of infection is considered a carrier. Carriers who are symptom- free are less likely to infect others than people with active strep infections.

Causes and symptoms

A person with strep throat suddenly develops a painful sore throat one to five days after being exposed to streptococcus bacteria. The **pain** is indistinguishable from sore throats caused by other types of bacteria or viruses. Strep throat is often mistaken as a symptom of a cold. Unlike a cold, strep throat does not usually produce **cough** or a stuffy, runny nose.

The infected person usually feels tired and has a **fever**, sometimes accompanied by **chills**, **headache**, muscle aches, swollen lymph glands, and **nausea**. Young children may complain of abdominal pain. The tonsils look swollen and are bright red, with white, grayish, or yellow patches of pus on them. Sometimes the roof of the mouth is red or has small red spots. Often a person with strep throat has bad breath.

Despite these common symptoms, strep throat can be deceptive. It is possible to have the disease and not show any of these symptoms. Many young children complain only of a headache and stomach ache, without the characteristic sore throat symptoms. Nausea and occasionally **vomiting** also may occur in children.

It is important to identify and treat strep throat promptly because if left untreated, it can lead to serious health problems. Occasionally within a few days of developing the sore throat, an individual may develop a fine, rough, sunburn-like rash over the face and upper body and have a fever of 101–104°F (38.3–40°C). The tongue becomes bright red, with a flecked, strawberry-like appearance. When a rash develops, this form of strep throat is called **scarlet fever**. The rash is a reaction to toxins (poisons) released by streptococcus bacteria. Scarlet fever is no more dangerous than strep throat, and it is treated in the same way. The rash disappears in about five days. One to three weeks later, patches of skin may peel off, as might occur with a **sunburn**, especially on the fingers and toes.

Although scarlet fever is no more serious than strep throat, rheumatic fever rheumatic **heart disease** (damage to the heart caused by rheumatic fever) are serious illnesses that can develop from untreated strep infections. Rheumatic fever is uncommon in the United States because most people with strep infections; it does not occur if all the streptococcus bacteria are killed with antibiotic treatment within the first 10–12 days after infection Worldwide, however, 90,000 people are estimated to die from rheumatic heart disease each year, with the highest rates occurring in developing countries.

Rheumatic fever occurs most often in children between the ages of five and 15. It begins one to six

weeks after an untreated streptococcal infection. The joints, especially the wrists, elbows, knees, and ankles become red, sore, and swollen. The infected person develops a high fever, and possibly a rapid heartbeat when lying down, paleness, shortness of breath, and fluid retention. A red rash over the trunk may come and go for weeks or months. An acute attack of rheumatic fever lasts about three months.

Rheumatic fever can cause permanent damage to the heart and heart valves. It can be prevented by promptly treating streptococcal infections with antibiotics. Although the strep throat that causes rheumatic fever is contagious, rheumatic fever itself is not.

Diagnosis

Diagnosis of strep throat by a doctor begins with a physical examination of the throat and chest. The doctor will also look for signs of other illness, such as a **sinus infection** or **bronchitis**, and seek information about whether the patient has been around other people with strep throat. If it appears that the patient may have strep throat, the doctor will do laboratory tests.

A rapid strep test is a painless test that involves using a swab to remove a specimen from the throat of the infected person. The results of the test are available in 10–20 minutes. If the rapid strep test is negative, the doctor may send a similar specimen to a laboratory to have a throat culture performed because rapid strep tests have a false negative rate of about 25% (that is, about one-quarter of people whose test shows that they do not have strep throat actually do have strep). The laboratory culture test takes a day or two to complete and is highly accurate. A negative culture usually indicates that the cause is viral in nature, in which case antibiotics will not be effective in fighting the disease.

Treatment

Conventional medicine is very successful in treating strep throat. However, several alternative therapies may help to resolve the disease or relieve symptoms. Herbal remedies such as **echinacea** (*Echinacea* spp.), **goldenseal** (*Hydrastis canadensis*), and **garlic** (*Allium sativum*) are believed to strengthen the immune system and combat bacterial infections.

Goldenseal

One of the active agents in goldenseal is a chemical called berberine. This alkaloid is believed to have antibiotic effects against streptococci bacteria. Goldenseal is also believed to increase the activity of disease-fighting white blood cells.

Echinacea

This popular herb fights viral and bacterial infections by boosting the immune system, according to herbalists. Echinacea may also combat strep throat by interfering with hyaluronidase, an enzyme that helps the offending bacterium to grow and spread.

Garlic

The focus of hundreds of medical studies and papers, garlic is believed to be an antibiotic as well as an antiviral. As an added benefit, garlic may also prevent **atherosclerosis**, lower **cholesterol** levels, and act as an antioxidant.

Zinc and ginger

Zinc and **ginger** (*Zingiber officinale*) are sometimes recommended to help treat symptoms of sore throat. In addition to strengthening the immune system, zinc may reduce throat inflammation and pain regardless of the cause. Ginger may have analgesic properties and ease throat irritation. **Vitamin C** may also help to boost the immune system. In some studies, it has been shown to shorten the duration of colds.

Easing symptoms

Many other alternative treatment focuses on easing the symptoms of strep throat through herbs and botanical medicines. Some practitioners suggest using these treatments in addition to antibiotics, since they primarily address the comfort of the patient and not the underlying infection. Many practitioners recommend *Lactobacillus acidophilus* to offset the suppressive effects of antibiotics on the beneficial bacteria of the intestines.

Some suggested treatments include:

- Inhaling fragrances of the essential oils of lavender (*Lavandula officinalis*), thyme (*Thymus vulgaris*), eucalyptus (*Eucalyptus globulus*), sage (*Salvia officinalis*), and sandalwood (Aromatherapy).
- Gargling with a mixture of water, salt, and tumeric (*Curcuma longa*) powder or astringents, such as alum, sumac, sage, and bayberry (Ayurvedic medicine).
- Taking osha root (*Ligusticum porteri*) internally for infection or drinking tea made of sage, echinacea (*Echinacea* spp.) and cleavers (*Gallium aparine*) Osha root has an unpleasant taste many children will not accept (Botanical medicine).

Homeopathy

In the practice of **homeopathy**, **belladonna**, **lachesis**, and mercurius vivus are usually the remedies of choice for strep throat and other causes of throat

irritation. Which remedy to use depends on the exact nature of the symptoms. These homeopathic treatments are not recommended for more than a few days or symptoms may actually return.

Allopathic treatment

Antibiotics, the conventional treatment of choice, are very effective in curing strep throat. Without treatment, the symptoms of strep throat begin subsiding in four or five days. However, because of the possibility of developing rheumatic fever, it is important to treat strep throat promptly with antibiotics.

Ten days of oral penicillin is a typical course of therapy. Patients need to take the entire amount of antibiotic prescribed and not to discontinue taking the medication when they feel better. Stopping the antibiotic early can lead to a return of the strep infection. Occasionally, a single injection of long-acting penicillin (Bicillin) is given instead of 10 days of oral treatment.

About 10% of the time, penicillin is not effective against the strep bacteria. When this happens a doctor may prescribe other antibiotics such as cefuroxime (Ceftin), cefixime (Suprax), cefpodoxime proxetil (Vantin), loracarbef (Lorabid), cefditoren (Spectracef), azithromycin (Zithromax), clindamycin (Cleocin), or a cephalosporin (Keflex, Durocef, Ceclor). Erythromycin (Eryzole, Pediazole, Ilosone), another inexpensive antibiotic, can be given to people who are allergic to penicillin. Scarlet fever is treated with the same antibiotics as strep throat.

Home care for strep throat

These are home care steps may ease the discomfort of strep throat.

- Take acetaminophen or ibuprofen for pain. Aspirin should not be given to children because of its association with an increase in Reye's Syndrome, a serious disease.
- Gargle with warm double strength tea or warm salt water, made by adding one teaspoon of salt to eight ounces of water, to relieve sore throat pain.
- Drink plenty of fluids, but avoid acidic juices like orange juice because they irritate the throat.
- Eat soft, nutritious foods such as noodle soup. Avoid spicy foods.
- Avoid smoke and smoking.
- Rest until the fever is gone, then resume strenuous activities gradually.
- Use a room humidifier, as it may help ease throat irritation.
- Be aware that antiseptic lozenges and sprays may aggravate the sore throat rather than improve it.

KEY TERMS

Analgesic—Pain reliever.

Antioxidant—A molecule that prevents oxidation. In the body antioxidants attach to other molecules called free radicals and prevent the free radicals from causing damage to cell walls, DNA, and other parts of the cell

Lactobacillus acidophilus—A bacteria found in yogurt that changes the balance of the bacteria in the intestine in a beneficial way.

Expected results

The symptoms associated with strep throat usually begin to disappear within several days, even without treatment. When antibiotics are used, fever may subside within 24 hours, and the course of the illness may be shortened by two days. People who have taken an atnibiotic for 24 hours are normally no longer contagious.

People who use alternative remedies in the absence of antibiotics should consult a doctor if symptoms do not subside within a week. Because of the potential risk of life-long heart damage from rheumatic fever, the use of antibiotics is strongly recommended.

Prevention

Washing the hands frequently can help to prevent strep throat. Exposure to infected people should also be avoided. In order to prevent transmission of the disease within households, consult a doctor if any family member suddenly develops a sore throat (especially if it is accompanied by fever).

Boosting the immune system is also important to help prevent the development of strep throat. Vitamin C and zinc are often recommended for this purpose, as are goldenseal, echinacea, and garlic. Reducing stress and getting proper sleep can also strengthen the body's defenses against infection.

Resources

BOOKS

Fauci, Anthony, et al., eds. *Harrison's Principles of Internal Medicine,* 17th ed. New York, NY: McGraw Hill, 2008.

Laskey, Elizabeth. *Strep Throat* Chicago: Heinemann Library, 2003.

Offit, Paul A. *Breaking the Antibiotic Habit: A Parent's Guide to Coughs, Colds, Ear Infections, and Sore Throats*. New York: John Wiley, 1999.

OTHER

"Group A Streptococcal Infections." *National Institute of Allergy and Infectious Diseases*. September 17, 2007 [cited February 21, 2008]. http://www3.niaid.nih.gov/healthscience/healthtopics/streptococcal/default.htm.

"Strep Throat." *Mayo Clinic*. Nov 3, 2008 [cited February 21, 2008]. http://www.mayoclinic.com/health/strep throat/DS00260.

"Strep Throat." *Web MD* August 19, 2006 [cited February 21, 2008]. http://www.webmd.com/a to z guides/strep throat topic overview.

ORGANIZATIONS

Alternative Medicine Foundation, P. O. Box 60016, Poto mac, MD, 20859, (301) 340 1960, http://www.amfoundation.org.

American Holistic Medical Association, P. O. Box 2016 , Edmonds, WA, 98020, (425) 967 0737, http://www.holisticmedicin.org.

Greg Annussek
Rebecca J. Frey, Ph.
Tish Davidson, A. M.

KEY TERMS

Adjustment disorder—A psychiatric disorder marked by inappropriate or inadequate responses to a change in life circumstances.

Biofeedback—A technique in which patients learn to modify certain body functions, such as temperature or pulse rate, with the help of a monitoring machine.

Burnout—An emotional condition, marked by tiredness, loss of interest, or frustration, that interferes with job performance. Burnout is usually regarded as the result of prolonged stress.

Stress hardiness—A personality characteristic that enables persons to stay healthy in stressful circumstances. It includes belief in one's ability to influence the situation; being committed to or fully engaged in one's activities; and having a positive view of change.

Stress management—A category of popularized programs and techniques intended to help people deal more effectively with stress.

Stressor—A stimulus or event that provokes a stress response in an organism. Stressors can be categorized as acute or chronic, and as external or internal to the organism.

Stress

Definition

Stress is an individual's physical and mental reaction to environmental demands or pressures.

Description

When stress was first studied, the term was used to denote both the causes and the experienced effects of these pressures. More recently, however, the word stressor has been used for the stimulus that provokes a stress response. One recurrent disagreement among researchers concerns the definition of stress in humans. Is it primarily an external response that can be measured by changes in glandular secretions, skin reactions, and other physical functions, or is it an internal interpretation of, or reaction to, a stressor; or is it both?

Stress was first studied in 1896 by Walter B. Cannon (1871–1945). Cannon used an x-ray instrument called a fluoroscope to study the digestive system of dogs. He noticed that the digestive process stopped when the dogs were under stress. Stress triggers adrenal hormones in the body and the hormones become unbalanced. Based on these findings, Cannon continued his experimentation and came up with the term homeostasis, a state of equilibrium in the body.

Hans Selye, a Canadian scientist (1907–1982), noticed that people who suffered from chronic illness or disease showed some of the same symptoms. Selye related this to stress and he began to test his hypothesis. He exposed rats to different physical stress factors such as heat, sound, poison, and shock. The rats showed enlarged glands, shrunken thymus glands and lymph nodes, and gastric ulcers. Selye then developed the Three Stage Model of Stress Response. This model consisted of alarm, resistance, and exhaustion. Selye also showed that stress is mediated by cortisol, a hormone that is released from the adrenal cortex. This increases the amount of glucose in the body while under stress.

Stress in humans results from interactions between persons and their environment that are perceived as straining or exceeding their adaptive capacities and threatening their well-being. The element of perception indicates that human stress responses reflect differences in personality, as well as differences in physical strength or general health.

Risk factors for stress-related illnesses are a mix of personal, interpersonal, and social variables. These factors include lack or loss of control over one's physical environment, and lack or loss of social support networks. People who are dependent on others (e.g., children or the elderly) or who are socially disadvantaged (because of race, gender, educational level, or similar factors) are at greater risk of developing stress-related illnesses. Other risk factors include feelings of helplessness, hopelessness, extreme fear or anger, and cynicism or distrust of others.

Causes and symptoms

Causes

The causes of stress can include any event or occurrence that a person considers a threat to his or her coping strategies or resources. Researchers generally agree that a certain degree of stress is a normal part of a living organism's response to the inevitable changes in its physical or social environment, and that positive, as well as negative, events can generate stress as well as negative occurrences. Stress-related disease, however, results from excessive and prolonged demands on an organism's coping resources. It is now believed that 80–90% of all disease is stress-related.

Recent research indicates that some vulnerability to stress is genetic. Scientists at the University of Wisconsin and King's College London discovered that people who inherited a short, or stress-sensitive, version of the serotonin transporter gene were almost three times as likely to experience **depression** following a stressful event as people with the long version of the gene. Further research is likely to identify other genes that affect susceptibility to stress.

One cause of stress that has affected large sectors of the general population around the world since 2001 is terrorism. The events of September 11, 2001, the sniper shootings in Virginia and Maryland and the Bali nightclub bombing in 2002, the suicide bombings in the Middle East in 2003, have all been shown to cause short-term symptoms of stress in people who read about them or watch television news reports as well as those who witnessed the actual events. Stress related to terrorist attacks also appears to affect people in countries far from the location of the attack as well as those in the immediate vicinity. It is too soon to tell how stress related to episodes of terrorism will affect human health over long periods of time, but researchers are already beginning to investigate this question.

Symptoms

The symptoms of stress can be either physical and/or psychological. Stress-related physical illnesses, such as irritable bowel syndrome, heart attacks, and chronic headaches, result from long-term over-stimulation of a part of the nervous system that regulates the heart rate, blood pressure, and digestive system. Stress-related emotional illness results from inadequate or inappropriate responses to major changes in one's life situation, such as marriage, completing one's education, the death of a loved one, divorce, becoming a parent, losing a job, or retirement. Psychiatrists sometimes use the term adjustment disorder to describe this type of illness. In the workplace, stress-related illness often takes the form of burnout—a loss of interest in or ability to perform one's job due to long-term high stress levels.

Diagnosis

When the doctor suspects that a patient's illness is connected to stress, he or she will take a careful history that includes stressors in the patient's life (family or employment problems, other illnesses, etc.). Many physicians will evaluate the patient's personality as well, in order to assess his or her coping resources and emotional response patterns. There are a number of personality inventories and psychological tests that doctors can use to help diagnose the amount of stress that the patient experiences and the coping strategies that he or she uses to deal with them. Stress-related illness can be diagnosed by primary care doctors as well as by those who specialize in psychiatry. The doctor will need to distinguish between adjustment disorders and **anxiety** or mood disorders, and between psychiatric disorders and physical illnesses (e.g. thyroid activity) that have psychological side effects.

Treatment

Relaxation training, yoga , **t'ai chi**, and dance therapy help patients relieve physical and mental symptoms of stress. **Hydrotherapy**, massage therapy, and **aromatherapy** are useful to some anxious patients because they can promote general relaxation of the nervous system. **Essential oils** of **lavender**, **chamomile**, neroli, sweet marjoram, and ylang-ylang are commonly recommended by aromatherapists for stress relief.

Meditation can also be a useful tool for controlling stress. **Guided imagery**, in which an individual is taught to visualize a pleasing and calming mental image in order to counteract feelings of stress, is also helpful. Many individuals may find activities such as

exercise, art, music, and writing useful in reducing stress and promoting relaxation.

Sometimes the best therapy for alleviating stress is a family member or friend who will listen. Talking about stressful situations and events can help an individual work through his or her problems and consequently reduce the level of stress related to them. Having a social support network to turn to in times of trouble is critical to everyone's mental and physical well-being. **Pet therapy** has also been reported to relieve stress.

Herbs known as adaptogens may also be prescribed by herbalists or holistic healthcare providers to alleviate stress. These herbs are thought to promote adaptability to stress, and include **Siberian ginseng** (*Eleutherococcus senticosus*), ginseng (*Panax ginseng*), wild yam (*Dioscorea villosa*), borage (*Borago officinalis*), licorice (*Glycyrrhiza glabra*), chamomile (*Chamaemelum nobile*), milk thistle (*Silybum marianum*), and nettle (*Urtica dioica*).

Practitioners of Ayurvedic, or traditional Indian, medicine might prescribe root of winter cherry, fruit of emblic myrobalan, or the traditional formulas geriforte or mentat to reduce stress and fix the imbalance in the vata dosha.

It is also said that stress reduces the body's immunity, therefore vitamin supplementation can be helpful in counteracting the depletion. Diet is also important—coffee and other caffeinated beverages in high doses produce jitteriness, restlessness, anxiety, and insomnia. High protein animal foods elevate brain levels of dopamine and norepinephrine, which are associated with higher levels of anxiety and stress. Whole grains promote production of the brain neurotransmitter serotonin for a greater sense of well-being.

Allopathic treatment

Recent advances in the understanding of the many complex connections between the human mind and body have produced a variety of mainstream approaches to stress-related illness. Present treatment regimens may include one or more of the following:

- Medications. These may include drugs to control blood pressure or other physical symptoms of stress, as well as drugs that affect the patient's mood (tranquilizers or antidepressants).
- Stress management programs. These may be either individual or group treatments, and usually involve analysis of the stressors in the patient's life. They often focus on job- or workplace-related stress. A number of studies have found that good stress management programs significantly reduce absenteeism from work and visits to the doctor. They also improve immune system function and overall well-being in patients with such chronic disorders as HIV infection and diabetes.
- Behavioral approaches. These strategies include relaxation techniques, breathing exercises, and physical exercise programs including walking.
- Biofeedback. Biofeedback is a technique in which patients are taught to interpret and respond to signals from their own bodies. It can be taught by doctors, dentists, nurses, and physical therapists as well as by psychologists or psychiatrists. Biofeedback is often recommended as a treatment for chronic tension-type headaches.
- Massage. Therapeutic massage relieves stress by relaxing the large groups of muscles in the back, neck, arms, and legs. It is particularly helpful for people who tend to convert stress into muscle tension.
- Cognitive therapy. These approaches teach patients to reframe or mentally reinterpret the stressors in their lives in order to modify the body's physical reactions.

Expected results

The prognosis for recovery from a stress-related illness is related to a wide variety of factors in a person's life, many of which are genetically determined (race, sex, illnesses that run in families) or beyond the individual's control (economic trends, cultural stereotypes and prejudices). It is possible, however, for humans to learn new responses to stress and change their experiences of it. A person's ability to remain healthy in stressful situations is sometimes referred to as stress hardiness. Stress-hardy people have a cluster of personality traits that strengthen their ability to cope. These traits include believing in the importance of what they are doing; believing that they have some power to influence their situation; and viewing life's changes as positive opportunities rather than as threats.

Prevention

Complete prevention of stress is neither possible nor desirable because stress is an important stimulus of human growth and creativity, as well as an inevitable part of life. In addition, specific strategies for stress prevention vary widely from person to person, depending on the nature and number of the stressors in an individual's life, and the amount of control he or she has over these factors. In general, however, a combination of attitudinal and behavioral changes work well for most patients. The best form of

prevention appears to be parental modeling of healthy attitudes and behaviors within the family.

Resources

BOOKS

Clark, R. Barkley. "Psychosocial Aspects of Pediatrics and Psychiatric Disorders." *Current Pediatric Diagnosis &Treatment*. Edited by William W. Hay, Jr., et al. Stamford, CT: Appleton & Lange, 1997.

Eisendrath, Stuart J. "Psychiatric Disorders." *Current Medical Diagnosis & Treatment*. Edited by Lawrence M. Tierney, Jr., Stephen J. McPhee, and Maxine A. Papadakis. Stamford, CT: Appleton &Lange, 1997.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I, "Spirituality and Healing." New York: Simon & Schuster, 2002.

"Psychiatry in Medicine. " Section 15, Chapter 185 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laborato ries, 1999.

Selye, Hans, MD. *The Stress of Life*. New York, Toronto, and London: McGraw Hill Book Company, 1956.

PERIODICALS

Antoni, M. H., D. G. Cruess, N. Klimas, et al. "Stress Management and Immune System Reconstitution in Symptomatic HIV Infected Gay Men Over Time: Effects on Transitional Naive T Cells (CD4(+)CD45RA(+)CD29(+))." *American Journal of Psychiatry* 159 (January 2002): 143 145.

Blumenthal, J. A., M. Babyak, J. Wei, et al. "Usefulness of Psychosocial Treatment of Mental Stress Induced Myocardial Ischemia in Men." *American Journal of Cardiology* 89 (January 15, 2002): 164 168.

Cardenas, J., K. Williams, J. P. Wilson, et al. "PSTD, Major Depressive Symptoms, and Substance Abuse Following September 11, 2001, in a Midwestern University Pop ulation" *International Journal of Emergency Mental Health* 5 (Winter 2003): 15 28.

Gallo, L. C., and K. A. Matthews. "Understanding the Association Between Socioeconomic Status and Phys ical Health: Do Negative Emotions Play a Role?" *Psy chological Bulletin* 129 (January 2003): 10 51.

Hawkley, L. C., and J. T. Cacioppo. "Loneliness and Path ways to Disease." *Brain, Behavior, and Immunity* 17 (February 2003) (Supplement 1): S98 S105.

Latkin, C. A., and A. D. Curry. "Stressful Neighborhoods and Depression: A Prospective Study of the Impact of Neighborhood Disorder." *Journal of Health and Social Behavior* 44 (March 2003): 34 44.

Ottenstein, R. J. "Coping with Threats of Terrorism: A Protocol for Group Intervention." *International Jour nal of Emergency Mental Health* 5 (Winter 2003): 39 42.

Rahe, R. H., C. B. Taylor, R. L. Tolles, et al. "A Novel Stress and Coping Workplace Program Reduces Illness and Healthcare Utilization." *Psychosomatic Medicine* 64 (March April 2002): 278 286.

Solomon, G. D. "Chronic Tension Type Headache: Advice for the Viselike Headache Patient." *Cleveland Clinic Journal of Medicine* 69 (February 2002): 173 174.

Surwit, R. S., M. A. van Tilburg, N. Zucker, et al. "Stress Management Improves Long Term Glycemic Control in Type 2 Diabetes." *Diabetes Care* 25 (January 2002): 30 34.

West, P., and H. Sweeting. "Fifteen, Female and Stressed: Changing Patterns of Psychological Distress Over Time." *Journal of Child Psychology and Psychiatry* 44 (March 2003): 399 411.

ORGANIZATIONS

The American Institute of Stress. 124 Park Avenue, Yonkers, NY 10703 (914) 963 1200. Fax: (914) 965 6267. http://www.stress.org.

National Institute of Mental Health (NIMH). 6001 Execu tive Boulevard, Room 8184, MSC 9663, Bethesda, MD 20892 9663. (301) 443 4513. www.nimh.nih.gov.

Stress and Anxiety Research Society (STAR). STAR is an international multidisciplinary organization of researchers that began in the Netherlands in 1980. http://www.star society.org.

OTHER

National Center for Post Traumatic Stress Disorder, Department of Veterans Affairs. *Fact Sheet: Survivors of Human Caused and Natural Disasters*. http://www. ncptsd.org/facts/disasters/fs_survivors_disaster.html.

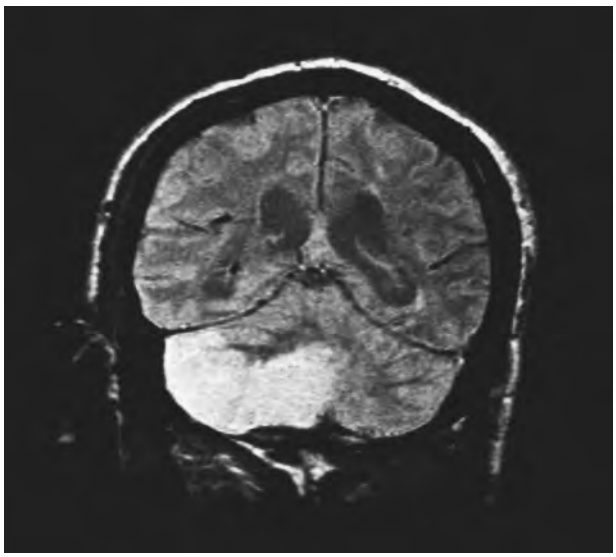
National Institute of Mental Health (NIMH) news release, July 17, 2003. "Gene More Than Doubles Risk of Depression Following Life Stresses." http://www. nimh.nih.gov/events/prgenestress.cfm.

Paula Ford-Martin
Rebecca J. Frey, PhD

Stroke

Definition

Stroke is the common name for the injury to the brain that occurs when flow of blood to brain tissue is interrupted by a clogged or burst artery. Arterial blood carries oxygen and **nutrition** to the cells of the body. When arteries are unable to carry out this function due to rupture, constriction, or obstruction, the cells nourished by these arteries die. The medical term for stroke is the acronym CVA, or cerebral vascular accident. It is estimated that four of every five families in the United States will be affected by stroke in their lifetime, and it is the top cause of adult disability worldwide. Stroke is ranked third in the leading causes of death in the United States, has left three million Americans permanently disabled, and costs



This frontal MRI view of the brain shows the appearance of an infarct (stroke) conforming to the vascular territory of the PICA (posterior inferior cerebellar artery). *(Living Art Enterprises, LLC / Photo Researchers, Inc.)*

the United States 30 billion dollars each year in terms of health care costs and lost productivity.

The most common type of stroke is classified as *ischemic*, or occurring because the blood supply to a portion of the brain has been cut off. Ischemic strokes account for approximately 80% of all strokes, and can be further broken down into two subtypes: thrombotic, also called cerebral thrombosis; and embolic, termed cerebral embolism.

Thrombotic strokes are by far the more prevalent, and can be seen in nearly all **aging** populations worldwide. As people grow older, **atherosclerosis**, or hardening of the arteries, occurs. This results in a buildup of a waxy, cholesterol-laden substance in the arteries, which eventually narrows the interior space, or lumen, of the artery. This arterial narrowing occurs in all parts of the body, including the brain. As the process continues, the occlusion, or shutting off of the artery, eventually becomes complete, so that no blood supply can pass through. Usually the presentation of the symptoms of a thrombotic stroke are much more gradual, and less dramatic, than other strokes due to the slow, ongoing process that produces it. Transient ischemic attacks, or TIAs, are one form of thrombotic stroke, and usually the least serious. TIAs represent the blockage of a very small artery or arteriole, or the intermittent or temporary obstruction of a larger artery. This blockage affects only a small portion of brain tissue and does not leave noticeable permanent ill effects. These transient ischemic attacks last only a matter of minutes, but are a forewarning that part of the brain is not receiving its necessary supply of blood, and thus oxygen and nutrition. Thrombotic strokes account for 40-50% of all strokes.

Embolic strokes are more acute and rapid in onset. They take place when the heart's rhythm is changed for a number of different reasons, and blood clot formation occurs. This blood clot can move through the circulatory system until it blocks a blood vessel and stops the blood supply to cells in a specific portion of the body. If it occludes an artery that nourishes heart muscle, it causes myocardial infarction, or heart attack. If it blocks off a vessel that feeds brain tissue, it is termed an embolic stroke. Embolisms account for 25-30% percent of all strokes. Normally these blockages occur in the brain itself, when arteries directly feeding portions of brain tissue are blocked by a clot. But occasionally the obstruction is found in the arteries of the neck, especially the carotid artery.

Approximately 20% of cerebral vascular accidents are termed hemorrhagic strokes. Hemorrhagic strokes occur when an artery to the brain has a weakness, and balloons outward, producing what is called an aneurysm. Such aneurysms often rupture due to this inflation and thinning of the arterial wall, causing a hemorrhage in the affected portion of the brain.

Both ischemic and hemorrhagic strokes display similar symptoms, depending on which portion of the brain is cut off from its supply of oxygen and nourishment. The brain is divided into left and right hemispheres. These hemispheres are responsible for bodily movement on the opposite side of the body from the brain hemisphere. For example, the left hemisphere of the brain is responsible for both motor control and sensory discrimination for the right side of the body, just as the right hemisphere is responsible for left body movements and feeling. Deeper brain tissue in the left hemisphere of the brain directs muscle tone and coordination for both the right arm and leg. As the communication and speech centers for the brain are also located in the left hemisphere of the brain, interruption of blood supply to that area can also typically affect the person's ability to speak.

Description

Strokes are always considered a medical emergency, and every minute is important in initiating treatment. With the possible exception of transient ischemic attacks, all other types of stroke are life-threatening events. Stroke is a leading cause of death in all nations of the Western world and the more

KEY TERMS

Angiography—The procedure that enables blood vessels to be seen on film after the vessels have been filled with a contrast medium (a substance that shows up opaque on x rays).

Arteriole—The tiny extensions of arteries that lead into the capillaries.

Atherosclerosis—Disease of the arterial wall in which the inner layer thickens, causing narrowing of the channel and thus impairing blood flow.

CT (computer tomography) scan—The diagnostic technique in which the combined use of a computer and x rays passed through the body at different angles produces clear, cross-sectional images *(slices)* of the tissue being examined.

Encephalitis—Inflammation of the brain, usually caused by a viral infection.

Ischemic—Insufficient blood supply to a specific organ or tissue.

Lumbar puncture—A procedure in which a hollow needle is inserted into the lower part of the spinal canal to withdraw cerebrospinal fluid (the clear liquid which surrounds the brain and spinal cord), or to inject drugs or other substances.

Meningitis—Inflammation of the meninges (membranes which cover the brain and spinal cord).

MRI (magnetic resonance imaging)—The diagnostic technique which provides high quality cross-sectional images of organs or structures within the body through the use of a high-speed magnetic imaging device.

Myocardial infarction—Heart attack. Sudden death of part of the heart muscle characterized in most cases by severe, unremitting chest pain.

Subdural hematoma—Bleeding into the space between the outermost and middle membranes covering the brain.

Thrombotic—Pertaining to a blood clot formed within an intact blood vessel as opposed to a clot formed to seal the wall of a blood vessel after an injury.

TIA (transient ischemic attack)—Occlusion of smaller blood vessels to the brain which can produce stroke-like symptoms for anywhere from a few minutes to 24 hours, but leaves no permanent damage.

affluent Asian countries. One-quarter of all strokes are fatal. Cerebral vascular accidents are typically a condition of the elderly, and more often happen to men than women. In the United States, strokes occur in roughly one of every 500 people, and the likelihood of becoming a stroke victim rises sharply as a person ages. The incidence of strokes among people ages 30-60 years is less than 1%. This figure triples by the age of 80 years.

Causes and symptoms

Along with the typical risk factors for heart disease, the most common risk factor for thrombotic stroke is age. Some buildup of material along the inner lumen of the artery, or atherosclerosis, is a normal part of growing older. Hypertension, or high blood pressure, can result from this buildup, as the heart attempts to pump blood through these narrowed arteries. High blood pressure is one of the foremost causes of stroke. Aside from aging and **hypertension**, heart disease, **obesity**, diabetes, smoking, oral contraceptives in women, polycythemia, and a condition called **sleep apnea** are all risk factors for stroke, as is a diet high in **cholesterol** or fatty foods.

The risk factors for hemorrhagic stroke are those that can weaken arteries supplying blood to the brain. They include high blood pressure which can, over a period of time, cause the ballooning of arteries known as aneurysm, and hereditary malformations that produce defective and weakened veins and arteries. **Substance abuse** also is a major cause. It has been demonstrated for years that cocaine and stimulants such as amphetamine drugs are culprits, and chronic **alcoholism** can cause a weakening of blood vessels that also can result in hemorrhagic stroke.

Exactly what triggers the actual ischemic stroke event continues to puzzle clinicians. Researchers refer to these triggers as "short-term risk" vs. long-term risk factors. If researchers can help identify the triggers for stroke in those with high risk factors, they might be able to help prevent the stroke from occurring. One 2002 report found that abrupt changes in body position caused by sudden loud noises or other unexpected events might trigger a stroke. These events occurred during a two-hour period before the stroke.

Diagnosis

As noted previously, the symptoms of stroke observed depend upon the part of the brain, and how

large a portion of brain tissue has been damaged by the CVA. Unconsciousness and even seizures can be initial components of a stroke. Other effects materialize over a time period ranging from minutes to hours, and even, in some rare instances, over several days. Headache (often described as "the worst **headache** I've ever had" in hemorrhagic stroke), mental confusion, vertigo, vision problems, aphasia, or difficulty speaking and communicating, including slurring of words; are major symptoms. Hemiplegia, or weakness or paralysis of one side of the body, is a symptom that is frequently seen. This one-sided weakness is often first noticed in the person's face. Stroke victims often have facial drooping, or slackness of the facial muscles, on the affected side, as well as difficulty swallowing. The severity of these symptoms will depend upon the amount of brain tissue that has died, and its location in the brain.

Computed tomography (CT) brain scans, angiography, lumbar puncture, and magnetic resonance imaging (MRI) are all used to rule out any other possible causes of the symptoms seen. Other possible causes of these symptoms could be brain tumor, brain **abscess**, subdural hematoma, encephalitis, and **meningitis**.

Treatment

There are many applications of alternative and complementary medicine in the treatment and prevention of stroke. Alternative therapies are also used in rehabilitation of stroke victims. Acupuncture and **acupressure** are commonly used for stroke patients, as is massage. Movement and **meditation** programs such as **t'ai chi** are also helpful. Herbs with antioxidant properties may be prescribed by a practitioner. Many therapies aid in blood pressure control, including meditation, **guided imagery** , **biofeedback** and t'ai chi.

Allopathic treatment

Much of the needed care immediately following a stroke will be to prevent further damage than that which has already occurred. Paralysis requires prevention of contractures, or tightening up of paralyzed limbs. This is done through physiotherapy, and may include the use of supportive braces for arms or hands, footboards or wearing sneakers when in bed to prevent foot drop. The severely ill stroke patient will need to be repositioned frequently to prevent complications such as **pneumonia** and venous or pulmonary embolism.

Because of the difficulty swallowing, the person who has suffered a stroke may need a temporary or permanent feeding tube inserted into the stomach to ensure adequate nutrition. Such tubes can be placed through the nose, into the esophagus, and into the stomach, or gastrically, with a wider-lumen tube surgically implanted into the stomach.

A severe stroke that results in coma or unconsciousness will require medical monitoring and support, including oxygen and even possibly intubation to assure an adequate airway and facilitate breathing. Provision of fluids that the person may not be able to take by mouth due to swallowing difficulties will be necessary, as will possibly the administration of blood-thinning or clot-dissolving medications such as Coumadin or heparin. A five-year clinical trial completed in 1995 and reported by the *New England Journal of Medicine* showed that stroke patients treated with t-PA, a clot-dissolving medication, within three hours of the stroke were one-third more likely to be left with no permanent residual difficulty. The trauma of the brain caused by stroke may result in **edema**, or swelling, which may have to be reduced by giving the patient diuretic or steroid medications. Sometimes surgical removal of a clot obstructing an artery is necessary. Hemorrhagic stroke can cause a buildup of pressure on the brain that must be relieved as quickly as possible to prevent further brain damage. In extreme cases, this may require incision through the skull to relieve that pressure.

Expected results

Studies reported by the National Institute of Neurological Disorders and Stroke report that 25% of people who suffer a stroke recover completely and 20% die within three months after the stroke. Of the remaining 55% percent, 5% will require long-term (nursing home) care, and for the rest — roughly half of all stroke patients — rehabilitative and restorative services will be necessary to regain as much of their former capabilities as possible. It has been estimated that the most common irreversible damage from stroke is that done to intellectual functions.

Prevention

Control of blood pressure is the single most important factor in preventing stroke. People should have their blood pressure checked regularly, and if consistently elevated, (diastolic, or lower blood pressure beat above 90 to 100, systolic or top beat above 140 to 150), a physician should be consulted.

The American Heart Association recommends that cigarette smokers break the habit to reduce stroke risk. Current cigarette use can increase risk of cerebral infarction to nearly double and **smoking** is associated with other risk factors of stroke. Risk begins to increase as time since quitting smoking also increases.

The AHA also recommends that those at risk for stroke avoid secondhand tobacco smoke if possible.

Diet, including reduction of **sodium** (salt) intake, **exercise** and weight loss, if overweight, are all non-drug treatments for lowering blood pressure. Other natural remedies include the use of **artichoke**, which lowers the fat content of the blood, **garlic**, now believed to lower cholesterol and blood pressure as well as to reduce the clotting ability of the blood, and ginkgo, which improves circulation and strengthens arteries and veins. The use of **folic acid**, **lecithin**, vitamins B_6 and B_{12}, vitamins C and E are all recommended as supportive measures in reducing blood pressure. Two new Harvard studies found that eating a diet high in fruits and vegetables (particularly leafy green vegetables and cruciferous ones like broccoli, cauliflower, and cabbage) can reduce the risk of ischemic stroke. When fruits and vegetables were not only added to the diet, but replaced meat and trans fats, they further reduced stroke risk.

Avoiding substances that can cause stroke. A 2002 report revealed that the popular herbal supplement ephedrine can cause stroke, **heart attack**, and sudden death.

Multiple studies have found that aspirin acts as a blood-thinning, or clot-reducing medication when taken in small doses. One baby aspirin tablet per day provides this anticoagulant prevention.

If necessary, a physician may also order medication to lower blood pressure. These medications include the following categories of drugs:

- *Beta blockers* reduce the force and speed of the heartbeat.
- *Vasodilators* dilate the blood vessels.
- *Diuretics* reduce the total volume of circulating blood and thus the heart's work by removing fluid from the body.
- *Lipid-lowering drugs* increase the loss of cholesterol from the body or prevent the conversion of fatty acids to cholesterol. This lowers fat levels in the blood stream.

A preliminary report out of France in 2002 stated that getting a flu shot might reduce risk of stroke. Previous research has also suggested that flu shots might stimulate a response in the immune system that helps reduce inflammation throughout the body. If true, those most likely to benefit would be the people age 75 and older.

Resources

BOOKS

Clayman, Charles B., MD. *The American Medical Association Home Medical Encyclopedia*. Random House, 1989.

Landis, Robyn, and Karta Purkh Singh Khalsa. *Herbal Defense: Positioning Yourself to Triumph Over Illness and Aging*. Warner Books, 1997.

Sammons, James H., MD, John T. Baker, MD, Frank D. Campion, Heidi Hough, James Ferris, Brenda A. Clark. *The American Medical Association Guide to Prescription and Over the counter Drugs*. Random House, 1988.

Thomas, Clayton L. *Taber's Cyclopedic Medical Dictionary*. F.A.Davis Co., 1998.

PERIODICALS

"Abrupt Changes in Body Position Can Trigger Stroke." *Heart Disease Weekly* (March 24, 2002):15.

"Flu Shots May Prevent Strokes." *Medical Update* (February 2002):5.

Hall, Zach W., Ph.D. *New England Journal of Medicine* (December 14, 1995).

Samenuk, David. "Adverse Cardiovascular Events Temporarily Associated with Ma Huang, an Herbal Source of Ephedrine." *JAMA, Journal of the American Medical Association* (March 27, 2002):1506.

"Strategies Identified to Prevent Primary Stroke." *Clinician Reviews* (March 2002):89.

"Vegetables and Fruits Cut Stroke Risk."*Health Science* (Winter 2002):7.

ORGANIZATIONS

National Institute of Neurological Disorders and Stroke. National Institutes of Health, Building 31, Room 8A 16, P.O. Box 5801, Bethesda, MD 20824. (301) 496 5751.

National Stroke Association. 1 800 STROKES. http://www.stroke.org.

OTHER

Dr. Rappa. "What Is a Stroke?" http://www.medhealthsolution.com.

Joan Schonbeck
Teresa G. Odle

Structural integration *see* **Rolfing**

Substance abuse and dependence

Definition

Substance abuse is the continued, compulsive use of mind-altering substances despite personal, social, and/or physical problems caused by the substance use.

Frequency of substance abuse by gender and age

Men	
Ages 18 to 29	17 to 24 percent
Ages 30 to 44	11 to 14 percent
Ages 45 to 64	6 to 8 percent
Over age 65	1 to 3 percent
Women	
Ages 18 to 29	4 to 10 percent
Ages 30 to 44	2 to 4 percent
Ages 45 to 64	1 to 2 percent
Over age 65	less than 1 percent

Acupuncture points associated with the relief of substance abuse problems. *(Illustration by Corey Light. Cengage Learning, Gale)*

Abuse may lead to dependence, where increased amounts are needed to achieve the desired effect or level of intoxication and the patient's tolerance for the drug increases.

Description

Substance abuse and dependence cuts across all lines of race, culture, education, and socioeconomic status, leaving no group untouched by its devastating effects. Substance abuse is an enormous public health problem, with far-ranging effects throughout society. In addition to the toll substance abuse can take on one's physical health, substance abuse is considered an important factor in a wide variety of social problems, affecting rates of crime, domestic violence, sexually transmitted diseases (including HIV/AIDS), unemployment, homelessness, teen **pregnancy**, and failure in school. One study estimated that 20% of the total yearly cost of health care in the United States is spent on the effects of drug and alcohol abuse.

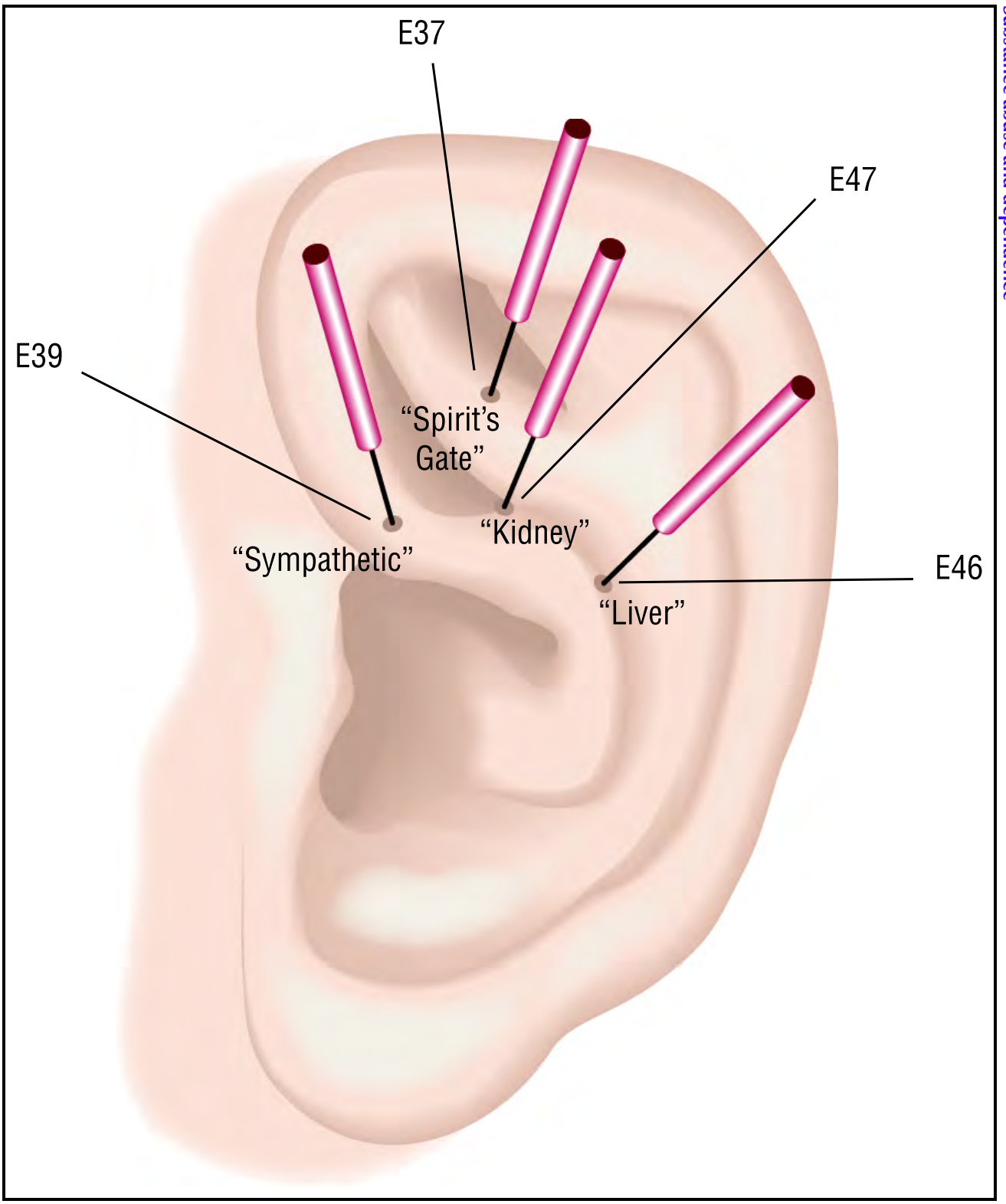
A wide range of substances can be abused. The most common classes include:

- alcohol
- cocaine-based drugs
- opioids (including such prescription pain killers as morphine and Demerol, as well as illegal substances such as heroin)
- benzodiazapines (including prescription drugs used for treating anxiety, such as valium)
- sedatives or "downers" (including prescription barbiturate drugs commonly referred to as tranquilizers)
- stimulants or "speed" (including prescription amphetamine drugs used as weight loss drugs and in the treatment of attention deficit disorder) and Ecstasy (which in 2001 had been tried by more than 12 % of teens, up 71% over 1999 figures)
- cannabinoid drugs obtained from the hemp plant (including marijuana and hashish)
- hallucinogenic or "psychedelic" drugs (including LSD, PCP or angel dust, and other PCP-type drugs)
- inhalants (including gaseous drugs used in the medical practice of anesthesia, as well as such common substances as paint thinner, gasoline, and glue). A 2002 study found that inhalant use was even higher than that of Ecstasy

Over time, the same dosage of an abused substance will produce fewer of the desired feelings. This is known as drug tolerance. In order to continue to feel the desired effect of the substance, progressively higher drug doses must be taken.

Substance dependence is a phenomenon whereby a person becomes physically addicted to a substance. A substance-dependent person must have a particular dose or concentration of the substance in his or her bloodstream at any given moment in order to avoid the unpleasant symptoms associated with withdrawal from that substance. The common substances of abuse tend to exert either a depressive (slowing) or a stimulating (speeding up) effect on such basic bodily functions as respiratory rate, heart rate, and blood pressure. When a drug is stopped abruptly, the person's body will respond by overreacting to the substance's absence. Functions slowed by the abused substance will be suddenly speeded up, while previously stimulated functions will be suddenly slowed. This results in very unpleasant effects, known as withdrawal symptoms.

Addiction refers to the mind-state of a person who reaches a point where he/she must have a specific substance, even though the social, physical, and/or legal consequences of substance use are clearly negative (e.g., loss of relationships, employment, housing). Craving refers to an intense hunger for a specific substance, to the point where this need essentially directs the individual's behavior. Craving is usually seen in both dependence and addiction and can be so strong



Acupuncture points associated with the relief of substance abuse problems. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

KEY TERMS

Addiction—The state of being both physically and psychologically dependent on a substance.

Dependence—A state in which a person requires a steady concentration of a particular substance in order to avoid experiencing withdrawal symptoms.

Detoxification—A process whereby an addict is withdrawn from a substance.

High—The altered state of consciousness that a person seeks when abusing a substance.

Street drug—A substance purchased from a drug dealer. It may be a legal substance, sold illicitly (without a prescription, and not for medical use), or it may be a substance which is illegal to possess.

Tolerance—A phenomenon whereby a drug user becomes physically accustomed to a particular dose of a substance, and requires ever-increasing dosages in order to obtain the same effects.

Withdrawal—Those side effects experienced by a person who has become physically dependent on a substance, upon decreasing the substance's dosage, or discontinuing its use.

that it overwhelms a person's ability to make any decisions that will possibly deprive him/her of the substance. Drug possession and use becomes the most important goal, and other forces (including the law) have little effect on changing the individual's substance-seeking behavior.

Causes and symptoms

It is generally believed that there is not one single cause of substance abuse, though scientists are increasingly convinced that certain people possess a genetic predisposition that can affect the development of addictive behaviors. One theory holds that a particular nerve pathway in the brain (dubbed the "mesolimbic reward pathway") holds certain chemical characteristics which can increase the likelihood that substance use will ultimately lead to substance addiction. Certainly, however, other social factors are involved, including family problems and peer pressure. Primary mood disorders (bipolar), personality disorders, and the role of learned behavior can be influential on the likelihood that a person will become substance dependent.

The symptoms of substance abuse may be related to its social effects as well as its physical effects. The social effects of substance abuse may include dropping out of school or losing a series of jobs, engaging in fighting and violence in relationships, and legal problems (ranging from driving under the influence to the commission of crimes designed to obtain the money needed to support an expensive drug habit).

Physical effects of substance abuse are related to the specific drug being abused:

- Opioid drug users may appear slowed in their physical movements and speech, may lose weight, exhibit mood swings, and have constricted (small) pupils.
- Benzodiazapine and barbiturate users may appear sleepy and slowed, with slurred speech, small pupils, and occasional confusion.
- Amphetamine users may have excessively high energy, inability to sleep, weight loss, rapid pulse, elevated blood pressure, occasional psychotic behavior and dilated (enlarged) pupils.
- Marijuana users may be sluggish and slow to react, exhibiting mood swings and red eyes with dilated pupils.
- Cocaine users may have wide variations in their energy level, severe mood disturbances, psychosis, paranoia, and a constantly runny nose. "Crack" cocaine use may cause aggressive or violent behavior.
- Hallucinogenic drug users may display bizarre behavior due to hallucinations (hallucinations are imagined sights, voices, sounds, or smells which seem completely real to the individual experiencing them) and dilated pupils. LSD can cause flashbacks.

Other symptoms of substance abuse may be related to the form in which the substance is used. For example, heroin, certain other opioid drugs, and certain forms of cocaine may be injected using a needle and a hypodermic syringe. A person abusing an injectable substance may have "track marks" (outwardly visible signs of the site of an injection, with possible redness and swelling of the vein in which the substance was injected). Furthermore, poor judgment brought on by substance use can result in the injections being made under dirty conditions. These unsanitary conditions and the use of shared needles can cause **infections** of the injection sites, major infections of the heart, as well as infection with HIV (the virus which causes **AIDS**), certain forms of **hepatitis** (a liver infection), and **tuberculosis**.

Cocaine is often taken as a powdery substance that is "snorted" through the nose. This can result in frequent **nosebleeds**, sores in the nose, and even erosion (an eating away) of the nasal septum (the structure that separates the two nostrils). Other forms of

cocaine include smokable or injectable forms such as freebase and crack cocaine.

Overdosing on a substance is a frequent complication of substance abuse. Drug overdose can be purposeful (with suicide as a goal), or due to carelessness. It may also be the result of the unpredictable strength of substances purchased from street dealers, mixing of more than one type of substance or of a substance and alcohol, or as a result of the ever-increasing doses the person must take of those substances to which he or she has become tolerant. Substance overdose can be a life-threatening emergency, with the specific symptoms dependent on the type of substance used. Substances with depressive effects may dangerously slow the breathing and heart rate, drop the body temperature, and result in general unresponsiveness. Substances with stimulatory effects may dangerously increase the heart rate and blood pressure, increase body temperature, and cause bizarre behavior. With cocaine, there is a risk of **stroke**.

Still other symptoms may be caused by unknown substances mixed with street drugs in order to "stretch" a batch. A health care worker faced with a patient suffering extreme symptoms will have no idea what other substance that person may have unwittingly put into his or her body. Thorough drug screening can help with this problem.

Diagnosis

The most difficult aspect of diagnosis involves overcoming the patient's denial. Denial is a psychological trait whereby a person is unable to allow him- or herself to acknowledge the reality of a situation. This may lead a person to completely deny his or her substance use, or may cause the person to greatly underestimate the degree of the problem and its effects on his or her life.

One of the simplest and most common screening tools practitioners use to begin the process of diagnosing substance abuse is the CAGE questionnaire. CAGE refers to the first letters of each word that forms the basis of each of the four questions of the screening exam:

- Have you ever tried to *cut* down on your substance use?
- Have you ever been *annoyed* by people trying to talk to you about your substance use?
- Do you ever feel *guilty* about your substance use?
- Do you ever need an *eye opener* (use of the substance first thing in the morning) in order to start your day?

Other, longer lists of questions exist in order to try to determine the severity and effects of a person's substance abuse. Certainly, it is also relevant to determine whether anybody else in the user's family has ever suffered from substance or alcohol addiction.

A physical examination may reveal signs of substance abuse in the form of needle marks, tracks, trauma to the inside of the nostrils from snorting drugs, unusually large or small pupils. With the person's permission, substance use can also be detected by examining an individual's blood, urine, or hair in a laboratory. This drug testing is limited by sensitivity, specificity, and the time elapsed since the person last used the drug.

Treatment

Treatment has several goals, which include helping a person deal with the uncomfortable and possibly life-threatening symptoms associated with withdrawal from an addictive substance (called **detoxification**), helping an abuser deal with the social effects that substance abuse has had on his or her life, and efforts to prevent relapse (resumed use of the substance). Individual or group **psychotherapy** may be helpful.

Ridding the body of toxins is believed to be aided by **hydrotherapy** (bathing regularly in water containing baking soda, sea salt, or Epsom salts). Hydrotherapy can include a constitutional effect where the body's vital force is stimulated and all organ systems are revitalized. Herbalists or naturopathic physicians may prescribe such herbs as **milk thistle** (*Silybum marianum*), burdock (*Arctium lappa*, a blood cleanser), and **licorice** (*Glycyrrhiza glabra*) to assist in detoxification. **Anxiety** brought on by substance withdrawal is thought to be lessened by using other herbs, which include **valerian** (*Valeriana officinalis*), vervain (*Verbena officinalis*), **skullcap** (*Scutellaria baicalensis*), and kava (*Piper methysticum*).

Other treatments aimed at reducing the **stress** a person suffers while attempting substance withdrawal and throughout an individual's recovery process include **acupuncture**, **hypnotherapy**, **biofeedback**, **guided imagery**, and various meditative arts (including **yoga** and **t'ai chi**).

Use of acupuncture to treat addiction is becoming more common, and in 2002, a study was undertaken in Maine to treat substance abuse users who were dually diagnosed with chronic mental illness and substance abuse problems with ear acupuncture. The technique appears to cleanse organs and to aid in **relaxation**, which eases many of the stresses believed to lead these patients to maintain their reliance on the drugs. Another clinical trial in the same year, however, found that acupuncture was not effective alone for treating cocaine-dependent adults. However, the study did

conclude that acupuncture may be effective for these patients when used in combination with other treatments. New research also suggests that **qigong** therapy may be an effective alternative for patients with heroin addiction.

Allopathic treatment

Detoxification may take from several days to many weeks. Detoxification can be accomplished "cold turkey," by complete and immediate cessation of all substance use, or by slowly decreasing (tapering) the dose which a person is taking, to minimize the side effects of withdrawal. Some substances absolutely must be tapered, because "cold turkey" methods of detoxification are potentially life threatening. Alternatively, a variety of medications may be utilized to combat the unpleasant and threatening physical symptoms of withdrawal. A substance (such as methadone in the case of heroin addiction) may be substituted for the original substance of abuse, with gradual tapering of this substituted drug. In practice, many patients may be maintained on methadone and lead a reasonably normal life style. Because of the rebound effects of wildly fluctuating blood pressure, body temperature, heart and breathing rates, as well as the potential for bizarre behavior and hallucinations, a person undergoing withdrawal must be carefully monitored.

Expected results

After a person has successfully withdrawn from substance use, the even more difficult task of recovery begins. Recovery refers to the life-long efforts of a person to avoid returning to substance use. The craving can be so strong even years and years after initial withdrawal that a previously addicted person is virtually forever in danger of slipping back into substance use. Triggers for such a relapse include any number of life stresses (problems on the job or in the marriage, loss of a relationship, death of a loved one, financial stresses), in addition to seemingly mundane exposure to a place or an acquaintance associated with previous substance use. While some people remain in counseling indefinitely as a way of maintaining contact with a professional who can help monitor behavior, others find that various support groups or 12-step programs such as Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) are most helpful in monitoring the recovery process and avoiding relapse.

Another important aspect of treatment for substance abuse concerns the inclusion of close family members in treatment. Because substance abuse has severe effects on the functioning of the family, and because research shows that family members can accidentally develop behaviors which inadvertently serve to support a person's substance habit, most good treatment will involve all family members.

Prevention

Prevention is best aimed at teenagers, who are at very high risk for substance experimentation. Education regarding the risks and consequences of substance use, as well as teaching methods of resisting peer pressure, are both important components of a prevention program. Furthermore, it is important to identify children at higher risk for substance abuse (including victims of physical or sexual abuse, children of parents who have a history of substance abuse, especially alcohol, and children with school failure and/or attention deficit disorder). These children will require a more intensive prevention program. A 2002 report demonstrated that prevention programs worked with high risk youth in reducing rates of alcohol, tobacco, and **marijuana** use.

Resources

BOOKS

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Washington, DC: Ameri can Psychiatric Association, 1994.

O'Brien, C.P. "Drug Abuse and Dependence." In *Cecil Textbook of Medicine,* edited by J. Claude Bennett and Fred Plum. Philadelphia: W.B. Saunders, 1996.

PERIODICALS

Imperio, Winnie A. "Substance Abuse Prevention Works." *Clinical Psychiatry News* (March 2002):41.

"Inhalant Use More Popular than Ecstasy, OxyContin." *Alcoholism & Drug Abuse Weekly* (March 25, 2002):8.

Margolin, Arthur, et al. "Acupuncture for the Treatment of Cocaine Addiction: A Randomized Controlled Trial." *JAMA, The Journal of the American Medical Associa tion* (January 2, 2002):55 59.

Monroe, Judy. "Recognizing Signs of Drug Abuse." *Current Health* (September 1996):16+.

O'Brien, Charles P. and A. Thomas McLellan. "Addiction Medicine." *Journal of the American Medical Association* (18 June 1997): 1840+.

"Qigong Therapy Evaluated for Detoxification." *The Brown University Digest of Addiction Theory and Application* (March 2002):S1.

Rivara, et al. "Alcohol and Illicit Drug Abuse and the Risk of Violent Death in the Home." *Journal of the American Medical Association* (20 August 1997): 569+.

Savage, Lorraine. "Grant to Study Acupuncture's Effec tiveness on Patients Suffering from Substance Abu se."*Healthcare Review*. (March 19, 2002): 16.

"Survey Finds Rise in Ecstasy Use Among Teens."*Alcohol ism & Drug Abuse Weekly*. (February 25, 2002): 3.

ORGANIZATIONS

Al Anon, Alanon Family Group, Inc. P.O. Box 862, Mid town Station, New York, NY 10018 0862. (800) 356 9996. http://www.recovery.org/aa.

Alcoholics Anonymous. World Service Organization. P.O. Box 459, New York, NY 10163. (212) 870 3400. http://www.aa.org.

National Alliance On Alcoholism and Drug Dependence, Inc. 12 West 21st St., New York, NY 10010. (212) 206 6770.

OTHER

National Clearinghouse for Alcohol and Drug Information. http://www.health.org.

Parent Resources and Information for Drug Education (PRIDE). 10 Park Place South, Suite 340, Atlanta, GA 30303. (800) 853 7867 or (404) 577 4500.

Paula Ford-Martin
Teresa G. Odle

Sugar diabetes *see* **Diabetes mellitus**

Sulfur

Description

Sulfur is a homeopathic remedy that is used to treat a variety of chronic or acute ailments. The element sulfur is present in all living tissues. Sulfur is often referred to as brimstone or flowers of sulfur.

Sulfur was used during biblical times as a remedy for skin disorders such as **acne** and **scabies**. Flowers of sulfur were burned to disinfect the rooms of persons with infectious disease. Sulfur was also taken with molasses as an internal cleanser, and was used to treat chronic **bronchitis**, **constipation**, and rheumatism. Now the element is used in the manufacture of dyes, gunpowder, insecticides, fungicides, sulfuric acid, and rubber (as a hardening agent).

General use

Sulfur is known as the king of homeopathic remedies because it has such a wide range of use. It works well with almost every other remedy and it acts on many different maladies and ailments. This polychrest has a deep, long–lasting effect on the body and is often used to bring out symptoms for further treatment. For this reason, sulfur is generally used to treat chronic ailments, although it is also used for acute conditions such as fevers and colds. Sulfur stimulates the body's natural healing powers, causing a general improvement of symptoms and sometimes causing new symptoms.

Homeopaths prescribe sulfur to treat skin ailments such as herpes, **rashes**, **psoriasis**, **eczema**, and acne. Other conditions helped by this remedy include arthritis, colds, coughs, flatulence, gastrointestinal disturbances, and headaches.

Physical symptoms include excessive thirst, swollen glands, profuse sweat, sensitivity to heat, burning pains, hot feet, **boils**, and acne. Symptoms generally appear on the left side of the body. Bodily discharges are hot, burning, and sour smelling. The patient is extremely intolerable of the cold and other weather conditions. Arthritis, coughing, and hoarseness of the throat are all caused by damp weather or a change in weather. Skin conditions are often caused by a change in weather.

These patients are very sensitive to food and the times they eat. If a meal is delayed they may become nauseous and weak. At 10 A.M. or 11 A.M. they get an empty feeling in their stomachs and feel an intense hunger. Patients generally suffer from **indigestion** and other gastrointestinal disorders. They crave alcohol, sweets, spicy foods, fatty foods, and stimulants, but dislike milk and meat. Bread, cold food or drinks, fats, milk, and sweets aggravate their systems.

Mentally, patients are irritable, critical, discontented, impatient, depressed, quarrelsome, restless, hurried, anxious, easily offended, fearful, timid, absent–minded, sad, and weepy. The patient is always tired and lacks endurance. If made to stand for long periods of time he may feel faint.

Symptoms are aggravated by bathing, cold air, motion, **itching**, **fasting**, heat, milk, or standing. They are worse from 10–11 A.M., after eating, or if the patient is in a stuffy room. Symptoms such as headaches may recur on a regular basis, i.e. every seven or ten days. Patients are worse after a long sleep and may not want to get up. Fresh air and warm drinks can help the patient.

Specific indications

The backache typical of sulfur is aching, sore, and stiff. The back feels weak, tired, and bruised. It is worse from standing or walking, after sitting for long periods, during **menstruation**, or at night.

Sulfur patients catch colds easily and often. They cannot become overheated, remain in a cold place, or overexert themselves without catching a cold. The sulfur cold is accompanied by smelly nasal discharge, congestion, **sneezing**, eye inflammations, and an itchy, dry nose that, when blown, may bleed.

The sulfur **cough** is generally dry in the evening and loose in the morning. The chest is congested and the sides hurt from coughing. There is a feeling of dust in the throat. The discharge that is expectorated from the cough is of a greenish color. Patients may often awake from coughing. The cough is better when exposed to open air.

Diarrhea that occurs early in the morning around 5 A.M. is indicative of sulfur. The diarrhea is painless, slimy, watery, and foul smelling. It is accompanied by flatulence and is somewhat relieved by the **gas**.

Earaches are accompanied by aching and lacerating pains. The **earache** is worse in the left ear. There is a ringing or roaring noise in the ear. The ears are frequently plugged and itchy.

Eye inflammations often accompany a cold. The eyes are itchy, watery, burning, dry, and sensitive to light. The eyelids itch in the daytime only. The patient may wake up with his eyes glued shut. Washing them, however, aggravates the condition.

Headaches are confined to the forehead or top of the head. They are hot and burning with hammering pains. These congestive headaches are caused by damp weather and are accompanied by **nausea** and **vomiting**. They often occur on Sunday and recur periodically. They are aggravated by motion, cold drinks, eating, bending over, blowing the nose, coughing, rising in the morning, and sneezing. Sometimes stars, zigzags, or other shapes will appear before the eyes.

Indigestion is common in sulfur patients. The patient can digest almost nothing, but he can't go long without eating. He has a weak stomach and a slow digestion. Stomach pains are sensitive to touch and a heavy feeling is present in the stomach. The patient is hungry at 10 A.M. and may need to eat to avoid feeling faint or weak. She may get a **headache** if she doesn't eat at that time. Indigestion is accompanied by sour belches, gas that smells rotten, bloating, and burning pains. It is worse after eating or from drinking milk.

Insomnia is caused by frequent waking in the early morning hours (3–5 A.M.). For this reason, the patient has a tendency to sleep late. However, no matter how much sleep the patient has, he always wakes up feeling tired. Short catnaps taken throughout the day refresh the patient. Patients are often unable to sleep before midnight.

Skin conditions are itchy, intense, and worse at night or in warm beds. The skin is itchy and burning and chaps easily. Ailments include herpes, rashes, acne, eczema, psoriasis, and **dermatitis**.

KEY TERMS

Polychrest—A homeopathic remedy that is used in the treatment of many ailments.

Succussion—A process integral to the creation of a homeopathic remedy in which a homeopathic solution is repeatedly struck against a firm surface. This is performed to thoroughly mix the substance and magnify its healing properties.

The **sore throat** of a sulfur patient is accompanied by swollen tonsils, burning pains, and a hoarse voice upon waking. The throat is dry and raw and may feel dusty. The throat is worse from coughing and swallowing.

Preparations

The homeopathic remedy is created by adding pure sulfur powder to a water/alcohol mixture or by grinding it with milk sugar. The mixture is then diluted and succussed to create the final preparation.

Sulfur is available at health food and drug stores in various potencies in the form of tinctures, tablets, and pellets.

Precautions

If symptoms do not improve after the recommended time period, a homeopath or health care practitioner should be consulted.

The recommended dose should not be exceeded.

Side effects

Individual aggravations may occur.

Interactions

When taking any homeopathic remedy, use of **peppermint** products, coffee, or alcohol is discouraged. These products may cause the remedy to be ineffective.

Sulfur should not be taken immediately before **lycopodium**.

Resources

BOOKS

Feingold, Ellen. *The Complete Self Care Guide to Homeo pathy, Herbal Remedies & Nutritional Supplements.* Albany, N.Y.: Whitston Publishing Company, 2008.

Hayfield, Robyn. *Simple Homeopathy: An Easy to follow Guide to Using Homeopathic Remedies to Heal Common*

Ailments, with Expert Safe Advice and 100 Colour Pho tographs. London: Southwater, 2008.

ORGANIZATIONS

The American Institute of Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314, (888) 445 9988, http://www.homeopathyusa.org/.

Jennifer Wurges
David Edward Newton, Ed.D.

Suma

Description

Suma is the common name for a tropical ground vine native to the Amazon rain forest of Central and South America. Its botanical name is *Pfaffia paniculata*, and it belongs to the Amaranthaceae family. Referred to by the people of the rain forest as *para todo,* which can be translated as "for all things," the herb has been used for 300 years in the Amazon for many different ailments.

Sometimes called Brazilian ginseng, suma has a reputation as an energy booster, aphrodisiac, and wound healer; it has also been used to treat a wide range of medical conditions such as diabetes, **cancer**, and various skin conditions. Despite suma's traditional use as a folk remedy, its medicinal properties are not widely recognized around the world. While suma is on the list of about 600 Brazilian medicinal plants published by Brazil's Department of Health in the early 1980s, the herb was not included as of 2008 in most of the well-known compilations of herbs outside South America. Only the dried root of the suma plant is used as a drug. According to tradition, the root is also used in cooking and has a mild flavor resembling vanilla.

Although it is marketed to the public as Brazilian ginseng, suma is actually not related to ginseng in any way. *Panax ginseng,* which is cultivated in several parts of the globe outside South America, is a popular herbal stimulant and adaptogen in the United States, Asia, and Europe. Like ginseng, suma is described as an adaptogen. This drug class was first defined in the mid-twentieth century by Russian scientist Nikolai Lazarev, who described Siberian ginseng's broad therapeutic effects. In simple terms, an adaptogen acts nonspecifically to optimize function and help the body to adapt to physical and mental **stress** (infection, hot or cold temperatures, physical exertion, and emotional distress). In order to meet the stricter definition of this concept, an adaptogen should lack side effects, be effective against a wide range of diseases or disorders, and restore the body to a healthy equilibrium regardless of the cause of the disruption.

While in the late 2000s it was not known exactly how suma produces its effects, researchers had identified some of the herb's chemical constituents. These include pfaffosides A, B, C, D, E, and F; sitosterol; stigmasterol; allantoin; and germanium. As of 2008, there had been only a handful of clinical studies on suma, most conducted on mice. One of these studies, conducted by researchers at the University of São Paulo, Brazil, reported in 2005 that suma was effective in treating **pain** and inflammation in mice. It was reported in the February 16, 2006, issue of the scientific journal *Life Sciences*. The safety, indications, and ideal dosage of the herb in humans had not been determined by scientific studies as of early 2008.

General use

While not approved by the United States Food and Drug Administration (FDA), suma has been reported to have a number of beneficial effects. There is, however, little scientific evidence to support these claims. Aside from its use as an energy booster, some people use the herb to treat **chronic fatigue syndrome**, ulcers, **anxiety**, menstrual problems, **impotence**, and menopausal symptoms. Olympic competitors from Russia have used suma in conjunction with other adaptogens to enhance athletic performance. The herb has also been used to strengthen the immune system and fight infection. Like *Panax ginseng,* suma is purported to be an aphrodisiac.

Some of the most intriguing research regarding suma is difficult to verify. At the center of this research is Milton Brazzach of the University of São Paulo in Brazil, who has reportedly treated several thousand patients with suma after he claimed his wife was cured of **breast cancer** using the herb. He has prescribed suma in dosages as high as 28 g daily, for periods of months and years, to treat diabetes and various cancers such as **leukemia** and Hodgkin's disease. While Brazzach has reported that he achieved good results with suma, the full details of his research have not been published in medical journals. Until these studies have been published and reviewed by other experts, the evidence of suma's effectiveness in the treatment of these diseases cannot be authenticated.

Not all practitioners of alternative medicine agree when it comes to the virtues and possible dangers of suma. In *The Way of Herbs*, Michael Tierra compares the herb to **Siberian ginseng** and **Korean ginseng** in terms of effectiveness. He reports that suma increased

KEY TERMS

Adaptogen—A substance that acts in nonspecific ways to improve the body's level of functioning and its adaptations to stress.

Aphrodisiac—An agent that stimulates or enhances sexual function or arousal.

In vitro—A Latin phrase that literally means "in the glass." It refers to an entity or process developed in a laboratory or similar controlled nonliving environment.

Panax ginseng—A popular longevity herb cultivated in Asia, Russia, and the United States. Described by some herbalists as an adaptogen, it is purported to strengthen the immune system and have a number of other beneficial effects.

the sense of overall well-being in one elderly patient with cancer and had beneficial effects on a teenager with leukemia. Suma appears to have the most consistent effect in people who suffer from chronic **fatigue** syndrome or lack of energy, states Tierra. By contrast, prominent pharmacologist Varro Tyler emphasizes safety concerns in *Tyler's Honest Herbal*. Even without extensive scientific testing, many folk remedies are considered relatively safe due to the fact that they have been used without apparent harm for centuries or even millennia, according to Tyler. It is not certain, however, that suma falls into the category of time-proven natural remedies. The claims that suma has been used for centuries in the Amazon are mainly derived from marketing material as opposed to recognized herbal literature. Due to concerns regarding the safety and effectiveness of suma, Tyler does not recommend using the herb for any purpose.

Preparations

The optimum daily dosage of suma has not been established by the FDA. The typical dosage is 1,000 mg daily, taken in divided doses. Much higher dosages have also been recommended.

Precautions

Suma is not known to be harmful when taken in recommended dosages, though it is important to remember that the effects of taking the herb (in any amount) are unknown.

Due to lack of sufficient medical study, suma should be not be used, or used with caution in children, women who are pregnant or breast-feeding, and people with liver or kidney disease.

Side effects

When taken in recommended dosages, suma has not been associated as of 2008 with any significant adverse side effects.

Interactions

Suma is not known to interact adversely with any drugs or dietary supplements.

Resources

BOOKS

Taylor, Leslie. *The Healing Power of Rainforest Herbs: A Guide to Understanding and Using Herbal Medicinals*. Garden City Park, NY: Square One Publishers, 2005.

PERIODICALS

Matsuzaki, Patricia, et al. "Antineoplastic Effects of Buta nolic Residue of *Pfaffia Paniculata*." *Cancer Letters* (July 8, 2006): 85 89.

Mendes, Fulvio Rieli, and Elisaldo A. Carlini. "Brazillian Plants as Possible Adaptogens: An Ethnopharmaco logical Survey of Books Edited in Brazil." *Journal of Ethnopharmacology* (February 12, 2007): 493 500.

Pinello, Katia Cristina, et al. "Effects of *Pfaffia Paniculata* (Brazilian Ginseng) Extract on Macrophage Activity." *Life Sciences* (February 16, 2006): 1287 1292.

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

National Center for Complementary and Alternative Med icine, PO Box 7923, Gaithersburg, MD, 20898, (888) 644 6226, http://www.nccam.nih.gov.

Greg Annussek
Ken R. Wells

Sunburn

Definition

A sunburn is an inflammation or blistering of the skin caused by overexposure to the sun.

Description

Sunburn is caused by excessive exposure to the ultraviolet (UV) rays of the sun. There are two types of ultraviolet rays, UVA and UVB. UVA rays penetrate the skin deeply and can cause melanoma in

Woman with a sunburn. *(Michelle Del Guercio / Photo Researchers, Inc.)*

KEY TERMS

Gingko biloba—A shade tree native to China that has fan-shaped leaves and fleshy seeds. Gingko extract is being studied as a sunburn remedy and preventative.

Malignant melanoma—The most deadly of the three types of skin cancer.

Melanin—A biological pigment that gives color to skin, hair, and the iris of the eye.

Sunscreen—Products that block the damaging rays of the sun. Good sunscreens contain either para-aminobenzoic acid (PABA) or benzophenone, or both. Sunscreen protection factors range from 2-45.

Topical—A type of medication that is applied to the external surface of the skin.

susceptible people. UVB rays, which don't penetrate as deeply, cause sunburn and wrinkling. Most UVB rays are absorbed by sunscreens, but only about half the UVA rays are absorbed.

Skin cancer from sun overexposure is a serious health problem in the United States, affecting almost one million Americans each year. One person out of 87 will develop malignant melanoma, the most serious type of skin **cancer**, and 7,300 of them will die each year. The Environmental Protection Agency (EPA) reported in 2000 that the rate of malignant melanoma is rising faster in the United States than the rates of all other preventable cancers except **lung cancer**. One reason for this high rate is the popular belief that suntanned skin is healthy and attractive. Many people spend more time in the sun than is good for their skin trying to achieve a fashionable tan.

People with fair skin are most susceptible to sunburn, because their skin produces only small amounts of the protective black or dark brown pigment called melanin. However, people of any race can get sunburned if they do not protect their skin against overexposure. People trying to get a tan too quickly in strong sunlight are also more vulnerable to sunburn.

Repeated sun overexposure and burning can prematurely age the skin, causing yellowish, wrinkled skin. Overexposure, especially a serious burn in childhood, can increase the risk of skin cancer.

Causes and symptoms

The ultraviolet rays in sunlight destroy cells in the outer layer of the skin, damaging tiny blood vessels underneath. When the skin is burned, the blood vessels dilate and leak fluid. Cells stop making protein. Their DNA is damaged by the ultraviolet rays. Repeated DNA damage can lead to cancer.

When the sun **burns** the skin, it triggers immune defenses which identify the burned skin as foreign. At the same time, the sun transforms a substance on the skin which interferes with this immune response. While this substance keeps the immune system from attacking a person's own skin, it also means that any malignant cells in the skin will be able to grow freely.

Sunburn causes skin to turn red and blister. Several days later, the dead skin cells peel off. In severe cases, the burn may occur with sunstroke (**vomiting**, **fever**, and fainting).

While overexposure to the sun is harmful, even fatal, no exposure means the body can't manufacture **vitamin D**, which is the only vitamin whose biologically active form is a hormone. Vitamin D is produced in the skin from the energy of the sun's UV rays. People at risk for vitamin D deficiency include alcoholics, non-milk drinkers, and those who do not receive much sunlight, especially those who live in regions that get little natural light. Dr. Sheldon Saul Hendles says that as more people use sunscreens and decrease exposure to the sun, they should make sure to have adequate dietary and supplementary sources of vitamin D. Sunscreen prevents the synthesis of the vitamin.

Diagnosis

Symptoms of sunburn may not appear until several hours after exposure. A deep pink skin color accompanied by a sensation of heat and burning indicates a mild sunburn. A red color with visible strap lines, burning, **itching**, and stinging indicates a moderate burn. Bright red skin with **blisters**, fever, **chills**, and **nausea** indicates severe burn and medical help should be sought quickly.

Treatment

Over-the-counter preparations containing **aloe** (*Aloe barbadensis*) are an effective treatment for sunburn, easing **pain** and inflammation while also relieving dryness of the skin. A variety of topical herbal remedies applied as lotions, poultices, or compresses may also help relieve the effects of sunburn. **Calendula** (*Calendula officinalis*) is one of the most frequently recommended to reduce inflammation.

Other natural remedies include:

- Apply compresses dipped in cold water, one part skim milk mixed with four parts cold water, aluminum acetate antiseptic powder mixed with water, witch hazel, white vinegar, or baking soda mixed with water.
- Make a paste out of cornstarch and water, and apply directed to affected areas.
- Place thin, cold slices of raw cucumber, potato, or apple on the burned areas.
- Make a soothing solution by boiling lettuce in water, strain, cool the water for several hours in the refrigerator, then use cotton balls to pat the liquid onto the skin.
- Apply tea bags soaked in cold water to burned eyelids.
- Sooth the burn with cool yogurt, then rinse with a cold shower.

Another natural remedy that has been proposed for treating sunburn is gingko biloba extract. A Turkish study published in 2002 reported that gingko biloba appears to heal sunburned skin after exposure as well as protect against ultraviolet radiation before exposure. These findings, however, await confirmation by other researchers.

Allopathic treatment

Aspirin can ease pain and inflammation. Tender skin should be protected against the sun until it has healed.

In addition, people suffering from sunburn may apply:

- calamine lotion
- sunburn cream or spray
- cool tap water compresses
- colloidal oatmeal (Aveeno) baths
- dusting powder to reduce chafing

People who are severely sunburned should see a doctor, who may prescribe corticosteroid cream to speed healing, and prescription pain medication. Topical corticosteroids that have been shown to be safe as well as effective in treating sunburn include methylprednisolone aceponate and hydrocortisone 17-butyrate.

Expected results

Moderately burned skin should heal within a week. While the skin will heal after a sunburn, the risk of skin cancer increases with exposure and subsequent burns. Even one bad burn in childhood carries an increased risk of skin cancer.

Prevention

Sun protection education

Concern about the rising rate of melanoma in Europe, Australia, and the United States has led public health experts to recommend adding instruction about the importance of sun protection to elementary and junior high school programs. A 1999 cross-sectional study of boys and girls in all 50 states found that 83% of the students had at least one sunburn during the previous summer, with 36% reporting three or more episodes of sunburn. Only 34% used sunscreen. As of 1998, only 3.4% of schools in the United States had sun protection policies to protect students from excessive sun exposure during recess or athletic practice. A standardized program of sun protection education developed by the EPA in 2000 has been reported to be effective in

changing students' attitudes toward tanning and the importance of using sunscreen.

Specific preventive measures

To prevent sunburn, everyone over the age of six months should use a water-resistant sunscreen with a sun protective factor (SPF) of at least 15. Apply at least an ounce of sunscreen 15–30 minutes before going outside. It should be reapplied every two hours (more often after swimming). Babies should be kept completely out of the sun for the first six months of life, because their skin is thinner than older children. Sunscreens have not been approved for infants. Some people are allergic to para-aminobenzoic acid (PABA) a major ingredient in sunscreen products and should check all labels or consult a doctor prior to application.

In addition, people should follow these guidelines:

- Limit sun exposure to 15 minutes the first day, even if the weather is hazy; then slowly increase exposure daily.
- Reapply sunscreen every two hours (more often if swimming or perspiring heavily).
- Reapply waterproof sunscreen after swimming more than 80 minutes, after toweling off, or after perspiring heavily.
- Avoid the sun between 10 A.M. and 3 P.M.
- Use waterproof sunscreen on legs and feet, since sun rays can burn even through water.
- Wear an opaque shirt in water, because reflected rays are intensified.

Patients using a sunscreen rated lower than SPF 15 should note that simply applying more of the same SPF won't prolong allowed time in the sun. Instead, patients should use a higher SPF in order to safely lengthen their exposure time. A billed cap protects 70% of the face; a wide-brimmed hat is better. People at very high risk for skin cancer can wear clothing that blocks almost all UV rays, but most people can simply wear white cotton summer-weight clothing with a tight weave. In 2001, the U.S. Food and Drug Administration will require all sunscreen makers to label their products as providing minimum, moderate, or high sun protection.

Resources

BOOKS

Blumenthal, Mark. *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicine*. Boston: Integrative Medicine Communications, 1999.

Orkin, Milton, Howard Maibach, and Mark Dahl. *Dermatology*. Norwalk, CT: Appleton & Lange, 1992.

PERIODICALS

Buller, D. B., A. C. Geller, M. Cantor, et al. "Sun Protection Policies and Environmental Features in US Elementary Schools." *Archives of Dermatology* 138 (June 2002): 771 774.

Duteil, L., C. Queille Roussel, B. Lorenz et al. "A Randomized, Controlled Study of the Safety and Effi cacy of Topical Corticosteroid Treatments of Sunburn in Healthy Volunteers." *Clinical and Experimental Dermatology* 27 (June 2002): 314 318.

Geller, A. C., M. Cantor, D. R. Miller, et al. "The Envi ronmental Protection Agency's National SunWise School Program: Sun Protection Education in US Schools (1999 2000)." *Journal of the American Academy of Dermatology* 46 (May 2002): 683 689.

Geller, A. C., G. Colditz, S. Oliveria, et al. "Use of Sunscreen, Sunburning Rates, and Tanning Bed Use Among More Than 10 000 US Children and Adoles cents." *Pediatrics* 109 (June 2002): 1009 1014.

Ozkur, M. K., M. S. Bozkurt, B. Balabanli, et al. "The Effects of EGb 761 on Lipid Peroxide Levels and Superoxide Dismutase Activity in Sunburn." *Photo dermatology, Photoimmunology and Photomedicine* 18 (June 2002): 117 120.

Tyler, Varro. "Aloe: Nature's Skin Soother." *Prevention* 50 (April 1, 1998): 94 96.

ORGANIZATIONS

American Academy of Dermatology. 930 East Woodfield Rd., PO Box 4014, Schaumburg, IL 60168. (847) 330 0230. www.aad.org.

Environmental Protection Agency. Ten regional offices with region specific addresses and phone numbers. www.epa.gov.

Ken R. Wells
Rebecca J. Frey, PhD

Sun's soup

Description

Sun's soup is a packaged food product made by Sun Farm Corporation (Milford, Connecticut), which contains vegetables and herbs. The soup's ingredients are said to possess anticancer and immune-building properties. Named for its creator, biochemist Alexander Sun, Ph.D., who began work on the soup formula during the 1980s, it is also known as Dr. Sun's soup. Two versions are available, freeze-dried and frozen. It may be ordered online and by phone.

According to a National **Cancer** Institute report, the original soup formula contained shiitake mushrooms (*Lentinus edodes*), mung bean (*Phaseolus aureus*), and

the Chinese herbs *Bai Hua She She Cao* (*Hedyotis diffusa*) and *Ban Zhi Lian* (*Scutellaria barbata*). The Institute report also included two other Sun Farm products, Selected Vegetables (SV) and Frozen Selected Vegetables (FSV), which are believed to contain:

- soybean (*Glycine max*
- shiitake mushroom
- mung bean
- red date (*Ziziphus zizyphus*)
- scallion (*Allium cepa*)
- garlic (*Allium tuberosum*)
- leek (*Allium porrum*)
- lentil (seed of the *Lens ensculenta* plant)
- hawthorn fruit (*Crataegus pinnatifida fructus*)
- onion (*Allium x proliferum*)
- ginseng (*Panax ginseng*)
- angelica root (*Dahurica*)
- licorice (*Glycyrrhiza glabra*)
- dandelion root (*Taraxacum officinale*)
- senega root (*Polygala senega*)
- ginger (*Zingiber officinale*)
- olive (*Bucida spinosa*)
- sesame seed (*Sesamum indicum*)
- parsley (*Petroselinum sativum* or *crispum*).

General use

When Alexander Sun's mother was diagnosed with non-small cell **lung cancer**, the Taiwanese biochemist began studying the research about treatments for her condition. According to an article on the Sun Farm Web site, Sun's mother underwent surgery to remove a tumor. During treatment that included chemotherapy, a new tumor was discovered. Sun then began researching **traditional Chinese medicine**, looking for herbal remedies that would help boost his mother's immune system and cause her tumor to shrink.

Based on his studies of Chinese medical textbooks, Sun developed an herb-and-vegeta ble soup, which his mother ate daily. According to the article, her condition was improved three months later, and doctors removed the remaining tumor. Sun's mother was reported to be cancer-free 13 years later, according to a citation in "Selected Vegetables/Sun's soup," a 13-page summary from the National Cancer Institute of the National Institutes of Health.

In 1992, Sun filed a patent application for his soup product, described as an "herbal treatment of malignancy." He received the patent three years later, and conducted clinical trials involving cancer patients who consumed the soup. Sun classified his product as a dietary supplement. In the United States, dietary supplements are categorized as foods rather than drugs. Companies planning to market new drugs must have their products evaluated by the United States Food and Drug Administration (FDA). The federal agency must approve the new drug before it is sold to the public as a medical treatment. No premarket evaluation and approval is required for dietary supplements. However, the FDA may remove a supplement from the market if the product is determined to be unsafe.

KEY TERMS

Non-small cell lung cancer—A group of lung cancers: squamous cell carcinoma, adenocarcinoma, and large cell carcinoma.

As of 2004, Sun's soup is marketed as a food. The National Cancer Institute report noted that the FDA had not approved any formulation of Sun's soup for the treatment of cancer or any other medical condition. Clinical trials have been conducted on the soup, and the Sun Farm Web site contains references to those studies.

The National Cancer Institute report provided more in-depth analysis of two studies. The Institute cited research findings that Dr. Sun published in 1999 and 2001. While Sun's research indicated "improved survival" of cancer patients who consumed the soup, the Institute pointed out that only 18 people participated in the trials. That small number was among the "major weaknesses" of the research, according to the report. The Institute noted that different soup formulas were used in the studies, making it difficult to compare results.

Some of the known ingredients in Sun's soup may be effective as anticancer agents. The National Cancer Institute report described the potential benefits and uses of some ingredients in the various formulas of the herbal vegetable soup:

- Shiitake mushrooms are known to contain anticancer substances including lentinan.
- Mung bean may have an anticancer effect.
- *Bai Hua She She Cao* is a Chinese herb used to boost the immune system. It may have an anticancer effect.
- *Ban Zhi Lian* (barbat skullcap) may have an anticancer effect.

- Red date is the fruit of the jujube plant. It has been used to treat medical problems in some cultures.
- Hawthorn fruit is the fruit of the hawthorn tree or bush. It has been used to treat conditions such as heart and gastrointestinal disorders.
- Ginseng may have an anticancer effect.
- Angelica root is the root of the angelica herb. It is used to treat gastrointestinal conditions such as gas, appetite loss, and feelings of fullness.
- Senega root is the root of the Polygala senaga herb. It is used to treat respiratory difficulties and other conditions.

Preparations

The original Sun's soup was prepared by adding it to hot water or another soup. The package contents may also be served on a salad.

The Sun Farm Web site lists daily recommended dosages for the supplement. For the freeze-dried product, the dosage is two 0.7-oz (20-g) pouches. The frozen soup is sold in 10-oz (0.3 kg) containers. The recommended dosage is one container per day.

Precautions

A diet rich in vegetables may reduce the risk of cancer. However, as of 2004, the FDA has not approved Sun's soup formula as a cancer treatment, and the soup is marketed as a food product. On the Sun Farm Web site, the business has a disclaimer regarding any medical effect of its products. While the site contains information about clinical trials, Internet visitors are advised to check with their doctors regarding their medical condition.

The National Cancer Institute report concluded that there was little evidence that Sun's soup was effective as a cancer treatment. The Institute maintained that data was "limited" and "weak." The report called for larger, better-designed clinical studies to determine if the soup could be used to treat cancers, such as non-small cell lung cancer.

Sun's soup is said to be expensive, costing as much as hundreds of dollars per month, according to a 2001 report on the Cancer Guide Web site. The Sun Farm Web site in 2004 listed no prices for online ordering.

Side effects

According to the National Cancer Institute report, consumption of Sun's soup did not cause any adverse side effects. Some people reported feelings of fullness or bloating after consuming the soup.

Interactions

There are no published reports of drug interactions from consuming Sun's soup.

Resources

OTHER

American Cancer Society. [cited April 30, 2004]. http://www.cancer.org.

Dunn, Steve. "Sun Soup." October 7, 2001. *Cancer Guide* [cited April 30, 2004. http://wwww.cancerguide.org/sun_soup.html.

Dupach, Etieune, Jr. "Cure for Cancer in a Bowl of Soup?" March 6,2000. [cited April 30, 2004]. http://www.sun farmcorp.com/title miami.htm.

National Cancer Institute. (800) 4 CANCER. "Selected Vegetables/Sun's soup." July 24, 2003. [cited April 30, 2004]. http://www.nci.nhi.gov/cancerinfo/pdq/cam/vegetables sun soup.

Sun Farm Corporation. [cited April 30, 2004]. http://www.sunfarmcorp.com.

Liz Swain

Swedish massage

Definition

Swedish massage is the most popular type of massage in the United States. It involves the use of hands, forearms or elbows to manipulate the superficial layers of the muscles to improve mental and physical health. Active or passive movement of the joints may also be part of the massage. The benefits of Swedish massage include increased blood circulation, mental and physical **relaxation**, decreased **stress** and muscle tension, and improved range of motion.

Origins

Swedish massage was invented by a Swedish fencing instructor named Per Henrik Ling in the 1830s. When he was injured in the elbows, he reportedly cured himself using tapping (percussion) strokes around the affected area. He later developed the technique currently known as Swedish massage. This technique was brought to the United States from Sweden by two brothers, Dr. Charles and Dr. George Taylor in the 1850s. The specific techniques used in Swedish massage involve the application of long gliding strokes, friction, and kneading and tapping movements on the soft tissues of the body. Sometimes, passive or active joint movements are also used.

Swedish massage involves the use of hands, forearms or elbows to manipulate the superficial layers of the muscles to improve mental and physical health. *(Libby Welch / Alamy)*

KEY TERMS

Cupping—A type of percussion stroke in which the massage therapist strikes or thumps the muscles with cupped hands.

Effleurage—A massage technique that involves light stroking with the palms or thumbs.

Petrissage—A massage technique in which the therapist kneads or squeezes the muscles with both hands.

Tapotement—A group of massage techniques in which the therapist strikes the soft tissues with the sides of the hands or with loose fists. It is intended to invigorate and tone the body.

Benefits

Unlike drug therapy, which is often associated with many systemic and long-term side effects, **massage therapy** is relatively safe and has few contraindications. It also provides many benefits.

Physical benefits

There are numerous physical benefits associated with the use of Swedish massage:

- loosening tight muscles and stretching connective tissues
- relieving cramps and muscle spasms and decreasing muscle fatigue
- loosening joints and improving range of motion
- increasing muscle strength
- sedating the nervous system
- stimulating blood circulation
- firming up muscle and skin tone
- relieving symptoms of such disorders as asthma, arthritis, carpal tunnel syndrome, chronic and acute pain syndromes, myofacial pain, headache, temporomandibular joint (TMJ) dysfunction, and athletic injuries
- speeding up healing from injury and illness
- improving lymphatic drainage of metabolic wastes

Mental and emotional benefits

Mental benefits associated with massage therapy include the following:

- Mental relaxation
- Improvement in length and quality of sleep
- Relief of stress, depression, anxiety and irritation
- Increased ability to concentrate
- Improved sense of well-being

Description

In Swedish massage, the person to be massaged lies on a massage table and is draped with a towel or sheet. It is a full-body massage treatment, except in areas that are contraindicated or where the client requests not to be touched. Aromatic or unscented oil or lotion is used to facilitate the massage movements. Each session usually lasts 30-60 minutes. Depending on the client's preferences, a massage session may involve the use of several or all of the following basic techniques: effleurage, petrissage, friction, vibration, and tapotement.

Effleurage

Effleurage is the most common **stroke** in Swedish massage. It is a free-flowing and gliding movement towards the heart, tracing the contours of the body

using the palm of one or both hands. Oil is applied with this stroke to begin the first stage of massage. The therapist applies a light or medium constant pressure. This stroke is used to warm up the muscles, relax the body, calm the nerves, improve blood circulation and heart function, and improve lymphatic drainage.

Petrissage

This technique resembles kneading dough. It involves lifting, rolling, and squeezing the flesh under or between the hands. Petrissage is designed to release muscle tension, improve blood flow, and increase lymphatic drainage.

Friction

Friction strokes work on deeper muscles than the techniques previously described. The friction technique is a pressure stroke and is the deepest that is used in Swedish massage. The massage therapist applies pressure by placing the weight of his or her body on the flat of the hand and the pads of the thumbs, knuckles, fingers, or the back of the forearms, and then releases the pressure slowly and gently. This movement should be a continuous sliding motion or a group of alternating circular motions.

Vibration

To effect vibration, the massage therapist gently shakes or trembles the flesh with the hand or fingertips, then moves on to another spot and repeats this stroke. Vibration is designed to release muscle tension in small muscle areas, such as those on the face or along the spine.

Tapotement

Tapotement, or tapping and percussion, is a quick, choppy, rhythmic movement that has a stimulating or toning effect. The following are variations of tapotement:

- Cupping: The therapist forms the hands into a cup shape with fingers straight but bending only at the lower knuckles; the thumbs are kept close to the palms. The therapist strikes the flesh with the flat of the hands one after another in quick succession.
- Hacking: This technique is similar to cupping. The therapist uses the sides of the hands with palms facing one another to make a chopping movement.
- Pummeling: For this stroke, the therapist makes loose fists in both hands and applies them rapidly in succession over the thighs and buttocks.

Tapotement techniques are invigorating to most people but may be too strong for some. When prolonged, tapotement leads to overstimulation and even exhaustion of the nerves and muscles. In addition, it should not be used over **varicose veins** or directly above bony structures.

Preparations

Swedish massage requires the following equipment:

- Massage surface: This may be a professional massage table or any firm but well-padded surface.
- A clean sheet to cover the part of the body that is not massaged.
- Cushions: These may be needed, depending on the client's wishes, to prevent lower back pain. The cushions may be placed under the head and the knees.
- Oils: The base oil should be a vegetable oil, cold pressed, unrefined, and free of additives. These oils contain such nutrients as vitamins and minerals in addition to fatty acids. They do not clog the pores as mineral oils often do. Essential (aromatic) oils may be added to provide additional relaxation or other therapeutic effects. Massage oil should be warmed in the therapist's hands before it is applied to the client's skin.

Precautions

Swedish massage should not be given to patients with the following physical disorders or conditions:

- nausea, vomiting or diarrhea
- fever
- broken bones, fractures, dislocations, or severe sprains
- contagious diseases
- open or unhealed sores or wounds
- body areas that are inflamed, swollen or bruised
- varicose veins
- recent surgery
- severe pain
- jaundice
- frostbite
- kidney disease
- large hernias
- hemorrhaging
- torn ligaments, tendons, or muscles
- high blood pressure or heart problems
- certain kinds of cancer

- history of phlebitis or thrombosis (These patients may have blood clots that may become dislodged and travel to the lungs, with potentially fatal results.)
- drug treatment with blood thinners (These medications increase the risk of bleeding under the skin.)

Some clients with histories of physical violence or abuse may feel uncomfortable about removing their clothing or other aspects of massage. A brief explanation of what happens in a massage session and how they can benefit from massage is usually helpful.

Side effects

There have been few reported side effects associated with massage of low or moderate intensity. Intense massage, however, may increase the risk of injury to the body. Vigorous massage has been associated with muscle pain and such injuries as bleeding in the liver or other vital organs, and the dislodgment of **blood clots**.

Research and general acceptance

Swedish massage is now gaining acceptance from the medical community as a complementary treatment. Studies have shown that massage can relax the body, decrease blood pressure and heart rate, and reduce stress and depression. It may also provide symptomatic relief for many chronic diseases. Many doctors now prescribe massage therapy as symptomatic treatment for **headache**, facial pain, **carpal tunnel syndrome**, arthritis, other chronic and acute conditions, stress, and athletic injuries. Many insurance companies now reimburse patients for prescribed massage therapy. As of 2000, however, Medicare and Medicaid do not pay for this form of alternative treatment.

Training and certification

There are 58 school programs accredited by the Commission for Massage Therapy Accreditation/Approval in the United States. They provide a minimum 500 hours of massage training. Certified therapists have graduated from these programs and passed the national certification examination for therapeutic massage. They are also required to participate in continuing education programs to keep their skills current.

There are several national associations for massage therapists in the United States, including the American Massage Therapy Association and the National Association of Nurse Massage Therapists. Persons interested in massage therapy should contact these organizations for referral to local certified therapists.

Resources

BOOKS

Beck, Mark F. *Milady's Theory and Practice of Therapeutic Massage,* 3rd ed. Albany, NY: Milady Publishing, 1994.

Claire, Thomas. *Bodywork: What Type of Massage to Get and How to Make the Most of It*. New York: William Morrow and Company, Inc., 1995.

PERIODICALS

Trotter, James F. "Hepatic Hematoma after Deep Tissue Massage." *New England Journal of Medicine* 341 (1999): 2019 2020.

ORGANIZATIONS

American Massage Therapy Association. 820 Davis St., Suite 100. Evanston, IL 60201. (847) 864 0123. Fax: (847) 864 1178. http://wwww.amtamassage.org.

National Association of Nurse Massage Therapists. 1710 East Linden St. Tucson, AZ 85719.

National Certification Board of Therapeutic Massage and Bodywork. 8201 Greensboro Dr., Suite 300. McLean, VA 22102. (703) 610 9015. (800) 296 0664.

Mai Tran

Sweet clover

Definition

Sweet clover (*Melilotus officinalis*) is a biennial plant that grows to heights of 2-4 ft (0.6-1.2 m) and produces small yellow flowers emitting a fragrance resembling that of hay or vanilla. It is a member of the legume, or Leguminosae, family. During its first year of growth, most of its energy goes into developing

White sweet clover. *(© Arco Images / Alamy)*

its root system. In the second year it flowers between May and September, sets its seeds, and dies. Its seeds may remain viable for over 30 years. The plant is also called hart's tree, hay flower, king's clover, melilot, sweet lucerne, or wild laburnum. Sweet clover grows in North America, Europe, Australia, and the temperate regions of Asia. In the early 1900s, sweet clover was grown for forage and to build up the soil, since its roots help to keep nitrogen in the soil. Today it is used to support honey production. In some agricultural areas of the United States, however, sweet clover is now considered a nuisance because it spreads rapidly and can take over open fields or prairies.

KEY TERMS

Coumarin—A chemical compound found in sweet clover that has blood-thinning properties.

Poultice—A warm mass of moist cloth or other soft material, used as a healing treatment. Poultices may contain crushed herbs or they may be moistened with herbal preparations.

Tisane—A decoction of herbs, usually drunk for medicinal purposes.

General use

Sweet clover is valued for its medicinal uses because the flower contains coumarinic acids. Coumarin is the active ingredient in prescription anticoagulants (blood-thinning medications). Its presence in sweet clover allows it to reduce inflammation and swelling by increasing the flow of blood between the heart and the veins. As an herbal remedy, sweet clover is used in the treatment of **bruises**, **hemorrhoids**, and **varicose veins**. Its wound-healing properties have been confirmed in tests conducted on animals.

Taken internally as a tea or as a tisane, sweet clover relieves discomfort in the legs, particularly night cramps, **itching**, and swelling. The herb also supports the traditional medical treatments of vein inflammation, **blood clots**, and congestion of the lymph nodes. Applied externally as a poultice, sweet clover speeds the healing of bruises and eases the swelling of hemorrhoids.

Preparations

Commercial preparations of sweet clover are available as dried crushed herb, as ointments, and as suppositories.

To prepare a sweet clover infusion, boiling water is poured over 1-2 tsp of the crushed flowers and stems. The infusion is allowed to steep for 5-10 minutes, then strained into a cup. For the treatment of varicose veins, 2-3 cups per day is recommended.

To prepare as a poultice, the crushed herb is mixed with a small amount of boiling water, then spread on a soft cloth. The cloth is applied to the affected area until the cloth is cold. The poultice is applied as needed.

Precautions

The sale of herbal products is not regulated in the United States. They are sold as dietary supplements without proof of safety or a standard of quality control. In addition, the lack of comprehensive scientific research leaves the consumer without a standard to follow. Therefore, persons interested in using sweet clover or any other herbal remedy should always consult a physician or pharmacist before beginning a program of herbal therapy.

Side effects

Long-term ingestion of high doses of sweet clover can cause **headache** and stupor. In isolated cases, temporary liver damage can result. These side effects disappear when the treatment is halted.

Interactions

Although sweet clover does not have any identified interactions, prescription drugs containing coumarin have been known to interact adversely with other prescription drugs, especially blood thinners, aspirin, and heart medications. Persons taking prescription drugs of any type should check with their physicians before begining a regimen of sweet clover.

Coumarin can also cause birth defects and bleeding in the fetus. Therefore, the use of sweet clover should be avoided during **pregnancy**.

Resources

BOOKS

PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company, 1998.

Mary McNulty

Swelling *see* **Edema**

Swimmer's ear

Definition

Swimmer's ear, also known as otitis externa, is an inflammation of the outer ear canal. Although it is most prevalent among young adults and children, who often contract the condition from frequent swimming, swimmer's ear can affect anyone.

Description

Swimmer's ear is an inflammation of the outer ear that may lead to a painful and often itchy infection. It begins with the accumulation of excess moisture from swimming or daily showering. The skin inside the ear canal may flake due to moisture. This flaking may cause persistent **itching** that may lead to a break in the skin from scratching. Broken skin allows bacteria or a fungus to infect the tissues lining the ear canal. Swimming in polluted water can easily bring harmful bacteria into the outer ear.

Close-up of otitis externa, also called swimmer's ear. *(Pulse Picture Library/CMP Images/Phototake. Reproduced by permission.)*

Causes and symptoms

Causes

In swimmer's ear, the patient nearly always has a history of recent exposure to water combined with mild injury to the skin of the inner ear. This injury is typically caused by scratching or excessive and improper attempts to clean wax from the ears. Wax is one of the best defense mechanisms the ear has against infection due to the protection it offers from excess moisture and the environment it provides for friendly bacteria. Earwax should not be removed by such sharp objects as fingernails or hairpins. If the wax is scratched away, it becomes easier for an infection to occur.

The infection itself is usually caused by gram-negative bacilli (*Pseudomonas aeruginosa* or *Proteus*) or by fungi (*Aspergillus*) or even yeasts that thrive in moist environments. There are a surprisingly large number of different organisms that can cause otitis externa; one study of 2039 patients diagnosed with swimmer's ear found that 202 different species of bacteria, 32 species of yeast, and 17 species of mold could be identified as the infectious agents in this group of patients.

In recent years, some of the organisms most likely to cause otitis externa have developed resistance to antibiotics; the resistant organisms vary from country to country. One Asian study found that *Staphylococcus aureus* is responsible for more cases of swimmer's ear in East Asia than *Pseudomonas aeruginosa*, and that methicillin-resistant *S. aureus*, or MRSA, is an increasingly worrisome problem in these countries. A study done in Texas, however, found that *Staphylococcus epidermidis* was responsible for the largest number of antibiotic-resistant cases.

In a minority of cases, otitis externa is caused by an allergic reaction. The most common allergens in chronic otitis externa are topical medications used in the ear, particularly preparations containing neomycin; nickel and other metals used in inexpensive earrings; and some materials used to make hearing aids.

Symptoms

The symptoms of swimmer's ear include swelling, redness, heat, and **pain**. The inflammation may produce a foul-smelling, yellowish, or watery discharge from the ear. The skin inside the ear canal may swell to the point that the examiner cannot see the patient's eardrum.

KEY TERMS

Analgesic—A medication given to relieve pain.

Mullein—A plant related to the figwort, used by Native Americans to treat inflammations. It is still recommended by naturopaths to reduce the discomfort of swimmer's ear.

Otitis externa—Inflammation of the outer ear. Otitis externa is the medical term for swimmer's ear.

Otoscope—An instrument that allows doctors to examine the inside of a patient's ear.

Topical—A type of medication that is applied to the skin or other outer surface of the body.

The patient may also experience itching inside the ear and a temporary minor **hearing loss** due to the blockage of the ear canal. The severe pain and tenderness associated with the condition may intensify when the patient's head is moved, or if the examiner gently pulls the earlobe.

Diagnosis

The diagnosis of swimmer's ear is made from clinical observation. The doctor looks inside the ear with an instrument called an otoscope. The otoscope allows him or her to see whether there is swelling, redness, and a discharge. The doctor may also take a specimen of the discharge by swabbing just inside the ear. This specimen is then sent to a laboratory to identify the bacterium or fungus.

Treatment

Swimmer's ear is not usually a dangerous infection and often heals itself within a few days. If the infection is mild, alternative methods of treatment may be beneficial.

Herbal remedies

Native Americans used **mullein** (*Verbascum thapsus*) oil to treat minor inflammations. To ease the discomfort of swimmer's ear, 1–3 drops of a mullein preparation may be placed in the ear every three hours.

Garlic (*Allium sativum*) has been shown to be effective in treating swimmer's ear. As a natural antibiotic, garlic is a useful herb for inflammation of the outer ear. Equal parts of garlic juice and glycerin are added to a carrier oil, such as olive or sweet almond. One to three drops of this mixture may be placed in the infected ear every three hours.

Homeopathy

Specific homeopathic remedies for swimmer's ear may include *Aconite*, *Apis*, *Graphites*, or *Pulsatilla*. A homeopathic practitioner should always be consulted for specific treatment recommendations.

A 1997 German study found that homeopathic treatments reduced the duration of pain in children with ear **infections** more quickly than those treated with conventional drugs. The homeopathic-treated group was also found to have a greater resistance to recurrence of the infection within one year after treatment.

Home remedies

The inflammation and pain of otitis externa may be eased with the following home remedies:

- The infected ear canal may be washed with an over-the-counter topical antiseptic. A homemade solution using equal parts white vinegar and isopropyl alcohol may be placed, a few drops at a time, into the ear every two to three hours. The vinegar-alcohol drops should be kept in the ear for at least 30 seconds.
- A warm heating pad or compress may be placed on the ear to relieve pain.
- Pain may also be eased by taking aspirin or another analgesic.
- To assist the healing process, the infected ear canal should be kept dry. When showering, the patient should use earplugs or a shower cap.

Allopathic treatment

A doctor will use conventional medicine to treat swimmer's ear. The ear is typically cleaned with a cotton-tipped probe or a suction device to relieve irritation and pain. Ear drops containing a combination of hydrocortisone to help relieve the itching and an antibiotic to fight infection (usually neomycin sulfate and polymyxin B sulfate) may be prescribed.

For severe pain, doctors may recommend aspirin, acetaminophen, or some other over-the-counter pain medication. To assist the healing process, the infected ear must be kept dry. An infection typically begins to improve within three to four days. If the pain persists, or becomes worse, the doctor may prescribe an oral antibiotic or an anti-inflammatory drug.

If the doctor prescribes an oral antibiotic to treat the infection, it is important for the patient to finish taking the entire course of medication even if he or she feels better fairly quickly. The reason is that a single antibiotic can kill off most of the bacteria causing the infection, but a few organisms may survive that have a higher degree of natural resistance to the drug. If the

patient stops taking the antibiotic too soon, not all the bacteria will be killed off, and those that survive may develop resistance to the particular drug that was used.

If the otitis externa is caused by an allergic reaction, a patch test is necessary in order to identify the substance or object that is causing the reaction. Treatment consists of avoiding further contact with the allergen; or switching medications if the patient has developed an allergic sensitivity to a topical ear medication.

Expected results

Swimmer's ear is usually a minor inflammation of the outer ear canal that may even heal itself within a few days. It usually responds to many alternative treatments as well as to the conventional methods prescribed by doctors.

Rapidly spreading redness and swelling of the outer ear or nearby skin, or **fever**, are indications of an aggressively spreading infection. These symptoms require immediate medical attention.

Prevention

Prevention is the key component in avoiding swimmer's ear. Patients should be careful when cleaning the ears—never dig into the ear canal; wear earplugs when swimming and avoid swimming in dirty water; and use earplugs or a shower cap when showering.

Additional methods to ensure the prevention of swimmer's ear include: putting a dropperful of isopropyl alcohol or white vinegar into the ear after swimming or showering to dry out the ear and help kill germs; before swimming, create a protective coating by squirting a dropperful of mineral oil, baby oil, or lanolin into the ear; and when wearing a hearing aid, remove it often to allow the ear an opportunity to dry out completely.

Resources

BOOKS

Cummings, Stephen, MD, and Dana Ullman, MPH. *Everybody's Guide to Homeopathic Medicines*. New York: G. P. Putnam's Sons, 1991.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative & Conventional Treatments*. Richmond, VA: Time Life Inc., 1996.

The Merck Manual of Diagnosis and Therapy, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Berenholz, L., U. Katzenell, and M. Harell. "Evolving Resistant *Pseudomonas* to Ciprofloxacin in Malignant Otitis Externa." *Laryngoscope* 112 (September 2002): 1619 1622.

Hwang, J. H., C. K. Chu, and T. C. Liu. "Changes in Bacteriology of Discharging Ears." *Journal of Laryngology and Otology* 116 (September 2002): 686 689.

Ramsey, A. M. "Diagnosis and Treatment of the Child with a Draining Ear." *Journal of Pediatric Health Care* 16 (July August 2002): 161 169.

Roland, P. S., and D. W. Stroman. "Microbiology of Acute Otitis Externa." *Laryngoscope* 112 (July 2002): 1166 1177.

Sood, S., D. R. Strachan, A. Tsikoudas, and G. I. Stables. "Allergic Otitis Externa." *Clinical Otolaryngology* 27 (August 2002): 233 236.

ORGANIZATIONS

American Academy of Otolaryngology Head and Neck Surgery. 1 Prince Street. Alexandria, VA 22314. (703) 836 4444.

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847) 434 4000. www.aap.org.

International Foundation for Homeopathy. 2366 Eastlake Avenue East, Suite 329. Seattle, WA 98102. (206) 324 8230.

Beth Kapes
Rebecca J. Frey, PhD

Swollen testicles *see* **Epididymitis**

Syntonic optometry

Definition

Syntonic optometry uses colored light, shone into a patient's eyes, to treat visual and other dysfunction.

Origins

The founding father of syntonic optometry is Dr. Harry Riley Spitler, who developed the discipline during the 1920s and 1930s. Building on the work of earlier investigators including Edwin Babbit, Spitler studied the effects of light on human health and performance. Illness, he concluded, is largely caused by imbalances in the body's endocrine and nervous systems. Balance could be restored and healing achieved, he decided, by exposing the eyes to visible frequencies of light. Spitler founded the College of Syntonic Optometry in 1933, and eight years later he wrote a book titled *The Syntonic Principle*.

Benefits

Practitioners of syntonic optometry claim to be able to treat or support treatment of asthenopia (eye **fatigue**), strabismus (crossed eyes), amblyopia (unclear vision), ametropia (defective refraction of light), problems with focusing or converging the eyes, and visual field constrictions related to brain trauma, visual/emotional **stress**, or degenerative eye disorders. They also claim to be able to help correct visual attention deficit, and learning and behavior problems related to vision.

Description

In syntonic optometry, the patient is exposed to one or more colors of light for a fixed period of time. This is done in a darkened room, with colors generated by a machine known as a syntonizer. In a typical session, a patient might absorb one color for 10 minutes, then another for an additional 10 minutes. Alternatively, just one color might be absorbed for 20 minutes. Treatment typically could involve between three and five sessions a week, for a period of four to eight weeks. In most cases, syntonics is used in conjunction with other therapeutic procedures.

Precautions

The usefulness of syntonic optometry is a contentious issue, and a medical opinion should be sought in all cases of serious illness. The application of syntonic optometry to treating behavioral and **learning disorders** is especially controversial. Because the aftereffects of these problems can affect a child for a lifetime, it is prudent to obtain a second opinion from a university-affiliated practitioner.

Side effects

Conducted properly, syntonic optometry is thought to be generally free of adverse side effects, although it is expensive.

Research and general acceptance

American Academy of Ophthalmology, an association of medical eye specialists, states that "as with other forms of vision therapy, there is no scientifically verified evidence to support claims for syntonic optometry." The College of Syntonic Optometry acknowledges that "researchers and other professionals are still a step away from understanding the clinical methods and practice of light stimulation which syntonists have used with positive results for over a half a century." There is, however, growing acceptance in medical circles of the therapeutic effects of light, especially its usefulness in treating **seasonal affective disorder**.

Training and certification

The College of Syntonic Optometry, an international group based in the United States, offers training, research grants, and membership to registered optometrists. The college also offers associate memberships to licensed educators and health care practitioners who employ phototherapy techniques. Practitioners of syntonic optometry are most common in the United States, but can be found in numerous other countries.

Resources

ORGANIZATIONS

College of Syntomic Optometry. (717) 387 0900. http://www.syntonicphototherapy.com.

David Helwig

Syphilis

Definition

Syphilis is an infectious systemic disease that may be either congenital or acquired through sexual contact or contaminated needles.

Description

Syphilis has both acute and chronic forms that produce a wide variety of symptoms affecting most

Secondary syphilis. *(© Medical-on-Line / Alamy)*

of the body's organ systems. The range of symptoms makes it easy to confuse syphilis with less serious diseases and ignore its early signs. Acquired syphilis has four stages (primary, secondary, latent, and tertiary) and can be spread by sexual contact during the first three of these four stages.

Syphilis, which is also called lues (from a Latin word meaning plague), has been a major public health problem since the sixteenth century. The disease was treated with mercury or other ineffective remedies until World War I, when effective treatments based on arsenic or bismuth were introduced. These treatments were succeeded by antibiotics after World War II. At that time, the number of cases in the general population decreased dramatically, falling from nearly 25 cases per 100,000 among men and 17 cases per 100,000 among women to less about three cases per 100,000 for men and about two cases per 100,000 for women in 2000. This decrease resulted from both better treatments for the disease and an aggressive public education program about syphilis. After 2000, the rate of syphilis among men in the United States began to increase, reaching 5.7 cases per 100,000 in 2006, the last year for which data are available as of 2008. The rate for women remained low, at 1.0 case per 100,000 in 2006. A total of 36,935 cases of infectious syphilis and 349 cases of congenital syphilis were reported in the United States in 2006. Some authorities estimate the annual worldwide total of syphilis cases at about 50 million.

In 1999, the Centers for Disease Control and Prevention (CDC) joined several other federal agencies in announcing the National Plan to Eliminate Syphilis in the United States. Eliminating the disease was defined as the absence of transmission of the disease; that is, no transmission after 90 days following the report of an imported index case. The national goals for eliminating syphilis included bringing the annual number of reported cases in the United States below 1,000, and increasing the number of syphilis-free counties to 90% by 2005. In 2006 the CDC announced an update of the National Plan that focuses on three goals: (1) investing and enhancing public health services and interventions for syphilis treatment, (2) prioritizing and targeting interventions for high-risk populations, such as African Americans and men who have sex with other men (**MSM**), and (3) improving accountability of prevention efforts. To a large extent, the revised program was motivated by the striking increase in syphilis rates among MSM (an increase of 5% of all syphilis cases in 1999 to 64% of all cases in 2006) and among African American men (an increase of 22.6% in the one-year period from 2003 to 2004).

The increased incidence of syphilis since the 1970s is associated with drug abuse as well as changes in sexual behavior. The connections between drug abuse and syphilis include needle sharing and exchanging sex for drugs. In addition, people using drugs are more likely to engage in risky sexual practices. The risk of contracting syphilis as of 2008 was particularly high among those who abuse crack cocaine.

With respect to changing patterns of conduct, a sharp increase in the number of people having sex with multiple partners makes it more difficult for public health doctors to trace the contacts of infected persons. Women are not necessarily protected by having sex only with other women; in the past few years, several cases have been reported of female-to-female transmission of syphilis through oral-genital contact. In addition, the incidence of syphilis among men who have sex with other men continues to rise. Several studies in Latin America as well as in the United States reported in late 2002 that unprotected sexual intercourse is on the increase among gay and bisexual men.

Changing patterns of sexual behavior have led to a striking increase in the number of cases of syphilis in eastern Europe since the collapse of the Soviet Union; Slovenia reported an 18-fold increase in reported cases of syphilis just between 1993 and 1994. Over half of the new cases were linked to a source of infection in another European country.

In general, high-risk groups for syphilis in the United States and Canada include:

- sexually active teenagers
- people infected with another sexually transmitted disease (STD), including AIDS, herpes, and gonorrhea
- sexually abused children
- women of childbearing age
- prostitutes of either sex and their customers
- prisoners
- persons who abuse drugs or alcohol

The chances of contracting syphilis from an infected person in the early stages of the disease during unprotected sex range from 30 to 50%.

Causes and symptoms

Syphilis is caused by a spirochete, *Treponema pallidum*. A spirochete is a thin spiral- or coil-shaped bacterium that enters the body through the mucous membranes or breaks in the skin. In 90% of cases, the spirochete is transmitted by sexual contact. Transmission by blood transfusion is possible but rare, not only because blood products are screened for the disease,

but also because the spirochetes die within 24 hours in stored blood. Other methods of transmission are highly unlikely because *T. pallidum* is easily killed by heat and drying.

Primary syphilis

Primary syphilis is the stage of syphilis that begins when the organism enters the body. The first signs of infection are not always noticed. After an incubation period ranging from 10 to 90 days, the infected individual develops a chancre, which is a small blister-like sore about 0.5 in (10 mm) in size. Most chancres are on the genitals, but they may also develop in or on the mouth or on the breasts. Rectal chancres are common in MSM. Chancres in women are sometimes overlooked if they develop in the vagina or on the cervix. The chancres are not painful and disappear in three to six weeks even without treatment. They resemble the ulcers of lymphogranuloma venereum, herpes simplex virus, or skin tumors.

About 70% of individuals with primary syphilis also develop swollen lymph nodes near the chancre. The nodes may have a firm or rubbery feel when the doctor touches them but are not usually painful.

Secondary syphilis

Syphilis enters its secondary stage ranging from six to eight weeks to six months after the infection begins. Chancres may still be present but are usually healing or healed. Secondary syphilis is a systemic infection marked by the eruption of skin **rashes** and ulcers in the mucous membranes. The skin rash may mimic a number of other skin disorders such as drug reactions, **rubella** ringworm, **mononucleosis**, and **pityriasis rosea**. Characteristics that point to syphilis include:

- a coppery color
- absence of pain or itching
- occurrence on the palms of hands and soles of feet

The skin eruption may resolve in a few weeks or last as long as a year. The patient may also develop condylomata lata, which are weepy pinkish or gray areas of flattened skin in the moist areas of the body. The skin rashes, mouth and genital ulcers, and condylomata lata are all highly infectious.

About 50% of individuals with secondary syphilis develop swollen lymph nodes in the armpits, groin, and neck areas; about 10% develop inflammations of the eyes, kidney, liver, spleen, bones, joints, or the meninges (membranes covering the brain and spinal cord). Patients may also have a flu-like general illness with a low **fever**, **chills**, loss of appetite, headaches, runny nose, **sore throat**, and aching joints.

Latent syphilis

Latent syphilis is a phase of the disease characterized by relative absence of external symptoms. The term latent does not mean that the disease is not progressing or that individuals cannot infect others. For example, pregnant women can transmit syphilis to their unborn children during the latency period.

The latent phase is sometimes divided into early latency (less than two years after infection) and late latency. During early latency, patients are at risk for spontaneous relapses marked by recurrence of the ulcers and skin rashes of secondary syphilis. In late latency, these recurrences are much less likely. Late latency may either resolve spontaneously or continue for the rest of the individual's life.

Tertiary syphilis

Untreated syphilis progresses to a third or tertiary stage in about 35 to 40% of individuals who go untreated. These individuals cannot infect others with the disease. It is thought that the symptoms of this stage are a delayed immune hypersensitivity reaction to the spirochetes. Some individuals develop so-called benign late syphilis, which begins between three and 10 years after infection and is characterized by the development of gummas, that is, rubbery tumor-like growths that are most likely to involve the skin or long bones but may also develop in the eyes, mucous membranes, throat, liver, or stomach lining. Gummas are increasingly uncommon since the introduction of antibiotics for treating syphilis. Benign late syphilis is usually rapid in onset and responds well to treatment.

CARDIOVASCULAR SYPHILIS. Cardiovascular syphilis occurs in 10 to 15% of patients who have progressed to tertiary syphilis. It develops between 10 and 25 years after infection and often occurs together with neurosyphilis. Cardiovascular syphilis usually begins as an inflammation of the arteries leading from the heart and heart attacks, scarring of the aortic valves, congestive heart failure, or the formation of an aortic aneurysm.

NEUROSYPHILIS. About 8% of individuals with untreated syphilis develop symptoms in the central nervous system that include both physical and psychiatric symptoms. Neurosyphilis can appear at any time, from five to 35 years after the onset of primary syphilis. It affects men more frequently than women and Caucasians more frequently than African Americans.

Neurosyphilis is classified as four types:

- Asymptomatic. In this form of neurosyphilis, the individual's spinal fluid gives abnormal test results but there are no symptoms affecting the central nervous system.
- Meningovascular. This type of neurosyphilis is marked by changes in the blood vessels of the brain or inflammation of the meninges (the tissue layers covering the brain and spinal cord). The patient develops headaches, irritability, and visual problems. If the spinal cord is involved, the patient may experience weakness of the shoulder and upper arm muscles.
- Tabes dorsalis. This progressive degeneration of the spinal cord and nerve roots causes individuals to lose their sense of perception of body position and orientation in space (proprioception), resulting in difficulties walking and loss of muscle reflexes. They may also have shooting pains in the legs and periodic episodes of pain in the abdomen, throat, bladder, or rectum. Tabes dorsalis is sometimes called locomotor ataxia.
- General paresis. This condition concerns the effects of neurosyphilis on the cortex of the brain. The patient has a slow but progressive loss of memory, decreased ability to concentrate, and less interest in self-care. Personality changes may include irresponsible behavior, depression, delusions of grandeur, or complete psychosis. Sometimes called dementia paralytica, general paresis is most common in patients over 40.

Special populations

CONGENITAL SYPHILIS. The incidence of congenital syphilis dropped from a high of 17,600 cases in 1941 to a low of 239 in 1983, only to rebound to another high of 4,067 in 1992. It decreased dramatically then to a low point of 349 cases in 2006. The prognosis for early congenital syphilis is poor: about 54% of infected fetuses die before or shortly after birth. Those who survive may look normal at birth but show signs of infection between three and eight weeks later.

Infants with early congenital syphilis have systemic symptoms that resemble those of adults with secondary syphilis. There is a 40 to 60% chance that the child's central nervous system will be infected. These infants may have symptoms ranging from **jaundice**, enlargement of the spleen and liver, and **anemia** to skin rashes, condylomata lata, certain congenital bone abnormalities, inflammation of the lungs, a persistent runny nose, and swollen lymph nodes.

CHILDREN. Children who develop symptoms after the age of two years are said to have late congenital syphilis. The characteristic symptoms include facial deformities (saddle nose), Hutchinson's teeth (abnormal upper incisors), saber shins, dislocated joints, deafness, mental retardation, paralysis, and seizure disorders.

PREGNANT WOMEN. Syphilis can be transmitted from the mother to the fetus through the placenta at any time during **pregnancy** or through the child's contact with syphilitic ulcers during the birth process. The chances of infection are related to the stage of the mother's disease. Almost all infants of mothers with untreated primary or secondary syphilis are infected, whereas the infection rate drops to 40% if the mother is in the early latent stage and 6 to 14% if she has late latent syphilis.

Pregnancy does not affect the progression of syphilis in the mother; however, pregnant women should not be treated with tetracyclines.

HIV PATIENTS. Syphilis has been closely associated with HIV infection since the late 1980s. Syphilis sometimes mimics the symptoms of **AIDS**. Conversely, AIDS appears to increase the severity of syphilis in patients suffering from both diseases and to speed up the development or appearance of neurosyphilis. Patients with HIV are also more likely to develop lues maligna, a skin disease that sometimes occurs in secondary syphilis. Lues maligna is characterized by areas of ulcerated and dying tissue. In addition, HIV patients have a higher rate of treatment failure with penicillin than patients without HIV.

ADULT MALES. One study indicates that infection with syphilis increases a man's risk of developing **prostate cancer** in later life. It is thought that the infection may represent one mechanism among several through which prostate **cancer** may develop.

Diagnosis

Patient history and physical diagnosis

The diagnosis of syphilis is often delayed because of the variety of early symptoms, the varying length of the incubation period, and the possibility of not noticing the initial chancre. Patients do not always connect their symptoms with recent sexual contact. They may go to a dermatologist when they develop the skin rash of secondary syphilis rather than to their primary care doctor. Women may be diagnosed in the course of a gynecological checkup. Because of the long-term risks of untreated syphilis, certain groups of people are routinely screened for the disease:

- pregnant women
- sexual contacts or partners of patients diagnosed with syphilis
- children born to mothers with syphilis
- patients with HIV infection
- persons applying for marriage licenses

When doctors take the patient's history, they ask about recent sexual contacts in order to determine whether the patient falls into a high-risk group. Other symptoms, such as skin rashes or swollen lymph nodes, are noted with respect to the dates of the patient's sexual contacts. Definite diagnosis, however, depends on the results of laboratory blood tests.

Blood tests

There are several types of blood tests for syphilis used in the United States. Some are used in follow-up monitoring of patients as well as diagnosis.

NONTREPONEMAL ANTIGEN TESTS. Nontreponemal antigen tests are used as screeners. They measure the presence of reagin, which is an antibody formed in reaction to syphilis. In the Venereal Disease Research Laboratory (VDRL) test, a sample of the patient's blood is mixed with cardiolipin and **cholesterol**. If the mixture forms clumps or masses of matter, the test is considered reactive or positive. The serum sample can be diluted several times to determine the concentration of reagin in the patient's blood.

The rapid plasma reagin (RPR) test works on the same principle as the VDRL. It is available as a kit. The patient's serum is mixed with cardiolipin on a plastic-coated card that can be examined with the naked eye.

Nontreponemal antigen tests require a doctor's interpretation and sometimes further testing. They can yield both false-negative and false-positive results. False-positive results (test shows a positive result when the patient does not have the disease) can be caused by other infectious diseases, including mononucleosis, **malaria**, leprosy, **rheumatoid arthritis**, and lupus. HIV patients have a particularly high rate (4%, compared to 0.8% of HIV-negative patients) of false-positive results on reagin tests. False negative results (patient does have the disease, but test comes back negative) can occur when patients are tested too soon after exposure to syphilis; it takes about 14 to 21 days after infection for the blood to become reactive.

TREPONEMAL ANTIBODY TESTS. Treponemal antibody tests are used to rule out false-positive results on reagin tests. They measure the presence of antibodies that are specific for *T. pallidum*. The most commonly used tests are the microhemagglutination-*T. pallidum* (MHA-TP) and the fluorescent treponemal antibody absorption (FTA-ABS) tests. In the FTA-ABS, the patient's blood serum is mixed with a preparation that prevents interference from antibodies to other treponemal **infections**. The test serum is added to a slide containing *T. pallidum*. In a positive reaction, syphilitic antibodies in the blood coat the spirochetes on the slide. The slide is then stained with fluorescein, which causes the coated spirochetes to fluoresce when the slide is viewed under ultraviolet (UV) light. In the MHA-TP test, red blood cells from sheep are coated with *T. pallidum* antigen. The cells clump if the patient's blood contains antibodies for syphilis.

The treponemal antibody test developed in Belgium, the INNO-LIA, uses recombinant and peptide antigens derived from *T. pallidum* proteins. Studies suggest that the INNO-LIA is the most accurate as of 2008 of the available treponemal antibody tests for syphilis.

Treponemal antibody tests are more expensive and more difficult to perform than nontreponemal tests. They are, therefore, used to confirm the diagnosis of syphilis rather than to screen large groups of people. These tests are, however, highly specific and sensitive; false-positive results are relatively unusual.

INVESTIGATIONAL BLOOD TESTS. Three additional tests, ELISA, Western blot, and PCR, are also being used under some circumstances for syphilis testing, particularly for congenital syphilis and neurosyphilis.

Other laboratory tests

MICROSCOPE STUDIES. The diagnosis of syphilis can also be confirmed by identifying spirochetes in samples of tissue or lymphatic fluid. Fresh samples can be made into slides and studied under darkfield illumination. A newer method involves preparing slides from dried fluid smears and staining them with fluorescein for viewing under UV light. This method is replacing darkfield examination because the slides can be mailed to professional laboratories.

SPINAL FLUID TESTS. Testing of cerebrospinal fluid (CSF) is an important part of patient monitoring as well as a diagnostic test. The VDRL and FTA-ABS tests can be performed on CSF as well as on blood. An abnormally high white cell count and elevated protein levels in the CSF, together with positive VDRL results, suggest a possible diagnosis of neurosyphilis. CSF testing is not used for routine screening. It is used most frequently for infants with congenital syphilis, HIV-positive patients, and patients of any age who are not responding to penicillin treatment.

Treatment

It is difficult to obtain information about alternative treatments for syphilis. The disease has a high profile as a public health issue, and few alternative practitioners want to risk accusations of minimizing its dangers. Many naturopathic practitioners agree that antibiotics are essential for the treatment of syphilis. Others would add that recovery from the disease can be assisted by dietary changes, sleep, **exercise**, and **stress** reduction, and immune support measures.

Homeopathy

Homeopathic practitioners are forbidden by law in the United States to claim that homeopathic treatment can cure syphilis. Given the high rate of syphilis in HIV-positive patients, however, some alternative practitioners who are treating AIDS patients with homeopathic remedies maintain that they are beneficial for syphilis as well. The remedies suggested most frequently are *Medorrhinum*, *Syphilinum*, ***Mercurius vivus***, and *Aurum*. The use of *Mercurius vivus* as a homeopathic remedy reflects the past use of mercury to treat syphilis prior to the discovery of penicillin. *Syphilinum* represents a class of homeopathic remedies called nosodes. A nosode is a homeopathic medicine made from diseased material, such as bacteria, viruses, or pus. Its effect is based on the homeopathic law of similars, in which a substance that causes a specific set of symptoms in a healthy person is determined curative when given to a sick person with the same symptoms. *Syphilinum* is a nosode made from a dilution of killed *Treponema pallidum*. The historical link between **homeopathy** and syphilis is Hahnemann's theory of miasms, which he defined as fundamental predispositions toward disease that were transmitted from one generation to the next. He thought that the syphilitic miasm was the second oldest cause of constitutional weakness in humans.

Other

Traditional Chinese medicine (TCM) and other alternative methods emphasize the mental aspects of conditions and diseases such as syphilis. Mind-body medicine, **guided imagery**, and affirmations are often used to help support a person through such a disease. Some theories hold that humans can control physical as well as mental or spiritual events through the power of thinking itself. Some alternative therapies reflect these thought beliefs by maintaining that humans make themselves ill through harmful thought patterns and that they can heal themselves by affirming positive beliefs. One affirmation suggested for healing syphilis is: "I decide to be me." Most alternative practitioners would recommend this or similar thought affirmations only as adjuncts to conventional medical treatment for syphilis.

Certain supposedly outdated or discredited treatments for syphilis have resurfaced as alternative treatments for AIDS or cancer. One study of alternative treatments for HIV infection notes that **hyperthermia**, which involves treating a disease by giving the patient a fever, originated as a treatment for syphilis. Syphilis patients were given malaria in the belief that the resultant fever would kill the spirochetes that cause syphilis.

Another example is the so-called Hoxsey treatment for cancer, which was started in the 1920s by the Illinois practitioner, Harry Hoxsey. The treatment is no longer legally available in the United States but is offered through a clinic in Tijuana, Mexico. The treatment consists of several chemical mixtures applied externally and a formula of nine herbs taken internally. The Hoxsey herbal formula is almost identical to a remedy that was listed in the 1926 and 1936 editions of the *United States National Formulary* called compound fluidextract of trifolium. It was recommended as a treatment for secondary and tertiary syphilis. One of the external Hoxsey compounds contains both arsenic and antimony, which were used to treat syphilis before the use of antibiotics. The internal formula includes *Phytolacca americana*, or pokeweed, which was used by Native Americans to treat syphilitic chancres; and *Stillingia sylvatica*, or queensroot, which has also been used to treat syphilis. As of 2008, there was no demonstrated data to support the therapy's effectiveness for syphilis.

It should be noted that many alternative medicine therapies that claim to help such infectious diseases as syphilis have little data supporting their effectiveness.

Allopathic treatment

Medications

Syphilis is treated with antibiotics given either intramuscularly (benzathine penicillin G or ceftriaxone) or orally (doxycycline, minocycline, tetracycline, or azithromycin). Neurosyphilis is treated with a combination of aqueous crystalline penicillin G, benzathine penicillin G, or doxycycline. It is important to keep the levels of penicillin in the patient's tissues at sufficiently high levels over a period of days or weeks because the spirochetes have a relatively long reproduction time. Penicillin is more effective in treating the early stages of syphilis than the later stages.

Some researchers have recommended alternative antibiotics for the treatment of syphilis. They suggest that azithromycin and ceftriaxone are candidates for supplemental use with penicillin. Evidence suggests that ceftriaxone may be useful, although as of 2008, the proper dosage had not been determined. Studies with azithromycin indicate that the drug has been less effective than expected. Overall, the primary treatment of syphilis in primary and secondary stages remains penicillin, which is rapidly effective in a single dose in the vast majority of cases.

Doctors do not usually prescribe separate medications for the skin rashes or ulcers of secondary syphilis. The patient is advised to keep them clean and dry and to avoid exposing others to fluid or discharges from condylomata lata.

Pregnant women should be treated as early in pregnancy as possible. Infected fetuses can be cured if the mother is treated during the second and third trimesters of pregnancy. Infants with proven or suspected congenital syphilis are treated with either aqueous crystalline penicillin G or aqueous procaine penicillin G. Children who acquire syphilis after birth are treated with benzathine penicillin G.

Jarisch-Herxheimer reaction

The Jarisch-Herxheimer reaction, first described in 1895, is a reaction to penicillin treatment that may occur during the late primary, secondary, or early latent stages. The patient develops chills, fever, **headache**, and muscle pains within two to six hours after the penicillin is injected. The chancre or rash gets temporarily worse. The Jarisch-Herxheimer reaction, which lasts about a day, is thought to be an allergic reaction to toxins released when the penicillin kills massive numbers of spirochetes.

Expected results

The expected results of alternative therapies used as adjuncts to conventional antibiotic treatment, for stress reduction or similar purposes, would include improvements in the patient's emotional and spiritual quality of life. The effectiveness of homeopathic treatment for syphilis has not been evaluated in clinical trials, although there are anecdotal reports of successful treatment of syphilis by homeopathic methods.

Analysis of the Hoxsey formulae, however, indicates that they should not be used to treat syphilis or other venereal diseases. Two ingredients in the internal formula have toxic effects: queensroot contains an irritant that can cause inflammation or swelling of the skin and mucous membranes, whereas pokeweed can cause potentially fatal respiratory paralysis. In addition, the arsenic and antimony in the external formula could potentially cause heavy metal toxicity. Allopathic treatments of the disease, the use of penicillin in particular, provide a quick and virtually certain cure for syphilis when administered in its early stages.

Prevention

Immunity

Patients with syphilis do not acquire lasting immunity against the disease. No effective vaccine for syphilis had been developed as of 2008, even though the genome of *T. pallidum* was completely sequenced in 1998. The sequencing may, however, speed up the process of developing an effective vaccine. Prevention depends on a combination of personal and public health measures.

Lifestyle choices

The only reliable methods for preventing transmission of syphilis are sexual abstinence or monogamous relationships between uninfected partners. Condoms offer some protection but protect only the covered parts of the body.

Public health measures

CONTACT TRACING. United States law requires reporting of syphilis cases to public health agencies. Sexual contacts of patients diagnosed with syphilis are traced and tested for the disease. Tracing includes all contacts for the past three months in cases of primary syphilis and for the past year in cases of secondary disease. Neither the patients nor their contacts should have sex with anyone until they have been tested and treated.

Because of the rising incidence of syphilis abroad, a growing number of public health physicians recommend routine screening of immigrants, refugees, and international adoptees for syphilis.

All patients who test positive for syphilis should be tested for HIV infection at the time of diagnosis.

PRENATAL TESTING OF PREGNANT WOMEN. Pregnant women should be tested for syphilis at the time of their first visit for prenatal care and again shortly before delivery. Proper treatment of secondary syphilis in the mother reduces the risk of congenital syphilis in the infant from 90% to less than 2%.

Many obstetricians and gynecologists recommend routine screening of nonpregnant as well as pregnant women for syphilis. As of 2008, only about half of obstetricians and gynecologists in the United States screened nonpregnant women for **chlamydia** and **gonorrhea**, while fewer than one-third screen them for syphilis.

KEY TERMS

Chancre—The initial skin ulcer of primary syphilis, consisting of an open sore with a firm or hard base.

Condylomata lata—Highly infectious patches of weepy pink or gray skin that appear in the moist areas of the body during secondary syphilis.

Darkfield—A technique of microscopic examination in which light is directed at an oblique angle through the slide so that organisms look bright against a dark background.

General paresis—A form of neurosyphilis in which patients' personality, as well as their control of movement, is affected. Patients may develop convulsions or partial paralysis.

Gumma—A symptom that is sometimes seen in tertiary syphilis, characterized by a rubbery swelling or tumor that heals slowly and leaves a scar.

Index case—The first case of a contagious disease in a group or population that serves to call attention to the presence of the disease.

Jarisch-Herxheimer reaction—A temporary reaction to penicillin treatment for syphilis that includes fever, chills, and worsening of the skin rash or chancre.

Lues maligna—A skin disorder of secondary syphilis in which areas of ulcerated and dying tissue are formed. It occurs most frequently in HIV-positive patients.

Miasm—In homeopathy, an inherited weakness or predisposition to disease. One of the most powerful miasms is the so-called syphilitic miasm.

Nosode—A homeopathic remedy made from microbes, pus, or other diseased matter. The nosode called *Syphilinum* is made from a diluted solution of killed spirochetes.

Spirochete—A type of bacterium with a long, slender, coiled shape. Syphilis is caused by a spirochete.

Tabes dorsalis—A progressive deterioration of the spinal cord and spinal nerves associated with tertiary syphilis.

EDUCATION AND INFORMATION. Patients diagnosed with syphilis should be given information about the disease and counseling regarding sexual behavior and the importance of completing antibiotic treatment. It is also important to inform the general public about the transmission and early symptoms of syphilis and provide adequate health facilities for testing and treatment.

Resources

BOOKS

Barlow, David. *Sexually Transmitted Infections: The Facts*. Oxford: Oxford University Press, 2006.

Holmes, King K., et al., eds. *Sexually Transmitted Diseases*. New York: McGraw Hill Medical, 2008.

Klausner, Jeffrey D., and Edward W. Hook III, eds. *Current Diagnosis & Treatment of Sexually Transmitted Dis eases*. New York: McGraw Hill Medical, 2007.

Silverstein, Alvin, Virginia B. Silverstein, and Laura Silver stein Nunn. *The STDS Update*. Berkeley Heights, NJ: Enslow, 2006.

Stokes, John H. *The Third Great Plague: A Discussion of Syphilis for Everyday People*. Charleston, SC: Biblio Bazzar, 2006.

Winters, Adam. *Syphilis*. New York: Rosen, 2006.

PERIODICALS

Angus, J., et al. "The Many Faces of Secondary Syphilis: A Reemergence of an Old Disease." *Clinical & Experi mental Dermatology* (September 2006): 741 745.

Buvé, Anne. "Should All Pregnant Women Be Screened for Syphilis?" *Women's Health* (September 2007): 547 555

Cole, M., K. Perry, and J. Parry. "Comparative Evaluation of 15 Serological Assays for the Detection of Syphilis Infection." *European Journal of Clinical Microbiology and Infectious Diseases* (October 2007): 705 713.

Coleman, Claire, and Maria Lohan. "Sexually Acquired Infections: Do Lay Experiences of Partner Notification Challenge Practice?" *Journal of Advanced Nursing* (April 2007): 35 43.

Meffert, Jeffrey J. "Sexually Transmitted Infections and HIV Control Efforts." *Expert Review of Dermatology* (October 2006): 655 665.

Pereira, Teresa M., et al. "Tertiary Syphilis." *International Journal of Dermatology* (November 2007): 1192 1195.

ORGANIZATIONS

Centers for Disease Control and Prevention, 1600 Clifton Rd. NE, Atlanta, GA, 30333, (800) 311 3435, http://www.cdc.gov/.

Rebecca J. Frey, PhD
David Edward Newton, Ed.D.

Systemic lupus erythematosus

Definition

Systemic lupus erythematosus (also called lupus or SLE) is a disease in which a person's immune system attacks and injures the body's own organs and tissues. Almost every system of the body can be affected.

KEY TERMS

Autoimmune disorder—A disorder in which the body's antibodies mistake the body's own tissues for foreign invaders. The immune system then attacks and causes damage to these tissues.

Immune system—The system of specialized organs, lymph nodes, and blood cells throughout the body that work together to prevent foreign organisms (bacteria, viruses, fungi, etc.) from invading the body.

Psychosis—Extremely disordered thinking with a poor sense of reality; may include hallucinations (seeing, hearing, or smelling things that are not really there).

Description

The body's immune system is a network of cells and tissues responsible for clearing the body of invading organisms, like bacteria, viruses, and fungi. Antibodies are special immune cells that recognize these invaders, and begin a chain of events to destroy them. In an autoimmune disorder like SLE, a person's antibodies begin to identify the body's own tissues as foreign. Cells and chemicals of the immune system damage the tissues of the body. The reaction that occurs in tissue is called inflammation. Inflammation includes swelling, redness, increased blood flow, and tissue destruction.

In SLE, some of the common antibodies that normally fight diseases are thought to be out of control. These include antinuclear antibodies, which are directed against the cell structure that contains genetic material (the nucleus), and anti-DNA antibodies, which are directed against genetic material (DNA).

SLE can occur in both males and females of all ages, but 90% of patients are women. The majority of these women are in their childbearing years. African Americans are more likely than Caucasians to develop SLE.

Occasionally, such medications as hydralazine and procainamide can cause symptoms very similar to SLE. This condition is called drug-induced lupus. Drug-induced lupus usually disappears after the patient stops taking the particular medication.

Causes and symptoms

The cause of SLE is unknown. Because the vast majority of patients are women, some research is being done to determine what (if any) link the disease has to female hormones. Susceptibility to SLE is known to have a genetic basis, although more than one gene is believed to be involved in disease development. As of 2002, notable progress has been made in narrowing the location of these genes. Because SLE patients may suddenly have worse symptoms (called a flare) after exposure to sunlight, such foods as **alfalfa** sprouts, and certain medications, environmental factors may also be at work.

The severity of symptoms varies over time, with periods of mild or no symptoms, followed by a flare. During a flare, symptoms increase in severity and new organ systems may become affected.

Many SLE patients have fevers, **fatigue**, muscle **pain**, weakness, decreased appetite, and weight loss. The spleen and lymph nodes are often swollen and enlarged. Recurrent **infections**, particularly those caused by bacteria, are common in patients with SLE. The development of other symptoms in SLE varies, depending on the organs affected.

- Joints. Joint pain and problems, including arthritis, are very common. About 90% of all SLE patients have these types of problems.
- Skin. A number of skin rashes may occur, including a red butterfly-shaped rash that spreads across the face. The "wings" of the butterfly appear across the cheekbones, and the "body" appears across the bridge of the nose. A discoid, or coin-shaped, rash causes red, scaly bumps on the cheeks, nose, scalp, ears, chest, back, and the tops of the arms and legs. The roof of the mouth may develop sore, irritated pits (ulcers). Hair loss is common. SLE patients tend to be very easily sunburned (photosensitive).
- Lungs. Inflammation of the tissues that cover the lungs and line the chest cavity causes pleuritis, with fluid accumulating in the lungs. The patient frequently experiences coughing and shortness of breath.
- Heart and circulatory system. Inflammation of the tissue surrounding the heart causes pericarditis; inflammation of the heart itself causes myocarditis. These heart problems may result in abnormal beats (arrhythmias), difficulty pumping the blood strongly enough (heart failure), or even sudden death. Blood clots often form in the blood vessels and may lead to complications.
- Nervous system. Headaches, seizures, changes in personality, and confused thinking (psychosis) may occur. The molecular mechanism responsible for brain dysfunction in lupus was identified in 2001.
- Kidneys. The kidneys may suffer significant destruction, with serious life-threatening effects. They may become unable to adequately filter the blood, leading to kidney failure.

- Gastrointestinal system. Patients may experience nausea, vomiting, diarrhea, and abdominal pain. The lining of the abdomen may become inflamed (peritonitis).
- Eyes. The eyes may become red, sore, and dry. Inflammation of one of the nerves responsible for vision may cause vision problems, and blindness can result from inflammation of the blood vessels (vasculitis) that serve the retina.

Diagnosis

Diagnosis of SLE can be somewhat difficult. There are no definitive tests for diagnosing SLE. Many of the symptoms and laboratory test results of SLE patients are similar to those of patients with other diseases, including **rheumatoid arthritis**, **multiple sclerosis**, and various nervous system and blood disorders.

Laboratory tests that are helpful in diagnosing SLE include several tests for a variety of antibodies commonly elevated in SLE patients (including antinuclear antibodies, anti-DNA antibodies, etc.). A blood test called the lupus erythematosus cell preparation (or LE prep) test is also performed. The LE prep is positive in 70–80% of all patients with SLE. SLE patients tend to have low numbers of red blood cells (**anemia**) and low numbers of certain types of white blood cells. The erythrocyte sedimentation rate (ESR), a measure of inflammation in the body, tends to be quite elevated. Samples of tissue (biopsies) from affected skin and kidneys show characteristics of the disease.

The American Rheumatism Association developed a list of symptoms used to diagnose SLE. Research supports the idea that people who have at least four of the 11 criteria (not necessarily simultaneously) are extremely likely to have SLE. The criteria are:

- butterfly rash
- discoid rash
- photosensitivity
- mouth ulcers
- arthritis
- inflammation of the lining of the lungs or the lining around the heart
- kidney damage, as noted by the presence of protein or other abnormal substances called casts in the urine
- seizures or psychosis
- the presence of certain types of anemia and low counts of particular white blood cells
- the presence of certain immune cells, anti-DNA antibodies, or a falsely positive test for syphilis
- the presence of antinuclear antibodies

Treatment

Although there is no cure for SLE, a number of alternative treatments may help reduce symptoms.

- Acupuncture can relieve pain in joints and muscles.
- Chinese herbals are chosen based on treatment principles and the patients specific symptoms. A simple decoction for the treatment of SLE joint and kidney problems is Lei Gong Teng (*Caulis tripterygii*), Ji Xue Teng (*Caulis spatholobi*), and Gan Cao (*Radix glycyrrhizae*). Chinese patent medicines for SLE include Qin Jiao Wan (Gentiana Macrophylla Pill) and Kun Ming Shan Hai Tang Pian (Tripterygii Tablet).
- DHEA (dehydroepiandrosterone) treatment, in a small study, led to disease improvement and reduction in the use of corticosteroids.
- Diet. The SLE patient should drink plenty of water and eat a well balanced diet of whole, unprocessed foods that are low in fat and high in fiber. Mackerel, sardines, and salmon contain the beneficial fatty acid omega-3. Caffeine, sugar, alcohol, red meats, and alfalfa sprouts should be avoided. Because food allergies can be associated with SLE, an elimination/change in diet can help identify the offending foods (often wheat, dairy products, and/or soy).
- Enzyme therapy treats SLE with 10X U.S.P. of digestive enzymes, protease, lipase, amylase, and cellulase to improve digestion of foods, based on the theory that a leaky gut causes SLE.
- Exercise can reduce fatigue, reduce muscle weakness, speed weight loss, and increase energy, stamina, and confidence.
- Herbals include capsaicin (*Capsicum* species) cream, pau d'arco (*Tabebuia* species), pine (*Pinus* species) extract, wheat grass (*Triticum aestivum*), *Bupleurum falcatum*, licorice (*Glycyrrhiza glabra*), wild mexican yam (*Dioscorea villosa*), stinging nettle (*Urtica dioica*), flaxseed (*Linus usitatissimum*) oil, turmeric (*Curcuma* species), and borage (*Borago officinalis*) oil.
- Massage can relieve pain and reduce stress.
- Probiotic treatment using *Lactobacillus* species to restore a healthy balance of bacteria in the intestines.
- Stress management techniques, such as guided imagery, meditation, hypnotherapy, and yoga, can reduce stress that exacerbates SLE.
- Supplements commonly recommended for SLE patients include vitamins B, C, and E, beta-carotene, bioflavonoids, selenium, zinc, magnesium, a complete trace mineral supplement, glutamine, gamma-oryzanol, 1-butyrate, fructooligosaccharides (FOS), and omega-3 fatty acids (fish oil). Vitamin A is believed to help improve discoid skin rashes.

- Support groups for SLE patients can provide emotional and social help.

Allopathic treatment

Treatment depends on the organ systems affected and the severity of the disease. Patients with a mild form of SLE can be treated with nonsteroidal anti-inflammatory drugs, or NSAIDs, like ibuprofen (Motrin, Advil) and aspirin. More severely ill patients with potentially life-threatening complications (including kidney disease, pericarditis, or nervous system complications) will require treatment with more potent drugs, including steroid medications and possibly other drugs that decrease the activity of the immune system (immunosuppressant drugs).

Kidney failure may require the blood to be filtered by a machine (dialysis) or even a kidney transplantation.

Expected results

The prognosis for patients with SLE varies, depending on the organ systems most affected and the severity of inflammation. Some patients have long periods of time with mild or no symptoms. About 90–95% of patients are still living after two years with the disease, 82–90% after five years, 71–80% after 10 years, and 63–75% after 20 years. The most likely causes of death during the first 10 years include infections and kidney failure. During years 11–20 of the disease, the development of abnormal **blood clots** is the most common cause of death.

For pregnant SLE patients, about 30% of the pregnancies end in miscarriage and about 25% of all babies are born prematurely. Most babies born to mothers with SLE are normal. Rarely, babies develop a condition called neonatal lupus which is characterized by a skin rash, liver or blood problems, and a serious heart condition.

Prevention

There are no known ways to avoid developing SLE. However, it is possible for a patient who has been diagnosed with SLE to prevent flares of the disease. Recommendations to prevent flares include decreasing sun exposure, getting sufficient sleep, eating a healthy diet, decreasing **stress**, and exercising regularly.

Resources

BOOKS

Aaseng, Nathan. *Autoimmune Diseases*. New York: F. Watts, 1995.

Hahn, Bevra Hannahs. "Systemic Lupus Erythematosus." In *Harrison's Principles of Internal Medicine*. 15th ed., edited by Anthony S. Fauci, et al. New York: McGraw Hill, 2001.

Long, James W. *The Essential Guide to Chronic Illness*. New York: HarperPerennial, 1997.

Ravel, Richard. "Systemic Lupus Erythematosus (SLE)." In *Clinical Laboratory Medicine: Clinical Application of Laboratory Data*. St. Louis: Mosby, 1995.

Wallace, Daniel J. *The Lupus Book*. New York: Oxford University Press, 1995.

Ying, Zhou Zhong, and Jin Hui De. "Lupus Erythemato sus." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Graham, R. R., W. A. Ortmann, P. M. Gaffney, et al. "Localization of the Human SLE Susceptibility Genes Within the HLA Using a Recombinant Ancestral Haplotype Approach." *American Journal of Human Genetics* 69 (October 2001): 507.

"Lupus Brain Damage Pathway Identified Through Molec ular Mechanism." *Immunotherapy Weekly* (December 12, 2001): 7.

Mann, Judy. "The Harsh Realities of Lupus." *The Wash ington Post* 120 (October 8, 1997): C12.

Noel, V., O. Lortholary, P. Casassus, et al. "Risk Factors and Prognostic Influence of Infection in a Single Cohort of 87 Adults with Systemic Lupus Erythematosus.&rd quo *Annals of the Rheumatic Diseases* 60 (December 2001): 1141 1144.

Umansky, Diane. "Living with Lupus." *American Health for Women* 16 (June 1997): 92+.

Yap, Hui Kim, Siau Gek Ang, Yee Hing Lai, Vinod Ram golam, and Stanley C. Jordan. "Improvement in Lupus Nephritis Following Treatment with a Chinese Herbal Preparation." *Archives of Pediatric and Adolescent Medicine* 153 (August 1999): 850 852.

ORGANIZATIONS

American College of Rheumatology. 1800 Century Place, Suite 250, Atlanta, GA 30345. (404) 633 3777. acr@ rheumatology.org. http://www.rheumatology.org.

Lupus Foundation of America, Inc. 1300 Piccard Dr., Suite 200, Rockville, MD 20850. (800) 558 0121. http:// www.lupus.org.

OTHER

Balch, T. Stephen. "Living Well with Lupus." January 1, 2001 [cited October 2002]. http://www.hamline.edu/ ~lupus/articles/living_well_with_lupus.html.

Hoffman, David L. "The Use of Herbs in the Treatment of Systemic Lupus Erythematosus." *HealthWorld Online*. [cited October 2002]. http://www.healthy.net.

Belinda Rowland
Rebecca J. Frey, PhD

T

Taheebo *see* **Pau d'arco**

T'ai chi

Definition

T'ai chi is an ancient Chinese **exercise** with movements that originate in **martial arts** practice. While used as a type of self-defense in its most advanced form, t'ai chi is practiced widely for its health and **relaxation** benefits. Those in search of well being and a way to combat **stress** have made what has also been called "Chinese shadow boxing" one of the most popular low-intensity workouts around the world.

Origins

Also known as t'ai chi ch'uan (pronounced *tie-jee chu-wan*), the name comes from Chinese characters that translated mean "supreme ultimate force." The concept of t'ai chi, or the "supreme ultimate," is based on the Taoist philosophy of yin and yang, or the nature of when opposites attract. Yin and yang combine opposing, but complementary, forces to create harmony in nature. By using t'ai chi, it is believed that the principal of yin and yang can be achieved. A disturbance in the flow of ch'i (qi), or the life force, is what **traditional Chinese medicine** bases all causes of disease in the body. By enhancing the flow of ch'i, practitioners of t'ai chi believe that the exercise can promote physical health. Students of t'ai chi also learn how to use the exercise in the form of meditation and mental exercise by understanding how to center and focus their cerebral powers.

In the traditional Chinese understanding of health and well-being, t'ai chi is not regarded as a self-sufficient compartment of a person's life, as physical exercise often is viewed by Westerners. Instead, t'ai chi is considered part of an overall way of healthful living that includes massage, proper diet, **meditation**, and herbal medicines as needed.

The origins of t'ai chi are rooted deep in the martial arts and Chinese folklore, causing its exact beginnings to be based on speculation. The much-disputed founder of t'ai chi is Zhang San-feng (Chang San-feng), a Daoist (Taoist) monk of the Wu Tang Monastery, who, according to records from the Ming-shih (the official records of the Ming dynasty), lived sometime during the period from 1391–1459. Legend states that Zhang happened upon a fight between a snake and a crane, and, impressed with how the snake became victorious over the bird through relaxed, evasive movements and quick counterstrikes, he created a fighting-form that shadowed the snake's strongest attributes. With his experience in the martial arts, Zhang combined strength, balance, flexibility, and speed to bring about the earliest form of t'ai chi.

Historians also link Zhang to joining yin-yang from Taoism and "internal" aspects together into his exercises. This feeling of inner happiness, or as a renowned engineering physicist and t'ai chi master, Dr. Martin Lee, states in his book *The Healing Art of t'ai Chi*, "l; of becoming one with nature," remains a primary goal for those who practice t'ai chi. Although its ancient beginnings started as a martial art, t'ai chi was modified in the 1930s to the relaxing, low-intensity exercise that continues to have the potential to be transformed into a form of self-defense, similar to karate or kung-fu.

Benefits

The art of t'ai chi is many things to the many who practice it. To some, it is a stretching exercise that incorporates a deep-breathing program. To others, it is a martial art—and beyond this, it is often used as a

T'ai chi on The Bund, Shanghai, China. *(© Jon Arnold Images Ltd / Alamy)*

dance or to accompany **prayer**. While the ways in which it is used may vary, one of the main benefits for those who practice it remains universal—t'ai chi promotes good health. This sense of well being complements t'ai chi's additional benefits of improved coordination, balance, and body awareness, while it also calms the mind and reduces stress. Those in search of harmony between the mind and the body practice "dynamic relaxation."

Dr. Martin Lee believes that the ancient art also holds healing powers. In his book, *The Healing Art of t'ai Chi,* he states: "By practicing t'ai chi and understanding chi and its breathing techniques, I was able to heal my **allergies** and other ailments." Lee contends that stress is the culprit of much of the pain and suffering that are a part of everyday life. The growing evidence that stress contributes to devastating physical and mental ailments has led Lee to teach a systematic, effective, and manageable way to restore both body and mind to a natural, stress-free state. As of 1996, Lee has been teaching t'ai chi for 20 years to help his students with physical ailments that have been caused by stress. He believes that illness can be overcome through understanding the body as a mental and physical system, which is accomplished through t'ai chi.

While the martial arts offer very vigorous physical workouts and often result in injuries, the practice of t'ai chi is a good alternative to these sports without overstraining the body. Those with bad backs have also found t'ai chi to ease their discomfort.

Description

Zhang, the notable originator of t'ai chi, created a combination of movements and beliefs that led to the formation of the fundamental "Thirteen Postures" of his art. Over time, these primary actions have transformed into soft, slow, relaxed movements, leading to a series of movements known as the form. Several techniques linked together create a form. Proper posture is a key element when practicing t'ai chi to maintain balance. All of the movements used throughout the exercise are relaxed with the back straight and the head up.

Just as the movements of t'ai chi have evolved, so have the various styles or schools of the art. As the form has grown and developed, the difference in style along with the different emphasis from a variety of teachers has as well. A majority of the different schools or styles of t'ai chi have been given their founder's surnames.

The principal schools of t'ai chi include:

- Chen style
- Hao (or Wu Shi) style
- Hu Lei style
- Sun style
- Wu style
- Yang style
- Zhao Bao style.

Many of the most commonly used groupings of forms are based on the Yang style of t'ai chi, developed by Yang Pan-Hou (1837–1892). Each of the forms has a name, such as "Carry the Tiger to the Mountain," and as the progression is made throughout the many forms, the participant ends the exercise almost standing on one leg. While most forms, like "Wind Blows Lotus Leaves," has just one movement or part, others, like "Work the Shuttle in the Clouds," have as many as four. While the form is typically practiced individually, the movement called "Pushing Hands" is a sequence practiced by two people together.

Preparations

Masters of t'ai chi recommend that those who practice the art begin each session by doing a warm-up of gentle rotation exercises for the joints and gentle stretching exercises for the muscles and tendons. Some other suggestions to follow before beginning the exercise include: gaining a sense of body orientation; relaxation of every part of the body; maintaining smooth and regular breathing; gaining attention or feeling; being mindful of each movement; maintaining proper posture; and moving at the same pace throughout each movement. The main requirement for a successful form of t'ai chi is to feel completely comfortable while performing all of the movements.

LAO TZU

Lao Tzu (sixth century ***B.C.***) is believed to have been a Chinese philosopher and the reputed author of the *Tao te ching*, the principal text of Taoist thought. He is considered the father of Chinese Taoism.

The main source of information on Lao Tzu's life is a biography written by the historian Ssu ma Ch'ien (145 86 ***B.C.***) in his *Records of the Historian* . Actually, Lao Tzu is not really a person's name and is only an honorific desig nation meaning old man. It was common in this period to refer to respected philosophers and teachers with words meaning old or mature. It is possible that a man who assumed the pseudonym Lao Tzu was a historical person, but the term Lao Tzu is also applied as an alternate title to the supreme Taoist classic, *Tao te ching* (Classic of the Way and the Power).

An important quality of the tao is its "weakness," or "submissiveness." Because the tao itself is basically weak and submissive, it is best for man to put himself in harmony with the tao. Thus, the *Tao te ching* places strong emphasis on nonaction (*wu wei*), which means the absence of aggressive action. Man does not strive for wealth or pres tige, and violence is to be avoided. This quietist approach to life was extremely influential in later periods and led to the development of a particular Taoist regimen that involved special breathing exercises and special eating habits that were designed to maintain quietude and har mony with the tao.

Precautions

Although t'ai chi is not physically demanding, it requires close attention to one's posture. Those who want to practice the exercise should notify their physician before beginning. The physician will know whether the person is taking medications that might interfere with balance, or has a condition that could make a series of t'ai chi movements unwise to attempt.

Research and general acceptance

While the reasons why t'ai chi is practiced vary, research has uncovered several reasons why it may help many medical conditions. For example, people with **rheumatoid arthritis** (RA) are encouraged to practice t'ai chi for its graceful, slow sweeping movements. Its ability to combine stretching and range-of-motion exercises with relaxation techniques work well to relieve the stiffness and weakness in the joints of RA patients. An ongoing research program at Stanford University in California is evaluating the beneficial effects of t'ai chi on patients with **fibromyalgia**. A study of fibromyalgia patients in Georgia reported in 2003 that t'ai chi brought about significant improvement in the patients' control of their symptoms.

T'ai chi has also been shown to benefit patients with **osteoarthritis** (OA). A group of Korean researchers found that women diagnosed with OA showed significant improvement in their balance and abdominal muscle strength after a 12-week program of Sun-style t'ai chi.

In 1999, investigators from Johns Hopkins University in Baltimore, Maryland, studied the effects of t'ai chi on those with elevated blood pressure. Sixty-two sedentary adults with high-normal blood pressure or stage I **hypertension** who were aged 60 or older began a 12-week aerobic program or a light-intensity t'ai chi program. The exercise sessions both consisted of 30-minute sessions, four days a week. The study revealed that while the aerobics did lower the systolic blood pressure of participants, the t'ai chi group systolic level was also lowered by an average of seven points—only a point less than the aerobics group. Interestingly, t'ai chi hardly raises the heart rate while still having the same effects as an intense aerobics class.

In addition to lowering blood pressure, research suggests that t'ai chi improves heart and lung function. The exercise is linked to reducing the body's level of a stress hormone called cortisol, and to the overall effect of higher confidence for those who practice it. As a complementary therapy, t'ai chi is also found to enhance the mainstream medical care of **cancer** patients who use the exercise to help control their symptoms and improve their quality of life.

Physical therapists investigated the effects of t'ai chi among 20 patients during their recovery from coronary artery bypass surgery. The patients were placed into either the t'ai chi group or an unsupervised control group. The t'ai chi group performed classical Yang exercises each morning for one year, while the control group walked three times a week for 50 minutes each session. In 1999, the study reported that after one year of training, the t'ai chi group showed significant improvement in their cardiorespiratory function and their work rate, but the unsupervised control group displayed only a slight decrease in both areas.

T'ai chi has also shown to keep people from falling—something that happens to one in three people over age 65 each year. Researchers from Emory University in

KEY TERMS

Aerobics—Any of various forms of sustained vigorous exercise, such as jogging, calisthenics, or jazz dancing, intended to stimulate and strengthen the heart and respiratory system.

Cortisol—A steroid hormone released by the cortex (outer portion) of the adrenal gland when a person is under stress.

Fibromyalgia—A chronic disease syndrome characterized by fatigue, widespread muscular soreness, and pain at specific points on the body.

Qi—The traditional Chinese term for vital energy or the life force. The word is also spelled "ki" or "chi" in English translations of Japanese and Chinese medical books.

Taoism—A Chinese religion and philosophy based on the doctrines of Laotse which advocates simplicity and selflessness.

Atlanta, Georgia, had dozens of men and women in their 70s and older learn the graceful movements of t'ai chi. The study discovered that those who learned to perform t'ai chi were almost 50% less likely to suffer falls within a given time frame than subjects who simply received feedback from a computer screen on how much they swayed as they stood. Those who suffer falls experience greater declines in everyday activities than those who do not fall, and are also at a greater risk of requiring placement in a nursing home or other type of assisted living. Researchers recommend the use of t'ai chi for its ability to help people raise their consciousness of how their bodies are moving in the environment around them. By raising awareness of how the body moves, people can focus on their relationship to their physical environment and situations they encounter everyday.

In addition to studying the cardiovascular and range-of-motion benefits of t'ai chi, researchers are also investigating its positive effects on the immune system. A team of scientists in California reported in 2003 that t'ai chi boosts the resistance of older people to the **shingles** virus— a virus that is both more common and more severe in the elderly.

Some research done in the United States focuses on the emotional and psychological benefits of t'ai chi. One recently discovered advantage of t'ai chi is its ability to hold people's interest longer than many other forms of exercise. One study in Oregon found that only 20% of people enrolled in a six-month t'ai chi program dropped out before the end, compared to an average of 55% for other forms of exercise. With regard to **depression**, a study of college students found that those who were taking t'ai chi classes had a lower rate of depression than students enrolled in other fitness programs.

One interesting recent change in the acceptance of t'ai chi in the United States and Canada is its growing popularity among men. In the 1970s and 1980s, many adult males regarded t'ai chi as a form of exercise that was not challenging enough for "real men." Since the late 1990s, however, more men have begun practicing t'ai chi in order to relieve stress or as a form of cross-training with another sport.

While the additional benefits of t'ai chi remain to be studied in the United States, it continues to be widely practiced in this and other Western countries. The ancient art maintains its prominence in China, where many people incorporate it into their daily routines at sunrise.

Training and certification

Masters of t'ai chi are trained extensively in the various forms of the art by grandmasters who are extremely skillful of the exercise and its origins. For those who wish to learn t'ai chi from a master, classes are taught throughout the world in health clubs, community centers, senior citizen centers, and official t'ai chi schools. Before entering a class, the instructor's credentials should be reviewed, and they should be questioned about the form of t'ai chi they teach. Some of the more rigorous forms of the art may be too intense for older people, or for those who are not confident of their balance. Participants are encouraged to get a physician's approval before beginning any t'ai chi program.

There is no age limitation for those who learn t'ai chi, and there is no special equipment needed for the exercise. Participants are encouraged to wear loose clothing and soft shoes.

Resources

BOOKS

Lee, Martin, Emily Lee, Melinda Lee, and Joyce Lee. *The Healing Art of T'ai Chi*. New York: Sterling Publishing Company, Inc., 1996.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Part I: Sound Mind, Sound Body. New York: Simon & Schuster, 2002.

Reid, Daniel. *Chinese Herbal Medicine*. Boston, MA: Shambhala, 1996.

PERIODICALS

Christou, E. A., Y. Yang, and K. S. Rosengren. "Taiji Training Improves Knee Extensor Strength and Force Control in Older Adults." *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 58 (August 2003): 763 766.

Cooper, Bob. "An Exercise in Vitality: Put Away Your Prejudices T'ai Chi Ain't Just for Senior Citizens and Vegans." *Men's Fitness* 18 (September 2002): 86 91.

Filusch Betts, Elaine. "The Effect of T'ai Chi on Cardi orespiratory Function in Patients with Coronary Artery Bypass Surgery." *Physical Therapy* (Septem ber 1999).

Irwin, M. R., J. L. Pike, J. C. Cole, and M. N. Oxman. "Effects of a Behavioral Intervention, T'ai Chi Chih, on Varicella Zoster Virus Specific Immunity and Health Functioning in Older Adults." *Psychosomatic Medicine* 65 (September October 2003): 824 830.

Li, F., K. J. Fisher, P. Harmer, and E. McAuley. "Delin eating the Impact of T'ai Chi Training on Physical Function Among the Elderly." *American Journal of Preventive Medicine* 23 (August 2002): 92 97.

Song, R., E. O. Lee, P. Lam, and S. C. Bae. "Effects of T'ai Chi Exercise on Pain, Balance, Muscle Strength, and Perceived Difficulties in Physical Functioning in Older Women with Osteoarthritis: A Randomized Clinical Trial." *Journal of Rheumatology* 30 (September 2003): 2039 2044.

Taggart, H. M., C. L. Arslanian, S. Bae, and K. Singh. "Effects of T'ai Chi Exercise on Fibromyalgia Symptoms and Health Related Quality of Life." *Orthopaedic Nursing* 22 (September October 2003): 353 360.

ORGANIZATIONS

American Association of Oriental Medicine. 5530 Wisconsin Avenue, Suite 1210, Chevy Chase, MD 20815. (301) 941 1064. www.aaom.org.

Canadian Taijiquan Federation. P.O. Box 421, Milton, Ontario L9T 4Z1. www.canadiantaijiquanfederation.ca.

Patience T'ai Chi Association. 2620 East 18th Street, Brooklyn, NY 11235. (718) 332 3477. www.patience taichi.com.

OTHER

WebMD. http://WebMD.com.

"Yang Style T'ai Chi Ch'uan." http://www.chebucto.ns.ca/Philosophy/Taichi/styles.html.

Beth Kapes
Rebecca J. Frey, PhD

T'ai chi ch'uan *see* **T'ai chi**

Tang shen *see* **Codonopsis root**

Tangerine peel

Description

This popular, widely known fruit goes by a variety of names, creating some possible confusion at times as to which plant one is dealing with. Commonly known as mandarin in much of the world (in Japan it goes by satsuma), the fruit is most often called tangerine in the United States. Generally listed under the botanical name *Citrus reticulata*, it is also known as *C. nobilis*, *C. madurensis*, *C. unshiu*, *C. deliciosa*, *C. tangerina* or *C. erythrosa*.

A native of Asia, the plant was introduced into Europe early in the nineteenth century. By mid-century, it had spread to the United States, where it was re-christened tangerine. Today, the easily cultivated plant is grown around the Mediterranean, in north Africa, and in both North and South America. Tangerines are generally bigger, rounder, and have more of a yellow-colored skin; mandarins, on the other hand, are smaller, more angular, and deeper orange in color.

The oils produced from the many different cultivars of this plant can vary significantly in chemical composition, reflecting both the particular variety, the country of origin, and the local growing environment.

This small, evergreen tree reaches a height of up to about 20 ft (6 m). It has glossy, pointed leaves and produces fragrant white flowers. The round, fleshy fruit is green when young but ripens to a bright orange or yellow-orange. It was traditionally presented as a gift to the Mandarins of China.

General use

Tangerine peel—called *Chen Pi* or, sometimes, *Ju Hong* meaning red tangerine peel—has a lengthy history of use in **traditional Chinese medicine**. It is commonly used to treat **indigestion**, **diarrhea**, **vomiting** and other forms of digestive weakness or upset, as well as **hiccups** and certain types of coughs (specifically, wet coughs involving excessive production of phlegm). It is said to settle, regulate, and normalize the flow of qi (in traditional Chinese medicine, the term for life force), and to break up congestion. In addition, it is believed to enhance the flow of liquids through the body.

The peel of young, green tangerines is called *Qing Pi* and is used to treat pain—particularly in the side and the breast, as well as **pain** from hernia. In addition, the green peel has been used in the treatment of low blood pressure and (in combination with other herbs) breast inflammation.

C. reticulata is also an ingredient in many traditional Chinese tonics. Among these are the Great Orange Peel Decoction used to treat **gout**, the Two Cure Decoction used to control **morning sickness** in pregnant women, and the Five Seed Decoction used to treat male sexual problems, including low sperm count, **impotence**, and premature ejaculation. A related fertility-and-longevity formula, The Duke of Chou's Centenarian Liquor, is said to have been prescribed for the founder of the Chou Dynasty, more than 3,000 years ago. Tangerine peel is also used to make Dr. Huang's Internal Injury Poultice, which is said to promote healing and ease inflammation in connection with pulled muscles, **sprains**, twisted tendons, and other sports injuries.

The other primary application for *C. reticulata* is in **aromatherapy**, where it is used to treat a wide variety of conditions. Some of these uses parallel those in Traditional Chinese medicine: for digestive and intestinal complaints (as well as hiccups), to stimulate the lymph system, to eliminate excess fluid, to boost the flow of urine, and to combat **obesity**. In France and other parts of Europe, it is known particularly as a remedy for children and the elderly—both for digestive problems and to soothe overwrought young minds. One of the gentler citrus oils, it is also used frequently by pregnant women, and is generally said to be a calmative and tranquilizer, helpful in treating nervous tension, emotional **stress**, **depression**, and sleep-related difficulties.

Mirroring its use in cosmetics, the oil is also used to treat various skin conditions (such as healing scars, stretch marks, and even **acne**), and to discourage excessively oily skin.

Tangerine peel is also an ingredient in certain herbal formulas for pets, particularly to treat excess **gas**.

A 2002 study aimed to test the effect of aromatherapy on pain perception. One of the pleasant odors included orange water, while medicinal odors included vinegar and a dental product. The study found that pleasant odors reduced pain perception in women, but not in men. The study suggested that in clinical settings, smells like disinfectants might promote the perception of pain in some patients.

Preparations

In Traditional Chinese medicine, the dried peel of the fruit is used, often aged (sometimes until it turns black in color) and sometimes even toasted in a wok. *Chen Pi* means aged peel. A decoction is then made from the peel in combination with other herbs. Both the outermost peel (exocarp) and the inner peel (pericarp) are used, for different specific medicinal purposes. *C. reticulata* is also used to make poultices—a paste of finely powdered herbs that is applied externally to help heal internal injuries. Tangerine peel is also available in pill form.

Aromatherapy, on the other hand, relies on the essential oil extracted from the peel. Depending on the precise type of fruit used, the oil can range from yellow-orange to orange in color, and its chemical properties and uses will also vary. Among the primary chemical constituents of the oil are limonene (as much as 90%), geraniol, citral, and citronella. Several of these (most prominently limonene) have been investigated in the laboratory, showing some potential as **cancer** inhibitors. Mandarin oil also contains nitrogen compounds such as methyl methyl-anthranilate, which may not be present in tangerine oil.

All of these oils are cold-pressed. In addition, yet another type of mandarin oil is made from the plant's twigs and leaves, using steam distillation. Mandarin oil is widely used in beverages for its intensely orange flavor, as well as in the production of cosmetics and soaps. It blends readily with other oils. Tangerine oil, on the other hand, is not commonly used in cosmetics.

The oil can be applied in a variety of ways: in therapeutic massage, in healing baths, in compresses, or in unguents (healing salves or ointments). It can also be taken in food or drink, put in a diffuser or inhaler, or used in pillows.

Precautions

Because of the potential confusion over which variety of the plant is called for in a given situation, extra caution is advised to avoid compromising the therapeutic action, introducing unwanted elements, or provoking unintentional interactions. This is particularly true in the context of Traditional Chinese medicine in which many different kinds of citrus fruits are used, often for overlapping but not identical purposes. In aromatherapy too, however, care should be taken to determine which oil is required for the desired formula or use.

Side effects

Occasional allergic reactions to tangerine peel have been noted in the form of prolonged **sneezing**, **cough**, chest discomfort, and restlessness.

Interactions

There are no known interactions.

Resources

BOOKS

Lawless, Julia. *The Illustrated Encyclopedia of Essential Oils*. Rockport, Mass.: Element Books, 1995.

Reid, Daniel. *A Handbook of Chinese Healing Herbs*. Bos ton: Shambhala Publications, 1995.

PERIODICALS

Berger, Joanne M. "Smells Like Relief (Indications)." *Internal Medicine News* (August 1, 2002): 39.

Peter Gregutt
Teresa G. Odle

TB *see* **Tuberculosis**

TCM *see* **Traditional Chinese medicine**

Tea tree oil

Description

Tea tree oil (*Melaleuca alternifolia*) is a multipurpose herb that traces its roots to the Aboriginal people of Australia. For thousands of years, they used the leaves as an antiseptic and antifungal by crushing the leaves and making a mudpack. However, the plant didn't receive the name "tea tree" until 1770, when the name was given by the British explorer Captain James Cook and his crew. Although Cook's crew first used the leaves for tea, they later mixed them with spruce leaves as a beer. The plant's medicinal properties remained a secret with the Australian aboriginal people until the early 1920s when Sydney, Australia chemist, Dr. Arthur Penfold, researched its antiseptic properties. In 1929, along with F.R. Morrison, Penfold published "Australian Tea Trees of Economic Value." This started a flurry of research into tea tree oil. The Australian government considered tea tree oil a World War II essential for their armed forces' first aid kits. After the war, increased use of pharmaceutical antibiotics decreased tea tree oil's appeal everywhere except in Australia. Tea tree oil started to regain its popularity in 1960, with a recharge in its research around the world. Today, *Melaleuca alternifolia* is also grown in California.

New England Tablelands Tea Tree of Australia. *(Geoff Bryant / Photo Researchers, Inc.)*

Properties of tea tree oil

Tea tree oil's properties are contained in the oils of its leaves. The oil is steam distilled from the leaves and then tested for chemical properties, which can number between 50 and 100. This may explain tea tree oil's many beneficial uses. The main active components are terpinen-4-ol, 1,8-cineole, gamma-terpinene, p-cymene and other turpenes. Its aroma is one of a healthy pleasant disinfectant.

General use

Antibacterial

The most promising new function of tea tree oil is to counter methicillin-resistant *Staphylococcus aureus* (MRSA), also called the hospital super bug. In United States and European hospitals, MRSA grew from under 3% in the 1980s to 40% in the late 1990s. This super bug attacks people who have **wounds**, such as post-operative **infections**, and a depressed immune system. MRSA resists conventional antibiotics, except Vancomycin. A Thursday Plantation *in vitro* study, at East London University, comparing Vancomycin and tea tree oil, shows the latter as a powerful alternative. This study corroborated the University of Western Australia study by Thomas Riley and Christine Carson. Because the spread of MRSA occurs mainly by hands, one London hospital uses tea tree oil soap for staff and patient hygiene.

Research reported on in 2002 reported that tea tree oil performed better than certain antibiotics in fighting MRSA, but the sample size of the study was small. Later studies involving herpes simplex and

orthopedic infections also showed promising results for tea tree oil, but again failed to show enough statistical significance to prove tea tree oil works better than antibiotics.

Tea tree oil works as an expectorant when inhaled or taken internally and has a soothing effect; therefore, it can be used for throat and chest infections, and clearing up mucus. It is also effective against earaches, cystitis, and gingivitis. Inhaling steaming hot water with five drops of tea tree essential oil added can not only soothe coughing and plugged noses, but doing so at the start of the infection might stop it from spreading. Gargling with six drops of tea tree oil in a glass of warm water may soothe sore throats.

Antiseptic

Tea tree essential oil is an excellent natural antiseptic for skin infections. The oil immediately penetrates outer skin layers and mixes with body oils to treat such conditions as insect **bites**, **cuts**, **burns**, **acne**, infected wounds, **bruises**, **boils**, **scabies**, lice, chilblains, **diaper rash**, **hives**, poison ivy and **oak**, **prickly heat**, and sunburn.

A 1990 study published in the *Medical Journal of Australia*, outlined the results of using 5% tea tree oil gel versus 5% benzoyl peroxide lotion for acne. The 124 participants showed improvement with both treatments. Benzoyl peroxide worked better with non-inflamed acne while the tea tree gel caused only 44% of side effects such as dryness and red skin compared to benzoyl peroxide's 79%.

The simplest methods to treat acne with tea tree oil are to wash the face with soap containing tea tree essential oil or swab pure tea tree oil on the acne twice daily. (Too high a percentage or direct application of essential oil can cause irritation and blistering.) Applying tea tree oil cream can prevent blistering from sunburns.

Anti-inflammatory

Tea tree oil has pain-numbing properties and can be used topically for sprains, arthritis, bunions, **bursitis**, **eczema**, **gout**, carpal tunnel syndrome, and hemorrhoids. It is best to use products containing essential tea tree oil, since the pure essential oil would be irritating to sensitive areas.

A study at the Flinders University of Adelaide researched tea tree oil's affects on various inflammations in the body to discover if the essential oil reduces the inflammation besides killing the microorganisms causing it.

For relief from **pain** caused by the various arthritic afflictions (**rheumatoid arthritis**, **osteoarthritis**, etc.), 18 drops of tea tree oil can be combined with 1/8 cup of almond oil, then put in a dark bottle and shaken before applying topically two to four times a day as a massage oil. It can also be used to massage the wrists for **carpal tunnel syndrome**. A dozen drops of tea tree oil can be added to bath water.

Anti-fungal

Tea tree oil is an excellent antifungal and can be employed to treat *Candida albicans,* **athlete's foot**, **jock itch**, ringworm, thrush, and onychomycosis (nail infections).

A study published in the *Journal of Family Practice* in 1994 compared the treatment of onychomycosis with a pharmaceutical clotrimazole solution at 1% to tea tree oil at 100% on 117 patients. After six months, the two groups had similar results, with the culture from the clotrimazole group showing 11% infection and that of the tea tree oil group, 18%.

For ringworm and nail infections, besides applying a tea tree gel, cream, or essential oil, bath and laundry water can be disinfected by adding a few drops of tea tree essential oil to the tub and washing machine.

Preventative

Tea tree oil can boost suppressed immune systems and help those with chronic illnesses such as chronic **fatigue** syndrome. Surgeons in Australian hospitals treat patients in these situations with tea tree oil before surgery.

To increase the power of the immune system, several drops of tea tree oil can be added to the bath or weekly massages. A few drops of tea tree oil can also be added to vaporizers.

Personal hygiene

To fight plaque, brushing with toothpaste containing tea tree oil or adding some to regular toothpaste is advised, as is adding a few drops of tea tree oil to mouthwash. The latter helps both teeth and gums. For sore gums, a few drops of the oil can be swabbed on the sore area.

Household cleaning

Tea tree oil's natural solvent properties make it an excellent biodegradable cleaning product. It can be used for washing cotton diapers, as a deodorizer, disinfectant, to remove mold and to treat houseplants for molds, fungus, and **parasitic infections**.

Animal care

Because pets also suffer many of the same diseases as humans, tea tree oil can also be used as treatment for such diseases as arthritis, fleas, bad breath, **gum disease**, abscesses, **dermatitis**, lice, parasites, ringworm, **rashes** and **sprains**. Dogs, in particular, are susceptible to mange, a hard-to-eliminate skin disorder causing **hair loss** and **itching**. Washing a dog or cat using a mild soap and water, then clipping or shaving excess hair before soaking a cotton puff with tea tree oil and saturating on specific areas twice daily will help treat mange. For overall application, mixing one teaspoon tea tree oil with 1/3 cup of water and spraying the mixture from a plant mister onto the mange areas is advised.

When using tea tree oil for animals, it should always be diluted, as full strength can cause such reactions as muscle tremors and poor coordination. The oil should be kept away from the eyes.

Precautions

It is wise to check with your health care practitioner when using tea tree oil internally. Some people might be allergic to the cineole in tea tree oil, although studies show that the 1,8-cineole part improves the skin's absorption of the oil. Dr. Ian Southwell, Research Scientist at the New South Wales Department of Australia suggests the **allergies** could be from alcoholic tea tree oil substances. In 1998-99, skin sensitivity studies conducted at the University of Western Australian Centre for Pathology and Medical Research showed that only three out of 219 volunteers had an allergic reaction to only one or two tea tree oil ingredients. Pure tree oil is also contraindicated for babies, young children, pregnant women, and some pets.

Australian Standard No. AS 2782-1985 requires tea tree oil contain a minimum of terpinen-4-ol over 30% and cineole content of 15%. Tea tree oil is not to be used for daily hygiene, and is toxic to the liver and kidneys in high or chronic doses. High doses can also be irritating to the skin and provoke an allergic reaction in some people.

Resources

BOOKS

Ali, Dr. Elivs, Dr. George Grant, and Ken Vegotsky. *The Tea Tree Oil Bible*. AGES Publications, Inc. 1999

Murry, Michael. *The Healing Power of Herbs*. Prima Pub lishing, 1995

Rothenberg, Mikel A., and Charles F. Chapman. *Barron's Dictionary of Medical Terms* third edition. Barron's Education Series, Inc. New York, 1994.

PERIODICALS

"Ti tree Oil and Chickenpox." *Aromatherapy Quarterly* (Summer 1986):12.

Walsh, Nancy."Tea Tree Oil for Infections." *Internal Medi cine News*(July 1, 2002):16 21.

OTHER

"Antimicrobial activity of Tea Tree Oil." http://www.phar minfo.com/pubs/msb/teaoil240.html.

Australian Tea Tree Oil Product Safety and recent progress in Research and Development. Courtesy of Robert Riedl, Technical Manager, Regional Affairs, from his lecture in London, England, September, 1999, Thurs day Plantation Laboratories Limited, New South Wales, Australia.

The Tea Tree Oil Information Site. http://www.teatree.co.uk.

Thursday Plantation. http://www.thursdayplantation.com.

Sharon Crawford
Teresa G. Odle

Teen nutrition

Definition

Teen **nutrition** involves making sure that teens eat healthy foods to help them grow and develop normally, as well as to prevent **obesity** and future disease. Following dietary guidelines recommended by research and medical professionals supports proper nutrition. The guidelines include selections from different food groups to provide the vitamins and minerals teens need as they grow through puberty and into adulthood. The U.S. Department of Agriculture's (USDA) Food Guide Pyramid recommends how many servings a day a child should eat of each food group, such as milk,

Healthy eating at fast food restaurants

- Skip "value-sized" or "super-sized" meals
- Choose a grilled chicken sandwich or a plain, small burger
- Use mustard instead of mayonnaise
- Limit fried foods or remove breading from fried chicken, which can cut half the fat
- Order garden or grilled chicken salads with light or reduced-calorie dressings
- Choose water or fat-free or low-fat milk instead of sweetened soda

SOURCE: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services

(Illustration by GGS Information Services. Cengage Learning, Gale)

vegetables, fruits, fats, and meats. By sticking closely to the guidelines, parents can ensure their teens get a well-balanced diet that supplies the vitamins and calories they need to stay healthy and support growing bodies and active lifestyles.

Origins

Humans, unlike plants, cannot manufacture the nutrients they need to function. Each culture over centuries has developed its own traditional diet. In Western civilization, many of these **diets** have developed into convenient, fatty and sugary foods, leading to obesity even in children and teens.

Advice on nutritional choices predates recorded language, but the first science-based approach to a healthy diet probably began just over 100 years ago. W. O. Atwater, the first director of the Office of Experiment Stations in the USDA and a pioneer in the field of nutrition investigation, developed some of the components needed for a food guide. He created food tables with data on protein, fat, carbohydrate, mineral matter, and fuel value for common foods.

Food guides with food groups similar to those used today first appeared in USDA publications in 1916 and were developed by nutrition specialist Caroline L. Hunt. The first daily food guide was published under the title *Food for Young Children*. In the early 1930s, the **Depression** caused economic restraints on families and the USDA responded with advice on how to select healthy foods more cheaply. In 1941, the Food and Nutrition Board of the National Academy of Sciences released the first recommended dietary allowances (RDAs) for calories and essential nutrients. The nine nutrients included on the list were protein, **iron**, **calcium**, vitamins A, C, and D, thiamin, **riboflavin**, and **niacin**.

Throughout the years following the release of the first guidelines, recommendations were debated and revised. The new food guide was first presented in 1984 as a *food wheel*. The USDA first used a pyramid to represent the food groups in 1992 after intensive research on the most effective way to visually communicate healthy eating by portion and food choice. Although it has been modified over the years, the pyramid has continued to represent the food groups and continues to be revised.

Benefits

The Food Guide Pyramid and other healthy eating recommendations generally apply to children age two and older. When used as a starting point for planning family meals and snacks, applying these sensible recommendations to teenagers' daily diets can encourage good eating habits before adulthood. This will help teens develop mentally and physically and prevent obesity or eating disorders. Many nutritional experts agree that if teens eat a balanced diet that includes all of the recommended food groups, they will not need to take any vitamin supplements. Eating a balanced diet with a variety of foods will give teens the energy they need to stay physically active, which is important to their growth, mental health, and to keeping obesity in check.

KEY TERMS

Anorexia—A serious and sometimes fatal eating disorder characterized by intense fear of being fat and severe weight loss. It primarily affects young females. Sufferers may see themselves as fat even when they are underweight.

Bulimia—Sometimes called binge eating, this eating disorder consists of cravings for foods that often result in periods of continuous eating followed by purging (forced vomiting or diarrhea) and depression or food-deprivation, etc.

Malnutrition—Any disorder of nutrition caused by insufficient or unbalanced diet that can result in impaired absorption or use of foods.

Puberty—The period of life in which boys' and girls' sexual organs begin to reach maturity and the ability to reproduce begins.

Description

In spite of recommendations, the diet quality of most teens is not what it should be. Today, about nine million U.S. children ages six to 19 are overweight. The number of teens age 12 to 19 with weight problems has tripled since the 1980s. Body mass index (BMI) is a measurement system used to assess if a child (or adult) is underweight, overweight, or at risk for becoming overweight. Pediatricians use height and weight measurements taken at a child's regular checkups to determine his or her BMI. Anyone who weighs more than 85% of teens the same height, age, and sex is considered overweight. The Centers for Disease Control (CDC) considers anyone in the 95th percentile obese. To help guide teens, their families, schools, and others in making healthy nutritional choices, the USDA guidelines suggest the following daily food selections:

- Six to 11 servings of breads, cereals, rice, and pasta
- Three to five servings of vegetables
- Two to four servings of fruit
- Two to three servings of dairy products

- Two or three servings of meat, fish, poultry, and legumes

Fats, oils, and sweets are at the top of the pyramid, but are not considered an actual food group. They occur in many foods from other groups and should only be used sparingly. The USDA says only about 30% of daily calories should come from fat.

Calcium requirements are particularly important for teens, yet studies show that about 60% of teenage boys and more than 85% of teenage girls fail to get the recommended daily allowance of calcium. Calcium not only helps strengthen bones and make for healthier teeth, it also is important in the teen years to prevent future **osteoporosis**, a painful condition that causes weakened, less dense bones in later adult years. Teens should consume 1,200–1,500 mg of calcium per day. Some excellent sources of calcium include:

- lowfat milk: 300 mg per cup
- white beans: 115 mg per 0.5 cup
- lowfat yogurt: 300 mg per 8 oz
- orange: 40–50 mg per medium-sized orange

Iron requirements are also very important for adolescent health and growth. Teens need 12–15 mg of iron per day. A variety of iron sources come from each food group. Some include:

- peanut butter
- whole grain bread
- spinach
- green beans and lima beans
- beef, poultry, or fish
- strawberries

For both calcium and iron, female teens need the higher recommended amount per day in order to build strong bone and muscle that will prevent against osteoporosis and other conditions associated with post-menopausal women. Teen males need at least the minimum requirement.

Preparations

Getting teenagers to eat the right foods is easier if they have begun good eating habits at a young age and if they are offered a variety of healthy foods. Many books, magazines, and web sites offer tips on making healthy foods interesting. Many of these resources are geared to teens and include recipes. Some selections for each food group include:

- Breads, cereals, and pastas include whole grain breads, bagels, unsweetened cereals, rice, whole grain crackers, cornbread, English muffins, and rice cakes.
- Vegetable servings can come from cooked or raw vegetables such as asparagus, beets, broccoli, carrots, corn, green and red peppers, green beans, kale, peas, pumpkin, squash, sweet potato, tomato, zucchini, or vegetable juice.
- Good fruit choices include such whole fruits as apples, applesauce, bananas, cantaloupe, apricots, peaches, fruit cocktail, plums, grapefruit, kiwi, nectarines, strawberries, and watermelon.
- In addition to milk, low-fat yogurts and cheeses are good dairy sources, as are low-fat cottage cheese, custard, ice milk, and occasional ice cream servings.
- Meat, fish, poultry, and legumes choices include lean meats, dried beans, peanut butter, shellfish, dried peas, lentils, and tofu.

To reduce fat in a teen's diet, parents and their teenage children can switch to low-fat or nonfat milk, remove skin from poultry or trim fat from red meat, reduce use of margarine and butter, use low-fat cooking methods such as baking, broiling, and steaming, and serve foods rich in fiber. Fresh salads can improve fiber in diet, as can adding oat or wheat bran to baked foods. Milk, cheeses, tofu, and salmon are good sources of calcium. Fruit smoothies are good replacements for milk shakes.

It is important that teens eat three meals a day and not skip breakfast. Studies have shown that children and teens that skip breakfast have more trouble concentrating and do not perform as well in school. Skipping breakfast in childhood and adolescence also is related to later health problems such as obesity and **heart disease**.

While the obesity problem in today's youth can be blamed on a number of factors, including larger food portions for adults and children, convenient salty snack foods, and cheap and convenient fast food, much attention has been focused on the nation's schools. There are fewer physical education classes because of more emphasis on academic classes and those gym classes that remain have too much standing around and not enough activities that interest the students, say some experts. School lunches generally offer balanced nutrition, but many schools also offer "snack bars" or vending machines with sodas and sugary, fatty, or salty snacks. Many teens have been choosing these snacks over the prepared school lunches.

To counter the problem in schools, the Healthy Schools Summit was held in October 2002. It consisted of representatives from more than 30 national education, fitness, nutrition, and health organizations, as well as 450 school administrators, government leaders, food service directors, counselors, dietitians, nurses,

and health and fitness teachers. Since that time, many school districts around the country have been working to improve their physical education programs and to remove or change the selections in vending machines and snack bars on school campuses. Educating teens and helping them choose healthy alternatives from home, school, or away from campus can help solve the problem as well.

At home, parents also choose convenient snack and fast foods because often, both parents work long hours. Along with bigger portions and increased time spent in front of the television instead of out being physically active, today's youth are becoming obese. They are receiving and growing accustomed to less nutritional food choices. Many experts say that getting teens up off the couch and stocking healthy snack choices helps. Also, many sources can help parents find healthier alternatives to fast food meals for their families. Suggestions include cooking meals on weekends and freezing them for busy weekdays, and looking for cookbooks or online sources of quick and healthy recipes. Simply cooking with less fat by using cooking sprays and baking, roasting, or poaching methods instead of frying helps teens and adults. Also, offering teens healthy snacks to last them until mealtime will keep them from reaching for poor snack choices and make them less likely to overeat at the evening meal.

Teens who are very active and participate in organized sports need a particularly healthy diet. Many teens hear of ideas such as loading up on carbohydrates or proteins to train for sports, often the night before a competition. In reality, the best training is to stick to the Food Pyramid, say nutrition experts. Athletic teens may eat extra complex carbohydrates, such as whole grain rice, pasta, bread, and cereal. Some extra protein is good to help build strong muscles, but eating too much of just one food group, rather than eating a balanced diet is not recommended for athletes or anyone else. An active male teen needs approximately 2,800 calories per day. They should eat the higher suggested number of servings in each food group. Active female teens require 2,200 calories per day. They should eat the average number of suggested servings per food group. Teens that are not as active and are overweight should eat the lower number of suggested servings per food group and cut back on their daily ingestion of fats, oils, and sugars.

While all teens need to drink plenty of water, those who participate in sports need to drink even more. Some experts say an easy formula to remember is one cup of fluid for every one-half hour of physical activity. Another telltale sign of thirst is the color of a teen's urine. If a teen's urine is clear or the color of pale lemonade, he/she is drinking enough fluids. Dark urine the color of apple juice indicates too little hydration and the teen is in danger of dehydration or heatstroke.

For a variety of reasons, some teenagers follow vegetarian diets. Some people are concerned that a vegetarian diet is harmful for children and teens, but generally, if the teen still follows the recommended Food Guide Pyramid and makes good food choices, a vegetarian diet can be healthy. About 2% of children ages six to 17 never eat meat, fish, or poultry and a survey in early 2003 found that vegetarian adolescents drank fewer sodas and ate less fast food than non-vegetarian teens. Vegetarian teens may need vitamin supplements to make up for some of the vitamins normally obtained in meats or meat products; a physician or professional nutritionist can help determine the proper level of supplement needed.

Precautions

Many teens and their parents have been cautioned not to turn to fad diets for teenage weight problems. Many of the diets and diet products on the market have not been proven by clinical studies as effective in the long term for adults; they certainly have not been proven safe or effective as a solution to weight problems in children and teens. Often, teenagers are more susceptible to claims made about diet plans and parents should help them research these diets or to speak with a physician or other licensed practitioner to determine their effectiveness.

The best solution for obesity is a combination of activity, a balanced diet that follows the USDA guidelines for food groups and portions, and involvement of a physician, dietitian, or other trained professional as needed. Further, adolescents who worry too much about weight and appearance can develop social anxieties and eating disorders such as anorexia and bulimia. Over one third of American teenaged females have used such unhealthy methods as self-induced **vomiting**, laxative abuse, diet pills, and water pills to control their weight.

Eating disorders

Anorexia usually occurs in teenage girls and young women who have a greater than normal fear of being fat. People with anorexia hardly eat at all, and they obsess over the food they do eat. A teenage girl with anorexia might weigh every bit of food she eats, compulsively count all calories, or **exercise** to the extreme to work off calories she has consumed. The difference between anorexia and normal dieting is the serious compulsion with weight loss and the desire to go beyond being fit and trim to being as

thin as possible, no matter the cost. Warning signs for anorexia are a weight drop to abut 20% below normal, a teen who denies feeling hungry, excessive exercise, feeling fat, and withdrawal from social activities.

Teens with bulimia binge on food for a few hours, then get rid of it quickly by vomiting or taking laxatives. This binge and purge behavior is more difficult to spot than anorexia, because the teenager may be of average weight. The warning signs for bulimia include frequent excuses to go to the restroom immediately after meals, eating huge amounts of food without gaining weight, and using laxatives or diuretics.

Side effects

Only the fat-soluble (capable of being dissolved in fat or oil) vitamins A, D, K and E have side effects that are potentially, though rarely, toxic (poisonous).

In their book *The Real Vitamin & Mineral Book,* Sheri Lieberman and Nancy Bruning state, "The facts are that only a few vitamins and minerals have any known toxicities, all of which are reversible, with the exception of **vitamin D**. Anything can be harmful if you take enough of it—even pure water. But vitamins and minerals are among the safest substances on earth. The amounts needed to become toxic are enormous." They add that being on medication or having a medical condition can influence vitamin/mineral requirements and indicate that when one's physician is not well-versed in nutrition, it is ideal to have him work with a qualified nutritionist.

With regard to vitamin D, they indicate, "According to several studies, up to 1,000 IU per day of vitamin D appears to be safe. Both the beneficial and adverse effects of exceeding this amount are controversial. Overdosing of vitamin D is irreversible and may be fatal. Symptoms of too much vitamin D are **nausea**, loss of appetite, **headache**, **diarrhea**, **fatigue**, restlessness, and calcification of the soft tissues (insoluble lime salts in tissue) of the lungs and the kidneys, as well as the bones." Vitamin D (400 IU) is usually sold with **vitamin A** (5,000 IU) in a tiny tablet or capsule.

Lieberman and Bruning say that active vitamin A from fish liver oil or synthetic palmitate is stored in the liver; that 15,000 IU would cause problems in infants; but that 100,000 IU of active vitamin A would have to be taken daily for months before any signs of toxicity (state of being poisonous) appear. Vitamin A in the form of beta-carotene can be taken without any risk of toxicity.

At doses of 800–1,200 IU per day, Lieberman/Bruning found no well-documented toxicity of **vitamin E**. At doses of over 1,200 IU per day, adverse effects such as flatulence, diarrhea, nausea, headache, heart palpitations, and fainting have been reported, but were completely reversible when dosage was reduced.

Vitamin K is easily obtained by the body from a healthy diet and deficiencies are rare, especially in children. It is given prophylactically to newborn infants to prevent hemorrhage and before surgery to people with blood-clotting problems. Lieberman/Bruning describe the major effect of too much vitamin K as an **anemia** where red blood cells die more quickly than usual and cannot be replaced by the body.

Eating disorders

If a teen weighs less than 15% of the normal weight for his/her height, he/she may not have enough body fat to keep vital organs functioning. When a person is undernourished the body slows down as if it is starving and blood pressure, pulse rate, and breathing slow. Girls with anorexia often stop having their menstrual cyles. Anorexics can also experience lack energy and concentration, as well as lightheadedness. They become anemic, their bones can become brittle, and they can damage their heart, liver, and kidneys. In the most severe cases, they can suffer malnutrition or even death.

The repeated vomiting of bulimia causes constant stomach **pain**. It also can damage the stomach and kidneys. Acids from the stomach that come up into the mouth when vomiting can cause tooth decay. Teenage girls with bulimia also may stop having menstrual cycles. Constant vomiting may also cause bulimics to lose too much of a mineral called **potassium**, which can lead to heart problems and even death.

Research and general acceptance

The American Medical Association (AMA) has based many of its food choices on the Dietary Guidelines for Americans, which were developed through research by the U.S. Department of Agriculture and the U.S. Department of Human Services. Input for the guidelines comes from a number of resources, including national surveys from the Centers for Disease Control (CDC).

As for teens, accepting the importance of nutrition is another story. A 2000 report from the CDC showed that many teens know the basics of healthy eating but few actually follow the recommendations. They simply prefer unhealthy foods most of the time. In focus groups, some teens in the eighth and ninth grades said they would eat healthy foods right before participating in a sport, but most thought their current behaviors could not affect their health at this time in their lives.

Training and certification

Qualified dieticians and nutritionists may have a bachelor's, master's or a doctoral degrees in nutrition and dietetics from an accredited college. They also are required to constantly update their knowledge with continuing education. Through the American Dietetic Association, these professionals can gain certification in their fields, including a certificate of training in childhood and adolescent weight management. Pediatricians obtain M.D. or D.O. degrees and some specialize in childhood diseases and treatment. In the field of alternative medicine, parents may choose to seek treatment from naturopaths and homeopaths.

Resources

PERIODICALS

Berler, Ron. "The Problem is Big: More Kids than Ever are Overweight. We'll Tell You About the Crisis, Offer Some Solutions, and Explain Why Controlling Your Weight Can Make You a Better Athlete." *Sports Illus trated for Kids*(October 1, 2003):60.

"Food Insecurity." *Pediatrics*(February 2003):357 358.

"Kids Don't Think Obesity is a Health Problem." *Nutrition Today*(July August 2003): 115 116.

Perry, Cheryl L, et al. "Adolescent Vegetarians: How Well do Their Dietary Patterns Meet the Healthy People 2010 Objectives?." *American Academy of Child and Adolescent Psychiatry*(February 2003): 252 253.

ORGANIZATIONS

The American Academy of Pediatrics. 141 Northwest Point Boulevard, Elk Grove Village, IL 60007 1098. (888) 227 1770. http://www.aap.org/family.

International Food Information Council. 1100 Connecticut Avenue, NW, Suite 430, Washington, DC, 20036. (202) 296 6540. http://www.ific.org.

KidsHealth/Nemours Foundation. 4600 Touchton Road East, Building 200, Suite 500, Jacksonville, FL 32246. http://www.kidshealth.org/teen/.

National Eating Disorders Association. 603 Stewart Street, Suite 803, Seattle, WA 98101. (800)931 2237. http://www.nationaleatingdisorders.org.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (888)878 3256. http://www.usda.gov/FoodAndNutrition.

OTHER

"BMI For Children and Teens." National Center for Chronic Disease Prevention and Health Promotion. [cited June 18, 2004]. http://www.cdc.gov/nccdphp/dnpa/bmi/bmi for age.htm.

"Eating Disorders: Anorexia and Builimia." TeenHealth/Nemours Foundation. [cited June 18, 2004]. http://www.kidshealth.org.

"Healthy Weight, Physical Activity, and Nutrition: Focus Group Research With African American, Mexican American and White Youth. Executive Summary." Centers for Disease Control. http://www.cdc.gov.

Teresa G. Odle

Teeth clenching *see* **Bruxism**

Teething problems

Definition

Teething is the eruption of the primary set of teeth (baby teeth) through the gums.

Description

Humans are born with two sets of teeth under the gums. Twenty of these are primary, or baby teeth. Occasionally a child is born with some primary teeth already visible, but more commonly, they begin to erupt around the middle of the first year. The timing of eruption is quite variable, but tends to be similar among members of the same family. Generally, all 20 primary teeth have come in by two and a half years of age. Lower teeth usually come in before their upper counterparts. Incisors often erupt first (centrals, then laterals), followed by first molars, canines, and then two-year molars. An early or late pattern of getting baby teeth will sometimes correspond with a similar pattern of losing the baby teeth and getting the permanent teeth. Issues of spacing and orientation of these first teeth does not necessarily indicate that there will be a problem with the permanent teeth. Gaps and crookedness will often resolve.

Causes and symptoms

Many symptoms of teething are nonspecific, and can occur for weeks or even months before the teeth actually appear. The teething child may be more irritable, particularly at night. Drooling is likely to become heavier when teeth are coming through, which can also cause the stools to become looser. The excess saliva may cause a rash around the mouth and chin, and produce coughing. Some children will run a low-grade fever, typically about 101°F (38.3°C). Commonly the baby will chew on fingers or other objects to relieve the discomfort. This may also include biting during nursing. The areas where teeth are coming through may appear swollen and red. Sucking can be painful for some babies, who may find nursing uncomfortable at the height of teething.

KEY TERMS

Caries—Cavities in the teeth.

Eruption—Emergence of teeth through the gums.

Fluoride—A mineral compound, taken orally or topically, used to strengthen teeth.

Occasionally, a small, dark blue area will form on the gums where a tooth is about to emerge. This is the result of a small amount of bleeding beneath the surface of the gums, and is not a cause for concern. It will generally resolve without any special treatment, but cold compresses may be used for comfort and to reduce swelling.

Babies may sail through teething with very little apparent discomfort, or may particularly struggle with certain circumstances. Sometimes the first teeth to erupt seem the most bothersome. Others find that it is the large molars which cause the most problem, or groups of teeth coming in simultaneously.

Diagnosis

Swollen gums combined with irritability are good clues to teething **pain**, but serious or long lasting symptoms warrant a visit to the health care provider. If the baby has a **fever** over 101 °F (38.3°C), teething is unlikely to be the cause. Even lower fevers that persist for three days or more should prompt a call to ask whether the baby needs to be seen. Teething is not usually associated with nasal discharge. Although babies that are cutting teeth sometimes pull at their ears, a combination of ear pulling, cold symptoms, and increased nighttime fussing could indicate an **ear infection**. If the child seems to be getting worse or there is any doubt that the symptoms are attributable to teething, professional advice should be sought.

Treatment

Pressure on the areas where teeth are coming through can provide comfort for teething babies. Some babies appear to get relief from a gentle gum massage, or they may enjoy chewing on different textures of teething toys. Some types can be chilled or frozen, which can numb the tender gums a little. A clean, damp washcloth placed in the freezer is an inexpensive substitute for a freezable toy and may be dampened with **chamomile** tea. Chilled foods or drinks can also do the trick, but do not use items that could become choking hazards.

Drool **rashes** are treated by keeping the affected area as free from saliva as possible, and using a mild skin cream. A diaper or wash cloth placed under the crib sheet where the baby's head rests will help to absorb the excess drool and keep the face from being as wet.

Be sure to take care of primary teeth as they come in. A piece of moist gauze is an effective cleanser for baby's first teeth. To prevent dental caries, avoid letting children sleep with a bottle of anything but water. Milk and juice can pool in the mouth, coating the teeth in sugar, and result in decay. Sticky foods and other processed sugars also put teeth at higher risk for damage. A toothbrush will be a more effective cleaner than gauze once the molars come in, and can be used with plain water. Children who aren't yet able to spit out toothpaste residue can get an overdose of fluoride from swallowing fluoridated toothpaste.

Homeopathic treatment

Homeopathic tablets and gels, typically combination homeopathic remedies, are available for teething pain. They are nontoxic, and some find them invaluable in treating teething pain. Individual homeopathic remedies are also available, based on the specific symptoms the baby is having. Consult a practitioner for assistance with the correct remedy and dose.

Herbal treatment

Slippery elm powder and infusion of German chamomile can be made into a paste to be applied to swollen gums. Some babies have also been permitted to teethe on peeled root of marsh mallow (no relation to the confection) to soothe inflammation. Chamomile tea in double strength can be very soothing, especially at night.

Allopathic treatment

Acetaminophen (Tylenol) or ibuprofen (Motrin, Advil) can be given to alleviate the swelling and discomfort of teething, particularly at night to allow less interruption of sleep. A health care provider can outline the appropriate dose and frequency. Topical gels with anesthetic ingredients are available, but they work only for a brief time and occasionally cause allergic reactions. They also cause numbness which may be unpleasant to the baby.

Expected results

Teething is an experience that every baby goes through, either with periodic discomfort, or none at

all. Fortunately, once all the primary teeth come in, it is over.

Prevention

Teething pain cannot be completely prevented, but parental attentiveness to comfort measures can help the baby get through it with less distress.

Resources

BOOKS

Eisenberg, Arlene, Heidi Murkoff and Sandee Hathaway. *What to Expect the First Year*. New York: Workman Publishing, 1989.

Sears, William and Martha Sears. *The Baby Book*. Boston: Little, Brown and Company, 1993.

OTHER

Greene, Alan. *Dr. Greene's HouseCalls: Dealing with teeth ing pain*. http://drgreene.com/990703.asp (1999).

Judith Turner

Temporomandibular joint syndrome

Definition

Temporomandibular joint syndrome (TMJ) is the name given to a group of symptoms that cause **pain** in the head, face, and jaw. The symptoms include headaches, soreness in the chewing muscles, and clicking or stiffness of the joints.

Description

TMJ syndrome, which is also sometimes called TMJ disorder, results from pressure on the facial nerves due to muscle tension or abnormalities of the bones in the area of the hinge joint between the lower jaw and the temporal bone. This hinge joint is called the temporomandibular joint. There are two temporomandibular joints, one on each side of the skull just in front of the ear. The temporal bone is the name of the section of the skull bones to which the jawbone (the mandible) is connected. The jawbone is held in place by a combination of ligaments, tendons, and muscles. The temporomandibular joint also contains a piece of cartilage called a disc, which keeps the temporal bone and the jawbone from rubbing against each other. The jaw pivots at the joint area in front of the ear. The pivoting motion of the jaw is complicated because it can move downward and from side to side as well as forward. Anything that causes a change in shape or functioning of the temporomandibular joint will cause pain and other symptoms.

Causes and symptoms

TMJ syndrome has several possible physical causes:

- Muscle tension. Muscle tightness in the temporomandibular joint usually results from overuse of muscles, which is itself often associated with psychological stress and clenching or grinding of the teeth (bruxism).
- Injury. A direct blow to the jaw or the side of the head can result in bone fracture, soft tissue bruising, or a dislocation of the temporomandibular joint itself.
- Arthritis. Both osteoarthritis and rheumatoid arthritis can cause TMJ.
- Internal derangement. With this condition, the cartilage disk lies in front of its proper position. In most cases of internal derangement, the disc moves in and out of its correct location, making a clicking or popping noise as it moves. In a few cases, the disc is permanently out of position, and the patient's range of motion in the jaw is limited.
- Hypermobility. In this case, the ligaments that hold the jaw in place are too loose and the jaw tends to slip out of its socket.
- Birth abnormalities. These are the least frequent causes of TMJ but do occur in a minority of patients. In some cases, the top of the jawbone is too small; in others, the top of the jawbone outgrows the lower part.
- Oral habits. Some dentists think that such habits as wide yawning, lip or tongue biting, or mouth breathing can contribute to TMJ by putting the jaw in an abnormal position for long periods of time.
- Dental work. Some people develop TMJ following dental work that requires the dentist to hold the patient's jaw open wide for extended periods of time. Other patients develop TMJ following removal of the wisdom teeth.

In addition to the physical causes of TMJ, dentists are increasingly recognizing the importance of psychosocial factors in the disorder. One important factor is the patient's concept of pain itself. People who are already suffering from **depression** or an **anxiety** disorder, people who have little social support in their lives, and those who feel that they have little control over their lives are at greater risk of developing chronic pain syndromes, including TMJ.

In many cases TMJ results from a combination of psychological, anatomical, and functional factors rather than a single abnormality.

The symptoms of TMJ depend in part on its cause or causes. The most common symptoms are facial pain in front of the ears, headaches, sore jaw muscles, a clicking sound when chewing, a grating sensation when opening and closing the mouth, and temporary locking of the jaw. Some patients also report a sensation of buzzing or ringing in the ears. Usually, the temporomandibular joint itself is not painful. Most cases of TMJ are seen in women between 20–50 years of age.

Diagnosis

TMJ syndrome is most frequently diagnosed by dentists. The dentist can often diagnose TMJ based on physical examination of the patient's face and jaw. The examination might include pressing on (palpating) the jaw muscles for soreness or asking the patient to open and close the jaw in order to check for misalignment of the teeth in the upper and lower jaw. This condition is called malocclusion. The dentist might also gently move the patient's jaw in order to check for loose ligaments.

Imaging studies are not usually necessary to diagnose TMJ. In most cases, x rays and MRI scans of the temporomandibular joint will be normal. Consequently, these two tests are not commonly used to diagnose TMJ. If the dentist suspects that the patient has internal derangement of the disc, a technique called arthrography can be used to make the diagnosis. In an arthrogram, a special dye is injected into the joint, which is then x-rayed. Arthrography can be used to evaluate the movement of the jaw and the disc as well as size and shape, and to evaluate the effectiveness of treatment for TMJ.

Another aid to diagnosing TMJ is a new questionnaire designed to discriminate between facial pain related to TMJ and myogenic facial pain, a chronic condition that is caused by trigger points in the muscles of the face and neck. The McGill Pain Questionnaire has been reported to have a high degree of reliability in distinguishing between patients with TMJ and patients with myogenic facial pain.

Treatment

In many cases, the cause of pain in the TMJ area is temporary and disappears without treatment. About 80% of patients with TMJ improve in six months without medications or physical treatments.

Biofeedback, which teaches an individual to control muscle tension and any associated pain through thought and visualization techniques, is also a treatment option for TMJ. In biofeedback treatments, sensors placed on the surface of the jaw are connected to a special machine that allows the patient and healthcare professional to monitor a visual and/or audible readout of the level of tension in the jaw muscles. Through **relaxation** and visualization exercises, patients learn to relieve the tension and can actually see or hear the results of their efforts instantly through the sensor readout on the biofeedback equipment. Once the technique is learned and patients are able to recognize and differentiate between the feelings of muscle tension and muscle relaxation, the electromyographic biofeedback equipment itself is no longer needed and patients have a powerful, portable, and self-administered treatment tool to deal with pain and tension.

Stress management and relaxation techniques may be useful in breaking the habit of jaw clenching and teeth grinding. Tight jaw muscles are often relaxed by applying warm compresses to the sides of the face. **Massage therapy** and deep tissue realignment can also assist in releasing the clenching pattern. Extra **calcium** and **magnesium** can also help relax jaw muscles. Other treatments include hypnosis, cognitive-behavioral therapy, electrotherapy, **exercise**, and educating patients to change their perception of pain.

Acupuncture may relieve the jaw tension associated with TMJ. A British study concluded that acupuncture was safe and effective for treating TMJ. The study involved 60 patients and found that 85% reported benefits of acupuncture, with an average reduction of pain of 75%. Results of the study were published in the January 2006 issue of *Acupuncture in Medicine*.

Allopathic treatment

Allopathic practitioners are increasingly recommending more conservative treatments for TMJ, on the grounds that the majority of patients can be successfully treated with noninvasive, reversible approaches. These include patient education and eating softer foods as well as medication and the use of bite plates.

Patients with TMJ can use muscle relaxants if their symptoms are related to muscle tension. Some patients may take aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) for minor discomfort. If the TMJ is related to **rheumatoid arthritis**, it may be treated with corticosteroids, methotrexate (MTX, Rheumatrex) or gold **sodium** (Myochrysine).

Patients who have difficulty with **bruxism** may be treated with splints. A plastic splint, called a

KEY TERMS

Arthrography—An imaging technique that is sometimes used to evaluate TMJ associated with internal derangement.

Bruxism—Habitual clenching and grinding of the teeth, especially during sleep.

Electromyographic biofeedback—A method for relieving jaw tightness by monitoring the patient's attempts to relax the muscle while the patient watches a gauge. The patient gradually learns to control the degree of muscle relaxation.

Internal derangement—A condition in which the cartilage disc in the temporomandibular joint lies in front of its proper position.

Malocclusion—The misalignment of opposing teeth in the upper and lower jaws.

Mandible—The medical name for the lower jaw.

Osteoarthritis—A type of arthritis marked by chronic degeneration of the cartilage of the joints, leading to pain and sometimes loss of function.

Rheumatoid arthritis—A chronic autoimmune disorder marked by inflammation and deformity of the affected joints.

Temporal bones—The compound bones that form the left and right sides of the skull.

Transcutaneous electrical nerve stimulation (TENS)—A method for relieving the muscle pain of TMJ by stimulating nerve endings that do not transmit pain. It is thought that this stimulation blocks impulses from nerve endings that do transmit pain.

nightguard, is placed over the teeth before going to bed. Splints can also be used to treat some cases of internal derangement by holding the jaw forward and keeping the disc in place until the ligaments tighten. The splint is adjusted over a period of two to four months.

TMJ can also be treated with ultrasound, stretching exercises, transcutaneous electrical nerve stimulation (TENS), stress management techniques, or friction massage.

Surgery is ordinarily used only to treat TMJ caused by birth deformities or certain forms of internal derangement caused by misshapen discs. Artificial temporomandibular joint implants are sometimes used to replace the jaw in patients to decrease pain and improve jaw function.

Expected results

The prognosis for recovery from TMJ is excellent for almost all patients. Most patients do not need any form of long-term treatment. Surgical procedures to treat TMJ are quite successful. In the case of patients with TMJ caused by arthritis or infectious diseases, the progression of the arthritis or the success of eliminating infectious agents determines whether TMJ can be eliminated.

Resources

BOOKS

Laskin, Daniel M., et al. *Temporomandibular Disorders: An Evidence Based Approach to Diagnosis and Treatment*. Hanover Park, IL: Quintessence, 2006.

Okeson, Jeffrey P. *Management of Temporomandibular Dis orders and Occlusion*. Burlington, MA: Mosby, 2007.

PERIODICALS

Arabshahi, Bita, et al. "Reactive Arthritis of the Temporo madibular Joints and Cervical Spine in a Child." *Pediatric Rheumatology* (April 4, 2007): 4.

Buescher, Jennifer J. "Temporomandibular Joint Disor ders." *American Family Physician* (November 15, 2007): 1477.

London, Robert T. "Stress Related Temporomandibular Dysfunction." *Clinical Psychiatry News* (October 2006): 60.

Medlicott, Marega S., and Susan R. Harris. "A Systematic Review of the Effectiveness of Exercise, Manual Ther apy, Electrotherapy, Relaxation Training, and Bio feedback in the Management of Temporomandibular Disorder." *Physical Therapy* (July 2006): 955(19).

Rosted, Palle, et al. "The Use of Acupuncture in the Treat ment of Temporomandibular Dysfunction: An Audit." *Acupuncture in Medicine* (January 2006): 16(7).

Shapira, Ira. "The National Heart, Lung, and Blood Insti tute Considers the Cardiac and Sleep Consequences of Temporomandibular Disorders." *CRANIO: The Jour nal of Craniomandibular Practice* (April 2007): 77(2).

ORGANIZATIONS

American Dental Association, 211 East Chicago Ave., Chi cago, IL, 60611, (312) 440 2500, http://www.ada.org.

Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, ON, K1G 3Y6, Canada, (613) 523 1770, http://www. cda adc.ca.

National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health, Bethesda, MD, 20892 2190, (301) 496 4261, http://www. nidr.nih.gov.

TMJ Association, PO Box 26770, Milwaukee, WI, 53226 0770, (262) 432 0350, http://www.tmj.org.

Paula Ford-Martin
Ken R. Wells

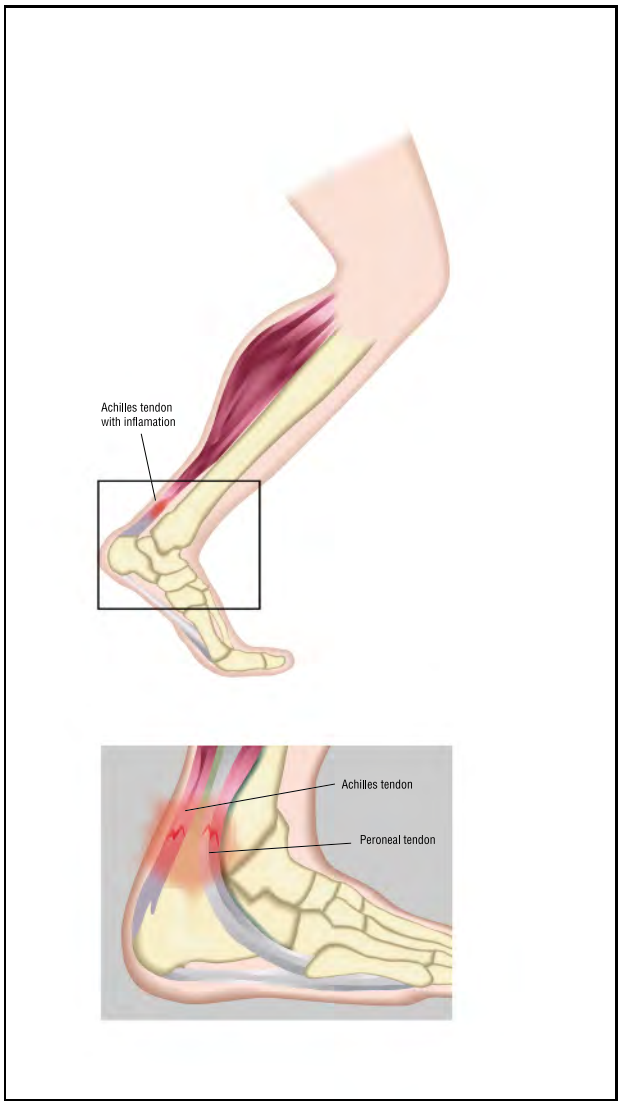
Tendinitis

Definition

Tendinitis is a condition caused by the tearing of tendon fibers and subsequent inflammation in the tendon. Tendons are the strong connective tissue that connect muscle to bone.

Description

When a muscle contracts, it pulls on the tendon, which is composed of tissue that cannot stretch. The tendon then transmits that pulling force to the bone and moves the bone, producing movement. Tendinitis usually results from excessive repeated demands placed on the tendon by the muscle. Tendinitis is not usually caused by a sudden injury; it is more commonly a result of a long period of overuse. Tendinitis occurs frequently with active individuals and those whose occupational tasks require repetitive motion.



Anatomical view of an inflamed tendon and close up of the achilles. *(Illustration by GGS Information Services, Inc. Cengage Learning, Gale)*

Tendons that commonly become inflamed include:

- tendons of the hand
- tendons of the upper arm that affect the shoulder
- tendons of the forearm at the elbow
- the tendon of the quadriceps muscle group at the knee
- the Achilles tendon at the ankle

Causes and symptoms

Repeated overuse of the tendon will cause small tears to develop in the tendon fibers. As a result, the body will initiate the injury repair process in the area and lay down scar tissue. Inflammation will develop in the area as part of the injury repair process. Inflammation increases the blood supply, bringing nutrients to the damaged tissues along with infection-fighting agents. The result is swelling, tenderness, **pain**, and heat. Redness may occur if the injury is close to the skin. Since many cases of tendinitis result from chronic inflammatory conditions that develop from long periods of overuse, the inflammatory process is not as exaggerated as with an acute injury. Therefore swelling, heat, and redness are not always visible in a tendinitis complaint because the inflammation is really at a low level.

Recent research has found that tendinitis sometimes develops as a side effect of treatment with quinolones, which are a group of antibiotics frequently used to treat bacterial **infections**. The tendon most likely to be affected by these drugs is the Achilles tendon, and the tendinitis usually develops within the first few weeks of antibiotic treatment.

Diagnosis

Some common tendon injuries are superficial and easy to identify. These include lateral epicondylitis (commonly referred to as **tennis elbow**) and Achilles' tendinitis, which affects the tendon just above the heel of the foot. While tennis elbow occurs more often in workers than in athletes (in spite of its name), tendinitis affecting the Achilles tendon is almost always related to sports. Tendinitis in the shoulder area is

KEY TERMS

Moxibustion—A treatment where crushed leaves of the mugwort, or moxa, plant (*Artemisia vulgaris*) are shaped into a cigar-like form that is lit and held directly over the skin of the area being treated.

Palpation—A diagnostic technique in which the organ or tissue is examined or explored by pressing lightly on the skin above the injury.

Quinolones—A group of antibiotics, often used to treat bacterial infections, that sometimes cause tendinitis.

Tendon—A band or cord of thick white fibrous tissue that connects a muscle to bone.

almost always found in workers who frequently carry heavy loads as part of their job.

Tendinitis is most often diagnosed by evaluating factors in the patient's history that indicate muscular overuse. Tendinitis will often develop when an individual suddenly increases his or her level of activity without adequate training or conditioning. This occurs frequently in occupational and recreational settings.

In addition to evaluating factors in the patient's history that are likely to lead to tendinitis, the clinician may use several physical examination procedures. Most tendons are near the surface of the skin and therefore can be easily palpated (touched or pressed in order to make a diagnosis), especially by practitioners of manual therapy who have highly developed palpation skills. Pressure placed directly on these tendons is likely to cause discomfort. In addition, the practitioner may ask the patient to contract the muscle attached to the tendon, usually against resistance, to see if this causes pain.

Treatment

Ice is often advocated for tendinitis when the tendon is in an aggravated state. Ice is particularly useful for limiting inflammation in the tendon. Ice may be applied by placing a bag of ice on the skin. It may also be applied directly to the skin using an ice cube wrapped in a paper towel or ice frozen in a paper cup with the top portion of the cup peeled away to expose the ice. An ice massage—rubbing the skin and underlying tissue with ice in a slow, circular or back-and-forth motion—will cool the injured area quickly. If ice is applied to the skin without a barrier between the ice and the skin, the patient should be carefully monitored so that **frostbite** does not occur. Generally no more than about five minutes of treatment in one area is necessary with ice massage.

Compression wraps, such as elastic bandages, may be used to help provide mechanical support for the tendon during active movement. These compression wraps can be helpful, but they may also slow the healing process in the tendon if left on for long periods because they decrease blood supply in the area.

Various types of soft tissue manipulation are very effective for treating tendinitis and may be employed by a variety of practitioners, including chiropractors, massage therapists, physical therapists, and osteopaths. One of the most common methods of soft tissue treatment for tendinitis is a vigorous friction massage to the damaged tendon. This friction massage will stimulate the healing of tissue in the area. It is also thought to help produce a healthy and strong scar-tissue repair of the damaged tendon fibers. Practitioners of manual therapy are also likely to advocate a regular stretching program to help decrease tension in those muscles that may be pulling excessively on the tendon.

Acupuncture and **traditional Chinese medicine** are quite effective in treating tendinitis. Acupuncture may be used in the immediate vicinity of the tendinitis to help address muscular dysfunction. Acupuncture treatment may also use more distant points along the energy meridians to help address pain and reduce inflammation. Acupuncture may also have significant benefits in creating an optimum environment for healing of the tendon fiber to take place.

Topical liniments and herbal preparations are often used to treat tendinitis. They have anti-inflammatory properties and will help heal the torn tendon fibers. If a condition is chronic, treatment with **moxibustion** (burning a small amount of **mugwort** near the skin) may hasten the healing process. Some oral herbal preparations may also be used in order to create the optimal healing environment for the tendon and address any underlying problems. Practitioners of traditional Chinese medicine may also use a special form of **acupressure** massage called Tui-Na.

Allopathic treatment

Pain and anti-inflammatory medications (aspirin, naproxen, and ibuprofen) will help and are often used to treat tendinitis along with ice, compression wraps, and activity modification, as mentioned earlier. Sometimes the inflammation lingers and requires additional treatment. Injections of anti-inflammatory medication, such as cortisone, often relieve chronic tendinitis,

but they should be used with caution. Research has indicated that cortisone may have detrimental effects on the healing of connective tissues and may, in fact, weaken them in the long run. This would make the person susceptible to a greater injury in the future.

If tendinitis is persistent and unresponsive to non-surgical treatment, the afflicted portion of tendon can be removed through surgery. Surgery is also performed to remove the **calcium** buildup that comes with persistent tendinitis.

Expected results

Generally, tendinitis will heal if the activity that provokes it is stopped. Various kinds of treatments may accelerate the healing process. Some tendinitis complaints may last for a long time because they are not given adequate healing time before the individual returns to a vigorous level of activity.

Prevention

If given enough time, tendons will strengthen to meet the demands placed on them. The blood supply to tendons is poor, so tendons grow slowly. Therefore, adequate time is required for good conditioning. Stretching the muscles that are associated with problematic tendon will also help decrease overuse on the tendon.

Resources

BOOKS

Beinfield, Harriet, and Efrem Korngold. *Between Heaven and Earth: A Guide to Chinese Medicine*. New York: Ballantine, 1991.

Hammer, Warren I. *Functional Soft Tissue Examination and Treatment by Manual Methods: New Perspectives*. 2nd ed. Gaithersburg, MD: Aspen, 1999.

Kaptchuk, Ted J. *The Web That Has No Weaver*. Chicago: NTC Publishing Group, 1999.

Malone, Terry R., Thomas G. McPoil, and Arthur J. Nitz, eds. *Orthopedic and Sports Physical Therapy*. St. Louis: Mosby, 1997.

Pelletier, Kenneth R. *The Best Alternative Medicine: What Works? What Does Not?* New York: Simon & Schuster, 2000.

Weintraub, William. *Tendon and Ligament Healing: A New Approach Through Manual Therapy*. Berkeley, Calif.: North Atlantic Books, 1999.

PERIODICALS

Fenwick, S. A., B. L. Hazleman, and G. P. Riley. "The Vasculature and Its Role in the Damaged and Healing Tendon." *Arthritis Research* 4 (March 2002): 252 260.

Frost, P., J. P. Bonde, S. Mikkelsen, et al. "Risk of Shoulder Tendinitis in Relation to Shoulder Loads in Monotonous Repetitive Work." *American Journal of Industrial Medicine* 41 (January 2002): 11 18.

Oliphant, C. M., and G. M. Green. "Quinolones: A Com prehensive Review." *American Family Physician* 65 (February 2002): 455 464.

Schepsis, A. A., H. Jones, and A. L. Haas. "Achilles Tendon Disorders in Athletes." *American Journal of Sports Medicine* 30 (March April 2002): 287 305.

Stahlmann, R. "Clinical Toxicological Aspects of Fluoro quinolones." *Toxicology Letter* 127 (February 28, 2002): 269 277.

Whitney Lowe
Rebecca J. Frey, PhD

Tennis elbow

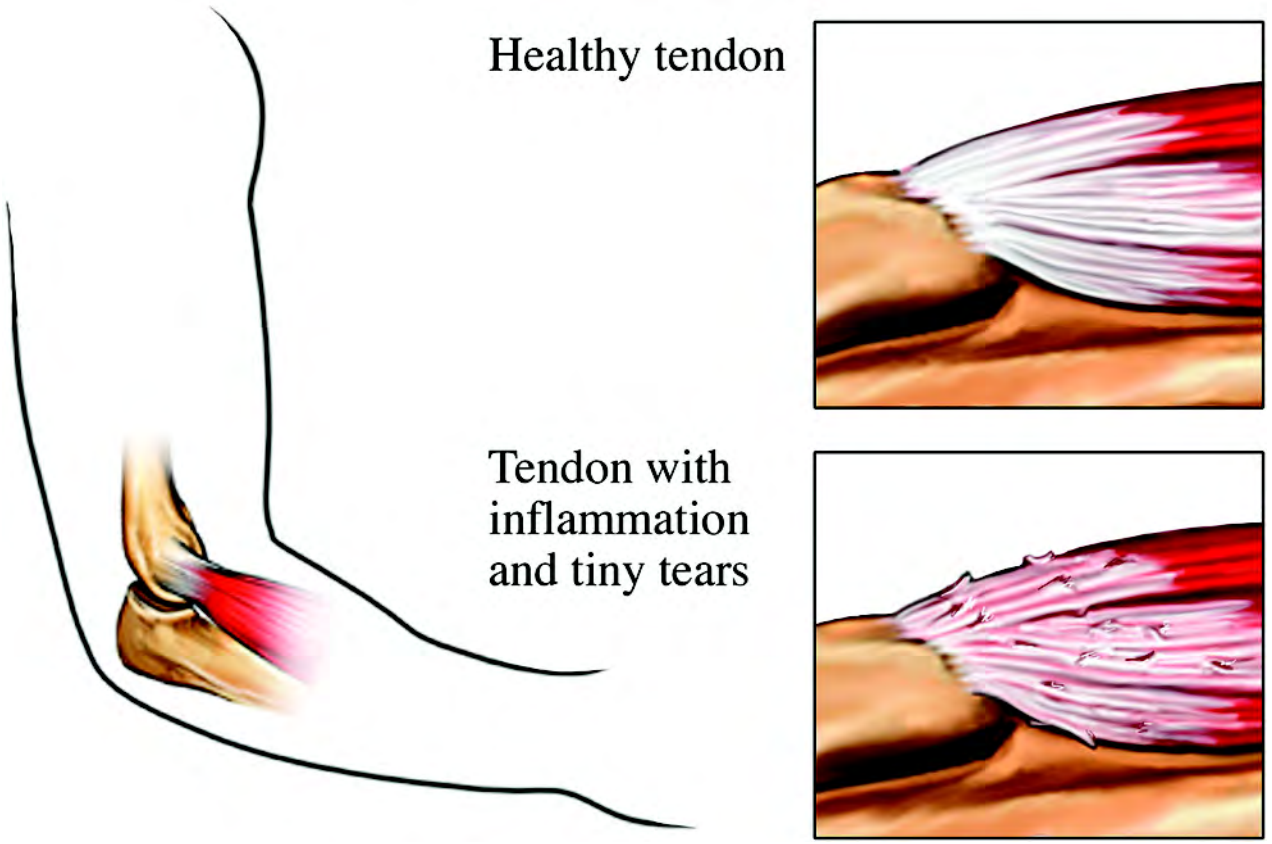
Definition

Tennis elbow is an inflammation of several structures of the elbow. These include muscles, tendons, bursa, periosteum, and epicondyle (bony projections on the outside and inside of the elbow, where muscles of the forearm attach to the bone of the upper arm). This condition is also called epicondylitis, lateral epicondylitis, medial epicondylitis, or golfer's elbow, where **pain** is present at the inside epicondyle.

Description

The classic tennis elbow is caused by repeated forceful contractions of wrist muscles located on the outer forearm. The **stress**, created at a common muscle origin, causes microscopic tears leading to inflammation. This is a relatively small surface area located at the outer portion of the elbow (the lateral epicondyle). Medial tennis elbow, or medial epicondylitis, is caused by forceful, repetitive contractions from muscles located on the inside of the forearm. All of the forearm muscles are involved in tennis serves, when combined motions of the elbow and wrist are employed. This overuse injury is common between ages 20–40.

People at risk for tennis elbow are those in occupations that require strenuous or repetitive forearm movement. Such jobs include mechanics or carpentry. Sport activities that require individuals to twist the hand, wrist, and forearm, such as tennis, throwing a ball, bowling, golfing, and skiing, can cause tennis elbow. Individuals in poor physical condition, who are exposed to repetitive wrist and forearm movements for long periods of time, may also be prone to tennis elbow.



Regular tennis elbow is caused by repeated forceful contractions of wrist muscles located on the outer forearm. *(© Nucleus Medical Art, Inc. / Alamy)*

Causes and symptoms

Tennis elbow pain originates from a partial tear of the tendon and the attached covering of the bone. It is caused by chronic stress on tissues attaching a group of forearm muscles known as extensor muscles to the elbow area. Individuals experiencing tennis elbow may complain of pain and tenderness over either of the two epicondyles. This pain increases with gripping or rotation of the wrist and forearm. If the condition becomes long-standing and chronic, a decrease in grip strength can develop.

Diagnosis

Diagnosis of tennis elbow includes the individual observation and recall of symptoms, a thorough medical history, and physical examination by a physician. Diagnostic testing is usually not necessary unless there may be evidence of nerve involvement from underlying causes. X rays are usually always negative because the condition is primarily soft tissue in nature, in contrast to a disorder of the bones. However, magnetic resonance imaging (MRI) has been shown to be helpful in diagnosing cases of early tennis elbow because it can detect evidence of swelling and tissue tears in the common extensor muscle group.

Treatment

Heat or ice is helpful in relieving tennis elbow pain. Once acute symptoms have subsided, heat treatments are used to increase blood circulation and promote healing. The physician may recommend physical therapy to apply **diathermy** or ultrasound to the inflamed site. These are two common modalities used to increase the thermal temperature of the tissues in order to address both pain and inflammation. Occasionally, a tennis elbow splint may be useful to help decrease stress on the elbow throughout daily activities. Routine exercises become very important to improve flexibility to all forearm muscles, and will aid in decreasing muscle and tendon tightness that has been creating excessive pull at the common attachment of the epicondyle.

KEY TERMS

Epicondyle—A projection on the surface of a bone; often an area for muscle and tendon attachment.

Epicondylitis—A painful and sometimes disabling inflammation of the muscle and surrounding tissues of the elbow caused by repeated stress and strain on the forearm near the lateral epicondyle of the humerous (arm bone).

Extensor muscles—A group of muscles in the forearm that serve to lift or extend the wrist and hand. Tennis elbow results from overuse and inflammation of the tendons that attach these muscles to the outside of the elbow.

Periosteum—A fibrous vascular membrane that covers bones.

Shock wave therapy—A method of treating tennis elbow and other musculoskeletal injuries that involves directing bursts of high-pressure sound waves at the affected area.

Massage therapy also has been found to be beneficial if symptoms are mild. Massage techniques are based primarily on increasing circulation to promote efficient reduction of inflammation. Manipulation, **acupuncture**, and **acupressure** have been used as well. Contrast **hydrotherapy** (alternating hot and cold water or compresses, three minutes hot, 30 seconds cold, repeated three times, always ending with cold) applied to the elbow can help bring nutrient-rich blood to the joint and carry away waste products. **Botanical medicine** and **homeopathy** may also be effective therapies for tennis elbow. For example, **cayenne** (*Capsicum frutescens*) ointment or **arnica**, **wintergreen**, or rue oil applied topically may help to increase blood flow to the affected area and speed healing.

Allopathic treatment

The physician may also prescribe nonsteroidal anti-inflammatory drugs (NSAIDS) to reduce inflammation and pain. Injections of cortisone or anesthetics are often used if physical therapy is ineffective. Cortisone reduces inflammation, and anesthetics temporarily relieve pain. Physicians are cautious regarding an excessive number of injections as they have been found to weaken the tendon's integrity. In addition, a significant number of patients experience a temporary increase in pain following corticosteroid injections.

A newer method of treatment for tennis elbow is shock wave therapy, in which pulses of high-pressure sound are directed at the injured part of the tendon. The "shock" refers to the high pressure, which breaks down scar tissue and stimulates the regrowth of blood vessels in healthy tissue. Shock wave therapy sessions take about 20 minutes and have been reported to have a success rate of 80%. Shock wave therapy has very few side effects; one group of German physicians found that temporary reddening of the skin or small **bruises** were the most commonly reported side effects.

Botulinum toxin, or Botox, is also being tried as a treatment for tennis elbow as of late 2003. Although further research needs to be done, Botox appears to relieve pain in chronic tennis elbow by relaxing muscles that have gone into spasm from prolonged inflammation.

Surgery

If conservative methods of treatment fail, surgical release of the tendon at the epicondyle may be a necessary form of treatment. Although surgical intervention is relatively rare in the treatment of tennis elbow, it is completely succesful in about 70% of cases.

Expected results

Tennis elbow is usually curable; however, if symptoms become chronic, it is not uncommon for treatment to continue for three to six months.

Prevention

Until symptoms of pain and inflammation subside, activities requiring repetitive wrist and forearm motion should be avoided. Once pain decreases to the point that return to activity can begin, the playing of such sports as tennis for long periods should not occur until excellent condition returns. Many times, choosing a different size or type of tennis racquet or tool may help. Frequent rest periods are important despite what the wrist and forearm activity may be. Compliance to a stretching and strengthening program is very important in helping prevent recurring symptoms and exacerbation. In some cases, the patient may be advised to change his or her occupation to prevent further injury.

Resources

BOOKS

Hertling, Darlene, and Randolph M. Kessler. *Management of Common Musculoskeletal Disorders: Physical Therapy Principles and Methods*. 2d ed. Philadelphia: J.B. Lippincott Company, 1990.

Norkin, Cynthia C., and Pamela K. Levangie. *Joint Structure and Function: A Comprehensive Analysis*. Philadelphia: F.A. Davis Company, 1992.

PERIODICALS

Altay, T., I. Gunal, and and H. Ozturk. "Local Injection Treatment for Lateral Epicondylitis." *Clinical Orthopedics* 398 (May 2002): 127 130.

Das, D., and N. Maffulli. "Surgical Management of Tennis Elbow." *Journal of Sports Medicine and Physical Fitness* 42 (June 2002): 190 197.

de Seze, M. P., M. de Seze, P. Dehail, et al. "Botulinum Toxin A and Musculoskeletal Pain." [in French] *Annales de réadaptation et de médecine physique* 46 (July 2003): 329 332.

Haake, M., I. R. Boddeker, T. Decker, et al. "Side Effects of Extracorporeal Shock Wave Therapy (ESWT) in the Treatment of Tennis Elbow." *Archives of Orthopaedic and Trauma Surgery* 122 (May 2002): 222 228.

Mackay, D., A. Rangan, G. Hide, et al. "The Objective Diagnosis of Early Tennis Elbow by Magnetic Resonance Imaging." *Occupational Medicine (London)* 53 (August 2003): 309 312.

Melikyan, E. Y., E. Shahin, J. Miles, and L. C. Bainbridge. "Extracorporeal Shock Wave Treatment for Tennis Elbow. A Randomised Double Blind Study." *Journal of Bone and Joint Surgery, British Volume* 85 (August 2003): 852 855.

Rompe, J. D., M. Buch, L. Gerdesmeyer, et al. "Musculoskeletal Shock Wave Therapy Current Database of Clinical Research." [in German] *Zeitschrift Orthopädische Ihre Grenzgebiet* 140 (May June 2002): 267 274.

Smith, A. M., J. A. Castle, and D. S. Ruch. "Arthroscopic Resection of the Common Extensor Origin: Anatomic Considerations." *Journal of Shoulder and Elbow Surgery* 12 (July August 2003): 375 379.

Walther, M., S. Kirschner, A. Koenig, et al. "Biomechanical Evaluation of Braces Used for the Treatment of Epicondylitis." *Journal of Shoulder and Elbow Surgery* 11 (May June 2002): 265 270.

Wang, A. A., E. Whitaker, D. T. Hutchinson, and D. A. Coleman. "Pain Levels After Injection of Corticosteroid to Hand and Elbow." *American Journal of Orthopedics* 32 (August 2003): 383 385.

ORGANIZATIONS

American College of Occupational and Environmental Medicine (ACOEM). 1114 North Arlington Heights Road, Arlington Heights, IL 60004. (847) 818 1800. www.acoem.org.

American College of Sports Medicine. PO Box 1440, Indianapolis, IN 46206 1440 or 401 W. Michigan St., Indianapolis, IN 46202. (317) 637 9200. Fax: (317) 634 7817. www.acsm.org.

Kathleen D. Wright
Rebecca J. Frey, PhD

Tetanus

Definition

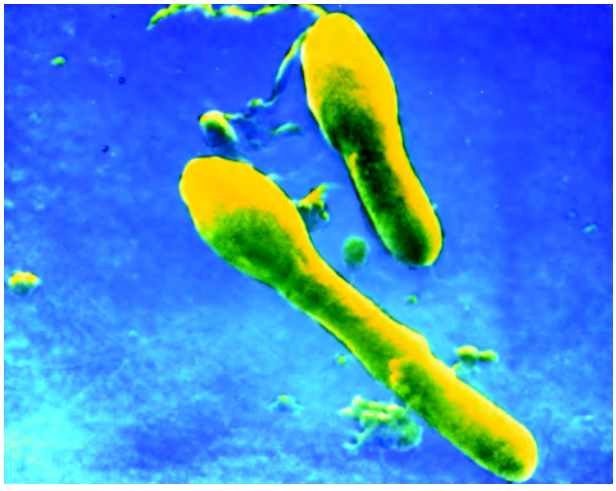
Tetanus is a rare but often fatal disease that affects the central nervous system by causing painful and often violent muscular contractions. The earliest descriptions of the disease can be found in the medical papyri of ancient Egypt. The disease begins when the tetanus bacterium (*Clostridium tetani*) enters the body, usually through a wound or cut that has come in contact with the spores of the bacterium. Tetanus spores are commonly found in soil, dust, and animal manure. Tetanus is a noncommunicable disease, meaning that it cannot be passed directly from one person to another.

Description

Tetanus is uncommon in the United States, with nearly all cases occurring in adults who were not vaccinated as children, or in those who have not had a booster vaccination in 10 years.

In the United States, there are between 50 and 100 reported cases of tetanus a year. About 30% of cases are fatal. Most people who die of tetanus **infections** are over 50 years old.

Tetanus causes convulsive **muscle spasms** and rigidity that can lead to respiratory paralysis and death. It is sometimes called "lockjaw" because one of the most common symptoms is a stiff jaw that cannot be opened. Sometimes tetanus is localized, that is, it affects only the part of the body where the infection



Clostridium tetani, the species of Gram-positive, spore-forming, rod-like bacteria that causes tetanus. *(CNRI / Photo Researchers, Inc.)*

KEY TERMS

Adjuvant—A substance added to a vaccine to stimulate a stronger immune response. Aluminum is commonly used as an adjuvant in tetanus vaccines.

Anaerobe—A type of bacterium that does not require oxygen to live. The tetanus bacterium is an anaerobe.

Clostridium—A genus of deadly bacteria that are responsible for tetanus and other serious diseases, including botulism and gangrene from war wounds. It thrives without oxygen.

DTaP—Diphtheria and tetanus toxoids and acellular Pertussis combination vaccine.

DTP—Diphtheria, tetanus, and whole-cell pertussis vaccine.

Lockjaw—Refers to a common name given to the disease taken from its most pervasive symptom.

Td—The abbreviation for tetanus and diptheria vaccine.

Toxin—A poisonous substance, often produced by bacteria, that flows through the body.

began. However, in almost all reported cases, tetanus spreads to the entire body. The incubation period, from the time of the injury until the first symptoms appear, ranges from five days to three weeks. Symptoms usually occur within eight to 12 days. The chance of death is increased when symptoms occur early.

Causes and symptoms

Tetanus is caused by a bacterium called *Clostridium tetani*, whose spores (the dormant form) are found in soil, street dust, and animal feces. The bacteria enter the body through **cuts** and abrasions but will multiply only in an environment that is anaerobic, or oxygen-free. Deep puncture **wounds** and wounds with a lot of dead tissue provide an oxygen-free environment for the bacteria to grow.

As *C. tetani* grows, it excretes a highly poisonous toxin called tetanospasmin into the bloodstream, spreading it the nervous system. The infection is usually transmitted through deep puncture wounds or through cuts or **scratches** that are not cleaned well. Many people associate tetanus with rusty nails and other dirty objects, but any wound can be a source. Less common ways of getting tetanus are animal scratches and **bites**; surgical wounds; dental work; punctures caused by glass, thorns, needles, and splinters; and therapeutic abortion. Rare cases have been reported in people with no known wound or medical condition.

Neonatal tetanus in newborns can be caused by cutting the umbilical cord with an unsterile instrument or by improper care of the umbilical stump. It is less common in developed countries.

Tetanus toxin affects the nerve endings, causing a continuous stimulation of the muscles. Initial symptoms may include restlessness, irritability, a stiff neck, and difficulty swallowing. In about half of all cases, the first symptom is a stiff or "locked" jaw, which prevents patients from opening their mouths or swallowing. This symptom is also called trismus and results in a facial expression called risus sardonicus, which is a Latin phrase meaning "sardonic smile." Trismus is often followed by stiffness of the neck and other muscles throughout the body as well as uncontrollable spasms. Sometimes these convulsions, known as opisthotonos, are severe enough to cause broken bones. Other symptoms of tetanus include loss of appetite and drooling. People with localized tetanus experience **pain** and tingling only at the wound site and spasms in nearby muscles.

In the underdeveloped world, neonatal tetanus accounts for about one-half of tetanus deaths and is related to infection of the umbilical stump in a baby born of an unimmunized mother. In many cases the risk is increased by the mother's giving birth on a floor made of hard-packed soil. Worldwide, 800,000 children die of tetanus each year.

Diagnosis

Tetanus is diagnosed by the clinical symptoms and a medical history that shows no tetanus immunization. Early diagnosis and treatment is crucial for recovery.

In general, the shorter the incubation period, the more severe the disease.

Treatment

As traditional medical treatment revolves around drug therapy, **Traditional Chinese medicine** herbal remedies are the most common alternative treatment for tetanus. Herbs that have sedative effects should be given to reduce the frequency of convulsions, along with herbs to fight the bacteria.

Tetanus and convulsions can be treated with a concoction made from the dried body of a long-noded pit viper, called this drug Qi She in Mandarin. Chan Tui, or **cicada** slough (the skin the cicada sheds) is also helpful. Also helpful are the dried root of the

Saposhnikovia divaricata, called divaricate saposhnikovia root, and jack-in-the-pulpit tuber, if it is treated so it is not poisonous.

There are several alternative treatments aimed at prevention of the disease.

Allopathic treatment

Tetanus is a life-threatening disease. Patients diagnosed with it are usually hospitalized, usually in an intensive-care ward. Treatment can take several weeks and includes antibiotics to kill the bacteria and shots of antitoxin to neutralize the toxin. It also includes anti-anxiety drugs to control muscle spasms or barbiturates for sedation. In severe cases, patients are placed on an artificial respirator. Recovery can take six weeks or more. After recovery, since the levels of circulating toxin are quite low, the patient must still be adequately immunized against this disease.

Expected results

Full recovery is common in patients who can be kept alive during the most violent portion of the attacks. Yet up to 30% of tetanus victims in the United States die. Early diagnosis and treatment improves the prognosis. Neonatal tetanus has a mortality rate of more than 90%.

Prevention

Castor oil is a natural remedy that can be used to clean out a wound and prevent tetanus. When a wound is sustained, a cotton ball dunked in castor oil should be placed on the wound, and then fixed on the wound with a bandage. Castor oil has tremendous drawing power and can pull out rust and other infectious agents. The dressing should be changed every two hours the first day of treatment and twice a day for the next three days.

Tetanus is easily preventable through vaccination. All children should have a series of five doses of DTaP, a combined vaccine that offers protection against diphtheria, tetanus, and pertussis, before the age of seven. This position is supported by numerous organizations, including the World Health Organization, the Centers for Disease Control and Prevention, the Advisory Committee on Immunization Practices, the Committee on Infectious Diseases of the American Academy of Pediatrics, and the American Academy of Family Physicians. Children in the United States will not be admitted to school without proof of this and other immunizations.

The DTaP (Diptheria, Tetanus, accellular Pertussis) vaccine should be given at ages two months, four months, six months, 15-18 months, and four to six years. DTaP is the preferred vaccine for children up to the age of seven in the United States; it has fewer side effects than DTP and can be used to complete a vaccination schedule begun with DTP. DTaP was first approved by the Food and Drug Administration in September 1996. In December 1996, it was approved for use in infants. Between age 11 and 13, children should have a booster, called Td, for diphtheria and tetanus.

Adults should have a Td booster every 10 years. Statistics from the Centers for Disease Control and Prevention show that fewer than half of Americans aged 60 and older have antibodies against tetanus. The Centers for Disease Control and Prevention suggests adults be revaccinated at mid-decade birthdays (for example, at 45). Adults who have never been vaccinated against tetanus should get a series of three injections of Td over six to 12 months and then follow the 10-year booster shot schedule.

Side effects of the tetanus vaccine are minor: soreness, redness, or swelling at the site of the injection that appear any time from a few hours to two days after the vaccination and disappear in a day or two. Rare but serious side effects that require immediate treatment by a doctor are serious allergic reactions or deep, aching pain and muscle wasting in the upper arms. These symptoms could start from two days to four weeks after the shot and could continue for months.

For those who are averse to immunizations, tetanus immunity can be boosted naturally by taking **vitamin E**, according to a study from Tufts University in Medford, Massachusetts. To get the most benefit, 200 mg should be taken daily.

Keeping wounds and scratches clean is important in preventing infection. Since this organism grows only in the absence of oxygen, the wounds must be adequately cleaned of dead tissue and foreign substances. Run cool water over the wound and wash it with a mild soap. Dry it with a clean cloth or sterile gauze. To help prevent infection, apply an antibiotic cream or ointment and cover the wound with a bandage. Try the castor oil remedy. The longer a wound takes to heal, the greater the chance of infection. Consult a doctor if the wound doesn't heal, if it is red or warm, or if it drains or swells.

If the wounded individual does not have an adequate history of immunization, a doctor may administer a specific antitoxin (human tetanus immune globulin, TIG) to produce rapid levels of circulating antibody. The antitoxin is given at the same sitting as a dose of vaccine but at a separate site.

Some persons will report a history of significant allergy to "tetanus shots." In most cases, the reaction occurred in the remote past and was probably caused by antitoxin derived from horse serum. More recently, however, the use of aluminum as an adjuvant, or substance added to a vaccine to increase the body's immune response, has been associated with skin eruptions and swelling in hypersensitive individuals. In some cases, these persons can be safely vaccinated for tetanus with a graduated series of shots. Adverse reactions of any kind to tetanus vaccine should be reported to the Center for Biologics Evaluation and Research (CBER) of the Food and Drug Administration (FDA).

Resources

BOOKS

Evelyn, Nancy. *The Herbal Medicine Chest*. Trumansburg, N.Y.: The Crossing Press, 1986.

Magill's Medical Guide, edited by Tracy Irons Georges. Englewood Cliffs, N.J.: Salem Press, 1998.

PERIODICALS

Baylor, N. W., W. Egan, and P. Richman. "Aluminum Salts in Vaccines US Perspective." *Vaccine* 20 (May 31, 2002)(Supplement 3): S18 S23.

Quddus, A., et al. "Neonatal Tetanus: Mortality Rate and Risk Factors in Loralai District, Pakistan." *Interna tional Journal of Epidemiology* 31 (June 2002): 648 653.

Rennels, M. B., M. A. Deloria, M. E. Pichichero, et al. "Lack of Consistent Relationship Between Quantity of Aluminum in Diphtheria Tetanus Acellular Pertussis Vaccines and Rates of Extensive Swelling Reactions." *Vaccine* 20 (May 31, 2002)(Supplement 3): S44 S47.

Shin, D. H., J. H. Park, P. J. Jung, et al. "A Case of Maternal Tetanus in Korea." *Journal of Korean Medical Science* 17 (April 2002): 260 262.

Williams, A. N., et al. "Tetanus Immunisation in Hyper sensitive Individuals." *Journal of the Royal Army Med ical Corps* 148 (June 2002): 148 150.

ORGANIZATIONS

Food and Drug Administration (FDA), Center for Biologics Evaluation and Research (CBER), 1401 Rockville Pike, Suite 200 N, Rockville, MD 20852. www.fda.gov/cber.

OTHER

Centers for Disease Control and Prevention. "Tetanus & Diphtheria (Td) Vaccine." Healthtouch Online. http://www.healthtouch.com/bin/EContent_HT/showAllLfts.asp.

"Shots for Safety." National Institute on Aging Age Page. www.nih.gov/nia/health/pubpub/shots.htm.

"TCM Herbal Database." China Med.net. http://www.chinamed.net/herb_search.html.

Lisa Frick
Rebecca J. Frey, PhD

Thai massage

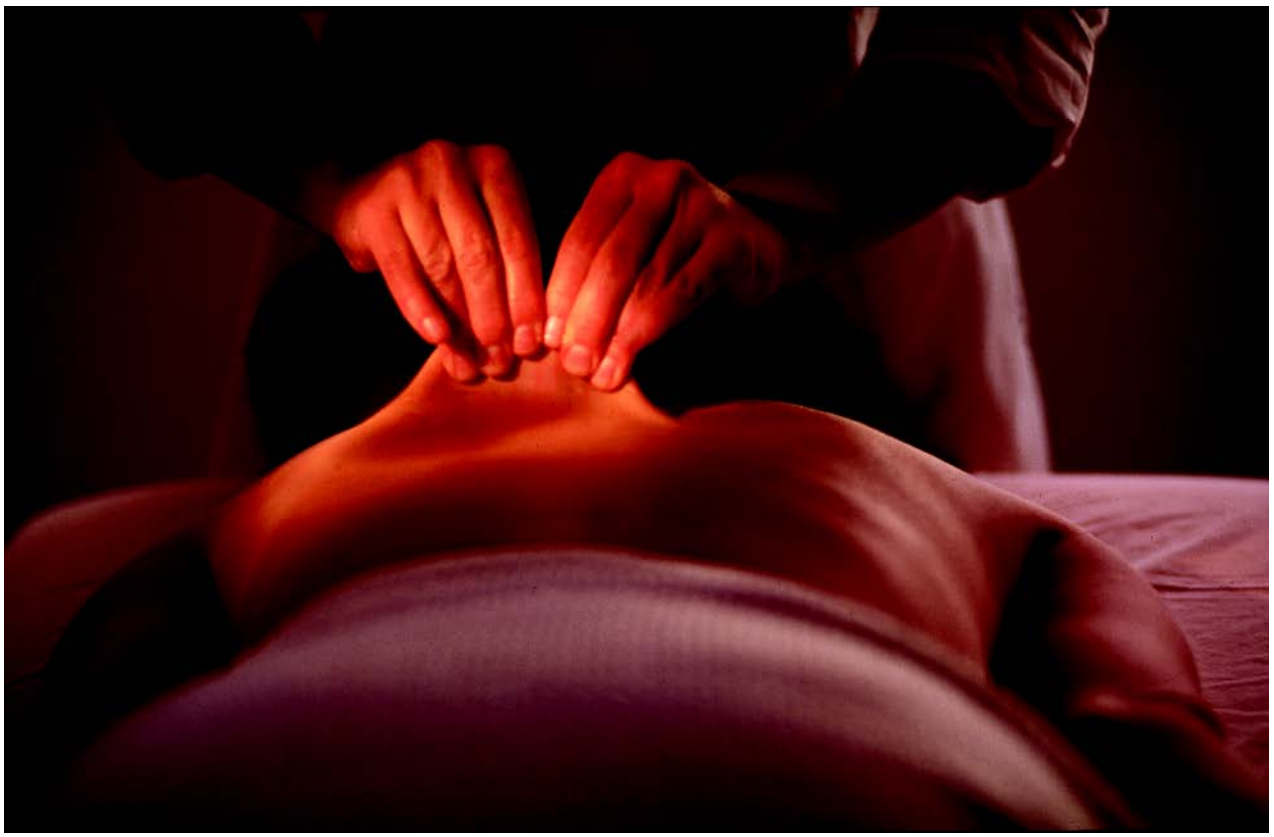
Definition

Thai massage, also known as Nuad bo-Rarn in its traditional medical form, is a type of Oriental bodywork therapy that is based on the treatment of the human body, mind, and spirit. The therapy includes treating the electromagnetic or energetic field which surrounds, infuses and brings the body to life through pressure and/or manipulative massage.

Origins

The origins of traditional Thai massage reputely began over 2,000 years ago along with the introduction of Buddhism. It is one of four branches of traditional medicine in Thailand, the others being herbs, **nutrition**, and spiritual practice. The legendary historical creator of Thai medicine is Dr. Jivaka Kumar

Man enjoying a Thai massage. *(© Peter Widmann / Alamy)*



Thai massage therapist using techniques designed to alter the flow of qi, or energy, in the body. *(© Photo Researchers, Inc. Reproduced by permission.)*

Bhaccha, known as Shivago Komarpaj in Thailand. Bhaccha was from the north of India and said to be a close associate of the Buddha and chief to the original community gathered around the Buddha. The movement of medicine into Thailand accompanied migration of monks from India to Thailand, possibly around the second century B.C.E. Thai medicine developed within the context of Buddhist monasteries and temples, where Thai have traditionally sought relief from all kinds of suffering.

While the recorded history of Thai massage was lost during the Burmese attack on the royal capital of Ayutthia in 1767, the surviving records are now inscribed in stone and can be found at the Sala Moh Nuat (massage pavilion) within the temple of Pra Chetuphon in Bangkok, known as wat Po, the temple of the reclining Buddha. Its spiritual aspect also remains as teachers of the therapy begin classes with the practice of *wai-kru,* a series of prayers and recitations dedicated to Shivago Komarpaj, the father of Thai massage and the Goddess of Healing, and teaches of the tradition through the centuries.

Benefits

The benefits of Thai massage are numerous with the most predominant being the maintenance of good health and its ability to treat a wide spectrum of health concerns. Traditional Thai massage is known for its ability to clear the energy pathways.

The following are some of the benefits of traditional Thai massage.

- increases flexibility and range of movement
- eliminates muscle pain and muscle spasms
- improves postural alignment
- calms the nervous system and promotes a deep sense of relaxation with an increased energy level
- allows for a significant release of deep, emotional distress
- stimulates blood circulation and lymph drainage
- stimulates internal organs
- relieves fatigue, swollen limbs, painful joints, and headaches

KEY TERMS

Buddhism—A philosophy founded in India in the sixth century B.C. and based on the teachings of the historical Buddha, born Siddartha Gautama.

Lymph—An alkaline fluid found in the lymphatic vessels that is usually clear, transparent fluid, unless it is draining from the intestines when it then appears milky.

Description

Thai massage looks like a cross between **acupressure**, **yoga**, and zen **shiatsu** and is inspired by Buddhist teachings. The actual massage consists of a technique that uses slow, rhythmic compressions and stretches along the body's energy lines, also called sen in Thai. Over 70,000 sen are said to exist within the body, and Thai massage concentrates on applying pressure along 10 of the most important sen using the palms of the hands, thumbs, elbows, and feet. The effort from the practitioner works to free tension within the body. Practitioners also position the body into yoga-like poses and gently rock the body to more deeply open joints and facilitate limbering.

A thorough Thai massage includes the following four basic positions:

- from the front with the client lying supine
- from the side with the client alternately lying on either side
- from the back with the client lying prone
- in a sitting position

One of the most important principles of Thai massage is the continuous flow of sequential movements that prepares the client for the next step in the massage. The practitioner is always aware of his position so that an uninterrupted, slow rhythm is maintained. Deep, sustained pressure ensures that the myofascia, or the muscle's connective tissue, soften and relax in order to release the flow of energy along the sen, and to prepare the client for the large-scale stretches that follow.

There are two styles of practice, Northern (*Chiang-mai*) and Southern (Bangkok). The former is considered gentler. The latter is faster and sometimes more intense but is widespread in Thailand, while the Northern style has become popular in the United States.

Preparations

The preparation needed before receiving a Thai massage is minimal. A Thai massage is typically performed on a floor mat enabling practitioners the ability to use their body weight and to incorporate the many movements that would not be possible on a massage table. Normally, the client remains fully clothed, and lubricant for the skin is rarely used. A Thai massage usually lasts one to two hours, but may be three hours or more if needed.

Precautions

While some of the pressure techniques used in Thai massage may seem too penetrating to many, most can adjust to it quickly. For those who are frail or stiff, a skilled practitioner will be able to adjust all of the soft tissue and manipulation work to their level of comfort.

Research and general acceptance

The practice of Thai massage is multinational. While a unique modality, Thai massage is slowly spreading into the western world. Knowledge of therapeutic benefits comes from anecdotal evidence rather than research in Western scientific mode.

Training and certification

Thai massage can be strenuous for the practitioner. To become a Thai master, it is said that the best place to learn is where the therapy originates. The well known school at Wat Po in Bangkok and in Chiang Mi, The Institute of Thai Massage, both in Thailand, are famous for their teachings of the ancient art. It is also possible to receive instruction in the United States from teachers who studied in Thailand, as well as Thai instructors who came over to offer classes in American massage school.

Practitioners of Thai massage are taught the most important aspects of the meditative spirit—awareness, mindfulness, and concentration. Correct body positioning and posture control while giving a massage are of vital importance to the practitioner in order to avoid injury, especially to the back.

Resources

PERIODICALS

Kallenbach, Laurel. "In Good Hands: Five hands on therapies offer a combination of energy, reduced ten sion and a healing touch." *Delicious! Your magazine of Natural Living* (January 31, 2000).

Mercati, Maria. "The Healing Benefits of Oriental Mas sage." *Positive Health* (May 31, 1999).

Simpson, Ian. "Traditional Thai Massage." *Journal of the Australian Traditional Medical Society* (June 30, 1998).

OTHER

American Oriental Bodywork Therapy Association. http://www.aobta.org.

Beth Kapes

Theanine

Description

Theanine is an amino acid, which is a building block of protein. It is found in tea that is made by steeping leaves from an evergreen shrub known as a tea plant or tea tree. The scientific name for the tea plant is *Camellia sinensis*, and it is in the family Theaceae. At one time, the plant had the genus name *Thea* instead of *Camellia*, and this led to the amino acid's name of theanine. The tea plant can reach 20–30 feet in height. It has fragrant, yellow-centered, white flowers and oblong, dark green leaves that can grow to as much as a foot long. Leaves from *Camellia sinensis* are used to make green, black, white, and oolong tea. The twigs and stems of the plant are also used to make another type of tea known as kukicha.

Camellia sinensis, a native plant in South Asia and Southeast Asia, is grown in the late 2000s in many tropical and subtropical regions of the world, where its leaves are gathered, dried, and eventually used to make tea. Tea plants arrived in North America in the late 1700s courtesy of André Michaux, a French botanist who tried to begin a crop near Charleston, South Carolina, but Michaux returned to Europe before the crop had taken hold. Two other major attempts to grow tea in the United States began in 1848 and in 1874, but both were halted following the untimely deaths of the tea-plantation owners. Finally in 1888, Charles Shepard and his plantation in Summerville, South Carolina, began producing tea. The oolong tea produced by his farm, called the Pinehurst Tea Plantation, was even good enough to win the 1904 World's Fair. Tea is still grown in the United States, particularly in the humid Southeast.

Theanine is a prominent component of tea. It is also known commercially as suntheanine, and in scientific circles as [gamma]-glutamylethylamide and [gamma]-ethylamino-L-glutamic acid.

General use

Tea made from the leaves of *Camellia sinensis* has been a popular beverage for many years, first in South and Southeast Asia and later in Europe, the United States, and other parts of the world. Most people drink it because they enjoy it, but tea is also a healthful beverage. Consumption of tea has been linked to such benefits as **cancer** prevention, decreased risk of **stroke**, a strengthened immune system, and reduced blood **cholesterol**. Historically, **green tea** in particular has been used as a relaxing agent.

Camellia sinensis is one of the only known plants to contain the amino acid theanine. It is also found in other *Camellia* species (*C. japonica* and *C. sasanqua*) and in a mushroom known as bay bolete (*Xerocomus badius* or *Boletus badius*). Theanine was first isolated from green tea in 1949. Theanine comes in two forms that are identical in chemical structure and composition, but are mirror images of one another. The vast majority of theanine in tea leaves is the form called L-theanine. Many scientific studies of the purported benefits of tea made with the leaves of *Camellia sinensis* have focused on L-theanine.

Scientific studies have shown that L-theanine helps relieve **anxiety**. In a study published in a 2007 issue of *Biological Psychology*, for instance, researchers gave participants either water or L-theanine dissolved in water. The participants did not know, and could not tell, which they were drinking. The participants were then asked to perform a mental arithmetic **exercise**. The researchers found that L-theanine reduced both the perceived **stress** felt by the participants as well as their physiological stress, which the researchers were able to measure objectively. Other studies have shown similar anti-anxiety effects.

Another study presented at the Fourth International Scientific Symposium on Tea and Human Health in 2007 revealed that the combination of theanine and caffeine—both occur naturally in tea made with *Camellia sinensis* leaves—heightened the activity of nerve cells in the brain and improved concentration. The study's results showed individuals who had consumed theanine and **caffeine** together were able to focus on the tasks at hand better than those who had taken theanine or caffeine alone, or those who had taken neither. Subsequently, researchers in 2008 investigated the effects of theanine and caffeine on blood pressure and cognitive performance. The researchers for this study, which was published in *Psychopharmacology*, tested the two compounds in 48 healthy adults. They found that theanine did not cause jitteriness, as caffeine did, and that it also reduced the increases in blood pressure that caffeine promoted. The reduction in blood pressure has also been noted in other studies. Some even suggest that tea may reduce the risk of cardiovascular and cerebrovascular disease, although

that reduction may be related to other compounds in tea, such as **antioxidants** called catechins. The tea plant converts theanine into catechins.

Theanine may also improve the effectiveness of various agents used to treat cancer. Animal studies have shown that it enhances the antitumor activity of the cancer-treatment agent known as doxorubicin and may do the same with other agents. For example, a study published in the October 2000 issue of *Cancer Letters* reported that theanine increased the effects of the cancer treatment idarubicin in mice that had been inoculated with **leukemia** cells. The researchers combined theanine with a low dose of idarubicin. Normally at that dose, idarubicin has no effect on tumors. In combination with theanine, however, the weight of the tumors decreased significantly. The researchers also tested theanine with regular-dose idarubicin and found that it not only heightened idarubicin's antitumor effects, but also eliminated an adverse side effect of idarubicin. That side effect is myelosuppression, or a drop in blood production from bone marrow. In addition, a separate study published in a 2006 issue of the *Journal of Agricultural and Food Chemistry* indicated that theanine had anti-cancer effects on colon, breast, liver, and prostate cancers.

Research has suggested that theanine may help fight off bacterial **infections** by boosting the body's immune response, but more studies were needed as of 2008 before this hypothesis could be confirmed. Limited research has also suggested that it might have a protective effect against **atherosclerosis** (often called hardening of the arteries), but again more research was required.

Practitioners of herbal medicine may prescribe theanine supplements to boost the immune system, counter anxiety, promote a good night's sleep, improve mood, and heighten both learning and memory. Many anti-anxiety medications make users drowsy, but theanine does not appear to have this side effect. Some users take theanine supplements to help them focus on the task at hand and to promote creativity. Theanine is also sometimes prescribed to treat high cholesterol. It may also be beneficial in protecting individuals against cerebral **ischemia**, which is insufficient blood flow to the brain often caused by a stroke.

Preparations

Tea from these leaves can be processed into black, green, oolong, or white tea. The upper leaves of the plant are used to make black, green, and oolong tea; the leaf buds and some new leaves are used to make white tea. Black tea is made by wilting the leaves and then rolling them while exposing them to oxygen, a process known as oxidation, which makes the leaves dark brown or black. Oolong leaves are only partially oxidized. Green and white leaves are steamed or fired (exposed to heat), which inactivates the enzymes that promote oxidation, so green and white tea leaves are unoxidized.

To make tea, experts recommend that black and oolong tea leaves be steeped in water at approximately the boiling point (212 degrees Fahrenheit) and that green and white tea leaves be steeped in water that has boiled but then cooled down to about 165–185 degrees Fahrenheit. Properly heated water will produce a green-colored cup of green tea, while overly heated water will produce more of a yellow-colored cup of green tea as well as a bitter flavor.

Theanine is available as a supplement that comes in capsule form. Herbal practitioners may prescribe doses of 100–400 mg of theanine per day.

KEY TERMS

Camellia sinensis—Tea plant or tea tree from which black, oolong, green, and white tea are made.

Catechins—Antioxidants that appear to have numerous healthful benefits.

Precautions

Individuals should consult their primary healthcare physician about any health problems they have and refrain from self-treating such conditions as high blood pressure or high cholesterol with tea or other alternative-medicine choices. In addition, women who are pregnant or lactating should consult a primary healthcare physician about the use of any supplements.

Side effects

No known side effects existed as of 2008. As noted, theanine has relaxing effects without the sedative side effects common to other anti-anxiety supplements.

Interactions

Persons who are taking medications to lower blood pressure or lipids, or who are undergoing chemotherapy should consult their primary healthcare physician before taking theanine, which may boost the effects of those agents. In addition, theanine may counter the stimulating action of caffeine or other similar agents.

Resources

PERIODICALS

Eschenauer, Gregory, and Burgunda Sweet. "Pharmacology and Therapeutic Uses of Theanine." *American Journal of Health System Pharmacy* 63, no. 1 (January 1, 2006): 26 32.

Friedman, Mendel, Bruce E. Mackey, Hyun Jeong Kim, In Seon Lee, Kap Rang Lee, Seung Un Lee, et al. "Structure Activity Relationships of Tea Compounds against Human Cancer Cells." *Biological Psychology* 55, no. 2 (January 24, 2007): 243 253.

Kimura, Kenta, Makoto Ozeki, Lekh Raj Juneja, and Hideki Ohira. "L theanine Reduces Psychological and Physiological Stress Responses." *Biological Psychology* 74, no. 1 (January 2007): 39 45.

Raloff, Janet. "Distracted? Tea Might Help Your Focus." *Science News* 172, no. 13 (September 29, 2007): 206.

Rogers, Peter J., Jessica E. Smith, Susan V. Heatherley, and C. W. Pleydell Pearce. "Time for Tea: mood, Blood Pressure and Cognitive Performance Effects of Caffeine and Theanine Administered Alone and Together." *Psychopharmacology* 195, no. 4 (January 2008): 569 577.

OTHER

"Health and Tea FAQs." University of Arizona Mel and Enid Zuckerman College of Public Health, 2007. http://www.publichealth.arizona.edu/(S(q0ypi4n35toqn255mx20sg55))/Divisions/HPS/TeaStudies/TeaStudyFAQs.aspx?AspxAutoDetectCookieSupport 1 (March 4, 2008).

Leslie Mertz, Ph.D.

Therapeutic touch

Definition

Therapeutic touch, or TT, is a noninvasive method of healing derived from an ancient laying-on of hands technique. In TT, the practitioner alters the patient's energy field through a transfer of energy from the hands of the practitioner to the patient.

Origins

Therapeutic touch was developed in 1972 by Dora Kunz, a psychic healer, and Dolores Krieger, PH.D., R.N, a nurse and professor of nursing at New York University. In 1971, when Krieger had been working as a registered nurse in a hospital, she became very frustrated when one of her patients, a 30-year-old female, lay dying from a gallbladder condition. In desperation, she tried what she was learning from Kunz. After one treatment, the patient's condition began to mend; and she lived, surprising the other hospital staff. Krieger and Kunz met during the study of Oskar Estebany, a world renowned healer. They had invited Estebany to form a study group for three years, observing his work with patients. In this study, Estebany practiced healing on various patients using the laying-on of hands. Using her psychic and intuitive abilities, Kunz would observe and assist in the healing, while Krieger recorded the activities of the healing session and compiled profiles of the patients.

As the study progressed, Kunz began teaching Krieger how to heal, based on her perceptions of Estebany's healing techniques. During her research of ancient healing methods, Krieger concluded that the energy transfer between the healer and the recipient that takes place in a TT session is *prana*, an Eastern Indian word that means energy, vitality, and vigor. Krieger then combined her research with Kunz's techniques to develop TT.

TT was initially developed for use by persons in the health professions, but is currently taught worldwide to anyone who is interested in learning the technique. An estimated 100,000 people around the world have been trained in TT; 43,000 of those persons are healthcare professionals, many of whom use TT in conjunction with traditional medicine, as well as osteopathic, **chiropractic**, naturopathic, and homeopathic therapies. TT is taught in over 100 colleges, universities, and medical schools.

Benefits

The major effects of TT are **relaxation**, **pain** reduction, accelerated healing, and alleviation of psychosomatic symptoms. Studies have shown that TT has a beneficial effect on the blood, as it has the ability to raise hemoglobin values. It also affects brain waves to induce a relaxed state. TT can induce the relaxation response often within five minutes.

Krieger has said that it is not individual illnesses that validate the effectiveness of TT, but rather the body systems that are most sensitive to TT. She and others have found that the most sensitive body system is the autonomic nervous system (ANS), which, for example, controls urination. Next in order of sensitivity are the lymphatic and circulatory systems, and then finally the musculoskeletal system. In addition, the female endocrine system is more sensitive to TT than the corresponding male system. Thus, TT helps with **dysmenorrhea**, **amenorrhea**, problems with contraception, and the course of **pregnancy**.

DOLORES KRIEGER (1935–)

Dolores Krieger, a prominent professor of nursing at the New York University Division of Nursing, conceived of therapeutic touch as a healing technique in the early 1970s and introduced the therapy in 1972. Therapeutic touch rarely consists of physical contact with the patient. The practitioner focuses positive energy through their hands, which are held or waved two to three inches away from the patient, and directs it towards the patient's energy field. Krieger developed the technique along with a colleague, Dora Van Gelder Kunz, who is believed to be clairvoyant. They initially taught the system to graduate students at the nursing school, and it evolved from that basis. Since the introduction of therapeutic touch, Krieger traveled the world in teaching the technique before she retired as pro fessor emerita at the university. An estimated 70,000 nurses were trained by Krieger and Kunz.

In 1981 Dr. Krieger published, *Foundations for Holis tic Health Nursing Practices*. She later published a manual, *The Therapeutic Touch: how to use you hands to help or to heal,* in 1992.

Krieger became embroiled in controversy over the potential benefits of therapeutic touch technique between 1996 98 when nine year old schoolgirl Emily Rosa challenged the validity of the therapy with a simple experiment. She gathered 21 practitioners and through a covered box held her hand over one of the practitioner's own to test whether they could sense her energy field. Only 44% of the time were the practitioners able to determine which of their hands that Rosa's was hovering over. Although Rosa contacted Krieger in 1997, Krieger refused to meet with her, refused to participate in Rosa's experiment, and disputed the relevancy of an elemen tary school student's observations. Krieger holds both an R.N. and a Ph.D. degree and dismissed the validity of the experiment due to the student's and practitioners' lack of experience.

Krieger continues to promote her technique and her latest book, *Living the Therapeutic Touch*, was published by in 1999.

TT is reported to have a positive effect on the immune system and thus accelerates the healing of **wounds**. Nurses use therapeutic touch in operating rooms to calm patients before surgery and in recovery rooms on postoperative patients to help speed the healing process. TT is used in the treatment of terminally ill patients, such as those with **cancer** and acquired immune deficiency syndrome (**AIDS**), to relieve **anxiety** and **stress**, create peace of mind, and reduce pain.

Many nurses use TT in the nursery. The conditions of many premature babies who received TT have reportedly improved rapidly. TT has been used to calm colicky infants, assist women in **childbirth**, and increase milk let-down in breast-feeding mothers.

Other claims made for TT include relief of acute pain, **nausea**, **diarrhea**, tension and migraine headaches, **fever**, and joint and tissue swelling. TT has been used to treat thyroid imbalances, ulcers, psychosomatic illnesses, **premenstrual syndrome**, **Alzheimer's disease**, **stroke** and coma patients, **multiple sclerosis**, **measles**, **infections**, **asthma**, and bone and muscle injuries.

Therapeutic touch is performed in many different locations, including healing centers, delivery rooms, hospitals, hospice settings, accident scenes, homes, and schools.

Description

Therapeutic touch treats the whole person: relaxes the mind, heals the body, and soothes the spirit. The principle behind it is that it does not stop at the skin. The human body has an energy field, or aura, that extends several inches to several feet from the body. When illness occurs, it creates a disturbance or blockage in the vital energy field. The TT practitioner uses her/his hands to sense the blockage or disturbance. In a series of gentle strokes, the healer removes the disturbance and rebalances the energy to restore health.

The TT session generally lasts about 20–30 minutes. Although the technique is called "therapeutic touch," there is generally no touching of the client's physical body, only his or her energetic body or field. TT is usually performed on fully clothed patients who are either lying down on a flat surface or sitting up in a chair.

Each session consists of five steps. Before the session begins, the practitioner enters a state of quiet **meditation** where he/she becomes centered and grounded in order to establish intent for the healing session and to gain access to the compassion necessary to heal.

The second step involves an assessment of the person's vital energy field. During this step, the practitioner places the palms of his/her hands 2–3 in (5–8 cm) from the patient's body and sweeps them over the energy field in slow, gentle strokes beginning at the head and moving toward the feet. The practitioner might feel heat, coolness, heaviness, pressure, or a

KEY TERMS

Aura—An invisible energy field surrounding the physical body.

Prana—An Indian word that refers to the spiritual energy or vital force within a person.

prickly or tingling sensation. These cues, as they are called, signal blockages or disturbances in the field.

To remove these blockages and restore balance to the body, the practitioner then performs a series of downward sweeping movements to clear away any energy congestion and smooth the energy field. This is known as the unruffling process and is generally performed from the head toward the feet. To prevent any energy from clinging to him/her, the practitioner shakes his/her hands after each stroke.

During the next phase, the practitioner acts as a conduit to transfer energy to the patient. The energy used is not solely the energy of the practitioner. The practitioner relies on a universal source of energy so as not to deplete his/her own supply. In short, the healer acts as an energy support system until the patient's immune system is able to take over.

The practitioner then smoothes the field to balance the energy and create a symmetrical flow. When the session is over, it is recommended that the patient relax for 10–15 minutes in order for the energies to stabilize.

Side effects

The side effects reported occur when an excess of energy enters the body for an extended period of time creating restlessness, irritability, and hostility, or increasing anxiety and pain. **Burns** are sensitive to therapeutic touch, and it is recommended that TT be performed on burned tissue for short periods, generally two to three minutes at a time.

Research and general acceptance

Therapeutic touch is not generally accepted by Western medical professionals, although it has been studied by researchers at the Office of Alternative Medicine of the National Institutes of Health. Anecdotal research has been performed on TT since its development in 1972, but little quantitative research has been carried out. In April 1998 therapeutic touch became national news, however, when an elementary-school student carried out research for a science project that questioned the claims made for TT. Twenty-one TT practitioners with experience ranging from one to 27 years were blindfolded and asked to identify whether the investigator's hand was closer to their right hand or their left. Placement of the investigator's hand was determined by flipping a coin. The TT practitioners were able to identify the correct hand in only 123 (44%) of 280 trials, a figure that could result from random chance alone.

On the other side of the debate, one frequently cited study was designed to determine the effect TT would have on wounds that resulted from a biopsy of the upper arm. Forty-four patients placed their injured arms through a hole in a door. Twenty-two of them received TT on their arms. The other half received no treatment. The wounds treated with TT healed more quickly than the wounds that received no treatment.

In 1998, a study was performed on 27 patients with **osteoarthritis** in at least one knee. For six weeks, the patients were treated with therapeutic touch, mock therapeutic touch, or standard care. According to *The Journal of Family Practice*, the results showed that the patients who had received TT had "significantly decreased pain and improved function as compared with both the placebo and control groups."

Therapeutic touch can be combined with a number of different therapies, including **acupressure**, massage, mental imagery, physical therapy, and **yoga**. When combined with massage and physiotherapy, TT may reduce tension headaches, back pain, stress-related problems, circulatory problems, and **constipation**. **Shiatsu** and TT may help sinusitis, digestive disorders, **muscle cramps**, menstrual difficulties, and **insomnia**. Yoga and TT may be beneficial in the treatment of **bronchitis**, asthma, blood pressure, **fatigue**, and anxiety.

TT is practiced in over 70 countries worldwide: by Egyptians and Israelis during fighting in the Gaza Strip; in South Africa to reduce racial strife; and in Poland, Thailand, and the former Soviet Union.

Training and certification

Therapeutic touch is taught at over 100 universities and nursing and medical schools around the United States and Canada. Although the technique was developed primarily for nurses, anyone can learn TT.

State laws vary regarding the practice of TT. In general, laypersons are allowed to practice TT within their families. Therapeutic touch is considered an extension of health care skills, so most health care professionals are covered under state medical practice acts.

Many hospitals have established policies allowing nurses and staff to perform TT on patients at no extra charge. The American Nurse's Association often holds workshops on TT at national conventions. Therapeutic touch classes are often held for the general public through community education, healing clinics, and holistic schools.

Resources

BOOKS

Krieger, Dolores, Ph.D., R.N. *Accepting Your Power to Heal. The Personal Practice of Therapeutic Touch*. Bear & Company, 1993.

Krieger, Dolores, Ph.D., R.N. *The Therapeutic Touch. How to Use Your Hands to Help or to Heal*. Prentice Hall Press, 1979.

Macrae, Janet, Ph.D., R.N. *Therapeutic Touch: A Practical Guide*. Knopf, 1998.

PERIODICALS

Baird, Carol L. "First line Treatment for Osteoarthritis: Part 2: Nonpharmacologic Interventions and Evalua tion." *Orthopaedic Nursing* 20 (November December 2001): 13 20.

Gordon, A., J. H. Merenstein, et al. "The Effects of Ther apeutic Touch on Clients with Osteoarthritis of the Knee." *Journal of Family Practice* 47 (1998): 271 277.

Rosa, Linda, MSN, Emily Rosa, Larry Sarner, and Stephen Barrett, MD. "A Close Look at Therapeutic Touch." *Journal of the American Medical Association* 279 (April 1, 1998): 1005 11.

OTHER

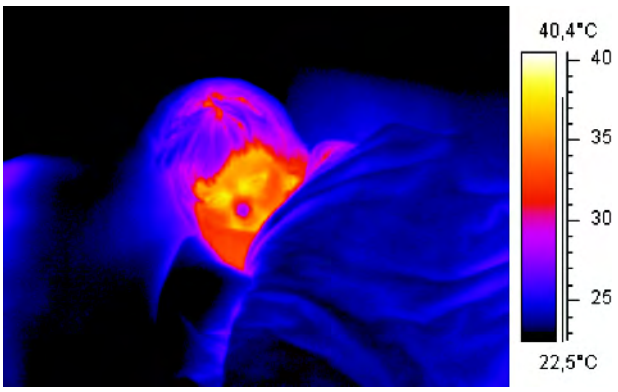
The Nurse Healers Professional Associates International (NH PAI), the Official Organization of Therapeutic Touch. 3760 S. Highland Drive, Salt Lake City, UT 84106. (801) 273 3399. nhpai@therapeutic touch.org. http://www.therapeutic touch.org

Jennifer Wurges
Rebecca J. Frey, PhD

Thermography

Definition

Thermography, also known as digital infrared imaging (DII) or digital infrared thermal imaging (DITI), is a non-invasive procedure used to help diagnose a variety of diseases and conditions. Thermography uses sensors and complex computer imaging technology to visualize body temperatures. Trained doctors and technicians can use the computer generated thermal images to see various body processes. Thermography is based on the idea that various physiological processes cause higher levels of cell metabolism than others. Areas of the body in which cells are undergoing large amounts of metabolism have higher temperatures than others because cell metabolism produces heat as a by-product.



Thermography uses sensors and complex computer imaging technology to visualize body temperatures. *(Nutscode / T Service / Photo Researchers, Inc.)*

Origins

Interest in the infrared radiation emitted from the human body dates back at least to the 1920s. At first, however, the technology was only researched for use by the military. Infrared detection devices can pick up thermal information about a body or object even if it is camouflaged and in the dark. The military was therefore interested in the use of thermal imaging to help soldiers, and others, see at night and to detect a variety of weapons that leave a thermal trace. The first use of thermal information for the diagnosis of **breast cancer** was published in 1956 in the *Journal of the Canadian Medical Association*. Although the technique and equipment used were not sophisticated, the research was compelling and led to interest in the medical community in doing further research.

After the late 1950s, research continued on the possible use of thermography to diagnosis **cancer** and other diseases, especially breast cancer. Studies both supported thermography in its predicative abilities and showed that it provided no significant information. In the 1970s, a large study on thermography and its use in detecting breast cancer showed that it was not particularly effective. Proponents of thermography criticized the study for poor construction and use of individuals who were not properly trained. Although the validity of the study continued to be debated, it caused many people to lose interest in thermography.

As of 2008, many doctors and other medical professionals believe thermography can be an important diagnostic tool. Although it does not have the amazing diagnostic properties some had once hoped it would, thermography is often recognized as playing an important complementary role, especially in breast cancer detection. There are many trained and licensed practitioners around the United States who provide thermography services.

Benefits

There are many potential benefits of thermography, although some of them are more widely accepted than others. Thermography is most widely used as a diagnostic device for breast cancer. Before a tumor forms in a breast, there is often a network of blood vessels that forms. These vessels are often the first change that takes place in a breast in the presence of cancerous cells. These additional blood vessels generate additional heat because of the increased metabolic processes. This increased heat is detectable on the thermal image. Many practitioners believe that this can help determine if a breast may become cancerous and should be watched closely, before any other signs of cancer are present. Thermography can also be used in some cases in which breast biopsy is indicated. A thermal image can help indicate to a knowledgeable doctor if a suspect lesion is cancerous.

Thermography is also believed by some practitioners to be useful in other areas of medicine. Some chiropractors believe that thermography can help diagnose the cause of **pain** in certain patients when the cause is not clear. Other healthcare professionals believe that thermography can help diagnose other problems, including problems with joints, nerves, and soft tissues. Thermography is non-invasive and, in many cases, relatively inexpensive, which may make it a valuable diagnostic tool.

Description

During thermography individuals are either standing or lying down. No part of the imaging equipment actually touches the individual, although devices may be used to steady the part of the body being imaged. Thermography does not require radiation or any potentially harmful chemicals to be ingested. Instead, it relies on the infrared radiation (heat) being given off naturally by the human body. The infrared detection device is aimed at the body part being imaged, or it can be used to produce a full body image. The infrared detection device takes the infrared radiation received and changes it into electrical impulses that can be interpreted by a computer. The computer then produces a color image map, known as a thermogram, that shows different temperature areas in different colors. Many infrared detection devices used in thermography are sensitive to temperature differentials as small as 0.1° Celsius.

The thermographic procedure itself usually takes between 15 and 45 minutes, depending on variables such as how many angles are needed and the area being imaged. It should be performed by a trained, certified thermographer to ensure the highest level of accuracy. After the procedure is finished, an individual trained in reading thermograms, sometimes called a thermologist, interprets the image.

The thermologist looks at the thermogram for different characteristics depending on the area of the body and the suspected problem. In many cases the thermologist may search for an increased temperature over normal because this may indicate increased blood flow to the area. When examining thermograms for breast cancer screening and diagnoses, the thermologist compares the thermal maps of the two breasts. Any difference in these thermal maps may indicate a problem. For women who do not yet have any indication of breast cancer, a thermal scan may be kept on record as a baseline for interpreting later thermograms. Any change in the thermogram over time may indicate a potential problem.

In breast thermograms, cancerous or precancerous areas show up as areas of increased temperature because cancerous cells require more nutrients than normal body cells and so they draw increased blood flow to them. The additional blood flow causes increased metabolic activity and shows up on the thermogram as an area of increased temperature.

Preparations

Typically individuals are cautioned not to expose themselves to strong sunlight or remain in the sun for a lot of time on the day a scan is performed. Many practitioners ask individuals not to smoke for a few hours before the scan, and not to use lotions on the day of the scan as these may interfere with the accuracy of the thermographic imaging equipment. The individual will be asked to remove any clothing covering the subject area. The individual may be asked to sit for fifteen minutes or so in the room in which the imaging will occur so that the skin's surface temperature can come in line with the room temperature to ensure that the digital infrared image is accurate.

Precautions

There are no side effects expected from thermography. No special precautions are recommended. However, it is important that thermography be used in conjunction with, not as a replacement for, other screening and diagnostic procedures. Women who decide to undergo thermography for breast cancer screening should also get all scheduled mammograms and physical examinations, even if the thermographic procedure shows no signs of a problem.

Research and general acceptance

Thermography is a highly debated procedure. In 1982 the United States Food and Drug Administration (FDA) approved it for use as an adjunctive procedure for screening for breast cancer. However, many professionals do not believe it to be an effective tool. It is not covered by many insurance providers and, as of 2008, was not covered by Medicare. It is available at a small number of U.S. clinics and clinics throughout the world.

Research scientists in the 2000s continued to refine thermography's ability to detect and diagnoses breast cancer. In this work, they have attempted to develop new and better thermographic equipment and techniques, and others are investigating thermal images of both normal and abnormal breasts to help achieve baselines. One 2007 study even found that in women with normal breast health the average temperature of the left breast is actually somewhat higher than the average temperature of the right breast. Because comparisons between breasts are often used to detect abnormalities, information of this sort can help medical practitioners have more accurate diagnoses.

Other research has focused on non breast-cancer related ways to use thermography in medicine. A study published in 2006 in the *British Journal of Clinical Pharmacology* found that facial thermography can determine the activity of antihistamines in the nose just as accurately as traditional methods. Thermography was also being applied to dermatology, rheumatology, and cardiology. Because thermography is a noninvasive procedure, it is attractive as a possible alternative diagnostic tool in many fields of medicine.

Training and certification

Individuals who perform the thermographic imaging procedure and those who make diagnosis based on the resulting images must receive special training in thermographic technology. There are a number of programs in the United States that provide training and certification in thermography and infrared digital imaging in general. The American College of Clinical Thermography (ACCT) provides training and certification in thermography for medical uses.

Many different healthcare professionals may be certified thermographers and thermologers. These may include doctors, nurses, and technicians, among others. The ACCT provides three levels of certification in clinical thermography. This training teaches and certifies individuals in the use of thermographic equipment. The ACCT also provides three levels of certification in clinical thermology, the practice of reading thermographic images. The ACCT provides certification in two levels of thermography clinic management.

KEY TERMS

Thermologist—A professional trained in reading thermograms.

Thermogram—The image created by thermography.

Resources

BOOKS

Joy, Janet E., Edward E. Penhoet, and Diana B. Petitti, eds. *Saving Women's Lives: Strategies for Improving Breast Cancer Detection and Diagnosis*. Washington DC: National Academies Press, 2005.

Suri, Jasjit, S., and Rangaraj M. Rangayyan, eds. *Recent Advances in Breast Imaging, Mammography, and Com puter Aided Diagnosis of Breast Cancer*. Bellingham, WA: SPIE Press, 2006.

Tartar, Marie, Christopher E. Comstock, and Michael S. Kipper. *Breast Cancer Imaging: A Multidisciplinary, Multimodality Approach*. Philadelphia: Mosby/Elsev ier, 2008.

PERIODICALS

Clark, A. T., et al. "Facial Thermography Is a Sensitive and Specific Method for Assessing Food Challenge Out come." *Allergy* 62, No. 7 (July 2007): 744 750.

Zhang, Dong. "Method of Selecting Acupoints for Acu puncture Treatment of Peripheral Facial Paralysis by Thermography." *American Journal of Chinese Medicine* 35, no. 6 (December 30, 2007): 967 976.

ORGANIZATIONS

National Association of Certified Thermographers, 4248 Park Glen Rd., Minneapolis, MN, 55407, (866) 417 3949, http://www.mynact.org.

Helen Davidson

Thiamine

Description

Thiamine, also known as vitamin B_1, was the first of the water-soluble B-vitamin family to be discovered. It is an essential component of an enzyme, thiamine pyrophosphate, that is involved in metabolizing carbohydrates. Thiamine works closely with other B vitamins to assist in the utilization of proteins and fats as well, and helps mucous membranes and the heart to stay healthy. The brain relies on thiamine's role in the conversion of blood sugar (glucose) into biological energy to function properly. Thiamine is also involved in certain key metabolic reactions occurring in nervous tissue, the heart, in the formation of red blood cells, and in the maintenance of smooth and skeletal muscle.

General use

The recommended daily allowance (RDA) of thiamine is 0.3 mg for infants less than six months old, 0.4 mg for those from six months to one year old, 0.7 mg for children ages one to three years, 0.9 mg for those four to six years, and 1.0 mg for those seven to 10 years. Requirements vary slightly by gender after age 10. Males need 1.3 mg from 11 to 14 years, 1.5 mg from 15 to 50 years, and 1.2 mg when over age 50 years. Females require 1.1 mg from 11 to 50 years of age, and 1.0 mg if older than 50 years. The RDA is slightly higher for women who are pregnant (1.5 mg) or lactating (1.6 mg). Adults need a minimum of 1.0 mg of thiamine a day, but the requirement is increased by approximately 0.5 mg for each 1,000 calories of daily dietary intake over a 2,000-calorie base.

Thiamine has limited therapeutic use apart from supplements for people who are deficient or have significant risk factors for deficiency, such as **alcoholism**. High doses are used to treat some metabolic disorders, including certain enzyme deficiencies, Leigh's disease, and maple syrup urine disease. People suffering from diabetic neuropathy may sometimes benefit from additional thiamine. This supplementation should be taken only on the advice of a healthcare provider. Claims have been made that it can also help people with **Alzheimer's disease**, **epilepsy**, **canker sores**, **depression**, **fatigue**, **fibromyalgia**, and **motion sickness**. Improvement of these conditions based on supplementation with thiamine is unsubstantiated. Although a deficiency of thiamine may cause canker sores, taking extra amounts of the vitamin after they appear does not seem to help them heal.

Recommended dietary allowance of thiamin

Age	mg/day
Children 0-6 mos.	0.2
Children 7-12 mos.	0.3
Children 1-3 yrs.	0.5
Children 4-8 yrs.	0.6
Children 9-13 yrs.	0.9
Boys 14-18 yrs.	1.2
Girls 14-18 yrs.	1.0
Men ≥ 19 yrs.	1.2
Women ≥ 19 yrs.	1.1
Pregnant women	1.4
Breastfeeding women	1.4

Foods that contain thiamin	mg
Sunflower seeds, 1/2 cup	1.64
Beans, baked, canned with pork, 1 cup	0.60
Tuna, 4 oz.	0.57
Sesame seeds, 1/2 cup	0.56
Beans, black, cooked, 1 cup	0.42
Peas, green, boiled, 1 cup	0.41
Beans, navy, cooked, 1 cup	0.37
Peas, split, cooked, 1 cup	0.37
Corn, cooked, 1 cup	0.36
Lentils, cooked, 1 cup	0.33
Beans, lima, cooked, 1 cup	0.30
Beans, kidney, cooked, 1 cup	0.28
Oats, whole grain, cooked, 1 packet	0.26
Asparagus, boiled, 1 cup	0.22
Brussels sprouts, boiled, 1 cup	0.17
Spinach, boiled, 1 cup	0.17
Squash, winter, baked, 1 cup	0.17
Pineapple, 1 cup	0.14
Carrots, raw, 1 cup	0.12
Watermelon, 1 cup	0.12
Oranges, 1 whole	0.11
Tomato, 1 cup	0.11
Broccoli, steamed, 1 cup	0.09
Beans, green, boiled, 1 cup	0.09
Cabbage, boiled, 1 cup	0.09
Eggplant, cooked, 1 cup	0.08
Squash, summer, cooked, 1 cup	0.08
Kale, boiled, 1 cup	0.07
Beans, baked, canned with pork, 1 cup	0.06
Celery, raw, 1 cup	0.06
Red peppers, raw, 1 cup	0.06
Turnip greens, cooked, 1 cup	0.06
Romaine lettuce, 1 cup	0.05
Cauliflower, boiled, 1 cup	0.05

AI = Adequate Intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

KEY TERMS

Beriberi—A deficiency disease caused by insufficient thiamine in the diet. Its symptoms include abdominal cramps, muscle spasms, and memory loss.

Hypermetabolic—Conditions that increase the rate of metabolism, such as fever and hyperthyroidism.

Neuropathy—Abnormality of the nerves that may be manifested as numbness, tingling, or weakness of the affected area.

Wernicke-Korsakoff syndrome—A disorder of the central nervous system resulting from long-term thiamine deficiency. It is characterized by amnesia, confusion, visual problems, and unsteady gait; and is most commonly seen in alcoholics.

Preparations

Natural sources

While all plant and animal foods have thiamine, higher levels of thiamine are found in many nuts, seeds, brown rice, seafood, and whole-grain products. Sunflower seeds are a particularly good source. Grains are stripped of the B vitamin content during processing, but it is often added back to breads, cereals, and baked goods. Legumes, milk, beef liver, and pork are other foods with high vitamin B_1 content. Thiamine is destroyed by prolonged high temperatures, but not by freezing. Food should be cooked in small amounts of water so that thiamine and other water-soluble vitamins don't leach out. Baking soda should not be added to vegetables, and fresh foods should be eaten to avoid sulfite preservatives. Both of these chemicals will break down the thiamine content found in foods. Drinking tea or alcohol with a meal will also drastically decrease the amount of thiamine that is absorbed by the body.

Supplemental sources

Thiamine is available in oral, intramuscular injectable, and intravenous formulations. Injectable formulas are usually preserved for persons who are severely thiamine deficient. Supplements should always be stored in a cool dry place, away from direct light, and out of the reach of children.

Deficiency

A deficiency of thiamine leads to a condition known as beriberi. Once common in sailors, it has become rare in the industrialized parts of the world except in cases of alcoholism and certain disease conditions. Beriberi is, however, frequently found in refugee camps and similar shelters for displaced persons. Infantile beriberi is presently the leading cause of death among the children of ethnic minority groups in southeast Asia. The syndrome typically causes poor appetite, abdominal **pain**, heart enlargement, **constipation**, weakness, swelling of limbs, **muscle spasms**, **insomnia**, and **memory loss**. Under treatment, the condition can resolve very quickly. Untreated beriberi will lead eventually to Wernicke-Korsakoff syndrome. These patients experience confusion, disorientation, inability to speak, gait difficulties, numbness or tingling of extremities, **edema**, **nausea**, **vomiting**, visual difficulties, and may progress to psychosis, coma, and death. Even in advanced states, this condition can be reversible if thiamine is given, nutritional status is improved, and use of alcohol is stopped.

Risk factors for deficiency

The leading risk factor for developing a deficiency of thiamine is alcoholism. Generally, alcoholics eat poorly, and therefore have a low dietary intake of thiamine and other vitamins to begin with. Alcohol also acts directly to destroy thiamine, and increases the excretion of it. People with **cirrhosis** of the liver, malabsorption syndromes, diabetes, kidney disease, chronic **infections**, or hypermetabolic conditions also have increased susceptibility to deficiency. The elderly are more prone to poor nutritional status, as well as difficulties with absorption, and may need a supplement. Others with nutritionally inadequate **diets**, or an increased need as a result of **stress**, illness, or surgery may benefit from additional vitamin B_1 intake since utilization is higher under these conditions. Those who diet or fast frequently may also be at risk for low levels of thiamine. Use of tobacco products, or carbonate and citrate food additives can impair thiamine absorption. A shortage of vitamin B_1 is likely to be accompanied by a shortage of other B vitamins, and possibly other nutrients as well. A supplement containing a balance of B complex and other vitamins is usually the best approach unless there is a specific indication for a higher dose of thiamine, or other individual vitamins.

Precautions

Thiamine should not be taken by anyone with a known allergy to B vitamins, which occurs rarely.

Side effects

In very unusual circumstances, large doses of thiamine may cause **rashes**, **itching**, or swelling. These reactions are more common with intravenous injections than oral supplements. Most people do not experience any side effects from oral thiamine.

Interactions

Oral contraceptives, antibiotics, sulfa drugs, and certain types of diuretics may lower thiamine levels in the body. Consult a health care professional about the advisability of supplementation. Taking this vitamin may also intensify the effects of neuromuscular blocking agents that are used during some surgical procedures. B vitamins are best absorbed as a complex, and **magnesium** also promotes the absorption of thiamine.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. Arizona: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. California: Therapeutic Research Faculty, 1999.

Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha Books, 1997.

PERIODICALS

McGready, Rose, Julie A. Simpson, Thein Cho, et al. "Postpartum Thiamine Deficiency in a Karen Displaced Population." *American Journal of Clinical Nutrition* 74 (December 2001): 808 813.

OTHER

American Society for Nutritional Sciences. http://www.nutrition.org.

Judith Turner
Rebecca J. Frey, PhD

Thrombus *see* **Blood clots**

Thromophlebitis *see* **Phlebitis**

Thrush *see* **Yeast infection**

Thuja

Description

Thuja is a general term for trees of the genus *Thuja*, which belongs to the Cupressaceae or cypress family. The most common species in North America are *Thuja occidentalis*, whose common names include arbor vitae or tree of life, white cedar, yellow cedar, American cedar, hackmatack, Thuia du Canada, swamp cedar, and Lebensbaum; and *Thuja plicata*, the Western **red cedar**. The species of cedar found in China and Japan is *Thuja orientalis*, and is known as ce bai ye or ya bai shu in Chinese.

Thujas are evergreen conifers, or cone-bearing trees. The name "Thuja" was given to this group of trees by the Swedish botanist Linnaeus in 1753; it comes from the Greek word *thuo*, which means "to sacrifice," as cedar wood was often burned with animal sacrifices by the ancients to add a pleasing aroma to the fire.

Thujas are evergreen conifers, or cone-bearing trees. *(Holmes Garden Photos / Alamy)*

KEY TERMS

Abortifacient—A drug or preparation given to induce abortion.

Conifer—Any of several families of trees and shrubs, mostly evergreen, belonging to the order Coniferales, distinguished by bearing seeds and pollen in the form of dry scales arranged in a cone.

Emmenagogue—A medication or herbal preparation given to bring on a woman's menstrual period.

Expectorant—A medication or herbal preparation given to promote coughing, in order to bring up phlegm or other secretions from the upper respiratory tract.

Diuretic—A medication or preparation given to increase the body's output of urine.

Thujone—A natural compound found in the essential oils of cedar, wormwood, sage, mugwort, and clary. It is banned as a flavoring agent in the United States because of its neurotoxicity. Thujone is classified as a monoterpene ketone. It is insoluble in water, but can be dissolved in alcohol or chloroform.

Vermifuge—A medication or preparation given to expel worms and other intestinal parasites.

Volatile oil—Any plant oil that evaporates at room temperature and retains the odor of the plant from which it comes. Volatile oils are also called essential oils.

Thuja occidentalis is native to North America and grows in dense forests in southeastern Canada and the northeastern United States. American cedar trees grow to a height of about 60 ft (18.2 m), with trunks between 12 and 24 in (31 and 61 cm) in diameter. They are slow-growing trees, and prefer wet soils. American cedars are some of the oldest trees in northern woods; some are estimated to be at least 800 years old. *Thuja occidentalis* is conical in shape, with the lower branches almost horizontal to the ground and the upper branches more nearly vertical, forming a dense cone at the top of the tree. The leaves of the American cedar are bright green, opposite leaves that resemble overlapping scales, and give off a fragrant odor when crushed. The tiny yellow or greenish flowers appear between April and July. American cedar cones are pale green when young but turn a pale reddish-brown color as they mature.

The Western red cedar, or *Thuja plicata*, which is found from Alaska southward to the Pacific Northwest, Montana and Idaho, Alberta, and British Columbia, is similar in shape to *Thuja occidentalis*, except that it is a much taller tree, growing to a height of 150–200 ft (46–61 m). *Thuja orientalis*, on the other hand, is a short tree growing to a height of only 12–20 ft (4–6 m), and is sometimes used to form hedges, as it tolerates pruning. The Chinese cedar, however, is not as hardy as its North American counterparts.

Thuja is also the name for a homeopathic remedy made from *Thuja occidentalis*.

General use

Cedar trees in general have a long history of use for furniture and buildings as well as in various herbal remedies and **aromatherapy** preparations. According to the Old Testament, King Hiram of Tyre sent cedar wood from Lebanon to King Solomon for the construction of the Temple in Jerusalem. Cedar wood has also been used for centuries to line closets or make chests to protect clothing from moths. The fragrant wood was also used by Native Americans as well as the ancient Egyptians, Greeks, and Romans as an ingredient in incense blends.

In Western herbal medicine, cedar leaf oil was used as an emmenagogue, abortifacient, vermifuge, diuretic, and digestive aid. It was applied externally to relieve the pains of arthritis and rheumatism, to treat external **fungal infections** of the skin (ringworm and thrush), and to remove anal or **genital warts**. Native Americans used cedar leaf preparations to relieve **headache** and to prevent scurvy. Cedar leaves and twigs are in fact rich in **vitamin C**, and it was their effectiveness in preventing or treating scurvy that led to the tree's being called arbor vitae or tree of life. In addition, recent research has shown that extracts prepared from either *Thuja occidentalis* or *Thuja plicata* do in fact have antiviral, anti-inflammatory, and antibacterial properties. A group of German researchers reported in 2002 that an extract prepared from cedar leaf, alcohol, and water inhibits the reproduction of **influenza** virus type A, while a team of researchers in Japan found that an extract of Western red cedar was effective in treating **eczema**. Lastly, another group of Japanese researchers reported in 2003 that several compounds isolated from the stem bark of Japanese cedar appear to have significant antitumor activity.

In **traditional Chinese medicine**, the leaves and stems of *Thuja orientalis* are used to treat nervous disorders, **insomnia**, and heart palpitations, as well as to stop hemorrhages and bring down fevers. Traditional Chinese physicians also make a preparation of fresh cedar leaves steeped for seven days in a 60%

alcohol solution to promote hair growth. The mixture is rubbed on the bald spots three times daily.

The homeopathic preparation known as *Thuja* is made from the leaves of *Thuja occidentalis*, and is given to treat soft or bleeding **warts** on the chin, genitals, or anus. The most widely used homeopathic *materia medica*, or reference book, also recommends *Thuja* for headaches that feel like a nail is being driven into the head; vertigo brought on by standing up; emotional **depression** and restlessness; **pain** or **itching** in the scalp; painful swallowing or a feeling of obstruction in the throat; intense thirst at night or early in the morning; stomach cramps that are worse in the evening; difficulty in breathing combined with a violent thirst for cold water; frequent need to urinate, with frothy or cloudy urine; insomnia or restless sleep; or **fever** and **chills** that grow worse toward evening.

In aromatherapy, cedar leaf oil is classified as a base note, which means that it has a very long-lasting scent when added to a perfume or incense blend. One Canadian producer of essential oil advises, "... the scent is strong and should be used sparingly.... One small application is all you need!" It is considered to have a sedative or calming effect, and is recommended for treating **anxiety** states as well as **asthma**, **bronchitis**, and head colds. Some aromatherapists also recommend cedar leaf oil for treating **acne** and **dandruff**.

Cedar leaf oil is still used in some mainstream over-the-counter (OTC) preparations to relieve congestion in the upper respiratory tract. The best-known of these cold remedies is Vicks VapoRub(tm), which can be applied directly to the chest and covered with a hot towel, or added to a vaporizer to produce fragrant steam. Cedar leaf oil is also added to pest repellant sprays and paints to protect against mites, moths, and rodents. It is used to scent some brands of shoe polish, and is blended into some men's colognes, including Hugo Boss and Ralph Lauren's Safari.

Preparations

Most products used in Western medicine and aromatherapy that contain cedar oil are made with oil from the leaves and twigs of *Thuja occidentalis*. These parts of the tree yield about 1% volatile oil, which is about 65% thujone. The other components include fenchone, borneol, limonene, pinene, camphor, myrcene, a flavonoid known as thujin, and tannin. The essential oil is either clear or pale yellow in color. Most of the cedar leaf oil used in North America is made in Quebec by small family businesses; about 80% of their production is sold in the United States. The oil is extracted from the leaves by a process of steam distillation, cooled in an indirect contact heat exchanger, filtered, and stored in barrels for distribution to wholesalers.

According to a Canadian producer, essential oil from American cedar can be applied directly to picnic tables or outdoor furniture as a natural insect repellant, or to wooden drawers or closets to repel moths. A few drops of cedar leaf oil can also be added to a pail of warm water for damp-mopping hardwood floors. When the oil is used in aromatherapy, a few drops are mixed with several ounces of safflower or another vegetable oil for massages, or added to bath water for **hydrotherapy**. Essential cedar leaf oil should never be applied directly to the skin, as it can cause irritation. It should be mixed with softened beeswax or a mild cream if used externally to treat aching muscles or joints. A 1/2-oz bottle of the oil costs about $10 in health food stores.

For internal use as a diuretic or expectorant, Western herbalists recommend taking 1/4-tsp of liquid extract of cedar leaf in a glass of water three to six times a day. Alternately, an infusion can be prepared by adding 1 ounce of fresh cedar leaves to a pint of boiling water. The infusion is taken cold in 1-tbsp doses every three to six hours.

Homeopathic preparations of *Thuja* include pills, granules, and liquid dilutions, in potencies ranging from 3X to 50M. The cost of these preparations ranges from $5.99 for a half-ounce container of 3X pills to $43.69 for a 1-oz (28-g) bottle of 50M liquid dilution. Tinctures of *Thuja* are sold only to homeopathic practitioners, and cost around $8 for a 1-oz bottle. Boiron, a well-known manufacturer of homeopathic remedies, also offers a *Thuja* ointment for the treatment of external warts; a 1-oz (28-g) tube costs between $5.05 and $7.24, depending on the supplier.

Incense made from pure cedar or containing a mixture of cedar and other fragrances is available in stick or cone form for prices ranging between $1.49 and $5 for two to four ounces of incense.

Precautions

Herbal preparations for internal use that contain cedar leaf oil should not be used by pregnant women, as the oil may cause contractions of the uterus. In addition, anyone using the essential oil for external applications is advised to consult either a professional aromatherapist or their physician beforehand, as the high content of thujone in cedar leaf oil is a health concern. Thujone in pure form is a neurotoxin, which means that it affects the central nervous system in humans and other mammals. Absinthe, a liqueur

containing thujone derived from **wormwood**, can cause convulsions, hallucinations, and psychotic episodes. In addition to products containing thujone derived from wormwood, products made with cedar leaf oil have been investigated by the U. S. National Toxicology Program to make certain that workers involved in the manufacture of perfumes or other products scented with the oil were not at risk. The agency reported that the oil does not appear to be harmful to the skin or respiratory system under ordinary workplace conditions; all known instances of thujone poisoning since 1968 have been caused by drinking absinthe or undiluted **essential oils** of wormwood, **sage**, or cedar. With one exception, all these poisonings took place in France.

Side effects

No side effects have been reported from the use of perfumes, incense, aromatherapy products, pest repellants, or OTCs for external use that contain cedar leaf oil when used as directed. In addition, no side effects have been reported for homeopathic preparations containing *Thuja*.

Interactions

No interactions between products containing cedar oil and prescription medications have been reported.

Resources

BOOKS

Cummings, Stephen, MD, and Dana Ullman, MPH. *Everybody's Guide to Homeopathic Medicines*, revised ed. NY: G. P. Putnam's Sons, 1991.

Grieve, M., and C. F. Leyel, ed. *A Modern Herbal*, vol. 2. Mineola, NY: Dover Publications, Inc., 1971.

Price, Shirley. *Practical Aromatherapy*, 2nd ed. London: Thorsons, 1994.

Reid, Daniel P. *Chinese Herbal Medicine*. Boston: Shamb hala, 1993.

PERIODICALS

Arima, Y., Y. Nakai, R. Hayakawa, and T. Nishino. "Antibacterial Effect of Beta Thujaplicin on Staphylo cocci Isolated from Atopic Dermatitis: Relationship Between Changes in the Number of Viable Bacterial Cells and Clinical Improvement in an Eczematous Lesion of Atopic Dermatitis." *Journal of Antimicrobial Chemotherapy* 51 (January 2003): 113 122.

Bodinet, C., R. Mentel, U. Wegner, et al. "Effect of Oral Application of an Immunomodulating Plant Extract on Influenza Virus Type A Infection in Mice." *Planta Medica* 68 (October 2002): 896 900.

Iwamoto, M., T. Minami, H. Tokuda, et al. "Potential Antitumor Promoting Diterpenoids from the Stem Bark of *Thuja standishii*." *Planta Medica* 69 (January 2003): 69 72.

ORGANIZATIONS

Cèdres Recyclés. 60 Adrien Robert, Hull, Quebec, Canada J8Y 3S2. (819) 771 3446. Fax: (819) 771 0067. http:// cedarleaf.org.

National Toxicology Program (NTP) Liaison and Scientific Review Office. P. O. Box 12233, MD A3 01, Research Triangle Park, NC 27709. (919) 541 0530. http://ntp server.niehs.nih.gov.

Valley Cedar Leaf Oil. RR #5, Eganville, Ontario, Canada K0J 1T0. (613) 628 2892. http://www.valleycedarleafoil. com.

OTHER

National Toxicology Program (NTP). *Summary of Data for Chemical Selection Alpha Thujone 546 80 5*. http://ntp server.niehs.nih.gov/htdocs/Chem_Background/Exec Summ/Thujone.html.

Rebecca Frey

Thuja occidentalis see **Thuja**

Thunder god vine

Description

Thunder god vine (*Tripterygium wilfordii*) is the English translation of the Chinese name for the perennial plant *lei gong teng*. The plant grows in the mountains of China, as well as Taiwan and Myanmar (formerly Burma). It is a deciduous climbing vine that sheds its leaves, and produces white flowers and red fruit with three "wings." The plant's leaves, flowers, and outer skin of the root are poisonous. In fact, honey taken from the plant's pollen is also poisonous. The root pulp is the non-poisonous part, which is used medicinally. There is a risk of poisoning if the herb is not extracted properly.

The potentially dangerous aspects of this plant are reflected in two of its Chinese folk names, "Walk Seven Steps and Die" and "Intestine-Breaking Plant." In Asia, the plant is also called "three-wing-nut."

In ancient China, practitioners carefully extracted the portion of the thunder god vine used for treatment. They gathered roots in the summer or early fall. The poisonous bark was removed, and the inner portion of the root was utilized. In past centuries, this procedure may have involved grinding the root into a powder. The remedy usually was applied topically to the skin,

KEY TERMS

Prednisone—A steroid, immune suppressing, anti-inflammatory medication used to treat the symptoms of rheumatoid arthritis, auto-immune, and many inflammatory conditions.

Rheumatoid arthritis—A painful autoimmune condition, with inflammation and swelling in the joints, somtimes accompanied by spasms in nearby muscles, and frequently resulting in loss of joint function. Rheumatoid arthritis occurs two to three more times in women than men.

since there was a risk of poisoning if thunder god vine was taken orally.

General use

Use of thunder god vine in **traditional Chinese medicine** dates back thousand of years. Ancient Chinese practitioners used the root of thunder god vine to treat a range of conditions including **rheumatoid arthritis**, swelling, skin **infections** and leprosy, **fever**, **boils**, and **chills**. However, practitioners were aware that the plant could be deadly. In fact, was likely used as a murder weapon. Farmers in Asia also used thunder god vine as an insecticide.

In the latter half of the twentieth century, interest again turned to the healing potential of thunder god vine. Research of the remedy included a double-blind trial performed in China during the 1980s. Among the researchers was physician Xue-Lian Tao, a former post-doctoral fellow at University of Texas Southwestern Medical Branch (UTSMB). In the study, the scientists and the research subjects (over 2,000 patients) did not know whether participants received the extract or a placebo. Patients reported that the remedy reduced the symptoms of rheumatoid arthritis.

Tao returned to the United States and continued research with Dr. Peter Lipsky, then-director of the Harold C. Simmons Arthritis Center at the University of Texas. Research in the United States focused on finding a safe dosage of thunder god vine, and locating the part of the plant that appeared to ease arthritis **pain**. Lipsky reported that in 1994 the team evaluated toxicity of the vine, and found "very little" toxicity, thus reducing the possibility of poisoning. They also saw the potential in the herbal remedy.

During the 1990s, researchers at UTSMB studied the plant's effectiveness in treating the symptoms of inflammatory conditions such as rheumatoid arthritis (RA). If thunder god vine is proven safe and effective for medical treatment of RA, researchers hope it may also be approved to treat other autoimmune conditions. These include lupus (a rheumatic condition that affects the skin and tissue, producing symptoms of rash, joint pain, and inflammation) and psoriasis—this inflammatory condition causes portions of the skin to raise, turn red, and scale. By 1998, the research team had developed a root extract from the plant that could be studied for its effectiveness in providing relief of arthritis symptoms. They named the extract "Texas Ethyl Acetate" (TEA), and applied to the United States Food and Drug Administration (FDA) for permission to test the extract on arthritis patients.

The FDA issued permission for the thunder god vine research using root extract. Studies were done through UTSMB and the National Institutes of Health (NIH). In 1999, Lipsky was named scientific director of NIH's National Institute of Arthritis and Muscoskeletal and Skin Diseases (NIAMS).

In 2002, NIAMS announced the results of a 20-week study involving 21 rheumatoid arthritis patients. Patients received a high-dose extract, low-dose extract, or a placebo. After four weeks, rapid improvement in symptoms was reported by 80% of those in the high-dose group, and in 40% of low-dose participants. There was no change was reported by people who took placebos. Lipsky rated the results as promising, saying that the extract slowed down an overactive immune system.

Response to the NIAMS study was generally positive. However, some scientists noted that the test group was small and the trial lasted only 20 weeks. Lipsky announced in 2002 that additional research was planned, using thunder god vine to treat RA and conditions such as lupus.

Prior to the NIAMS study, researchers imported thunder god vine root extract from China, where its medicinal use stretches back thousands of years. In 2002, after news of the NIAMS study was released, it was announced that Phytomedics Inc., a New Jersey biopharmaceutical company, was growing thunder god vine. Phytomedics Inc. renamed the extract "PMI-001," and announced plans to develop a botanical drug for the treatment of arthritis. The New Jersey-based company partnered with Pfizer, another pharmaceutical company, to manufacture the drug. As of 2008, the PMI-001 product had not been brought to the FDA.

Preparations

The remedy portion of thunder god vine is the vascular part of the root, the interior section consisting

of cells that carry water and food to the plant. The plant interior is dried and cut into pieces for processing.

Thunder god vine is available in the United States, where it has been advertised as a Chinese herb that may offer temporary relief for conditions such as aches, joint pain, colds, **fatigue**, **insomnia**, **stress**, and **anxiety**. The herbal remedy has been sold on the Internet, where a California business offers thunder god vine in pill form. The business recommended a daily dosage of two pills taken with warm water.

After UTSMB received approval from the FDA, researchers extracted the active ingredient from the plant. The process involved extracting ethanol and acetate from the root. The extract powder was then packaged into capsules.

According to the Arthritis Foundation, some research participants took a daily dosage of 30 milligrams of thunder god vine extract.

Precautions

No standard, safe dosage of thunder god vine had been established. The herb's use as a diet supplement has not been evaluated for safety or content of the product. Herbal supplements are not regulated by the FDA; therefore, ordering this product carries risks. The consumer has no assurance about the strength of the dosage or the portion of the plant used to make the supplement.

In the United States, thunder god vine cannot be marketed as a drug until it receives FDA approval, a process that includes evaluation of a product for safety and effectiveness. This preliminary review is not required for herbs marketed as diet supplements. However, the FDA can stop the sale of supplements determined to be unsafe.

The leaves and flowers of thunder god vine are very toxic and may cause death. Extreme caution in purchasing is advised to ascertain that the supplement is a proper extraction made only from the interior of the plant root.

Side effects

Thunder god vine is toxic and could be lethal if not properly extracted.

In the Chinese 1980s double-blind trial, some people experienced **diarrhea** and related gastrointestinal disturbances. Tao reported that those side effects disappeared as people continued treatment. Moreover, side effects in the NIAMS study were described as "minor."

According to the Arthritis Foundation, possible side effects of thunder god vine include upset stomach and skin reactions. Men may experience temporary **infertility**, while women may have a lack of **menstruation** (**amenorrhea**).

Interactions

People taking immunosuppressive drugs such as prednisone should not use thunder god vine.

Resources

PERIODICALS

Balick, Michael J., and Roberta Lee. "Digging in the Herb Garden: Responding to a Patient's Query About Thunder God Vine." *Alternative Therapies* (November/December 2001): 100 3.

OTHER

DeNoon, Daniel. "Chinese Herb May Ease Arthritis." (August 13, 2002. *WebMD* [cited April 30, 2004]. http://www.my.webmd.com.

Freeman, Elizabeth. "Chinese Thunder God Vine Gives Relief from Rheumatoid Arthritis Symptoms." National Institute of Arthritis and Musculoskeletal and Skin Diseases. October 2002. [cited April 30, 2004]. http://www.niams.nih.gov/ne/highlights/spotlight/2002/thunder.htm.

National Institute of Arthritis and Musculoskeletal and Skin Diseases. [cited April 30, 2004]. http://www.niams.nih.gov.

Phytometics Inc. [cited April 30, 2004]. http://www.phytometics.com.

United States Food and Drugs Administration. [cited April 30, 2004]. http://www.fda.gov.

University of Texas Southwestern Medical Center. [cited April 30, 2004] http://www.swmed.edu.

Liz Swain

Thyme

Description

Thyme (*Thymus vulgaris L.*) known as garden thyme, and *T. serpyllum*, known as creeping thyme, mother of thyme, wild thyme, and mountain thyme, are two similarly beneficial evergreen shrubs of the Labiatae or mint family. The aromatic thyme is a perennial native of southern Europe and the western Mediterranean. Thyme is extensively cultivated, both commercially and in home gardens, as a culinary and medicinal herb. There are hundreds of species of thyme.

Thyme. *(© Arco Images / Alamy)*

Garden thyme grows from a woody, fibrous root to produce thin, erect, stems up to 15 in (38 cm) high. It is most commonly cultivated for its culinary uses. Wild thyme is found growing on heaths, in sheep pastures, and mountainous areas in temperate regions. It was probably introduced to North America by European colonists, and has escaped cultivation. Wild thyme produces long, low-lying, sprawling and creeping stems. This habit inspired the designation *serpyllum* referring to the serpent-like growth of the species. Thyme has tiny, narrow, gray-green leaves that grow in opposite pairs on the square, woody stems. The edges of the stalkless, slightly hairy leaves are rolled inward. The blossoms may be white to rose colored or a blue to purple hue, depending on the species and variety. Flowers are tiny and tubular and grow in terminal clusters up to 6 in (15.2 cm) long. Flowering time is mid-summer. Seeds are minuscule and abundant. Thyme thrives in sunny locations on dry, stony banks and heaths. The aromatic herb attracts bees that produce a uniquely flavored honey from the herb. It also acts to repel whiteflies.

Thyme has been known since ancient times for its magical, culinary, and medicinal virtues. Tradition held that an infusion of thyme taken as a tea on midsummer's eve would enable one to see the fairies dancing. Young women wore a corsage of blossoming thyme to signal their availability for romance. The generic name may have been inspired by one of thyme's traditional attributes. Greek folk herbalists believed that thyme would impart courage (*thumus* in Greek) to those who used the herb, particularly soldiers. Greek men particularly liked the pungent scent of thyme and would rub the herb on their chests. The Roman people believed that adding thyme to bath water would impart energy. They also included thyme in bedding to chase melancholy and to prevent nightmares. The strong scent of thyme was employed as a moth repellent, and burned as fumigating incense. The philosopher-herbalist Pliny the **Elder** recommended burning the dried herb in the house to "put to flight all venomous creatures." In the kitchen thyme has been used for centuries to season sauces, soups, stuffing, and soups. Thyme has long been recognized for its antiseptic properties. The Egyptians used the herb in formulas for embalming the dead. The herb was among those burned in sickrooms to help stop the spread of disease. The oil of thyme was used on surgical dressings and in times of war, as recently as World War I, to treat battle **wounds**.

General use

The fresh and dried leaf, and the essential oil extracted from the fresh flowering herb, are medicinally potent. Thyme is one of the most versatile herbs for use in home remedies. It is aromatic, antiseptic, diaphoretic (increases perspiration), analgesic, antispasmodic, and diuretic. It acts as an emmenagogue (increases menstrual discharge), carminative (expels **gas**), and stimulant. Thyme's essential oil contains the crystalline phenol known as thymol, a powerful and proven antibiotic and disinfectant that enhances the immune system and fights infection. The aromatic and medicinal strength of the essential oil varies with the species harvested. The essential oil exerts a swift and effective action against bacteria. With external application, the essential oil is especially good for maintaining the health of the teeth and gums and relieving **toothache**. An ointment made with the essential oil is used to disinfect **cuts** and wounds, and is effective against the fungi that cause athletes' foot. As a massage oil, thyme can relieve rheumatism, **gout**, and **sciatica** (**pain** along the course of a sciatic nerve, especially in the back of the thigh). As an ingredient in

Thyme plant. *(Photo by Kelly Quin. Reproduced by permission.)*

a lotion used as a chest rub, thyme will help break up catarrh (inflammation of the mucous membrane) of the upper respiratory tract. A strong decoction of the leaves and flowers, added to the bath water, will stimulate circulation. When used as a hair rinse, combined with a scalp massage, the herb decoction may help to prevent **hair loss**.

Taken internally as an infusion or syrup, thyme is an effective remedy for ailments of the respiratory, digestive, and genitourinary systems. The herb relaxes the bronchial muscles, helping to quell dry coughs. The warm infusion can relieve **migraine headache**, **colic**, and flatulence, promote perspiration, and expel **worms**. A strong decoction, sweetened with honey, is good for easing the spasms of **whooping cough** and expelling catarrh. The infused herb can be used as a gargle for **sore throat**. Taken warm, thyme tea will bring relief for menstrual pain, and relieve **diarrhea**. Thyme has an antioxidant effect and is a good tonic and digestive tea. The phytochemicals (plant chemicals) in thyme include tannins, **bitters**, essential oil, terpenes, flavonoids, and saponins.

Preparations

The aerial parts of thyme can be harvested before and during flowering. The leaves should be removed from the woody stems and placed in single layers on a paper-lined tray in a warm, airy room, out of direct sunlight, or hung to dry in bunches in a shady location. The dried leaf should be stored in dark glass, tightly sealed, and clearly labeled containers. Thyme can also be frozen for later use.

Infusion: Two ounces of fresh thyme leaf (less if dried) are placed in a warmed glass container, and 2.5 cups of fresh, nonchlorinated, boiling water are added to the herbs. Twice as much herb is used in preparing an infusion for use as a gargle or bath additive. The tea should be covered and infused from 10-30 minutes, depending on the strength desired. After straining, the prepared tea will store for about two days in the refrigerator. Thyme tea may be enjoyed by the cupful as a tonic beverage taken after meals up to three times a day.

Tincture: Four ounces of finely-cut fresh or powdered dry herb are combined with 1 pt of brandy, gin, or vodka in a glass container. There should be enough

KEY TERMS

Flavonoids—A group of aromatic compounds that includes many pigments. As a group, they are considered antioxidants.

Tannins—Plant substances used in dyeing and tanning.

Terpenes—Hydrocarbons found especially in essential oil.

Saponins—Glucosides that occur in plants and produce a soapy lather.

alcohol to cover the plant parts and have a 50:50 ratio of alcohol to water. The mixture is stored away from light for about two weeks, and needs to be shaken several times each day. The mixture is strained and then stored in a tightly-capped, dark glass bottle. A standard dose is one-half to one teaspoon of the tincture, taken in hot water, up to three times a day.

Essential oil: Commercial extracts of the essential oil of thyme are available. These are not to be taken internally. The essential oil must be diluted in water or vegetable oil, such as almond or sunflower oil, before applying to minimize the toxicity. The oil contains thymol, a component in many commercially available antiseptics, mouthwash, toothpaste, and gargle preparations. It is antibacterial and antifungal.

Precautions

Very small amounts of thyme used in culinary preparations are generally safe. In large amounts, thyme acts as a uterine stimulant. Pregnant women should not use the herb, tincture, or the essential oil of thyme.

Excessive use of the undiluted essential oil is toxic. If the oil is ingested, it may cause gastrointestinal distress such as diarrhea, **nausea**, and **vomiting**. Other adverse toxic effects may include **headache**, muscular weakness, and **dizziness**. The oil of thyme may act to slow the heartbeat, depress respiration, and lower body temperature. Applied externally in undiluted form the essential oil may cause skin irritation. The oil should be diluted before use.

Side effects

The U. S. Food and Drug Administration (FDA) has rated thyme as "food safe." The *PDR For Herbal Medicine* lists "No health hazards or side effects" when the herb is properly administered in designated therapeutic dosages.

Interactions

None reported.

Resources

BOOKS

Duke, James A., Ph.D. *The Green Pharmacy*. Pennsylvania: Rodale Press, 1997.

Elias, Jason, and Shelagh Ryan Masline. *The A to Z Guide to Healing Herbal Remedies*. Lynn Sonberg Book Associ ates, 1996.

Foster, Steven, and James A. Duke. *Peterson Field Guides, Eastern/Central Medicinal Plants*. Boston New York: Houghton Mifflin Company, 1990.

Gibbons, Euell. *Stalking The Healthful Herbs, Field Guide Edition*. New York: David McKay Company, Inc., 1974

Hutchens, Alma R. *A Handbook Of Native American Herbs*. Boston: Shambhala Publications, Inc., 1992.

Kowalchik, Claire, and William H.Hylton. *Rodale's Illus trated Encyclopedia of Herbs*. Pennsylvania: Rodale Press, 1987

Lust, John. *The Herb Book* New York: Bantam Books, 1974.

Magic And Medicine of Plants. The Reader's Digest Asso ciation, Inc. 1986.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, Inc., 1997.

Meyer, Joseph E. *The Herbalist*. Clarence Meyer, 1973.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. New Jersey: Medical Economics Company, 1998.

Phillips, Roger, and Nicky Foy. *The Random House Book of Herbs*. New York: Random House, Inc., 1990.

Polunin, Miriam, and Christopher Robbins. *The Natural Pharmacy*. New York: Macmillan Publishing Com pany, 1992.

Prevention's 200 Herbal Remedies. Pennsylvania: Rodale Press, Inc., 1997.

Schar, Douglas. *The Backyard Medicine Chest, An Herbal Primer*. DC: Elliott & Clark Publishing, 1995.

Thomson, M.D., William A. R. *Medicines From The Earth, A Guide to Healing Plants*. San Francisco: Harper & Row, 1978.

Tyler, Varro E., Ph.D. *Herbs Of Choice, The Therapeutic Use of Phytomedicinals*. New York: The Haworth Press, Inc., 1994

ORGANIZATIONS

National Association of Holistic Aromatherapy. 836 Hanley Industrial Court, St. Louis, MO 63144. 888 ASK NAHA. http://www.naha.org.

Clare Hanrahan
Teresa G. Odle

TIA *see* **Stroke**

Tibetan medicine

Definition

Tibetan medicine differs from allopathic medicine in that it has no concept of "illness" as such, but rather the concept is of "disharmony" of the organism. Accordingly, this system of medicine, like many alternative therapies, seeks to achieve a harmony of the self.

Medicine is one of five branches of Tibetan science, and is known to the Tibetans as gSoba Rig-pa—the science of healing. The Tibetan pharmacopoeia utilizes many different elements in the treatment of disease, such as trees, rocks, resins, soil, precious metals, sap, and so on, but like Chinese medicine, to which it is related, it mainly relies on herbs for treatment.

Origins

Tibetan medicine, like its relative Chinese medicine, is an ancient art that has become associated with many legends and is surrounded by a shroud of mysticism. Although Tibetan culture is more recent, Tibetan medical practices can be traced back over 2,500 years. It is now practiced in secret or by those in exile since communist rule has suppressed it in its country of origin.

The treatise of Tibetan medicine, which can be described as a manual compiled over thousands of years, is called the "Chzud-shi." In addition to the medical theory, this manual also incorporates the Tibetan pharmacopoeia.

Benefits

Tibetan medicine has been particularly successful at treating chronic conditions such as rheumatism, arthritis, ulcers, digestive problems, **asthma**, hepatitis, **eczema**, liver disorders, sinus problems, emotional disorders and nervous system problems. Like many alternative therapies, it is a holistic therapy that treats the whole person and encourages a healthy way of life that will promote well being at all levels.

Description

Harmony and the balance of all aspects of the human organism are the concepts that form the basis for Tibetan medicine. The three elements that must be kept in harmony are known collectively as the Nyipa sum, and they are rLung, mKhris-pa, and Bad-kan. It is said that the Tibetan words describing their medicine are very difficult to translate, rather an explanation of the meaning is attempted. Desire, hatred, and delusion are considered to be very harmful influences affecting this harmony, and illustrate the close connection between the Tibetan medical art and Buddhist teachings.

KEY TERMS

Decoction—To extract the water-soluble substances in a drug or medicinal herb by boiling.

Pharmacopoeia—A reference book containing a list of medicinal substances used by a particular medical stream or area.

rLung is considered to be a "subtle flow of energy" that is most closely connected with the "air" element. However, since all five elements; earth, water, fire, air and space, in addition to the concept of "hot" and "cold" play a complex role in the health of the individual, this is no simple matter. All elements and aspects are held to be interdependent.

Types of rLung:

- *Srog-'dzin* (life-grasping rLung). Located in the brain, governs swallowing of food, breathing, spitting, sneezing, and the clearing and steadying of the mind.
- *Gyen-rgyu* (rLung moving upwards). Located in the chest, it governs speech, physical vigor, general health, and appearance of skin.
- *Khyab-byed* (all pervading rLung). Located in the stomach, it governs digestion, metabolism, and the seven physical sustainers referred to as lus-zung dhun.
- *Thur-sel* (downward cleansing rLung). Located in the rectum, it governs the elimination of waste products and reproductive fluids in addition to the birth process (for women).

Types of mKhris-pa:

- *mKhris-pa* is the heat of human nature, related to fire, described as oily, sharp, hot, light, pungent and moist. Its major function is to balance body temperatures. Governs hunger and thirst, and regulates skin condition. There are five types of mKhris-pa.
- *Ju-byed*. This is located between the stomach and the intestine. Governs digestion and assimilation, providing heat and energy.
- *SGrub-byed*. Located in the heart. Responsible for anger, aggression, and hatred, and is considered to lead to desire, achievement, and ambition.

- *mDangs-sgur*. Located in the liver, it is responsible for maintaining and promoting color and essential components of blood.
- *mThong-byed*. Located in the eye, it governs vision.
- *mDog-sel*. Located in the skin, it governs skin appearance and texture.

Types of Bad-kan:

- *rTen-byed* (supporting Bad-kan). Located in the chest, plays a supporting role to the other four types of Bad-kan.
- *Myag-byed* (mixing Bad-kan). Located in the upper half of the body. Mixes nutrients (liquids and solids).
- *Myong-byed* (experiencing Bad-kan). Located in the tongue, governs experience of taste.
- *Tsim-byed* (satisfaction Bad-kan). Located in the head. Governs the five senses and responsible for heightening their power.
- *Byor-byed* (joining Bad-kan). Located in the joints, it is considered responsible for their flexibility.

When these components of Nyipa sum are balanced, the seven bodily sustainers will also be in harmony. They are essential nutrients, blood, muscle tissue, fat, bone, marrow, and reproductive fluids.

Diagnosis

A practitioner of Tibetan medicine will employ several diagnostic tools. Chief of these is a very complicated system of pulse reading, which involves 13 different positions, with a possibility of over 300 different readings. This is similar to traditional Chinese medicine and **Ayurvedic medicine**. The pulse is likened to a messenger between doctor and patient. For this diagnosis to be efficient, it is necessary for the patient to be rested and relaxed.

Another tool of diagnosis is observation, which consists of urine analysis and examining the tongue. To examine the urine, a physician will assess the color, vapor, odor, bubbles, sediments, and albumin content. The color of urine is determined by food and drink, the seasons, and whatever diseases the patient suffers from.

The final tool of diagnosis is questioning. The physician will ask specific questions of his patient, and will include questions such as how and when the illness started, where **pain** is felt, and if the condition is affected by foods eaten.

Treatment

Treatment is divided into four categories, which are dietary advice, lifestyle recommendations, the prescription of medicine, and if necessary, surgical procedures, according to the type of patient. Treatment proceeds in this order, according to the seriousness of the disorder. For example minor problems are considered to need merely a reassessment of dietary habits, but only in the most serious cases will surgery be considered.

Preparations

A Tibetan physician prescribes medicines and recommends surgery as a last resort. When it is necessary, the prescription is likely to be made up from certain herbs in the form of a decoction, powder, or pills. The prescription will be made up at one of the branches of the Tibetan Medical Institute specifically for each patient.

Precautions

The qualifications of any physician should be checked before treatment proceeds.

Side effects

As a natural therapy, Tibetan medicine, if administered correctly, is not known to be associated with any side effects. According to their medical treatise, one of the criteria for medical prescriptions is that it should be absolutely harmless.

Research and general acceptance

The Tibetan system of medicine has roots in medical practices over 2,500 years old, so it can be considered well researched. Despite the communist crackdown in Tibet, and the oppression and persecution of their physicians, the Tibetan people still prefer to seek the advice of a traditional physician rather than take advantage of "new" systems of medicine recently introduced.

In 1994, the Natural Medicine Research Unit, (NMRU) of Hadassah University Hospital in Jerusalem began double-blind, randomized clinical trial of Tibetan herbal formulas which have been on sale in Switzerland for more than seventeen years. Previous trials had already demonstrated the harmlessness of these formulas. The aim of the unit is to compile a database of Tibetan formulas.

Training and certification

The headquarters of the main Tibetan medical institute is now in Dharamsala in northern India. Tibetan medicines are also manufactured there. The minimum period of training for a Tibetan physician is seven years. The first five years mainly consists of theoretical training, and for the sixth and seventh

years, medical students are sent for a period of practical training under a senior physician at one of the Institute's branches, of which there are over 30 in India and Nepal.

Resources

BOOKS

Clark, Barry, ed. *The Quintessence Tantras of Tibetan Medicine*. Snow Lion Publications, 1995.

Donden, Yeshi. *Healing from the Source*. Snow Lion Publications, 2000.

ORGANIZATIONS

The official Website of the exiled Tibetan government. http://www.tibet.com/Med_Astro/tibmed.html.

OTHER

World around BaiKal. http://www.pitt.edu/~jpc7/baikal/5.htm.

Patricia Skinner

Tineas pedis *see* **Athlete's foot**

Tinnitus

Definition

Tinnitus is a condition where the patient hears ringing, buzzing, or other sounds without an external cause. Patients may experience tinnitus in one or both ears or in the head.

Description

Tinnitus affects as many as 40 million adults in the United States. It is defined as either objective or subjective. In objective tinnitus, the doctor can hear the sounds, as well as the patient. Objective tinnitus is typically caused by tumors, turbulent blood flow through malformed vessels, or by rhythmic muscular spasms. Most cases of tinnitus are subjective, which means that only the patient can hear the sounds.

Causes and symptoms

Subjective tinnitus is frequently associated with **hearing loss** and damage to the cochlea, or the inner ear. About 90% of patients have sensorineural hearing loss; 5% suffer from conductive hearing loss; 5% have normal hearing.

The causes of subjective tinnitus include:

- impacted ear wax
- ear infections

A patient with tinnitus hears ringing, buzzing, or other sounds without an external cause. *(© ACE STOCK LIMITED / Alamy)*

- hardening of the structures of the inner ear
- hearing loss related to age
- prolonged exposure to excessive noise
- ototoxic medications, including aspirin, quinine, some diuretics, heavy metals, alcohol, and certain antibiotics
- Ménière's syndrome
- head trauma
- systemic diseases, including syphilis, hypertension, anemia, or hypothyroidism
- tumors of the ear

Diagnosis

Diagnosis of tinnitus includes a physical examination of the patient's head and neck. The doctor will use an instrument called an otoscope to examine the ears for wax, infection, or structural changes. He or she will

also use a stethoscope to listen to the blood vessels in the neck.

The patient's doctor may also refer him or her to an audiologist, who is a health care professional trained to perform diagnostic testing of hearing problems.

In some cases, tinnitus is a symptom of temporomandibular joint disorder, or TMJ, which is caused by dysfunction of the temporomandibular joint in the jaw. The muscles and nerves in the jaw are located very close to the nerves that control hearing, which is why TMJ can cause tinnitus. Patients with tinnitus may be referred to a dentist or orthodontist for assessment of their jaw muscles or a misaligned bite.

Additional tests may include the following:

Tuning fork tests

The Rinne and Weber tests are commonly used to evaluate the type and severity of hearing loss. In the Weber test, the doctor holds a tuning fork against the patient's forehead or front teeth. If the hearing loss is sensorineural, the sound radiates to the ear with better hearing; if the hearing loss is conductive, the sound will be louder in the damaged ear. In the Rinne test, the tuning fork is placed alternately on the mastoid bone, which is behind the ear, and then in front of the ear. In conductive hearing loss, bone conduction (BC) is greater than air conduction (AC). In sensorineural hearing loss, AC is greater than BC.

Diagnostic imaging

Magnetic resonance angiography or venography (MRA and MRV) can be used to evaluate malformations of the blood vessels. Computed tomography scans (CT scans) or magnetic resonance imaging scans (MRIs) can be used to locate tumors or abnormalities of the brain stem.

Blood tests

The doctor may order a complete blood count (CBC) with specific antibody tests to rule out **syphilis** or immune system disorders.

Treatment

Dietary adjustments, including the elimination of coffee and other stimulants, may be useful in treating tinnitus. In addition, reducing the amount of fat and **cholesterol** in the diet can help improve blood circulation to the ears. Nutritional supplementation with **vitamin C**, **vitamin E**, B vitamins, **calcium**, **magnesium**, **potassium**, and **essential fatty acids** is also recommended.

KEY TERMS

Audiologist—A health care professional who performs diagnostic testing of impaired hearing.

Cochlea—The hearing part of the inner ear. This snail-shaped structure contains fluid and thousands of microscopic hair cells tuned to various frequencies, in addition to the organ of Corti (the receptor for hearing).

Conductive hearing loss—Hearing loss caused by loss of function in the external or middle ear.

Ménière's syndrome—A disease of the inner ear, marked by recurrent episodes of loss of balance (vertigo) and roaring in the ears lasting several hours. Its cause is unknown.

Ototoxic—Damaging to the nerves controlling the senses of hearing and balance.

Sensorineural hearing loss—Hearing loss caused by damage to the nerves or parts of the inner ear that control the sense of hearing.

In particular, **zinc** supplements have been recommended for patients diagnosed with tinnitus. A recent Turkish study has confirmed that older people whose **diets** have been deficient in zinc may benefit from supplements of this mineral as a treatment for tinnitus, but that younger patients eating well-balanced dietsdo not find that their symptoms improve when they take zinc supplements. The American Tinnitus Association comments that zinc supplements "... generally carry little risk to health and some people find them helpful."

Gingko biloba, an herbal extract, has been shown to decrease tinnitus symptoms in controlled animal studies and may be helpful in treating humans, since it is believed to enhance circulation to the brain in situations where reduced circulation is the cause. Individuals taking such blood thinners as coumadin or heparin should not take *Ginkgo biloba,* as the herb can interfere with platelet activating factor, the chemical that enables blood to clot.

Acupuncture treatments may help decrease the level of tinnitus sounds the patient hears, and constitutional homeopathic treatment may also be effective. Some Chinese herbal treatments can be effective, as well.

Tinnitus Retraining Therapy, or TRT, has been successful in treating some subjective tinnitus patients. This therapy is based on the assumption that the severity of tinnitus is determined not by the patient's auditory system, but by the parts of the brain that

control emotion (the limbic system) and body functions (autonomic nervous system). TRT focuses on habituating the patient to his or her tinnitus, retraining the brain to, in effect, "become used to" the tinnitus so that it does not perceive it as an annoyance.

Allopathic treatment

Some cases of tinnitus can be treated by removal of the underlying cause. These include surgical treatment of impacted ear wax, tumors, head injuries, or malformed blood vessels; discontinuance of ototoxic medications; and antibiotic treatment of **infections**.

Patients whose tinnitus is related to TMJ usually experience improvement in or complete disappearance of the tinnitus when the dental problem is corrected.

Subjective tinnitus, especially that associated with age–related hearing loss, can be treated with hearing aids, noise generators or other masking devices, **biofeedback**, antidepressant medications, or lifestyle modifications.

One mainstream form of **psychotherapy** that is recommended to patients with tinnitus is cognitive-behavioral therapy, or CBT. CBT works by changing the patient's emotional reaction to the tinnitus. The patient keeps a symptom diary and works on an individual basis with a counselor to identify negative thought patterns and behaviors related to the tinnitus and then changes them. The latest innovation in CBT for tinnitus is therapy via the Internet. According to a 2002 study by a group of Swedish researchers, 31% of patients who participated in a CBT program via the Internet reported significant relief from tinnitus at 1-year follow-up.

Expected results

The prognosis depends on the cause of the tinnitus and the patient's emotional response. Most patients with subjective tinnitus do not find it seriously disturbing, but about 5% have strong negative feelings. These patients are frequently helped by instruction in **relaxation** techniques.

Studies indicate that CBT is most effective as a treatment for tinnitus when it is combined with masking techniques or medication.

Prevention

One preventive measure is to wear earplugs when operating loud machinery or spending extended periods in such noisy environments as rock concerts. Prolonged exposure to noises of 90 decibels (about as loud as a running blender) or higher can cause permanent hearing loss and tinnitus. In some cases a change of occupation may be advisable; a recent British study found that as many as 266,000 men and 84,000 women in the United Kingdom between the ages of 35 and 64 suffer from tinnitus resulting from work-related noise.

More detailed information and advice on dealing with tinnitus associated with noise-induced hearing loss is available from the National Institute on Deafness and Communication Disorders (NIDCD), listed under Resources below.

Resources

BOOKS

House, John W. "Tinnitus." In *Conn's Current Therapy,* edited by Robert E. Rakel. Philadelphia: W. B. Saunders, 1998.

Jackler, Robert K., and Michael J. Kaplan. "Ear, Nose, & Throat." In *Current Medical Diagnosis & Treatment 1998,* edited by Lawrence M. Tierney, Stephen J. McPhee, and Maxine Papadakis. Stamford, CT: Appleton & Lange, 1997.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Tin nitus." New York: Simon & Schuster, 2002.

"Tinnitus." Section 7, Chapter 82 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2001.

PERIODICALS

Andersson, G., T. Stromgren, L. Strom, and L. Lyttkens. "Randomized Controlled Trial of Internet Based Cog nitive Behavior Therapy for Distress Associated with Tinnitus." *Psychosomatic Medicine* 64 (September October 2002): 810 816.

Delb, W., R. D′Amelio, C. J. Boisten, and P. K. Plinkert. "Evaluation of the Tinnitus Retraining Therapy as Combined with a Cognitive Behavioral Group Ther apy" [in German] *HNO* 50 (November 2002): 997 1004.

Henry, J. A., M. M. Jastreboff, P. J. Jastreboff, et al. "Assessment of Patients for Treatment with Tinnitus Retraining Therapy." *Journal of the American Academy of Audiology* 13 (November December 2002): 523 544.

Jastreboff, P.J., W.C. Gray, and S.L. Gold. "Neurophysio logical Approach to Tinnitus Patients." *American Journal of Otology* 17 (1996): 236 240.

Palmer, K. T., M. J. Griffin, H. E. Syddall, et al. "Occupa tional Exposure to Noise and the Attributable Burden of Hearing Difficulties in Great Britain." *Occupational and Environmental Medicine* 59 (September 2002): 634 639.

Schechter, M. A., and J. A. Henry. "Assessment and Treat ment of Tinnitus Patients using a 'Masking Approach.'" *Journal of the American Academy of Audiology* 13 (November December 2002): 545 558.

Yetiser, S., F. Tosun, B. Satar, et al. "The Role of Zinc in Management of Tinnitus." *Auris Nasus Larynx* 29 (October 2002): 329 333.

ORGANIZATIONS

American Academy of Audiology. 11730 Plaza America Drive, Suite 300, Reston, VA 20190. (703) 790 8466. www.audiology.org.

American Tinnitus Association. P.O. Box 5, Portland, Ore gon 97207 0005. (800) 634 8978 or (503) 248 9985. www.ata.org.

Better Hearing Institute. 515 King Street, Suite 420, Alex andria, VA 22314. (703) 684 3391.

National Institute on Deafness and Other Communication Disorders (NIDCD), National Institutes of Health. 31 Center Drive, MSC 2320. Bethesda, MD 20892 2320. www.nidcd.nih.gov.

Vestibular Disorders Association (VEDA). PO Box 4467, Portland, OR 97208 4467. (800) 837 8428. www. vestibular.org.

OTHER

National Institute on Deafness and Other Communication Disorders (NIDCD). *Noise Induced Hearing Loss*. Bethesda, MD: NIDCD, 2002. NIH Publication No. 97 4233. www.nidcd.nih.gov/health/hearing/noise/asp.

Paula Ford-Martin
Rebecca J. Frey, PhD

TMJ *see* **Temporomandibular joint syndrome**

Tocopherol *see* **Vitamin E**

Tomatis method *see* **Auditory integration training**

Tongue diagnosis *see* **Traditional Chinese medicine**

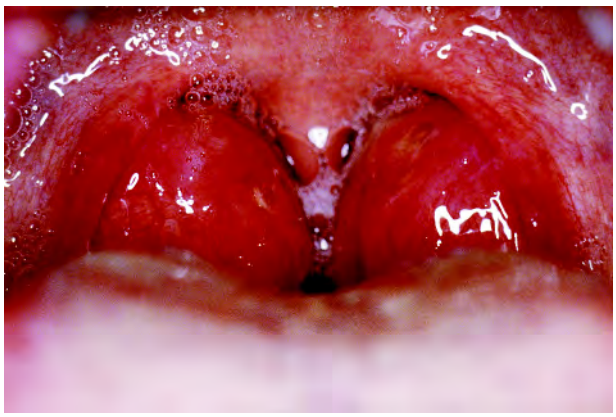
Tonsillitis

Definition

Tonsillitis is an infection and swelling of the tonsils, which are oval-shaped masses of lymph gland tissue located on both sides of the back of the throat.

Description

The tonsils normally help to prevent **infections**. They act like filters to trap bacteria and viruses entering the body through the mouth and sinuses. The tonsils also stimulate the immune system to produce antibodies which fight off infections. Anyone can have tonsillitis; however, it is most common in children between the ages of five and 10 years.



Acute tonsilitis. *(Biophoto Associates / Photo Researchers, Inc.)*

Causes and symptoms

Tonsillitis is caused by viruses or bacteria that cause the tonsils to swell and become inflamed. A mild or severe **sore throat** is one of the first symptoms of tonsillitis. Symptoms can also include **fever**, **chills**, lethargy, muscle aches, **earache**, **pain** or discomfort when swallowing, and swollen glands in the neck. Young children may be fussy and stop eating. When a doctor or nurse looks into the mouth with a otoscope, the tonsils may appear swollen and red. Sometimes, they will have white or yellow spots and a thin mucous coating. Symptoms usually last four to six days.

Diagnosis

The diagnosis of tonsillitis is made from the visible symptoms and a physical examination of the patient. The doctor will examine the eyes, ears, nose, and throat, looking at the tonsils for signs of swelling, redness, or a discharge. A careful examination of the throat is necessary to rule out diphtheria and other conditions which may cause a sore throat. Since most sore throats in children are caused by viruses rather than bacteria, the doctor may take a throat culture or rapid diagnostic test in order to test for the presence of streptococcal bacteria. A throat culture is performed by wiping a cotton swab across the tonsils and back of the throat and sending the swab to a laboratory for culturing. *Streptococcus pyogenes*, the bacterium that causes **strep throat**, is the most common disease agent responsible for tonsillitis. Depending on what type of test is used for strep, the doctor may be able to determine within a few minutes if *S. pyogenes* is present. The quick tests for strep are not as reliable as a laboratory culture, which can take 24-48 hours. If the results of a quick test are positive, however, the doctor can prescribe antibiotics right away. If the quick test results are negative, the doctor can do a throat culture

KEY TERMS

***Streptococcus pyogenes*—**A common bacterium that causes strep throat and can also cause tonsillitis.

Tonsils—Oval-shaped masses of glandular tissue located on both sides at the back of the throat. Tonsils act like filters to trap bacteria and viruses.

to verify the results and wait for the laboratory report before prescribing antibiotics. A blood test may also be done to rule out a more serious infection or condition, and to check the white blood cell count to see if the body is responding to the infection. In some cases, the doctor may order blood tests for **mononucleosis**, since about a third of patients with mononucleosis develop infections in the tonsils.

Treatment

Treatment of tonsillitis usually involves keeping the patient comfortable while the illness runs its course. This supportive care includes bed rest, drinking extra fluids, gargling with warm salt water, and taking pain relievers to reduce fever. Frozen juice bars and cold fruit drinks can bring some temporary relief of sore throat pain and drinking warm tea or broth can be soothing.

Strengthening the immune system is important whether tonsillitis is caused by bacteria or viruses. Naturopaths often recommend dietary supplements of **vitamin C**, **bioflavonoids**, and beta-carotenes–found naturally in fruits and vegetables–to ease inflammation and fight infection. A variety of herbal remedies also may be helpful in treating tonsillitis. **Calendula** (*Calendula officinalis*) and cleavers (*Galium aparine*) target the lymphatic system, while **echinacea** (*Echinacea spp.*) and **astragalus** (*Astragalus embranaceus*) stimulate the immune system. **Goldenseal** (*Hydrastis canadensis*), **myrrh** (*Commiphora molmol*), and bitter orange (*Citrus aurantium*) act as antibacterials. *Lomatium dissectum* and *Ligusticum porteri* have an antiviral action.

Some of the homeopathic medicines that may be used to treat symptoms of tonsillitis include *Belladonna*, *Phytolacca*, *Mercurius*, *Lycopodium*, *Lachesis*, ***Hepar sulphuris***, *Arsenicum*, or *Rhus toxicodenedron*. As with any condition, the treatment and dosage should be appropriate for the particular symptoms and age of the patient. Other demulcent herbs include teas made with **slippery elm** bark, wild cherry, and **licorice**.

Allopathic treatment

If the throat culture shows that *S. pyogenes* is present, penicillin or other antibiotics will be prescribed. An injection of benzathine or procaine penicillin may be most effective in treating the infection, but it is also painful. If an oral antibiotic is prescribed, it must be taken for the full course of treatment, which is usually in 10-14 days.

Expected results

Tonsillitis is usually resolved within a few days with rest and supportive care. Treating the symptoms of sore throat and fever will make the patient more comfortable. If fever persists for more than 48 hours, however, or is higher than 102°F (39°C), the patient should be seen by a doctor. If antibiotics are prescribed to treat an infection, they should be taken as directed for the complete course of treatment, even if the patient starts to feel better in a few days. Prolonged symptoms may indicate that the patient has other upper respiratory infections, most commonly in the ears or sinuses. An **abscess** behind the tonsil (a peritonsillar abscess) may also occur. In rare cases, a persistent sore throat may point to more serious conditions, such as **rheumatic fever** or **pneumonia**.

Prevention

The bacteria and viruses that cause tonsillitis are easily spread from person to person. It is not unusual for an entire family or several students in the same classroom to come down with similar symptoms, especially if *S. pyogenes* is the cause. The risk of transmission can be lowered by avoiding exposure to anyone who already has tonsillitis or a sore throat. Drinking glasses and eating utensils should not be shared and should be washed in hot, soapy water before reuse. Old toothbrushes should be replaced to prevent reinfection. People who are caring for someone with tonsillitis should wash their hands frequently, to prevent spreading the infection to others.

Resources

BOOKS

Berkow, Robert. "Tonsillitis." In *The Merck Manual of Diagnosis and Therapy*. Rahway, NJ: Merck Research Laboratories, 1992.

Eckman, Margaret, and Nancy Priff. "Ear, Nose, and Throat Disorders: Tonsillitis." In *Diseases*. Spring house, PA: Springhouse Corporation, 1997.

Inlander, Charles B., ed., et al. "Tonsillitis." *The Consumer's Medical Desk Reference*. New York: A Stonesong Press Book, 1995.

Norris, June. "Tonsillitis." In *Professional Guide to Diseases*. Springhouse, PA: Springhouse Corporation, 1995.
Shaw, Michael. "Tonsillitis." In *Everything You Need to Know about Diseases*. Springhouse, PA: Springhouse Corporation, 1996.

Kathleen D. Wright

Toothache

Definition

A toothache is any **pain** or soreness within or around a tooth, indicated by inflammation and infection.

Description

A toothache may feel like a sharp pain or a dull, throbbing ache. The tooth may be sensitive to pressure, heat, cold, or sweets. In cases of severe pain, identifying the problem tooth is often difficult. Any patient with a toothache should see a dentist at once for diagnosis and treatment. Most toothaches get worse if not treated.

Causes and symptoms

Toothaches may result from any of a number of causes:

- tooth decay (dental caries)
- inflammation of the tooth pulp (pulpitis)
- abscesses
- gum disease, including periodontitis
- loose or broken filling
- cracked or impacted tooth
- exposed tooth root
- food wedged between teeth or trapped below the gum line
- tooth nerve irritated by clenching or grinding of teeth (bruxism)
- pressure from congested sinuses
- traumatic injury

Diagnosis

Diagnosis includes identifying the location of the toothache, as well as the cause. The dentist begins by asking the patient specific questions including increased sensitivity or if the pain is worse at night. The patient's mouth is then examined for signs of swelling, redness, and obvious tooth damage. The presence of pus indicates an **abscess** or **gum disease**. The sore area is flushed with warm water to dislodge any food particles and to test for sensitivity to temperature. The dentist may then dry the area with gauze to determine sensitivity to pressure. Finally, the dentist may take x rays, looking for evidence of decay between teeth, a cracked or impacted tooth, or a disorder of the underlying bone.

KEY TERMS

Abscess—A hole in the tooth or gum tissue filled with pus as the result of infection.

Bruxism—Habitual clenching and grinding of the teeth as a result of stress. The behavior usually occurs during sleep.

Cavity—A hole or weak spot in the tooth surface caused by decay.

Dental caries—A disease of the teeth in which microorganisms convert sugar in the mouth to acid, which then erodes the tooth.

Enamel—The hard outermost surface of a tooth.

Endodontist—A dentist who specializes in diagnosing and treating diseases of the pulp and other inner parts of the tooth.

Impacted tooth—A tooth that is growing against another tooth, bone, or soft tissue.

Periodontitis—A gum disease that destroys the structures supporting the teeth, including bone.

Pulp—The soft innermost part of a tooth, containing blood vessels and nerves.

Pulpitis—Inflammation of the pulp of a tooth that involves the blood vessels and nerves.

Treatment

Emergency self-care

Toothaches should always be professionally treated by a dentist. Some methods of self-treatment, however, may help manage the pain until professional care is available:

- Rinsing with warm salt water.
- Using dental floss to remove any food particles.
- Taking aspirin or acetaminophen (Tylenol) to relieve pain. The drug should be swallowed–*never* placed directly on the aching tooth or gum.
- Applying a cold compress against the outside of the cheek. Do not use heat, because it will tend to spread infection.

- Using clove oil (*Syzygium aromaticum*) to numb the gums. The oil may be rubbed directly on the sore area or used to soak a small piece of cotton and applied to the sore tooth.
- A washcloth soaked in chamomile tea and placed on the infected tooth, or swished around in the mouth will help to ease the pain.

Toothaches caused by infection or tooth decay must be treated by a dentist. Several alternative therapies may be helpful for pain relief until dental treatment is available. The herb **corydalis** (*Corydalis yanhusuo*) may also help relieve toothache pain. Pain also may be reduced using **acupressure**, **acupuncture**, or **reiki**. Acupuncture should only be done by a licensed practitioner.

Allopathic treatment

Treatment will depend on the underlying cause of the toothache. If the pain is due to tooth decay, the dentist will remove the decayed area and restore the tooth with a filling of silver amalgam or composite resin. Loose or broken fillings are removed, decay cleaned out, and a new filling is placed. If the pulp of the tooth is damaged, root canal therapy is needed. The dentist or endodontist removes the decayed pulp, fills the space left behind with a soothing paste, and covers the tooth with a crown to protect and seal it. If the damage cannot be treated by these methods then the tooth must be extracted.

Expected results

Prompt dental treatment provides a positive outcome for a toothache. In the absence of active infection, fillings, root canal treatments, or extractions may be performed with minimal discomfort to the patient. When a toothache is left untreated, a severe infection may develop and spread to the sinuses or jawbone, and eventually cause **blood poisoning**.

Prevention

Maintaining proper oral hygiene is the key to the prevention of toothaches. The best way to prevent tooth decay is to brush at least twice a day, preferably after every meal and snack. Flossing once a day also helps prevent gum disease by removing food particles and bacteria at and below the gum line, as well as between teeth. People should visit their dentist at least every six months for oral examinations and professional cleaning.

Resources

ORGANIZATIONS

Academy of General Dentistry. Suite 1200, 211 East Chi cago Avenue, Chicago, IL 60611. (312) 440 4300. http://www.agd.org.

Alliances, Inc. 2121 Eisenhower Avenue, Suite 603, Alexandria, VA 22314. (800) 463 6482. http://www.medsource.com.

American Dental Association. 211 East Chicago Avenue, Chicago, IL 60611. (312) 440 2500. http://www.ada.org.

Kathleen Wright

Tourette syndrome

Definition

Tourette syndrome (TS) is an inherited disease of the nervous system, first described more than a century ago by a pioneering French neurologist, George Gilles de la Tourette. Before they are 18 years of age, patients with TS develop motor tics; that is, repeated, jerky, purposeless muscle movements in almost any part of the body. Patients also develop vocal tics, which occur in the form of loud grunting or barking noises, or in some cases words or phrases. In most patients, the tics come and go, and are often replaced by different sounds or movements. The tics may become more complex as the patient grows older.

Description

TS is three times more common in men than in women. The motor tics, which usually occur in brief episodes several times a day, may make it very hard for the patient to perform such simple acts as tying shoelaces, not to mention work-related tasks or driving. In addition, TS may have negative effects on the patient's social development. Some patients have an irresistible urge to curse or use offensive racial terms (a condition called coprolalia), although these impulses are not under voluntary control. Other people may not enjoy associating with TS patients. Even if they are accepted socially, TS patients live in fear of offending others and embarrassing themselves. In time, they may close themselves off from former friends and even relatives.

It is important to note, however, that the symptoms of Tourette syndrome are not always dramatic and are often overlooked in people with mild cases of the disorder. A 2001 report published in Pain & Central Nervous System Week, in fact, states that TS is much more common than doctors had thought. A study of 1,596 special-education children in

KEY TERMS

Basal ganglia (singular, ganglion)—Masses of gray matter in the cerebral hemispheres of the brain that are involved in the regulation of voluntary movements. Tourette syndrome has been linked to these areas of the brain.

Biofeedback—A method of learning to modify a body function, such as blood pressure, muscle tension, or rate of breathing, with the help of an electronic instrument.

Compulsion—A very strong urge to do or say something, usually something irrational or contrary to one's will. Compulsions are often experienced as irresistible.

Coprolalia—The involuntary use of vulgar or obscene language.

Dyslexia—Difficulty in reading, spelling, and writing words.

Neurotransmitters—Any of several chemical substances that transmit nerve impulses across the small gaps between nerve cells.

Tic—An involuntary, sudden, spasmodic muscle contraction.

Rochester, NY, found that 8% met the criteria for TS, and 27% had a tic disorder. In Rochester's general population, 3% were found to have Tourette syndrome, and 20% had a tic disorder. The rate of 3% in the general population is 50–75 times higher than the usual estimates given.

The tics of TS are often described as involuntary, meaning that patients cannot stop them. This description is not strictly true, however. A tic is a very strong urge to make a certain motion or sound. It is more like an itch that demands to be scratched. Some patients are able to control their tics for several hours, but once they are allowed expression, they are even stronger and last longer. Tics become worse when the patient is under **stress**, and usually are much less of a problem during sleep.

Some people with TS have trouble paying attention. They often seem grumpy and may have periods of **depression**. TS patients may think the same thoughts over and over, a mental tic known as an obsession. It is these features that place TS patients on the border between diseases of the nervous system and psychiatric illness. In fact, before research showed that the brains of TS patients undergo abnormal chemical changes, many doctors were convinced that TS was a mental disorder. It still is not clear whether these behaviors are a direct result of TS itself, or a reaction to the stress of having to live with the disease.

Causes and symptoms

Causes

Tourette syndrome has been linked to parts of the brain known as the basal ganglia, which regulate movements and is involved in concentration, paying attention, and decision-making. Research has also demonstrated that in TS, there is a malfunction in the brain's production or use of important substances called neurotransmitters. Neurotransmitters are chemicals that control the signals that are sent along the nerve cells. The neurotransmitters dopamine and serotonin have been implicated in TS; noradrenaline is thought to be the most important stimulant. Medications that mimic noradrenaline may cause tics in susceptible patients.

TS has a genetic component. If one parent has TS, each child has a 50% chance of getting the abnormal gene. Seven of every 10 girls who inherit the gene, and nearly all boys who inherit it, will develop symptoms of TS. Overall, about one in every 2,500 persons has full-blown TS. Three times as many will have some features, usually chronic motor tics or obsessive thoughts. Patients with TS are more likely to have trouble controlling their impulses, to have **dyslexia** or other learning problems, and to talk in their sleep or wake frequently. Compulsive behavior, such as constantly washing the hands or repeatedly checking that a door is locked, is a common feature of TS. Compulsions are seen in 30–90% of all TS patients.

Recent research findings suggest that Tourette syndrome may also be related to an autoimmune response. A subset of TS patients have symptoms triggered by infection with Group A beta-hemolytic streptococci. In addition, blood serum antibodies against human basal ganglia have been found in patients with TS.

Symptoms

Motor tics in TS can be classified as simple or complex. Simple tics are sudden, brief movements involving a single group of muscles or a few groups, which may be repeated several times. Complex tics consist of a repeated pattern of movements that can involve several muscle groups and usually occur in the same order. For instance, a boy with TS may repeatedly move his head from side to side, blink his eyes, open his mouth, and stretch his neck. Vocal tics may be sounds or noises that lack all meaning, or repeated words and phrases that can be understood. Tics tend to get worse and better in cycles, and patients can

develop new tics as they grow older. The symptoms of TS may get much better for weeks or months at a time, only to worsen later.

The following examples show why TS can be such a strange and dramatic disorder:

- Simple motor tics. These may include blinking the eyes, pouting the lips, shaking or jerking the head, shrugging the shoulders, and grimacing or making faces. Any part of the body may be tensed up or rapidly jerked, or a patient may suddenly kick. Rapid finger movements are common, as are snapping the jaws and clicking the teeth.
- Complex motor tics. These may include jumping, touching parts of the body or certain objects, smelling things over and over, stamping the feet, and twirling about. Some TS patients throw objects, others arrange things in a certain way. Biting, headbanging, writhing movements, rolling the eyes up or from side to side, and sticking out the tongue may all be seen. A child may write the same letter or word over and over, or may tear apart papers and books. Though they do not intend to be offensive, TS patients may make obscene gestures like "giving the finger," or they may imitate any movements or gestures made by others.
- Simple vocal tics. These include clearing the throat, coughing, snorting, barking, grunting, yelping, and clicking the tongue. Patients may screech or make whistling, hissing, or sucking sounds. They may repeat sounds such as "uh, uh," or "eee."
- Complex vocal tics and patterns. Older children with TS may repeat a phrase such as "Oh boy," "All right," or "What's that?" Or they may repeat everything they, or others, say a certain number of times. Some patients speak very rapidly or loudly, or in a strange tone or accent. Coprolalia (saying "dirty words" or suggestive or hostile phrases) is probably the best known feature of TS, but fewer than one-third of all patients display this symptom.

Behavioral abnormalities that may be associated with TS include attention deficit hyperactivity disorder (ADHD) and disruptive behaviors, including conduct disorder and oppositional defiant disorder, with aggressive, destructive, antisocial, or negativistic behavior. Academic disorders, **learning disorders**, and sleep abnormalities (such as sleepwalking and nightmares) are also seen in TS patients.

Diagnosis

There are no specific tests for TS. TS is diagnosed by observing the symptoms and asking whether relatives have had a similar condition. To qualify as TS, both motor and vocal tics should be present for at least a year and should begin before age 18 (or, some believe, age 21). Often, the diagnosis is delayed because the patient is misunderstood not only at home and at school, but in the doctor's office as well. It may take some time for the patient to trust the doctor enough not to suppress the strangest or most alarming tics. Blood tests may be done in some cases to rule out other movement disorders. A test of the brain's electrical activity (electroencephalograph or EEG) is often abnormal in TS, but not specific. A thorough medication history is very important in making the diagnosis as well, because stimulant drugs may provoke tics or aggravate the symptoms of TS.

Treatment

Although there is no cure for TS, many alternative treatments may lessen the severity and frequency of the tics. These include:

- Acupuncture. In one study, acupuncture treatment of 156 children with TS had a 92.3% effective rate.
- Behavioral treatments. Some of these can help TS patients control tics. A large variety of these methods exist, some with proven success.
- Cognitive behavioral therapy. This form of therapy helps the patient to change his or her ingrained response to a particular stimulus. It is somewhat effective in treating the obsessive-compulsive behaviors associated with TS.
- Neurofeedback (electroencephalographic biofeedback). In neurofeedback, the patient learns to control brain wave patterns; it may be effective in reducing the symptoms of TS. There are, however, no data on this modality as a treatment for TS.
- Psychotherapy. This form of treatment can help the TS patient, and his or her family, cope with depression, poor relationships, and other issues commonly associated with TS.
- Relaxation techniques. Yoga and progressive muscular relaxation are believed to help TS, especially when used in combination with other treatments, because they lower the patient's stress level. One small study found that relaxation therapy (awareness training, deep breathing, behavioral relaxation training, applied relaxation techniques, and biofeedback) reduced the severity of tics, although the difference between the treatment group and control group was not statistically significant.
- Stress reduction training. This training may help relieve the symptoms of TS because stress worsens the tics.

- Other alternative therapies. Homeopathy, hypnosis, guided imagery, and eliminating allergy-provoking foods from the diet have all been reported as helping some TS patients.

Allopathic treatment

Most TS patients do not need to take drugs, as their tics do not seriously interfere with their lives. Drugs that are used to reduce the symptoms of TS include haloperidol (Haldol), pimozide (Orap), clonidine (Catapres), guanfacine (Tenex), and risperidone (Risperdal). One interesting recent finding is that the transdermal nicotine patch, developed to help people quit **smoking**, improves the control of TS symptoms in children who take haloperidol. Use of the patch allows the haloperidol dosage to be cut in half without loss of effectiveness in symptom control.

Stereotactic treatment, which is high-frequency stimulation of specific regions of the brain, was reported to be successful in significantly reducing tics in a TS patient who had failed to respond to other treatments.

Expected results

Although there is no cure for TS, many patients improve as they grow older, often to the point where they can manage their lives without drugs. A few patients recover completely after their teenage years. Others learn to live with their condition. There is always a risk, however, that a patient who continues having severe tics will become more antisocial or depressed, or develop severe mood swings and panic attacks.

Prevention

The only way to prevent TS is for a couple not to have children when one of them has the condition. Any child of a TS parent has a 50% chance of inheriting the syndrome.

Resources

BOOKS

Landau, Elaine. *Tourette Syndrome*. Danbury, CT: Franklin Watts, 1998.

Leckman, James F., and Donald J. Cohen. *Tourette's Syndrome Tics, Obsessions, Compulsions: Develop mental Psychopathology and Clinical Care*. New York: John Wiley &Sons, Inc., 1998.

The Merck Manual of Diagnosis and Therapy. Edited by Mark H. Beers, MD, and Robert Berkow, MD. White house Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

"Nicotine Patch Could Help Against Condition's Tics." *Health & Medicine Week* (October 8, 2001).

"Rate of Disease Much Higher Than Had Been Thought." *Pain and Central Nervous System Week* (November 19, 2001): 9.

Trifiletti, Rosario. "Antistriatal Antibodies in Tourette Syndrome: Not a Simple Story." *Neurology Alert* 20 (October 2001): 14.

ORGANIZATIONS

National Institute of Neurological Disorders and Stroke. National Institutes of Health. P.O. Box 5801, Bethesda, MD 20824. (800) 352 9424. http://www.ninds.nih.gov.

Tourette Syndrome Association, Inc. 42 40 Bell Boulevard, Bayside, NY 11361 2820. (718) 224 2999. Fax: (718) 279 9596. ts@tsa usa.org. http://www.tsa usa.org.

OTHER

"Tourette Disorder." *Internet Mental Health*. [cited October 2002]. http://www.mentalhealth.com/fr00.html.

Belinda Rowland
Rebecca J. Frey, PhD

Toxemia *see* **Blood poisoning**

Toxic building syndrome *see* **Sick building syndrome**

Toxic shock syndrome

Definition

Toxic shock syndrome (TSS) is an uncommon, but potentially serious, illness that occurs when poisonous substances (toxins) produced by certain bacteria enter the bloodstream. The toxins cause a type of **blood poisoning** caused by staphylococcal, or less commonly streptococcal, **infections** in the lungs, throat, skin or bone, or from injuries. Women using super-absorbent tampons during **menstruation** were found to be most likely to get toxic shock syndrome.

Description

TSS first came to the attention of the public in the 1970s. Shortly after the introduction of a super-absorbent tampon, young women across the United States experienced an epidemic of serious but unexplained symptoms. Thousands went to emergency rooms with high **fever**, **vomiting**, peeling skin, low blood pressure, **diarrhea**, and a rash resembling **sunburn**. The only thing they had in common was that they all were menstruating

KEY TERMS

Shock—A condition in which the amount of blood circulating in the body is inadequate to meet the body's needs. Shock can be caused by certain diseases, serious injury, or blood loss.

Staphylococcus—A genus of bacteria that is commonly found on human skin and mucous membranes.

Streptococcus—A genus of sphere-shaped bacteria that can cause a wide variety of infections.

at the time they felt sick, and all were using tampons—especially super absorbent products.

At its height, the epidemic affected 15,000 people in the United States each year between 1980 and 1984; 15% of the women died. Since the offending products were taken off the market, the numbers of TSS cases have declined sharply. As of 1998, only about 5,000 cases are diagnosed annually in the United States, 5% of which are fatal. The decline is most likely due to the tampon manufacturers' discontinuing the use of some synthetic materials, and the removal from the market of the brand of tampon associated with most cases of TSS. Today, most of these products are made with rayon and cotton.

In spite of TSS's association with menstruating women, the disease can affect anyone of either sex or any age or race. The infection may occur in children, men, and non-menstruating women who are weakened from surgery, injury, or disease, and who cannot fight off a staphylococcal infection. New mothers are also at higher risk for TSS, particularly if they had a caesarean section or if they are breastfeeding their infants.

Most cases reported in Western countries still involve menstruating women under age 30. TSS still occurs in about 17 out of every 100,000 menstruating girls and women each year; more than half of these cases are related to tampons. Between 5% and 10% of patients with TSS die.

In the developing countries, however, toxic shock syndrome often affects children. A recent report of staphylococcal TSS from Saudi Arabia concerned a four-month-old infant. **Burns** appear to increase the risk of TSS in children in all countries.

Streptococcal toxic shock syndrome (STSS)

A new type of toxic shock syndrome is caused by a different bacterium, called Group A streptococcus. This form of TSS is called streptococcal toxic shock syndrome, or STSS. Officially recognized in 1987, STSS is related to the strain of streptococcus called the flesh-eating bacterium. STSS affects only one or two out of every 100,000 Americans. It almost never follows a simple **strep throat** infection.

In Europe and the United Kingdom, however, the incidence of streptococcal toxic shock syndrome has continued to rise through the 1990s. In one district in the United Kingdom, the annual rate rose from 1.1 cases per million population in 1990 to 9.5 cases per million by 1999. The fatality rate is 64%, even in healthy young adults.

Causes and symptoms

Transmission

STSS is caused by a strain of *Streptococcus pyogenes* found in the nose, mouth, and occasionally the vagina. The bacteria produce a characteristic toxin. In large enough quantities, the toxin can enter the bloodstream, causing a potentially fatal infection.

While experts know the name of the bacterium, more than 10 years after the 1980s epidemic scientists still do not fully understand the link between TSS and tampons. Most medical researchers today suspect that the absorbent tampons introduce oxygen into the vagina, which is normally an oxygen-free area of the body. Oxygen triggers bacterial growth, and the more absorbent the tampon, the more bacteria it can harbor. Some experts believe that the reason TSS is linked to tampons in particular is that bacteria can contaminate and multiply in a tampon. If left in place for a long time—as a woman could do with a super absorbent product—the bacteria have a better chance of multiplying and producing a large amount of toxin. It is also possible that the tampons or the chemicals they contain may irritate the vaginal lining, enabling the toxin to enter the bloodstream.

These type of bacteria are normally present either on hands or in the vagina, and it takes an amount of bacteria only the size of a grain of sand to start an infection. Of the 15% of women who carry *Staphylococcus aureus*, only about 5% have the strain that produces the TSS toxin.

Symptoms

TSS. TSS begins suddenly, with a high fever of 102°F (38.9°C) or above, vomiting and watery diarrhea, **headache**, and sunburn-like rash; together with a **sore throat** and body aches. Blood pressure may plummet a day or two after the first symptoms appear.

When the blood pressure drops, a woman may become disoriented or go into shock and her kidneys may fail. After these developments, the skin on her hands and feet may peel.

STSS. STSS can occur after a streptococcal infection in the body, usually from an infected wound or even **chickenpox**. Typically, within 48-96 hours, the patient's blood pressure drops. There is also fever, **dizziness**, breathing problems, and a weak, rapid pulse. The area around the wound may swell, the liver and kidneys can fail, and bleeding problems may occur.

Diagnosis

Any woman who is wearing a tampon and begins to experience the symptoms of toxic shock syndrome should remove the tampon right away and seek medical care.

The doctor will probably examine the vagina for signs of inflammation and rule out common sexually transmitted diseases with similar symptoms. A variety of blood tests, tests of vaginal secretions, and a physical examination are needed to identify this condition.

Treatment

Toxic shock syndrome is a life-threatening condition. If it is suspected, emergency medical attention should be sought immediately. Treatment with antibiotic drugs and IV fluids will be necessary.

Goldenseal, **calendula**, and **echinacea** can be applied topically. A diet low in sugar, with an increase in the consumption of vegetables and fruit helps to build the immune system. Movement therapies and **exercise** is also beneficial.

Allopathic treatment

TSS

In a menstruating woman, the vagina is first cleansed with an antiseptic solution to eliminate some of the bacteria that produce the toxin. TSS is treated with antibiotics, together with other drugs and fluids to lower fever and control blood pressure.

STSS

Antibiotics are used to treat STSS. Surgery may be needed to remove dead skin and muscle.

Expected results

TSS lasts as long as three weeks, and may have a tendency to recur. About a third of the women who are treated for TSS have it again within six months. In addition, TSS can affect the liver, kidneys, lungs, and other organs, depending on the severity of the infection. Untreated toxic shock syndrome can be fatal.

Prevention

TSS

Women who wear tampons should change them often and use different brands and types of pads and tampons. If a woman really prefers tampons, experts recommend using the lowest possible absorbency product made of cotton and rayon, and wearing it only during the day. In the past, it was difficult to compare absorbency rates for different products. Today, the Food and Drug Administration (FDA) requires standardized absorbency measurements on all tampon boxes. Above all, women should wash their hands before inserting a tampon, and change the tampon every four to six hours.

Anyone who has had TSS even once should not use tampons again.

STSS

Doctors still are not sure how people can avoid STSS, but they advise patients to clean and bandage open **wounds** immediately. Anyone with a red, swollen, or tender wound, or a sudden fever should seek medical care.

Resources

BOOKS

Turkington, Carol A. *Infectious Disease A to Z*. New York: Facts on File, 1998.

PERIODICALS

Amir, L. "Breastfeeding and *Staphylococcus aureus*: Three Case Reports." *Breastfeeding Review* 10 (March 2002): 15 18.

Barnham, M. R., N. C. Weightman, A. W. Anderson, and A. Tanna. "Streptococcal Toxic Shock Syndrome: A Description of 14 Cases from North Yorkshire, UK." *Clinical Microbiology and Infection* 8 (March 2002): 174 178.

Ghazal, S. S., M. N. Al Hawasi, S. A. Al Mosallam, et al. "Staphylococcal Toxic Shock Syndrome in a Small Infant." *Saudi Medical Journal* 23 (February 2002): 229 231.

Johnson, D., and P. D. Panthirana. "Toxic Shock Syndrome Following Cessation of Prophylactic Antibiotics in a Child with a 2% Scald." *Burns* 28 (March 2002): 181 184.

"Toxic shock syndrome United States." *Morbidity and Mortality Weekly Report* 46 (22) (June 6, 1997): 492 495.

Paula Ford-Martin
Rebecca J. Frey, PhD

Traditional African medicine

Definition

Traditional African medicine is a holistic discipline involving extensive use of indigenous herbalism combined with aspects of African **spirituality**.

Origins

Despite numerous attempts at government interference, this ancient system of healing continues to thrive in Africa and practitioners can be found in many other parts of the world. Under colonial rule, many nations considered traditional diviner-healers to be practitioners of witchcraft and outlawed them for that reason. In some areas of colonial Africa, attempts were also made to control the sale of traditional herbal medicines. After Mozambique obtained independence in 1975, diviner-healers were sent to re-education camps. Opposition to traditional medicine has been particularly vehement during times of conflict, when people have been more likely to call on the supernatural realm. More recently, interest has been expressed in integrating traditional African medicine with the continent's national health care systems. In Kwa-Mhlanga, South Africa, a 48-bed hospital combines traditional African medicine with **homeopathy**, **iridology**, and other Western healing methods, as well as traditional Asian medicine. Founded by a traditional African healer, the hospital is said to be the first of its kind in the country.

An African man has cut his forehead to relieve a headache.
(© Photo Researchers, Inc. Reproduced by permission.)

Benefits

Practitioners of traditional African medicine claim to be able to cure a wide range of conditions, including cancers, acquired immunodeficiency syndrome (**AIDS**), psychiatric disorders, high blood pressure, cholera, **infertility**, and most venereal diseases. Other applications include **epilepsy**, **asthma**, **eczema**, hayfever, **anxiety**, **depression**, benign prostatic hypertrophy, urinary tract **infections**, **gout**, and healing of **wounds** and **burns**.

Description

Traditional African medicine involves diviners, midwives, and herbalists. Diviners are responsible for determining the cause of illness, which in some causes are believed to stem from ancestral spirits and other influences. Traditional midwives make extensive use of indigenous plants to aid **childbirth**. Herbalists are so popular in Africa that an herb trading market in Durban is said to attract between 700,000 and 900,000 traders a year from South Africa, Zimbabwe, and Mozambique. Smaller herb markets exist in virtually every community.

There are strong spiritual aspects to traditional African medicine, with a widespread belief among practitioners that psycho-spiritual aspects must be addressed before medical aspects. Among traditional healers, the ability to diagnose an illness is considered a gift from both God and the practitioner's ancestors. A major emphasis is placed on determining the root cause underlying any sickness or bad luck. Illness is said to stem from a lack of balance between the patient and his or her social environment. It is this imbalance that determines the choice of the healing plant, which is valued as much for its symbolic and spiritual significance as for its medicinal effect. For example, the colors white, black, and red are considered especially symbolic or magical. Seeds, leaves, and twigs bearing these colors are deemed to possess special properties.

Diviners may use plants not only for healing purposes but also to control weather and events. In addition to plants, traditional African healers may employ charms, incantations, and casting of spells.

One traditional African medicinal cure that has developed a wide following outside the continent is pygeum (*Prunus africana*), which has been sold in Europe since the 1970s as a treatment for mild-to-moderate benign prostatic hyperplasia. Each year, 2,000 metric tons of pygeum bark are harvested in Cameroon and another 600 tons are harvested in Madagascar. In Africa, the bark is made into a tea. Elsewhere in the world, it is sold in powders, tinctures, and pills, often combined with other herbs believed to help with prostate problems. Users report greater ease of urination, with reduced inflammation and **cholesterol** deposits.

A comparison between numbers of traditional healers and medical doctors demonstrates the importance of this healing modality in Africa. In the Venda area of South Africa, there is one traditional practitioner for every 700–1,200 people, compared to one physician for every 17,400 people. Swaziland has one traditional healer for every 110 people. Benin City, Nigeria has the same ratio. Urban Kenya has one traditional healer per 833 population.

Precautions

All cases of serious illness need to be examined by a medical doctor. Even though many prostate conditions are not serious, patients thinking of using pygeum should first undergo a medical examination to rule out more serious problems.

Concern has been expressed that increased demand for wild plants used in traditional African medicine is endangering local plant populations. For example, the Washington-based group Future Harvest says that a $220 million annual market for *Prunus africana* as a prostrate remedy could lead to extinction of the slow-maturing evergreen tree in the African wilds.

Some Christian church officials express opposition to elements of witchcraft used by some African healers.

Side effects

Serious side effects, even death, can result from incorrect identification of healing plants. For example, species of the **aloe** plant are extensively used in traditional African medicine, but some forms, such as *Aloe globuligemma,* are toxic and can result in death if misidentified.

Convulsions and fatalities have been linked to the use of African herb concoctions known as *imbiza,* used for male erectile problems. Suppliers insist the problems occur only when too much of the concoction is consumed.

Research and general acceptance

Although many of the principles and methods of traditional African medicine are quite foreign to orthodox medical thinking, there is nonetheless considerable interest in exploiting Africa's ethnobotanical knowledge for drug-development purposes. For example, U.S. researchers have expressed interest in using seed extracts from *Garcinia kola,* a common African tree used by traditional healers, to treat Ebola and Marburg disease.

Training and certification

The field is largely unregulated. In Africa, many traditional practitioners are simple, uneducated people who have nonetheless accumulated a great deal of knowledge about native plants and their actions on the human body. There is considerable interest in integrating traditional African medicine more fully with the continent's national medical systems. In Harare, Zimbabwe, a school of Traditional African Medicine opened its doors in October, 1999. Students include both traditional healers and university graduates.

Resources

PERIODICALS

Kale, R. "Traditional healers in South Africa: a parallel health care system." *British Medical Journal* 310 (6988) (May 6 1995):1182 5.

David Helwig

Traditional Chinese medicine

Definition

Traditional Chinese medicine (TCM) is based on a set of interventions designed to restore balance to human beings. The therapies usually considered under the heading of classic Chinese medicine include:

- acupunture and moxibustion
- dietary regulation
- herbal remedies
- massage
- therapeutic exercise

These forms of treatments are based upon beliefs that differ from the disease concept favored by Western medicine. What is referred to as illness by Western medicine is considered in traditional Chinese medicine to be a matter of disharmony or imbalance.

The philosophy behind Chinese medicine is a melding of tenets from Buddhism, Confucianism, and the combined religious and philosophical ideas of Taoism. Although there are various schools of thought among practitioners of traditional Chinese medicine, five Taoist axioms form its basis:

- There are natural laws which govern the universe, including human beings.
- The natural order of the universe is innately harmonious and well-organized. When people live according to the laws of the universe, they live in harmony with that universe and the natural environment.
- The universe is dynamic, with change as its only constant. Stagnation is in opposition to the law of the universe and causes what Western medicine calls illness.
- All living things are connected and interdependent.
- Humans are intimately connected to and affected by all facets of their environment.

KEY TERMS

Five Elements—The five basic substances (water, wood, earth, fire, and metal) that symbolize the fundamental qualities of the universe. In Chinese food cures, the five elements are correlated with the internal organs of the body and with the five basic food tastes.

Five Substances—The basic entities in the human body that serve its development and maintenance. They include qi, Vital Essence, Spirit, Blood, and Fluids.

Meridians—Pathways of subtle energy that link and regulate the various structures, organs, and substances in the human body.

Moxibustion—A technique of treatment in which the practitioner warms the skin over vital qi points by holding a burning herbal wick above the skin.

Qi—The universal life-force or energy. The quality, quantity, and balance of a person's qi determines their state of health and longevity.

Qigong—A form of therapeutic exercise that emphasizes breathing techniques to direct the qi to different parts of the body.

Taoism—The system of thought that shaped the view of creation underlying traditional Chinese medicine.

Tui na—A form of Chinese massage in which the therapist vigorously pushes and kneads the soft tissues of the patient's body. Its name means "push and grasp."

Yin and yang—In Taoist thought, the two primordial opposing yet interdependent cosmic forces.

Origins

Historical background

Traditional Chinese medicine is more than 2,000 years old. It originated in the region of eastern Asia that today includes China, Tibet, Vietnam, Korea, and Japan. The first written Chinese medical treatises (as the West understands the term) date from the Han dynasty (206 B.C.– A.D. 220). Tribal shamans and holy men who lived as hermits in the mountains of China as early as 3500 B.C. practiced what was called the "Way of Long Life." This regimen included a diet based on herbs and other plants; kung-fu exercises; and special breathing techniques that were thought to improve vitality and life expectancy.

After the Han dynasty, the next great age of Chinese medicine was under the Tang emperors, who ruled from A.D. 608-A. D. 906. The first Tang emperor established China's first medical school in A.D. 629. Under the Song (A.D. 960–1279) and Ming (A.D. 1368–1644) dynasties, new medical schools were established, their curricula and qualifying examinations were standardized, and the traditional herbal prescriptions were written down and collected into encyclopedias. One important difference between the development of medicine in China and in the West is the greater interest in the West in surgical procedures and techniques. In the nineteenth and early twentieth centuries, the opening of China to the West led to the establishment of Western-style medical schools in Shanghai and other large cities, and a growing rivalry between the two traditions of medicine. In 1929 a group of Chinese physicians who had studied Western medicine petitioned the government to ban traditional Chinese medicine. This move was opposed, and by 1933 the Nationalist government appointed a chief justice of the Chinese Supreme Court to systematize and promote the traditional system of medicine. In contemporary China, both traditional and Western forms of medicine are practiced alongside each other.

Philosophical background: the cosmic and natural order

In Taoist thought, the Tao, or universal first principle, generated a duality of opposing principles that underlie all the patterns of nature. These principles, yin and yang, are mutually dependent as well as polar opposites. They are basic concepts in traditional Chinese medicine. Yin represents everything that is cold, moist, dim, passive, slow, heavy, and moving downward or inward; while yang represents heat, dryness, brightness, activity, rapidity, lightness, and upward or outward motion. Both forces are equally necessary in nature and in human wellbeing, and neither force can exist without the other. The dynamic interaction of these two principles is reflected in the cycles of the seasons, the human life cycle, and other natural phenomena. One objective of traditional Chinese medicine is to keep yin and yang in harmonious balance within a person.

In addition to yin and yang, Taoist teachers also believed that the Tao produced a third force, primordial energy or qi (also spelled chi or ki). The interplay between yin, yang, and qi gave rise to the Five Elements of water, metal, earth, wood, and fire. These entities are all reflected in the structure and functioning of the human body.

The human being

Traditional Chinese physicians did not learn about the structures of the human body from dissection because they thought that cutting open a body insulted the person's ancestors. Instead they built up an understanding of the location and functions of the major organs over centuries of observation, and then correlated them with the principles of yin, yang, qi, and the Five Elements. Thus wood is related to the liver (yin) and the gall bladder (yang); fire to the heart (yin) and the small intestine (yang); earth to the spleen (yin) and the stomach (yang); metal to the lungs (yin) and the large intestine (yang); and water to the kidneys (yin) and the bladder (yang). The Chinese also believed that the body contains Five Essential Substances, which include blood, spirit, vital essence (a principle of growth and development produced by the body from qi and blood); fluids (all body fluids other than blood, such as saliva, spinal fluid, sweat, etc.); and qi.

A unique feature of traditional Chinese medicine is the meridian system. Chinese doctors viewed the body as regulated by a network of energy pathways called meridians that link and balance the various organs. The meridians have four functions: to connect the internal organs with the exterior of the body, and connect the person to the environment and the universe; to harmonize the yin and yang principles within the body's organs and Five Substances; to distribute qi within the body; and to protect the body against external imbalances related to weather (wind, summer heat, dampness, dryness, cold, and fire).

Benefits

Traditional Chinese medicine offers the following benefits:

- It is believed by some to treat certain chronic illnesses more effectively than Western medicine.
- It is holistic; all aspects of the person's being are taken into account.
- It treats the root cause of the disease as well as the manifest symptoms. Chinese practitioners distinguish between the root (*ben*) of an illness and its branches (*biao*). The root is the basic pattern of imbalance in the patient's qi; the branches are the evident symptoms.
- Traditional Chinese medicine does not rely on pharmaceutical products that often cause side effects.
- It improves a person's general health as well as treating specific diseases or disorders.
- It is often less expensive than standard allopathic treatment.
- It is not a self-enclosed system but can be used in combination with Western medicine.
- It can be used to treat the side effects of Western modalities of treatment.

Description

Acupuncture/moxibustion

Acupuncture is probably the form of treatment most familiar to Westerners. It is often used for **pain** relief, but has wider applications in traditional Chinese practice. It is based on a view of the meridians that regards them as conduits or pathways for the qi, or life energy. Disease is attributed to a blockage of the meridians; thus acupuncture can be used to treat disorders of the internal organs as well as muscular and skin problems. The insertion of needles at specific points along the meridians is thought to unblock the qi. More than 800 acupuncture points have been identified, but only about 50 are commonly used. Acupuncture is usually used as a treatment together with herbal medicines.

Moxibustion refers to the practice of burning a moxa wick over the patient's skin at vital points. Moxa is a word derived from Japanese and means "burning

herbs." The moxa wick is most commonly made from *Artemisia vulgaris*, or Chinese **wormwood**, but other herbs can also be used. Moxibustion is thought to send heat and nourishing qi into the body. It is used to treat a number of different illnesses, including **nosebleeds**, pulled muscles, **mumps**, arthritis, and vaginal bleeding.

Dietary regulation

Diet is regarded as the first line of treatment in Chinese medicine; acupuncture and herbal treatments are used only after changes in diet fail to cure the problem. Chinese medicine uses foods to keep the body in internal harmony and in a state of balance with the external environment. In giving dietary advice, the Chinese physician takes into account the weather, the season, the geography of the area, and the patient's specific imbalances (including emotional upsets) in order to select foods that will counteract excesses or supply deficient elements. Basic preventive dietary care, for example, would recommend eating yin foods in the summer, which is a yang season. In the winter, by contrast, yang foods should be eaten to counteract the yin temperatures. In the case of illness, yin symptom patterns (**fatigue**, pale complexion, weak voice) would be treated with yang foods, while yang symptoms (flushed face, loud voice, restlessness) would be treated by yin foods.

Chinese medicine also uses food as therapy in combination with **exercise** and herbal preparations. One aspect of a balanced diet is maintaining a proper balance of rest and activity as well as selecting the right foods for the time of year and other circumstances. If a person does not get enough exercise, the body cannot transform food into qi and Vital Essence. If they are hyperactive, the body consumes too much of its own substance. With respect to herbal preparations, the Chinese used tonics taken as part of a meal before they began to use them as medicines. Herbs are used in Chinese cooking to give the food specific medicinal qualities as well as to flavor it. For example, **ginger** might be added to a fish dish to counteract **fever**. Food and medical treatment are closely interrelated in traditional Chinese medicine. A classical Chinese meal seeks to balance not only flavors, aromas, textures, and colors in the different courses that are served, but also the energies provided for the body by the various ingredients.

Herbal remedies

Chinese herbal treatment differs from **Western herbalism** in several respects. In Chinese practice, several different herbs may be used, according to each plant's effect on the individual's qi and the Five Elements. There are many formulas used within traditional Chinese medicine to treat certain common imbalance patterns. These formulas can be modified to fit specific individuals more closely.

In 2002, a study in Texas showed that a traditional Chinese antirheumatic herb extract helped patients with **rheumatoid arthritis** by improving symptoms such as morning stiffness and tender, swollen joints. Side effects of decreased appetite and **nausea** were tolerable for those the herb helped. The researchers planned to move on to a more scientifically controlled clinical trial phase to further test the herb's effectiveness. Another scientific study that year reported new benefits for applying soy proteins, an ancient Chinese practice, to the skin. Scientists worked on a new preparation that showed benefits in reducing age spots and ultraviolet ray damage, and smoothing and moisturizing the skin, among other benefits.

A traditional Chinese herbal formula typically contains four classes of ingredients, arranged in a hierarchical order: a chief (the principal ingredient, chosen for the patient's specific illness); a deputy (to reinforce the chief's action or treat a coexisting condition); an assistant (to counteract side effects of the first two ingredients); and an envoy (to harmonize all the other ingredients and convey them to the parts of the body that they are to treat).

Massage

Massage is recommended in traditional Chinese medicine to unblock the patient's meridians, stimulate the circulation of blood and qi, loosen stiff joints and muscles, and strengthen the immune system. It may be done to relieve symptoms without the need for complex diagnosis. **Chinese massage** is commonly used to treat back strain, pulled muscles, **tendinitis**, **sciatica**, rheumatism, arthritis, **sprains**, and similar ailments. In *Tui na* massage, the practitioner presses and kneads various qi points on the patient's body. The patient does not need to undress but wears thin cotton clothes. He or she sits on a chair or lies on a massage couch while the practitioner presses on or manipulates the soft tissues of the body. *Tui na* means "push and grasp" in Chinese. It is not meant to be relaxing or pampering but is serious treatment for sports injuries and chronic pain in the joints and muscles. *Tui na* is used to treat the members of Chinese Olympic teams.

Therapeutic exercise

Therapeutic exercise, or *qigong*, is an ancient Chinese form of physical training that combines

preventive healthcare and therapy. *Qigong* relies on breathing techniques to direct the qi to different parts of the body. The literal translation of *qigong* is "the cultivation and deliberate control of a higher form of vital energy." Another form of therapeutic exercise is **t'ai chi**, in which the person moves through a series of 30–64 movements that require a relaxed body and correct rhythmic breathing. Many Chinese practice t'ai chi as a form of preventive medicine.

Preparations

Preparations for treatment in traditional Chinese medicine are similar to preparing for a first-time visit to a Western physician. The patient will be asked to give a complete and detailed medical history. The practitioner may touch the patient's acupuncture meridians to evaluate them for soreness or tightness. The major difference that the patient will notice is the much greater attention given in Chinese medicine to the tongue and the pulse. The Chinese practitioner will evaluate the patient's tongue for form, color, and the color and texture of the tongue fur. In taking the pulse, the Chinese therapist feels three pressure points along each wrist, first with light pressure and then with heavy pressure, for a total of 12 different pulses on both wrists. Each pulse is thought to indicate the condition of one of the 12 vital organs.

Precautions

There are no special precautions necessary for treatment with traditional Chinese medical techniques other than giving the practitioner necessary details about major or chronic health problems.

Side effects

Side effects with traditional Chinese medicine are usually minor. With herbal treatments, there should be no side effects if the patient has been given the correct formula and is taking it in the prescribed manner. Some people feel a little sore or stiff the day after receiving *Tui na* massage, but the soreness does not last and usually clears up with repeated treatments. Side effects from acupuncture or from therapeutic exercise under the guidance of a competent teacher are unusual. However, care should be taken in using herbal preparations and possible side effects or toxins within any preparations, as well as interactions with other drugs. Patients should consult with qualified practitioners.

Research and general acceptance

At present, there is renewed interest in the West in traditional Chinese medicine. Of the 700 herbal remedies used by traditional Chinese practitioners, over 100 have been tested and found effective by the standards of Western science. Several United States agencies, including the National Institutes of Health, the Office of Alternative Medicine, and the Food and Drug Administration are currently investigating Chinese herbal medicine as well as acupuncture and *Tui na* massage. In general, however, Western studies of Chinese medicine focus on the effects of traditional treatments and the reasons for those effects, thus attempting to fit traditional Chinese medicine within the Western framework of precise physical measurements and scientific hypotheses.

As use of traditional Chinese medicine has increased steadily in the West, many allopathic physicians have needed to understand the intricacies of the practice and to know how to deal with adverse reactions to herbal remedies. In 2002, a project was undertaken to develop a Chinese herbal medicine toxicology database to share information about English and Chine studies on Chinese herbal medicines. The goal of the project was to help doctors in Western hospitals better manage poisonings or adverse reactions to Chinese medicines.

Training and certification

Traditional Chinese medicine practitioners can be either acupuncturists, herbalists, or both. At present, no schools accredited in the United States confer the degree of Doctor of Oriental Medicine because the standards for such a degree have not yet been established. More than half of the 50 states now have licensing boards for acupuncturists. There is no present independent licensing for herbalists. California has been the only state that has required (since 1982) acupuncture practitioners to take licensing examinations in both acupuncture and herbal medicine.

There is also a national organization called the National Commission for the Certification of Acupuncture and Oriental Medicine (NCCAOM) that offers certification in acupuncture. This certification provides the basis for licensure in a number of states. The NCCAOM also offers a certificate in herbal medicine that does not lead to licensure at present but is beginning to be used in some states as a basis for practice.

Resources

BOOKS

Mills, Simon, M.A., and Steven Finando, PhD. *Alternatives in Healing*. New York: NAL Penguin, Inc., 1989.

Reid, Daniel P. *Chinese Herbal Medicine*. Boston: Shamb hala, 1993.
Stein, Diane. "All Women Are Healers: A Comprehen sive Guide to Natural Healing." *Chinese Healing and Acupressure*. Freedom, CA: The Crossing Press, 1996.
Svoboda, Robert, and Arnie Lade. *Tao and Dharma: Chi nese Medicine and Ayurveda*. Twin Lakes, WI: Lotus Press, 1995.

PERIODICALS

Bensoussan, Alan, et al."Development of a Chinese Herbal Medicine Toxicology Database."*Journal of Toxicolo gy:Clinical Toxicology*(March 2002): 159.
"Chinese Herbal Extract Safe and Effective for RA."*The Journal of Musculoskeletal Medicine*(Janu ary 2002): 43.
Liu, Jue Chen, et al. "Applications of Soy in Skin Care."*The Journal of Nutrition*(March 2002): 574S.

ORGANIZATIONS

American Association of Oriental Medicine. 433 Front St. Catasaqua, PA 18032. (610) 266 1433 or (888) 500 7999. Fax: (610) 264 2768. aaom1@aol.com.
American Foundation of Traditional Chinese Medicine (AFTCM). 505 Beach Street. San Francisco, CA 94133. (415) 776 0502. Fax: (415) 392 7003.aftcm@ earthlink.net.
Florida Institute of Traditional Chinese Medicine. (800) 565 1246. fitcm@gte.net.

Joan Schonbeck
Teresa G. Odle

Trager psychophysical integration

Definition

Trager psychophysical integration therapy, also known as the Tragerwork system of physical integration, is a combination of hands-on tissue mobilization, **relaxation**, and movement reeducation called Mentastics. The underlying principle of psychophysical integration is that clients learn to be lighter, easier, and freer by experiencing lightness, ease, and freedom of movement in their bodies.

The Trager method is a psychologically grounded physical approach to muscle relaxation, which is induced when a practitioner and patient achieve a state of mind called hook-up. Hook-up is described as a connection to a state of grace or powerful and nourishing life force. It is the opposite of strain or effort.

KEY TERMS

Hook-up—A state of effortless connection with a life-enhancing force. Trager practitioners enter a state of hook-up before working with clients in order to focus on their needs. Trager himself described hook-up as a meditative process of "becoming one with the energy force that surrounds all living things."

Mentastics—The active phase of Trager therapy. Mentastics are a form of movement reeducation in which clients learn to reexperience movement as pleasurable and positive.

Tablework—The passive phase of Trager therapy, in which the practitioner uses gentle and noninvasive movements to allow the client to relax deeply and experience physical movement as free and effortless.

Origins

Psychophysical integration therapy began with Dr. Milton Trager (1908–1977), who earned a medical degree in midlife after working out his approach to healing chronic **pain**. Trager was born with a spinal deformity and overcame it through practicing a variety of athletic exercises. At the time that he discovered his approach to bodywork, he was training to become a boxer. His therapy came to public attention when Esalen Institute in California, the famous center of the human potential movement, invited him to give a demonstration of his technique during the mid-1970s. Trager abandoned his private medical practice in 1977 to devote full energy to the development and further understanding of psychophysical integration. The Trager Institute, which continues his work, was founded in 1980.

Benefits

Psychophysical integration therapy has been helpful in relieving muscle discomfort in patients afflicted with polio, muscular dystrophy, **Parkinson's disease**, **multiple sclerosis**, post-stroke trauma, and psychiatric disturbances. The therapy is useful in alleviating such chronic conditions as back and leg pain. Athletes may benefit from this system to increase resilience to injuries and to improve their mental attitudes. In addition, the Trager Institute maintains that Tragerwork helps clients achieve greater mental clarity through the release of "deep-seated physical and mental patterns."

Description

The Trager method consists of two parts, a passive aspect referred to as tablework and an active aspect called Mentastics, which is a self-care **exercise** program. Although the benefits of the Trager approach are said to be cumulative, practitioners and clients appear to be free to set their own schedules for a series of sessions. There is no minimum number of sessions that clients must agree to take.

Tablework

The tablework is performed on a comfortable padded table. Sessions last about 60-90 minutes. The practitioner moves the client in ways that he or she naturally moves, in such a way that he or she experiences how it feels to move effortlessly and freely on one's own. The movements resemble general mobilization techniques, and incorporate some manual, cervical, and lumbar traction. The goal of tablework is to allow the client "slowly to give up muscular and mental control and sink into a very deep state of relaxation not unlike that experienced in hypnosis."

Mentastics

Mentastics are free-flowing dance-like movements intended to increase the client's self-awareness, as well as providing tools to help the client move through and control chronic pain. The client is encouraged to "let go," which means that they are asked to begin a movement, then release their muscle tension and allow the weight of the body part involved to complete the motion. By experiencing movement as something pleasurable and positive rather than painful or negative, clients begin to loosen up, learn new movements more easily, and even begin inventing their own. In the early stages of treatment, clients are advised to do Mentastic movements at home for 10–15-minute sessions, three times per day.

Preparations

Prior to a session of tablework, the client dresses for comfort, "with a minimum of swimwear or briefs," according to the Trager Institute. The client is also covered with a drape. No oils or lotions are used.

The practitioner prepares for the session by clearing his or her mind of everything but the client, until he or she achieves a state of hook-up. This attitude of "relaxed meditative awareness" on the part of the practitioner is one of the unique features of Tragerwork. It is described as allowing the therapist "to connect deeply with the recipient in an unforced way and enables the practitioner to perceive the slightest responses from the [client's] body."

Precautions

Because of the unusual sensitivity and heightened awareness that is associated with the practitioner's touch, pain should never result from tablework sessions. It is important for clients to alert the practitioner to any pain associated with either the tablework or the Mentastics program.

Although the movements used in Trager tablework are gentle and noninvasive, clients who have had recent injuries or surgery should wait to heal before undertaking a course of Tragerwork.

Side effects

The Trager method should not produce physical side effects when employed by a qualified practitioner. It is possible that some clients may have emotional reactions associated with the release of physical patterns acquired as a response to trauma, but such reactions are unusual.

Research and general acceptance

Tragerwork, like other forms of bodywork, has gained increasing acceptance as a form of treatment since the 1980s. In 2000 there were 1,200 certified psychophysical integration practitioners in 15 countries worldwide. The therapy has been reported as a commonly employed treatment for mainstream athletes. In addition, the National Institutes of Health lists psychophysical therapy as a mind-body form of complementary alternative medicine.

Training and certification

Practitioners of psychophysical therapy undergo classroom instruction as well as a directed practice (internship) where they apply the learned techniques. Psychophysical therapy is demanding, and proficiency in the practice results only after dozens of therapy sessions have been completed. As many as 100 sessions may be given before the student practitioner achieves the appropriate mental and physical state to communicate an effortless way of being.

Practitioner certification is available for Tragerwork. The curriculum at the Florida Institute of Psychophysical Integration involves a 15-day (150-hour) program of study. Course work progresses through three phases. The initial phase, independent study, is followed by a residential internship. A third phase of combined work and study brings the student to sufficient mastery of the Trager method for certification.

Guidelines for acceptance at the Florida Institute include a college degree and a background in

MILTON TRAGER (1909–1997)

Milton Trager was a medical doctor and a somatic edu cator, specializing in body learning. He was a contemporary of F. Matthias Alexander, Moshe Feldenkrais, and Ida Rolf.

As a young man in the 1920s, he occupied himself with gymnastics and boxing. Through his intensely phys ical pursuits, he arrived at his self taught body learning theories. The techniques that he nurtured emphasized body control over strength, prowess, and endurance. For example, in striving to leap as high as possible, Trager focused his concentration on landing as softly as possi ble. He obtained a degree in physical medicine before serving in the military during World War II.

Upon his return, Trager funded medical school with his GI benefits. He established a private practice and spent the ensuing 50 years refining his body learning techniques and assisting afflicted individuals in the process. When Trager's father was stricken with sciatic pain, Trager learned to relieve the spasms by hand. In time he learned to alleviate the symptoms of polio victims and others who suffered from muscle spasms.

Trager established the Trager Institute in the 1970s to propagate the techniques that he developed. By the year 2000, an estimated 2,000 students and practitioners had embraced the Trager Approach.

Trager lived with his wife, Emily, in Southern Califor nia at the time of his death in January 1997.

counseling, touch, and massage. Also required are an understanding of the human muscular system and the completion of preliminary postural integration studies. Students must be at least 25 years of age.

Resources

BOOKS

Juhan, Deanne. *Job's Body*. Station Hill Press, 1987.
Trager, Milton, M.D. *Trager Mentastics: Movements as a Way to Agelessness*. Station Hill Press, 1987.

ORGANIZATIONS

Florida Institute of Psychophysical Integration: Quantum Balance. 5837 Mariner Drive. Tampa, FL 33609 3411. (813) 186 2273. Fax: (813) 287 2870. Dr.Joy@Johnson Mail.com.
Trager Institute. 21 Locust Avenue. Mill Valley, CA 94941 2806. (415) 388 2688. Fax: (415) 399 2710. admin@trager.com. http://www.trager.com.

Gloria Cooksey

Trancendental meditation *see* **Meditation**
Transient ischemic attack *see* **Stroke**
Trefoil *see* **Red clover**

Tremor

Definition

Tremor is an unintentional (involuntary), rhythmical alternating movement that may affect the muscles of any part of the body. Tremor is caused by the rapid alternating contraction and **relaxation** of muscles and is a common symptom of diseases of the nervous system (neurologic disease).

Description

Occasional tremor is felt by almost everyone, usually as a result of fear or excitement. However, uncontrollable tremor or shaking is a common symptom of disorders that destroy nerve tissue such as **Parkinson's disease** or **multiple sclerosis**. Tremor may also occur after **stroke** or head injury. Other tremor appears without any underlying illness.

Causes and symptoms

Tremor may be a symptom of an underlying disease, or it may be caused by drugs. It may also exist as the only symptom (essential tremor).

Underlying disease

Some types of tremor are signs of an underlying condition. About 1.5 million Americans have Parkinson's disease, a disease that destroys nerve cells. Severe shaking is the most apparent symptom of Parkinson's disease. This coarse tremor features four to five muscle movements per second. These movements are evident at rest but decline or disappear during movement.

Other disorders that cause tremor are multiple sclerosis, Wilson's disease, **mercury poisoning**, thyrotoxicosis, and liver encephalopathy.

A tremor that gets worse during body movement is called an "intention tremor." This type of tremor is a sign that something is amiss in the cerebellum, a region

KEY TERMS

Computed tomography (CT) scan—An imaging technique in which cross-sectional x rays of the body are compiled to create a three-dimensional image of the body's internal structures.

Essential tremor—An uncontrollable (involuntary) shaking of the hands, head, and face. Also called familial tremor because it is a sometimes inherited, it can begin in the teens or in middle age. The exact cause is not known.

Intention tremor—A rhythmic purposeless shaking of the muscles that begins with purposeful (voluntary) movement. This tremor does not affect muscles that are resting.

Liver encephalopathy—A condition in which the brain is affected by a buildup of toxic substances that would normally be removed by the liver. The condition occurs when the liver is too severely damaged to cleanse the blood effectively.

Magnetic resonance imaging (MRI)—An imaging technique that uses a large circular magnet and radio waves to generate signals from atoms in the body. These signals are used to construct images of internal structures.

Multiple sclerosis—A degenerative nervous system disorder in which the protective covering of the nerves in the brain are damaged, leading to tremor and paralysis.

Parkinson's disease—A slowly progressive disease that destroys nerve cells. Parkinson's is characterized by shaking in resting muscles, a stooping posture, slurred speech, muscular stiffness, and weakness.

Thyrotoxicosis—An excess of thyroid hormones in the blood causing a variety of symptoms that include rapid heart beat, sweating, anxiety, and tremor.

Wilson's disease—An inborn defect of copper metabolism in which free copper may be deposited in a variety of areas of the body. Deposits in the brain can cause tremor and other symptoms of Parkinson's disease.

of the brain concerned chiefly with movement, balance, and coordination.

Drugs and tremor

Several different classes of drugs can cause tremor as a side effect. These drugs include amphetamines, antidepressants drugs, antipsychotic drugs, **caffeine**, and lithium. Tremor also may be a sign of withdrawal from alcohol or street drugs.

Essential tremor

Many people have what is called "essential tremor," in which the tremor is the only symptom. This type of shaking affects between three and four million Americans.

The cause of essential tremor is not known, although it is an inherited problem in more than half of all cases. The genetic condition has an autosomal dominant inheritance pattern, which means that any child of an affected parent will have a 50% chance of developing the condition.

Essential tremor most often appears when the hands are being used, whereas a person with Parkinson's disease will most often have a tremor while walking or while the hands are resting. People with essential tremor will usually have shaking head and hands, but the tremor may involve other parts of the body. The shaking often begins in the dominant hand and may spread to the other hand, interfering with eating and writing. Some people also develop a quavering voice.

Essential tremor affects men and women equally. The shaking often appears at about age 45, although the disorder may actually begin in adolescence or early adulthood. Essential tremor that begins very late in life is sometimes called "senile tremor."

Diagnosis

Close attention to where and how the tremor appears can help provide a correct diagnosis of the cause of the shaking. The source of the tremor can be diagnosed when the underlying condition is found. Diagnostic techniques that make images of the brain, such as computed tomography scan (CT scan) or magnetic resonance imaging (MRI), may help form a diagnosis of multiple sclerosis or other tremor caused by disorders of the central nervous system. Blood tests can rule out metabolic causes such as thyroid disease. A family history can help determine whether the tremor is inherited.

Treatment

Neither tremor nor most of its underlying neurological causes can be cured. Tremor caused by

medications, or by drug withdrawal, can sometimes be lessened with herbs which relax the nerves and muscle tissue, such as **skullcap** (*Scutellaria laterifolia*), **valerian** (*Valeriana officinalis*), and Jamaican dogwood (*Piscidia piscipula*).

Patients suffering from Parkinson's disease-related tremors may benefit from mucuna seeds (*Mucuna pruriens*). Practitioners of Ayurveda, or traditional Indian medicine, have prescribed mucuna to treat Parkinson's disease (or *Kampavata*) for over 4,000 years. Mucuna contains a natural form of L-dopa, a powerful anti-Parkinson's drug.

Allopathic treatment

Most people with essential tremor respond to drug treatment, which may include propranolol, primidone, or a benzodiazepine. People with Parkinson's disease may respond to anti-Parkinson's drugs.

Research has shown that about 70% of patients treated with botulinus toxin (Botox) have some improvement in tremor of the head, hand, and voice. Botulinus is derived from the bacterium *Clostridium botulinum*. This bacterium causes botulism, a form of **food poisoning**. It is poisonous because it weakens muscles. A very weak solution of the toxin is used in cases of tremor and paralysis to force the muscles to relax. However, some patients experience unpleasant side effects with this drug and cannot tolerate effective doses. For other patients, the drug becomes less effective over time. Medications do not produce any tremor relief in about half of all patients.

Tremor control therapy

Tremor control therapy is a type of treatment that uses mild electrical pulses to stimulate the brain. These pulses block the brain signals that trigger tremor. In this technique, the surgeon implants an electrode into a large oval area of gray matter within the brain that acts as a relay center for nerve impulses and is involved in generating movement (thalamus). The area that is particularly targeted for relief of tremor associated with PD is called the ventralis intermedius nucleus of the thalamus. The electrode is attached to an insulated wire that runs through the brain and exits the skull where it is attached to an extension wire. The extension is connected to a generator similar to a heart pacemaker. The generator is implanted under the skin in the chest, and the extension is tunneled under the skin from the skull to the generator. The patient can control his or her tremor by turning on the generator with a hand-held magnet to deliver an electronic pulse to the brain.

Some patients experience complete relief with this technique, but for others it has no benefit at all. About 5% of patients experience complications from the surgical procedure, including bleeding in the brain. The procedure causes some discomfort, because patients must be awake while the implant is placed. Batteries must be replaced by surgical procedure every three to five years.

Other surgical treatments

A patient with extremely disabling tremor may find relief with a surgical technique called thalamotomy, in which the surgeon destroys part of the thalamus. However, the procedure is complicated by numbness, balance problems, or speech problems in a significant number of cases.

Pallidotomy is another type of surgical procedure sometimes used to decrease tremors from Parkinson's disease. In this technique, the surgeon destroys part of a small structure within the brain called the globus pallidus internus. The globus is part of the basal ganglia, another part of the brain that helps control movement. This surgical technique also carries the risk of permanent disabling side effects.

Fetal tissue transplantation (also called a nigral implant) is a controversial experimental method to treat Parkinson's disease symptoms. This method implants fetal brain tissue into the patient's brain to replace malfunctioning nerves. Unresolved issues include how to harvest the fetal tissue and the moral implications behind using such tissue, the danger of tissue rejection, and how much tissue may be required. Although initial studies using this technique looked promising, there has been difficulty in consistently reproducing positive results. More promising is the development of dopamine-producing cells from neuronal stem cells for transplantation into the brains of patients with PD. A method for producing these dopaminergic cells was patented in 2001.

Small amounts of alcohol may temporarily (sometimes dramatically) ease the shaking. Some experts recommend a small amount of alcohol (especially before dinner). The possible benefits, of course, must be weighed against the risks of alcohol abuse.

Expected results

Essential tremor and tremor caused by neurologic disease (including Parkinson's disease) slowly get worse and can interfere with a person's daily life. While the condition is not life-threatening, it can severely disrupt a person's everyday experiences. One recent finding is that Parkinson's patients are more concerned about the limitations imposed on their

functioning and social life by the tremor than they are by the symptom itself.

Prevention

Essential tremor and tremor caused by a disease of the central nervous system cannot be prevented. Avoiding use of such stimulant drugs as caffeine and amphetamines can prevent tremor that occurs as a side effect of drug use.

Resources

BOOKS

Fauci, Anthony S. et al., eds. *Harrison's Principles of Internal Medicine*. New York: McGraw Hill, 1998.

PERIODICALS

Eskandar, Emad N., G. Rees Cosgrove, Leslie A. Shinobu. "Surgical Treatment of Parkinson Disease. (Contempo Updates Linking Evidence and Experience). " *Journal of the American Medical Association* 286 (December 26, 2001): 3056 3059.

"Neuralstem Patents Methods for Generating Dopamine Producing Neurons from Neural Stem Cells." *Stem Cell Week* (December 31, 2001): 13.

Whetten Goldstein, K., et al. "Patients' Perceptions of Living with Parkinson's Disease." *Gerontologist* (October 15, 2001): 281.

ORGANIZATIONS

American Academy of Neurology. 1080 Montreal Ave., St. Paul, MN 55116. (612) 695 1940. http://www.aan.com/public/con.html.

American Parkinson Disease Association. 1250 Hylan Boulevard, Suite 4B, Staten Island, NY 10305 1946. (800) 223 2732. http://www.apdaparkinson. com/.

International Tremor Foundation. 7046 West 105th Street, Overland Park, KS 66212. (913) 341 3880.

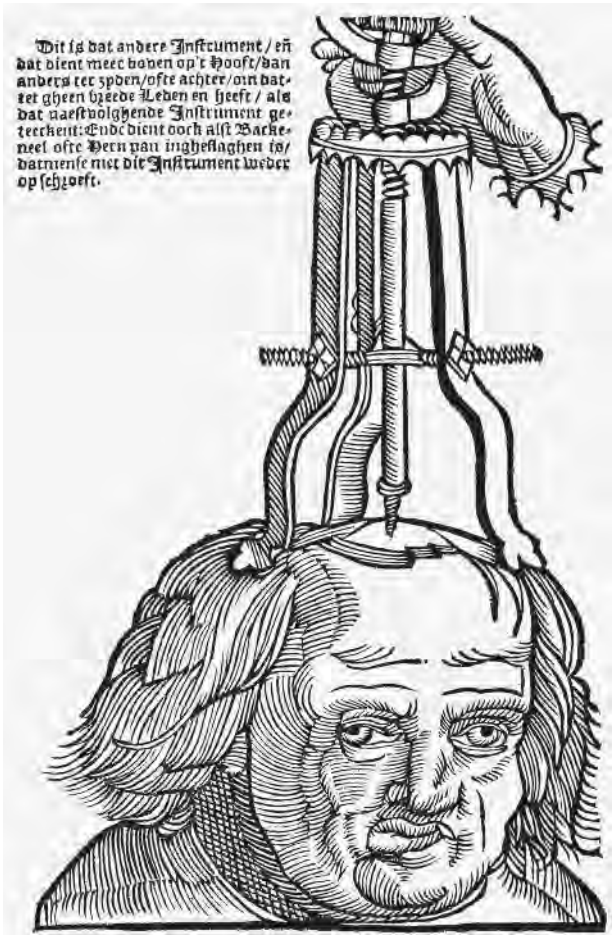
National Parkinson Foundation. 1501 NW Ninth Avenue, Miami, FL 33136. (800) 327 4545. http://www.parkinson.org.

Paula Ford-Martin
Rebecca J. Frey, PhD

Trepanation

Definition

Trepanation is a surgical procedure in which a circular piece of bone is removed from the skull by a special saw-like instrument called a trephine or trepan. The operation is also known as trephination or trephining. The English word "trepan" comes from the Greek word *trypanon*, which means "auger" or "drill."



Trepanation is a surgical procedure in which a circular piece of bone is removed from the skull by a special saw-like instrument called a trephine or trepan. *(The Print Collector / Alamy)*

In standard medical practice, trepanation is occasionally performed by a neurosurgeon in order to relieve pressure on the brain caused by trauma, or to remove a blood clot from brain tissue. In recent years, however, trepanation has been touted by a small group of alternative practitioners as a way to expand one's consciousness through the increase of blood flow to the brain and opening the "third eye," also known as the inner eye or eye of the mind. Practitioners of kundalini **yoga** refer to the opening of the third eye, located in the middle of the forehead, as entry into a new and completely different dimension of reality.

Origins

Trepanation is the oldest surgical procedure known to humans; skulls of Cro-Magnon people estimated to be 40,000 years old have been discovered with

KEY TERMS

Engram—A permanent trace left in nerve tissue by a stimulus; in psychology, a latent memory picture or lasting trace left in the psyche by any experience.

Fontanelle—A membrane-covered soft spot in an infant's skull where the bone has not yet completely formed.

Kundalini yoga—A type of yoga that focuses on the body's innate psychospiritual energy (*kundalini shakti* or "serpent power" in Sanskrit) through breathing exercises, meditation, yoga postures, and chanting. Its goal is to empower the individual's consciousness to merge with universal consciousness.

Meninges—The three layers of membranous tissue that form a protective cover for the brain and spinal cord. The outermost layer is the dura mater, the middle is the arachnoid mater, and the innermost is the pia mater. In trepanation, a piece of the skull is removed without cutting through the underlying meninges.

Third eye—A term used to refer to the inner eye or eye of the mind. Opening the third eye refers to admission to a new level of consciousness.

Trephine—A saw- or drill-like instrument used to remove a circular piece of bone from the skull. It is also called a trepan.

circular holes as large as 2 in in diameter. The Incas of Peru are known to have performed trepanation as early as 2000 B.C. It is thought that these operations were performed to treat people suffering from psychotic disorders, **epilepsy**, or chronic migraine headaches by allowing demons to escape through the hole in the skull.

The oldest written reference to trepanation comes from Hippocrates (c. 400 B.C.), whose descriptions of head injuries refer to it as a necessary treatment for skull **fractures** with bone fragments pushed inward and compressing the brain. Celsus and Galen refer to Roman surgeons of the first century A.D. as performing trepanations with implements resembling carpenters' drills. Trephines were refined in various ways through the Middle Ages, the Renaissance, and the eighteenth and nineteenth centuries. It should be emphasized that trepanations were done by ancient, medieval, and early modern physicians to relieve pressure on brain tissue—not to perform surgery on the brain itself. Care was taken not to penetrate the dura mater, which is the outermost of the three meninges or membranes that lie beneath the skull and form a protective cover for the brain and spinal cord. Historians of medicine estimate, however, that as many as 40 percent of patients died from **infections** following the procedure rather than from the surgery itself.

Contemporary interest in trepanation as a path to expanded consciousness goes back only to the 1960s. Bart Huges, a Dutchman who was expelled from medical school in the early 1960s for failing his examinations and using **marijuana**, is generally considered the founder of alternative trepanation. Huges developed a theory that he called brainbloodvolume while he was smoking marijuana at a party on the island of Ibiza. He noticed another guest standing on his head to increase the intoxicating effects of the drug. Huges concluded that the expansion of consciousness associated with hallucinogens results from an increased volume of blood in the brain. He reasoned that the removal of a piece of the skull would allow an even larger amount of blood to enter the brain, speeding up the delivery of oxygen and glucose to the brain cells as well as the removal of toxins. Huges had also learned in medical school that infants are born with soft spots in the skull known as fontanelles, which are membrane-covered areas where the bone has not yet completely formed. He concluded that trepanation would help to return an adult's consciousness to the intense imagination and vivid dreams of a child.

Hugues—who never obtained a medical degree—managed to convert several individuals to his brainbloodvolume theory—among them Peter Halvorson, who underwent trepanation and credits it with curing his **depression**, increasing his energy level, and giving him a permanent drug-free high. As of 2004, Halvorson is the head of the International Trepanation Advocacy Group (ITAG), headquartered in Wernersville, Pennsylvania. The ITAG web site includes accounts of a pilot study of six volunteers who were trepanned in June 2002 as well as personal testimonials from others who have undergone the procedure.

Benefits

According to the testimonials collected by Halvorson, trepanation confers the following benefits:

- relief from anxiety, depression, and other mood disorders
- feelings of freedom and serenity
- a richer emotional life
- greater ability to recall dreams on awaking
- decrease in frequency and severity of chronic headaches
- higher energy levels

Other people who have undergone trepanation, however, maintain that these benefits are only temporary and may be due to the **placebo effect**. A man who performed trepanation on himself in 2000 reported to an interviewer from an online body modification journal that he had "come to the frustrating conclusion [four weeks after the procedure] that the trepanation has had no lasting effect.... Trepanation has no more physiological effect than any other trauma.... it does not do what many hope it will."

Description

Surgical trepanation

A standard trepanation—most commonly done to relieve pressure on the brain when a portion of the skull has been pushed inward—is performed with the patient under general anesthesia under sterile conditions. The neurosurgeon cuts the scalp over the injured area, pulls back a flap of skin, and bores a hole in the underlying skull with a trephine. After the depressed bone has been removed together with any **blood clots** that have formed, the surgeon carefully cleanses the area and closes the incision.

Alternative trepanation

Some alternative trepanations have been performed by people on themselves, with friends to assist with the procedure. In the early 1980s, several people in England performed the entire operation on themselves, with others present to help only if an emergency arose. The reason for this stipulation was to protect the others in the room from criminal prosecution for performing surgery without credentials. The trepanner typically shaved his or her head and injected a local anesthetic. He or she then made an incision in the scalp over the area to be trepanned. Next, a hole between 1/4 and 1/2 in in diameter was cut in the skull with a foot-powered dental drill. The trepanner then removed the piece of skull, cleaned the incision, and bandaged it. The scalp gradually grew back over the hole, leaving only a small permanent indentation. More recently, however, trepanners have allowed others to assist with the operation; the man who was interviewed for the online journal had three friends who covered the walls of his room with plastic sheeting, did part of the drilling, and rinsed out the incision from time to time with sterile saline solution. He reported that the entire procedure took about 3-1/2 hours.

The participants in the ITAG pilot study, however, went to a clinic in Monterrey, Mexico, for their trepanations. The ITAG web site states plainly that "Self-trepanation today is a very selfish act. It opens the door for no one and you'd always have to keep it a secret. The public mind can't handle this. You'd be labeled 'insane.'" According to the ITAG web site, the surgeon who presently performs the procedures for Halvorson's groups was trained in Texas and is board-certified in four countries (France, Spain, Mexico, and the United States). The trepanations take about 35 minutes to complete. The cost of the operation is $2400–$3600, not including travel and hotel fees.

Preparations

People who have performed trepanations on themselves have prepared by assembling the needed equipment and setting aside a room in their house to serve as the operating room.

ITAG requires persons interested in trepanation (who must be 18 or older) to go through a period of mental preparation known as engramming, which Halvorson defines idiosyncratically as "becom[ing] thoroughly acquainted with the terminology of conscious expansion." In addition, the volunteers must sign an informed consent form and a protocol that indicates that they understand the procedure is considered experimental. They are given MRIs before and after the trepanation.

Precautions

Mainstream medical professionals uniformly warn against alternative trepanation because it is an extremely risky procedure—particularly if done by amateurs—with no certain or permanent benefits. Because scalp incisions bleed profusely, people who attempt to trepan themselves are likely to find that the flow of blood obscures their field of vision, thus increasing the risk of self-injury.

Side effects

The potential side effects of alternative trepanation are severe, even life-threatening; they include permanent injury or death from infections, **stroke**, direct damage to brain tissue, generalized encephalitis, epilepsy, or brain abscesses.

Research and general acceptance

Trepanation is not accepted as an alternative therapy by any mainstream physicians or surgeons in the United States or Canada. In addition to the dangers of the procedure itself, neurosurgeons who have studied

the claims made for trepanation say that Huges' brain-bloodvolume theory is anatomically impossible.

Training and certification

As of 2004, there are *no* reputable medical school courses, training institutions, or licensing procedures in the United States or Canada for trepanation performed as a means to altered or higher consciousness.

Resources

BOOKS

Michell, John. *Eccentric Lives and Peculiar Notions*. Secau cus, NJ: Citadel Press, 1984.

PERIODICALS

Clower, W. T., and S. Finger. "Discovering Trepanation: The Contribution of Paul Broca." *Neurosurgery* 49 (December 2001): 1417 1425.

Facchini, F., E. Rastelli, L. Ferrero, and E. Fulcheri. "Cra nial Trepanation in Two Skulls of Early Medieval Italy." *Homo* 53 (2003): 247 254.

Van Alphen, H. A. "Elective Trepanation for Acute Epi dural Hematoma by Dr. Nicolaes Tulp (1593 1674)." *Neurosurgery* 48 (February 2001): 401 404.

Weber, J., and A. Czarnetzki. "Trepanations from the Early Medieval Period of Southwestern Germany Indications, Complications and Outcome." *Zentralblatt für Neuro chirurgie* 62 (February 2001): 10 14.

ORGANIZATIONS

American Association of Neurological Surgeons (AANS). 5550 Meadowbrook Drive, Rolling Meadows, IL 60008. (888) 566 AANS or (847) 378 0500. Fax: (847) 378 0600. http://www.aans.org.

International Trepanation Advocacy Group (ITAG), Inc. P. O. Box 65, Wernersville, PA 19565. (610) 693 6869. Fax: (610) 693 3261.

OTHER

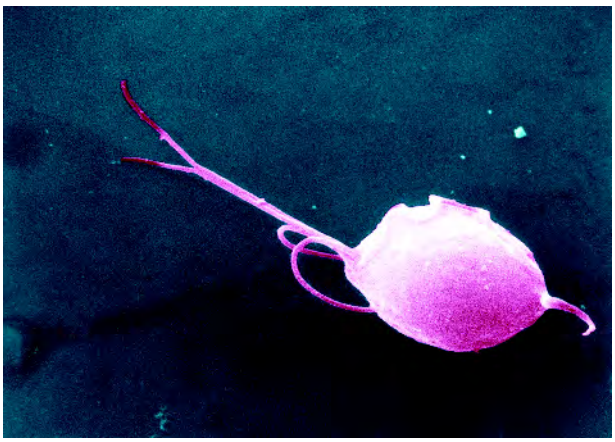
Henderson, Bryan. "Trepanation." Interview conducted for *Body Modification Ezine* (BME). http://www.bmezine.com/news/people/A10101/trepan.

Rebecca Frey

Trichomoniasis

Definition

Trichomoniasis refers to an infection of the genital and urinary tract. It is the most common sexually transmitted disease, affecting about 120 million women worldwide each year.



Scanning electron micrograph (SEM) of *Trichomonas vaginalis*, the human parasitic flagellate that causes the sexually transmitted disease trichomoniasis. *(BSIP / Photo Researchers, Inc.)*

Description

Trichomoniasis is caused by a protozoan (the smallest, single-celled members of the animal kingdom). *Trichomonas vaginalis* is almost always passed through sexual contact. Trichomoniasis is primarily an infection of women's vaginal and urinary tracts. A woman is most susceptible to infection just after having completed her menstrual period. Men may carry the organism unknowingly, since infection in men may cause mild or no symptoms. Men may also experience urethral discharge or persistent urethritis. Trichomoniasis is associated with HIV transmission and may be associated with adverse **pregnancy** outcomes.

Causes and symptoms

Because trichomoniasis is a sexually transmitted disease, it occurs more often in individuals who have multiple sexual partners. The protozoan is passed to an individual by contact within the body fluids of an infected sexual partner. It often occurs simultaneously with other sexually transmitted diseases, especially **gonorrhea**.

In women, the symptoms of trichomoniasis include an unpleasant vaginal odor, and a heavy, frothy, yellow discharge from the vagina. The genital area (vulva) is often very itchy, and there is frequently **pain** with urination or with sexual intercourse. The labia (lips) of the vagina, the vagina itself, and the cervix (the narrowed, lowest segment of the uterus which extends into the upper part of the vagina) will be bright red and irritated. Women may also experience lower abdominal discomfort.

KEY TERMS

Metronidazole—An anti-infective agent regarded as the best available drug for treating trichomoniasis. It is sold under the trade names Flagyl and MetroGel.

Protozoan—A one-celled organism belonging to the simplest phylum of the animal kingdom. Trichomoniasis is caused by a protozoan.

Urethritis—Inflammation of the urethra, which is the canal that carries urine from the bladder to the outside of the body.

In men, there may be no symptoms at all. Some men notice a small amount of yellowish discharge from the penis, usually first thing in the morning. There may be some mild discomfort while urinating, testicular pain or tenderness, or lower abdominal pain. Some men infected with trichomoniasis experience persistent urethritis.

The use of antibiotics is a contributing factor to recurrent trichomoniasis in some women because antibiotics affect the balance of bacteria in the vagina, allowing such organisms as *T. vaginalis* to multiply more rapidly.

Diagnosis

Diagnosis is easily made by taking a sample of the discharge from the woman's vagina, or from the opening of the man's penis. The sample is put on a slide, and viewed under a microscope. The protozoa, which are able to move about, are easily viewed.

Trichomoniasis tends to be underdiagnosed in men because of the relative mildness of symptoms in men and insufficiently sensitive diagnostic tests. The recent introduction of DNA amplification, however, indicates that the incidence of trichomoniasis in men is much higher than was previously thought.

Treatment

Cure of trichomoniasis may be difficult to achieve with alternative treatments. Some practitioners suggest eliminating sweets and carbohydrates from the diet and supplement with **antioxidants**, including vitamins A, C, and E, and **zinc**. Naturopaths may recommend treatment with two douches (a wash used inside the vagina), alternating one in the morning and one at bedtime. One douche contains the herbs **calendula** (*Calendula officinalis*), **goldenseal** (*Hydrastis canadensis*), and **echinacea** (*Echinacea* spp.); the other douche contains plain yogurt with live **acidophilus** cultures. The herbal douche helps to kill the protozoa, while the yogurt reestablishes healthy flora in the vagina. **Tea tree oil** is another alternative remedy for trichomoniasis. Acidifying the vagina by douching with boric acid or vinegar may also be useful. Although not a cure, *The Gynecological Sourcebook* suggests inserting a **garlic** (*Allium sativum*) suppository (a peeled whole clove wrapped in gauze) every 12 hours for symptomatic relief.

Other remedies include vaginal suppositories that include the ingredient acidophilus once a day for three days. An alternative medicine practitioner can recommend the correct mixture. A vaginal douche consisting of **grapefruit seed extract** may also help relieve symptoms.

Allopathic treatment

The usual treatment is a single large dose of metronidazole (Flagyl) or split doses over the course of a week. Some sources suggest clotrimazole (Gyne-lotrimin, Mycelex) as an alternative treatment showing a lower cure rate. Application of Betadine, a concentrated antiseptic solution, is another recommendation. However, Betadine is messy, stains, and should not be used by pregnant women. However, the Centers for Disease Control (CDC) states that there are no effective alternatives to therapy with metronidazole available. Topical treatment of metronidazole is not advised. Individual evaluations are recommended for those who are allergic to metronidazole or who experience treatment-resistant trichomoniasis. Sexual partners of an infected individual must all be treated, to prevent the infection from being passed back and forth. Sexual intercourse should be avoided until all partners are cured.

As of late 2003, the number of cases of metronidazole-resistant trichomoniasis appears to be increasing rapidly. Some success has been reported with the broad-spectrum anti-parasitic drug nitazoxanide, but further research needs to be done. A group of researchers in Thailand is currently investigating the effectiveness of a group of drugs known as bisquaternary quinolinium salt compounds in treating trichomoniasis.

Women who are taking antibiotics for other illnesses should speak to their health care provider about the possibile effects of the medication(s) on the balance of organisms in their vagina.

Expected results

Prognosis is excellent (90–95%) with appropriate treatment of the patient and all sexual partners.

Without treatment, the infection can remain for a long time, and can be passed to all sexual partners.

Prevention

All sexually transmitted diseases can be prevented by using adequate protection during sexual intercourse. Effective forms of protection include male and female condoms. Other preventive measures are similar to those for other forms of **vaginitis** including wearing loose cotton clothing and not using douches, vaginal deodorants, or sprays.

Resources

BOOKS

Nash, Theodore E., and Peter F. Weller. "Protozoal Intes tinal Infections and Trichomoniasis." *Harrison's Prin ciples of Internal Medicine, 14th ed.* Edited by Anthony S. Fauci, et al. New York: McGraw Hill, 1998.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Vaginitis." New York: Simon & Schuster, 2002.

Plorde, James J. "Introduction to Pathogenic Parasites: Pathogenesis and Chemotherapy of Parasitic Diseases." *Sherris Medical Microbiology: An Introduction to Infectious Diseases*. Edited by Kenneth J. Ryan. Nor walk, CT: Appleton and Lange, 1994.

Rosenthal, M. Sara. *The Gynecological Sourcebook*. Los Angeles, Lowell House. 1994.

PERIODICALS

Chavalitshewinkoon Petmitr, P., M. Ramdja,S. Kajornde chakiat, et al. "In vitro Susceptibility of *Trichomonas vaginalis* to AT Specific Minor Groove Binding Drugs" *Journal of Antimicrobial Chemotherapy* 52 (August 2003): 287 289.

Ching, Susanne, and Phuong H. Nguyen. "Vaginitis." *eMedicine*, 5 April 2002. http://emedicine.com/med/ topic2358.htm.

Davis, Annabel. "*Trichomonas vaginalis*: Signs, Tests, and Treatment." *Nursing Times* 94 (November 25 December 1, 1998): 58 59.

Dunne, R. L., L. A. Dunn, P. Upcroft, et al. "Drug Resist ance in the Sexually Transmitted Protozoan *Trichomo nas vaginalis*." *Cell Research* 13 (August 2003): 239 249.

Pirotta, M. V., J. M. Gunn, and P. Chondros. "'Not Thrush Again!' Women's Experience of Post Antibiotic Vul vovaginitis." *Medical Journal of Australia* 179 (July 7, 2003): 47 49.

Schwebke, J. R., and E. W. Hook, 3rd. "High Rates of *Trichomonas vaginalis* Among Men Attending a Sexu ally Transmitted Diseases Clinic: Implications for Screening and Urethritis Management." *Journal of Infectious Diseases* 188 (August 1, 2003): 465 468.

OTHER

Centers for Disease Control and Prevention (CDC). Fact Sheet:*Trichomonas* Infection. http://www.cdc.gov/ncidod/ dpd/parasites/trichomonas/factsht_trichomonas.htm.

Kathy S. Stolley
Rebecca J. Frey, PhD

Trigger point therapy

Definition

Trigger point therapy is a bodywork technique that involves the application of pressure to tender muscle tissue in order to relieve **pain** and dysfunction in other parts of the body. It may also be called myofascial (*myo* meaning muscle, *fascial* meaning connective tissue) trigger point therapy. Trigger point therapy is sometimes regarded as one of a group of treatment aproaches called neuromuscular therapy or NMT. **Myotherapy**, developed by Bonnie Prudden, is a related type of trigger point therapy.

Origins

Trigger point therapy was developed by Dr. Janet Travell in the United States in the 1940s; she is credited with having first used the phrase "trigger point" in print in 1942. Through her work and events in her personal life, Travell advanced the theory that pain experienced in one part of the body is actually caused by an injury or dysfunction in another part of the body. Ultimately, she mapped what she termed the body's trigger points and the manner in which pain radiates to the rest of the body. Travell's work came to national attention when she treated President John F. Kennedy for his back pain.

Trigger points are thought to result from a variety of causes, including birth trauma, **hypoglycemia**, vitamin B_6 deficiency, food **allergies**, traumatic injuries, poor posture, skeletal asymmetry, overexertion, or such diseases of the digestive tract as ulcers and **irritable bowel syndrome**. During times of physical or emotional **stress**, the points cause muscles to spasm. Travell's therapy called for the injection of saline (a salt solution) and procaine (also known as Novocaine, an anesthetic) into the trigger point. Although beneficial in the relief of pain, the injections are a painful procedure for some people.

In the 1970s, Bonnie Prudden, a physical fitness and **exercise** therapist, found that applying sustained pressure to a trigger point also relieved pain. Prudden

KEY TERMS

Bodywork—Any healing technique involving hands-on massage or manipulation of the body.

Myotherapy—A form of trigger point therapy that relies on deep massage of the trigger points rather than injections to relieve pain.

Trigger point—An area of intense irritability within soft tissue structures, characterized by local soreness and sometimes referred pain.

developed her techniques over a number of years and called the treatments myotherapy. Myotherapy is beneficial to patients who find that trigger point injections are too painful.

Benefits

Trigger point therapy is said to interrupt the neural signals that cause both the trigger point and the pain. The object is to eliminate pain and to re-educate the muscles into pain-free habits. In this manner, the swelling and stiffness of neuromuscular pain is reduced, range of motion is increased, and flexibility and coordination are improved. The therapy can also relieve tension and improve circulation.

The list of conditions that benefit from trigger point therapy include arthritis; **carpal tunnel syndrome**; chronic pain in the back, knees, and shoulders; headaches; menstrual cramps; **multiple sclerosis**; **muscle spasms**, tension, and weakness; postoperative pain; **sciatica**; **temporomandibular joint syndrome** (TMJ); **tendinitis**; and whiplash injuries.

Description

Typically, a health care professional refers a patient to a trigger point therapist. The therapist will take a history of injuries suffered, occupations held, and sports played. He or she will ask the individual to describe the pain and its location in detail.

The therapist will then probe the area of the coordinating trigger point. An injection of lidocaine, saline, or other medicines, or probing with a dry needle, may be done. In myotherapy, once the point is found, the therapist will apply sustained pressure using the fingers, knuckles, or elbows for several seconds.

Pain relief is often experienced immediately. Following the injection or pressure treatment, the therapist will then gently stretch the muscles of the trigger point. Finally, a series of exercises is taught to the individual to reeducate the muscles and to prevent the pain from returning.

Workbooks are now available to help patients maximize the benefits of trigger point therapy through self-treatment at home.

Preparation

Persons should consult a health care professional before beginning trigger point therapy to insure that the pain is not caused by fracture or disease. In fact, a certified trigger point therapist will not provide services to someone who is not referred by a health care professional.

The therapy is usually conducted on a padded table or treatment chair. The individual should wear comfortable, loose-fitting clothing. An ongoing, honest interaction with the therapist will facilitate the sessions.

Treatment sessions can last 30 minutes to an hour. The range of cost is approximately $45–60 per session. Acute pain can be relieved in as little as one session. Chronic pain may require numerous treatments.

Precautions

Persons with infectious diseases, open sores, or recent injuries should wait until they have recovered before beginning trigger point therapy.

Persons taking anticoagulant prescription drugs may experience bruising after trigger point therapy.

Research and general acceptance

Research into the effects of trigger point therapy is sketchy, although the growing acceptance of **acupuncture** within the mainstream medical community has led to a few recent published studies of trigger point therapy. Interest in trigger point therapy is growing in Europe and Asia as well as in the United States; one recent study by a group of Japanese researchers reported that trigger point therapy was superior to standard allopathic drugs in relieving the pain of renal **colic**.

The American Academy of Pain Management (AAPM) reports that studies of trigger point therapy on back pain and headaches have been conducted on groups of fewer than 10 people. The AAPM does, however, recognize trigger point therapy as a valid approach to the management and relief of pain.

In the traditional medical community, trigger point therapy is viewed as a complement to treatment. Patients are referred by a variety of health

professionals including psychiatrists, orthopedic surgeons, and anesthesiologists.

Training and certification

The Pittsburgh School of Pain Management, formerly the Academy for Myofascial Trigger Point Therapy, is located in Pittsburgh, Pennsylvania. The school is licensed by the Commonwealth of Pennsylvania and offers a 650-hour program for persons seeking certification as myofascial trigger point therapists. Eligible entrants are those with such allied health backgrounds as nursing, dentistry, **massage therapy**, physical therapy, occupational therapy, exercise physiology, and sports training. Additionally, a background in biology, anatomy, **nutrition** and/or physiology are often accepted as qualifications. Graduates of the Academy are allowed to sit for certification by the National Certification Board for Trigger Point Myotherapy.

Practitioners carrying the Bonnie Prudden myotherapist certification will have completed a nine-month, 1,300-hour training program and passed the board examination. Therapists are re-certified with a 45-hour training program every other year.

Resources

BOOKS

Credit, Larry, Sharon G. Hartunian, and Margaret J. Nowak. *Your Guide to Complementary Medicine*. Garden City Park, New York: Avery Publishing Group, 1998.

Davies, Clair. *The Trigger Point Therapy Workbook: Your Self Treatment Guide for Pain Relief*. Oakland, CA: New Harbinger Publications, 2001.

Prudden, Bonnie. *Myotherapy: Bonnie Prudden's Complete Guide to Pain Free Living*. New York: Ballantine 1984.

Travell, Janet, M.D. *Office Hours: Day and Night*. Cleveland, OH: New American Library, 1968.

PERIODICALS

Baldry, P. "Superficial Versus Deep Dry Needling." *Acupuncture in Medicine* 20 (August 2002): 78 81.

Iguchi, M., Y. Katoh, H. Koike, et al. "Randomized Trial of Trigger Point Injection for Renal Colic." *International Journal of Urology* 9 (September 2002): 475 479.

Irnich, D., N. Behrens, J. M. Gleditsch, et al. "Immediate Effects of Dry Needling and Acupuncture at Distant Points in Chronic Neck Pain: Results of a Randomized, Double Blind, Sham Controlled Crossover Trial." *Pain* 99 (September 2002): 83 89.

ORGANIZATIONS

American Academy of Pain Management. 13947 Mono Way #A, Sonora, CA 95370. (209) 533 9744. www.aapainmanage.org.

American Academy of Pain Medicine. 4700 W. Lake, Glen view, IL 60025. (847) 375 4731. www.painmed.org.

Bonnie Prudden Pain Erasure, LLC. P.O. Box 65240, Tucson, AZ 85728 5240. (800) 221 4634. www.bonnieprudden.com.

Pittsburgh School of Pain Management. 1312 E. Carson Street, Pittsburgh, PA 15203. (412) 481 2553. www.painschool.com.

Mary McNulty
Rebecca J. Frey, PhD

Triphala

Description

Triphala, an ancient herbal blend, is one of the most commonly used herbal remedies in the Ayurvedic system of healing. **Ayurvedic medicine** originated in ancient India and has developed over thousands of years, and is one of the oldest systems of healing. Thus triphala is one of the longest used herbal remedies in the world. Triphala, meaning "three fruits," is made from the fruits of three trees that grow throughout India and the Middle East, including amalaki fruit (*Embelica officinalis*), bibhitaki fruit (*Terminalia belerica*), and haritaki fruit (*Terminalia chebula*). In preparing triphala, these fruits are dried, ground into powder, and then blended; all according to the precision of Ayrurvedic tradition together.

Amalaki fruit, also called amla or Indian gooseberry, is renowned as one of the best rejuvenating herbs in Ayurvedic medicine. It contains more **vitamin C** than any almost all other fruits, consisting of nearly 3,000 mg of vitamin C per piece. It has been nicknamed the nurse herb in India, because of its widespread effectiveness against sickness, and has cooling effects on the body. Haritaki is also considered one of the most useful of Ayurvedic herbs, particularly for its rejuvenating, warming, and balancing effects. Combined with bibhitaki fruit, another tonifying and warming herb, these three compounds are believed to have healing and balancing effects on all three of the principle body types or constitutions (termed doshas) in Ayurvedic medicine. As a balanced formula, triphala can be effectively used by most people and is prescribed for a variety of health conditions.

General Use

Triphala is taken as a general health tonic, useful for all body types and a variety of conditions. It is commonly prescribed to tone and strengthen the

KEY TERMS

Dosha—One of the three physical constitution types (vata, pitta, and kapha) in Ayurvedic medicine.

Intestinal flora—The friendly bacteria that live in the digestive tract and aid digestion of food.

digestive system, particularly in cases of weak digestion and **constipation**, and has a mild laxative effect. Triphala is a gentle laxative that can be used daily and is not habit-forming, and has no adverse effects on the intestinal flora (the microorganisms that aid digestion). It is said to improve the function of the stomach and intestines, and is also prescribed for cases of excess stomach acid. Triphala regulates and detoxifies the bowels, improves overall health by increasing the efficiency and absorption of digestion, and reduces **gas**. It has a balancing effect on the body's metabolism, and is prescribed to restore appetite. The herbal compound also helps the body to eliminate excess fat, by improving metabolism. Because of its gentle properties, triphala is recommended as a digestive aid for the elderly and for those with sensitive stomachs.

In addition to restoring the balance of the digestive tract, triphala is used as a blood builder and purifier, and may increase red blood cell count and hemoglobin levels. Some healers prescribe it for diabetes, for its balancing effect on blood sugar levels. It also has anti-cholesterol and anti-mucus properties in the body. Triphala is believed to strengthen the kidneys and liver, and is prescribed for **hepatitis** sufferers.

Triphala is a source of vitamin C and is believed to improve the function of the immune system. The herbs in triphala have anti-inflammatory properties. The remedy is prescribed for **gout**, a form of arthritis caused by excess uric acid in the body, and other inflammatory conditions. Triphala is said to have a calming and tonic effect on the nervous system, and is recommended for **Alzheimer's disease** and other degenerative disorders of the nervous system.

Another use for triphala is to strengthen the eyes, particularly in cases of **cataracts**, **glaucoma**, and **conjunctivitis**. It can be used as an eyewash and may reduce soreness and redness in the eyes. Triphala can also be applied topically to the skin, to speed the healing of **bruises** and **sunburn**.

Preparations

Triphala is available as a powder, and in tablets and capsules as well. For those who do not like very strong and bitter tastes, tablets or capsules are recommended. Triphala can be taken daily. As a digestive tonic and laxative, it is best taken in the evening, about two hours after eating, and at least 30 minutes before bedtime. No food should be eaten for one and a half hours after ingestion. Tablets and capsules can be swallowed, while the powder can be mixed thoroughly in a small amount of cold or warm water. The powder can also be simmered in water and drunk as a medicinal tea.

Individuals should start with small amounts of triphala, a quarter teaspoon of the powder or one tablet, and gradually increase the dosage until finding the optimal dosage. No more than one teaspoon of the powder or four to six tablets or capsules should be taken per day, and the dosage should be reduced in cases of stomach upset or **diarrhea**.

As triphala is not addictive, it can be taken over long periods of time. It is recommended that every ten weeks, users should stop taking the herbal compound for two to three weeks, to give the body a rest and to maintain the effectiveness of the remedy.

When used as an eyewash, one teaspoon of triphala powder can be added to one cup of boiled and cooled water. The solids should be removed by straining through a dense cloth. The eyewash can be applied to the eyes three times per day. For topical application to the skin, the powder can be mixed with a small amount of water to make an easily applied paste.

Precautions

Triphala is not recommended during **pregnancy** or nursing, and should not be used with cases of diarrhea and dysentery.

Side Effects

The use of triphala may increase intestinal gas at first, a possible by-product of the cleansing and **detoxification** effects in the digestive tract. Loose stools or diarrhea may indicate too high a dosage, and the amount ingested should be reduced.

Interactions

There are no known interactions with this herbal compound.

Resources

BOOKS

Frawley, Dr. David and Dr. Vasant Lad. *The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine*. Lotus Press, 2001.
Morrison, Judith. *The Book of Ayurveda*. Fireside Books, 1995.
Tierra, Michael. *The Way of Herbs*. Pocket Books, 1998.

Tiwari, Maya. *Ayurvedic Secrets of Healing*. Lotus Press, 1995.

ORGANIZATIONS

The Ayurvedic Institute. 11311 Menaul NE, Albuquerque, New Mexico 87112. (505)291 9698. http://www.Ayurveda.com.

Douglas Dupler

TSS *see* **Toxic shock syndrome**

Tuberculosis

Definition

Tuberculosis (TB) is a contagious and potentially fatal disease that can affect almost any part of the body but manifests mainly as an infection of the lungs. It is caused by a bacterial microorganism, the tubercle bacillus or *Mycobacterium tuberculosis*. TB infection can either be acute and short-lived or chronic and long-term.

Description

Although TB can be prevented, treated, and cured with proper treatment and medications, scientists have never been able to eliminate it entirely. The organism that causes tuberculosis, popularly known as consumption, was discovered in 1882. Because antibiotics were unknown, the only means of controlling the spread of infection was to isolate patients in private sanatoriums or hospitals limited to patients with TB—a practice that continues to this day in many countries. TB spread very quickly and was a leading cause of death in Europe. At the turn of the twentieth century more than 80% of the people in the United States were infected before age 20, and tuberculosis was the single most common cause of death. Streptomycin was developed in the early 1940s and was the first antibiotic effective against the disease. The number of cases declined until the mid- to late-1980s, when overcrowding, homelessness, immigration, decline in public health, decline in funding, and the **AIDS** epidemic caused a slight resurgence of the disease. The increase in TB in the United States peaked in 1992, and now cases reported in the United States continue to decrease. Yet the number of cases in foreign-born individuals is rising, and the number of deaths from TB has been rising, making TB a leading cause of death from infection throughout the world. It is estimated that in the next 10 years 90 million new cases of TB will be reported, with the result of 30 million deaths, or about 3 million deaths per year.

Tuberculosis lesion in the lung. *(Brian Evans / Photo Researchers, Inc.)*

Several demographic groups are at a higher risk of contracting tuberculosis. Tuberculosis is more common in elderly persons. More than one-fourth of the nearly 23,000 cases of TB in the United States in 1995 were reported in people above age 65. TB also is more common in populations where people live under conditions that promote infection, such as homelessness and injection drug use. In the late 1990s, two-thirds of all cases of TB in the United States affected African Americans, Hispanics, Asians, and persons from the Pacific Islands. Finally, the high risk of TB includes people who have a depressed immune system. High-risk groups include alcoholics, people suffering from malnutrition, diabetics, and AIDS patients — and those infected by human immunodeficiency virus (HIV) — who have not yet developed clinical signs of AIDS. TB is the number one killer of women of childbearing age worldwide and in poor countries, women with TB often don't know they have the disease until symptoms become severe.

Lymph node enlarge by tuberculosis. *(© Medical-on-Line / Alamy)*

TB is a major health problem in certain immigrant communities, such as the Vietnamese in southern California. One team of public health experts in North Carolina maintains that treatment for tuberculosis is the most pressing health care need of recent immigrants to the United States. In some cases, the vulnerability of immigrants to tuberculosis is increased by occupational exposure, as a recent outbreak of TB among Mexican poultry farm workers in Delaware indicates. Other public health experts are recommending tuberculosis screening at the primary care level of all new immigrants and refugees.

Causes and symptoms

Transmission

Tuberculosis spreads by droplet infection, in which a person breathes in the bacilli released into the air when a TB patient exhales, coughs, or sneezes. However, TB is not considered highly contagious compared to other infectious diseases. Only about one in three people who have close contact with a TB patient, and fewer than 15% of more remote contacts are likely to become infected. Unlike many other **infections**, TB is not passed on by contact with a patient's clothing, bed linens, or dishes and cooking utensils. Yet if a woman is pregnant, her fetus may contract TB through blood or by inhaling or swallowing the bacilli present in the amniotic fluid.

Once inhaled, water in the droplets evaporates and the tubercle bacilli may reach the small breathing sacs in the lungs (the alveoli), then spread through the lymph vessels to nearby lymph nodes. Sometimes the bacilli move through blood vessels to distant organs. At this point they may either remain alive but inactive (quiescent), or they may cause active disease. The likelihood of acquiring the disease increases with the concentration of bacilli in the air, and the seriousness of the disease is determined by the amount of bacteria with which a patient is infected.

Ninety percent of patients who harbor *M. tuberculosis* do not develop symptoms or physical evidence of the disease, and their x rays remain negative. They are not contagious; however, these individuals may get sick at a later date and then pass on TB to others.

KEY TERMS

Bacillus Calmette-Guérin (BCG)—A vaccine made from a damaged bacillus similar to the tubercle bacillus, which may help prevent serious pulmonary TB and its complications.

Miliary tuberculosis—A form of TB in which the bacillus spreads through all body tissues and organs, producing many thousands of tiny tubercular lesions. Miliary TB is often fatal unless promptly treated.

Mycobacteria—A group of bacteria that includes *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis, and other forms that cause related illnesses.

Pneumothorax—Air inside the chest cavity, which may cause the lung to collapse. Pneumothorax is both a complication of pulmonary tuberculosis and a means of treatment designed to allow an infected lung to rest and heal.

Purified protein derivative (PPD)—An extract of tubercle bacilli that is injected into the skin to find out whether a person presently has or has ever had tuberculosis.

Sputum—Secretions produced in a patient's infected lung and coughed up. Sputum is routinely used as a specimen for culturing the tubercle bacillus in the laboratory.

Though it is impossible to predict whether a person's disease will become active, researchers surmise that more than 90% of cases of active tuberculosis come from this pool of people. An estimated 5% of infected persons get sick within 12-24 months of being infected. Another 5% heal initially but, after years or decades, develop active tuberculosis. This form of the disease is called reactivation TB, or post-primary disease. On rare occasions a previously infected person gets sick again after a second exposure to the tubercle bacillus.

Pulmonary tuberculosis

Pulmonary tuberculosis is TB that affects the lungs, and represents about 85% of new cases diagnosed. It usually presents with a **cough**, which may or may not produce sputum. In time, more sputum is produced that is streaked with blood. The cough may be present for weeks or months, and may be accompanied by chest **pain** and shortness of breath. Persons with pulmonary TB often run a low grade **fever** and suffer from night-sweats. The patient often loses interest in food and may lose weight. If the infection allows air to escape from the lungs into the chest cavity (pneumothorax) or if fluid collects in the pleural space (pleural effusion), the patient may have difficulty breathing. The TB bacilli may travel from the lungs to lymph nodes in the sides and back of the neck. Infection in these areas can break through the skin and discharge pus.

Extrapulmonary tuberculosis

Although the lungs are the major site of damage caused by tuberculosis, many other organs and tissues in the body may be affected. Abut 15% of newly diagnosed cases of TB are extrapulmonary, with a higher proportion of these being HIV-infected persons. The usual progression of the disease is to begin in the lungs and spread to locations outside the lungs (extrapulmonary sites). In some cases, however, the first sign of disease appears outside the lungs. The many tissues or organs that tuberculosis may affect include:

- Bones. TB is particularly likely to attack the spine and the ends of the long bones.
- Kidneys. Along with the bones, the kidneys are probably the most common site of extrapulmonary TB. There may, however, be few symptoms even though part of a kidney is destroyed.
- Female reproductive organs. The ovaries in women may be infected; TB can spread from them to the peritoneum, which is the membrane lining the abdominal cavity.
- Abdominal cavity. Tuberculous peritonitis may cause pain ranging from the mild discomfort of stomach cramps to intense pain that may mimic the symptoms of appendicitis.
- Joints. Tubercular infection of joints causes a form of arthritis that most often affects the hips and knees.
- Meninges. The meninges are tissues that cover the brain and the spinal cord. Infection of the meninges by the TB bacillus causes tuberculous meningitis, a condition that is most common in young children and the elderly. It is extremely dangerous. Patients develop headaches, become drowsy, and eventually comatose. Permanent brain damage can result without prompt treatment.
- Skin, intestines, adrenal glands, and blood vessels. All these parts of the body can be infected by *M. tuberculosis*. Infection of the wall of the body's main artery (the aorta), can cause it to rupture with catastrophic results. Tuberculous pericarditis occurs when the membrane surrounding the heart (the pericardium) is infected and fills up with fluid that interferes with the heart's ability to pump blood.

- Miliary tuberculosis. Miliary TB is a life-threatening condition that occurs when large numbers of tubercle bacilli spread throughout the body. Huge numbers of tiny tubercular lesions develop that cause marked weakness and weight loss, severe anemia, and gradual wasting of the body.

Diagnosis

TB is diagnosed through laboratory test results. The standard test for tuberculosis infection, the tuberculin skin test, detects the presence of infection, not of active TB. Skin testing has been done for more than 100 years. In this process, Tuberculin is an extract prepared from cultures of *M. tuberculosis*. It contains substances belonging to the bacillus (antigens) to which an infected person has been sensitized. When tuberculin is injected into the skin of an infected person, the area around the injection becomes hard, swollen, and red within one to three days.

Today skin tests utilize a substance called purified protein derivative (PPD) that has a standard chemical composition and is therefore a good measure of the presence of tubercular infection. The PPD test, also called the Mantoux test, is not always 100% accurate; it can produce false positive as well as false negative results. The test may indicate that some people who have a skin reaction are not infected (false positive) and that some who do not react are in fact infected (false negative). The PPD test is, however, useful as a screener and can be used on people who have had a suspicious chest x ray, on those who have had close contact with a TB patient and persons who come from a country where TB is common.

Because of the multiple and varied symptoms of TB, diagnosis on the basis of external symptoms is not always possible. TB is often discovered by an abnormal chest x ray or other test result rather than by a claim of physical discomfort by the patient. After an irregular x ray, a PPD test is always done to show whether the patient has been infected. To verify the test results, the physician obtains a sample of sputum or a tissue sample (biopsy) for culture. In cases where other areas of the body might be infected, such as the kidney or the brain, body fluids other than sputum (urine or spinal fluid, for example) can be used for culture.

One important new advance in the diagnosis of TB is the use of molecular techniques to speed the diagnostic process as well as improve its accuracy. Four molecular techniques are increasingly used in laboratories around the world. They include polymerase chain reaction to detect mycobacterial DNA in patient specimens; nucleic acid probes to identify mycobacteria in culture; restriction fragment length polymorphism analysis to compare different strains of TB for epidemiological studies; and genetic-based susceptibility testing to identify drug-resistant strains of mycobacteria.

Treatment

Because of the nature of tuberculosis, the disease should never be treated by alternative methods alone. Alternative treatments can help support healing, but treatment of TB must include drugs and will require the care of a physician. Any alternative treatments should be discussed with a medical practitioner before they are applied.

Supportive treatments include:

- Diet. Nutritionists recommend a whole food diet including raw foods, fluids, and particularly pears and pear products (pear juice, pear sauce), since pears may help heal the lungs. Other helpful foods include fenugreek, alfalfa sprouts, garlic, pomegranate, and yogurt or kefir. Four tablespoons of pureed steamed asparagus at breakfast and dinner taken for a few months may also be helpful.
- Nutritional therapy. Nutritionists may recommend one or many of the following vitamins and minerals: vitamin A at 300,000 IU for the first three days, 200,000 IU for the next two days, then 50,000 IU for several weeks; beta-carotene at 25,000-50,000 IU; vitamin E at up to 1,000 IU daily unless the patient is a premenopausal woman with premenstrual symptoms; lipotrophic formula (one daily); deglycerolized licorice; citrus seed extract; vitamin C; lung glandular; essential fatty acids; vitamin B complex; multiminerals; and zinc.
- Herb therapy may use the tinctures of echinacea, elecampane and mullein taken three times per day, along with three garlic capsules three times per day.
- Hydrotherapy may be used up to five times weekly. Dr. Benedict Lust, the founder of naturopathy, supposedly cured himself of tuberculosis by using hydrotherapy.
- Juice therapy. Raw potato juice, may be taken three times daily with equal parts of carrot juice plus one teaspoon of olive or almond oil, one teaspoon of honey, beaten until it foams. Before using the potato juice, starch should be allowed to settle from the juice.
- Topical treatment may use eucalyptus oil packs, grape packs or grain alcohol packs.

Professional practitioners may also treat tuberculosis using **cell therapy**, magnetic field therapy or **traditional Chinese medicine**. **Fasting** may be undertaken, but only with a doctor's supervision.

Allopathic treatment

Drug therapy

Five drugs are most commonly used today to treat tuberculosis: isoniazid, rifampin, pyrazinamide, streptomycin, and ethambutol. Of the five medications, INH is the most frequently used drug for both treatment and prevention. The first three drugs may be given in the same capsule to minimize and treat active TB the number of pills in the dosage. Many patients are given INH and rifampin together for six months, with pyrazinamide added for the first two months. Hospitalization is rarely necessary because many patients are no longer infectious after about two weeks of combination treatment. A physician must monitor side effects and conduct monthly sputum tests. In 2002, The Centers for Disease Control (CDC) worked with medical organizations to release new guidelines that better individualize the drug regimens received by TB patients depending on their disease symptoms and severity. Many can now receive once-weekly doses of rifapentine in the continuation phase of treatment.

The first large scale trial of a new agent to treat TB began in 2002. The promising new drug, called moxifloxacin, may mean a shorter treatment course for TB sufferers in the near future. It will also be tested in combination with rifapentine, and researchers believe that using the drugs together will mean a less frequent dosing schedule for patients.

Drug resistance has become a problem in treating TB. When patients do not take medication properly or for long enough periods of time, the TB organisms may become drug resistant. This makes the patient vulnerable to further infection and allows the TB organism to develop resistance.

Surgery

Surgical treatment of TB may be used if medications are ineffective. There are three surgical treatments for pulmonary TB: pneumothorax, in which air is introduced into the chest to collapse the lung; thoracoplasty, in which one or more ribs are removed; and removal of a diseased lung, in whole or in part. It is possible for patients to survive with one healthy lung.

Expected results

The prognosis for recovery from TB is good for most patients, if the disease is diagnosed early and given prompt treatment with appropriate medications on a long-term regimen. According to a 2002 Johns Hopkins study, most patients in the United States who die of TB are older—average age 62— and suffer from such underlying diseases as diabetes and kidney failure.

Modern surgical methods are usually effective when necessary. Miliary tuberculosis is still fatal in many cases but is rarely seen today in developed countries. Even in cases in which the bacillus proves resistant to all of the commonly used medications, other seldom-used drugs may be tried because the tubercle bacilli have not yet developed resistance to them.

Prevention

Vaccination is widely used as a prevention measure for TB. A vaccine called BCG (Bacillus Calmette-Guérin, named after its French developers) is made from a weakened mycobacterium that infects cattle. Vaccination with BCG does not prevent infection, but it does strengthen the immune system of first-time TB patients. As a result, serious complications are less likely to develop. BCG is used more widely in developing countries than in the United States. Though the vaccine has been proven beneficial and fairly safe, its use is still controversial. It is not clear whether the vaccine's effectiveness depends on the population in which it is used or on variations in its formulation. Recently, efforts have been focused on developing a new vaccine.

Generally, prevention focuses on the prevention of transmission, skin testing high-risk persons and providing preventive drug therapy to people at risk. Measures such as avoidance of overcrowded and unsanitary conditions are necessary aspects of prevention. Hospital emergency rooms and similar locations can be treated with ultraviolet light which has an antibacterial effect.

INH is also given to prevent TB, and decreases the incidence of TB by about 60% over the life of the patient. INH is effective when taken daily for 6 to 12 months by people in high-risk categories who are under 35 years of age. About 1% of patients in preventive treatment develop toxicity. Because INH carries the risk of side effects (liver inflammation, nerve damage, changes in mood and behavior), it is important for its use to be monitored and to give it only to persons at special risk.

Unfortunately, failure of TB patients to complete the full course of their drugs adds to TB incidence and encourages development of drug-resistant strains of the disease. As scientists try to develop drugs that require shorter courses, physicians must work with patients to encourage compliance with their treatments. Even if symptoms go away, patients often have to continue their drug treatment for six months to be sure to stop the spread of their TB infection to others.

Resources

BOOKS

Burton Goldberg Group. *Alternative Medicine: The Definitive Guide*. Puyallup, WA: Future Medicine Publishing, Inc., 1994.

"Infectious Diseases Caused by Mycobacteria." Section 13, Chapter 157 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2001.

Merck Manual of Medical Information: Home Edition. Edited by Robert Berkow, et al. Whitehouse Station, NJ: Merck Research Laboratories, 1997.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part II, "CAM Therapies for Specific Conditions: Tuberculosis." New York: Simon & Schuster, 2002.

Smolley, Lawrence A., and Debra F. Bryse. *Breathe Right Now: A Comprehensive Guide to Understanding and Treating the Most Common Breathing Disorders*. New York: W. W. Norton & Co., 1998.

PERIODICALS

"Changing Patterns of New Tuberculosis Infections." *Infectious Disease Alert* (August 15, 2002): 171 172.

"'Drug of Dreams' Preps for First Large Scale Trail: Study to Begin this Year; Moxifloxacin to Debut Soon in Study 27." *TB Monitor* (July 2002): 73.

Efferen, Linda S. "Tuberculosis: Practical Solutions to Meet the Challenge." *Journal of Respiratory Diseases* (November 1999): 772.

Fielder, J. F., C. P. Chaulk, M. Dalvi, et al. "A High Tuberculosis Case Fatality Rate in a Setting of Effective Tuberculosis Control: Implications for Acceptable Treatment Success Rates." *International Journal of Tuberculosis and Lung Disease* 6 (December 2002): 1114 1117.

"Guidelines Roll Out Two New Variations: Experts give Both a Thumbs Up." *TB Monitor* (August 2002): 85.

Houston, H. R., N. Harada, and T. Makinodan. "Development of a Culturally Sensitive Educational Intervention Program to Reduce the High Incidence of Tuberculosis Among Foreign Born Vietnamese." *Ethnic Health* 7 (November 2002): 255 265.

Kim, D. Y., R. Ridzon, B. Giles, and T. Mireles. "Pseudo Outbreak of Tuberculosis in Poultry Plant Workers, Sussex County, Delaware." *Journal of Occupational and Environmental Medicine* 44 (December 2002): 1169 1172.

Moua, M., F. A. Guerra, J. D. Moore, and R. O. Valdiserri. "Immigrant Health: Legal Tools/Legal Barriers." *Journal of Law and Medical Ethics* 30 (Fall 2002) (3 Suppl.): 189 196.

"New Drugs Sought for Top Killer of Young Women Worldwide." *Women's Health Weekly* (July 25, 2002): 20.

"Poor Patient Compliance Key to Drug Resistance in Tuberculosis." *Pulse* (July 1, 2002): 18.

Stauffer, W. M., D. Kamat, and P. F. Walker. "Screening of International Immigrants, Refugees, and Adoptees." *Primary Care* 29 (December 2002): 879 905.

Su, W. J. "Recent Advances in the Molecular Diagnosis of Tuberculosis." *Journal of Microbiology, Immunology, and Infection* 35 (December 2002): 209 214.

ORGANIZATIONS

American Lung Association. 432 Park Avenue South, New York, NY 10016. (800) LUNG USA. www.lungusa.org.

National Heart, Lung, and Blood Institute (NHLBI). P. O. Box 30105, Bethesda, MD 20824 0105. (301) 592 8573. www.nhlbi.nih.gov.

OTHER

New York State Department of Health. Communicable Disease Fact Sheet. nyhealth@health.state.ny.us.

University of Wisconsin Madison Health Sciences Libraries. "Pulmonary Medicine" Healthweb. http://www.biostat.wisc.edu/chslib/hw/pulmonar.

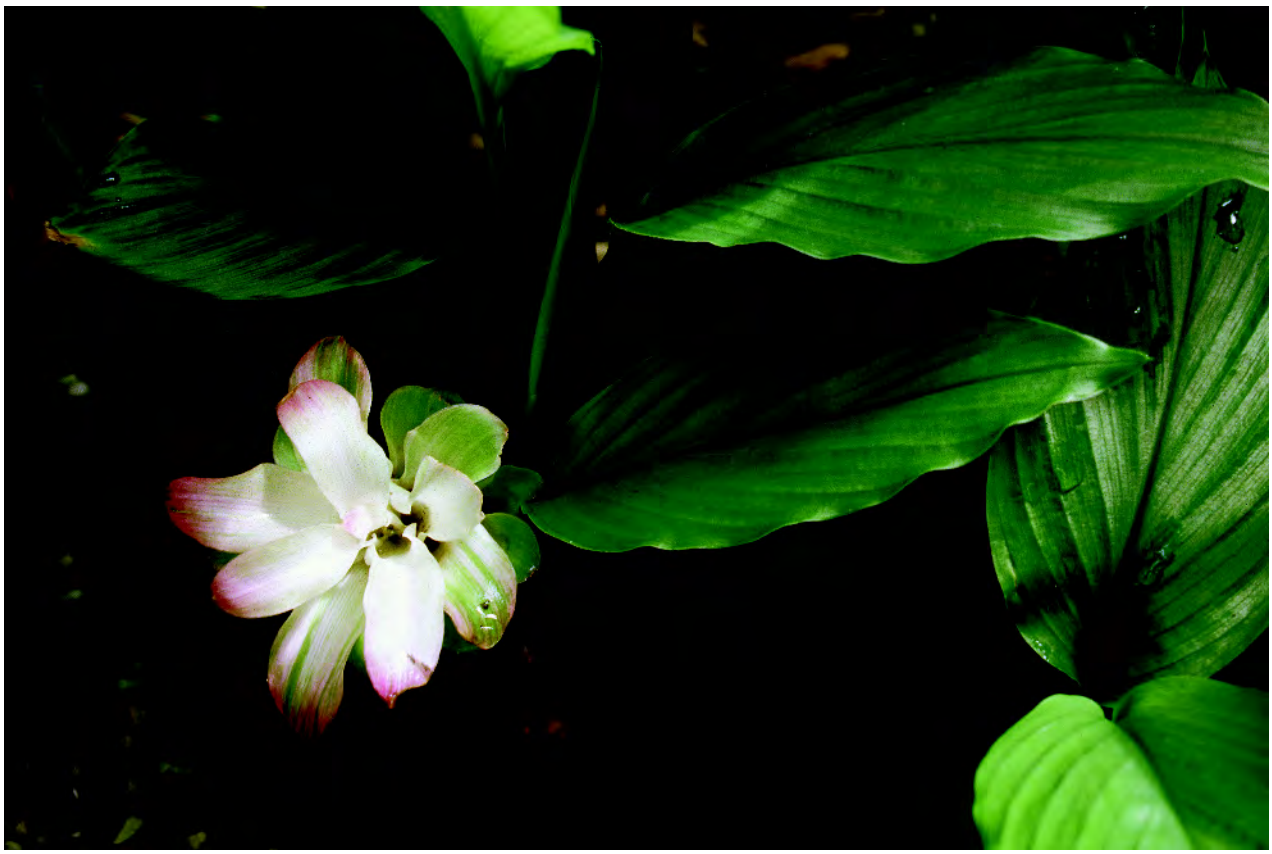
Amy Cooper
Teresa G. Odle
Rebecca J. Frey, PhD

Tui na *see* **Thai massage**

Turmeric

Description

Turmeric is a member of the *Curcuma* botanical group, which is part of the **ginger** family of herbs, the Zingiberaceae. Its botanical name is *Curcuma longa*. Turmeric is widely grown both as a kitchen spice and for its medicinal uses. Two closely related plants, *Curcuma petolata* and *Curcuma roscoeana*, are natives of Cambodia and are grown for their decorative foliage and blossoms. All curcumas are perennial plants native to southern Asia. They grow in warm, humid climates and thrive only in temperatures above 60°F (29.8°C). India, Sri Lanka, the East Indies, Fiji, and



Turmeric blossom. *(©PlantaPhile, Germany. Reproduced by permission.)*

Queensland (Australia) all have climates that are conducive to growing turmeric.

The turmeric plant is identifiable by both its characteristic tuberous root and the leaves that extend upward from erect, thick stems arising from the root. Turmeric root is actually a fleshy oblong tuber 2–3 in (5–10 cm) in length, and close to 1 in (2.54 cm) wide. It is tapered at each end, and its exterior can be yellow, tan, or olive-green in color. The interior of the root is hard, firm, and either orange-brown or deeply rust-colored, with transverse resinous parallel rings. M. Grieve, in *A Modern Herbal*, states that the root is dense and breaks into a powder that is lemon yellow in color. Turmeric root has a fragrant aroma and a somewhat bitter, peppery, biting taste reminiscent of ginger. When eaten, it colors the saliva yellow and leaves a warm sensation in the mouth.

The root contains a bitter volatile oil, brown coloring matter, gum, starch, **calcium** chloride, woody fiber and a yellowish coloring material that is known as cucurmin. In addition to the root, the turmeric plant produces rhizomes, which are underground stems growing parallel to the ground that produce roots below and new shoots from their upper surface. Turmeric rhizomes have also been used for medicinal purposes. The plant's leaves are divided, lance-shaped and narrower at each end. They are close to 2 ft (61 cm), lustrous and deep green. The flowers arise from those leaves, and are a pale yellow color, growing in groupings of three to five.

General use

Powdered turmeric root is perhaps best known as a popular spice, frequntly used in Eastern cooking. It is an ingredient of curry powders, and is also used to give mustard its characteristic color. It is sometimes used as a substitute for **saffron**. The addition of turmeric to oils such as olive or **sesame oil** extends their shelf life due to its antioxidant properties. In addition, some orange and lemon drinks are now colored with turmeric, which is considered safer than artificial colorings derived from coal tar.

The powdered root of turmeric has been used for making a deep yellow dye for fabrics for hundreds of years, though it does not produce an enduring colorfast tint. It is also used as a coloring for medicines at

KEY TERMS

Anti-fungal—A medication prescribed to treat infections caused by fungi.

Anti-inflammatory—A medication or substance that reduces the symptoms of fever and inflammation.

Apoptosis—A type of cell death in which a damaged cell shuts down and in effect commits suicide. Cucurmin induces apoptosis in some kinds of cancer cells.

Cucurmin (sometimes spelled Curcumin)—A yellow material that gives turmeric root its characteristic color.

Gram-positive bacteria—Bacteria that retain a dark violet stain when treated with an iodine-based stain known as Gram's iodine, named for a Danish bacteriologist. Common examples of gram-positive bacteria include several species of streptococci, staphylococci, and clostridia.

In vitro—A term used to describe research carried out in laboratory equipment rather than in a living organism.

Lipopolysaccharide—A complex carbohydrate with lipids (organic fats and waxes) attached to its molecule.

Rhizome—An underground stem of a plant, usually horizontal, that sends roots from its lower surface and new shoots from the upper surface.

Tuber—A thick, fleshy underground stem that produces buds that can give rise to new plants.

times. A less familiar use of turmeric is in chemistry, in the making of papers to test for alkaline solutions. White paper soaked in a tincture of turmeric turns reddish-brown and dries to a violet color when an alkaline solution is added.

Though its use in Western herbal medicine has declined over the years, turmeric has long been used and continues in use in Eastern medicine, both Oriental herbal medicine and Ayurveda, the traditional system of medicine from India. R.C. Srimal, in *Turmeric: A Brief Review of Medicinal Properties*, describes the herb as having the ability to protect the liver against toxic substances, especially such heavy metals as lead; to prevent the formation of **gallstones** or decrease the size of stones already formed; and to increase the flow of bile.

Some studies have demonstrated that turmeric exhibits anti-inflammatory properties that are useful in the treatment of both **osteoarthritis** and **rheumatoid arthritis**. Alcohol extracts of turmeric have been found to reduce blood sugar, which could eventually affect the treatment of diabetes. In addiion, clinical trials in China have demonstrated that simply using turmeric as a food seasoning can reduce serum **cholesterol**. The World Health Organization has recommended the use of this spice.

A substance known as a lipopolysaccharide isolated from the turmeric root has shown a capacity to stimulate and increase the activity of the immune system. In addition, research has shown turmeric to be effective in destroying gram-positive salmonella bacteria *in vitro*. Turmeric also demonstrates anti-fungal properties.

Turmeric has long been used as an Eastern folk remedy for eye discharges and as a cooling, soothing skin lotion. In Chinese herbal medicine, under the name of *jiang huang*, the turmeric rhizome is used in many different formulas as an anti-inflammatory **pain** reliever, especially for shoulder pain. It is believed to invigorate and improve the movement of blood and stimulate **menstruation**. The turmeric tuber, which is called *yu jin* in Chinese medicine, also has many important uses. It is given for **jaundice**, pain in the liver area, agitation, and **insomnia**.

The cucurmin found in turmeric is being studied as a possible treatment to prevent **cancer**. Cucurmin appears to lower the rate of genetic mutations in experimental animals. It has also been shown to induce apoptosis, or cell suicide, in **leukemia** cells. In addition, recent studies done on tissue samples from the human digestive tract indicate that cucurmin may help to prevent colon cancer.

Preparations

Turmeric root is cleaned, boiled, and dried in the oven before being powdered. This pulverized root can then be dissolved in either water or alcohol. It is usually dissolved in boiling alcohol and filtered to make a medicinal tincture.

In India and Pakistan, turmeric is dissolved in water for use as an eyewash, and in milk to make a soothing skin lotion.

Precautions

Practitioners of Chinese herbal medicine advise against using turmeric during **pregnancy**.

Side effects

Like other anti-inflammatory agents, turmeric has been found to contribute to the formation of stomach ulcers.

Resources

BOOKS

Grieve, M., and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Costmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. New York: Barnes and Noble Publishing, 1992.

Molony, David, and Ming Ming Pan Molony. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: Berkley Publish ing, 1999.

Phillips, Ellen, and C. Colston Burrell. *Rodale's Illustrated Encyclopedia of Perennials*. Emmaus, PA: Rodale Press, Inc., 1993.

Srimal, R. C. *Turmeric: A Brief Overview of Medicinal Properties*. Filoterapia, 1997.

PERIODICALS

Anto, R. J., A. Mukhopadhyay, K. Denning, and B. B. Aggarwal. "Curcumin (Diferuloylmethane) Induces Apoptosis Through Activation of Caspase 8, BID Cleavage and Cytochrome C Release: Its Suppression by Ectopic Expression of Bcl 2 and Bcl xl." *Carcino genesis 23 (January 2002): 143 150*.

Ireson, C. R., D. J. Jones, S. Orr, et al. "Metabolism of the Cancer Chemopreventive Agent Curcumin in Human and Rat Intestine." *Cancer Epidemiology and Bio markers* 11 (January 2002): 105 111.

Shukla, Y., A. Arora, and P. Taneja. "Antimutagenic Potential of Curcumin on chromosomal aberrations in Wistar Rats." *Mutation Research* 25 (March 2002): 197 202.

Joan Schonbeck
Rebecca J. Frey, PhD

U

Ulcerative colitis *see* **Inflammatory bowel disease**

Ulcers, digestive

Definition

An ulcer is an eroded area of skin or mucous membrane. In common usage, however, ulcer usually refers to disorders in the upper digestive tract. The terms ulcer, gastric ulcer, and peptic ulcer are often used interchangeably. Peptic ulcers can develop in the lower part of the esophagus, the stomach, the first part of the small intestine (the duodenum), and the second part of the small intestine (the jejunum).

Description

It is estimated that 2% of the adult population in the United States has active digestive ulcers, and that about 10% will develop ulcers at some point in their lives. There are about 500,000 new cases in the United States every year, with as many as 4 million recurrences. The male/female ratio for digestive ulcers is 3:1.

The most common forms of digestive ulcer are duodenal and gastric. About 80% of all digestive ulcers are duodenal ulcers. This type of ulcer may strike people in any age group but is most common in males between the ages of 20 and 45. The incidence of duodenal ulcers has dropped over the past 30 years. Gastric ulcers account for about 16% of digestive ulcers. They are most common in males between the ages of 55 and 70. The most common cause of gastric ulcers is the use of nonsteroidal anti-inflammatory drugs, or NSAIDs. The current widespread use of NSAIDs is thought to explain why the incidence of gastric ulcers in the United States is rising.

Causes and symptoms

Causes of ulcers

There are three major causes of digestive ulcers: infection; certain medications; and disorders that cause oversecretion of stomach juices.

HELICOBACTER PYLORI INFECTION. *Helicobacter pylori* is a bacterium that lives in the mucous tissues that line the digestive tract. Infection with *H. pylori* is the most common cause of duodenal ulcers. About 95% of patients with duodenal ulcers are infected with *H. pylori*, as opposed to only 70% of patients with gastric ulcers.

USE OF NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS). Nonsteroidal anti-inflammatory drugs, or NSAIDs, are painkillers that many people use for headaches, sore muscles, arthritis, and menstrual cramps. Many NSAIDs are available without prescriptions. Common NSAIDs include aspirin, ibuprofen (Advil, Motrin), flurbiprofen (Ansaid, Ocufen), ketoprofen (Orudis), and indomethacin (Indacin). Chronic NSAID users have 40 times the risk of developing a gastric ulcer as nonusers. Users are also three times more likely than nonusers to develop bleeding or fatal complications of ulcers. Aspirin is the most likely NSAID to cause ulcers.

OTHER RISK FACTORS.

- Hypersecretory syndromes, including Zollinger-Ellison syndrome, secrete excessive amounts of digestive juices into the digestive tract. Fewer than 5% of digestive ulcers are due to these disorders.
- Smoking increases a patient's chance of developing an ulcer, decreases the body's response to therapy, and increases the chances of dying from complications.
- Blood type. Persons with type A blood are more likely to have gastric ulcers, while those with type O are more likely to develop duodenal ulcers.
- Attitudes toward stress, rather than the presence of stress, puts one at risk for ulcers.

Endoscope view of a stomach ulcer. *(Dr. Larpent / Groupe Rech. Hepato-Gastro-Enterologie & Proctologie / Photo Researchers, Inc.)*

KEY TERMS

Bismuth—A metallic element used to make medications that soothe the stomach lining. Bismuth appears to have some antimicrobial effectiveness against *Helicobacter pylori*.

Duodenum—The first of the three segments of the small intestine that connects the stomach and the jejunum. Most peptic ulcers are in the duodenum.

Helicobacter pylori—A bacterium that causes inflammation of the stomach lining.

Laparoscope—An instrument that allows a surgeon to look into the abdominal cavity through a small incision and perform surgery on a small area.

Zollinger-Ellison syndrome—A disorder characterized by the presence of tumors (gastrinomas) that secrete a hormone (gastrin), which stimulates the production of digestive juices.

- Having a critical illness. Patients who are very sick are at increased risk of developing stress-related ulcers.

The consumption of high-fat or spicy foods is not a significant risk factor.

Symptoms

Not all digestive ulcers produce symptoms; as many as 20% of ulcer patients have so-called painless or silent ulcers. Silent ulcers occur most frequently in the elderly and in chronic NSAID users.

The symptoms of gastric ulcers include feelings of **indigestion** and **heartburn**, weight loss, and repeated episodes of gastrointestinal bleeding. Ulcer **pain** is often described as gnawing, dull, aching, or resembling hunger pangs. The patient may be nauseated and suffer loss of appetite. About 30% of patients with gastric ulcers are awakened by pain at night. Many patients have periods of chronic ulcer pain alternating with symptom-free periods that last for several weeks or months. This characteristic is called periodicity.

The symptoms of duodenal ulcers include heartburn, stomach pain relieved by eating or antacids, weight gain, and a burning sensation at the back of the throat. The patient is most likely to feel discomfort two to four hours after meals, or after having citrus juice, coffee, or aspirin. About 50% of patients with duodenal ulcers awake during the night with pain, usually between midnight and 3 A.M. A regular pattern of ulcer pain associated with certain periods of day or night or a time interval after meals is called rhythmicity.

Complications

Between 10%–20% of peptic ulcer patients develop complications at some time during the course of their illness. All of these are potentially serious conditions. Complications are not always preceded by diagnosis of or treatment for ulcers; as many as 60% of patients with complications have not had prior symptoms.

Bleeding is the most common complication of ulcers. It may result in **anemia**, **vomiting** blood, or the passage of bright red blood through the rectum. The mortality rate from ulcer hemorrhage is 6-10%.

About 5% of ulcer patients develop perforations, which are holes through which the stomach contents can leak out into the abdominal cavity. The incidence of perforation is rising because of the increased use of NSAIDs, particularly among the elderly. The signs of an ulcer perforation are severe pain, **fever**, and tenderness when the doctor touches the abdomen. Most cases of perforation require emergency surgery. The mortality rate is about 5%.

Ulcer penetration is a complication in which the ulcer erodes through the intestinal wall without digestive fluid leaking into the abdomen. Instead, the ulcer penetrates into an adjoining organ, such as the

pancreas or liver. The signs of penetration are more severe pain *without* rhythmicity or periodicity, and the spread of the pain to the lower back.

Obstruction of the stomach outlet occurs in about 2% of ulcer patients. It is caused by swelling or scar tissue formation that narrows the opening between the stomach and the duodenum (the pylorus). Over 90% of patients with obstruction have recurrent vomiting of partly digested or undigested food; 20% are seriously dehydrated.

Diagnosis

Physical examination and patient history

The diagnosis of peptic ulcers is rarely made on the basis of a physical examination alone. The only significant finding may be mild soreness in the area over the stomach when the doctor presses (palpates) it. The doctor is more likely to suspect an ulcer if the patient has one or more of the following risk factors:

- member of the male sex
- age over 45
- recent weight loss, bleeding, recurrent vomiting, jaundice, back pain, or anemia
- history of using aspirin or other NSAIDs
- history of heavy smoking
- family history of ulcers or stomach cancer

Endoscopy and imaging studies

An endoscopy is considered the best procedure for diagnosing ulcers and taking tissue samples. An endoscope is a slender tube-shaped instrument used to view the tissues lining the stomach and duodenum. If the ulcer is in the stomach, then a tissue sample will be taken because 3-5% of gastric ulcers are cancerous. Duodenal ulcers are rarely cancerous. Radiological studies are sometimes used instead of endoscopy because they are less expensive, more comfortable for the patient, and are 85% accurate in detecting **cancer**.

Laboratory tests

Blood tests usually give normal results in ulcer patients without complications. They are useful, however, in evaluating anemia from a bleeding ulcer or a high white cell count from perforation or penetration. Serum gastrin levels can be used to screen for Zollinger-Ellison syndrome.

It is important to test for *H. pylori* because almost all ulcer patients who are not taking NSAIDs are infected. Noninvasive tests include blood tests for immune response and a breath test. In the breath test, the patient is given an oral dose of radiolabeled urea. If *H. pylori* is present, it will react with the urea and the patient will exhale radiolabeled carbon dioxide. Invasive tests for *H. pylori* include tissue biopsies and cultures performed from fluid obtained by endoscopy.

Treatment

Alternative treatments can relieve symptoms and promote healing of ulcers. A primary goal of these treatments is to rebalance the stomach's hydrochloric acid output and to enhance the mucosal lining of the stomach.

Food **allergies** have been considered a major cause of stomach ulcers. An elimination/challenge diet can help identify the allergenic food(s) and continued elimination of these foods can assist in healing the ulcer.

Ulcer patients should avoid aspirin, stop **smoking**, avoid antacids, and reduce **stress**. Dietary changes include avoidance of sugar, **caffeine**, and alcohol, and reducing milk intake.

Supplements

Dietary supplements that help to control ulcer symptoms include:

- vitamin A
- B-complex vitamins
- vitamin C
- vitamin E
- glutamine
- rice bran oil (gamma oryzanol)
- selenium
- deglycyrrhizinated licorice (DGL)
- zinc picolinate

Herbals

Botanical medicine offers the following remedies that may help treat ulcers:

- Bilberry (*Vaccinium myrtillus*): heals ulcers.
- Cabbage: heals ulcers.
- Calendula (*Calendula officinalis*): heals duodenal ulcers.
- Chamomile tea: speeds healing, reduces mucosal reaction, reduces stress, and lessens gas.
- Comfrey (*Symphytum officinale*) root: soothes the stomach, lessens bleeding, and speeds healing, however, the patient must take caution, in that prolonged or excessive use can be harmful to the liver.

- Geranium (*Pelargonium odoratissimum*): lessens bleeding.
- Licorice (*Glycyrrhiza glabra*): heals ulcers.
- Marshmallow (*Althaea officinalis*) root: soothes the stomach.
- Meadowsweet: soothes the stomach.
- Plantain (*Plantago major*): soothes the stomach.
- Slippery elm (*Ulmus fulva*): lessens bleeding and heals mucous membrane.
- Wheat grass (*Triticum aestivum*): heals ulcers.

Chinese medicines

Chinese herbal treatment principles are based upon specific groups of symptoms. Chinese patent medicines are also based upon specific symptoms and include:

- Wu Bei San (cuttlefish bone and fritillaria): acid reflux and bleeding
- Wu Shao San (cuttlefish bone and paeonia): acid reflux and bleeding
- Liang Fu Wan (galangal and cyperus pill): pain
- 204 Wei Tong Pian (204 epigastric pain tablet): pain, acid reflux, and bleeding
- Xi Lei San (tin-like powder): ulcer with tarry stool

Other treatments

Other treatments for ulcers are:

- Essence therapy. Dandelion essence can help reduce tension and pink yarrow essence can help the patient distinguish between his or her problems and those of others.
- Reflexology. For ulcers, work the solar plexus and stomach points on the feet and the solar plexus, stomach, and top of shoulder points on the hands.
- Biofeedback. Thermal biofeedback can help protect and heal the stomach.
- Sound therapy. Music with a slow, steady beat can promote relaxation and reduce stress.
- Ayurveda. Ayurvedic treatment is individualized to each patient but common ulcer remedies include: aloe vera natural gel, arrowroot powder with hot milk, and tea prepared from cumin, coriander, and fennel seeds.
- Acupuncture. Ulcers can be treated using target points for stress, anxiety, and stomach problems.
- Relaxation techniques. Stress reduction and involvement in stress management programs may help relieve ulcer symptoms.

Allopathic treatment

Medications

Most drugs that are used to treat ulcers work by either lowering the rate of stomach acid secretion or protecting the mucous tissues that line the digestive tract.

Medications that lower the rate of stomach acid secretions fall into two major categories: proton pump inhibitors and H_2 receptor antagonists. The proton pump inhibitors, which have been in use since the early 1990s, include omeprazole (Prilosec) and lansoprazole (Prevacid). The H_2 receptor antagonists include ranitidine (Zantac), cimetidine (Tagamet), famotidine (Pepcid), and nizatidine (Axid).

Drugs that protect the stomach tissues are sucralfate (Carafate), bismuth preparations, and misoprostol (Cytotec).

Most doctors presently recommend treatment to eliminate *H. pylori* to prevent ulcer recurrences. Without such treatment, ulcers recur at the rate of 80% per year. The drug combination used to eliminate the bacterium is tetracycline, bismuth subsalicylate (Pepto-Bismol), and metronidazole (Metizol). Eradication is not always successful, however, for reasons that are unclear.

Surgery

Surgical treatment of ulcers is generally used only for complications and suspected cancer. The introduction of a newer technique for repairing perforated ulcers using a laparoscope rather than opening the patient's abdomen may reduce some of the risks associated with surgical treatment of ulcers. The most common surgical procedures are vagotomies, in which the connections of the vagus nerve to the stomach are cut to reduce acid secretion; and antrectomies, which involve the removal of part of the stomach.

Expected results

The prognosis for recovery from ulcers is good for most patients. Very few ulcers fail to respond to the medications that are currently used to treat them. Recurrences can be cut to 5% by eradication of *H. pylori*. Most patients who develop complications recover without problems even when emergency surgery is necessary.

Prevention

Strategies for the prevention of ulcers or their recurrence include the following:

- giving misoprostol to patients who must take NSAIDs
- participating in integrated stress management programs
- avoiding unnecessary use of aspirin and NSAIDs
- improving the nutritional status of critically ill patients
- quitting smoking
- cutting down on alcohol, tea, coffee, and sodas containing caffeine
- eating high-fiber foods

Resources

BOOKS

Miller, David K. "Chronic Abdominal Pain." In *Current Diagnosis 9*. Edited by Rex B. Conn, et al. Philadelphia: W. B. Saunders Company, 1997.

Viggiano, Thomas R. "Peptic Ulcer Disease." In *Current Diagnosis 9*. Edited by Rex B. Conn, et al. Philadelphia: W. B. Saunders Company, 1997.

Way, Lawrence W. "Stomach and Duodenum." In *Current Surgical Diagnosis & Treatment*. Edited by Lawrence W. Way. Stamford, CT: Appleton & Lange, 1994.

Ying, Zhou Zhong, and Jin Hui De. "Gastrointestinal Dis eases." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Bown, R. L. "An Overview of the Pharmacology, Efficacy, Safety and Cost Effectiveness of Lansoprazole." *Inter national Journal of Clinical Practice* 56 (March 2002): 132 139.

Chen, M. H., M. S. Wu, W. C. Lee, et al. "A Multiple Logistic Regression Analysis of Risk Factors in Dif ferent Subtypes of Gastric Ulcer." *Hepatogastroenter ology* 49 (March April 2002): 589 592.

Fagerstrom, K. "The Epidemiology of Smoking: Health Consequences and Benefits of Cessation" *Drugs* 62 (2002): Supplement 2: 1 9.

Flannery, J., and D. A. Tucker. "Pharmacologic Prophy laxis and Treatment of Stress Ulcers in Critically Ill Patients." *Critical Care Nursing Clinics of North Amer ica* 14 (March 2002): 39 51.

Han, K. "The Effect of an Integrated Stress Management Program on the Psychologic and Physiologic Stress Reactions of Peptic Ulcer in Korea." *Journal of Holistic Nursing* 20 (March 2002): 61 80.

Siu, W. T., H. T. Leong, B. K. Law, et al. "Laparoscopic Repair for Perforated Peptic Ulcer: A Randomized Controlled Trial." *Annals of Surgery* 235 (March 2002): 320 321.

Wermeille, J., M. Cunningham, J. P. Dederding, et al. "Failure of *Helicobacter pylori* Eradication: Is Poor Compliance the Main Cause?" *Gastroenterology and Clinical Biology* 26 (March 2002): 207 209.

ORGANIZATIONS

American College of Gastroenterology. 4900 B South Thirty First Street, Arlington, VA 22206 1656. (703) 820 7400. *http://www.acg.cgi.gi.org/acghome/html*.

Digestive Health Initiative. 7910 Woodmont Avenue, #914, Bethesda, MD 20814. (800) 668 5237. *http://www.gastro.org./dhi.html*.

OTHER

Hoffman, David L. "Peptic Ulceration." *HealthWorld Online*. http://www.healthy.net/library/books/hoffman/digestive/ulcerati.htm.

Belinda Rowland
Rebecca J. Frey, PhD

Unani-tibbi

Definition

Unani-tibbi denotes Arabic or Islamic medicine, also known as prophetic medicine. It traditionally makes use of a variety of techniques, including diet, herbal treatments, manipulative therapies, and surgery. Unani-tibbi is a complete system, encompassing all aspects and all fields of medical care, from **nutrition** and hygiene to psychiatric treatment.

Origins

The name unani-tibbi, as literally translated from the Arabic, means Greek medicine. This name reflects the fact taht early Arab physicians took their basic knowledge from the Greeks. At the time, Greek medical knowledge was the best to be had, particularly from Galen, the renowned second-century Greek physician to the gladiators and Emperor Marcus Aurelius.

However, from that point onwards, Islamic medical scholars were responsible for many developments and advancements that, at the time, placed Arabic medicine firmly in the vanguard of medical science. There followed a steady stream of Muslim medical scholars, who not only upheld the high standards that came to be known of unani-tibbi, but carried on adding to and improving the basic pool of knowledge.

Some notable scholars of the science of unani-tibbi are listed below:

- Al Tabbari (838–870)
- Al Razi (Rhazes) (841–926)
- Al Zahrawi (930–1013)
- Avicenna (980–1037)

- Ibn Al Haitham (960–1040)
- Ibn Sina (Avicenna) (980–1037)
- Ibn Al Nafees (1213–1288)
- Ibn Khaldun (1332–1395)

Medical innovations introduced by unani-tibbi physicians include:

- Avicenna was the first to describe meningitis, so accurately and in such detail, that it has scarcely been added to after 1,000 years.
- Avicenna was the first to describe intubation (surgical procedure to facilitate breathing)—Western physicians began to use this method at the end of the eighteenth century.
- The use of plaster of Paris for fractures by the Arabs was standard practice; it was "rediscovered" in the West in 1852.
- Surgery was used by the Arabs to correct cataracts.
- Ibn Al Nafees discovered pulmonary blood circulation.
- A strict system of licensing for medical practitioners was introduced in Baghdad in 931, which included taking the Hippocratic oath and specific periods of training for doctors.
- There was a system of inspection of drugs and pharmaceuticals in Baghdad 1,000 years ago.
- The European system of medicine was based on the Arabic system, and even as recently as the early nineteenth century, students at the Sorbonne had to read the Cannon of Avicenna as a precondition to graduating.
- Unani-tibbi hospitals were, from the beginning, free to all without discrimination on the basis of religion, sex, ethnicity, or social status.
- Their hospitals allocated different wards for each classification of disease.
- Hospitals had unlimited water supplies and bathing facilities.
- Before the advent of the printing press, there were extensive handwritten libraries in Baghdad (80,000 volumes), Cordova (600,000 volumes), Cairo (two million volumes), and Tripoli (three million volumes).
- All Unani-tibbi hospitals kept patient records.
- A hospital was established for lepers. As many as six centuries later in Europe, they were still burning lepers to death by royal decree.
- In 830, nurses were brought from Sudan to work in the Qayrawan hospital in Tunisia.
- A system of fountain-cooled air was devised for the comfort of patients suffering from fever.
- Avicenna described the contamination of the body by "foreign bodies" prior to infection, and Ibn Khatima also described how "minute bodies" enter the body and cause disease—well in advance of Pasteur's discovery of microbes.
- Al Razi was the first to describe smallpox and measles. He was accurate to such a degree that nothing has been added since.
- Avicenna described tuberculosis as being a communicable disease.
- Avicenna devised the concept of anesthetics. The Arabs developed a "soporific sponge," (impregnated with aromatics and narcotics and held under the patient's nose), which preceded modern anesthesia.
- The Arab surgeon Al Zahrawi was the first to describe hemophilia.
- Al Zahrawi was also the first surgeon to use cotton, which is an Arabic word, as surgical dressings for the control of hemorrhage.
- Avicenna accurately described surgical treatment of cancer, saying that the excision must be radical and remove all diseased tissue, including amputation and the removal of veins running in the direction of the tumor. He also recommended cautery of the area if needed. This observation is relevant even in the early 2000s.
- Avicenna, Al Razi, and others formed a medical association for the purpose of holding conferences so that the latest developments and advancements in the field of medicine could be debated and passed on to others.

Benefits

What began as an advanced medical system that set world standards subsequently became regarded as a system of folk medicine. This decline coincided with the decline of the Islamic Empire and the dissolution of the Caliphate (spiritual head of Islam), as these were directly responsible for the direction and impetus of Islamic scientific scholars in all fields.

Unani-tibbi practitioners still treat people with herbal remedies and "manipulation," for a variety of illnesses. In the Islamic world, many poorer people who cannot afford allopathic medicine still resort to this traditional medicine. There is also an element of the society that prefers unani-tibbi to allopathic medicine as, indeed, the traditional unani-tibbi remedies do not bring with them the side effects commonly experienced with allopathic drugs.

Description

Similar to Greek humoral theory, unani-tibbi considers the whole human being, spiritual, emotional,

and physical. At the theory's foundation is the concept of the "four humors." These are Dum (blood), Bulghum (phlegm), Sufra (yellow bile), and Sauda (black bile). Each is further categorized as being hot and moist (blood), cold and moist (phlegm), hot and dry (yellow bile), and cold and dry (black bile). Individuals have their own unique profile of humors, which must be maintained in harmony to preserve health. If the body becomes weak and this harmony is disrupted, a physician can be called upon to help restore the balance.

This may be done using correct diet and nutrition and/or the unani-tibbi system of botanical therapy, **cupping**, bleeding, manipulation, and massage, among others, as treatments for all disease and ailments. Herbs or substances used to treat a patient will be matched to his humor type.

Unani-tibbi employs a detailed system of diagnosis, including observation of urine and stools, palpation of the body and pulse, and observation of the skin and eyes.

It also employs a system of prophylactics in order to preserve health and ward off disease, which includes the adherence to strict hygiene rules, protection of air, food, and water from contamination or pollution, sufficient rest and **exercise**, and attention to spiritual needs. Certain herbs are also taken on a prophylactic basis, such as black cumin and **sage**.

In general, unani-tibbi treatment is not expensive, and it is certainly less expensive than allopathic medicine. However, charges vary according to area and practitioner. Patients should discuss the cost of treatment with a practitioner before treatment begins.

Preparations

Remedies are often provided by the practitioner or are obtained from a specialized herbalist. The ingredients are mainly herbs and honey. It must be noted that the honey used is raw and unadulterated, rather than the type found in supermarkets, which is usually heat-treated.

A famous and widely used medicinal herb is black cumin (*Nigella sativa*), also known as Hab Al Baraka in Arabic, which means blessed seed. Black cumin has been cultivated since Assyrian times and it is beneficial for a very long list of ailments. It is widely mixed with other herbs for greater beneficial effect and is said to strengthen the immune system when taken over a period of time. Some research has suggested that it has the ability to slow the division of **cancer** cells.

Unani-tibbi uses a number of compounds that are combined into a tablet, liquid, paste, or powder. One example is qurs taifudia, used to treat typhoid **fever**. Its components are the dried blood from two rabbits, musk, **magnesium** carbonate, **arrowroot**, gelatin, paraffin (wax), ground soapstone, and damask rose water. The rabbits are killed by severing their jugular veins and their blood is collected on a plate, dried in the sun, ground to a powder, and sifted through a mesh sieve. The other ingredients are added and the mixture is formed into flat, round tablets.

Precautions

The achievements of the unani-tibbi practitioners of the early 2000s bear little resemblance to those of their illustrious predecessors, and some of those claiming to practice traditional medicine are woefully ill-equipped to practice. However, many Arab and Muslim doctors, after qualifying in allopathic medicine, continue to treat their patients with traditional remedies and take the trouble to educate themselves in this ancient art.

In India, where Islamic medicine is primarily known as unani-tibbi, the government set up a Central Council for Research in Unani Medicine (CCRUM), which also has a licensing system for these traditional practitioners.

In the Arab countries, the system of treatment is known as tibb-nabawi, or prophetic medicine, and mainly utilizes herbal remedies, honey, and other bee products.

Side effects

There are no known side effects.

Research and general acceptance

The herbal remedies employed by unani-tibbi are chosen for their non-toxicity and absence of side effects.

Although unani-tibbi has not been the subject of a great deal of research by modern-day scientists, it still enjoys enormous popularity in Muslim countries. The records left by Islamic medical scholars become more remarkable in the light of modern medicine, when their achievements and theories continue to compare admirably with allopathic medicine into the 2000s.

The CCRUM in India conducted research into aspects of unani-tibbi that are likely to be of particular benefit to modern society, for example, the substances that were originally used as safe forms of contraception, with none of the side effects of present-day chemical contraception. Still, unani-tibbi is not accepted by most

KEY TERMS

Excision—Surgical removal of tissue.

Hemophilia—Hereditary condition passed by women to their male children whereby the blood has no ability to clot.

Intubation—Surgical procedure whereby a tube is inserted into the windpipe of a seriously ill patient to facilitate breathing.

Tibb-nabawi—Prophetic medicine (another name for unani-tibbi).

traditional Western medical practitioners, primarily because of a lack of accepted scientific studies.

Training and certification

There are two classifications of practitioners of unani-tibbi: simple folk practitioners, dispensers of herbal remedies and so on, and the highly qualified doctors and scholars who conduct research. Research is conducted at the King Abdul Azeez University in Riyadh, Saudi Arabia, and the Sultan Qaboos University in Oman, among others, into the efficacy of traditional herbal remedies.

The CCRUM in India issues licenses to unani-tibbi practitioners and provides funds for research.

Resources

BOOKS

Khan, Muhammad S. *Islamic Medicine*. London: Routledge, 2007.

Pormann, Peter E., and Emilie Savage Smith. *Medieval Islamic Medicine*. Washington, DC: Georgetown Uni versity Press, 2007.

PERIODICALS

Tajuddin, M. Nasiruddin, and N. Ahmad. "Effect of an Unani Formulation on Lipid Profile in Rat." *Indian Journal of Pharmacology* (January/February 2006): N/A.

ORGANIZATIONS

International Institute of Islamic Medicine & The Islamic Medical Association of North America, PO Box 160, Brandon, FL, 33509, (813) 661 6161, http://www.iiim.org.

National Center for Alternative and Complementary Medicine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

Patricia Skinner
Ken R. Wells

Urinary incontinence

Definition

Urinary incontinence is unintentional loss of urine that is sufficient enough in frequency and amount to cause physical and/or emotional distress in the person experiencing it.

Description

Approximately 13 million Americans suffer from urinary incontinence. Women are affected by the disorder more frequently than are men; one in 10 women under age 65 suffers from urinary incontinence. A study published in late 2002 found that between 21% and 29% of adult women in the workforce reported at least one episode of urinary incontinence each month. Older Americans, too, are more prone to the condition. Twenty percent of Americans over age 65 are incontinent. In general, the condition is underrecognized and undertreated.

There are five major categories of urinary incontinence: overflow, **stress**, urge, functional, and reflex:

- Overflow incontinence. Overflow incontinence is caused by bladder dysfunction. Individuals with this type of incontinence have an obstruction to the bladder or urethra, or a bladder that doesn't contract properly. As a result, their bladders do not empty completely, and they have problems with frequent urine leakage.
- Stress incontinence. Stress incontinence occurs when an individual involuntarily loses urine after pressure is placed on the abdomen (i.e., during exercise, sexual activity, sneezing, coughing, laughing, or hugging).
- Urge incontinence. Urge incontinence occurs when a person feels a sudden need to urinate, and cannot control the urge to do so. As a consequence, urine is involuntarily lost before the individual can get to the toilet.
- Functional incontinence. Individuals who have control over their own urination and have a fully functioning urinary tract, but cannot make it to the bathroom in time due to a physical or cognitive disability, are functionally incontinent. These individuals may suffer from arthritis, Parkinson's disease, multiple sclerosis, or Alzheimer's disease.
- Reflex incontinence. Individuals with reflex incontinence lose control of their bladder without warning. They typically suffer from neurological impairment.

In some cases, an individual may develop short-term or *acute incontinence*. Acute incontinence may

Types of incontinence

Type	Description
Functional	Found mainly among older populations, functional incontinence occurs when, because of a physical or mental impairment, a person is unable to make it to the toilet in time.
Gross Total	The bladder has no storage capacity, which can lead to a continuous leakage of urine, day and night, or periodic large volumes of urine and uncontrollable leaking. This can be caused by an anatomical defect, spinal cord injury, or an injury to the urinary system from surgery.
Mixed	A person suffers from more than one type of incontinence, though one is usually worse than another.
Overflow	The bladder never empties and signal to void is lost. Urine overflows in small amounts and bladder remains partially full. Common in people with a damaged or blocked urethra and in men with prostate gland problems.
Stress	Prevalent in women, stress incontinence occurs when the pelvic floor muscles are weakened and cannot support increased bladder pressure. Coughing, sneezing, exercising, and laughing can trigger urine flow.
Urge	The bladder contracts when full and urine flows. The patient has no control over the urge to void. (This type of incontinence is also commonly referred to as "overactive bladder," because it may often contract when the bladder isn't full)

(Illustration by Corey Light. Cengage Learning, Gale)

occur as a symptom or by-product of illness, as a side effect of medication, or as a result of dietary intake. The condition is typically easily resolved once the cause is determined and addressed.

Causes and symptoms

Urinary incontinence can be caused by a wide variety of physical conditions, including:

- Childbirth. Childbirth can stretch the pelvic muscles and cause the bladder to lose some support from surrounding muscles, resulting in stress incontinence.
- Dysfunction of the bladder and/or the urinary sphincter. In a continent individual, as the bladder contracts, the outlet that releases urine into the urethra (bladder sphincter) opens and urine exits the body. In individuals with overflow incontinence, bladder contractions and dilation of the sphincter do not occur at the same time.
- Enlarged prostate. In men, an enlarged prostate gland can obstruct the bladder, causing overflow incontinence.
- Hysterectomy or other gynecological surgery. Any surgery involving the urogenital tract runs the risk of damaging or weakening the pelvic muscles and causing incontinence.
- Menopause. The absence of estrogen in the postmenopausal woman can cause the bladder to drop, or prolapse.
- Neurological conditions. The nervous system sends signals to the bladder telling it when to start and stop emptying. When the nervous system is impaired, incontinence may result. Neurological conditions such as multiple sclerosis, stroke, spinal cord injuries, or a brain tumor may cause the bladder to contract involuntarily, expelling urine without warning, or to cease contractions completely, causing urinary retention.

KEY TERMS

Bladder neck—The place where the urethra and bladder join.

Bladder sphincter—The outlet that releases urine into the urethra.

Calculi (singular, calculus)—Mineral deposits that can form a blockage in the urinary system.

Occlusive—Closing off. One of the newest treatments for stress urinary incontinence in women is an external occlusive single-use cap that covers the urethral opening.

Perineal area—The genital area between the vulva and anus in a woman, and between the scrotum and anus in a man.

Sacral nerves—The five pairs of nerves that arise from the lowermost segments of the spinal cord and control bladder, bowel, and pelvic functions. Stimulation of the sacral nerves by an implanted device is a newer treatment for urinary incontinence.

- Obesity. Persons who are overweight have undue pressure placed on their bladder and surrounding muscles.
- Obstruction. A blockage at the bladder outlet may permit only small amounts of urine to pass, resulting in urine retention and subsequent overflow incontinence. Tumors, calculi, and scar tissue can all block the flow of urine. A urethral stricture, or narrow urethra caused by scarring or inflammation, may also result in urine retention.

Acute incontinence is a temporary condition caused by a number of factors, including:

- Bladder irritants. Substances in the urine that irritate the bladder may cause the bladder muscle to malfunction. The presence of a urinary tract infection and the ingestion of excess caffeine can act as irritants. Highly concentrated urine resulting from low fluid intake may also irritate the bladder.
- Constipation. Constipation can cause incontinence in some individuals. Stool that isn't passed presses against the bladder and urethra, triggering urine leakage.
- Illness or disease. Diabetes can greatly increase urine volume, making some individuals prone to incontinence. Other illnesses may temporarily impair the ability to recognize and control the urge to urinate, or to reach the toilet in time to do so.
- Medications and alcohol. Medications that sedate, such as tranquilizers and sleeping pills, can interfere with the proper functioning of the urethral nerves and bladder. Both sedatives and alcohol can also impair an individual's ability to recognize the need to urinate, and act on that need in a timely manner. Other medications such as diuretics, muscle relaxants, and blood pressure medication can also affect bladder function.
- Surgery. Men who undergo prostate surgery can suffer from temporary stress incontinence as a result of damage to the urethral outlet.

Diagnosis

Urinary incontinence may be diagnosed by a general practitioner, urologist, or gynecologist. If the patient is over age 65, a geriatrician may diagnose and treat the condition. A thorough medical history and physical examination is typically performed, along with specific diagnostic testing to determine the cause of the incontinence. Diagnostic testing may include x rays, ultrasound, urine tests, and a physical examination of the pelvis. It may also include a series of exams that measure bladder pressure and capacity and the urinary flow (urodynamic testing). The patient may also be asked to keep a diary to record urine output, frequency, and any episodes of incontinence over a period of several days or a week.

Treatment

Adjusting dietary habits and avoiding acidic and spicy foods, alcohol, **caffeine**, and other bladder irritants can help to prevent urinary leaking. Eat recommended amounts of whole grains, fruits, and vegetables to avoid **constipation**. Bladder training, used to treat urge incontinence, can also be a useful treatment tool. The technique involves placing a patient on a toileting schedule. The time interval between urination is then gradually increased until an acceptable time period between bathroom breaks is consistently achieved.

Therapies designed to strengthen the pelvic muscles are also recommended for the treatment of urinary incontinence. Pelvic toning exercises, known as Kegel or PC muscle exercises, can alleviate stress incontinence in both men and women. These exercises involve repeatedly tightening the muscles of the pelvic floor.

Biofeedback techniques can teach incontinent patients to control the urge to urinate. Biofeedback uses sensors to monitor temperature and muscle contractions in the vagina to help incontinent patients learn to increase their control over the pelvic muscles.

An infusion, or tea, of **horsetail** (*Equisetum arvense*), agrimony (*Agrimonia eupatoria*), and sweet sumach (*Rhus aromatica*) may be prescribed by an herbalist or naturopath to treat stress and urge incontinence. These herbs are natural astringents, and encourage toning of the digestive and urinary tracts. Other herbs, such as urtica, or stinging **nettle** (*Urtica urens*), **plantain** (*Plantago major*), or maize (*Zea mays*) may be helpful. Homeopathic remedies may include **pulsatilla** and causticum. Chinese herbalists might recommend golden lock tea, a mixture of several herbs that helps the body retain fluids.

Allopathic treatment

There are numerous invasive and noninvasive treatment options for urinary incontinence:

- Behavior modification therapy. Behavior modification is a psychological approach to the treatment of urinary incontinence in which patients gradually increase the length of the time interval between voidings and "retrain" the bladder in other ways. It is reported to be highly effective in treating urge incontinence.
- Collagen injections. Collagen injected in the tissue surrounding the urethra can provide urethral support for women suffering from stress incontinence.
- External occlusive devices. A new single-use disposable urethral cap is available without a prescription for women suffering from stress urinary incontinence. The cap is noninvasive and appears to be quite effective in managing incontinence.
- Inflatable urethral insert. Sold under the tradename Reliance, this disposable incontinence balloon for women is inserted into the urethra and inflated to prevent urine leakage.
- Intermittent urinary catheterization. The periodic insertion of a catheter into a patient's bladder to drain urine from the bladder into an attached bag or container.
- Medication. Estrogen hormone replacement therapy can help improve pelvic muscle tone in postmenopausal women. Other medications, including flurbiprofen, capsaicin and botulinum toxin, are sometimes prescribed to relax the bladder muscles or to tighten the urethral sphincter. Newer medications for the treatment of urinary incontinence are undergoing clinical trials. One of these drugs, duloxetine, differs from present medications in targeting the central nervous system's control of the urge to urinate rather than the smooth muscle of the bladder itself.
- Perineal stimulation. Perineal stimulation is used to treat stress incontinence. The treatment uses a probe to deliver a painless electrical current to the perineal area muscles. The current tones the muscle by contracting it.
- Permanent catheterization. A permanent, or indwelling, catheter may be prescribed for chronic incontinence that doesn't respond to other treatments.
- Sacral nerve stimulation (SNS). Also known as sacral neuromodulation, SNS is a procedure in which a surgeon implants a device that sends continuous stimulation to the sacral nerves that control the urinary sphincter. The FDA approved sacral nerve stimulation for the treatment of urinary urge incontinence in 1997 and for urinary frequency in 1999.
- Surgery. Bladder neck suspension surgery is used to correct female urinary stress incontinence. Bladder enlargement surgery may be recommended to treat incontinent men and women with unusually small bladders.
- Urinary sphincter implant. An artificial urinary sphincter may be used to treat incontinence in men and women with urinary sphincter impairment.
- Vaginal inserts. Devices constructed of silicone or other pliable materials that can be inserted into a woman's vagina to support the urethra.

Expected results

Left untreated, incontinence can cause physical and emotional upheaval. Individuals with long-term incontinence suffer from urinary tract **infections**, and skin **rashes** and sores. Incontinence can also affect their self-esteem and cause **depression** and social withdrawal. They frequently stop participating in physical activities they once enjoyed because of the risk of embarrassing "accidents." However, with the wide variety of treatment options for incontinence available today, the prognosis for incontinent patients is promising. If incontinence cannot be stopped, it can be improved in the majority of cases.

Prevention

Women who are pregnant or who have gone through **childbirth** can reduce their risk for stress incontinence by strengthening their perineal area muscles with **Kegel exercises**. Men who have undergone prostate surgery may also benefit from pelvic muscle exercises. Men and women should consult with their doctor before initiating any type of **exercise** program.

Resources

BOOKS

Blaivas, Jerry. *Conquering Bladder and Prostate Problems: The Authoritative Guide for Men and Women*. New York, NY: Plenum, 1998.

"Urinary Incontinence." Section 17, Chapter 215 in *The Merck Manual of Diagnosis and Therapy*, edited by

Mark H. Beers, MD, and Robert Berkow, MD. White house Station, NJ: Merck Research Laboratories, 1999.

PERIODICALS

Amundsen, C. L., and G. D. Webster. "Sacral Neuromo dulation in an Older, Urge Incontinent Population." *American Journal of Obstetrics and Gynecology* 187 (December 2002): 1462 1465.

Bachmann, G., and B. Wiita. "External Occlusive Devices for Management of Female Urinary Incontinence." *Journal of Women's Health (Larchmont)* 11 (November 2002): 793 800.

Burgio, K. L. "Influence of Behavior Modification on Overactive Bladder." *Urology* 60 (November 2002): (5 Suppl. 1): 72 76.

Burgio, K. L., P. S. Goode, J. L. Locher, et al. "Behavioral Training With and Without Biofeedback in the Treatment of Urge Incontinence in Older Women: A Randomized Controlled Trial." *Journal of the American Medical Asso ciation* 288 (November 13, 2002): 2293 2299.

Haeusler, G., H. Leitich, M. van Trotsenburg, et al. "Drug Therapy of Urinary Urge Incontinence: A Systematic Review." *Obstetrics and Gynecology* 100 (November 2002) (5 Pt 1): 1003 1016.

Palmer, M. H., and S. Fitzgerald. "Urinary Incontinence in Working Women: A Comparison Study." *Journal of Women's Health (Larchmont)* 11 (December 2002): 879 888.

Sandroff, Ronni. "Urgent Matters: Incontinence is Treat able, If Only Women Would Talk About It." *American Health for Women* 16, no. 8 (Oct 1997): 28 30.

Viktrup, L. "Female Stress and Urge Incontinence in Family Practice: Insight Into the Lower Urinary Tract." *Inter national Journal of Clinical Practice* 56 (November 2002): 694 700.

Yoshimura, N., and M. B. Chancellor. "Current and Future Pharmacological Treatment for Overactive Bladder." *Journal of Urology* 168 (November 2002): 1897 1913.

ORGANIZATIONS

American Foundation for Urologic Disease. 1128 North Charles Street, Baltimore, MD 21201. (800) 242 2383. *http://www.afud.org/*.

American Urological Association (AUA). 1120 North Charles Street, Baltimore, MD 21201. (410) 727 1100. *www.auanet.org*.

Center for Biologics Evaluation and Research (CBER), U. S. Food and Drug Administration (FDA). 1401 Rockville Pike, Rockville, MD 20852 1448. (800) 835 4709 or (301) 827 1800. *www.fda.gov/cber*.

National Association for Continence. 2650 East Main Street, Spartanburg, SC 29307. (800) 252 3337. *http:// www.nafc.org*.

National Kidney and Urologic Diseases Information Clearinghouse. 3 Information Way, Bethesda, MD 20892 3580. (800) 891 5390.

Paula Ford-Martin
Rebecca J. Frey, PhD

Urinary tract infection *see* **Bladder infection**

Urine therapy

Definition

Urine Therapy is the use of one's urine, internally or externally, to heal **wounds** or alleviate disease symptoms and/or for overall well-being. It is also called uropathy, auto-urine therapy, amaroli, or shivambu.

Origins

References to the use of urine for medicinal purposes can be traced to ancient Egyptian, Chinese, Aztec, and Hindu histories. Proponents also point to Proverbs 5:15 in the Old Testament of the Bible: "Drink water from thy own cistern, and the streams of thy own well."

As an integral part of the ayurvedic tradition of **yoga**, it is known as amaroli. Ayurvedic yogis are encouraged to drink their own urine between 4 and 6 ***a.m.*** in the morning in the belief that the hormones ingested will facilitate a meditative state.

The rationale of the therapy is that urine is a by-product of blood filtration, not excess water from consumed food and liquid. In fact, the medical term for urine is plasma ultra filtrate. Blood filled with nutrients passes through the liver where toxins are filtered out and excreted as solid waste matter. This purified blood then travels to the kidneys where any excess elements form urine and are then eliminated from the body. As urine passes through the urethra, it is a sterile solution. Ninety-five percent of it is water; the remaining five percent is a combination of urea, vitamins, minerals, enzymes, hormones, proteins, and antibodies. Urine therapy advocates argue that the

Dried chicory leaves can be used to promote the production of bile, release gallstones and aid the elimination of excessive internal mucus. *(Bildagentur-online / TH Foto-Werbung/Photo Researchers, Inc.)*

KEY TERMS

Blood pressure—The force applied to the walls of the arteries as the heart pumps blood through the body.

Placebo—A medication prescribed more for the mental relief of the patient than for its actual effect on the individual's disorder.

Placebo effect—Improvement in a illness or symptom that occurs in response to treatment but cannot be credited to the specific treatment used.

Urea—A colorless compound that is the primary component of urine in mammals and that results from the oxidation of proteins.

Urethra—The canal carrying urine from the bladder

presence of these nutrients are proof of urine's medicinal powers.

Urea is an antibacterial, antifungal, and antiviral agent that forms when the body balances its ratio of **sodium** chloride to water. Urea is often used to create ointments and lotions for its properties of reducing inflammation and ability to kill bacteria. It can be duplicated under laboratory conditions by dissolving **calcium** cyanamid in water, and then heated under high pressure to produce a compound of urea and calcium hydroxide.

Benefits

Urine therapy has been touted as a remedy for a long list of ailments, including **multiple sclerosis**, **colitis**, lupus, **rheumatoid arthritis**, **cancer**, **hepatitis**, hyperactivity, **psoriasis**, **eczema**, diabetes, herpes, **mononucleosis**, and adrenal failure. It is a commonly used treatment for snakebites and bee and jellyfish **stings**. Childhood illnesses such as acute flu, colds, viral **infections**, **mumps**, chicken pox, and **allergies** have also said to be alleviated by urine therapy. Urine is an ingredient in Pergonal, a fertility drug, and in pharmaceuticals used to dissolve **blood clots**.

Description

Urine therapy can be applied internally or externally. For internal use, a sample of the morning's first urine is collected a sterile container. Using a clean medicine dropper, an amount between one to ten drops is placed under the tongue. Usually, one to five drops are applied on the first day; 5-10 drops on the second day; 5-10 drops on the morning of the third day followed by 5-10 drops that evening.

In homeopathic urine therapy, drops of urine are diluted in quantities of distilled water. Drops of the dilution are placed under the tongue hourly until a noticeable improvement in illness or the temporary worsening of the condition occurs. Then drops are applied at lengthening intervals for three days.

When taking orally, only fresh urine should be used. The genital area should be washed before collecting a specimen. The best time to collect urine is first thing in the morning, and collecting the mid-stream. Individuals should refrain from eating for a half hour after ingesting the urine.

For external use, new or old urine can be applied. Old urine has a higher ammonia content that is more effective on skin **rashes** such as eczema and psoriasis. To store urine for later use, pour it into a dark glass bottle and close it tightly. Keep the bottle in a cool, dark place for at least four days.

A small amount is applied to the affected area with a cotton ball or pad. Continue massaging 5-10 applications to the area until it is soaked. Tape a clean, soaked pad to the area for several hours. The urine can also be sprayed onto the skin. For cosmetic purposes, fresh or 1-2 day-old urine can be lightly massaged into the skin or added in small amounts to moisturizing cream. Some practitioners recommend avoiding the use of soap or lotion after applying urine to the skin. Dryness can be alleviated with **sesame oil**.

Injections of urine are not advised. One of the key components of therapy is the gradual introduction of urine into the body. The abrupt introduction of urine into the bloodstream could exacerbate possible side effects.

Preparation

Because any food, liquids, drugs, and/or medications consumed will affect the urine, an examination of one's diet is recommended before starting urine therapy. Keeping a daily **nutrition** journal will help to chart the body's reaction to different foods and the body's digestive patterns. High consumption of meat, for example, is thought to elevate the body's acid levels, particularly just before **fasting** or undergoing an intensive regime of urine therapy.

Users of urine therapy often keep regular measurements of their acid and alkaline levels, glucose levels, and blood pressure. Monitoring the body's acid and alkaline is accomplished by keeping track of the pH level in the saliva or urine. The ideal pH range

for saliva is 6.4 to 7.2; below 6.4 too acidic, above 7.2 too alkaline. Urine pH normally varies from 5.0 in the morning to 8.0 in the evening.

Glucose tests measure the level of sugar in the blood, by millimoles per litres (mmol/l). Normal levels range from 4 to 8 mmol/l during the day, with the lowest levels occurring in the morning and higher measures occurring after meals.

At-home testing kits for pH levels, glucose levels, and blood pressure are available in most stores that carry over-the-counter (OTC) medical products.

Precautions

Urine that will be taken orally should never be heated or boiled. On the other hand, some advocates suggest that boiled urine is best for massage purposes. Boiling should be done in a stainless steel pot.

Proponents are divided on whether or not pregnant women should practice urine therapy. Some believe that it is beneficial for both the mother and the growing fetus. Others advise against it. Because of the fertility properties of urine, birth control pills may be less effective.

Several pre-existing conditions preclude the use of urine therapy. Heavy smokers and people taking therapeutic or recreational drugs should not use their own urine. Those suffering from bladder infections or venereal disease are also advised against ingesting their urine.

Side Effects

Side effects can include **headache**, **diarrhea**, itch and rashes, **pain**, **fatigue**, soreness of the shoulder, and **fever**. An increase in symptoms of the specific illness may also occur. These symptoms can last from a week to six months. Starting the therapy with small doses can alleviate some of these side effects.

Research and general acceptance

Much of the current research is based on anecdotal evidence from users of urine therapy. Nonetheless, its popularity is growing worldwide. The first World Conference on Urine Therapy was held in 1996 in India. Two more conferences were convened at three-year intervals: in 1999 in Germany and in 2003 in Brazil. In the United States, urine therapy advocates cite the works of John W. Armstrong, *The Water of Life: A Treatise on Urine Therapy*, Martha M. Christy, *Your Own Perfect Medicine*, and Coen Van Der Kroon, *The Golden Fountain*.

Although components of urine are extracted to create a number of topical creams and fertility drugs, the drinking of urine is not generally accepted by the Western medical establishment. Dr. Andrew Weil, a noted physician, self-healing expert, and author of *Natural Health, Natural Medicine,* posits that reports of positive results experienced by users have more to do with placebo effects than with the actual healing properties of urine. According to Weil, treatments that elicit negative emotional charges can be result in benefits when the treatment "mobilizes attention and belief." In other words, adhering to urine therapy in spite of one's loathing for it increases its **placebo effect**.

Training and certification

No training or certification is required.

Resources

BOOKS

Christy, Martha M. *Your Own Perfect Medicine*. Mesa, Arizona: Wishland Publishing, 2000.

PERIODICALS

Bouaravong, Natalie. "Urine Therapy" *Berkeley Medical Journal Issues* [cited June 18, 2004]. http://www.ocf.berkeley.edu/~issues/fall02/urine.html.

ORGANIZATIONS

Chinese Association of Urine Therapy. 72 Wu Kon Lio Road, Wuku Industrial Park, Taipei Hsien, Taiwan, Republic of China. 886 2 22988446. http://www.everlifepharm.com/urine/.

OTHER

"Urine Therapy." Biomedx.com/ [cited April 13, 2004]. http://biomedx.com/urine/.

Mary McNulty

Usnea

Description

Usnea is a unique species because it is created through a symbiotic relationship between lichens and alga. Symbiosis refers to the living together of two different organisms. In the case of lichens, both the algae and the fungus benefit from the relationship. Other names for usnea include lichen moss and old man's beard. Usnea can be found in forests in northern North America and are also found in Europe.

Usnea barbata. *(© Petra Wegner / Alamy)*

Some usnea are able to keep growing even after being broken off from the parent organism. Usnea are very sensitive to the air quality and may be killed by absorbing pollutants. In fact, usnea are used as indicators of regional pollution levels.

When a fungus and analga combine, the resulting organism does not resemble either component. The fungal component has the main influence over the appearance and is the determinant for the species name of each lichen. The local environment also influences the appearance of the lichen. In general, usnea appear as long, hairy or fuzzy strings that hang from trees, rocks, and decomposing wood. The fibers (branches) of usnea are round and contain a slender white cord at the core. During wet conditions, the white cord has elastic properties. Lichens are usually gray or green in color that varies depending upon the algal component. For instance, green lichens have a green algal component. Some usnea are able to keep growing even after being broken off from the parent organism.

KEY TERMS

Gram-positive/negative—A classification system that differentiates bacteria into two classes based upon staining characteristics determined by the composition of the cell wall. Usnea are effective against gram-positive bacteria.

Lichen—An organism consisting of algal and fungal partners living together in a mutually beneficial relationship. Usnea are lichens.

Symbiotic—The living together of two different organisms. Symbiotic relationships can be mutually beneficial, beneficial to one partner and not harmful to the other partner, or beneficial to one partner and harmful to the other partner.

Usnea are very sensitive to the air quality and may be killed by absorbing pollutants. In fact, usnea are used as indicators of regional pollution levels.

The primary active ingredient in usnea is usnic acid. Usnic acid protects the lichen from overexposure to light and its bitter taste prevents invertebrates (creatures that lack a spinal cord) from eating it. Usnic acid has antibacterial and antitumor activities. Against certain bacteria, usnic acid is stronger than the antibiotic penicillin. Usnic acid is effective against gram-positive bacteria including *Streptococcus*, *Staphylococcus*, and *Pneumococcus* but, unlike many antibiotics, does not harm the gram-negative bacteria that live in the gut and vagina. It is also effective against the bacteria that causes **tuberculosis** and may be effective against certain fungi and protozoans (simple, single-celled organisms such as trichomonas). It is believed that usnic acid works by disrupting the metabolism (the chemical and physical processes of an organism) of bacteria while leaving human cells unharmed.

Usnea contains mucilage, which can help ease coughing. It also has expectorant (brings up lung mucous) activity. Mucilage is a thick, slimy substance produced by plants that has a soothing effect on mucous membranes. Herbalists consider usnea a muscle relaxant and an immune system stimulant.

Other constituents of usnea species may include barbatolic, evernic, lobaric, tartaric, thamnolic, stictinic, and usnaric acids.

General use

Usnea was historically used to treat **indigestion** because of its bitter taste and activity as a digestive

system stimulant. The peoples of ancient China, Egypt, and Greece used usnea to treat **infections**. In the fourteenth century, it was believed that usnea could strengthen hair because of its hair-like appearance.

Usnea is used to treat abscesses, colds, **cough**, cystitis, **fungal infections** (such as athletes foot or ringworm), gastrointestinal (stomach and intestine) irritations, **influenza**, sore throats (including **strep throat**), respiratory infections (sinusitis, **bronchitis**, **pneumonia**, etc.), skin ulcers, urinary tract infections, and vaginal infections. Extracts of lichens have been used in deodorants and soaps. Usnea is also used to promote healthy teeth and gums and to treat oral infections. It is used by naturopathic physicians to treat mild **cervical dysplasia** (abnormal Pap smear).

Usnea barbata is a homeopathic remedy for headaches and sunstroke. *Usnea hirta* is used as an antibiotic as is *Usnea florida*, which can also be an antituberculosis agent. *Usnea longissima* is used as an expectorant.

Because of the absorbent quality of usnea, it has been used in baby diapers, wound dressings, and feminine napkins (sanitary pads).

Preparations

Usnea is commercially available in bulk form or as a powder, capsule, or tincture.

The tincture should be diluted in water before ingesting or using externally. Usnea tincture may be taken every two hours to treat bacterial infections. Other sources recommend taking 3-4 ml of tincture three times daily.

A usnea tea can be prepared by steeping 2-3 tsp of dried lichen or 1-2 tsp of powdered lichen in 1 cup of boiling-hot water. The tea may be taken three times a day.

In the capsule form, the patient should take 100 mg of usnea three times a day.

Usnea is used externally to treat fungal infections and skin ulcers. It can also be used as a douche to treat cystitis, urinary tract infections, and vaginal infections. Usnea is generally used as a vaginal suppository to treat mild cervical dysplasia. It is taken by mouth to treat colds, strep throat, influenza, sore throats, respiratory infections, and gastrointestinal disorders.

Precautions

Usnea should not be used for more than three weeks in a row. Pregnant women should not use usnea because it may promote uterine contractions.

Side effects

Usnea may cause gastrointestinal disorders.

Interactions

Currently, there are no indications of interactions between usnea and other drugs or herbal medicines.

Resources

BOOKS

"Usnea." In *The Alternative Advisor: The Complete Guide to Natural Therapies and Alternative Treatments*. Virginia: Time Life Books, 1997.

OTHER

"Lichen Information Sheet: Some Types of Lichen." *http://www.alaskascreensavers.com/gallery/lichens/ak/lichinfo.htm*.

"Usnea Lichens." *http://www.nature.ca/English/treasures/trsite/trplant/tr3/tr3amaze.html*.

Willis, Cindy. "Herb to Know: Usnea." *http://www.wisetouch.com/usnea.html*.

Belinda Rowland

Uterine cancer

Definition

Uterine **cancer** can be divided into two primary forms, cervical and endometrial. Cancer of the cervix most often affects the neck of the cervix or the opening or the opening into the uterus from the vagina. Endometrial cancer affects the inside lining of the uterus.

Description

Cervical cancer is much more prevalent than cancer of the endometrium; some estimate the incidence ratio as 3:1. Statistics from the year 2000 indicated cervical cancer was the second leading cause of cancer deaths in women ages 20-39 years, and the fifth leading cause of cancer death in women from 40-59 years old. Unlike many other cancers, early cancer of the cervix can be identified as much as 10 or more years before the cancer invades other tissues. These visible changes in the structure and activity of the cervical cells are seen under the microscope with Papanicolaou (PAP) tests and are referred to as mild dysplasia. Over a time period of five to 10 years, these abnormal cells may disappear without treatment, or may invade into deeper tissues and progress into a true cancer. The

cancerous cells then may spread to endometrium, lymph glands, and nerves in the pelvic region.

As the population ages, cancer of the endometrium is becoming more common. Statistics indicate that approximately 50% of women with postmenopausal bleeding are diagnosed with endometrial cancer. This early symptom of irregular vaginal bleeding often allows removal of the uterus to result in cure of the disease, as endometrial cancer progresses and spreads slowly.

While all women are at risk for developing uterine cancer, specific risk factors for cervical cancer include sexual activity at an early age, and sex with multiple partners. **Infertility**, diabetes, **obesity**, and estrogen therapy place a woman at high risk for endometrial cancer. Other risk factors for uterine cancer include: endometrial hyperplasia, sexual inactivity, undergoing **menopause** after age 59 years, and never having had children.

Causes and symptoms

An important factor linked to cervical cancer is infection with one of the most common sexually transmitted diseases—human papillomavirus (HPV). Some strains of HPV can cause **genital warts** while others have no observable symptoms. Individuals infected with the herpes simplex virus, human immunodeficiency virus (HIV) or acquired immune deficiency syndrome (**AIDS**) are at increased risk for developing cancer of the cervix; the associated suppression of the immune system allows the HPV to more easily invade. Other chronic **infections** and erosions of the cervix also may increase the risk of cervical cancer.

While some women who have precancerous cervical changes experience no symptoms, others notice heavier or longer menstrual periods or vaginal bleeding after douching, intercourse or between periods. Symptoms of more advances stages of uterine cancer may include foul smelling vaginal discharge, rectal pressure or **constipation**, loss of appetite, **fatigue**, and back or leg **pain**.

Diagnosis

An annual PAP test and pelvic examination beginning as soon as young woman becomes sexually active, or between the age 17-20 years, are the most important diagnostic steps for early detection of uterine cancer. The PAP smear can pick up cervical dyplasia and the conventional physican may then perform a colposcopy and biopsy of the cervix to give a better understanding of the abnormalities. If only a small area of the cervix is affected, the recommendation may be made for more frequent PAP tests (about every three to six months) to monitor for changes in the cells of the cervix. Additional diagnostic tests for uterine cancer may include laparoscopy, laparotomy, or vaginosonography.

A Food and Drug Administration (FDA) advisory panel suggested adding a screening test for HPV in addition to Pap smears since HPV is such a high risk factor for cervical cancer. The screening test could help separate women at high risk for more frequent screening than women not at high risk.

KEY TERMS

Endometrium—The inside lining of the uterus.

Hyperplasia—An overgrowth of cells that results in increased size of a body organ.

Hysterectomy—Surgical removal of the uterus and proximal vagina.

Laparoscopy—An examination of the interior of the abdomen with a lighted tube called a laparoscope.

Laparotomy—Surgical operation performed to open the abdomen for inspection of the internal organs, or as a preliminary step to additional surgery.

Pelvic lymphadenectomy—Surgical removal of the lymph nodes and passageways within the pelvis.

Total pelvic exenteration—Surgical procedure involving removal of the rectum, lower portion of the large intestine, the urinary bladder, the pelvic reproductive organs, lymph nodes, pelvic muscles, and perineum. Both urinary and fecal diversions are required for this surgery.

Treatment

After **cervical dysplasia** has been found, several herbal remedies and supplements may be helpful. Practitioners of herbal medicine refer to this class of herbs as *emmenagogues* that includes supplements such as **squawvine**, **motherwort**, true unicorn, false unicorn, **black cohosh**, and **blessed thistle**. Studies have shown that as many as 67% of women with cervical dysplasia are deficient in various nutrients, including folate, beta-carotene, **selenium**, and vitamins B_6 and C. While these studies make no claim that taking a multivitamin or mineral supplement can reverse advanced cervical dysplasia, taking these supplements preventively may make sense.

The woman with uterine cancer will also benefit from nutritional supplements and a diet aimed at

strengthening the immune system. **Echinacea** and **garlic** supplements may not only have positive effects on immunities, but also counteract the side effects of cancer treatment. Many trace elements, flavonoids, and other phytochemicals are provided by eating a well balanced diet that may not be provided in a pill. Even with relatively low levels of dietary intake, shiitake mushrooms, lentinus edodes, laminaria sea vegetables, and kombu **kelp** are believed to have anticancer properties. The use of any supplements or specific dietary modification should be discussed with the physician treating the cancer in order to avoid any undesirable drug interactions or side effects.

Research emphatically supports the mind-body connection when considering the health of the individual with cancer. Studies have also shown the positive effects of imagery on boosting immunities and natural killer cells. Visualization of the dominant white blood cells successfully attacking weak cancer cells can not only have a positive effect on the mood and mental status, but may also shrink tumors and extend the life of a patient with cancer. Laughter has also been found to enhance immunities and stimulate the sympathetic nervous system, pituitary gland, and the hormones that reduce **stress**, inflammation, and pain.

In addition to the well known effects of massage for **relaxation** and stress reduction, there are other physiologic effects that may help the individual with cancer. Massage may slow the body's release of the stress hormone cortisol, decreasing **anxiety** and allowing for more effective periods of sleep and regeneration. Massage has also been found to increase the production of serotonin, which can improve overall mood and immune status.

Allopathic treatment

Early stages of cervical dysplasia may require only frequent re-evaluation to monitor progression or regression of the abnormal cells. Regression of abnormal cells may occur due to the immune response or lifestyle changes, such as discontinuing **smoking** or oral contraceptive use. In more advanced cases, the cervical lining may be removed via cautery, freezing or laser procedures.

Age, overall health status, and the presence of other abnormal findings will impact on the selection of most appropriate treatment plan for uterine cancer. Surgery may be presented as a treatment option for invasive cancer. Extent of the surgical procedures will depend upon the stage of the cancer. A hysterectomy, lymphadenectomy, or total pelvic exenteration may be recommended. Radiation therapy may be offered instead of, or in addition to, surgical removal of the affected tissues. Depending on the individual's disease stage, and the response and tolerance to the radiation, treatment may be provided by external beams directed over the pelvis, or by the insertion of radium tubes into the uterus and/or vagina. Chemotherapy may also be recommended, involving the infusion of tumor-fighting drugs directly into the circulatory system.

Expected results

The outcomes for the individual with uterine cancer are significantly related to the stage of the disease when cancer is found and treatment initiated. Early interventions can result in nearly 100% cure rates, while those individuals whose cancer is not discovered until abnormal tissue growth has invaded surrounding organs may have less positive outcomes. Those with advanced disease may experience pain, vaginal bleeding and/or foul smelling discharge, and intestinal obstruction.

Prevention

The best preventive measure against uterine cancer is an annual pelvic examination and PAP test. In fact, a 2002 report from the College of American Pathologists stated that 80 percent of the women who die from cervical cancer had not had a Pap test in the five years preceding their diagnosis. Recognition of risk factors for uterine cancer, along with an awareness of the early signs and symptoms of cervical dysplasia, can promote the early detection of changes in the cervical cells.

Resources

BOOKS

Fugh Berman, Adriane. *Alternative Medicine: What Works*. Baltimore, MD: Williams and Wilkins, 1997.

Gottlieb, James. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

PERIODICALS

Bence, Sharlene. "Stop Cervical Cancer in Its Tracks." *Nursing Management* (April 2000): 40 43.

"College of American Pathologists Applauds New Pap Test Guidelines." *Women's Health Weekly* (May 30, 2002):12.

Frieden, Joyce. "FDA Advisory Panel; Backs HPV Test as Pap Smear Adjunct (Identifies High Risk Strains)." *Family Practice News* (June 15, 2002):30 31.

Kathleen Wright
Teresa G. Odle

Uterine fibroids

Definition

Uterine fibroids (also called leiomyomas or myomas) are benign growths of the muscle inside the uterus. They are not cancerous, nor are they related to **cancer**. Fibroids can cause a wide variety of symptoms, including heavy menstrual bleeding and pressure on the pelvis.

Description

Uterine fibroids are extremely common. About 25% of women in their reproductive years have noticeable fibroids. There are probably many more women who have tiny fibroids that are undetected.

Fibroids develop in women between the ages of 30–50. They are never seen in women younger than 20 years old. After **menopause**, if a woman does not take estrogen, fibroids shrink. It appears that African American women are much more likely to develop uterine fibroids.

Fibroids are divided into different types, depending on the location. Submucous fibroids are found in the uterine cavity; intramural fibroids grow on the wall of the uterus; and subserous fibroids are located on the outside of the uterus. Many fibroids are so large that they fit into more than one category. The symptoms caused by fibroids are often related to their location.

Colored pelvic x ray of a 65 year old woman's calcified fibroid in her uterus. A fibroid is a benign tumor of fibrous and muscular tissue. *(SPL / Photo Researchers, Inc.)*

KEY TERMS

Anemia—Low blood count.

Embolization—A new technique that shrinks fibroids by cutting off their blood supply.

GnRH antagonists—A group of medications that affect the reproductive hormones. These medications are used to treat fibroids, endometriosis, and infertility.

Hysterectomy—Removal of the uterus (with or without removal of the ovaries) by surgery. The surgery can be performed through an incision in the abdomen, or the uterus can be removed through the vagina.

Leiomyoma—The medical term for a benign mass in muscle tissue. Uterine fibroids are one type of leiomyoma.

Menopause—The end of the reproductive years, signaled by the end of menstrual periods. Also known as "the change."

Osteoporosis—A condition that frequently occurs in older women in which the bones lose calcium and become increasingly brittle.

Causes and symptoms

No one knows exactly what causes fibroids. The growth of fibroids, however, appears to depend on the hormone estrogen. Fibroids often grow larger when estrogen levels are high, as in **pregnancy**. Medications that lower the estrogen level can cause the fibroids to shrink.

The signs and symptoms of fibroids include:

- Heavy uterine bleeding. This is the most common symptom, occurring in 30% of women who have fibroids. The excess bleeding usually happens during the menstrual period. Flow may be heavier, and periods may last longer. Women who have submucous or intramural fibroids are most likely to have heavy uterine bleeding.
- Pelvic pressure and pain. Large fibroids that press on nearby structures such as the bladder and bowel can cause pressure and pain. Larger fibroids tend to cause worse symptoms.
- Infertility. This is a rare symptom of fibroids. It probably accounts for less than 3% of infertility cases. Fibroids can cause infertility by compressing the uterine cavity. Submucous fibroids can fill the

uterine cavity and interfere with implantation of the fertilized egg.

- Miscarriage. This is also an unusual symptom of fibroids, probably accounting for only a tiny fraction of the miscarriages that occur.
- Pregnancy complications. Fibroids can greatly increase in size during pregnancy, because of increased levels of estrogen. They can cause pain, and even lead to premature labor.

Diagnosis

A health-care provider can usually feel fibroids during a routine pelvic examination. Ultrasound can be used to confirm the diagnosis, but this is not generally necessary.

Treatment

There are several natural treatments that help lower estrogen levels and slow the growth of the benign tumors. One study of alternative and complementary treatments for uterine fibroids found, however, that the cost of the alternative remedies was significantly higher than the cost of conventional treatments.

Nutritional therapy

There are several things women can do nutritional-wise to avoid having fibroids or prevent them from getting bigger:

- Eat more fruits, green or sea vegetables, whole grains, nuts, and seeds.
- Eat more soy foods such as tofu, tempeh, miso, or soy burger. Soy products contain isoflavones, which help reduce high levels of estrogens in the body.
- Avoid foods with high fat or sugar content, caffeine, or alcohol.
- Avoid eating produce sprayed with insecticides

Nutritional supplements

The following supplements may be helpful in lowering estrogen levels and controlling fibroids:

- Bromelain: reduces inflammation.
- Choline: may improve liver function.
- Flaxseed: helps reduce excessive production of estrogens and other hormones.
- Vitamin E and evening primrose oil: helps regulate hormone production and may even shrink the fibroids.
- Vitamin C and bioflavonoids: have antiinflammatory and antioxidant effects.

Herbal treatment

Kuei-chih-fu-ling-wan (Keishi-bukuryo-gan; KBG) is a traditional Chinese herbal preparation that can effectively shrink fibroid tumors in 60% of patients, according to one study conducted by Japanese scientists. KBG is a mixture of the following herbs: cassia bark (*Keihi*), herbaceous peony roots (*Shakuyaku*), peach kernels (*Tounin*), herbaceous fungus (*Bukuryo*), and root bark of peony (*Botanpi*). In addition to reducing fibroid size, KBG also successfully alleviated fibroid symptoms such as severe menstrual bleedings or menstrual **pain** in 90% of the women in the study. These researchers suggest that KBG may work by inhibiting the production of sex hormones including estrogen. Unlike many other presently available herbal preparations that may be effective but lack scientific evidence to support their uses, KBG is proven safe as well as having few side effects. Women with fibroids, therefore, have one more alternative treatment to hysterectomy.

There are many herbal formulas that can be used depending on specific symptoms and body types. Another herbal treatment that may also be effective is wild yam progesterone cream. However, these are potent drugs and patients should consult their doctors before trying any of these treatments.

Homeopathy

A homeopathic physician may prescribe patient-specific homeopathic remedies to control fibroid symptoms.

Allopathic treatment

Not all fibroids cause symptoms. Even fibroids that do cause symptoms may not require treatment. In the majority of cases, the symptoms are inconvenient and unpleasant, but do not result in health problems.

Occasionally, fibroids lead to such heavy menstrual bleeding that the woman becomes severely anemic. In these cases, treatment of the fibroids may be necessary. Very large fibroids are much harder to treat. Therefore, many doctors recommend treatment for moderately-sized fibroids, in the hopes of preventing them from growing into large fibroids that cause worse symptoms.

The following are possible treatment plans:

- Observation. Most women already have symptoms at the time their fibroids are discovered, but feel that they can tolerate their symptoms. Therefore, no active treatment is given, but the woman and her

physician stay alert for signs that the condition might be getting worse.

- Hysterectomy. This procedure involves surgical removal of the uterus, and it is the only definitive cure for fibroids. In fact, 25% of hysterectomies are performed because of symptomatic fibroids. A gynecologist can remove a fibroid uterus during either an abdominal or a vaginal hysterectomy. The choice depends on the size of the fibroids and other factors such as previous births and previous surgeries.
- Myomectomy. In this surgical procedure only the fibroids are removed; the uterus is repaired and left in place. This is the surgical procedure many women choose if they are not finished with childbearing. At first glance, it seems that this treatment is a middle ground between observation and hysterectomy. However, myomectomy is actually a difficult surgical procedure, more difficult than a hysterectomy. Myomectomy often causes significant blood loss, and blood transfusions may be required. In addition, some fibroids are so large, or buried so deeply within the wall of the uterus, that it is not possible to save the uterus, and a hysterectomy must be done, even though it was not planned.
- Lowering estrogen levels. Since fibroids are dependent on estrogen for their growth, medical treatments that lower estrogen levels can cause fibroids to shrink. A group of medications known as GnRH antagonists can dramatically lower estrogen levels. Women who take these medications for three to six months find that their fibroids shrink in size by 50% or more. They usually experience dramatic relief of their symptoms of heavy bleeding and pelvic pain.
- Uterine artery embolization (UAE). Embolization is a newer alternative to hysterectomy that shrinks fibroids by cutting off their blood supply. In UAE, the surgeon inserts a catheter into the uterine arteries. Small particles of polyvinyl foam or other inert substances are injected through the catheter into the arteries. The particles form an embolus, or clump, that blocks the blood supply to the fibroids and causes them to shrink. UAE is still controversial, however, because it has been associated with significant complications.

Unfortunately, GnRH antagonists cause unpleasant side effects in over 90% of women. The therapy is usually used for only three months, and should not be used for more than six months because the risk of developing brittle bones (osteoporosis)begins to rise. Once the treatment is stopped, the fibroids begin to grow back to their original size. Within six months, most of the old symptoms return. Therefore, GnRH agonists cannot be used as long-term solution. At the moment, treatment with GnRH antagonists is used mainly in preparation for surgery (myomectomy or hysterectomy). Shrinking the size of the fibroids makes surgery much easier, and reducing the heavy bleeding allows a woman to build up her blood count before surgery.

Fibroids can cause problems during pregnancy because they often grow in size. Large fibroids can cause pain and lead to premature labor. Fibroids cannot be removed during pregnancy because of the risk of injury to the uterus and hemorrhage. GnRH antagonists cannot be used during pregnancy. Treatment is limited to pain medication and medication to prevent premature labor, if necessary.

Expected results

Many women who have fibroids have no symptoms or have only minor symptoms of heavy menstrual bleeding or pelvic pressure. However, fibroids tend to grow over time, and gradually cause more symptoms. Many women ultimately decide to have some form of treatment. Currently, hysterectomy is the most popular form of treatment.

Prevention

Eating healthy, reducing **stress**, and exercising regularly is the preferred preventive treatment of many diseases including fibroids.

Resources

BOOKS

Bruce, Debra F. "Fibroids." In *The Unofficial Guide to Alternative Medicine*. New York, NY: McMillan Gen eral Reference, 1998, pp. 278 281.

Fetrow, Charles W., and Juan R. Avila. "Wild Yam." In *The Complete Guide to Herbal Medicines*. Springhouse, PA: Springhouse Corporation, 2000.

Friedman, Andrew J. "Uterine Fibroids." *Primary Care of Women*. edited by Karen J. Carlson and Stephanie A. Eisenstat. St. Louis, Missouri: Mosby Year Book, Inc., 1995, pp. 275 278.

Muto, Michael G., and Andrew J. Friedman. "Leiomyo mas." In *Kistner's Gynecology*. Sixth edition. Edited by Kenneth J. Ryan, Ross S. Berkowitz, and Robert L. Barbieri, St. Louis, MO: Mosby, 1995, pp. 147 149.

Zand, Janet, Allan N. Spreen, and James B. LaValle. "Fib roids, Uterine." In *Smart Medicine for Healthier Living: A Practical A to Z Reference to Natural and Conven tional Treatments for Adults*. Garden City Park, NY: Avery Publishing Group,1999: 282 285.

PERIODICALS

Lumsden, M. A. "Embolization versus Myomectomy versus Hysterectomy: Which Is Best, When?" *Human Repro duction* 17 (February 2002): 253 259.

Mehl Madrona, L. "Complementary Medicine Treatment of Uterine Fibroids: A Pilot Study." *Alternative Therapies in Health and Medicine* 8 (March April 2002): 34 6, 38 40, 42, 44 6.

Sakamoto, Shinobu, Haruno Yoshino, and Yaeko Shara hata. "Pharmacotherapeutic Effects of Kuei chih fu ling wan (Keishi bukuryo gan) on Human Uterine Myomas." *American Journal of Chinese Medicine* (1991): 313 317.

Todd, A. "An Alternative to Hysterectomy." *RN* 65 (March 2002): 30 34.

Watson, G. M., and W. J. Walker. "Uterine Artery Embolisation for the Treatment of Symptomatic Fibroids in 114 Women: Reduction in Size of the Fibroids and Women's Views of the Success of the Treatment." *British Journal of Obstetrics and Gynecology* 109 (February 2002): 129 135.

Mai Tran
Rebecca J. Frey, PhD

Uva ursi

Description

Uva ursi is a Latin name which means bear's grape. Its botanical name is *Arctostaphylos* and it is of the Ericaceae family. Other common names include bearberry, kinnikinnick (the name given to it by native Americans), whortleberry, spreng, mountain cranberry, and mealberry. It is a low-growing evergreen plant, usually reaching no more than 16 in (41 cm) in height.

Growing in the cooler, northern climates, uva ursi likes well-drained sandy soil and a sunny location. It can be found in the mountainous areas of Europe, Asia and America, where it is commonly used for ornamental purposes, mostly as shrubbery or hedging. It is widely found in Canada and the United States, but no further south than Wisconsin and New Jersey. In the British Isles, it is common in the Highlands of Scotland, the hilly areas of Ireland, and as far south as Yorkshire in England.

Uva ursi. *(©PlantaPhile, Germany. Reproduced by permission.)*

Uva ursi bears many pink or white flowers, which may be tinged with red, and grow in clusters. Bears are known to be fond of its red berries, hence the common name. The leaves, which are the part of the plant used for medicinal purposes, are smooth-edged, leathery, small, (between half an inch to an inch long), and oval. They are dark green in color and have lighter undersides. The leaves have no odor but are to be distinguished by their exceedingly bitter taste. They are attached to the branch by a very short stem. The branches tend to trail, are covered with a light brown bark, and are inclined to form a thick mass one to two feet long. Shoots rise obliquely from the stems and have soft hairs.

The chemical constituents of uva ursi include:

- arbutin (a glycoside) up to 10%, which is converted to hydroquinone in alkaline urine, thus releasing its active ingredient
- methyl arbutin
- flavonoids
- tannins, which can irritate stomach lining if taken in large quantities or over a long period of time
- alantoin
- phenolic acids (gallic and ellacic)
- volatile oil
- resin
- ursolic acid, which is known to be an effective diuretic
- quercetin and myricetin (coloring)

On incineration, the leaves yield approximately 3% ash. Uva usi also contains the following nutrients:

- vitamin A
- iron
- manganese
- selenium
- silicon

General use

Uva ursi, which is generally categorized as a treatment for the urinary and glandular systems, was commonly included in all the old pharmacopoeias, where it

KEY TERMS

Astringent—Drying effect.

Infusion—To make a tea.

Prophylactic—Preventative measure.

was sometimes mistakenly named Arbutas, and classified as such.

It has also been included in the modern pharmacopoeias due to its many medicinal uses and the fact that modern research has not detracted from the high esteem in which it is held in alternative health circles. The leaves of uva ursi are used mainly for kidney and urinary infections , for which it is exceptionally effective, having both anti-inflammatory and antiseptic properties. It is a famous herbal cure for cystitis, from which most women suffer at some time or another. It is also effective for the treatment of **kidney stones**, as it acts on these by softening them and has muscle relaxant properties, which may be beneficial here.

Other illnesses for which it has been used include Bright's disease, dysentery, nephritis, **gonorrhea** and syphilis, excessive **menstruation**, stimulation of the spleen, liver and pancreas, **hemorrhoids**, **menopause**, and diabetes. Research has indicated that the herb is more effective in its whole state than when broken down into components.

Some of the other uses for which uva ursi is also known include the following:

- Some native Americans combined it with tobacco and smoked it.
- Its astringent properties make it useful for infections (it dries them up).
- The tea may be used as an antiseptic for cuts and abrasions.
- It is sometimes used as a weight loss aid because it promotes production of urine, being an effective diuretic.
- In some places, notably Russia, it is drunk as a tea.
- Uva ursi is one of the rare herbs that can be helpful in cases of bedwetting.
- Uva ursi has such a high tannin content, that in Sweden and Russia, the leaves have actually been used to tan leather.
- In Scandinavia, an ash colored dye is made from the plant.
- Uva ursi berries are used as food for grouse.

Preparations

The leaves of the uva ursi plant may be harvested at any time, although traditionally this precious medicinal herb is gathered in late summer or autumn. The leaves should be picked in the morning after the dew has dried. They should then be left in a well-aired place to dry naturally and then stored in an airtight container (preferably glass or stainless steel, as these won't react with the volatile oils) to keep them dry, as they have a tendency to reabsorb moisture from the atmosphere. The hairs, which are present in growing uva ursi leaves, are absent once the herb is dried because they drop off in the drying process.

A guide to dosages of uva ursi preparations is as follows:

- Herbal extracts, as capsules or tablets, 250-500 mg three times daily.
- Tinctures, (which are alcohol-based), 5ml three times daily.
- For the purpose of treating urinary tract infections, 6-8 g of bicarbonate of soda in a glass of water should also be taken. This ensures alkalinity of the urine, thus releasing the active ingredient from the uva ursi. Another way to ensure alkalinity of the urine is to adhere to a vegetarian diet with lots of raw fruits and vegetables for a period.
- The leaves may be wrapped in gauze, and added to bath water for the treatment of hemorrhoids, inflammations and skin infections.
- Uva ursi should not be taken for more than two weeks at a time and individuals with high blood pressure should not take it at all. Some practitioners assert that this herb should not be used for more than three days at a time, as it can irritate mucous membranes.
- May be taken as a tea (infusion) for the treatment of minor vaginal irritations, menstrual bloating, and diabetes.

Uva ursi tea should not be boiled, as it becomes bitter and unpalatable and poisonous compounds may result. It is sufficient to prepare an infusion, by soaking the leaves for a few hours in cold water. This mode of preparations inhibits the release of tannins, which may irritate the stomach lining. Alternatively, boiling water may be added to the leaves, (one pint of water to 1 oz of leaves), which should then be allowed to steep for a while.

Some practitioners recommend always combining uva ursi with march mallow root or other mucilaginous diuretics.

Although high doses of uva ursi are not recommended for long periods, one cup of the tea is permissible as a prophylactic in cases of recurring cystitis. However, it is preferable to discontinue even this for intermittent periods.

Precautions

Occasionally, uva ursi is adulterated with other herbs, most notably cowberry and box, which will render the remedy less effective. Care must be taken to obtain the remedy from a reputable dealer.

Pregnant women should not take uva ursi and it should not be given to small children unless under the supervision of a health care practitioner.

Long term use of uva ursi is not recommended as hydroquinone (produced as a body-reaction with uva ursi) is poisonous in large amounts. Practitioners recommend that it be taken for no more than two weeks at a time.

Despite the powerful antiseptic/antibiotic properties of uva ursi, a natural health practitioner should be consulted if it is being used for infection.

It should be noted that practitioners recommend all alternative treatments should be used in conjunction with a healthy lifestyle.

Side effects

Uva ursi has been known to cause mild nausea. Fruit juice, **vitamin C**, and other acidic foods should not be taken with uva ursi preparations, in order to promote a pH balance in the body, thus preserving effectiveness of the remedy. If a patient develops any of the following toxic reactions that may be provoked by uva ursi, such as **nausea** and **vomiting**, shortness of breath, convulsions, ringing in the ears or even delirium and faintness, medical help should be sought immediately.

The bicarbonate of soda, which is recommended to be taken with uva ursi in cases of urinary tract infection, is unsuitable for those who suffer from high blood pressure, and in any case should not be taken for more than two weeks.

Uva ursi is not recommended for use during pregnancy as it may restrict blood supply to the fetus, due to its astringent properties.

Interactions

Uva ursi should not be taken in conjunction with the herb **buchu**, and should also not be taken with **cranberry** or anything containing cranberries. It should also not be used in conjunction with any drugs, which induce acid urine. Uva ursi may temporarily turn the urine green, which is a harmless side effect.

Arbutin, which is a constituent of uva ursi, is known to increase the anti-inflammatory effect of synthetic cortisone two. This may mean that a decrease in dosage could be considered.

Resources

HealthNotes. http://www.healthnotes.com.

MotherNature.com. http://www.mothernature.com/ency/Herb/Uva_Ursi.asp.

Snowbound Herbals. http://www.sbherbals.com/021999HotM.html.

Patricia Skinner

V

Vaginitis

Definition

Vaginitis is a condition characterized by inflammation of the vagina and vulva, most often caused by a bacterial, fungal, or parasitic infection.

Description

Vaginitis, vulvitis, and vulvovaginitis are general terms that refer to the inflammation of the vagina and/or vulva (the external genital organs of a woman). These conditions can be caused by bacterial, fungal, or **parasitic infections**; or by any type of allergic or irritation reaction to such things as spermicidal products, condoms, soaps, and bubble bath. A type of vaginitis that is caused by a low estrogen level is called atrophic vaginitis.

In general, vaginitis causes one or more of these symptoms: vaginal discharge; irritation; a burning sensation; and itching. One of the most common reasons women visit their doctor is because of a change in their vaginal discharge. It is completely normal for a woman to have a vaginal discharge, with the amount and consistency varying during the course of the menstrual cycle. The three most common types of vaginitis are bacterial vaginosis, candida vulvovaginitis, and **trichomoniasis**. Each will be discussed separately.

Bacterial vaginosis

Bacterial vaginosis is the most common cause of vaginitis during the childbearing years. Forty percent to 50% of vaginitis cases are caused by bacterial vaginosis. The occurrence of bacterial vaginosis is difficult to determine, but studies have proposed that 10–41% of women have had it at least once. The occurrence of bacterial vaginosis in the United States is highest among African-American women and women who have had multiple sexual partners, and is lowest among Asian women and women with no history of sexual contact with men. Bacterial vaginosis is not considered a sexually transmitted disease although it can be acquired through sexual intercourse. Recent findings indicate that bacterial vaginosis can be transmitted among women who have sex only with women, if vaginal secretions are exchanged.

Bacterial vaginosis is not caused by a particular organism but by a change in the balance of normal vaginal bacteria or by a change in the pH balance. Ninety percent of the bacteria found in a healthy vagina belong to the genus *Lactobacillus*. For various reasons, there is a shift in the bacterial population that results in overgrowth of other bacteria. Patients suffering from bacterial vaginosis have very high numbers of such bacteria as *Gardnerella vaginalis*, *Mycoplasma hominis*, *Bacteroides* species, and *Mobiluncus* species; and these bacteria can be found at numbers 100–1,000 times greater than are found in the healthy vagina. In contrast, *Lactobacillus* bacteria are very low in number or completely absent from the vagina of women with bacterial vaginosis.

Candida vulvovaginitis

Candida vulvovaginitis also has been called vulvovaginal candidiasis, candidal vaginitis, monilial infection, or vaginal **yeast infection**. Twenty to 25% of the vaginitis cases are candida vulvovaginitis. It has been estimated that about 75% of all women get a vaginal yeast infection at least once. In 80–90% of the cases, candida vulvovaginitis is caused by an overgrowth of the yeast *Candida albicans*. The remaining cases are caused by other species of *Candida*. It is not known what causes the yeast overgrowth. However, it is known that antibiotics can inadvertently kill normal bacteria in the vagina and cause an overgrowth of *Candida*.

Candida vulvovaginitis is not considered a sexually transmitted disease because *Candida* species are commonly found in the healthy vagina. It is rare to

KEY TERMS

Atrophic vaginitis—An inflammation of the vagina that develops when the estrogen levels in the body drop. It is usually associated with normal menopause or with surgical removal of the ovaries, but can occur with breast-feeding or premature menopause.

Parasite—An animal or plant that can only survive by living inside or upon another animal or plant.

pH—A measurement of the acidity or alkalinity (basicity) of a solution. A low pH indicates an acid solution; a high pH indicates a base, or alkaline, solution. The normal vaginal pH is 4-4.5.

Vaginosis—Bacterial infection of the vagina, caused by an overgrowth of bacteria that normally live in the vagina.

Vulva—The external genital organs of a woman, including the outer and inner lips, clitoris, and opening of the vagina.

find this disease in girls before puberty and in celibate women. Vaginal yeast **infections** tend to occur more frequently in women who are pregnant; diabetic and not controlling their disease; taking birth control pills, steroid drugs, or antibiotics; and those with the human immunodeficiency virus (HIV). The occurrence of four or more attacks per year is called recurrent vaginal candidiasis.

Trichomoniasis

Trichomoniasis, which is sometimes called "trich," accounts for 15–20% of the cases of vaginitis. It is estimated that two million to three million American women get trichomoniasis each year. Unlike the previous two types of vaginitis, trichomoniasis is primarily a sexually transmitted disease in that the disease is passed from person-to-person primarily by sexual contact. Trichomoniasis occurs in both men and women and is caused by an infection with the single-celled parasite *Trichomonas vaginalis*. Infection with *Trichomonas vaginalis* is frequently associated with other sexually transmitted diseases and helps spread the **AIDS** virus.

Causes and symptoms

Vaginitis is most often caused by a bacterial, fungal, or parasitic infection as described above. Other microorganisms may cause vaginitis, or it may be caused by allergic reaction, irritation, injury, low estrogen levels, and certain diseases. Common causes of bacterial vaginosis include:

- Repeated sexual intercourse over a short period of time, which raises vaginal pH and results in growth of bacteria and infection-like symptoms.
- Chronic vulvar dampness, aggravated by stress or restrictive, nonabsorbent synthetic clothing.
- Chemical irritants.
- Antibiotics, which disrupt the natural vaginal (and bowel) bacterial environment.

Additional risk factors for bacterial vaginosis include **stress**; a poor diet; use of an intrauterine device (IUD); being a member of a non-white race; a history of at least one prior **pregnancy**; first sexual activity at an early age; having multiple sex partners, and a history of sexually transmitted diseases.

Persons at an increased risk for candida vulvovaginitis include those who have had previous candida infections, have AIDS, or are diabetic; women who use douches, perfumed feminine hygiene sprays, vaginal sponges, or an IUD; those taking birth control pills, antibiotics, or corticosteroids; and those who wear tight clothing, are pregnant, or engage in frequent sexual intercourse.

The typical symptoms of vaginitis are vaginal discharge, **itching**, burning sensation, and irritation. Some women have few or no symptoms, while others may have pronounced symptoms. The main symptom of bacterial vaginosis is a fishy-smelling, thin, milky-white or gray vaginal discharge. Itching and burning may also be present. The fishy smell is stronger after sexual intercourse. The symptoms of *candida vulvovaginitis* are itching, soreness, painful sexual intercourse, and a thick, white, curdy (like cottage cheese) vaginal discharge. Trichomoniasis symptoms in women range from none at all to painful urination; painful sexual intercourse; and a yellow-green to gray, foul-smelling, sometimes frothy, vaginal discharge. In men, trichomoniasis may present no symptoms, or it may be associated with urethral discharge or persistent urethritis (inflammation of the urethra).

Diagnosis

Vaginitis can be diagnosed and treated by a nurse practitioner or physician. Most insurance companies cover the costs of diagnosis and treatment. To diagnose vaginitis, the doctor will examine the vagina (using a speculum to keep the vagina open) and take a sample of the vaginal discharge for tests and microscopic analysis. Laboratory culture results should be

available in two to three days, but the microscopic examination of the vaginal discharge may be performed immediately in the doctor's office. Diagnosis may be difficult because there are many different causes of vaginitis. Women who think that they have vaginitis should always visit their doctor to get an accurate diagnosis. Many women assume that they have a yeast infection and take over-the-counter medicines without first consulting their doctors.

To make a diagnosis of bacterial vaginosis, the doctor will check for four signs, called Amsel's criteria. These signs are: a thin, milky-white discharge that clings to the walls of the vagina; presence of a fishy odor; a vaginal pH of greater than 4.5; and the presence of "clue cells" in the vagina. Clue cells are vaginal cells that are covered with small bacteria. A diagnosis of candida vulvovaginitis is made after finding a normal vaginal pH (4–4.5) as well as the presence of many yeast cells in the sample of vaginal discharge or growth of yeast on laboratory media. A trichomoniasis diagnosis is made when the parasites are found in the vaginal discharge either by microscopic examination or in laboratory cultures. The newest system for testing for trichomoniasis is the InPouch test, which is more accurate than the older wet-mount method and easier to perform.

Treatment

Herbal remedies for vaginal infections are being aggressively investigated as of 2002 in hopes of lowering the rates of sexually transmitted diseases in developing countries that cannot afford Western allopathic treatments. Chinese, Ayurvedic, naturopathic, and homeopathic treatments for vaginitis are all being studied.

One of the primary focuses of alternative treatment for vaginal conditions including vaginitis is rebalancing the normal vaginal flora. To assist with this rebalancing, *Lactobacillus acidophilus* and *L. bifidus* are recommended, either taken internally or introduced directly into the vagina. Plain yogurt with live acidophilus cultures or **acidophilus** powder or capsules may be eaten. Yogurt can be inserted directly into the vagina or a tampon can be soaked in yogurt and inserted. **Garlic** (*Allium sativum*), taken both internally and inserted into the vagina (a peeled whole clove wrapped in gauze), may be helpful due to its antibacterial and antifungal actions. A variety of other herbs can be used as douches or in suppository form to help treat acute flare-ups of vaginal symptoms. For example, one remedy for reducing inflammation is a douche made by adding 1–2 tsp of **calendula** (*Calendula officinalis*) to boiling water, steeping the mixture, and letting it cool before using.

Herbal remedies for yeast infections also include a variety of antifungal, antiseptic, or immune-strengthening agents such as tea tree oil (inserted via a soaked tampon, douche, or suppository), black walnut (*Juglans nigra*), pau d'arco (*Tabebuia impestiginosa*), echinacea (*Echinacea* species), and **goldenseal** (*Hydrastis canadensis*). Echinacea and goldenseal should be taken only for a limited time. As with many herbs, medical supervision may be advised for those with certain health conditions. Persons with specific **allergies** may not be able to use some remedies. For example, **echinacea** should not be used by anyone allergic to plants in the sunflower family, and goldenseal should not be used during pregnancy or by anyone allergic to ragweed.

A boric acid douche can help to acidify the vaginal pH so that unwanted bacteria cannot survive and multiply. Because some women may be sensitive to this douche, a health professional should oversee this treatment. Also, care must be taken to keep boric acid away from children. Vaginal pH may also be lowered by using Summer's Eve medicated douche, which contains **potassium** iodide, or a vinegar douche (1 tbsp of vinegar per quart of warm water).

The Gynecological Sourcebook recommends Betadine and gentian violet for treating candida vulvovaginitis. Betadine, an antiseptic **iodine** solution, should not be used by pregnant women. Gentian violet is an antifungal stain. Both solutions are messy and leave stains, and some women may be allergic to either or both of them. *Oxygen Healing Therapies* reports successful treatment of candidiasis with intravenous hydrogen peroxide. Various homeopathic treatments are available over the counter or prepared for individual cases by homeopaths. Commonly cited ingredients are **pulsatilla** and **sepia**. For atrophic vaginitis, especially in menopausal women, topical application of progesterone cream can help symptoms abate by slowing the thinning of the tissue.

Dietary modification and nutritional supplementation may also be helpful in the treatment of vaginitis. Antioxidant vitamins, including A, C, and E, as well as B complex vitamins and **vitamin D** are recommended. *Prescriptions for Nutritional Healing* notes that if atrophic vaginitis is treated with prescription estrogen ointments, the body's need for vitamin B6 is increased. Topical application of **vitamin E** from prepared creams or from torn vitamin E capsules may help relieve itching. Other home remedies for itching from *The Gynecological Sourcebook* include **witch hazel** or cottage cheese compresses; or baths with epsom salts or baking soda followed by blow-drying the vagina and dusting the vagina with cornstarch.

Allergy tests may be useful for women with yeast infections. Additionally, foods that yeast organisms thrive on should be avoided. These foods include cheese, alcohol, chocolate, soy sauce, sugar, vinegar, fruits, and any fermented foods or foods containing molds (e. g., blue cheese). Wearing cotton underwear and loose-fitting clothes and avoiding pantyhose can help keep the vagina cool and dry, thus helping to prevent some forms of vaginitis. For recurrent yeast infections, alternative treatments recommended in *The Gynecological Sourcebook* include boric acid douches in declining doses; oral ingestion of acidophilus with meals; and caprylic acid and myocidin, which are fatty acids derived from antifungal oils. Cases of chronic vaginitis should be addressed on systemic level by an alternative practitioner.

Allopathic treatment

Both bacterial vaginosis and trichomoniasis require prescription medication for treatment. Candidal vulvovaginitis may be treated with either prescription or over-the-counter medicines. It is not advisable to take over-the-counter medications for vaginal yeast infections if one does not in fact have a yeast infection. A survey of 390 gynecologists found that 44% of the women who were diagnosed with bacterial vaginosis had first treated themselves with over-the-counter yeast infection medications.

Bacterial vaginosis should be treated daily for one week with the antibiotics metronidazole (Flagyl, Protostat) or clindamycin (Cleocin), either as pills taken orally or in a gel or cream form inserted into the vagina. Trichomoniasis is treated with either a large single dose of metronidazole or with a smaller dose taken twice daily for one week. Male sexual partners of women with trichomoniasis also must be treated, and intercourse should be avoided until both partners are cured. Possible side effects of the oral antibiotics include **nausea** and adverse reactions to drinking alcohol during the treatment period. Following treatment, natural flora need to be built up again through introduction of acidophilus and other lactobacilli.

Candida vulvovaginitis is most often treated by the application of medicated gels, creams, or suppositories applied directly to the vagina. The antifungal drugs used to treat candida vulvovaginitis include oral fluconazole (Diflucan); butoconazole (Femstat); clotrimazole (Gynelotrimin, Mycelex); miconazole (Monistat); ticonazole (Vagistat), and nystatin (Mycostatin, Nilstat, Nystex). Most require only one or a few days of therapy to be effective. Women who have recurrent candidal infections may receive treatment for several weeks followed by some form of a long-term preventative treatment. Ketoconazole (Nizoral) may be used to treat recurrent vaginitis.

Normal allopathic treatment of atrophic vaginitis includes either estrogen creams or low-dosage estrogen tablets. Tibolone, a synthetic steroid, is also given for the treatment of atrophic vaginitis. It appears to prevent bone loss as well as improving the condition of the vaginal lining.

Expected results

Vaginitis is a disease with minor symptoms, and most women respond well to medications. It is believed, however, that certain vaginal infections left untreated can lead to more serious conditions, such as pelvic inflammatory disease; endometritis; postsurgical infections; and spread of the AIDS virus. Bacterial vaginosis has been identified as a risk factor in certain complications of pregnancy, including early pregnancy loss, preterm labor, and low birth weight infants. In addition, recurrent trichomonal infection appears to be associated with an increased risk of cervical **cancer**.

Prevention

Women may avoid vaginal infections by following these suggestions:

- Do not take over-the-counter yeast infection treatments unless the woman has been diagnosed with candidiasis before and recognizes the symptoms.
- Avoid douching because it may disturb the balance of organisms in the vagina and may spread them higher into the reproductive system.
- Do not use vaginal deodorants or sprays because they can also disturb the vagina's natural balance.
- Thoroughly dry oneself after bathing and remove a wet bathing suit promptly.
- Avoid wearing tight clothing and wear cotton underwear. Change underwear often and avoid pantyhose made from synthetic fibers.
- Clean diaphragms, cervical caps, and spermicide applicators after every use. Use condoms to avoid sexually transmitted diseases.
- After a bowel movement, wipe the area around the anus from front to back to avoid spreading intestinal bacteria into the vagina.

Resources

BOOKS

Rosenthal, M. Sara. *The Gynecological Sourcebook*. Los Angeles: Lowell House, 1994.

PERIODICALS

Barenfanger, J., C. Drake, and C. Hanson. "Timing of Inoculation of the Pouch Makes No Difference in Increased Detection of *Trichomonas vaginalis* by the InPouch TV method." *Journal of Clinical Microbiology* 40 (April 2002): 1387 1389.

Cullins, Vanessa E., et al. "Treating Vaginitis." *Nurse Practitioner* 24 (October 1999): 46 65.

Davis, S. R. "The Effects of Tibolone on Mood and Libido." *Menopause* 9 (May June 2002): 153 155.

Marrazzo, J. M., L. A. Koutsky, D. A. Eschenbach, et al. "Characterization of Vaginal Flora and Bacterial Vaginosis in Women Who Have Sex with Women." *Journal of Infectious Diseases* 185 (May 1, 2002): 1307 1313.

Pumpradit, W., and M. Augenbraun. "Bacterial Vaginosis Complicating Pregnancy and Gynecologic Surgery." *Current Infectious Diseases Report* 4 (April 2002): 141 143.

Sayed el Ahl, S. A., H. S. el Wakil, N. M. Kamel, and M. S. Mahmoud. "A Preliminary Study on the Relationship Between *Trichomonas vaginalis* and Cervical Cancer in Egyptian Women." *Journal of the Egyptian Society of Parasitology* 32 (April 2002): 167 178.

Sobel, Jack D. "Vaginitis." *New England Journal of Medicine* 337 (December 1997): 1896 1903.

Vermani, K., and S. Garg. "Herbal Medicines for Sexually Transmitted Diseases and AIDS." *Journal of Ethnopharmacology* 80 (April 2002): 49 66.

Williams, Pamela A. "Nonscientifically Validated Herbal Treatments for Vaginitis." *Nurse Practitioner* 24 (August 1999): 101 4.

ORGANIZATIONS

National Institutes of Health, Office of Research on Women's Health. http://www4.od.nih.gov/orwh.

National Vaginitis Association. 117 South Cook Street, Suite 315, Barrington, IL 60010. (800) 909 8745. VagAssoc@aol.com. http://www.vaginalinfection.com.

OTHER

JAMA Women's Health STD Information Center. http://www.ama assn.org/special/std.

Kathy S. Stolley
Rebecca J. Frey, PhD

Valerian

Description

Valerian (*Valeriana officinalis*) is one of about 200 members of the Valerianaceae family. This plant is native to Europe and west Asia; it is naturalized throughout North America. A common name for this hardy perennial is garden heliotrope. Valerian has been valued for its soothing qualities for at least a millennium. The name valerian may have come from the Latin *valere* meaning "to be strong" or "to be in good health." Chaucer (c. 1343–1400) called the herb setewale. Other common names are all-heal, vandal root, and Capon's tail. The Greek doctor Galen called a particularly odorous species of valerian "phu," referring to the distinctively unpleasant smell of the dried root. The strong odor, which some say is reminiscent of dirty socks, appeals to earthworms, intoxicates cats, and attracts rats. According to legend, the Pied Piper of Hamelin, with the assistance of the odorous valerian root, lured the town's rats to the river to drown. Some Asian species of valerian have a more pleasant aroma and may have included spikenard (the biblical name for valerian), which was known as a perfume from the East.

In ancient times, valerian was believed to be under the influence of the god Mercury. The herb grows in lime-rich soil near streams or in damp, low meadows where it may reach a height of 5 ft (1.5 m). It is also found in drier environments at higher elevations, where it grows to just 2 ft (0.6 m). Roots harvested from the drier environment may be more medicinally potent. This variety is sometimes known as sylvestus.

Valerian's short vertical rhizome is dark yellow-brown in color and has round rootlets. These rootlets produce hollow, fluted stems with opposite leaves and a single leaflet at the tip and as many as eight to 10 pairs of toothed leaflets. The upper leaves are attached at their base and emerge from a white sheath along the stem. The stems remain erect and unbranched until the very top were the small, white flowers, tinged with pink, bloom in clusters in the middle of summer. Seeds are winged with tufts of white hair, and they scatter on the wind.

Valerian (Valeriana officinalis). *(© blickwinkel / Alamy)*

General use

As of 2007, researchers had identified some of the active ingredients in valerian that are responsible for its medicinal properties. A team of pharmacologists in Argentina reported that they had isolated two new flavonoids, 6-methylapigenin and **hesperidin**, as compounds with sedative and sleep-enhancing properties. In addition to these flavonoids, valerian contains volatile oil, valepotriates, glycosides, alkaloids, **choline**, tannins, and resins. Valerian's rhizome and root are the medicinal part of this herb. Fresh root will produce the highest quality of medicinal extract.

Valerian acts as a **pain** reliever, antispasmodic, sedative, carminative, and can help support nerve tissue. A British study published in 2002 suggests that valerian's effectiveness in relieving **stress** is related to its ability to lower the body's reactivity in stressful situations. Valerian can also help to promote menstrual flow. As a natural tranquilizer, valerian can soothe **anxiety**, nervous tension, **insomnia**, and **headache**. It acts on the peripheral nerves and relaxes both the smooth and skeletal muscle tissue to reduce tension. It also strengthens the heart and provides relief from menstrual cramps, stomach cramps, irritable bowel, and upset stomach caused by nerves. Valerian has also been shown to lower blood pressure. One study found that valerian tends to sedate the agitated person and stimulate the fatigued person, bringing about a balancing effect on the system. Externally, a lotion prepared with valerian extract will ease irritation from skin **rashes** and soothe swollen joints.

The plant has been used as a medicinal herb for more than a thousand years, especially for mild cases of insomnia. Research shows that proper use of valerian promotes sleep, reduces night awakenings, and increases dream recall in most people. Historically, valerian has been highly regarded as a tranquilizer that acts without narcotic effects. It is particularly popular with women; one herbal formula for menopausal women contains valerian along with **hops** and **black cohosh** as an active ingredient. The herb has also been used to treat illnesses as diverse as **epilepsy** and the plague. In the sixteenth century, valerian was reported to have cured a case of epilepsy. It was also used to treat hysteria, migraine, and vertigo. It has also been recommended for driving splinters or thorns from skin. Valerian was listed in the *United States Pharmacopoeia* from the early seventeenth century until the mid-twentieth century. During World War I, soldiers traumatized by the constant bombing and those suffering from what was then called shell shock were treated with valerian. The herb was listed in the *U.S. National Formulary* until 1950 and continued to be listed in the official pharmacopoeias of Germany, Belgium, and France.

A German study of more than 900 children suffering from pathological restlessness and/or difficulty falling asleep reported in 2006 that a twice-daily dose of 160 mg of valerian and 80 mg of **lemon balm** significantly decreased restlessness and difficulty falling asleep. The researchers suggested this combination may be a safer and more practical alternative to prescription medications.

Preparations

Valerian root should be harvested in the autumn of its second year. Valerian works well in combination with other tranquilizing herbs such as **passionflower** (*Passiflora incarnata*) to safely induce sleep or **skullcap** (*Scutellaria laterifolia*) to relieve nervous tension. The somewhat bitter, unpleasant taste of the tea may be masked by adding **peppermint** oil, or the user can take the herb in capsule form. Combinations contain equal parts of each herb. The herb may be drunk as an herbal tea, used as a tincture, or swallowed in capsule form one hour before bedtime.

It is important to note that there is no standard dosage for valerian and that the potency of valerian products can vary drastically from brand to brand. In 2006, ConsumerLab.com tested 16 brands of valerian products and found most had a lower potency than what was printed on the label and/or contained contaminants. One of the products was contaminated with lead, which can damage almost every system in the human body, and two others were contaminated with cadmium, a heavy metal that can cause kidney damage.

Precautions

Valerian should not be used in large doses or for an extended period. People should not take it continuously for more than two to three weeks. Users of valerian may become tolerant to its effects with prolonged use. Increasing the dose of the herb to achieve desired effects may result in negative side effects. Prolonged use, according to some research, could result in liver damage and central nervous system impairment.

Side effects

Large doses of valerian may occasionally cause headache, muscle spasm, heart palpitations, **dizziness**, gastric distress, sleeplessness, and confusion. Uninterrupted use may cause **depression**.

KEY TERMS

Carminative—A medication or preparation that prevents the formation of intestinal gas or allows it to be expelled.

Flavonoid—Any of a group of plant compounds with an aromatic nucleus, often found as a pigment. Two new flavonoids identified in valerian may be the source of its sedative effects.

Rhizome—A fleshy plant stem that grows horizontally under or along the ground; roots are sent out below this stem and leaves or shoots are sent out above it.

Interactions

Although valerian has been regarded as a relatively safe herb because few interactions with prescription medications have been reported, newer research indicates that it should be used cautiously following surgery. Like St. John's wort, valerian can interact with anesthetics and other medications given to patients after surgery. Because valerian has a mild sedative effect, it should not be taken together with alcoholic beverages, benzodiazepines, barbiturates, or antihistamines. Long-term safety studies of valerian have not been conducted as of early 2008.

Resources

BOOKS

Barnes, Joanne, et al. *Herbal Medicines (Includes CD ROM)*, 3rd. ed. London: Pharmaceutical Press, 2007.

PDR for Nonprescription Drugs, Dietary Supplements, and Herbs. Stamford, CT: Thomson Healthcare, 2007.

Woolven, Linda, and Ted Snider. *Healthy Herbs: Everyday Guide to Medicinal Herbs and Their Use*. Markham, ON Canada: Fitzhenry & Whiteside, 2006.

PERIODICALS

Bone, Kerry. "Valerian: A Safe and Effective Herb for Sleep Problems." *Townsend Letter for Doctors and Patients* (April 2005): 44.

Brown, Donald. "Valerian and Lemon Balm Safely and Effectively Treat Restlessness and Dyssomnia in Children" *Original Internist* (December 2006): 205(2).

Castleman, Michael. "Rest Assured: Valerian, a Safe and Effective Herbal Sleep Aid, Will Help You Close the Door on Insomnia." *Natural Health* (March 2007): 98.

Sego, Sherril. "Valerian." *Clinical Advisor* (March 2007): 171(2).

ORGANIZATIONS

American Institute of Homeopathy, 801 N. Fairfax St., Suite 306, Alexandria, VA, 22314, (888) 445 9988, http://www.homeopathyusa.org.

Homeopathic Medical Council of Canada, 3910 Bathurst St., Suite 202, Toronto, ON, M3H 3N8, Canada, (416) 638 4622, http://www.hmcc.ca.

National Center for Alternative and Complementary Medicine, 9000 Rockville Pike, Bethesda, MD, 20892, (888) 644 6226, http://www.nccam.nih.gov.

U.S. Food and Drug Administration (FDA), 5600 Fishers Lane, Rockville, MD, 20857, (888) 463 6332, http://www.fda.gov.

Clare Hanrahan
Ken R. Wells

Vanadium

Description

Named after the Scandinavian goddess of youth and beauty, vanadium is a trace element that has gained attention in recent years as a possible aid in controlling diabetes. While such macrominerals as calcium, **magnesium**, and potassium have become household names because they make up over 98% of the body's mineral content, certain trace minerals are also considered essential in very tiny amounts to maintain health and ensure proper functioning of the body. They usually act as coenzymes, working as a team with proteins to facilitate important chemical reactions. Even without taking vanadium supplements, people have about 20–25 micrograms (mcg) of the mineral in their bodies, which is derived from an average balanced diet. Despite the fact that vanadium has been studied for over 40 years, it is still not known for certain if the mineral is critical for optimal health. Whether taking extra amounts of vanadium is therapeutic or harmful is even more controversial. Like **chromium**, another trace mineral, vanadium has become the focus of study as a possible aid in lowering blood sugar levels in people with diabetes. Vanadium has also been touted as a potential treatment for osteoporosis. Some athletes and weight lifters take it to build muscle or improve performance.

Studies in animals suggest that vanadium may be necessary for the formation of bones, teeth, and cartilage. The mineral may also play a role in growth and reproduction as well as affect the processing of cholesterol and insulin in the body. In one animal study, goat kids whose mothers received a diet deficient in

vanadium showed skeletal damage; they died within days of their birth. In studies of mice, vanadium has been shown to lower blood sugar and levels of low-density lipoprotein (LDL) cholesterol and triglyceride. It is not certain, however, that such study results as these confirm the nutritional importance of the mineral for human beings. The effects of a vanadium-free diet have not been studied in people. Even if vanadium supplements prove to be effective for certain purposes, such as helping to control diabetes, animal studies suggest that the high dosages of vanadium necessary to produce results may be harmful. High dosages are often necessary because vanadium is not well absorbed by the body. As of 2000, a significant amount of research is still required to determine if vanadium can in fact produce significant health benefits safely and effectively. The proper dosage of the mineral supplement has also yet to be determined.

General use

Vanadium has been investigated most often as a possible aid in controlling diabetes. Studies in animals with type 1 (insulin-dependent) and type 2 (non-insulin-dependent) diabetes indicate that vanadium can help to improve blood sugar levels. Studies using human subjects have produced encouraging if preliminary results. Vanadium is used by some athletes and weight lifters to build muscle despite the fact that it does not appear to be effective for this purpose. Moreover, the potential usefulness of vanadium in treating **osteoporosis** is considered highly speculative. All of the human studies discussed below were conducted in small numbers of people for short periods of time and involved relatively high dosages of the mineral.

Diabetes

Several studies conducted in people suggest that vanadium may help to control blood sugar levels in diabetics. The mineral appears to work by mimicking the effects of insulin or by increasing the body's sensitivity to the hormone. This mechanism could allow diabetics to effectively control their blood sugar while using lower dosages of insulin medication. In a placebo-controlled study published in 1996 in the medical journal *Metabolism*, eight people with type 2 diabetes received vanadium for one month. Researchers found that vanadium was moderately successful in lowering blood sugar levels and had few side effects. Six of the eight patients taking vanadium during the study experienced gastrointestinal side effects during the first week of treatment, but these disappeared with continued use. In another small study of vanadium involving people with type 2 diabetes, published in the *Journal of Clinical Investigation* in 1995, researchers from the Albert Einstein College of Medicine reported that three weeks of treatment with the mineral improved the body's sensitivity to insulin. The effects of vanadium in lowering blood sugar levels persisted for up to two weeks after the drug was discontinued. A study published in the journal *Diabetes* in 1996, which involved seven people with type 2 diabetes as well as six nondiabetics, reported that vanadium improved insulin sensitivity in the diabetic subjects. Interestingly, the mineral did not improve sensitivity in the subjects who did not have the disease.

Sports medicine

The use of vanadium by body builders appears to stem from a misunderstanding of the mineral's effects. Because insulin is a hormone that plays a role in increasing muscle mass, some weight lifters have taken vanadium in high dosages because they believe it will act like insulin and make them stronger. The problem is that vanadium does not appear to mimic insulin or increase its efficiency in healthy people, only in diabetics. For people considering vanadium as an aid in strengthening muscles, the scientific evidence is not very convincing. In one double-blind, placebo-controlled study published in the *International Journal of Sport Nutrition* in 1996, high dosages of vanadium were given to a few dozen weight trainers for 12 weeks. The bench press and leg extension weight-training exercises were used to measure results. Researchers found that there was no difference in body composition between those who took vanadium and those in the placebo group. Vanadium appeared to slightly enhance performance during the leg extension aspect of the study, but this advantage can be explained by other factors and cannot be attributed to the mineral itself with any certainty.

Osteoporosis

It is important not to confuse vanadium with **calcium**. Calcium is considered an essential building block of bone, and calcium supplements are often an important part of a bone-strengthening program in women with osteoporosis. Studies in mice indicating that vanadium is also deposited in bone have led to suggestions that the mineral may be effective as a potential treatment for osteoporosis. It is known, however, that minerals can be added to bones without actually making them stronger. There is no evidence that taking vanadium supplements can increase bone density in humans.

KEY TERMS

Diabetes—A disease in which the body either cannot produce adequate amounts of insulin (type 1) or properly metabolize the hormone (type 2).

Insulin—A hormone produced by the pancreas that helps to regulate blood sugar levels.

Osteoporosis—An age-related disease in which bones become fragile and prone to debilitating fractures.

Placebo—A sugar pill or inactive agent often used in the control group of a medical study.

Triglyceride—A term referring to the total amount of fat in the blood. Triglyceride should not be confused with cholesterol, which is technically classified as a steroid and not as a fat.

Preparations

The estimated dosage of vanadium, which is available as an over-the-counter dietary supplement, generally ranges from 10–30 mcg a day. It is important to remember, however, that safe and effective dosages for the mineral have not yet been established. Some practitioners of complementary medicine, such as Dr. Robert Atkins, have recommended dosages as high as 25–50 mg (milligrams, not micrograms) daily for people with diabetes. The long-term health risks associated with taking dosages in this range are unknown.

Even without taking supplements, most adults get anywhere between 10–60 mcg of vanadium through a normal diet. Some authorities believe it is safer for people to avoid vanadium supplements altogether and increase their intake of foods known to contain the mineral. These include meat, seafood, whole grains, vegetable oil, canned fruit juices, soy products, and such vegetables as green beans, corn, carrots, and cabbage. Alcoholic beverages such as wine and beer also contain vanadium. Overdosing on the vanadium contained in food is not considered a significant risk because the mineral is present only in very small amounts in plants and animals.

Precautions

It is important not to exceed the recommended intake of vanadium without medical supervision. Studies conducted in rats suggest that high dosages of vanadium can be harmful. This results from the fact that the mineral tends to build up in the body, reaching dangerously high levels when taken in excess. The reader should keep in mind that high dosages of vanadium have not yet been proven to have significant health benefits. The long-term health risks associated with taking vanadium supplements (in any dosage) are unknown.

Side effects

When taken in recommended dosages, vanadium has not been associated with any significant or bothersome side effects. At high dosages, vanadium has been known to cause stomach cramping and diarrhea as well as a green tongue.

Interactions

No drugs are known to interact adversely with vanadium. Smokers may absorb less of the mineral.

Resources

BOOKS

Atkins, Robert C. *Dr. Atkins' Vita Nutrient Solution*. New York: Simon & Schuster, 1998.

Miller, Lucinda G., and Wallace J. Murray. *Herbal Medicinals: A Clinician's Guide*. New York: Pharmaceutical Products Press, 1998.

Sifton, David W. *PDR Family Guide to Natural Medicines and Healing Therapies*. New York: Three Rivers Press, 1999.

ORGANIZATIONS

Herb Research Foundation. 1007 Pearl Street, Suite 200. Boulder, CO 80302.

National Diabetes Information Clearinghouse. 1 Information Way. Bethesda, MD 20892 3560.

OTHER

Discovery Health. http://www.discoveryhealth.com.

National Institute of Diabetes and Digestive and Kidney Diseases. http://www.niddk.nih.gov.

Greg Annussek

Varicella *see* **Chickenpox**

Varicose veins

Definition

Varicose veins are dilated, tortuous, elongated superficial veins that appear most often in the legs.

Description

Varicose veins, also called varicosities, are seen most often in the legs, although they can be found in

Varicose veins on back of legs around knee area.
(© worldthroughthelens-medical / Alamy)

other parts of the body. Most often, they appear as lumpy, winding vessels just below the surface of the skin. There are three types of veins: superficial veins that are just beneath the surface of the skin; deep veins that are large blood vessels found deep inside the muscles; and perforator veins that connect the superficial veins to the deep veins. The superficial veins are the blood vessels most often affected by this condition and are the veins that are visible when the varicose condition has developed.

The inside walls of veins have valves that serve as one-way flaps, which open and close in response to the blood flow. When the left ventricle of the heart pushes blood out into the aorta, it produces the high-pressure pulse of the heartbeat and pushes blood throughout the body. Between heartbeats, there is a period of low blood pressure. During this period, blood in the veins is affected by gravity and would flow downward if not for valves in the veins that prevent this from happening. Varicose veins start when one or more valves fail to close. The blood pressure in that section of vein increases, causing additional valves to fail, which allows blood to pool and stretch the veins, further weakening the walls of the veins. The walls of the affected veins lose their elasticity in response to increased blood pressure. As the vessels weaken, more and more valves are unable to close properly. The veins become larger and wider over time and begin to appear as lumpy, winding chains underneath the skin. Varicosities can also develop in the deep veins. Varicose veins in the superficial veins are called primary varicosities, and varicose veins in the deep veins are called secondary varicosities.

Causes and symptoms

Varicose veins have a number of different causes; lifestyle and hormonal factors play a role. Some families seem to have a higher incidence of varicose veins, indicating that there may be a genetic component to this disease. Varicose veins are progressive; as one section of a vein weakens, it causes increased pressure on adjacent sections of the vein. These sections often develop varicosities. Varicose veins can appear following pregnancy, thrombophlebitis (which is inflammation of a vein caused by a blood clot), congenital blood vessel weakness, or **obesity**, but they are not limited to these conditions.

Edema (swelling) of the surrounding tissue, ankles, and calves is not usually a complication of primary (superficial) varicose veins. When edema develops, it usually indicates that the deep veins may have varicosities or clots.

About half of U.S. adults have some type of vein problem. Varicose veins are a common problem; according to the U.S. National Heart, Lung, and Blood Institute, they affect 25 million Americans, mainly people aged 30 to 70 years old. The symptoms can include aching, **pain**, itchiness, or burning sensations, especially when standing. They also sometimes lead to serious health problems, including skin ulcers, blood clots, and severe **infections**. Some individuals who have chronically bad veins may experience a brownish discoloration of the skin or ulcers (open sores) near the ankles. A condition that is frequently associated with varicose veins is spider-burst veins. Spider-burst veins are very small veins that are enlarged. They may be caused by back-pressure from varicose veins but can be caused by other factors. They are frequently associated with **pregnancy** and hormonal factors may be associated with their development. They are primarily of cosmetic concern and do not present any medical concerns.

Diagnosis

Varicose veins can usually be seen. In cases in which varicose veins are suspected, a physician may frequently detect them by palpation (pressing with the fingers). The physician will examine the veins while the patient is first in a standing position and a second time while the patient is lying down. X-rays or ultrasound tests can detect varicose veins in the deep and perforator veins and also rule out **blood clots** in the deep veins. A handheld Doppler instrument is a commonly used diagnostic tool for evaluating the leg veins.

Treatment

There is no cure for varicose veins. Treatment falls into two classes: relief of symptoms and removal of the affected veins. Symptom relief includes such measures as wearing support or compression stockings, which compress the veins and hold them in place. This pressure keeps the veins from stretching and limits pain. Other measures include sitting down, using a footstool to support the feet when sitting, avoiding standing for long periods of time or at least shifting the body weight from one foot to the other, and raising the legs whenever possible. These measures work by reducing the blood pressure in leg veins. Prolonged standing allows the blood to collect under high pressure in the varicose veins. Crossing the legs and wearing tight clothing (particularly around the waist, groin, and legs) should also be avoided. **Exercise** such as walking, biking, and swimming, is beneficial. When the legs are active, the leg muscles help pump the blood in the veins. This activity limits the amount of blood that collects in the varicose veins and reduces some of the symptoms but does not cure the condition.

Herbal therapy is used to help treat varicose veins. **Essential oils** of cypress and geranium or extracts from **horse chestnut** seeds (*Aesculus hippocastanum*) are massaged into the legs, stroking upward toward the heart. The oils should not be applied to broken skin, and massage should not be performed directly on the varicose veins. Research has also shown that an oral dose of horse-chestnut seed extract is as effective in treating chronic venous insufficiency (a cause of varicose veins) as is compression. Individuals should be advised that horse chestnut flower, branch bark, and leaf are toxic and should be avoided.

Persons with varicose veins sometimes drink fresh fruit juices, particularly those of dark colored berries (cherries, blackberries, and blueberries) to help tone and strengthen the vein walls. They may also take the enzyme **bromelain**, found in pineapple juice, to aid in the prevention of blood clots associated with the pooling of blood in the legs.

Deep-breathing exercises performed while lying down with the legs elevated can assist gravity in circulating blood from the legs. The flow of fresh blood into the legs can help relieve pain.

Allopathic treatment

Surgery can remove varicose veins that are causing pain or are very unsightly and when hemorrhaging or recurrent thrombosis (blood clot) appear. Surgery involves making an incision through the skin at both ends of the section of vein being removed. A flexible wire is inserted through one end and extended to the other. The wire is then withdrawn, pulling the vein out with it. This is called stripping and is the most common method to remove superficial varicose veins. As long as the deeper veins are still functioning properly, a person can live without some of the superficial veins. Because of this, stripped varicose veins are not replaced. Recovery time varies, but most patients can expect to be back to their normal routines in about one to four weeks.

Other surgical methods are available. In one, known as ambulatory phlebectomy, a surgeon uses a tool to pull the troubling vein from the appendage through a small incision. Recovery time is typically less than a day.

Injection therapy is an alternate therapy used to seal varicose veins. This prevents blood from entering the sealed sections of the vein. The veins remain in the body but no longer carry blood. This procedure can be performed on an out-patient basis and does not require anesthesia. It is frequently used if people who have undergone surgery to remove the larger varicose veins proceed to develop further varicose veins. It is also used to seal spider-burst veins for people concerned about cosmetic appearance. Injection therapy is also called sclerotherapy. At one time, a method of injection therapy was used that did not have a good success rate. Veins did not seal properly and blood clots formed. Modern injection therapy is improved, and patients can typically expect a 50 to 90 percent improvement in the treated veins. Sometimes, the procedure must be repeated to achieve the desired results.

Additional allopathic treatments that are much less invasive than stripping the veins were also available as of 2008 and were used to treat most patients who have either spider veins or more severe varicose veins. In this method, the doctor inserts a small tube, or catheter, through a small puncture and directly into the affected vein, and uses it to direct a radiofrequency

KEY TERMS

Aescinate—A chemical found in horse chestnut that is effective in relieving the tissue swelling associated with varicose veins.

Congenital—Existing at or before birth; a condition that developed while the fetus was in utero or as a consequence of the birth process.

Edema—Swelling caused by the collection of fluid in a tissue or body cavity.

Hemorrhage—Rapid high-volume loss of blood.

Palpation—A diagnostic technique in which the examiner gently presses, or palpates, a specific area of the patient's body. Palpation is used in the diagnosis of varicose veins.

Topical—A form of medication that is applied to the external surface of the affected part of the body.

burst or laser energy onto the wall of the vein, which causes the vein to contract and seal. Some patients find the heat caused by the procedure, which typically takes 15 minutes or so, to be uncomfortable. The patient can return to work or other normal activity immediately after the procedure. Typically, the patient returns at least once more for a follow-up treatment.

Expected results

Untreated varicose veins become increasingly large and more obvious with time. Surgical stripping of varicose veins is successful for most patients. Surgery does not decrease a person's tendency to develop varicose veins, but most patients do not develop new, large varicose veins following surgery. Varicose veins may develop in other locations after stripping.

Prevention

While genetic factors play a significant role in the development of varicose veins, swimming and other exercises to increase circulation in the legs help to prevent varicose veins. Preventive measures are especially important during pregnancy, when the additional weight of the fetus and placenta can exert pressure on the mother's legs and feet.

Resources

BOOKS

Bergan, John J., ed. *The Vein Book*. New York: Academic Press, 2006.

Craggs Hinton, Christine. *Coping Successfully with Varicose Veins*. London: Sheldon Press, 2008.

PERIODICALS

Naoum, Joseph J., and Glenn C. Hunter. "Pathogenesis of Varicose Veins and Implications for Clinical Manage ment." *Vascular* 15, no. 5 (2007): 242 249.

OTHER

"Varicose Veins and Spider Veins." U.S. Department of Health and Human Services, December 2005. http://www.4women.gov/faq/varicose.htm. (April 13, 2008).

"What Are Varicose Veins?" U.S. National Heart, Lung, and Blood Institute, National Institutes of Health. http://www.nhlbi.nih.gov/health/dci/Diseases/vv/vv_causes.html. (April 13, 2008).

Kathleen D. Wright
Rebecca J. Frey, PhD
Leslie Mertz, Ph.D.

Veganism

Definition

Veganism is a system of dietary and lifestyle practices that seeks to promote health and peace while reducing the suffering of both people and animals. Vegans (pronounced VEE-guns) are vegetarians who do not eat any foods derived from animal sources (e.g., eggs, dairy products, meat). Most vegans also do not use products that require the death or suffering of animals for their production, such as leather, fur, wool, down-filled garments and blankets, and certain cosmetics.

Origins

The word vegetarian was coined in England in 1847 by the founders of the Vegetarian Society of Great Britain. The word vegetarian has been used to describe people who do not eat meat, but do consume dairy products and eggs. The Vegan Society was founded in England in 1944 by Donald Watson and others who believed that vegetarians should strive to exist without eating or using any animal products at all. Watson stated that the crisis of World War II may have been a motivation behind his founding of the Vegan Society because he saw so much turmoil and suffering in the world around him. The Vegan founders believed that the first step to creating a better world is developing a diet that does not cause the death or suffering of any living beings. The term vegan is derived from the Latin word *vegetus*, which means

"full of life," which the founders hoped their system would be. Vegan also starts with the same three letters as vegetarian, and ends with the last two, as its founders believed they were starting with vegetarian ideas and taking them to their logical conclusion. The Vegan Society defines veganism as of 2007 as "a philosophy and way of living which seeks to exclude—as far as is possible and practical—all forms of exploitation of, and cruelty to, animals for food, clothing, or any other purpose." November 1, the anniversary of the foundation of the Vegan Society, is observed annually as World Vegan Day.

The American Vegan Society (AVS) was founded in 1960 by Jay Dinshah. The same year, the AVS began to publish a journal *Ahimsa*, which is a Sanskrit word that means "not causing harm" and "reverence for life." Dinshah and others conceived veganism to be a philosophy of living that has nonviolence, peace, harmony, honesty, service to the world, and knowledge as its goals. In 1974, the AVS became affiliated with the North American Vegetarian Society, which was formed to bring together all of the vegetarian groups in North America.

Since the 1970s, there has been a vast amount of research concerning **nutrition** and diet. It has been discovered that **diets** that emphasize meat and dairy products, such as the typical American diet, are high in **cholesterol** and saturated fat but low in fiber. These diets have been linked to many health problems, including **heart disease**, strokes, and diabetes, which together cause 68% of all the deaths in the United States. Thus, the interest in diets that reduce or eliminate foods that contribute to these conditions grew considerably.

The numbers of adult vegans in the United States and the United Kingdom vary somewhat depending on the particular population survey or poll. According to a 2002 poll conducted by *Time* magazine and CNN, 4 percent of American adults define themselves as vegetarians, and 5 percent of these vegetarians say that they are vegans, which comes to about 0.2 percent of the adult American population. Charles Stahler reported in an article in *Vegetarian Journal* in 2006, however, that a poll conducted by Harris Interactive indicated that vegans comprise about 1.3 percent of the adult population in the United States, or 2.4 million adults. He estimated that about half the vegetarians in Canada and the United States are vegans, which is considerably higher than the percentage given by *Time* in 2002. The American Dietetic Association (ADA) and the Dietitians of Canada (DC) accept Stahler's estimate that somewhere between 40 percent and 50 percent of vegetarians in North America are vegans. In the United Kingdom, the UK Food Standards Agency stated in 2002 that approximately 0.25 percent of British adults are vegans. *The Times* (London) reported in 2005, however, that there are at least 250,000 vegans in Britain, which represents about 0.4 percent of the adult population.

Benefits

The benefits of a vegan diet are similar to the health benefits of less strict vegetarian diets: lowered blood pressure, lower rates of cardiovascular disease and **stroke**, lower blood cholesterol levels, and lowered risks of colon and **prostate cancer** are associated with a vegan diet. Vegan diets are often recommended as dietary therapy for heart disease, high cholesterol, diabetes, strokes, **cancer**, **obesity**, arthritis, **allergies**, **asthma**, environmental illness, **hypertension**, **gout**, **gallstones**, **kidney stones**, ulcers, **colitis**, digestive disorders, **premenstrual syndrome**, **anxiety**, and **depression**. Most people lose weight on a vegan diet, especially in the first few months; moreover, weight loss is usually greater on a vegan diet than on a vegetarian diet that permits dairy products. In addition, most vegans have lower body mass indices (an important diagnostic criterion of obesity) than their meat-eating counterparts. Vegan diets also appear to lower the risk of developing type 2 (adult-onset) diabetes.

Description

Veganism can be better understood by considering the ethical, ecological, and health reasons that motivate vegans.

Ethical considerations

A vegan lifestyle seeks to promote awareness, compassion, and peace. Veganism is an ethical system as well as a diet. Ethics refers to rules of conduct or the moral ways in which people interact with others and the world. One poll in England showed that 83% of vegans listed ethical reasons as their main consideration in their practices. Vegans believe that health encompasses not only individuals' bodies, but also includes healthy relationships between people and their actions towards other living things, the earth, and the environment. Vegans believe that as long as animals are treated cruelly and are killed for meat, then the world's ethical and spiritual health will suffer. Vegans believe that people should become aware of how their food choices are creating suffering and affecting the health of the world as a whole. For instance, it has been estimated that the grain that goes to feed livestock in the United States could feed 1.3 billion people, which would relieve a large measure of the **pain** and suffering in the world.

Vegans claim that egg and dairy production may cause animals just as much suffering as killing them for meat because modern factory farming treats animals as unfeeling machines instead of as living beings. Eggs are produced by keeping chickens in small cages and in painful and unsanitary conditions. Vegans point out that dairy cattle are subjected to cruel treatment as well, being bred artificially and caged for much of their lives. Many dairy cattle are also injected with hormones that make them produce unnaturally high quantities of milk while weakening their immune systems and making them sick and unhealthy. Large amounts of antibiotics need to be used on weakened cows, which in turn affects the health of humans and creates diseases that are resistant to medicine. Dairy farming causes death to cows as well because undesirable or old cows are slaughtered for meat.

Other animal products are avoided by vegans as well. Leather, wool, down, and fur are not used because their production results in the suffering of animals. Some vegans do not use honey because they believe that the collection of honey is harmful to bees. Many vegans avoid using sugar because some sugar is made by using charcoal made from the bones of dead cattle. Vegans also do not use products that have been tested on animals, and many vegans are active in resisting the use of animals for dissection and medical experiments. Vegans are typically outspoken against hunting and the cruel treatment of animals in zoos or for entertainment (e.g., cockfighting, bullfighting, and rodeo).

Helping the Earth

Vegans believe that their dietary and lifestyle practices contribute to achieving a healthier world ecology. Vegans can cite many statistics that show that the American meat-centered diet is contributing to environmental problems. The main thrust of vegans' ecological position is that it takes many more resources to produce meat than it does to provide a grain-based diet, and people can be fed better with grain than with meat. For instance, it takes 10 lb (4.5 kg) of grain to make 1 lb (0.45 kg) of beef. On one acre of land, 20,000 lb (9,000 kg) of potatoes can be grown compared to 125 lb (57 kg) of beef during the same time. In the United States, livestock consumes six and a half times as much grain as the entire population. Different dietary habits applied in the United States could improve the whole world, vegans argue. Environmental problems caused by the inefficient production of livestock include topsoil loss, water shortages and contamination, deforestation, toxic waste, and air pollution.

Health considerations

People who eat vegetarian diets are at lower risk for many conditions, including heart disease, certain cancers, diabetes, obesity, high blood pressure, gallstones, and kidney stones. A vegan diet contains no cholesterol because cholesterol is found only in animal products. Diets high in cholesterol and saturated fat are responsible for heart disease. American men overall have a 50% risk of having a **heart attack**, whereas vegans have only a 4% risk. Vegans consume as much as four times the amount of fiber as the average person, and high fiber intake is believed to reduce the risk of heart disease, diabetes, cancer, and digestive tract problems. Vegan diets are also high in protective nutrients that are found in fruits and vegetables, such as **antioxidants**.

A vegan diet can also reduce exposure to chemicals that are found in meat and dairy products, such as pesticides and synthetic additives such as hormones. Chemicals tend to accumulate in the tissue of animals that are higher in the food chain, a process called bioaccumulation. By not eating animal products, vegans can avoid the exposure to these accumulated toxins, many of which are believed to influence the development of cancer. It is important, however, for vegans to eat organically produced vegetables and grains, as vegans who eat nonorganic food may get high doses of pesticides. One study showed that DDT, a cancer-causing pesticide, was present in significant levels in mother's milk for 99% of American women, but only 8% of vegetarian women had significant levels of the pesticide. The risks of women getting **breast cancer** and men contracting prostate cancer are nearly four times as high for frequent meat eaters as for those who eat meat sparingly or not at all. High consumption of dairy products has been linked to diabetes, **anemia**, **cataracts**, and other conditions.

Vegan diets may also be beneficial for those with allergic or autoimmune disorders such as asthma, allergies, and **rheumatoid arthritis**. Animal products cause allergic reactions in many people, and studies have shown that allergic responses and inflammation may be minimized by eliminating animal products from the diet. Furthermore, vegan diets are effective weight loss diets because the high levels of fiber and low levels of fat make it possible for dieters to eat until they are full and still take in lower calories than other diets.

Preparations

As with adoption of any vegetarian diet, people considering a vegan diet should consult a registered

dietitian as well as their primary physician before starting their new lifestyle. The reason for this precaution is the strictness of vegan regimens as well as the variations in height, weight, age, genetic inheritance, food preferences, level of activity, geographic location, and preexisting health problems among people. A nutritionist can also help design a diet that a vegan can enjoy eating and that can deliver adequate nourishment and other health benefits.

It is particularly important for pregnant or nursing women, or for families who wish to raise their children as vegans, to consult a dietitian as well as a pediatrician. There is some helpful and nutritionally sound information on the Vegetarian Resource Group Web site regarding meeting protein requirements during **pregnancy**, the protein needs of infants, and feeding vegan children.

Those considering veganism may wish to adopt the diet gradually to allow their bodies and lifestyles time to adjust to different eating habits. Some nutritionists have recommended transition diets to help people shift gradually from a meat-centered diet. Many Americans eat meat products at nearly every meal, and the first stage of a transition diet is to substitute just a few meals a week with wholly vegetarian foods. Then, particular meat products can be slowly reduced and eliminated from the diet and replaced with vegetarian foods. Red meat can be reduced and then eliminated, followed by poultry and fish. For vegans, the final step would be to substitute eggs and dairy products with other nutrient-rich foods. Individuals should be willing to experiment with transition diets and be patient when learning how combine veganism with such social activities as dining out.

Vegans should become informed on healthful dietary and nutrition practices as well. Sound nutritional guidelines include decreasing the intake of fat, increasing fiber, and emphasizing fresh fruits, vegetables, legumes, and whole grains in the diet while avoiding processed foods and sugar. Vegans can experiment with meat substitutes, foods that are high in protein and essential nutrients. Tofu and tempeh are soybean products that are high in protein, **calcium**, and other nutrients. There are veggie-burgers that can be grilled like hamburgers, and vegan substitutes for turkey and sausage with surprisingly realistic textures and taste. Furthermore, there are many vegan cookbooks available, as cooking without meat or dairy products can be challenging for some people.

Vegans should also become familiar with food labels and food additives because there are many additives derived from animal sources that are used in common foods and in such household items as soap. Vegans may also find social support at local health food stores or food cooperatives.

Precautions

The longstanding concern expressed by nutritionists and other health professionals about vegan diets is the risk of nutritional deficiencies, particularly for such important nutrients as protein, minerals (**iron**, calcium, and **zinc**), vitamins (**vitamin D**, **riboflavin**, **vitamin B_{12}**, and **vitamin A**), **iodine**, and n-3 fatty acids. The 2003 vegetarian food guide published by the ADA and DC recommends that vegans in all age groups take supplements of vitamin B_{12} and vitamin D, or use foods fortified with these nutrients. It is particularly important for pregnant women to maintain an adequate intake of vitamin B_{12}, as a lack of this vitamin can cause irreversible neurological damage in the fetus. In addition, some studies indicate that vegans are at increased risk of **osteoporosis** and bone **fractures** compared to either meat-eaters or less strict vegetarians because their average calcium intake is lower.

The ADA states that unsupplemented vegan diets do not provide vitamin B-12. Dairy products and eggs supply vitamin B-12; however, depending on food choices, some lacto-ovo-vegetarians may have inadequate intakes of these nutrients as well as vegans. The Institute of Medicine has recommended that all people over the age of 50, regardless of type of diet, take vitamin B-12 in the form found in supplements and fortified foods for optimal absorption. Vitamin B-12 is well-absorbed from fortified nondairy milks and from breakfast cereals, as well as from supplements. The symptoms of vitamin B_{12} deficiency include muscle twitching and irreversible nerve damage, weakness, numbness and tingling in the extremities, and a sore tongue.

Vitamin D supplements are recommended and may be particularly important for vegans living in northern latitudes or other situations in which they receive little sun because this vitamin is synthesized in the skin during exposure to sunlight. The ADA affirms that many breakfast cereals provide sufficient vitamin D.

In addition to nutritional concerns, there is some evidence that vegan diets may actually increase the risk of breast cancer in women, particularly in those who use large amounts of soy-based products. Soybeans contain phytoestrogens, or plant estrogens, which have been implicated in breast cancer. The plant estrogens in soy-based products may also

explain why committed vegans have a disproportionate number of female babies, and why these girls have a higher rate of precocious puberty than girls born to nonvegetarian mothers.

Vegans should be sure to get complete proteins in their diets. A complete protein contains all of the essential **amino acids**, which are essential because the body cannot make them. Meat and dairy products generally contain complete proteins, but most vegetarian foods such as grains and legumes contain incomplete proteins since they lack one or more of the essential amino acids. Vegans can easily obtain complete proteins by combining particular foods. For instance, beans are high in the amino acid **lysine** but low in tryptophan and **methionine**. Rice is low in lysine and high in tryptophan and methionine. Thus, a combination of rice and beans makes a complete protein. In general, combining legumes such as soy, lentils, beans, and peas with grains such as rice, wheat, or oats forms complete proteins. Nuts or peanut butter with grains such as whole wheat bread also forms complete proteins. Proteins do not necessarily need to be combined in the same meal, but should generally be combined over a period of a few days.

Riboflavin (vitamin B_2) is also generally found in high amounts in animal sources, so vegans should be aware of this fact and take a supplement if necessary. Vegetable sources of riboflavin include **brewer's yeast**, almonds, mushrooms, whole grains, soybeans, and green leafy vegetables.

Calcium can be obtained from enriched tofu, seeds, nuts, legumes, and dark green vegetables, including broccoli, kale, spinach, and collard greens. Iron is found in raisins, figs, legumes, tofu, whole grains (particularly whole wheat), potatoes, and dark green leafy vegetables, and by cooking with iron skillets. Iron is absorbed more efficiently by the body when iron-containing foods are eaten with foods that contain **vitamin C**, such as fruits, tomatoes, and green vegetables. Zinc is abundant in nuts, pumpkin seeds, legumes, whole grains, and tofu. Getting enough omega-3 **essential fatty acids** may be an issue for vegans. These are found in walnuts, canola oil, and such supplements as **flaxseed** oil. Vegans should consider purchasing organically grown food when possible to avoid exposure to pesticides and contribute to sound agricultural practices.

Research and general acceptance

Studies of the role of vegetarian diets of all types in preventing disease go back to the 1960s, when the National Institutes of Health (NIH) and the National Cancer Institute (NCI) began to study members of the Seventh-Day Adventist Church. Adventists, who advocate **vegetarianism** and general wellness, eat a diet that is low-fat and protein-rich. NIH findings indicate that Adventist men live on average seven years longer than men in the general population, and Adventist women eight years longer than their non-Adventist counterparts.

Studies of vegans as a subpopulation of vegetarians are fewer than those of less strict vegetarians; however, the emphasis in medical research shifted in the early 2000s from concern about nutritional deficiencies in people following these diets to the role of plant-based diets in preventing or treating chronic diseases. In this regard vegan diets and lifestyles appear to be beneficial. One 2005 study of 64 overweight postmenopausal women found that a vegan diet brought about a significant weight loss and improved insulin sensitivity (an important factor in

KEY TERMS

Bioaccumulation—The process in which toxic chemicals collect in the tissues of humans and other animals toward the top of the food chain.

Cholesterol—A steroid fat found in animal foods that is also produced in the body from saturated fat for several important functions. Excess cholesterol intake is linked to many diseases.

Complex carbohydrates—Carbohydrates that are broken down by the body into simple sugars for energy. They are found in grains, fruits, and vegetables. Complex carbohydrates are generally recommended by nutritionists over refined sugar and honey because they are a better source of energy and often contain fiber and nutrients as well.

Legume—A group of plant foods that includes beans, peas, and lentils. Legumes are high in protein, fiber, and other nutrients.

Organic food—Food grown without the use of synthetic pesticides and fertilizers.

Saturated fat—A fat that is usually solid at room temperature. Saturated fats are found mainly in meat and dairy products but also in such vegetable sources as some nuts, seeds, and avocados.

Unsaturated fat—A type of fat found in plant foods that is typically liquid at room temperature. Unsaturated fats can be monounsaturated or polyunsaturated, depending on their chemical structure. They are the most frequently recommended dietary fats.

evaluating the patient's risk of developing type 2 diabetes), despite the lack of prescribed limits on food portion size or calorie intake. Two studies published in 2004 comparing a group of overweight adults on a vegan diet with a control group following a National Cholesterol Education Program Step II Diet showed that the low-fat vegan diet was as acceptable to the subjects as the Step II diet and was equally effective in promoting weight loss. Those on the vegan diet, however, told the researchers that the vegan diet was harder to prepare than their normal meals.

In terms of general acceptance, vegan diets differ from less strict vegetarian regimens in being more difficult to follow and in causing more social friction with nonvegans. Some vegetarians who are not vegans have noted that evaluating foods, clothing, cosmetics, and other items as not containing animal products often requires considerable knowledge of production methods as well as the derivation of the ingredients. In addition, such items as vitamins, dietary supplements, and prescription medications may be processed using non-vegan ingredients (gelatin for capsules, glycerin in some liquid medications), and these are not always listed on the packaging. The complications of replacing animal-derived ingredients in some recipes and the difficulty of finding restaurants offering dishes acceptable to vegans also contribute to a widespread perception of veganism as a potentially problematic lifestyle.

Resources

BOOKS

Stuart, Tristan. *The Bloodless Revolution: A Cultural History of Vegetarianism from 1600 to Modern Times*. New York: Norton, 2006.

PERIODICALS

American Dietetic Association and Dietitians of Canada. "Position of the American Dietetic Association and Dietitians of Canada: Vegetarian Diets." *Canadian Journal of Dietetic Practice and Research* 64 (Summer 2003): 62 81.

Barnard, N. D., A. R. Scialli, G. Turner McGrievy, and A. J. Lanou. "Acceptability of a Low Fat Vegan Diet Compares Favorably to a Step II Diet in a Random ized, Controlled Trial." *Journal of Cardiopulmonary Rehabilitation* 24 (July/August 2004): 229 235.

Goff, L. M., J. D. Bell, P. W. So, et al. "Veganism and Its Relationship with Insulin Resistance and Intramyocel lular Liquid." *European Journal of Clinical Nutrition* 59 (February 2005): 291 298.

Key, T. J., P. N. Appleby, and M. S. Rosell. "Health Effects of Vegetarian and Vegan Diets." *Proceedings of the Nutrition Society* 65 (February 2006): 35 41.

Larsson, C. L., U. Ronnlund, G. Johansson, and L. Dahlg ren. "Veganism as Status Passage: The Process of Becoming a Vegan among Youths in Sweden." *Appetite* 41 (August 2003): 61 67.

Smith, A. M. "Veganism and Osteoporosis: A Review of the Literature." *International Journal of Nursing Practice* 12 (October 2006): 302 306.

Stahler, Charles. "How Many Adults Are Vegetarian?" *Vegetarian Journal* no. 4 (December 20, 2006). http://www.vrg.org/journal/vj2006issue4/vj2006issue4poll.htm (April 23, 2008).

Turner McGrievy, G. M., N. D. Barnard, A. R. Scialli, and A. J. Lanou. "Effects of a Low Fat Vegan Diet and a Step II diet on Macro and Micronutrient Intakes in Overweight Postmenopausal Women." *Nutrition* 20 (September 2004): 738 746.

ORGANIZATIONS

American Dietetic Association (ADA), 120 South Riverside Plaza, Suite 2000, Chicago, IL, 60606 6995, (800) 877 1600, http://www.eatright.org.

American Vegan Society (AVS), 56 Dinshah Lane, PO Box 369, Malaga, NJ, 08328, (856) 694 2887, http://www.americanvegan.org/index.htm.

Seventh Day Adventist Dietetic Association (SDADA). (SDADA is an official affiliate of the ADA.), 9355 Telfer Run, Orlando, FL, 32817, http://www. sdada.org.

Vegan Outreach, 211 Indian Drive, Pittsburgh, PA, 15238, (412) 968 0268, http://www.veganoutreach.org/.

Douglas Dupler
Helen Davidson

Vegetarianism

Definition

Vegetarianism refers to voluntary abstinence from eating meat. Vegetarians refrain from eating meat for various reasons, including religious, health, and ethical ones. Lacto-ovo vegetarians supplement their diet with dairy (lactose) products and eggs (ovo). Vegans (pronounced vee-guns) do not eat any animal-derived products at all.

Origins

The term vegetarian was coined in 1847, when the Vegetarian Society of the United Kingdom—the oldest organized vegetarian group in the world—was founded in Ramsgate, Kent. The Society, which has included George Bernard Shaw and Mahatma Gandhi among its members, chose the word *vegetarian* for its name because it is derived from the Latin *vegetus*, which means "lively" or "vigorous," and because it suggests the English word *vegetable*.

Vegetarian diet

Servings	Foods	Calcium-rich foods
Fats (2 servings)	1 tsp. oil, mayonnaise, soft margarine	
Fruits (2 servings)	1 med. piece of fruit ½ cooked or cut-up fruit ½ cup fruit juice ¼ cup dried fruit	½ cup fortified fruit juice
Vegetables (4 servings)	½ cup cooked vegetables 1 cup of raw vegetables ½ cup vegetable juice	1 cup cooked or 2 cups raw bok choy, broccoli, collards, Chinese cabbage, kale, mustard greens or okra ½ cup fortified tomato juice
Legumes, nuts, and other protein-rich foods (5 servings)	½ cup cooked beans, peas or lentils ½ cup tofu or tempeh 2 tbsp. nut or seed butter 1 egg	½ cup cow's milk or yogurt or fortified soy milk ¾ oz. cheese ½ cup tempeh or calcium-set tofu ½ cup cooked soybeans ¼ cup soynuts
Grains (6 servings)	1 slice bread ½ cup cooked grain or cereal 1 oz. ready to eat cereal	1 oz. calcium-fortified cereal

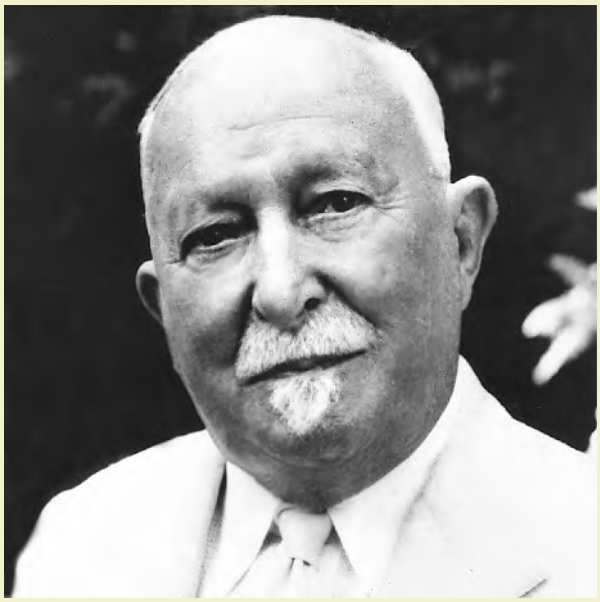
(Illustration by GGS Information Services. Cengage Learning, Gale)

Archaeological findings indicate that prehistoric humans were not vegetarians but obtained about a third of their daily calories from meat or other animal products. The structure of the human digestive tract suggests that humans evolved as omnivores (animals that feed on both plant and animal substances), as human intestines are relatively short in comparison with the lengthy intestines found in herbivores (plant-eating animals). Like the stomachs of other carnivores (meat-eating animals) and omnivores, the human stomach secretes pepsin, an enzyme necessary for digesting the proteins found in meat rather than plant matter. The human mouth contains pointed teeth (canines and incisors) adapted for tearing meat as well as teeth with flat crowns (molars) for chewing plant matter. In addition to the anatomical evidence, anthropologists have not discovered any primitive societies in the past or present whose members maintained good health and consumed a purely vegetarian diet. All contemporary indigenous groups that are healthy include fish or dairy products in their diet, and most eat meat, even if only in small amounts or on rare occasions.

Although early humans were omnivores, vegetarianism has been around as long as people have created **diets**. Some of the world's oldest cultures advocate a vegetarian diet for health and religious purposes. In India, millions of Hindus are vegetarians because of their religious beliefs. One of the ancient mythological works of Hinduism, the *Mahabharata*, states that, "Those who desire to possess good memory, beauty, long life with perfect health, and physical, moral and spiritual strength, should abstain from animal foods." The **yoga** system of living and health is vegetarian, because its dietary practices are based on the belief that healthy food contains *prana*. Prana is the universal life energy, which yoga experts believe is abundant in fresh fruits, grains, nuts and vegetables, but absent in meat because meat has been killed. Yogis also believe that spiritual health in influenced by the practice of *ahimsa*, or not harming living beings. The principle of *ahimsa* (non-violence) appears in the Upanishads (Vedic literature) from c. 600–300 B.C. The taking of animal life or human life under any circumstances is sinful and results in rebirth as a lower organism. It became a fundamental element of Jainism, another religion of India. Some Buddhists in Japan and China are also vegetarian because of spiritual beliefs. In the Christian tradition, the Trappist Monks of the Catholic Church are vegetarian, and some vegetarians argue that there is evidence that Jesus and his early followers were vegetarian. Other traditional cultures, such as those in the Middle East and the Mediterranean regions, have evolved diets that frequently consist of vegetarian foods. The **Mediterranean diet**, which a Harvard study declared to be one of the world's healthiest, is primarily, although not strictly, vegetarian.

The list of famous vegetarians forms an illustrious group. The ancient Greek philosophers, including Socrates, Plato, and Pythagoras, advocated vegetarianism. In modern times, the word to describe someone who likes to feast on food and wine is "epicure," but it is little known that Epicurus, the ancient philosopher, was himself a diligent vegetarian. Other famous

JOHN HARVEY KELLOGG (1852–1943)



(AP/Wide World Photos. Reproduced by permission.)

John Harvey Kellogg is known as the father of modern breakfast cereal. He was born in Tyrone Township, Michigan, on February 26, 1852, into a Seventh Day Adventist family. At age 12, he became an apprentice at the Review and Herald Press, a publishing company run by the church. He attended school in Battle Creek, Michigan. He attended Bellevue Hospital Medical College in New York where he received his medical degree in 1875. In 1876, at the age of 24, Kellogg became an abdominal surgeon and superintendent of the Western Health Reform Institute, which he renamed the Battle Creek Sanitarium. There, he began applying his theories about natural living to his medical practice. Himself a vegetarian, he first advocated a diet high in whole grains, fruits, nuts, and legumes. He later included all types of vegetables in the diet. His controversial health regimen included morning calisthenics, open air sleeping, cleansing enemas, chewing food hundreds of times before swallowing, and drinking plenty of water.

In the 1890s, Kellogg established a laboratory at the sanitarium to develop more nutritious foods. His brother, Will Keith Kellogg, joined in his research. In 1895 they developed a breakfast cereal of wheat flakes called Granose. The cereal quickly grew in popularity and was soon sold by mail order. This was followed by rice flakes and corn flakes. The brothers established the Sanitas Food Company. But philosophical differences led them to split into two companies. Will founded the W. K. Kellogg Company, which retained the rights to the cereal products. John set up the Battle Creek Food Company, which produced coffee substitutes and soymilk. John Kellogg also edited *Good Health Magazine*, which promoted vegetarianism, for 60 years. In 1904, he published a book, *The Miracle of Life*. He continued to promote his version of healthy living and radical techniques until his death in 1943.

vegetarians include Leonardo da Vinci, Sir Isaac Newton, Leo Tolstoy, Ralph Waldo Emerson, and Henry Thoreau. This century's celebrated vegetarians include Gandhi, the physician Albert Schweitzer, writer George Bernard Shaw, musician Paul McCartney, and champion triathlete Dave Scott. Albert Einstein, although not a strict vegetarian himself, stated that a vegetarian diet would be an evolutionary step for the human race.

Vegetarianism in America received a lot of interest during the last half of the nineteenth century and the beginning of the twentieth century, during periods of experimentation with diets and health practices. Vegetarianism has also been a religious practice for some Americans, including the Seventh-day Adventists, whose lacto-ovo vegetarian diets have been studied for their health benefits. Vegetarianism has been steadily gaining acceptance as an alternative to the meat-and-potatoes bias of the traditional American diet. In 1992, *Vegetarian Times* magazine performed a poll that showed that 13 million Americans, or 5% of the population, identified themselves as vegetarians.

Several factors contribute to the interest in vegetarianism in America. Outbreaks of **food poisoning** from meat products, as well as increased concern over the additives in meat such as hormones and antibiotics, have led some people and professionals to question meat's safety. There is also an increased awareness of the questionable treatment of farm animals in factory farming. But the growing health consciousness of Americans is a major reason for the surge in interest in vegetarianism. **Nutrition** experts have built up convincing evidence that there are major problems with the conventional American diet, which is centered around meat products that are high in **cholesterol** and saturated fat and low in fiber. **Heart disease**, **cancer**, and diabetes, which cause 68% of all deaths in America, are all believed to be influenced by this diet. Nutritionists have repeatedly shown in studies that a healthy diet consists of plenty of fresh

vegetables and fruits, complex carbohydrates such as whole grains, and foods that are high in fiber and low in cholesterol and saturated fat. Vegetarianism, a diet that fulfills all these criteria, has become part of many healthy lifestyles. In alternative medicine, vegetarianism is a cornerstone dietary therapy, used in **Ayurvedic medicine**, **detoxification** treatments, macrobiotics, the **Ornish diet** for heart disease, and in therapies for many chronic conditions.

Benefits

Vegetarianism is recommended as a dietary therapy for a variety of conditions, including heart disease, high cholesterol, type 2 diabetes, and **stroke**. Vegetarianism is a major dietary therapy in the alternative treatment of cancer. Other conditions treated with a dietary therapy of vegetarianism include **obesity**, **osteoporosis**, arthritis, **allergies**, **asthma**, environmental illness, **hypertension**, **gout**, **gallstones**, **hemorrhoids**, **kidney stones**, ulcers, **colitis**, **premenstrual syndrome**, **anxiety**, and **depression**. Vegetarians often report higher energy levels, better digestion, and mental clarity. Vegetarianism is an economical and easily implemented preventative practice as well.

The long-term NIH study of Seventh-day Adventists began to report in the 1970s and 1980s that lowered blood pressure, lower rates of cardiovascular disease and stroke, lower blood cholesterol levels, and lowered risks of colon and **prostate cancer** are associated with a vegetarian diet. In particular, SDAs were only half as likely to develop type 2 (adult-onset) diabetes as were nonvegetarian Caucasians. Although it is possible to gain weight on a vegetarian diet, most people lose weight, especially in the first few months; and most vegetarians have lower body mass indices (an important diagnostic criterion for obesity) than their meat-eating counterparts.

Several studies carried out in Germany and Austria reported in 2006 that vegetarian diets appear to be effective in lowering the risk of **rheumatoid arthritis**, osteoporosis, kidney disease, gallstones, **diverticulitis**, and **dementia** as well as heart attacks, stroke, and diabetes.

In addition to lowering the risk of chronic degenerative diseases, vegetarian diets have also been shown to be useful in treating **constipation** in adults and children, and **dysmenorrhea** (painful menstrual periods) in women of childbearing age.

Preparations

The ADA strongly recommends that people consult a registered dietitian as well as their primary physician before starting a vegetarian diet. The reason for this precaution is the variety of vegetarian regimens as well as the variations in height, weight, age, genetic inheritance, food preferences, level of activity, geographic location, and preexisting health problems among people. A nutritionist can also help design a diet that a new vegetarian will enjoy eating as well as getting adequate nourishment and other health benefits.

Some people, particularly those with such severe or chronic conditions as heart disease or cancer, may be advised by a health practitioner to become vegetarian suddenly. For most people, nutritionists recommend that a vegetarian diet be adopted gradually, to allow people's bodies and lifestyles time to adjust to new eating habits and food intake.

Some nutritionists have designed transition diets to help people become vegetarian in stages. Many Americans eat meat products at nearly every meal, and the first stage of a transition diet is to substitute just a few meals a week with wholly vegetarian foods. Then, particular meat products can be slowly reduced and eliminated from the diet and replaced with vegetarian foods. Red meat can be reduced and then eliminated, followed by pork, poultry, and fish. For those wishing to become strict vegetarians or vegans, the final step would be to substitute eggs and dairy products with other nutrient-rich foods. Individuals should be willing to experiment with transition diets, and should have patience when learning how to combine vegetarianism with such social activities as dining out. Fortunately, the number of restaurants that offer vegetarian dishes, or even all-vegetarian menus, is growing in the United States, particularly along the West Coast.

The transition to vegetarianism can be smoother for those who make informed choices with dietary practices. Sound nutritional guidelines include decreasing the intake of fat, increasing fiber, and emphasizing fresh fruits, vegetables, legumes, and whole grains in the diet while avoiding processed foods and sugar. Everyone can improve their health by becoming familiar with recommended dietary and nutritional practices, such as reading labels and understanding such basic nutritional concepts as daily requirements for calories, protein, fat, and nutrients. Would-be vegetarians can experiment with meat substitutes, foods that are high in protein and essential nutrients. Thanks to the growing interest in vegetarianism, many meat substitutes are now readily available. Tofu and tempeh are products made from soybeans that are high in protein, **calcium**, and other nutrients. There are "veggie-burgers" that can be grilled

like hamburgers, and vegetarian substitutes for turkey and sausage with surprisingly authentic textures and taste. There are many vegetarian cookbooks on the market as well.

A set of guidelines for North American vegetarian diets, updated for 2004, is available from the American Dietetic Association and the Dietitians of Canada. The new guidelines are intended to promote variety within vegetarian diets and to meet the needs of different stages in the life cycle as well as incorporate the most recent findings of medical research.

One objection that some people make to the practice of vegetarianism is the unpleasant taste or smell of many vegetables. A number of phytonutrients have a bitter, astringent, or acrid taste that they impart to products made from vegetables that contain them. Some experts think that people tend to reject such strong-smelling or bitter-tasting vegetables as turnips, cabbage, brussels sprouts, or broccoli because humans have been programmed in the course of evolution to associate bitter taste with poisonous plants. It is increasingly recognized that the major barrier to dietary change for the sake of health is taste. One recommendation for improving the taste appeal of vegetarian diets is more frequent use of spices. In addition to pleasing the human palate, spices derived from plants have been shown to have chemoprotective effects, boosting the immune system, reducing inflammation, and fighting harmful bacteria and viruses.

Precautions

In general, a well-planned vegetarian diet is healthful and safe; in the summer of 2003, a position paper endorsed by the American Dietetic Association and the Dietitians of Canada referred to vegetarian diets as "healthful, nutritionally adequate, and [able to] provide health benefits in the prevention and treatment of certain diseases." However, vegetarians, and particularly vegans who eat no animal products, should be aware of particular nutrients that may be lacking in non-animal diets. These are **amino acids**, **vitamin B_{12}**, **vitamin D**, calcium, **iron**, **zinc**, and **essential fatty acids**. Furthermore, pregnant women, growing children, and those with health conditions may have higher requirements for these nutrients.

Vegetarians should be aware of getting *complete protein* in their diets. A complete protein contains all of the essential amino acids, which are the building blocks for protein essential to the diet because the body cannot make them. Meat and dairy products generally contain complete proteins, but most vegetarian foods such as grains and legumes contain incomplete proteins, lacking one or more of the essential amino acids. However, vegetarians can easily overcome this by combining particular foods in order to create complete proteins. For instance, beans are high in the amino acid **lysine** but low in tryptophan and **methionine**, but rice is low in lysine and high in tryptophan and methionine. Thus, combining rice and beans makes a complete protein. In general, combining legumes such as soy, lentils, beans, and peas with grains like rice, wheat, or oats forms complete proteins. Eating dairy products or nuts with grains also makes proteins complete. Oatmeal with milk on it is complete, as is peanut butter on whole wheat bread. Proteins do not necessarily need to be combined in the same meal, but generally within four hours.

Getting enough vitamin B_{12} may be an issue for some vegetarians, particularly vegans, because meat and dairy products are the main sources of this vitamin. Vitamin supplements that contain vitamin B_{12} are recommended, particularly for older vegetarians. **Spirulina**, a nutritional supplement made from algae, is also a vegetarian source, as are fortified soy products and nutritional yeast.

Vitamin D can be obtained by vitamins, fortified foods, and sunshine. Calcium can be obtained in enriched tofu, seeds, nuts, legumes, dairy products, and dark green vegetables including broccoli, kale, spinach, and collard greens. Iron is found in raisins, figs, legumes, tofu, whole grains (particularly whole wheat), potatoes, and dark green leafy vegetables. Iron is absorbed more efficiently by the body when iron-containing foods are eaten with foods that contain **vitamin C**, such as fruits, tomatoes, and green vegetables. Zinc is abundant in nuts, pumpkin seeds, legumes, whole grains, and tofu. For vegetarians who don't eat fish, getting enough omega-3 essential fatty acids may be an issue, and supplements such as **flaxseed** oil should be considered, as well as eating walnuts and canola oil.

Vegetarians do not necessarily have healthier diets. Some studies have shown that some vegetarians consume large amounts of cholesterol and saturated fat. Eggs and dairy products contain cholesterol and saturated fat, while nuts, oils, and avocados are vegetable sources of saturated fat. To reap the full benefits of a vegetarian diet, vegetarians should be conscious of cholesterol and saturated fat intake. Vegetarians may also consider buying organic foods, which are grown without the use of synthetic chemicals, as another health precaution. Lastly, consuming large quantities of vegetables without other carbohydrates and sources of protein can produce its own kind of dietary imbalance. Cases have been reported of

carotenemia, which is a yellowish discoloration of the skin caused by high levels of carotene, a fat-soluble plant pigment turned into **vitamin A** in the liver. In one instance, the patient developed blood carotene levels nine times higher than normal values after putting himself on a diet that involved eating 2–3 pounds of vegetables every day. While carotenemia resulting from high vegetable intake has no known lasting consequences to health, it is still an indication of the importance of balance in vegetarian diets.

In addition to nutritional concerns, there is some evidence that vegetarian diets may actually increase the risk of **breast cancer** in women, particularly in those who use large amounts of soy-based products. Soybeans contain phytoestrogens, or plant estrogens, which have been implicated in breast cancer. The plant estrogens in soy-based products may also explain why vegetarians have a disproportionate number of female babies, and why these girls have a higher rate of precocious puberty than girls born to nonvegetarian mothers.

Research and general acceptance

Once considered an eccentricity, vegetarianism is widely accepted by the general public in developed countries as a legitimate dietary option in the early 2000s. The ADA and DC state that about 2.5 percent of adults (defined as people over 18 years of age) in the United States and 4 percent of Canadian adults follow vegetarian diets. The Vegetarian Resource Group (VRG), a nonprofit research organization, conducted a poll in 2006. It estimated that 2.3 percent of adults in the United States—4.7 million people—are vegetarians, with a third to a half of this group being vegans. In addition, the VRG notes that 30 to 40 percent of American adults choose vegetarian dishes over meat dishes at least some of the time. Other interesting details from the 2006 poll:

- People between 45 and 54 years of age are almost twice as likely to be vegetarians as people between 18 and 24 years of age.
- The Northeast has the highest percentage of vegetarians in the general population, with the South having the lowest.
- People who have graduated from college are twice as likely to be vegetarians as those who did not complete high school.
- Hispanics are more likely to be vegetarians than either Caucasians or African Americans.
- There is no correlation between household income and a vegetarian lifestyle as of the early 2000s; people at all income levels seem to be equally likely to become vegetarians.

A vegetarian diet has many well-documented health benefits. It has been shown that vegetarians have a higher life expectancy, as much as several years, than those who eat a meat-centered diet. The U.S. Food and Drug Administration (FDA) has stated that data have shown vegetarians to have a strong or significant probability against contracting obesity, heart disease, **lung cancer**, colon cancer, **alcoholism**, hypertension, diabetes, gallstones, gout, kidney stones, and ulcers. However, the FDA also points out that vegetarians tend to have healthy lifestyle habits, so other factors may contribute to their increased health besides diet alone.

Vegetarianism has been associated for many decades with abstinence from other habit-forming substances, including alcohol and tobacco. There is evidence, however, that this long-standing connection between vegetarianism and other health-conscious practices is breaking down. A recent study of Scandinavian teenage vegetarians found that there was no difference between their lifestyles and those of meat-eating peers with regard to **smoking**, alcohol consumption, **exercise**, or weight. Partly because of this trend, physicians in family practice as well as those in sports medicine are increasingly recommending nutritional counseling for vegetarian teens.

A vegetarian diet, as prescribed by Dr. Dean Ornish, has been shown to improve heart disease and reverse the effects of **atherosclerosis**, or hardening of the arteries. It should be noted that Dr. Ornish's diet was used in conjunction with exercise, **stress** reduction, and other holistic methods. The Ornish diet is lacto-ovo vegetarian, because it allows the use of egg whites and non-fat dairy products.

Vegetarians have a resource of statistics in their favor when it comes to presenting persuasive arguments in favor of their eating habits. Vegetarians claim that a vegetarian diet is a major step in improving the health of citizens and the environment. Americans eat over 200 lbs (91 kg) of meat per person per year. The incidence of heart disease, cancer, diabetes, and other diseases has increased along with a dramatic increase in meat consumption during the past century. Many statistics show significantly smaller risks for vegetarians contracting certain conditions. The risks of women getting breast cancer and men contracting prostrate cancer are nearly four times as high for frequent meat eaters as for those who eat meat sparingly or not at all. For heart attacks, American men have a 50% risk of having one, but the risk drops down to 15% for lacto-ovo vegetarians and to only 4% for vegans. For cancer, studies of populations

around the world have implied that plant-based diets have lower associated risks for certain types of cancer.

Vegetarians claim other reasons for adopting a meat-free diet. One major concern is the amount of pesticides and synthetic additives such as hormones that show up in meat products. Chemicals tend to accumulate in the tissue of animals that are higher in the food chain, a process called *bioaccumulation*. Vegetarians, by not eating meat, can avoid the exposure to these accumulated toxins, many of which are known to influence the development of cancer. One study showed that DDT, a cancer-causing pesticide, was present in significant levels in mother's milk for 99% of American women, but only 8% of vegetarian women had significant levels of the pesticide. Women who eat meat had 35 times higher levels of particular pesticides than vegetarian women. The synthetic hormones and antibiotics added to American cattle has led some European countries to ban American beef altogether. The widespread use of antibiotics in livestock has made many infectious agents more resistant to them, making some diseases harder to treat.

Vegetarians resort to ethical and environmental arguments as well when supporting their food choices. Much of U.S. agriculture is dedicated to producing meat, which is an expensive and resource-depleting practice. It has been estimated that 1.3 billion people could be fed with the grain that America uses to feed livestock, and starvation is a major problem in world health. Producing meat places a heavy burden on natural resources, as compared to growing grain and vegetables. One acre of land can grow approximately 40,000 lbs (18,000 kg) of potatoes or 250 lbs (113 kg) of beef, and it takes 50,000 gal (200,000 l) of water to produce 1 lb (0.45 kg) of California beef but only 25 gal (100 l) of water to produce 1 lb (0.45 kg) of wheat. Half of all water used in America is for livestock production. Vegetarians argue that the American consumption of beef may also be contributing to global warming, by the large amounts of fossil fuels used in its production. The South American rainforest is being cleared to support American's beef consumption, as the United States yearly imports 300 million lbs (136 million kg) of meat from Central and South America. The production of meat has been estimated as causing up to 85% of the loss of topsoil of America's farmlands. A German researcher in the field of nutrition ecology has summarized the environmental benefits of vegetarian diets: "Research shows that vegetarian diets are well suited to protect the environment, to reduce pollution, and to minimize global climate changes."

Most opposition to vegetarianism in developed countries is interpersonal rather than scientific or political, as some vegetarians develop a sense of moral or spiritual superiority to nonvegetarians and make themselves socially unpopular by criticizing or lecturing others for continuing to eat meat. NAVS advises new vegetarians, "Be cheerful about your choices [but] remember to let people come to their own dietary conclusions."

One area of concern about vegetarianism is in veterinary medicine—namely, the trend among some pet owners to put dogs and cats on vegetarian diets, often with homemade foods. Cats in particular are at risk of malnutrition and eventual blindness on a vegetarian or vegan diet because they are obligate carnivores (must have meat in the diet). Their bodies cannot form taurine (an amino acid), **thiamine**, retinol (a form of vitamin A essential to healthy eye tissue),

KEY TERMS

Cholesterol—A steroid fat found in animal foods that is also produced in the body from saturated fat for several important functions. Excess cholesterol intake is linked to many diseases.

Complex carbohydrates—Complex carbohydrates are broken down by the body into simple sugars for energy, are found in grains, fruits and vegetables. They are generally recommended in the diet over refined sugar and honey, because they are a more steady source of energy and often contain fiber and nutrients as well.

Legume—Group of plant foods including beans, peas, and lentils, which are high in protein, fiber, and other nutrients.

Organic food—Food grown without the use of synthetic pesticides and fertilizers.

Saturated fat—Fat that is usually solid at room temperature, found mainly in meat and dairy products but also in vegetable sources such as some nuts, seeds, and avocados.

Tempeh—A fermented cake of soybeans and other grains; it is a staple food in Indonesia.

Tofu—A soft cheeselike food made from curdled soybean milk.

Unsaturated fat—Fat found in plant foods that is typically liquid (oil) at room temperature. They can be monounsaturated or polyunsaturated, depending on the chemical structure. Unsaturated fats are the most recommended dietary fats.

Vegan—A vegetarian who omits all animal products from the diet.

and vitamin B_{12}—all micronutrients found primarily in meat. The Vegetarian Society (UK) has an information sheet warning against putting cats on a vegetarian diet, while the American Veterinary Medical Association (AVMA) strongly urges vegetarian pet owners to consult their veterinarian before offering either dogs or cats vegetarian pet food.

Resources

BOOKS

Akers, Keith. *A Vegetarian Sourcebook*. New York: Put nam, 1993.

Null, Gary. *The Vegetarian Handbook*. New York: St. Martins, 1987.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Part I: Food for Thought. New York: Simon & Schus ter, 2002.

Stuart, Tristan. *The Bloodless Revolution: A Cultural History of Vegetarianism from 1600 to Modern Times*. New York: W. W. Norton & Co., 2006.

PERIODICALS

American Dietetic Association; Dietitians of Canada. "Position of the American Dietetic Association and Dietitians of Canada: Vegetarian Diets." *Canadian Journal of Dietetic Practice and Research* 64 (Summer 2003): 62 81.

Berger, Joanne M. "Curiously Yellow." *Family Practice News* 32 (September 1, 2002): 47.

Fornell Barratt, Anne, and Adam Drewnowski. "The Taste of Health: Nature's Bitter Gifts." *Nutrition Today* 37 (July August 2002): 144 150.

Greydanus, D. E., and D. R. Patel. "Sports Doping in the Adolescent Athlete: The Hope, Hype, and Hyperbole." *Pediatric Clinics of North America* 49 (August 2002): 829 855.

Jenkins, D. J., C. W. Kendall, A. Marchie, et al. "Type 2 Diabetes and the Vegetarian Diet." *American Journal of Clinical Nutrition* 78 (September 2003) (3 Suppl): 610S 616S.

Key, T. J., P. N. Appleby, and M. S. Rosell. "Health Effects of Vegetarian and Vegan Diets." *Proceedings of the Nutrition Society* 65 (February 2006): 35 41.

Kwok, E., G. Cheng, J. Woo, et al. "Independent Effect of Vitamin B_{12} Deficiency on Hematological Status in Older Chinese Vegetarian Women." *American Journal of Hematology* 70 (July 2002): 186 190.

Lampe, J. W. "Spicing Up a Vegetarian Diet: Chemopre ventive Effects of Phytochemicals." *American Journal of Clinical Nutrition* 78 (September 2003) (Suppl 3): 579S 583S.

Larsson, C. L., K. S. Klock, A. Nordrehaug Astrom, et al. "Lifestyle Related Characteristics of Young Low Meat Consumers and Omnivores in Sweden and Norway." *Journal of Adolescent Health* 31 (August 2002): 190 198.

Leitzmann, C. "Nutrition Ecology: The Contribution of Vegetarian Diets." *American Journal of Clinical Nutri tion* 78 (September 2003) (Suppl 3): 657S 659S.

Messina, V., V. Melina, and A. R. Mangels. "A New Food Guide for North American Vegetarians." *Canadian Journal of Dietetic Practice and Research* 64 (Summer 2003): 82 86.

OTHER

Vegetarian Journal. Vegetarian Resource Group (VRG). PO Box 1463, Baltimore, MD 21203.

Vegetarian Times. 4 High Ridge Park, Stamford, CT 06905. (877) 321 1796.

Vegetarian Nutrition and Health Letter. 1707 Nichol Hall, Loma Linda, CA 92350. (888) 558 8703.

ORGANIZATIONS

American Dietetic Association, 216 West Jackson Blvd., Chicago, IL, 60606, (312) 899 0040, http://www. eatright.org.

Dietitians of Canada/Les diététistes du Canada, 480 Uni versity Avenue, Suite 604, TorontoON, M5G IV2, (416) 596 0857, http://www.dietitians.ca/.

North American Vegetarian Society (NAVS), PO Box 72, Dolgeville, NY, 13329, (518) 568 7970

Douglas Dupler
Rebecca J. Frey, PhD
Helen Davidson

Venom immunotherapy

Definition

Venom immunotherapy is the process of injecting venom to treat various conditions. The most common form of venom immunization is bee venom therapy (BVT), with honeybee venom or stingers used to treat conditions. BVT is one form of **apitherapy**, which is the therapeutic use of products made by honeybees. Other products used in apitherapy include **bee pollen** and **royal jelly**.

Origins

Apitherapy is thousands of years old. In ancient Egypt, venom from bee **stings** was used to treat arthritis. Hippocrates, the Greek physician known as the "father of medicine," used bee stings for treatments several centuries before the birth of Christ. Descriptions of apitherapy are found in 2,000-year-old Chinese writings, the Bible, and the Koran.

Bee venom therapy has remained part of folk medicine throughout the centuries. The modern study of apitherapy is said to have started in 1888, with Austrian physician Phillip Terc's research titled "Report about a Peculiar Connection between the Beestings and Rheumatism."

KEY TERMS

Anaphylaxis—An allergic hypersensitivity reaction to such allergens as bee stings. Anaphylaxis can result in shock, difficulty in breathing, and even death.

Apitherapy—A form of alternative therapy based on the use of honey and other bee products.

Benefits

Although a bee sting is painful for most people, the sting can be fatal to some. Approximately 15% of the population is allergic to the sting of such insects as bees and wasps. Allergic reactions range from mild to life-threatening.

In mainstream allopathic medicine, honeybee venom is used to treat people who are allergic to bee stings. A small amount of venom is injected during desensitization treatments to help patients develop a tolerance to stings.

Honeybee venom immunotherapy is used to treat many other conditions in alternative medicine. BVT is regarded as an effective treatment for arthritis, **multiple sclerosis** (MS), acute and chronic injuries, migraine headaches, **gout**, acute **sore throat**, **psoriasis**, **irritable bowel syndrome**, Bell's palsy, **depression**, **AIDS**, scar tissue, and **asthma**.

Bee venom is also said to relieve **premenstrual syndrome** (PMS) and conditions related to **menopause**. However, BVT is most commonly used as an anti-inflammatory remedy for arthritis and MS. Advocates maintain that it will provide relief for **rheumatoid arthritis** when injected into the joints. Bee venom is also used to lessen the **pain** and swelling of **osteoarthritis** as well as such inflammations and injuries as **tendinitis** and **bursitis**. Furthermore, people diagnosed with MS say that BVT significantly reduces symptoms that include **muscle spasms** and tiredness.

Description

Bee venom therapy involves the injection of venom by a needle, insertion of the stinger, or stinging by live bees. While a licensed physician must give injections, other treatments can be done by a bee venom therapist, a beekeeper, the patient, or a friend or relative.

The cost and length of treatment depends on the condition, as well as when and where a person is treated. If a physician provides the treatment, the doctor's appointment may be covered by health insurance. Rates for other therapies are set by beekeepers and bee venom therapists. Information about these providers can be found through organizations such as the American Apitherapy Society. The society's resources include an extensive web site with information about BVT. Apitherapy resources include books and videos about home treatment. Live bees can be ordered by mail; one business in June 2000 charged $50 for four boxes, each containing about 60 bees.

When live bees are utilized, tweezers are used to remove one bee from a container such as a box, jar, or hive. The bee is held over the area to be treated until it stings the patient. The stinger is removed after three to five minutes.

Patients receive an average of two to five stings per session. The number of stings and the number of sessions varies with the condition treated. Tendinitis might require two to three stings per session for two to five sessions. Arthritis is sometimes treated with several stings per session at two to three weekly sessions. MS may take months to treat. While BVT advocates say MS patients are more energetic after several sessions, they maintain that treatment should be done two to three times weekly for six months.

Preparations

Before beginning venom immunotherapy, a person should be tested for **allergies**. If a relative or friend plans to help with the therapy, that person should be tested, too. Bee venom may cause a severe allergic reaction called anaphylaxis. The symptoms of anaphylaxis include shock, respiratory distress, and in some cases, death. Even if tests indicate that a person isn't allergic to bee stings, it is important to obtain an emergency bee-sting allergy kit before beginning treatment.

Precautions

People should check with their doctor or practitioner before beginning bee venom immunotherapy. The therapy is not recommended for pregnant women, diabetics, people with heart conditions, **tuberculosis**, or **infections**.

An allergy test is a must before starting bee venom therapy. A person who is allergic to bee stings should not start venom treatment. In some cases, scarring and infections have resulted when the stinger was left in too long.

Side effects

If a person undergoing bee venom therapy has an allergic reaction, emergency treatment should be started.

Such symptoms as minor **itching** and swelling, however, are not causes for alarm. They are signs of the healing process.

Research and general acceptance

During the late 1990s, researchers in countries including the United States, France, and Russia began researching the effect of bee venom immunotherapy on humans. Before that, research with such animals as mice indicated that venom could be beneficial for treating inflammatory conditions.

Anecdotal reports by people with MS indicated that venom immunotherapy is effective. Those supporting the study of this therapy include the Multiple Sclerosis Association of America and the American Apitherapy Society. As of 2008, it remains to be seen whether bee venom immunotherapy is effective.

Training and certification

Although a doctor can administer bee venom therapy, no specific training or certification is required to perform the therapy. Training in handling bees is recommended. Organizations such as the American Apitherapy Society can provide information about training and therapy providers.

Resources

BOOKS

The Editors of Time Life Books. *The Alternative Advisor*. Alexandria, VA: Time Life Books, 1997.

Gottlieb, Bill. *New Choices in Natural Healing*. Emmaus, PA: Rodale Press, Inc., 1995.

Rosenfeld, Isadore. *Dr. Rosenfeld's Guide to Alternative Medicine*. New York: Random House, 1996.

ORGANIZATIONS

American Apitherapy Society (AAS). 5370 Carmel Road. Hillsboro, OH 45133. (937) 466 9214. Fax: (937) 466 9215. http://www.beesting.com

Arthritis Foundation. 1330 W. Peachtree St. Atlanta, GA 30309. http://www.arthritis.org.

Multiple Sclerosis Association of America. 706 Haddonfield Road. Cherry Hill, NJ 08002. (800) 833 4672.

Liz Swain

Vertigo *see* **Dizziness**

Vision disorders *see* **Hyperopia; Macular degeneration; Myopia; Night blindness; Retinal detachment**

Vision therapy *see* **Bates method**

Visualization *see* **Guided imagery**

Vitamin A

Description

Vitamin A is one of four fat-soluble vitamins necessary for good health. It serves an important role as an antioxidant by helping to prevent free radicals from causing cellular damage. Adequate levels are important for good eyesight, and poor night vision may be one of the first symptoms of a deficiency. It is also necessary for proper function of the immune, skeletal, respiratory, reproductive, and integumentary (skin) systems.

General use

An adequate level of vitamin A unquestionably contributes to good health. It is essential for the proper function of the retina, where it can act to prevent **night blindness**, as well as lower the odds of getting age-related **macular degeneration** (AMD), which is the most common cause of blindness in the elderly. There is also evidence that good levels of vitamin A in the form of **carotenoids** may decrease the risk of certain cancers, heart attacks, and strokes. The immune system is also strengthened. It is unclear, however, if supplemental forms of vitamin A have the same benefit as consuming the nutrient in natural foods in the case of a person without deficiency. Taking high levels of vitamin A in any supplemental form is not advisable without the counsel of a healthcare professional.

Preparations

Natural sources

There are two basic forms of vitamin A. Retinoids, the active types, are contained in animal sources, including meat, whole milk, and eggs. Liver is particularly rich in vitamin A, since it is one of the storage sites for excess. Precursor forms of the vitamin (carotenoids) are found in orange and leafy green produce such as sweet potatoes, carrots, collard greens, spinach, winter squash, kale, and turnip greens. Very fresh foods have the highest levels, followed by frozen foods. Typically, canned produce has little vitamin A. Preparing vegetables by steaming, baking, or grilling helps them to release the carotenes they contain. Alpha and **beta carotene**, as well as some of the other lesser-known carotenoids, can be converted to vitamin A in the small intestine. This is done by the body on an as-needed basis, so there is no risk of overdose as there is with the active form.

Recommended dietary allowance of vitamin A

Age	IU/day	RAE/day
Children 0-6 mos.	1,330 IU	400 RAE
Children 7-12 mos.	1,670 IU	500 RAE
Children 1-3 yrs.	1,000 IU	300 RAE
Children 4-8 yrs.	1,330 IU	400 RAE
Children 9-13 yrs.	2,000 IU	600 RAE
Boys 14-18 yrs.	3,000 IU	900 RAE
Girls 14-18 yrs.	2,310 IU	700 RAE
Men ≥ 19 yrs.	3,000 IU	900 RAE
Women ≥ 19 yrs.	2,310 IU	700 RAE
Pregnant women ≥ 19 yrs.	2,500 IU	750 RAE
Breastfeeding women ≥ 19 yrs.	4,300 IU	1,300 RAE

Foods that contain vitamin A (retinol)	IU
Beef liver, cooked, 3 oz.	27,185 IU
Chicken liver, cooked, 3 oz.	12,325 IU
Skim milk, vitamin A fortified, 1 cup	500 IU
Butter, 1 tbsp.	325 IU
Egg, 1 whole	300 IU
Whole milk cheddar cheese, 1 oz.	280 IU
Whole milk, 1 cup	250 IU

Foods that contain vitamin A (provitamin A corotenoid)	IU
Spinach, cooked, 1/2 cup	11,460 IU
Kale, cooked, 1/2 cup	9,560 IU
Carrot, raw, unpeeled, 1 whole (7.5")	8,670 IU
Cantaloupe, 1 cup	5,410 IU
Spinach, raw, 1 cup	2,800 IU
Papaya, 1 cup	1,530 IU
Carrot, raw, peeled, sliced, 1/2 cup	1,285 IU
Mango, 1 cup	1,260 IU
Tomato juice, 6 oz.	820 IU
Cereal, vitamin A fortified, 1 serving	500-700 IU

AI = Adequate Intake
IU = International Unit
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

Supplemental sources

Supplements may contain either the active or precursor forms of vitamin A. The active form may be more desirable for those who may have some difficulty in converting the carotenoids into the active vitamin. This is more often true in those over age 55 or who have a condition that impairs the absorption of fat. There is a water-soluble form of the vitamin, retinyl palmitate, which may be better utilized in the latter case. Carotenes are also available either as oil-based or natural water-based formulas. Be sure to store both away from light and heat, which will destroy them.

Units

There are several units that can express the amount of vitamin A activity in a product. Many supplements are still labeled with the old International Unit (IU), although the more current and most accurate unit is the Retinol Equivalent (RE). The new measurement distinguishes between the differences in absorption of retinol and beta carotene. One RE is equal to one microgram (µg) of retinol, or six µg of beta carotene.

Dose limits

Adults should take no more than 25,000 IU (5,000 RE) per day of vitamin A in its active form, except in the case of women who are pregnant or may become pregnant. The latter group should not exceed 10,000 IU (2,000 RE) per day in order to avoid potential toxic effects to the fetus. The best way to get vitamins is in the natural food form, as the complexities are not always either known or reproducible in a supplement. A diet rich in foods containing carotenoids is optimal, but in the event of nutritional deficiencies, supplements may be needed. Mixed carotenoids are preferable to either large doses of vitamin A or pure beta carotene supplements to avoid toxicity and maximize healthful benefits. Some of the minor carotenoids appear to have beneficial effects that are still being explored. A good mixture will contain alpha and beta carotene, as well as **lycopene** and xanthophylls. Eating foods high in many carotenoids may confer some benefits—such as a lower risk of **cancer**, heart attacks, and strokes—which a supplement may not.

Deficiency

Levels of vitamin A low enough to cause symptomatic deficiency are uncommon in people of normal health in industrialized nations. Symptoms of deficiency may include, but are not limited to, loss of appetite, poor immune function causing frequent **infections** (especially respiratory), **hair loss**, **rashes**, dry skin and eyes, visual difficulties including night blindness, poor growth, and **fatigue**. Generally symptoms are not manifested unless the deficiency has existed for a period of months. Deficiencies are more likely in people who are malnourished, including alcoholics, the chronically ill, and those with impaired fat absorption. Another group at increased risk of vitamin A deficiency are persons with type 1 diabetes whose disease is poorly controlled. People with normal

KEY TERMS

Antioxidant—Any substance, such as vitamin A, that blocks the destructive action of free radicals.

Carotenoids—Any of a group of over 600 orange or red substances which are found primarily in vegetables, many of which are vitamin A precursors.

Free radical—Highly reactive atoms that are very reactive as a result of having one or more unpaired electrons. They form through exposure to smoke and other environmental pollutants, as well as radiation and other sources. They have great potential to cause cellular damage, and may even be a factor in aging.

Retinoids—Any of the group of substances which comprise active vitamin A, including retinaldehyde, retinol, and retinoic acid.

health and nutritional status have a considerable vitamin A reserve.

In countries where nutritional status tends to be poor and deficiency is more common, vitamin A has been found to reduce the mortality rate of children suffering from a number of different viral infections.

Experts in plant genetics have been working on a strain of rice that contains beta carotene, hoping to help people in developing countries avoid the risk of vitamin A deficiency. Known as Golden Rice, the new strain is being sent to research institutes in developing countries for further study.

Risk factors for deficiency

Taking the RDA level of a nutrient will prevent a deficiency in most people, but under certain circumstances, an individual may require higher doses of vitamin A. Those who consume alcoholic beverages may be more prone to vitamin A deficiency. People taking some medications, including birth control pills, methotrexate, cholestyramine, colestipol, and drugs that act to sequester bile will also need larger amounts. Those who are malnourished, chronically ill, or recovering from surgery or other injuries may also benefit from a higher than average dose. Patients undergoing treatments for cancer, including radiation and chemotherapy, typically have compromised immune systems that may be boosted by judicious supplementation with vitamin A. Other conditions that may impair vitamin A balance include chronic **diarrhea**, cystic fibrosis, and kidney or liver disease. Diabetics are often deficient in vitamin A, but may also be more susceptible to toxicity. Any supplementation for these conditions should be discussed with a healthcare provider. Supplements are best taken in the form of carotenoids to avoid any potential for toxicity. There is not an established RDA for beta carotene. Recommendations for how much to take vary between 6 and 30 mg a day, but the middle range—around 15 mg—is a reasonable average.

Precautions

Overdose can occur when taking megadoses of the active form of this vitamin. Amounts above what is being utilized by the body accumulate in the liver and fatty tissues. Symptoms may include dry lips and skin, bone and joint **pain**, liver and spleen enlargement, diarrhea, **vomiting**, headaches, blurry or double vision, confusion, irritability, fatigue, and bulging fontanel (soft spot on the head) in infants; these are most often reversible, but a doctor should be contacted if a known overdose occurs. Very high levels of vitamin A may also create deficiencies of vitamins C, E, and K. Symptoms will generally appear within six hours following an acute overdose, and take a few weeks to resolve after ceasing the supplement. Children are more sensitive to high levels of vitamin A than adults are, so instructions on products designed for children should be followed with particular care. Vitamin supplements should always be kept out of reach of children.

It is especially important to avoid overdoses of vitamin A during **pregnancy**, as it may cause miscarriage or fetal malformations. Using supplements that provide carotenoids will avoid the potential of overdose. Those with kidney disease are also at higher risk for toxicity due to either vitamin A or beta carotene, and should not take these supplements without professional healthcare advice.

There is some evidence that taking beta carotene supplements puts smokers at a higher risk of lung cancers. The CARET (Beta Carotene and Retinol Efficacy Trial) study is one that demonstrated this effect. Clarification through more study is needed, as evidence also exists showing that beta carotene, along with other **antioxidants**, can be a factor in cancer prevention. For example, a team of American researchers has recently reviewed evidence that vitamin A protects against **bladder cancer**, and a group in Germany is testing an aerosol form of vitamin A to prevent **lung cancer**. Some of the lesser-known carotenoids may be key factors in the relationship between vitamin intake and cancer. Whole sources of vitamin A are better obtained from foods than from supplements. Smokers

should consult with a healthcare provider before taking supplemental beta carotene.

Side effects

Very high levels of carotenoids (carotenemia) may cause an orange discoloration of the skin, which is harmless and transient.

Interactions

Vitamin A supplements should not be taken in conjunction with any retinoid medications, including isotretinoin (Accutane), a drug used to treat **acne**. There is a higher risk of toxicity.

A very low fat diet or use of fat substitutes impairs absorption of all the fat-soluble vitamins, including A. Mineral oil and aluminum-containing antacids may also inhibit absorption, as do the cholesterol-lowering drugs cholestyramine and colestipol. Vitamin A reserves of the body are depleted by a number of substances, including alcohol, barbiturates, **caffeine**, cortisone, tobacco, and very high levels of **vitamin E**. Overuse of alcohol and vitamin A together may increase the possibility of liver damage.

Taking appropriate doses of **vitamin C**, vitamin E, **zinc**, and **selenium** optimizes absorption and use of vitamin A and carotenoids. As vitamin A is fat-soluble, a small amount of dietary fat is also helpful.

Studies of both children and pregnant women with **iron** deficiency **anemia** show that this condition is better treated with a combination of iron supplements and vitamin A than with iron alone.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehensive Database*. Therapeutic Research Faculty, 1999.

PERIODICALS

Baena, R. M., C. Campoy, R. Bayes, et al. "Vitamin A, Retinol Binding Protein and Lipids in Type 1 Diabetes Mellitus." *European Journal of Clinical Nutrition* 56 (January 2002): 44 50.

Beyer, P., S. Al Babili, X. Ye, et al. "Golden Rice: Introducing the Beta Carotene Biosynthesis Pathway Into Rice Endosperm by Genetic Engineering to Defeat Vitamin A Deficiency." *Journal of Nutrition* 132 (March 2002): 506S 510S.

Kamat, A. M., and D. L. Lamm. "Chemoprevention of Bladder Cancer." *Urology Clinics of North America* 29 (February 2002): 157 168.

Kohlhaufl, M., K. Haussinger, F. Stanzel, et al. "Inhalation of Aerosolized Vitamin A: Reversibility of Metaplasia and Dysplasia of Human Respiratory Epithelia A Prospective Pilot Study." *European Journal of Medical Research* 7 (February 21, 2002): 72 78.

Miksad, R., V. de Ledinghen, C. McDougall, et al. "Hepatic Hydrothorax Associated with Vitamin A Toxicity." *Journal of Clinical Gastroenterology* 34 (March 2002): 275 279.

Van den Berg, H., M. van der Gaag, and H. Hendriks. "Influence of Lifestyle on Vitamin Bioavailability." *International Journal of Vitamin and Nutrition Research* 72 (January 2002): 53 59.

Yeum, K. J., and R. M. Russell. "Carotenoid Bioavailability and Bioconversion." *Annual Review of Nutrition* 22 (2002): 483 504.

Judith Turner
Rebecca J. Frey, PhD

Vitamin B_1 *see* **Thiamine**

Vitamin B_{12}

Description

Cobalamin, also known as B_{12}, is a member of the water-soluble family of B vitamins. It is a key factor in the body's proper use of **iron** and formation of red blood cells. The nervous system also relies on an adequate supply of cobalamin to function appropriately, as it is an essential component in the creation and maintenance of the myelin sheath that lines nerve cells. Other roles of cobalamin include working with **pyridoxine** (vitamin B_6) and **folic acid** to reduce harmful homocysteine levels, participating in the metabolization of food, and keeping the immune system operating smoothly.

General use

Very small amounts of cobalamin are needed to maintain good health. The RDA value is 0.3 micrograms (mcg) for infants under 6 months, 0.5 mcg for those 6 months to 1 year old, 0.7 mcg for children 1-3 years old, 1.0 mcg for children 4-6 years old, 1.4 mcg for children 7-10 years old, and (2.0 mcg) for those 11 years of age and older. Requirements are slightly higher for pregnant (2.2 mcg) and lactating (2.6 mcg) women.

Recommended dietary allowance of vitamin B_{12}

Age	ng/day or mcg/day
Children 0-6 mos.	400 ng (AI)
Children 7-12 mos.	500 ng (AI)
Children 1-3 yrs.	900 ng
Children 4-8 yrs.	1.2 mcg
Children 9-13 yrs.	1.8 mcg
Children 14-18 yrs.	2.4 mcg
Adults ≥ 19yrs.	2.4 mcg
Pregnant women	2.6 mcg
Breastfeeding women	2.8 mcg

Foods that contain vitamin B_{12}

	mcg
Mollusks or clams, cooked, 3 oz.	84
Calf's liver, cooked, 4 oz.	41
Cereal, 100% fortified, 3/4 cup	6.0
Salmon, baked or broiled, 4 oz.	3.3
Beef, top sirloin, broiled, 3 oz.	2.4
Cheeseburger, fast food, double patty	1.9
Shrimp, steamed or broiled, 4 oz.	1.7
Taco, fast food, 1 large	1.6
Cereal, 25% fortified	1.5
Tuna, white, canned in water, 3 oz.	1.0
Milk, 1 cup	0.9
Ham, canned or roasted, 3 oz.	0.6
Chicken breast, roasted, 1/2 breast	0.3
Egg, 1 whole, cooked	0.3

AI = Adequate Intake
mcg = microgram
ng = nanogram

(Illustration by GGS Information Services. Cengage Learning, Gale)

The primary conditions that benefit from supplementation with cobalamin are megaloblastic and pernicious **anemia**. Megaloblastic anemia is a state resulting from an inadequate intake of cobalamin, to which vegans are particularly susceptible because of the lack of animal food sources. Vegans, who do not consume any animal products including meat, dairy, or eggs, should take at least 2 mcg of cobalamin per day in order to prevent this condition. In the case of pernicious anemia, intake may be appropriate but absorption is poor due to a lack of normal stomach substance, called intrinsic factor, that facilitates absorption of vitamin B_{12}. Large doses are required to treat pernicious anemia, which occurs most commonly in the elderly population as a result of decreased production of intrinsic factor by the stomach. Supplements are generally effective when taken orally in very large amounts (300-1000 mcg/day) even if no intrinsic factor is produced. These supplements require a prescription, and should be administered with the guidance of a health care provider. Injections, instead of the supplements, are often used.

Those who have **infections**, **burns**, some types of **cancer**, recent surgery, illnesses that cause decay or loss of strength, or high amounts of **stress** may need more than the RDA amount of B_{12} and other B vitamins. A balanced supplement is the best approach.

Male **infertility** can sometimes be resolved through use of cobalamin supplements. Other conditions that may be improved by cobalamin supplementation include: **asthma**, **atherosclerosis** (hardening of the arteries caused by plaque formation in the arteries), **bursitis** (inflammation of a bodily pouch, especially the shoulder or elbow), **Crohn's disease** (chronic recurrent inflammation of the intestines), **depression**, diabetes, high **cholesterol**, **osteoporosis**, and vitiligo (milky-white patches on the skin). There is not enough evidence to judge whether supplementation for these diseases is effective.

Preparations

Natural sources

Usable cobalamin is only found naturally in animal source foods. Fresh food is best, as freezing and exposure to light may destroy some of the vitamin content. Clams and beef liver have very high cobalamin levels. Other good sources include chicken liver, beef, lamb, tuna, flounder, liverwurst, eggs, and dairy products. Some plant foods may contain cobalamin, but it is not in a form that is usable by the body.

Supplemental sources

Cobalamin supplements are available in both oral and injectable formulations. A nasal gel is also made. Generally a balanced B-complex vitamin is preferable to taking high doses of cobalamin unless there is a specific indication for it, such as megaloblastic anemia. Strict vegetarians will need to incorporate a supplemental source of B_{12} in the diet. Cyanocobalamin is the form most commonly available in supplements. Two other, possibly more effective, types are hydrocobalamin and methyl-cobalamin. As with all supplements, cobalamin should be stored in a cool, dry, dark place and out of the reach of children.

Deficiency

Cobalamin deficiency may be manifested as a variety of symptoms since cobalamin is so widely used in the body. Severe **fatigue** may occur initially. Effects on the nervous system can be wide-ranging,

KEY TERMS

Homocysteine—An amino acid produced from the metabolization of other amino acids. High levels are an independent risk factor for heart disease.

Megaloblastic anemia—A condition caused by cobalamin deficiency, which is characterized by red blood cells which are too few, too fragile, and abnormally large. Also known as macrocytic anemia.

Pernicious anemia—Megaloblastic anemia resulting from a cobalamin deficiency that is the result of poor absorption due to inadequate production of intrinsic factor in the stomach..

Vegan—A person who doesn't eat any animal products, including dairy and eggs.

and include weakness, numbness and tingling of the limbs, **memory loss**, confusion, delusion, poor balance and reflexes, hearing difficulties, and even **dementia**. Severe deficiency may appear similar to **multiple sclerosis**. **Nausea** and **diarrhea** are possible gastrointestinal signs. The anemia that results from prolonged deficiency may also be seen as a pallor, especially in mucous membranes such as the gums and the lining of the inner surface of the eye.

Megaloblastic anemia is a common result of inadequate cobalamin. This condition can also result if a person stops secreting enough intrinsic factor in the stomach, a substance essential for the absorption of cobalamin. Inadequate intrinsic factor leads to pernicious anemia, so called because it persists despite iron supplementation. Long-term deficiencies of cobalamin also allow homocysteine levels to build up. Negative effects of large amounts of circulating homocysteine include **heart disease**, and possibly brain toxicity. Taking high levels of folic acid supplements can mask cobalamin deficiency and prevent the development of megaloblastic anemia, but neurological damage can still occur. This damage may become permanent if the cobalamin deficiency persists for a long period of time.

Risk factors for deficiency

The primary groups at risk for cobalamin deficiency are vegans who are not taking supplements, and the elderly. Older adults are more likely to have both insufficient intrinsic factor secreted by the stomach and low levels of stomach acid, causing cobalamin to be poorly absorbed. Malabsorptive diseases and stomach surgery can also predispose to a deficiency.

Precautions

People who are sensitive to cobalamin or cobalt should not take cobalamin supplements. Symptoms of hypersensitivity may include swelling, **itching**, and shock. Adverse effects resulting from B_{12} supplementation are rare. Cobalamin should also be avoided by those who have a type of hereditary optic nerve atrophy known as Leber's disease.

Side effects

Very high doses of cobalamin may sometimes cause **acne**.

Interactions

Large amounts of **vitamin C** taken within an hour of vitamin B supplements will destroy the cobalamin component. Absorption of cobalamin is also impaired by deficiencies of folic acid, iron, or **vitamin E**. Improved absorption occurs when it is taken with other B vitamins or **calcium**. Some medications may also cause an increased use or decreased absorption of this vitamin. Those on colchicine, corticosteroids, methotrexate, metformin, phenformin, oral contraceptives, cholestyramine, colestipol, clofibrate, epoetin, neomycin, or supplemental **potassium** may need extra cobalamin. Use of nicotine products or excessive alcohol can deplete B_{12}.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. CA: Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. PA: Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. AZ: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's Letter/Prescriber's Letter Natural Medicines Comprehensive Database*. CA: Therapeutic Research Faculty, 1999.

Pressman, Alan H. and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha Books, 1997.

Judith Turner

Vitamin B_2 *see* **Riboflavin**

Vitamin B_3 *see* **Niacin**

Vitamin B_5 *see* **Pantothenic acid**

Vitamin B_6 *see* **Pyridoxine**

Vitamin B_7 *see* **Biotin**

Vitamin B complex

Description

The vitamin B complex consists of 12 related water-soluble substances. Eight are considered essential vitamins because they need to be included in the diet. Four are not essential because the body can synthesize them. Although these vitamins are chemically distinct, they are grouped together because they are found with one another in the same foods. Since they are water-soluble, most are not stored for any length of time, and must be replenished daily. The eight vitamins have both names and corresponding numbers. They are:

- B_1 (thiamin)
- B_2 (riboflavin)
- B_3 (niacin)
- B_5 (pantothenic acid)
- B_6 (pyridoxine)
- B_7 (biotin)
- B_9 (folic acid)
- B_{12} (cobalamin)

Biotin is not always included among B complex supplements. The numbers that appear to have been skipped were found to be duplicate substances or non-vitamins. The four unnumbered components of the B complex that can be synthesized by the body are **choline**, **inositol**, PABA, and lipoic acid.

As a group, the B vitamins have a broad range of functions, including the maintenance of myelin, which is the covering of nerve cells. A breakdown of myelin can cause a large and devastating variety of neurologic symptoms. B vitamins are also key to producing energy from nutrients that are consumed. Three members of this group—folic acid, **pyridoxine**, and cobalamin—work together to keep homocysteine levels low. This is quite important, since high homocysteine levels are associated with **heart disease**. Some B vitamins prevent certain birth defects (including cleft palate and neural tube defects), maintain healthy red blood cells, support immune function, regulate cell growth, aid in hormone production, and may have a role in preventing certain types of **cancer**. They also help maintain healthy skin, hair, and nails.

General use

There are many claims regarding the usefulness of various B vitamins. **Thiamine** is thought to be supportive for people with **Alzheimer's disease**, a disorder that is also associated with low levels of pyridoxine and cobalamin. High doses of **niacin** lower **cholesterol**, and balance high-density (HDL) and low-density (LDL) lipoproteins. This should be done under medical supervision only. Some evidence shows that niacin may prevent juvenile diabetes (type 1, insulin dependent) in at-risk children. It may maintain pancreatic excretion of some insulin for a longer time than would occur normally. Niacin has also been used to relieve intermittent claudication and **osteoarthritis**, although the dose for the latter may lead to liver problems. The frequency of migraines may be significantly reduced, and the severity decreased, by the use of supplemental **riboflavin**. Pyridoxine is used therapeutically to lower the risk of heart disease, to relieve **nausea** associated with **morning sickness**, and to treat **premenstrual syndrome** (PMS). In conjunction with **magnesium**, pyridoxine may have some beneficial effects on the behavior of children with **autism**. Cobalamin supplementation has been shown to improve male fertility. **Depression**, **dementia**, and mental impairment are often associated with deficiencies of both cobalamin and **folic acid**. Folic acid may reduce the odds of cervical or colon cancer in certain risk groups.

Deficiency

Vitamin B complex is most often used to treat deficiencies that are caused by poor vitamin intake, difficulties with vitamin absorption, or conditions causing increased metabolism, such as **hyperthyroidism**, which deplete vitamin levels at a higher than normal rate.

Biotin and **pantothenic acid** are rarely deficient since they are broadly available in foods, but often persons lacking one type of B vitamin are lacking other B components as well. An individual who may have symptoms due to an inadequate level of one vitamin may suffer from an undetected underlying deficiency as well. One possibility of particular concern is that taking folic acid supplements can cover up the symptoms of cobalamin deficiency. This scenario could result in permanent neurologic damage if the cobalamin shortage remains untreated.

Some of the B vitamins have unique functions within the body that allow a particular deficiency to be readily identified. Often, however, they work in concert so symptoms due to various inadequate components may overlap. In general, poor B vitamin levels will cause profound **fatigue** and an assortment of neurologic manifestations, which may include weakness, poor balance, confusion, irritability, **memory loss**, nervousness, tingling of the limbs, and loss of coordination. Depression may be an early sign of significantly low levels of pyridoxine, as well as other B

KEY TERMS

Beriberi—A condition caused by a thiamine deficiency, with peripheral neurologic (nerve), cerebral (brain), and cardiovascular (heart and blood vessel) symptoms.

Cleft palate—A birth defect characterized by a deep split in the roof of the mouth, associated with folic acid deficiency.

Homocysteine—An amino acid produced from the metabolization of other amino acids. High levels are an independent risk factor for heart disease.

Intermittent claudication—Calf pain that occurs while walking and is relieved at rest, and related to restricted blood flow to the legs.

Macrocytic anemia—A condition caused by cobalamin deficiency, which is characterized by red blood cells that are too few, too fragile, and abnormally large.

Megaloblastic anemia—A form of anemia involving large, irregularly shaped red blood cells, called megaloblasts, and related to vitamin B_{12} and folic acid deficiency.

Neural tube defect—Incomplete development of the brain, spinal cord, or vertebrae of a fetus, which is sometimes caused by a folic acid deficiency.

Pellagra—A deficiency disease caused by a lack of niacin in the diet, characterized by skin rash, diarrhea, and mental symptoms.

Pernicious anemia—A type of anemia that occurs when the stomach does not secrete enough intrinsic factor, which is necessary for the absorption of vitamin B_{12}.

Vasodilatory—Causing the veins in the body to dilate, or enlarge.

Vegan—A person who doesn't eat any animal products, including dairy and eggs.

Wernecke-Korsakoff Syndrome—A condition caused by thiamine deficiency and usually related to alcoholism. Symptoms occur alternately in the central nervous system (brain and spinal cord) and peripheral nervous system (nerves in the remaining parts of the body). Alcohol interferes with the body's ability to metabolize thiamine.

vitamins. Additional symptoms of vitamin B deficiency are sleep disturbances, nausea, poor appetite, frequent **infections**, and skin lesions.

A certain type of **anemia** (megaloblastic) is an effect of inadequate cobalamin. This anemia can also occur if a person stops secreting enough intrinsic factor in the stomach. Intrinsic factor is essential for the absorption of cobalamin. A lack of intrinsic factor also leads to pernicious anemia, so called because it persists despite **iron** supplementation. Neurologic symptoms often precede anemia when cobalamin is deficient.

A severe and prolonged lack of niacin causes a condition called pellagra. The classic signs of pellagra are **dermatitis**, dementia, and **diarrhea**. It is very rare now, except in alcoholics, strict vegans, and people in areas of the world with very poor **nutrition**.

Thiamine deficiency is similarly rare, except among the severely malnourished and alcoholics. A significant depletion causes a condition known as beriberi, which can cause weakness, leg spasms, poor appetite, and loss of coordination. Wernicke-Korsakoff syndrome is the most severe form of deficiency, and occurs in conjunction with **alcoholism**. Early stages of neurologic symptoms are reversible, but psychosis and death may occur if the course is not reversed.

Risk factors for deficiency

People are at higher risk for deficiency if they have poor nutritional sources of B vitamins, take medications, or have conditions that impair absorption, or are affected by circumstances causing them to require above-normal levels of vitamin B components. Since the B vitamins often work in harmony, a deficiency in one type may have broad implications. Poor intake of B vitamins is most often a problem in strict vegetarians and the elderly. People who frequently fast or diet may also benefit from B vitamin supplements. Vegans need to use **brewer's yeast** or other sources of supplemental cobalamin, since the only natural sources are meats.

Risk factors that may decrease absorption of some B vitamins include **smoking**; excessive use of alcohol; surgical removal of portions of the digestive tract; and advanced age. Absorption is also impaired by some medications. Some of the drugs that may cause decreased absorption are corticosteroids, colchicine, metformin, phenformin, omeprazol, colestipol, cholestyramine, methotrexate, 5-fluorouracil, tricyclic antidepressants, and slow-release **potassium**.

A person's requirement for vitamin B complex may be increased by such conditions as **pregnancy**, breast-feeding, emotional **stress**, and physical stress due to surgery or injury. People who are very physically active require extra riboflavin. Use of birth control pills also increases the need for certain B vitamins.

Recent research indicates that children with **sickle cell anemia** are at high risk for elevated homocysteine levels and pyridoxine deficiency.

Studies of folic acid deficiency caused by cancer chemotherapy indicate that some patients are at greater risk than others due to genetic variations in metabolism of the B vitamins. Further research is needed to determine the role of these genetic factors in vitamin deficiency states.

Preparations

Natural sources

Although they are prevalent in many foods, fresh meats and dairy products are the best sources for most of the B vitamins. Cobalamin is only found naturally in animal source foods. Freezing of food and exposing foods or supplements to light may destroy some of the vitamin content. Dark-green leafy vegetables are an excellent source of folic acid. To make the most of the B vitamins contained in foods, they should not be overcooked. It is best to steam vegetables, rather than boil or simmer them.

Supplemental sources

B vitamins are generally best taken in balanced complement, unless there is a specific deficiency or need for an individual vitamin. An excess of one component may lead to depletion of the others. Injectable and oral forms of supplements are available. The injectable types may be more useful for those with deficiencies due to problems with absorption. B complex products vary in terms of components and dose level contained within them.

Individual components are also available as supplements. These are best used with the advice of a health care professional. Some are valuable when addressing specific problems such as pernicious anemia. Strict vegetarians will need to incorporate a supplemental source of B_{12} in their **diets**.

Precautions

In many cases, large doses of water-soluble vitamins can be taken with no ill effects since excessive amounts are readily excreted. However, liver inflammation may occur when niacin is taken at daily doses of over 500 mg. This problem occurs more often at doses six times as high. It is generally reversible once the supplementation is stopped. Niacin may also cause difficulty in controlling blood sugar in diabetics. It can increase uric acid levels, which will aggravate **gout**. Those with ulcers could be adversely affected, as niacin increases the production of stomach acid. Niacin also lowers blood pressure due to its vasodilatory effect, so it should not be taken in conjunction with medications that treat high blood pressure. If a form of niacin known as inositol hexaniacinate is taken, the beneficial effects on cholesterol are maintained without incurring the problems of flushing, gout, and ulcers.

High doses of pyridoxine may cause liver inflammation or permanent nerve damage. Megadoses of this vitamin are not necessary or advisable.

Those on medications for seizures, high blood pressure, and **Parkinson's disease** are at increased risk for interactions. Persons who have chronic health conditions, or take other medications, should seek the advice of a health professional before beginning any program of supplementation.

Side effects

In large amounts, niacin commonly causes flushing and **headache**, although this can be avoided by taking it in the form of inositol hexaniacinate. Large doses of riboflavin result in very bright yellow urine.

Interactions

Some medications may be affected by B vitamin supplementation, including those prescribed for high blood pressure; Parkinson's disease (such as levodopa, which is inactivated by pantothenic acid); and epileptiform conditions. Folic acid interacts with Dilantin (a brand name for phenytoin sodium), as well as other anticonvulsants. Large amounts of **vitamin C** taken within an hour of vitamin B supplements will destroy the cobalamin component. Niacin may interfere with control of blood sugar in people on antidiabetic drugs. Isoniazid, a medication to treat **tuberculosis**, can impair the proper production and utilization of niacin. Antibiotics potentially decrease the level of some B vitamins by killing the digestive tract bacteria that produce them.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. CA: Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. PA: Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. AZ: Fisher Books, 1998.

Janson, Michael. *The Vitamin Revolution in Health Care*. Arcadia Press, 1996.
Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehen sive Database*. CA: Therapeutic Research Faculty, 1999.
Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha Books, 1997.

PERIODICALS

Balasa, W., K. A. Kalinyak, J. A. Bean, et al. "Hyperho mocysteinemia is Associated with Low Plasma Pyri doxine Levels in Children with Sickle Cell Disease." *Journal of Pediatric Hematology and Oncology* 24 (June July 2002): 374 9.
Fairfield, K. M., and R. H. Fletcher. "Vitamins for Chronic Disease Prevention in Adults: Scientific Review." *Journal of the American Medical Association (JAMA)* 287 (June 19, 2002): 3116 26.
McCaddon, A., B. Regland, P. Hudson, and G. Davies. "Functional Vitamin B_{12} Deficiency and Alzheimer's Disease." *Neurology* 58 (May 14, 2002): 1395 9.
Miller, J. W., R. Green, D. M. Mungas, et al. "Homocys teine, Vitamin B_6, and Vascular Disease in AD Patients." *Neurology* 58 (May 28, 2002): 1449 50.
Morris, M. S. "Folate, Homocysteine, and Neurological Function." *Nutrition in Clinical Care* 5 (May June 2002): 124 32.
Prescott, N. J., and S. Malcolm. "Folate and the Face: Evaluating the Evidence for the Influence of Folate Genes on Craniofacial Development." *The Cleft Pal ate Craniofacial Journal* 39 (May 2002): 327 31.
Ulrich, C. M., K. Robien, and R. Sparks. "Pharmacoge netics and Folate Metabolism A Promising Direc tion." *Pharmacogenomics* 3 (May 2002): 299 313.
Wolters M., A. Strohle, and A. Hahn. "Age associated changes in the metabolism of vitamin B_{12} and folic acid: Prevalence, aetiopathogenesis and pathophysiological consequences." *Zeitschrift für Gerontologie und Geriatrie* 2004 Apr: 37(2):109 35. (article in German, reviewed in abstract only)

ORGANIZATIONS

American Dietetic Association. 216 West Jackson Blvd., Chi cago, IL 60606. (312) 899 0040. http://www.eatright.org.

Rebecca J. Frey, Ph.D.
Samuel Uretsky, Pharm.D.

Vitamin C

Description

Vitamin C, or ascorbic acid, is naturally produced in fruits and vegetables. The vitamin, which can be taken in dietary or supplementary form, is absorbed by the intestines. That which the body cannot absorb is excreted in the urine. Daily intake of vitamin C, preferably in dietary form, is recommended for optimum health.

Vitamin C doses for common illnesses

Illness	Dose per 24 hours
Asthma	15 - 50 grams (g); 4 - 8 doses per 24 hours
Hay fever	15 - 50 grams (g); 4 - 8 doses per 24 hours
Common cold	30 - 60 grams (g); 6 - 10 doses per 24 hours
Influenza	100 - 150 grams (g); 8 - 20 doses per 24 hours
Viral pneumonia	100 - 200+; 12 - 25 doses per 24 hours

(Illustration by Corey Light. Cengage Learning, Gale)

Long before people knew what vitamin C was, they understood that eating certain foods, especially citrus fruit, would prevent a disease called scurvy. Vitamin C turned out to be the essential health-promoting compound in these foods. This vitamin was isolated in the early 1930s, and by 1934, a synthetic version of vitamin C was produced by the pharmaceutical company Hoffman-La Roche.

All animals need vitamin C, but most animals can make their own. Humans, along with apes, guinea pigs, and a few other animals, have lost that ability. In humans, this occurs because of a gene mutation that controls an enzyme needed to make vitamin C. As a result, humans are completely dependent on getting enough of the vitamin from foods in their diet. In addition, vitamin C cannot be stored in the body. It is a water-soluble vitamin, and any amount that cannot be used immediately is excreted in urine. Vitamin C is not evenly distributed throughout the body. The adrenal glands, pituitary gland, thymus, retina, brain, spleen, lungs, liver, thyroid, testicles, lymph nodes, kidney, and pancreas all contain much higher levels of vitamin C than are found in circulating blood.

Certain health conditions may cause vitamin C depletion, including diabetes and high blood pressure. People who smoke and women who take estrogen may also have lower vitamin C levels. In addition, men are

Recommended dietary allowance of vitamin C

Age	mg/day
Children 0-6 mos.	40 (AI)
Children 7-12 mos.	50 (AI)
Children 1-3 yrs.	15
Children 4-8 yrs.	25
Children 9-13 yrs.	45
Boys 14-18 yrs.	75
Girls 14-18 yrs.	65
Men ≥ 19 yrs.	90
Women ≥ 19 yrs.	75
Men who smoke	125
Women who smoke	110
Pregnant women ≤ 18 yrs.	80
Pregnant women ≥ 19 yrs.	85
Breastfeeding women ≥ 19 yrs.	120

Foods that contain vitamin C	mg
Pepper, red bell, raw, 1/2 cup	141
Papaya, 1	94
Strawberries, 1 cup	82
Orange juice, 3/4 cup	75
Orange, 1 med.	70
Broccoli, steamed, 1/2 cup	62
Grapefruit juice, 3/4 cup	60
Grapefruit, 1/2 med.	44
Cauliflower, boiled, 1/2 cup	27
Potato, baked, 1 med.	26
Tomato, 1 med.	23

AI = Adequate Intake
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

more likely to be vitamin C depleted, as are the elderly. High **stress** levels have also been linked to vitamin C deficiency. In addition, certain medical and surgical procedures may lower the levels of vitamin C in the body. It has been found that hemodialysis causes patients with kidney disease to lose as much as 66 mg per session. Similarly, patients who have had kidney transplants are at increased risk of vitamin C deficiency.

Severe vitamin C deficiency leads to scurvy, a disease common on ships prior to the eighteenth century, due to the lack of fresh fruits and other dietary vitamin C sources. Symptoms of scurvy include weakness, bleeding, tooth loss, bleeding gums, bruising, and joint **pain**. Less serious vitamin C depletion can have more subtle effects such as weight loss, **fatigue**, weakened immune system (as demonstrated by repeated **infections** and colds), **bruises** that occur with minor trauma and are slow to heal, and slow healing of other **wounds**.

Low vitamin C levels have also been associated with high blood pressure, increased **heart attack** risk, increased risk for developing **cataracts**, and a higher risk for certain types of **cancer** (i.e., prostate, stomach, colon, oral, and lung).

General use

Vitamin C is a critical component of both disease prevention and of basic body building processes. The therapeutic effects of vitamin C include:

- Allergy and asthma relief. Vitamin C is present in the lung's airway surfaces, and insufficient vitamin C levels have been associated with bronchial constriction and reduced lung function. Some studies have associated vitamin C supplementation with asthmatic symptom relief, but results have been inconclusive and further studies are needed.
- Cancer prevention. Vitamin C is a known antioxidant and has been associated with reduced risk of stomach, lung, colon, oral, and prostate cancer.
- Cataract prevention. Long-term studies on vitamin C supplementation and cataract development have shown that supplementation significantly reduces the risk of cataracts, particularly among women. One study published in 2002 found that adequate vitamin C intake in women under 60 years of age reduced their risk of developing cataracts by 57%.
- Collagen production. Vitamin C assists the body in the manufacture of collagen, a protein that binds cells together and is the building block of connective tissues throughout the body. Collagen is critical to the formation and ongoing health of the skin, cartilage, ligaments, corneas, and other bodily tissues and structures. Vitamin C is also thought to promote faster healing of wounds and injuries because of its role in collagen production.
- Diabetes control. Vitamin C supplementation may assist diabetics in controlling blood sugar levels and improving metabolism.
- Gallbladder disease prevention. A study of over 13,000 subjects published in the *Archives in Internal Medicine* found that women who took daily vitamin C supplements were 34% less likely to contract gallbladder disease and gallstones, and that women deficient in ascorbic acid had an increased prevalence of gallbladder disease.
- Immune system booster. Vitamin C increases white blood cell production and is important to immune

system balance. Studies have related low vitamin C levels to increased risk for infection. Vitamin C is frequently prescribed for HIV-positive individuals to protect their immune system.

- Neurotransmitter and hormone building. Vitamin C is critical to the conversion of certain substances into neurotransmitters, brain chemicals that facilitate the transmission of nerve impulses across a synapse (the space between neurons, or nerve cells). Such neurotransmitters as serotonin, dopamine, and norepinephrine are responsible for the proper functioning of the central nervous system, and a deficiency of neurotransmitters can result in psychiatric illness. Vitamin C also helps the body manufacture adrenal hormones.

Other benefits of vitamin C are less clear cut and have been called into question with conflicting study results. These include vitamin C's role in treating the **common cold**, preventing **heart disease**, and treating cancer.

Respiratory health

Doses of vitamin C may reduce the duration and severity of cold symptoms, particularly in people who are vitamin C deficient. The effectiveness of vitamin C therapy on colds seems to be related to the person's dietary vitamin C intake and their general health and lifestyle. In addition, however, other researchers have found that vitamin C is associated with improved lung function and overall respiratory health.

Heart disease prevention

Some studies have indicated that vitamin C may prevent heart disease by lowering total blood **cholesterol** and LDL cholesterol and raising HDL, or good cholesterol, levels. The antioxidant properties of vitamin C have also been associated with protection of the arterial lining in patients with coronary artery disease. A study published in 2002 reported that the protective effects of vitamin C on the lining of the arteries reduces the risk of heart disease in patients who have received heart transplants.

On the other hand, the results of a recent study conducted at the University of Southern California and released in early 2000 have cast doubt on the heart protective benefits of vitamin C. The study found that daily doses of 500 mg of vitamin C resulted in a thickening of the arteries in study subjects at a rate 2.5 times faster than normal. Thicker arterial walls can cause narrow blood vessels and actually increase the risk for heart disease. Study researchers have postulated that the collagen-producing effects of vitamin C could be the cause behind the arterial thickening. Further studies will be needed to determine the actual risks and benefits of vitamin C in relation to heart disease and to establish what a beneficial dosage might be, if one exists. For the time being, it is wise for most individuals, particularly those with a history of heart disease, to avoid megadoses over 200 mg because of the risk of arterial thickening.

Blood pressure control

A 1999 study found that daily doses of 500 mg of vitamin C reduced blood pressure in a group of 39 hypertensive individuals. Scientists have hypothesized that vitamin C may improve high blood pressure by aiding the function of nitric oxide, a gas produced by the body that allows blood vessels to dilate and facilitates blood flow. Again, recent findings that vitamin C may promote arterial wall thickening seem to contradict these findings, and further long-term studies are needed to assess the full benefits and risks of vitamin C in relation to blood pressure control.

Cancer treatment

Researchers disagree on the therapeutic use of vitamin C in cancer treatment. On one hand, studies have shown that tumors and cancer cells absorb vitamin C at a faster rate than normal cells because they have lost the ability to transport the vitamin. In addition, radiation and chemotherapy work in part by stimulating oxidation and the growth of free radicals in order to stop cancer cell growth. Because vitamin C is an antioxidant, which absorbs free radicals and counteracts the oxidation process, some scientists believe it could be counterproductive to cancer treatments. The exact impact vitamin C has on patients undergoing chemotherapy and other cancer treatments is not fully understood, and for this reason many scientists believe that vitamin C should be avoided by patients undergoing cancer treatment.

On the other side of the debate are researchers who believe that high doses of vitamin C can protect normal cells and inhibit the growth of cancerous ones. In lab-based, in vitro studies, cancer cells were killed and/or stopped growing when large doses of vitamin C were administered. Researchers postulate that unlike normal healthy cells, which will take what they need of a vitamin and then discard the rest, cancer cells continue to absorb antioxidant vitamins at excessive rates until the cell structure is effected, the cell is killed, or cell growth simply stops. However, it is important to note that there have been no in vivo controlled clinical studies to prove this theory.

Based on the currently available controlled clinical data, cancer patients should avoid taking vitamin C supplementation beyond their recommended daily allowance.

Preparations

The United States Institute of Medicine (IOM) of the National Academy of Sciences has developed values called Dietary Reference Intakes (DRIs) for vitamins and minerals. The DRIs consist of three sets of numbers. The Recommended Dietary Allowance (RDA) defines the average daily amount of the nutrient needed to meet the health needs of 97–98% of the population. The Adequate Intake (AI) is an estimate set when there is not enough information to determine an RDA. The Tolerable Upper Intake Level (UL) is the average maximum amount that can be taken daily without risking negative side effects. The DRIs are calculated for children, adult men, adult women, pregnant women, and breastfeeding women.

The IOM has not set RDAs for vitamin C in children under one year old because of incomplete scientific information. Instead, it has set AI levels for this age group. RDAs and ULs for vitamin C are measured in milligrams (mg). The RDAs and ULs set by the IOM are highly controversial. They are set at a level based on preventing scurvy. Many researchers believe that doses hundreds of times higher are needed to prevent certain chronic diseases. They argue that large doses of vitamin C have minimal side effects and that RDAs and ULs should be much higher. These researchers suggest of anywhere from 400–3,000 mg per day for health adults.

The following list gives the daily RDAs and IAs and ULs for vitamin C for healthy individuals as established by the IOM.

- children birth–6 months: AI 40 mg; UL not established; All vitamin C should come from breast milk, fortified formula, or food.
- children 7–12 months: AI 50 mg; UL not established; All vitamin C should come from breast milk, fortified formula, or food.
- children 1–3 years: RDA 15 mg; UL 400 mg
- children 4–8 years: RDA 25 mg; UL 650 mg
- children 9–13 years: RDA 45 mg; UL 1,200 mg
- boys 14–18 years: RDA 75 mg; UL 1,800 mg
- girls 14–18 years: RDA 65 mg; UL 1,800 mg
- men age 19 and older: RDA 90 mg; UL 2,000 mg
- women age 19 and older: RDA 75 mg; UL 2,000 mg
- men who smoke: RDA 125 mg; UL 2,000 mg
- women who smoke: RDA 110 mg; UL 2,000 mg
- pregnant women 18 years and younger: RDA 80 mg; UL 1,800 mg
- pregnant women 19 years and older: RDA 85 mg; UL 2,000 mg
- breastfeeding women 19 years and older: RDA 120 mg; 2,000 mg

Many fruits and vegetables, including citrus fruits and berries, are rich in vitamin C. Foods rich in vitamin C include raw red peppers, guava, orange juice, and black currants. Rose hips, broccoli, tomatoes, strawberries, papaya, lemons, kiwis, and brussels sprouts are also good sources of vitamin C. Eating at least five to nine servings of fruits and vegetables daily should provide adequate vitamin C intake for most people. Fresh, raw fruits and vegetables contain the highest levels of the vitamin.

The following list gives the approximate vitamin C content for some common foods:

- orange, 1 medium: 70 mg
- orange juice, 3/4 cup (6 ounces): 75 mg
- grapefruit, 1/2 medium: 44 mg
- grapefruit juice, 3/4 cup (6 ounces): 60 mg
- strawberries, 1 cup: 82 mg
- papaya, 1: 94 mg
- tomato, 1 medium: 23 mg
- red bell pepper, 1/2 cup raw: 141 mg
- broccoli, steamed, 1/2 cup: 62 mg
- cauliflower, boiled, 1/2 cup: 27 mg
- potato, 1 medium, baked: 26 mg

Both heat and light can reduce vitamin C potency in fresh foods, so overcooking and improper storage should be avoided. Sliced and chopped foods have more of their surface exposed to light, so keeping vegetables and fruits whole may also help to maintain full vitamin potency.

Vitamin C supplements are another common source of the vitamin. Individuals at risk for vitamin C depletion such as smokers, women who take birth control pills, and those with unhealthy dietary habits may benefit from a daily supplement. Supplements are available in a variety of different forms including pills, capsules, powders, and liquids. Vitamin C formulas also vary. Common compounds include ascorbic acid, **calcium** ascorbate, **sodium** ascorbate, and C complex. The C complex compound contains a substance called **bioflavonoids**, which may enhance the benefits of vitamin C. Vitamin C is also available commercially as one ingredient of a multivitamin formula.

Vitamin C is added to some skin creams, throat lozenges, energy drinks, and energy bars, and to some

processed foods. In 2007, the two largest American soft drink manufacturers announced that they were going to produce carbonated drinks fortified with vitamins and minerals, including vitamin C.

Precautions

Overdoses of vitamin C can cause **nausea**, **diarrhea**, stomach cramps, skin **rashes**, and excessive urination.

Because of an increased risk of kidney damage, persons with a history of kidney disease or **kidney stones** should never take dosages above 200 mg daily, and should consult with their healthcare provider before starting vitamin C supplementation.

A 1998 study linked overdoses (above 500 mg) of vitamin C to cell and DNA damage. However, other studies have contradicted these findings, and further research is needed to establish whether high doses of vitamin C can cause cell damage.

Side effects

Vitamin C can cause diarrhea and nausea. In some cases, side effects may be decreased or eliminated by adjusting the dosage of vitamin C.

Interactions

Vitamin C increases **iron** absorption, and is frequently prescribed with or added to commercial iron supplements for this reason.

Individuals taking anticoagulant, or blood thinning, medications should speak with their doctor before taking vitamin C supplements, as large doses of vitamin C may impact their efficacy.

Large amounts of vitamin C may increase estrogen levels in women taking hormone supplements or birth control medications, especially if both the supplement and the medication are taken simultaneously. Women should speak with their doctor before taking vitamin C if they are taking estrogen-containing medications. Estrogen actually decreases absorption of vitamin C, so larger doses of vitamin C may be necessary. A healthcare provider can recommend proper dosages and the correct administration of medication and supplement.

Individuals who take aspirin, antibiotics, and/or steroids should consult with their healthcare provider about adequate dosages of vitamin C. These medications can increase the need for higher vitamin C doses.

Large dosages of vitamin C can cause a false-positive result in tests for diabetes.

KEY TERMS

Adrenal hormone—The adrenocortical hormones are cortisol and cortisone. They are anti-inflammatory substances that aid in the function of a number of body systems, including the central nervous system, the cardiovascular system, the musculoskeletal system, and the gastrointestinal system.

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Ascorbic acid—Another name for vitamin C, derived from its ability to prevent scurvy.

Bioflavonoids—Plant-derived substances that help to maintain the small blood vessels of the circulatory system.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with disease processes such as cancer.

In vitro testing—A test performed in a lab setting rather than in a human or animal organism. The test may involve living tissue or cells, but takes place out of the body.

In vivo testing—A test performed on a living organism, such as a controlled clinical study involving human test subjects. In vivo is Latin for "in the living body."

Resources

BOOKS

Berkson, Burt and Arthur J. Berkson. *Basic Health Publi cations User&s Guide to the B complex Vitamins*. Laguna Beach, CA: Basic Health Publications, 2006.

Lieberman, Shari and Nancy Bruning. *The Real Vitamin and Mineral Book: The Definitive Guide to Designing Your Personal Supplement Program*, 4th ed. New York: Avery, 2007.

Peel, Thomas, ed. *Vitamin C: New Research*. New York: Nova Science Publishers, 2006.

Reavley, Nocola. *The New Encyclopedia of Vitamins, Min erals, Supplements, and Herbs*. New York: M. Evans & Company, 1998.

PERIODICALS

du Plessis, A. S., H. Randall, E. Escreet, et al. "Nutritional Status of Renal Transplant Patients." *South African Medical Journal* 92 (January 2002): 68 74.

Fang, J. C., S. Kinlay, J. Beltrame, et al. "Effect of Vitamins C and E on Progression of Transplant Associated Arteriosclerosis: A Randomized Trial." *Lancet* 359 (March 30, 2002): 1108 1113.

Henderson, C.W."Prevalence Lower in Women with Increased Vitamin C Levels." *Women's Health Weekly* (April 22, 2000): 7.

Jacob, R. A., and G. Sotoudeh. "Vitamin C Function and Status in Chronic Disease." *Nutrition in Clinical Care* 5 (March April 2002): 66 74.

Leibman, Bonnie."Antioxidants." *Nutrition Action Health Letter* (June 2000): 9.

Morena, M., J. P. Cristol, J. Y. Bosc, et al. "Convective and Diffusive Losses of Vitamin C During Haemodiafiltra tion Session: A Contributive Factor to Oxidative Stress in Haemodialysis Patients." *Nephrology Dialysis Transplantation* 17 (March 2002): 422 427.

"New Questions About the Safety of Vitamin C Pills." *Tufts University Health & Nutrition Letter* (April 2000): 1.

Schunemann, H. J., S. McCann, B. J. Grant, et al. "Lung Function in Relation to Intake of Carotenoids and Other Antioxidant Vitamins in a Population Based Study." *American Journal of Epidemiology* 155 (March 1, 2002): 463 471.

Taylor, A., P. F. Jacques, L. T. Chylack, Jr., et al. "Long Term Intake of Vitamins and Carotenoids and Odds of Early Age Related Cortical and Posterior Subcapsular Lens Opacities." *American Journal of Clinical Nutrition* 75 (March 2002): 540 549.

Tsuchiya, M., A. Asada, E. Kasahara, et al. "Smoking a Single Cigarette Rapidly Reduces Combined Concen trations of Nitrate and Nitrite and Concentrations of Antioxidants in Plasma." *Circulation* 105 (March 12, 2002): 1155 1157.

ORGANIZATIONS

American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, Illinois, 60606 6995, (800) 877 1600, http://www.eatright.org.

United States Department of Agriculture. Center for Nutri tion Policy and Promotion, 1120 20th Street NW, Suite 200, North Lobby, Washington, D.C., 20036, (202)418 2312, john.webster@usda.gov, http://www. usda.gov/cnpp/.

Vitamin C Foundation, P. O. Box 73172, Houston, TX, 77273, (888) 443 3634, (281) 443 3634, http://www. vitaminc foundation.org/found.htm.

Paula Ford-Martin
Rebecca J. Frey, PhD
Helen Davidson

Vitamin D

Description

Vitamin D, also known as calciferol, is essential for strong teeth and bones. There are two major forms of vitamin D: D_2, or ergocalciferol, and D_3, or cholecarciferol. Vitamin D can be synthesized by the body in the presence of sunlight, as opposed to being required in the diet. It is the only vitamin whose biologically active formula is a hormone. It is fat-soluble, and regulates the body's absorption and use of the minerals **calcium** and **phosphorus**. Vitamin D is important not only to the maintenance of proper bone density, but to the many calcium-driven neurologic and cellular functions, as well as normal growth and development. It also assists the immune system by playing a part in the production of a type of white blood cell called the monocyte. White blood cells are infection fighters. There are many chemical forms of vitamin D, which have varying amounts of biological activity.

General use

The needed amount of vitamin D is expressed as an Adequate Intake (AI) rather than an Required Daily Amount (RDA). This is due to a difficulty in quantifying the amount of the vitamin that is produced by the body with exposure to sunlight. Instead, the AI estimates the amount needed to be eaten in order to maintain normal function. It is measured in International Units (IU) and there are 40 IU in a microgram (mcg). The AI for vitamin D in the form of cholecarciferol or ergocalciferol for everyone under 50 years of age, including pregnant and lactating women, is 200 IU. It goes up to 400 IU for people 51-70 years old, and to 600 IU for those over age 70. A slightly higher dose of vitamin D, even as little as a total of 700 IU for those over age 65, can significantly reduce age-related **fractures** when taken with 500 mg of calcium per day.

One of the major uses of vitamin D is to prevent and treat **osteoporosis**. This disease is essentially the result of depleted calcium, but calcium supplements alone will not prevent it since vitamin D is required to properly absorb and utilize calcium. Taking vitamin D without the calcium is also ineffective. Taking both together may actually increase bone density in postmenopausal women, who are most susceptible to bone loss and complications such as fractures.

Osteomalacia and rickets are also effectively prevented and treated through adequate vitamin D supplementation. Osteomalacia refers to the softening of the bones that occurs in adults that are vitamin D deficient. Rickets is the syndrome that affect deficient children, causing bowed legs, joint deformities, and poor growth and development.

Vitamin D also has a part in **cancer** prevention, at least for colon cancer. A deficiency increases the risk

Adequate intake of vitamin D

Age	IU/day	mcg/day
Children 0-12 mos.	200 IU	5 mcg
Children 1-18 yrs.	200 IU	5 mcg
Adults 19-50 yrs.	200 IU	5 mcg
Adults 51-70 yrs.	400 IU	10 mcg
Adults ≥ 71 yrs.	600 IU	15 mcg
Pregnant women	200 IU	5 mcg
Breastfeeding women	200 IU	5 mcg

Foods that contain vitamin D	mcg
Cod liver oil, 1 tbsp	1,360
Salmon, cooked, 3.5 oz.	360
Mackerel, cooked, 3.5 oz.	345
Tuna, canned in oil, 3 oz.	200
Milk, fortified, 1 cup	100
Orange juice, fortified, 1 cup	100
Cereal, fortified, 1 serving	40
Egg, 1 whole	20

IU = International Unit
mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

of this type of cancer, but there is no advantage to taking more than the AI level. There may also be a protective effect against breast and **prostate cancer**, but this is not as well established. Studies are in progress to see if it can help to treat **leukemia** and lymphoma. The action of at least one chemotherapeutic drug, tamoxifen, appears to be improved with small added doses of vitamin D. Tamoxifen is commonly used to treat ovarian, uterine, and breast cancers.

Many older adults are deficient in vitamin D. This can affect hearing by causing poor function of the small bones in the ear that transmit sound. If this is the cause of the **hearing loss**, it is possible that supplementation of vitamin D can act to reverse the situation.

Some metabolic diseases are responsive to treatment with specific doses and forms of vitamin D. These include Fanconi syndrome and familial hypophosphatemia, both of which result in low levels of phosphate. For these conditions, the vitamin is given in conjunction with a phosphate supplement to aid in absorption.

A topical form of vitamin D is available, and can be helpful in the treatment of plaque-type **psoriasis**. It may also be beneficial for those with vitiligo or scleroderma. This cream, in the form of calcitriol, is not thought to affect internal calcium and phosphorus levels. Oral supplements of vitamin D are not effective for psoriasis. The cream is obtainable by prescription only.

Evidence does not support the use of vitamin D to treat **alcoholism**, **acne**, arthritis, cystic fibrosis, or herpes.

KEY TERMS

Osteomalacia—Literally soft bones, a condition seen in adults deficient in vitamin D. The bones are painful and fracture easily.

Scleroderma—A condition causing thickened, hardened skin.

Tetany—Painful muscles spasms and tremors caused by very low calcium levels.

Vegan—A person who doesn't eat any animal products, including dairy and eggs.

Vitiligo—Patchy loss of skin pigmentation, resulting in lighter areas of skin.

Preparations

Natural sources

Exposure to sunlight is the primary method of obtaining vitamin D. In clear summer weather, approximately ten minutes per day in the sun will produce adequate amounts, even when only the face is exposed. In the winter, it may require as much as two hours. Many people don't get that amount of winter exposure, but are able to utilize the vitamin that was stored during extra time in the sun over the summer. Sunscreen blocks the ability of the sun to produce vitamin D, but should be applied as soon as the minimum exposure requirement has passed, in order to reduce the risk of **skin cancer**. The chemical 7-dehydrocholesterol in the skin is converted to vitamin D_3 by sunlight. Further processing by first the liver, and then the kidneys, makes D_3 more biologically active. Since it is fat-soluble, extra can be stored in the liver and fatty tissues for future use. Vitamin D is naturally found in fish liver oils, butter, eggs, and fortified milk and cereals in the form of vitamin D_2. Milk products are the main dietary source for most people. Other dairy products are not a good supply of vitamin D, as they are made from unfortified milk. Plant foods are also poor sources of vitamin D.

Supplemental sources

Most oral supplements of vitamin D are in the form of ergocalciferol. It is also available in topical (calcitriol or calcipotriene), intravenous (calcitriol), or intramuscular (ergocalciferol) formulations. Products designed to be given by other than oral routes are by prescription only. As with all supplements, vitamin D should be stored in a cool, dry place, away from direct light, and out of the reach of children.

Deficiency

In adults, a mild deficiency of vitamin D may be manifested as loss of appetite and weight, difficulty sleeping, and **diarrhea**. A more serious deficiency causes osteomalacia and muscle spasm. The bones become soft, fragile, and painful as a result of the calcium depletion. This is due to an inability to properly absorb and utilize calcium in the absence of vitamin D. In children, a severe lack of vitamin D causes rickets.

Risk factors for deficiency

The most likely cause of vitamin D deficiency is inadequate exposure to sunlight. This can occur with people who don't go outside much, those in areas of the world where pollution blocks ultraviolet (UV) light or where the weather prohibits spending much time outdoors. Glass filters out the rays necessary for vitamin formation, as does sunscreen. Those with dark skin may also absorb smaller amounts of the UV light necessary to effect conversion of the vitamin. In climates far to the north, the angle of the sun in winter may not allow adequate UV penetration of the atmosphere to create D_3. Getting enough sun in the summer, and a good dietary source, should supply enough vitamin D to last through the winter. Vegans, or anyone who doesn't consume dairy products in combination with not getting much sun, is also at higher risk, as are the elderly, who have a decreased ability to synthesize vitamin D.

Babies are usually born with about a nine-month supply of the vitamin, but breast milk is a poor source. Those born prematurely are at an increased risk for deficiency of vitamin D and calcium, and may be prone to tetany. Infants past around nine months old who are not getting vitamin D fortified milk or adequate sun exposure are at risk of deficiency.

People with certain intestinal, liver and kidney diseases may not be able to convert vitamin D_3 to active forms, and may need an activated type of supplemental vitamin D.

Those taking certain medications may require supplements, including anticonvulsants, corticosteroids, or the cholesterol-lowering medications cholestyramine or colestipol. This means that people who are on medication for arthritis, **asthma**, **allergies**, autoimmune conditions, high **cholesterol**, **epilepsy**, or other seizure problems should consult with a healthcare practitioner about the advisability of taking supplemental vitamin D. As with some other vitamins, the abuse of alcohol also has a negative effect. In the case of vitamin D, the ability to absorb and store it is diminished by chronic overuse of alcohol products.

Populations with poor nutritional status may tend to be low on vitamin D, as well as other vitamins. This can be an effect of poor sun exposure, poor intake, or poor absorption. A decreased ability to absorb oral forms of vitamin D may result from cystic fibrosis or removal of portions of the digestive tract. Other groups who may need higher than average amounts of vitamin D include those who have recently had surgery, major injuries, or **burns**. High levels of **stress** and chronic wasting illnesses also tend to increase vitamin requirements.

Precautions

The body will not make too much vitamin D from overexposure to sun, but since vitamin D is stored in fat, toxicity from supplemental overdose is a possibility. Symptoms are largely those of hypercalcemia, and may include high blood pressure, **headache**, weakness, **fatigue**, heart arrhythmia, loss of appetite, **nausea**, **vomiting**, diarrhea, **constipation**, **dizziness**, irritability, seizures, kidney damage, poor growth, premature hardening of the arteries, and **pain** in the abdomen, muscles, and bones. If the toxicity progresses, **itching** and symptoms referable to renal disease may develop, such as thirst, frequent urination, proteinuria, and inability to concentrate urine. Overdoses during **pregnancy** may cause fetal abnormalities. Problems in the infant can include tetany, seizures, heart valve malformation, retinal damage, growth suppression, and mental retardation. Pregnant women should not exceed the AI, and all others over one year of age should not exceed a daily dose of 2000 IU. Infants should not exceed 1000 IU. These upper level doses should not be used except under the advice and supervision of a healthcare provider due to the potential for toxicity.

Individuals with hypercalcemia, sarcoidosis, or hypoparathyroidism should not use supplemental calciferol. Those with kidney disease, arteriosclerosis, or **heart disease** should use ergocalciferol only with extreme caution and medical guidance.

Side effects

Minor side effects may include poor appetite, constipation, **dry mouth**, increased thirst, metallic taste, or fatigue. Other reactions, which should prompt a call to a healthcare provider, can include headache, nausea, vomiting, diarrhea, or confusion.

Interactions

The absorption of vitamin D is improved by calcium, **choline**, fats, phosphorus, and vitamins A and C. Supplements should be taken with a meal to optimize absorption.

There are a number of medications that can interfere with vitamin D levels, absorption, and metabolism. Rifampin, H_2 blockers, barbiturates, heparin, isoniazid, colestipol, cholestyramine, carbamazepine, phenytoin, fosphenytoin, and phenobarbital reduce serum levels of vitamin D and increase metabolism of it. Anyone who is on medication for epilepsy or another seizure disorder should check with a healthcare provider to see whether it is advisable to take supplements of vitamin D. Overuse of mineral oil, Olestra, and stimulant laxatives may also deplete vitamin D. Osteoporosis and hypocalcemia can result from long-term use of corticosteroids. It may be necessary to take supplements of calcium and vitamin D together with this medication. The use of thiazide diuretics in conjunction with vitamin D can cause hypercalcemia in individuals with hypoparathyroidism. Concomitant use of digoxin or other cardiac glycosides with vitamin D supplements may lead to hypercalcemia and heart irregularities. The same caution should be used with herbs containing cardiac glycosides, including black hellebore, Canadian hemp, **digitalis**, hedge mustard, figwort, lily of the valley, **motherwort**, oleander, pheasant's eye, **pleurisy**, squill, and strophanthus.

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. CA: Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. PA: Rodale Press, 1996.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. AZ: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehensive Database*. CA: Therapeutic Research Faculty, 1999.

Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha Books, 1997.

Judith Turner

Vitamin E

Description

Vitamin E is an antioxidant responsible for proper functioning of the immune system and for maintaining healthy eyes and skin. It is actually a group of fat soluble compounds known as tocopherols (i.e., alpha tocopherol and gamma tocopherol). Gamma tocopherol accounts for approximately 75% of dietary vitamin E. Vitamin E rich foods include nuts, cereals, beans, eggs, cold-pressed oils, and assorted fruits and vegetables. Because vitamin E is a fat soluble vitamin, it requires the presence of fat for proper absorption. Daily dietary intake of the recommended daily allowance (RDA) of vitamin E is recommended for optimum health.

Vitamin E is absorbed by the gastrointestinal system and stored in tissues and organs throughout the body. Certain health conditions may cause vitamin E depletion, including liver disease, **celiac disease**, and cystic fibrosis. Patients with end-stage renal disease (kidney failure) who are undergoing chronic dialysis treatment may be at risk for vitamin E deficiency. These patients frequently receive intravenous infusions of **iron** supplements which can act against vitamin E.

Vitamin E deficiency can cause **fatigue**, concentration problems, weakened immune system, **anemia**, and low thyroid levels. It may also cause vision problems and irritability. Low serum (or blood) levels of vitamin E have also been linked to major **depression**.

General use

Vitamin E is necessary for optimal immune system functioning, healthy eyes, and cell protection throughout the body. It has also been linked to the prevention of a number of diseases. The therapeutic benefits of vitamin E include:

- Cancer prevention and treatment. Vitamin E is a known antioxidant, and has been associated with a reduced risk of gastrointestinal, cervical, prostate, lung, and possibly breast cancer. In addition to its role as a cancer preventive, vitamin E is being studied as a cancer treatment. It has been shown to inhibit the growth of prostate tumors and to induce apoptosis (cell self-destruction) in cancer cells. Vitamin E is also being investigated as an adjunctive treatment for cancer patients undergoing radiation therapy; it is thought that high doses of dietary antioxidants may increase the efficacy of the radiation treatment while protecting healthy cells against damage.

Recommended dietary allowance of vitamin E

Age	IU/day	mg/day
Children 0-6 mos.	6.0 IU (AI)	4 mg (AI)
Children 7-12 mos.	7.5 IU (AI)	5 mg (AI)
Children 1-3 yrs.	9.0 IU	6 mg
Children 4-8 yrs.	10.5 IU	7 mg
Children 9-13 yrs.	16.5 IU	11 mg
Children 14-18 yrs.	22.5 IU	15 mg
Adult ≥ 19 yrs.	22.5 IU	15 mg
Pregnant women	22.5 IU	15 mg
Breastfeeding women	28.5 IU	19 mg

Foods that contain vitamin E	IU/day	mg/day
Wheat germ oil, 1 tbsp.	30.5	20.3
Almonds, roasted, 1 oz.	11	7.4
Sunflower oil, 1 tbsp.	8.5	5.6
Hazelnuts, roasted,1 oz.	6.5	4.3
Peanut butter, fortified, 1 oz.	6	4.2
Safflower oil, 1 tbsp.	6	4.6
Avacado, 1 med.	5	3.4
Olive oil, 1 tbsp.	3	1.9
Peanuts, roasted, 1 oz.	3	2.2
Spinach, raw, 1/2 cup	3	1.8
Spinach, cooked, 1/2 cup	2.5	1.6
Kiwi, 1 med.	1.5	1.1
Mango, sliced, 1/2 cup	1.5	0.9

AI = Adequate Intake
IU = International Unit
mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

- Immune system protection. Various studies have shown that vitamin E supplementation, particularly in elderly patients, boosts immune system function. Older patients have demonstrated improved immune response, increased resistance to infections, and higher antibody production. Vitamin E has also been used with some success to slow disease progression in HIV-positive patients.
- Eye disease prevention. Clinical studies on vitamin E have shown that supplementation significantly reduces the risk for cataracts and for macular degeneration, particularly among women.
- Memory loss prevention. Vitamin E deficiency has been linked to poor performance on memory tests in some elderly individuals.
- Alzheimer's disease (AD) treatment. In a study performed at Columbia University, researchers found that Alzheimer's patients who took daily supplements of vitamin E maintained normal functioning longer than patients who took a placebo. In 2002, a group of Dutch epidemiologists reported on a much larger population-based study conducted in the Netherlands between 1990 and 1993, with follow-up examinations in 1994 and 1999. The study confirmed the findings of the Columbia researchers, that high dietary intake of vitamin E lowers the risk of developing AD.
- Liver disease treatment. Vitamin E may protect the liver against disease.
- Diabetes treatment. Vitamin E may help diabetic patients process insulin more effectively. It has also been found to be effective in the treatment of diabetic neuropathy, a family of nerve disorders caused by diabetes. Vitamin E appears to reduce the symptoms of diabetic neuropathy and to improve the speed of transmission of nerve impulses.
- Pain relief. Vitamin E acts as both an anti-inflammatory and analgesic (or pain reliever). Studies have indicated it may be useful for treatment of arthritis pain in some individuals.
- Parkinson's disease prevention. High doses of vitamin E intake was associated with a lowered risk of developing Parkinson's disease in one 1997 Dutch study.
- Tardive dyskinesia treatment. Individuals who take neuroleptic drugs for schizophrenia or other disorders may suffer from a side effect known as tardive dyskinesia, in which they experience involuntary muscle contractions or twitches. Vitamin E supplementation may lessen or eliminate this side effect in some individuals.
- Porphyria treatment. Vitamin E has been found to be beneficial in treating patients with porphyria, a group of disorders characterized by abnormalities in the metabolism of blood pigments, by lowering the level of excretion of these blood pigments in the urine.

Other benefits of vitamin E are less clear cut, and have been called into question with conflicting study results or because of a lack of controlled studies to support them. These include:

- Heart disease prevention. A number of epidemiological studies have indicated that vitamin E may prevent heart disease by lowering total blood cholesterol levels and preventing oxidation of LDL cholesterol. However, a large, controlled study known as the Heart Outcomes Prevention Evaluation (HOPE) published in early 2000 indicates that vitamin E does not have any preventative effects against heart disease. The study followed 9,500 individuals who were considered to be at a high risk for heart disease. Half the individuals were randomly chosen to receive vitamin E supplementation, and the other half of the study population received a placebo. After five years,

there was no measurable difference in heart attacks and heart disease between the two patient populations. Still, vitamin E may still hold some hope for heart disease prevention. It is possible that a longer-term study beyond the five years of the HOPE study may demonstrate some heart protective benefits of vitamin E consumption. It is also possible that while the high-risk patient population that was used for the HOPE study did not benefit from vitamin E, an average-risk patient population might still benefit from supplementation. It is also possible that vitamin E needs the presence of another vitamin or nutrient substance to protect against heart disease. Further large, controlled, and long-term clinical studies are necessary to answer these questions.

- Skin care. Vitamin E is thought to increase an individual's tolerance to UV rays when taken as a supplement in conjunction with vitamin C. Vitamin E has also been touted as a treatment to promote faster healing of flesh wounds. While its anti-inflammatory and analgesic properties may have some benefits in reducing swelling and relieving discomfort in a wound, some dermatologists dispute the claims of faster healing, and there are no large controlled studies to support this claim.
- Hot flashes. In a small study conducted at the Mayo Clinic, researchers found that breast cancer survivors who suffered from hot flashes experienced a decrease in those hot flashes after taking vitamin E supplementation.
- Muscle maintenance and repair. Recent research has demonstrated that the antioxidative properties of vitamin E may prevent damage to tissues caused by heavy endurance exercises. In addition, vitamin E supplementation given prior to surgical procedures on muscle and joint tissues has been shown to limit reperfusion injury (muscle damage which occurs when blood flow is stopped, and then started again to tissues or organs).
- Fertility. Vitamin E has been shown to improve sperm function in animal studies, and may have a similar effect in human males. Further studies are needed to establish the efficacy of vitamin E as a treatment for male infertility; as of 2002, its role in such treatment is still controversial.

Preparations

The U.S. recommended dietary allowance (RDA) of the alpha-tocopherol formulation of vitamin E is as follows:

- men: 10 mg or 15 IU
- women: 8 mg or 12 IU
- pregnant women: 10 mg or 15 IU
- lactating women: 12 mg or 18 IU

KEY TERMS

Antioxidants—Enzymes that bind with free radicals to neutralize their harmful effects.

Apoptosis—A process of programmed cell death or cell self-destruction. Vitamin E is thought to induce apoptosis in cancer cells.

Contact dermatitis—Inflammation, redness, and irritation of the skin caused by an irritating substance.

Epidemiological study—A study which analyzes health events and trends in particular patient populations.

Free radicals—Reactive molecules created during cell metabolism that can cause tissue and cell damage like that which occurs in aging and with disease processes such as cancer.

Macular degeneration—Degeneration, or breakdown, of the retina that can lead to partial or total blindness.

Non-heme iron—Dietary or supplemental iron that is less efficiently absorbed by the body than heme iron (ferrous iron).

Reperfusion—The reintroduction of blood flow to organs or tissues after blood flow has been stopped for surgical procedures.

Vitamin A—An essential vitamin found in liver, orange and yellow vegetables, milk, and eggs that is critical for proper growth and development.

Vitamin K—A fat-soluble vitamin responsible for blood clotting, bone metabolism, and proper kidney function.

In April 2000, the National Academy of Sciences recommended changing the RDA for vitamin E to 22 international units (IUs), with an upper limit (UL), or maximum daily dose, of 1500 IUs. Daily values for the vitamin as recommended by the U.S. Food and Drug Administration, the values listed on food and beverage labeling, remain at 30 IUs for both men and women age four and older.

Many nuts, vegetable-based oils, fruits, and vegetables contain vitamin E. Foods rich in vitamin E include **wheat germ** oil (26.2 mg/tbsp), wheat germ cereal (19.5 mg/cup), peanuts (6.32 mg/half cup), soy beans (3.19 mg/cup), corn oil (2.87/tbsp), avocado (2.69 mg), and olive oil (1.68 mg/tbsp). Grapes, peaches, broccoli, Brussels sprouts, eggs, tomatoes, and blackberries are also good sources of vitamin E. Fresh, raw foods contain the highest levels of the

vitamin. Both heat and light can reduce vitamin and mineral potency in fresh foods, so overcooking and improper storage should be avoided. Sliced and chopped foods have more of their surface exposed to light, therefore keeping vegetables and fruits whole may also help to maintain full vitamin potency.

For individuals considered at risk for vitamin E deficiency, or those with an inadequate dietary intake, vitamin E supplements are available in a variety of different forms, including pills, capsules, powders, and liquids for oral ingestion. For topical use, vitamin E is available in ointments, creams, lotions, and oils. Vitamin E is also available commercially as one ingredient of a multivitamin formula.

The recommended daily dosage of vitamin E varies by individual need and by the amount of polyunsaturated fats an individual consumes. The more polyunsaturated fats in the diet, the higher the recommended dose of vitamin E, because vitamin E helps to prevent the oxidizing effects of these fats. Because vitamin E is fat soluble, supplements should always be taken with food.

Supplements are also available in either natural or synthetic formulations. Natural forms are extracted from wheat germ oil and other vitamin E food sources, and synthetic forms are extracted from petroleum oils. Natural formulas can be identified by a "d" prefix on the name of the vitamin (i.e., d-alpha-tocopherol).

Precautions

Overdoses of vitamin E (over 536 mg) can cause **nausea**, **diarrhea**, **headache**, abdominal **pain**, bleeding, high blood pressure, fatigue, and weakened immune system function.

Patients with rheumatic **heart disease**, iron deficiency anemia, **hypertension**, or thyroid dysfunction should consult their healthcare provider before starting vitamin E supplementation, as vitamin E may have a negative impact on these conditions.

Side effects

Vitamin E is well-tolerated, and side effects are rare. However, in some individuals who are **vitamin K** deficient, vitamin E may increase the risk for hemorrhage or bleeding. In some cases, side effects may be decreased or eliminated by adjusting the dosage of vitamin E and vitamin K.

Although the reasons are not yet clear, high intake of vitamin E has been associated with a statistically significant increased risk of **breast cancer** in men.

Vitamin E ointments, oils, or creams may trigger an allergic reaction known as **contact dermatitis**. Individuals who are considering using topical vitamin E preparations for the first time, or who are switching the type of vitamin E product they use, should perform a skin patch test to check for skin sensitivity to the substance. A small, dime sized drop of the product should be applied to a small patch of skin inside the elbow or wrist. The skin patch should be monitored for 24 hours to ensure no excessive redness, irritation, or rash occurs. If a reaction does occur, it may be in response to other ingredients in the topical preparation, and the test can be repeated with a different vitamin E formulation. Individuals who experience a severe reaction to a skin patch test of vitamin E are advised not to use the product topically. A dermatologist or other healthcare professional may be able to recommend a suitable alternative.

Interactions

Individuals who take anticoagulant (blood thinning) or anticonvulsant medications should consult their healthcare provider before starting vitamin E supplementation. Vitamin E can alter the efficacy of these drugs.

It is important for persons taking supplemental vitamin E to tell their surgeon if they are scheduled for an operation. Vitamin E may interact with some of the medications given prior to or during surgery; it has also been shown to increase bleeding time if the patient is taking such other herbal preparations as **feverfew** or gingko biloba.

Non-heme, inorganic iron supplements destroy vitamin E, so individuals taking iron supplements should space out their doses (e.g., iron in the morning and vitamin E in the evening).

Large doses of **vitamin A** can decrease the absorption of vitamin E, so dosage adjustments may be necessary in individuals supplementing with both vitamins.

Alcohol and mineral oil can also reduce vitamin E absorption, and these substances should be avoided if possible in vitamin E deficient individuals.

Resources

BOOKS

Reavley, Nocola. *The New Encyclopedia of Vitamins, Min erals, Supplements, and Herbs*. New York: M. Evans & Company, 1998.

PERIODICALS

Bolle, P., M. G. Evandri, and L. Saso. "The Controversial Efficacy of Vitamin E for Human Male Infertility." *Contraception* 65 (April 2002): 313 315.

Bonner, L. T., and E. R. Peskind. "Pharmacologic Treatments of Dementia." *Medical Clinics of North America* 86 (May 2002): 657 674.
Collins, S. C., R. G. Dufresne Jr. "Dietary Supplements in the Setting of Mohs Surgery." *Dermatologic Surgery* 28 (June 2002): 447 452.
Engelhart, M. J., M. I. Geerlings, A. Ruitenberg, et al. "Dietary Intake of Antioxidants and Risk of Alzheimer Disease." *Journal of the American Medical Association* 287 (June 26, 2002): 3261 3263.
Johnson, K. C., S. Pan, and Y. Mao. "Risk Factors for Male Breast Cancer in Canada, 1994 1998." *European Journal of Cancer Prevention* 11 (June 2002): 253 263.
Pinelli, A., S. Trivulzio, L. Tomasoni, et al. "High Dose Vitamin E Lowers Urine Porphyrin Levels in Patients Affected by Porphyria Cutanea Tarda." *Pharmacological Research* 45 (April 2002): 355 359.
Prasad, K. N., W. C. Cole, B. Kumar, and K. Che Prasad. "Pros and Cons of Antioxidant Use During Radiation Therapy." *Cancer Treatment Review* 28 (April 2002): 79 91.
Sytze Van Dam, P. "Oxidative Stress and Diabetic Neuropathy: Pathophysiological Mechanisms and Treatment Perspectives." *Diabetes/Metabolism Research and Reviews* 18 (May June 2002): 176 184.
"Vitamin E: E for Exaggerated?" *Harvard Health Letter* 25, no. 5 (March 2000): 6(3p).
Yu, A., P. Somasundar, A. Balsubramaniam, et al. "Vitamin E and the Y4 Agonist BA 129 Decrease Prostate Cancer Growth and Production of Vascular Endothelial Growth Factor." *Journal of Surgical Research* 105 (June 1, 2002): 65 68.

ORGANIZATIONS

American Dietetic Association. 216 West Jackson Blvd., Chicago, IL 60606. (312) 899 0040. http://www.eatright.org.
United States Department of Agriculture. Center for Nutrition Policy and Promotion. 1120 20th Street NW, Suite 200, North Lobby, Washington, D.C. 20036. (202) 418 2312. http://www.usda.gov/cnpp.
United States Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov.

Paula Ford-Martin
Rebecca J. Frey, PhD

Vitamin H *see* **Biotin**

Vitamin K

Description

Vitamin K originates from the German term *koajulation*. It is also known as antihemorrhagic factor and is one of the four fat-soluble vitamins necessary for good health. The others are vitamins A, D, and E. The primary and best-known purpose of vitamin K is support of the process of blood clotting. Prothrombin and other clotting factors are dependent on vitamin K for production. It also plays a role in bone health, and may help to prevent **osteoporosis**. Appropriate growth and development are supported by adequate vitamin K.

There are several forms of the vitamin:

- K_1 or phylloquinone; also known as phytonadione
- K_2, a family of substances called menaquinones
- K_3 or menadione, a synthetic form of this vitamin

Adequate intake of vitamin K

Age	mcg/day
Children 0-6 mos.	2
Children 7-12 mos.	2.5
Children 1-3 yrs.	30
Children 4-8 yrs.	55
Children 9-13 yrs.	60
Children 14-18 yrs.	75
Men ≥ 19 yrs.	120
Women ≥ 19 yrs.	90
Pregnant women ≤18 yrs.	75
Breastfeeding women ≤18 yrs.	75
Pregnant women ≥19 yrs.	90
Breastfeeding women ≥19 yrs.	90

Foods that contain vitamin K	mcg
Kale, cooked, 1/2 cup	530
Spinach, cooked, 1/2 cup	445
Swiss chard, cooked, 1/2 cup	285
Turnip greens, cooked, 1/2 cup	265
Parsley, fresh, 2 tbsp.	120
Brussel sprouts, cooked, 1/2 cup	110
Broccoli, cooked, 1/2 cup	77
Asparagus, cooked, 1/2 cup	46
Celery, raw, 1/2 cup	18
Carrots, raw, 1/2 cup	8
Milk, 2%, 1 cup	5
Miso, 1 oz.	4

mcg = microgram

(Illustration by GGS Information Services. Cengage Learning, Gale)

General use

The Required Daily Amount (RDA) of vitamin K is 5 micrograms (mcg) for infants less than six months

old, 10 mcg for babies six months to one year old, 15 mcg for children aged one to three years, 20 mcg for those aged four to six years, and 30 mcg for those seven to ten years old. Males require 45 mcg from 11–14 years, 65 mcg from 15–18 years, 70 mcg from 19–24 years, and 80 mcg after the age of 24 years. Females need 45 mcg from 11–14 years, 55 mcg from 15–18 years, 60 mcg from 19–24 years, and 65 mcg after the age of 24, and for pregnant or lactating women. These values are based on an estimate of 1 mcg of vitamin K per kilogram of body weight.

The most common use of vitamin K is to supplement babies at birth, thus preventing hemorrhagic disease of the newborn. Routine administration of vitamin K to newborns is, however, being questioned by practitioners of evidence-based nursing. In 2003 the American Academy of Pediatrics (AAP) restated that prevention of bleeding from early vitamin K deficiency by administration of the vitamin is accepted practice. The AAP also noted that a possible link between supplemental vitamin K and early childhood **cancer** has not been proven as of 2003.

Others who may benefit from supplemental vitamin K include those taking medications that interact with the vitamin or deplete its supply. It also appears to have some effectiveness in preventing osteoporosis, but some studies done involved patients using a high dietary intake of the vitamin rather than supplements. In 2003, however, a group of Japanese researchers reported that supplemental doses of vitamin K_2 given together with vitamin D_3 appeared to reduce bone turnover and sustain bone density in postmenopausal women with mild osteoporosis.

People taking warfarin, a vitamin K antagonist, are able to use the vitamin as an antidote if the serum level of warfarin is too high, increasing the risk of hemorrhage. Vitamin K taken by mouth appears to be more effective than intramuscular injections of the vitamin when it is used to counteract the effects of warfarin.

Vitamin K is also used to treat bleeding from the esophagus and other complications of **cirrhosis**, a disease of the liver.

Some women find that supplemental vitamin K relieves the symptoms of **morning sickness** during **pregnancy**. This treatment is even more effective if vitamin K is taken together with **vitamin C**.

Topical formulations of vitamin K are sometimes touted as being able to reduce spider veins on the face and legs. The creams are quite expensive and the efficacy is questionable at best. However, recent clinical studies have shown that topical applications of vitamin K given to patients following laser treatments on the face are effective in minimizing bruising from the procedure.

More recently, researchers have been studying vitamin K intensively for its potential anticancer effects. Vitamin K_3 in particular may be useful as an adjuvant treatment for **ovarian cancer**.

KEY TERMS

Adjuvant—Auxiliary or supplementary. An adjuvant treatment is one given to aid or assist the effects of other forms of therapy.

Anticoagulant—Substance that inhibits clotting, used therapeutically for such things as stroke prevention in susceptible people.

Bilirubin—When gathered in large amounts, this water-insoluble pigment occurs in bile and blood.

Hemolytic anemia—A blood disorder characterized by destruction of red blood cells.

Hemorrhage—Excessive bleeding.

Phylloquinone—An alternate name for vitamin K_1.

Phytonadione—Another name for vitamin K_1. It is the form of vitamin K most often used to treat patients on anticoagulant therapy.

Prothrombin—One protein component of the cascade reaction which results in clot formation.

Topical—A type of medication that is applied to the skin or other outer surface of the body.

Preparations

Natural sources

Dark green leafy vegetables are among the best food sources of vitamin K in the form of K_1. Seaweed is packed with it, and beef liver, cauliflower, eggs, and strawberries are rich sources as well. Vitamin K is fairly heat-stable, but gentle cooking preserves the content of other nutrients that are prone to breaking down when heated. Some of the supply for the body is synthesized as vitamin K_2 by the good bacteria in the intestines.

Supplemental sources

Vitamin K is not normally included in daily multivitamins, as deficiency is rare. Oral, topical, and injectable forms are available, but should not be used except under the supervision of a health care provider. Injectable forms are by prescription only. Supplements are

generally given in the form of phytonadione since it is the most effective form and has a lower risk of toxicity than other types. Synthetic forms of vitamin K are also available for supplemental use.

Deficiency

Deficiency of vitamin K is uncommon in the general population but is of particular concern in neonates, who are born with low levels of vitamin K. Hemorrhagic disease of the newborn can affect infants who do not receive some form of vitamin K at birth. Affected babies tend to have prolonged and excessive bleeding following circumcision or blood draws. In the most serious cases, bleeding into the brain may occur. Most commonly an injection of vitamin K is given in the nursery following birth, but a series of oral doses is also occasionally used. The primary sign of a deficiency at any age is bleeding, and poor growth may also be observed in children.

Chronically low levels of vitamin K are correlated with higher risk of hip fracture in older men and women. A study done in 2003 reported that the current recommended dietary intake for vitamin K in adults may not be adequate for older women.

Risk factors for deficiency

Vitamin K deficiency is unusual, but may occur in certain populations, including those on the medications mentioned in interactions, alcoholics, and people with diseases of the gastrointestinal tract that impair absorption. Conditions that may be problematic include **Crohn's disease**, chronic **diarrhea**, sprue, and ulcerative **colitis**. Anything that impairs fat absorption also risks decreasing the absorption of the fat-soluble vitamins. Long term use of broad spectrum antibiotics destroys the bacteria in the intestinal tract that are necessary for the body's production of vitamin K.

Precautions

Allergic reactions to vitamin K supplements can occur, although they are rare. Symptoms may include flushed skin, **nausea**, rash, and **itching**. Medical attention should be sought if any of these symptoms occur. Infants receiving vitamin K injections occasionally suffer hemolytic **anemia** or high bilirubin levels, noticeable from the yellow cast of the skin. Emergency medical treatment is needed for these babies. Liver and brain impairment are possible in severe cases.

Certain types of liver problems necessitate very cautious use of some forms of vitamin K. Menadiol **sodium** diphosphate, a synthetic form also known as vitamin K_4, may cause problems in people with biliary fistula or obstructive **jaundice**. A particular metabolic disease called G6-PD deficiency also calls for careful use of vitamin K_4. The expertise of a health care professional is called for under these circumstances. Sheldon Saul Hendler, MD, PhD, advises there is no reason to supplement with more than 100 mcg daily except in cases of frank vitamin K deficiency.

Side effects

Oral forms of vitamin K_4 may occasionally irritate the gastrointestinal tract. High doses greater than 500 mcg daily have been reported to cause some allergic-type reactions, such as skin **rashes**, itching, and flushing.

Interactions

There are numerous medications that can interfere with the proper absorption or function of vitamin K. The long-term use of antacids may decrease the efficacy of the vitamin, as can certain anticoagulants. Warfarin is an anticoagulant that antagonizes vitamin K. Efficacy of the vitamin is also decreased by dactinomycin and sucralfate. Absorption is decreased by cholestyramine and colestipol, which are drugs used to lower blood **cholesterol** levels. Other drugs that may cause a deficiency include long-term use of mineral oil, quinidine, and sulfa drugs. Primaquine increases the risk of side effects from taking supplements.

Other types of prescription medications that may cause vitamin K depletion include anticonvulsants (drugs to prevent seizures), including valproic acid; macrolide, aminoglycoside, cephalosporin, and fluoroquinolone antibiotics; phenobarbital; and dapsone (used to treat leprosy and skin **infections**).

Resources

BOOKS

Bratman, Steven, and David Kroll. *Natural Health Bible*. Rocklin, CA: Prima Publishing, 1999.

Griffith, H. Winter. *Vitamins, Herbs, Minerals & Supplements: The Complete Guide*. AZ: Fisher Books, 1998.

Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehensive Database*. CA: Therapeutic Research Faculty, 1999.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine, Part I: Food for Thought*. New York: Simon & Schuster, 2002.

Pressman, Alan H., and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: Alpha Books, 1997.

PERIODICALS

American Academy of Pediatrics Committee on Fetus and Newborn. "Controversies Concerning Vitamin K and the Newborn. American Academy of Pediatrics Com mittee on Fetus and Newborn." *Pediatrics* 112 (July 2003) (1 Pt 1): 191 192.

Booth, S. L., L. Martini, J. W. Peterson, et al. "Dietary Phylloquinone Depletion and Repletion in Older Women." *Journal of Nutrition* 133 (August 2003): 2565 2569.

Crowther, M. A., J. D. Douketis, T. Schnurr, et al. "Oral Vitamin K Lowers the International Normalized Ratio More Rapidly Than Subcutaneous Vitamin K in the Treatment of Warfarin Associated Coagulopathy. A Randomized, Controlled Trial." *Annals of Internal Medicine* 137 (August 20, 2002): 251 254.

Iwamoto, J., T. Takeda, and S. Ichimura. "Treatment with Vitamin D_3 and/or Vitamin K_2 for Postmenopausal Osteoporosis." *Keio Journal of Medicine* 52 (September 2003): 147 150.

Lamson, D. W., and S. M. Plaza. "The Anticancer Effects of Vitamin K." *Alternative Medicine Review* 8 (August 2003): 303 318.

Libby, E. N., and D. A. Garcia. "A Survey of Oral Vitamin K Use by Anticoagulation Clinics." *Archives of Internal Medicine* 162 (September 9, 2002): 1893 1896.

Lucena, M. I., R. J. Andrade, G. Tognoni, et al. "Multi center Hospital Study on Prescribing Patterns for Pro phylaxis and Treatment of Complications of Cirrhosis." *European Journal of Clinical Pharmacology* 58 (September 2002): 435 440.

Medves, J. M. "Three Infant Care Interventions: Reconsi dering the Evidence." *Journal of Obstetric, Gynecologic, and Neonatal Nursing* 31 (September October 2002): 563 569.

Shah, N. S., M. C. Lazarus, R. Bugdodel, et al. "The Effects of Topical Vitamin K on Bruising After Laser Treat ment." *Journal of the American Academy of Dermatol ogy* 47 (August 2002): 241 244.

von Gruenigen, V. E., J. M. Jamison, J. Gilloteaux, et al. "The in vitro Antitumor Activity of Vitamins C and K_3 Against Ovarian Carcinoma." *Anticancer Research* 23 (July August 2003): 3279 3287.

ORGANIZATIONS

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847) 434 4000. http://www.aap.org.

American Society for Clinical Nutrition. 9650 Rockville Pike, Bethesda, MD 20814. (301) 530 7110. http://www.faseb.org/ascn.

American Society of Hematology (ASH). 1900 M Street, NW, Suite 200, Washington, DC 20036. (202) 776 0544. http://www.hematology.org.

Judith Turner
Rebecca J. Frey, PhD

Vitex *see* **Chasteberry tree**

Vomiting

Definition

Vomiting is the forceful discharge of stomach contents through the mouth.

Description

Vomiting, also called emesis, is a symptomatic response to any number of harmful triggers. Vomiting is a forceful expulsion, and is different from regurgitation—the effortless return of stomach contents to the mouth. Although unpleasant, vomiting is an important function because it rids the body of harmful substances.

Vomiting is a complex process resulting from the coordinated interaction of nerve pathways, the brain, and muscles of the gastrointestinal system. The primary vomiting trigger point in the brain is called the area postrema. This structure is exposed to chemicals in the blood stream and the cerebrospinal fluid (the fluid found in the brain and spinal cord). Scientific studies have shown that stimulation of the area postrema by a wide variety of drugs as well as bacterial toxins, radiation, and physiologic conditions, induces vomiting.

Certain nerve pathways (called afferent neural pathways) induce vomiting when triggered by motion, ear **infections** or tumors, **Ménière's disease** (a disease characterized by recurrent vertigo), odors, visual stimulation, **pain**, and bad tastes. Still other nerve pathways (peripheral afferent neural pathways) induce vomiting in response to stomach irritants, distension of the intestines and bile ducts, abdominal inflammation, and myocardial infarction (**heart attack**).

The physical act of vomiting is controlled by multiple sites of the brain stem. When activated, these structures send signals to the throat, diaphragm, and abdominal muscles. These signals result in the simultaneous contraction of these muscles which brings the stomach contents up through the esophagus (the tube between the stomach and the throat) and out the mouth. During vomiting, breathing is inhibited, except for short breaths between discharges. Bradycardia (decrease in the heart rate) and changes in blood pressure may occur during retching and vomiting.

Causes and symptoms

Vomiting can be caused by many different things. Vomiting that lasts only one or two days is usually

KEY TERMS

Area postrema—A structure of the brain stem that triggers vomiting in response to toxins in the bloodstream and cerebrospinal fluid.

Emesis—The medical term for vomiting.

Retching—The coordinated contraction of muscles as for vomiting but without the discharge of stomach contents.

Vomitus—The medical term for the contents of the stomach expelled during vomiting.

caused by infection, a reaction to medication, a toxin, uremia (accumulation of protein breakdown products in the bloodstream), and diabetic ketoacidosis (accumulation of toxins resulting from uncontrolled diabetes). Vomiting that lasts longer than one week can be caused by a long-term medical or psychiatric condition. Causes of vomiting include:

- Medications. Drugs are the most common cause of vomiting, especially during the first days of use. Drugs can induce vomiting by stimulation of the area postrema or by direct stimulation of peripheral nerve pathways. Medications that commonly cause vomiting include cancer drugs, pain relievers (especially opioids), heart medications, diuretics, hormones, antibiotics, antiasthmatics, gastrointestinal drugs, and medications that act on the brain.
- Infections. Infections of the gastrointestinal system or whole body can cause vomiting. Gastrointestinal infections are more common in infants, toddlers, and young adults (20–29 years old) who usually get 1.2 infections each year. Infections that can cause vomiting include bacterial, viral, and parasitic gastrointestinal infections, severe acute respiratory syndrome (SARS), otitis media (ear infection), meningitis (infection of the membrane that surrounds the brain and spinal cord), and hepatitis (infection of the liver).
- Gastrointestinal and abdominal disorders. Disorders of the gastrointestinal system that can produce vomiting include blockage of the stomach or small intestine, motility disorders (muscles in the esophagus become discoordinated or weak, causing difficulty swallowing, regurgitation, and sometimes pain), indigestion, radiation therapy-induced changes, Crohn's disease (chronic recurrent inflammation of the intestines), peptic ulcer, worm infestations, or inflammation of the appendix, gall bladder, or pancreas.
- Nervous system disorders. Cancers, infarction (an area of dead tissue caused by an obstruction in the artery supplying the area), bleeding (hemorrhage), birth defects, ear disorders, motion sickness, weightlessness, ear tumors, Ménière's disease, unpleasant memories, psychogenic (caused by mental factors) vomiting, and bad tastes or smells can all cause vomiting.
- Hormones and physiological conditions. Hormonal and metabolic (physical and chemical processes of the body) conditions that can cause vomiting include: parathyroidism, diabetic ketoacidosis, hyperthyroidism (condition caused by excessive ingestion or production of thyroid hormone), Addison's disease, uremia, and pregnancy. Pregnancy is the most common cause of vomiting associated with the hormonal system. Vomiting associated with pregnancy is often called morning sickness.
- Postoperation. Anesthesia and pain medications can cause nausea and vomiting, which are complications associated with 17–39% of surgeries.
- Cyclic vomiting syndrome (CVS). This rare disorder occurs in children usually beginning at age five years, although it also occurs in adults. It is characterized by, on average, eight attacks of vomiting lasting for 20 hours each year. Although the exact cause is unknown, there seems to be a relationship between cyclic vomiting and migraine headaches.
- Poisons. Arsenic and other heavy metals, weed killers and household cleaning agents, and many other substances may cause vomiting if inhaled or swallowed.
- Miscellaneous causes. Excessive alcohol consumption causes vomiting by acting both on the gastrointestinal tract and the brain.

Nausea is often associated with vomiting. Vomiting may be preceded by retching, in which the muscles contract as for vomiting but without the discharge of stomach contents. The patient may hyperventilate (rapid, deep breathing) and salivate before vomiting begins. Patients should consult a physician immediately if there is blood in the vomitus (expelled stomach contents).

Other symptoms associated with vomiting depend upon the cause. Gastrointestinal infection would also cause **fever**, muscle pain, and **diarrhea**. Patients with peptic ulcer, intestinal blockage, cholecystitis, or **pancreatitis** (inflammation of the gall bladder or pancreas) would experience abdominal pain. **Meningitis** symptoms include neck stiffness, **headache**, vision changes, and changes in mental processes.

Diagnosis

Vomiting may be diagnosed by an internal medicine specialist or a gastroenterologist. A detailed medical history will be taken and will include specifics

about the vomiting including frequency, a description of the vomitus, duration, how soon after meals vomiting occurs, and any other symptoms. The history alone can help the physician to narrow down the possible causes. The patient's abdomen will be palpated (felt with the hands) to detect any abnormalities. Vital signs will be taken to identify any abnormalities in heart rate, blood pressure, or temperature.

Although the medical history and physical exam is usually sufficient to determine the cause of vomiting, certain laboratory tests may also be performed. Blood tests may be performed to check for dehydration (decreased water), **anemia** (decreased number of red blood cells or iron-poor blood), and electrolyte (blood chemicals) imbalances, as well as specific tests to confirm the suspected diagnosis.

In some cases, more advanced testing may be required. These include x rays, endoscopy (a thin, wand-like camera used to visualize internal organs), magnetic resonance imaging (MRI), ultrasound (using sound waves to visualize internal organs), and computed tomography (CT) scanning. In addition, there are tests that measure stomach emptying and the pressure and motility of the stomach and intestine.

Treatment

Alternative treatments can be effective in treating vomiting, but not the underlying cause. A physician should be consulted if vomiting is recurrent and/or lasts for more than a few days.

Dietary changes

The best dietary approach is to eat foods that can be quickly cleared from the stomach. Foods that are high in fat are slow to digest and place the patient at risk for additional vomiting. Ingestion of a low-fat, predominately liquid diet taken in frequent small meals can help relieve vomiting. Dry soda crackers are a good choice when nausea sets in. After vomiting, the patient should not eat for one hour, after which small servings of broth, bread, or flat soda may be eaten. It is important to replenish the fluids lost by vomiting. Juice therapists recommend drinking a juice made from fresh **ginger**, apples, and carrots. Supplementation with vitamin B_6 was found to reduce the symptoms of **morning sickness** in pregnant women.

Herbals

The herbs that are effective in relieving nausea and vomiting include:

- apple tree (*Pyrus malus*) bark tea
- bergamot (*Monarda citriodora*) tea
- black horehound (*Ballota nigra*) infusion
- codonopsis (*Codonopsis pilosula*) decoction
- galangal (*Alpinia officinarum*) infusion
- ginger (*Zingiber officinale*) infusion or crystallized
- lemongrass (*Cymbogen citratus*) oil or tea
- nutmeg (*Myristica fragrans*) capsules
- turmeric (*Curcuma longa*) infusion

Chinese medicine

Practitioners of **traditional Chinese medicine** use **acupuncture**, ear acupuncture, herbals, and patent medicines in the treatment of vomiting. The following herbals may be made into soups which are sipped frequently: Lu Gen (*Rhizoma phragmitis*); Zhu Ru (*Caulis bambusae in taeniis*), Bai Mao Gen (*Rhizoma imperatae*), and Pi Pa Ye (*Folium eriobotryae*); and Huo Xiang (*Herba agastachis*) and Pei Lan (*Herba eupatorii*). Placing a drop of Sheng Jiang (*Rhizoma zingiberis recens*) on the tongue can check vomiting. Patent medicines used to treat vomiting include: Huo Xiang Zheng Qi Wan (**Agastache** Pill to Rectify Qi), Yu Shu Dan (Jade Pivot Pill), Zuo Jin Wan (Left Metal Pill), and Bao He Wan (Preserve Harmony Pill).

Homeopathy

Homeopathic remedies are chosen based upon the specific set of symptoms displayed by the patient. **Ipecac** is chosen for strong nausea and vomiting. Bismuth or Phosphorous is indicated when vomiting is caused primarily by liquids. Nux vomica is recommended when vomiting is caused by emotional **stress** and for patients with **heartburn**, nausea, and retching. Tabacum is indicated for vomiting caused by motion. Veratrum album is indicated for the patient with nausea, vomiting, and diarrhea. Arsenicum is recommended for the patient with violent vomiting, diarrhea, abdominal pain, exhaustion, restlessness, and thirst. **Bryonia** is recommended for **gastroenteritis** (inflammation of the lining of the gastrointestinal system).

Ayurveda

Ayurvedic practitioners believe that vomiting is caused by high pitta in the stomach. Remedies for vomiting are:

- yogurt containing cardamon and honey
- warm milk containing cardamon and nutmeg
- tea prepared from cumin seeds and nutmeg
- fresh pineapple juice (1 cup with a pinch of ginger and black pepper and 0.5 tsp sugar) three times during a day of fasting

- water containing 10 drops lime juice, 0.5 tsp sugar, and 0.25 tsp baking soda
- cardamon seeds (chewed)
- ginger juice and onion juice (1 tsp each)
- water containing rose petal powder (0.5 tsp), sandalwood powder (0.25 tsp), rock candy powder (0.5 tsp), and lime juice (10 drops)

Other treatments

Various other treatments for vomiting include:

- Aromatherapy. The essential oil of peppermint is a traditional cure for vomiting.
- Acupressure. The acupressure points P5 and P6 located on the inner forearms are effective in treating vomiting. A wristband (Sea-Band) has been proven to be effective in reducing nausea and vomiting.
- Acupuncture. A National Institutes of Health consensus panel found that acupuncture is an effective treatment for chemotherapy and postoperative vomiting. A few people, however, experience nausea as a side effect of acupuncture.
- Behavioral interventions. Behavioral therapies such as desensitization, distraction, imagery, relaxation, and self-hypnosis have been shown to be effective in treating chemotherapy-induced vomiting.
- Hydrotherapy. Stomach upsets may be treated by drinking a glass of water containing activated charcoal powder.
- Reflexology. The reflex points solar plexus, chest, lung, diaphragm, esophagus, liver, stomach, gallbladder and thyroid, and pituitary and adrenal gland on the feet may help treat vomiting.
- Transcutaneous electrical nerve stimulation (TENS, which is a treatment where a mild electrical current is passed through electrodes on the skin to stimulate nerves and block pain signals). TENS can be effective in reducing postoperative vomiting.

Allopathic treatment

Treatment of vomiting depends upon the cause and severity but may include dietary changes, medications, and surgery. Replacement of lost fluids is an important component of treatment. Hospitalization may be required in some cases. Surgery may be needed to treat inflammatory conditions (such as cholecystitis) and physical abnormalities (such as blockage).

Medications used to treat vomiting are called antiemetics. Scopolamine, dimenhydrinate (Dramamine), and hyoscine are used to treat **motion sickness**; promethazine (Mepergan, Phenergan) is used to treat postoperative nausea; meclizine (Antivert, Bonine) is used to treat inner ear inflammation; and prochlorperazine (Compazine) is used for gastroenteritis, postoperative toxins, radiation, medications, and others. Other medications that target the underlying cause of the vomiting may be used.

Newer drugs that have been developed to treat postoperative or postchemotherapy nausea and vomiting include ondansetron (Zofran) and granisetron (Kytril). Another treatment that has been found to lower the risk of nausea after surgery is intravenous administration of supplemental fluid before the operation.

Expected results

Most cases of vomiting resolve spontaneously. Complications of vomiting include dehydration, malnutrition, weight loss, and abnormalities of blood chemicals (including electrolytes, pH, and **potassium**). Vomiting by unconscious patients can lead to aspiration (inhalation of stomach contents) which can affect the lungs.

Prevention

Antiemetic drugs are effective at preventing vomiting. Some alternative treatments are effective at reducing nausea which may prevent vomiting.

Resources

BOOKS

Cummings, Stephen and Dana Ullman. *Everybody's Guide to Homeopathic Medicines: Safe and Effective Remedies for You and Your Family*. 3rd. edition. New York, NY: Jeremy P. Tarcher/Putnam, 1997.

"Functional Vomiting." Section 3, Chapter 21 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Hasler, William L. "Approach to the Patient with Nausea and Vomiting." *Textbook of Gastroenterology*. 3rd edi tion, edited by Tadataka Yamada, et al. Philadelphia, PA: Lippincott Williams & Wilkins, 1999.

Reichenberg Ullman, Judyth, and Robert Ullman. *Homeo pathic Self Care: The Quick and Easy Guide for the Whole Family*. Rockland, CA: Prima Publishing, 1997.

Ying, Zhou Zhong, and Jin Hui De. Vomiting. *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Ali, S. Z., A. Taguchi, B. Holtmann, and A. Kurz. "Effect of Supplemental Pre Operative Fluid on Postoperative Nausea and Vomiting." *Anaesthesia* 58 (August 2003): 780 784.

Cepeda, M. S., J. T. Farrar, M. Baumgarten, et al. "Side Effects of Opioids During Short Term Administration:

Effect of Age, Gender, and Race." *Clinical Pharmacology and Therapeutics* 74 (August 2003): 102 112.
Chung, A., L. Bui, and E. Mills. "Adverse Effects of Acupuncture. Which Are Clinically Significant?" *Canadian Family Physician* 49 (August 2003): 985 989.
O'Brien, C. M., G. Titley, and P. Whitehurst. "A Comparison of Cyclizine, Ondansetron and Placebo as Prophylaxis Against Postoperative Nausea and Vomiting in Children." *Anaesthesia* 58 (July 2003): 707 711.
Quinla, J. D., and D. A. Hill. "Nausea and Vomiting of Pregnancy." *American Family Physician* 68 (July 1, 2003): 121 128.
Ratnaike, R. N. "Acute and Chronic Arsenic Toxicity." *Postgraduate Medical Journal* 79 (July 2003): 391 396.
Tan, M. "Granisetron: New Insights Into Its Use for the Treatment of Chemotherapy Induced Nausea and Vomiting." *Expert Opinion in Pharmacotherapy* 4 (September 2003): 1563 1571.
Tiwari, A., S. Chan, A. Wong, et al. "Severe Acute Respiratory Syndrome (SARS) in Hong Kong: Patients' Experiences." *Nursing Outlook* 51 (September October 2003): 212 219.
Walling, Anne D. "Ginger Relieves Nausea and Vomiting During Pregnancy." *American Family Physician* 64 (November 15, 2001): 1745.

ORGANIZATIONS

American Gastroenterological Association (AGA). 7910 Woodmont Ave., 7th Floor, Bethesda, MD 20814. (310) 654 2055. http://www.gastro.org/index.html. aga001@aol.com.

Belinda Rowland
Rebecca J. Frey, PhD

Vulvovaginitis *see* **Vaginitis**

W

Warts

Definition

Warts, also called verrucae, are small benign growths usually caused by a viral infection of the skin or mucous membrane. The virus infects the surface layer of skin. The viruses that cause warts are members of the human papilloma virus (HPV) family, of which there are many different strains. Warts are not cancerous but some strains of HPV, usually not associated with warts, have been linked with **cancer** formation. Warts are contagious from person to person and from one area of the body to another on the same person.

Description

Particularly common among children, young adults, and women, warts are a problem for 7–10% of the population. There are close to 60 types of HPV that cause warts, each preferring a specific skin location. For instance, some types of HPV cause warts to grow on the skin, others cause them to grow inside the mouth, while still others cause them to grow on the genital and rectal areas. However, most can be active anywhere on the body. The virus enters through the skin and produces new warts after an incubation period of one to eight months. Warts are usually skin colored and feel rough to the touch, but they also can be dark, flat, and smooth.

Warts are passed from person to person, directly and indirectly. Some people are continually susceptible to warts, while others are more resistant to HPV and seldom get them. The virus takes hold more readily when the skin has been damaged in some way, which may explain why children who bite their nails tend to have warts located on their fingers. People who take a medication to suppress their immune system or are on long-term steroid use are also prone to a wart virus infection. The same is true for patients with **AIDS**.

The main categories of warts are common warts (face and hands) plantar warts (feet) and venereal warts.

Hand warts (verruca vulgaris) can grow anywhere on the hands, but usually occur where skin has been damaged in some way (e.g. picking or nail biting). This is a rough horny lesion varying in size from 1 mm–2 cm in diameter.

Foot warts (verruca plantaris) known as plantar warts, are the most painful type of wart, due to the pressure exerted on them. They are most common in children and young adults, since they are often contracted in locker rooms and swimming pool areas. If left untreated, they can grow to an inch or more in circumference and spread into clusters. Those suffering from diabetes are more likely to suffer from plantar warts, and may also suffer complications, due to the reduced potential for their bodies to heal themselves.

Flat warts tend to grow in great numbers and are smaller and smoother than other warts. They can erupt anywhere, appearing more frequently on the legs of women, the neck and dorsum of the hands, the faces of children, and on the areas of the face that are shaved by young adult males.

Genital warts also called condylomata acuminata, moist warts, fig warts, or venereal warts, are one of the most common sexually transmitted diseases (STDs). Genital warts are more contagious than other types of warts. Approximately one million new cases of genital warts are diagnosed in the United States every year. It is estimated that two-thirds of persons coming into contact with genital warts will develop symptoms within three months.

Genital warts tend to be small flat bumps or they may be thin and pointed in shape. They are usually soft, moist, pink to red in color, occurring as a single lesion or in clusters that resemble a cauliflower, and not scaly like other warts. In women, genital warts appear on the external genitalia, within the vagina, on the cervix, and around the anus or within the

Warts on the thumb. *(© Medical-on-Line / Alamy)*

rectum. In men, genital warts usually appear on the tip of the penis but may also be found on the scrotum or around the anus. Genital warts can also develop in the mouth of a person who has had oral sexual contact with an infected person. They may also appear, less often, between the toes.

Filiform wart is a long, horny, finger-like projection that is usually found in multiples. Seen most commonly in adult males, they occur in the bearded area of the face or on the eyelids and neck.

Causes and symptoms

Since warts are caused by a virus, they can only be caught by contact with a source of infection. This can be direct physical contact or secondary contact with the shed skin of a wart (through a floor or a towel for example). As the incubation period for warts is quite long, it is often difficult to pinpoint sources of infection. Individuals whose immune systems are deficient most often contract warts. AIDS patients commonly suffer from warts, and it is not uncommon for warts to appear at the site of a trauma (**burns**, **cuts**, abrasions, etc).

KEY TERMS

Condyloma acuminata (plural, condylomata)—The medical term for warts in the genital region or anus.

Cryotherapy—A technique of removing warts by freezing with liquid nitrogen.

Epidermis—The outer layer of human skin.

Human papilloma virus—A family of viruses that causes hand warts, foot warts, flat warts, and genital warts.

Salicylic acid—An agent prescribed in the treatment of hyperkeratotic skin conditions and fungal infections.

Verruca (plural, verrucae)—The medical term for warts.

Diagnosis

Common warts are rough, irregular, skin colored or brownish. Warts that are brownish in color, or that do not respond to treatment, should be checked by a physician to exclude the possibility that they may be malignant growths.

Treatment

Warts may need no treatment at all, since a large proportion of them (67% over a two-year period) disappear spontaneously. This is particularly so in the case of flat warts. However, a wart that appears unusual in any way should be checked by a physician, as a small proportion can become malignant. Generally, the main criterion for treatment of warts is a cosmetic one, if it is found to be embarrassing by the sufferer or unpleasant to others.

Acupuncture

The aim with **acupuncture** will be to raise the general well being of the patient, improve the functioning of the immune system, and free blockages of "chi" or life force. Warts and other health problems will be less likely to occur as general health and resistance are improved.

Aromatherapy

Since warts are caused by viral **infections**, the aim of an **aromatherapy** treatment would be to kill the

virus with the application of an appropriate essential oil. There are many oils that have antiviral properties, so the therapist will also endeavor to choose oils that are appropriate for the patient. Onion and **garlic** oils both have powerful antiviral properties, but perhaps **tea tree oil**, which also possesses remarkable anti-viral properties, might be more acceptable as far as smell is concerned.

Colloidal silver

The use of **colloidal silver** against viruses of all kinds has proved very successful. It should be topically applied to the wart, but can be taken internally to promote functioning of the immune system, and thus prevent warts from occurring.

Herbal medicine

Herbal remedies for genital warts and other STDs have attracted considerable recent attention because of the epidemic spread of these diseases in developing countries where most people cannot afford allopathic treatments. One traditional herbal remedy from Colombia that is being studied is extracts of plants belonging to the Euphorbia family. These compounds have been used to treat ulcers, tumors, and warts for generations, and some of them appear to be effective in treating genital warts.

Before applying any herbal cure to a wart, as much of the wart as possible should be removed, in order to give the cure a head start.

- Apple juice: Apply the juice of a sour apple. Action is due to the **magnesium** in the juice.
- Banana skin: First the wart should be rubbed with an abrader and a fresh banana skin (immediately after opening) should be applied and left overnight.
- Cabbage: Apply fresh juice from a white cabbage.
- **Chickweed**: Apply the juice to the wart.
- **Dandelion**: The juice of the dandelion is a very old English cure for warts.
- Garlic: A raw clove rubbed on the wart every night until it disappears.
- Green figs: The white milk from a green fig is excellent at removing warts.
- House leek: This is a plant commonly found in rock gardens. It has thick fleshy leaves and its juice is rich in supermalate of **calcium**, which will destroy warts.
- Pineapple: Cotton wool should be soaked in the fresh juice of a pineapple. The enzymes of the pineapple will dissolve the wart.
- Rubber plant: If you take a leaf from a rubber plant and break its stem, white liquid will ooze out. If this is applied to the wart over a period of two to three days, the wart should disappear.

Naturopathy

Naturopathy, as with many alternative therapies, works on the principle that given the right circumstances, such as pure air, pure water, and good **nutrition**, the body will heal itself and become extremely resistant to illness. Naturopaths believe that symptoms such as warts are the result of toxins in the body and an immune system that is not running efficiently. They may prescribe treatments such as **colonic irrigation** with a program of healthy eating to raise the general level of health. A naturopath may suggest a paste made with **vitamin C**, applied to the wart daily for a period of a few weeks.

Visualization

This method, also known as creative or guided imagery, has skeptically been described as "willing yourself well," but practically it has been found to be very effective for a range of conditions, both physical and emotional. The patient is required to sit in a relaxed state, breathing evenly, and visualize the self in the condition he or she would like to be. In this case, perhaps to visualize the body overcoming the warts and absorbing them, leaving behind healthy skin. This method has been found particularly suitable for children, as it has no side effects and therapists claim it has a good success rate.

Folk remedies

There are many remedies for warts that have been handed down from generation to generation all over the world. The following remedies have excellent track records.

- Thread: a length of thread should be tied around the wart, and tightened every day until the wart drops off.
- Human saliva: the sufferer applies his or her saliva to the wart every morning.

Allopathic treatment

Warts may be self-treated using a number of allopathic remedies, but care should be taken as they are fairly strong chemicals (usually salicylic acid). Those suffering from diabetes, **heart disease** or circulation problems, or any degree of **peripheral neuropathy**, should not attempt to treat themselves with any of these preparations, because of the risk of damage

to tissue, and because of their increased susceptibility to infection.

In addition, the face and mucous membranes may scar, so it may be preferable to seek professional advice.

A physician may use cautery (use of heat) or cryosurgery (use of extreme cold, usually in the form of liquid nitrogen) to remove warts. These are processes that require precision, and therefore are highly skilled procedures. Another drawback is that they can be painful. Increasingly, laser treatments are also being used to treat warts, whereby the laser beam vaporizes the wart tissue. Pulsed laser treatments appear to be particularly effective in treating warts in the anogenital region of children.

A newer allopathic medication that shows promise in the treatment of resistant viral facial warts is diphencyprone (DPC), a drug that was developed to treat a type of **hair loss** known as alopecia areata. DPC has shown effectiveness in removing facial warts that were resistant to both cryosurgery and other topical drugs.

Expected results

Allopathic methods for the treatment of warts are generally successful, but they carry more risk of scarring than natural methods. More than one alternative method may have to be tried before success is achieved, but they carry the added bonus of adding to the well-being of the patient, and not harming the body. Allopathic treatments involve the use of strong chemicals, which carry risks and that are not compatible with body chemistry. Usually, warts either disappear spontaneously or are treated successfully with no scarring or lasting effects. However, occasionally, what appears to be a wart is the beginning of a type of cancer, so those that are resistant to treatment should be seen by a physician.

Recurrent genital warts are a serious personal and public health concern. Even though genital warts may be removed, the virus itself continues to live. Certain types of HPV can cause tissue changes in the cervix of women with recurrent infection that may lead to cervical cancer. The general recommendation for women who have a history of genital warts is to see their doctors every six months for Pap smears to monitor any changes that may occur.

Prevention

To avoid foot warts, footwear should always be worn in public places and feet should be kept clean and dry. In general, warts should not be picked, to avoid cross infection, and any patch of damaged skin should be protected. Every effort should be made to keep the immune system in peak working condition.

Genital warts can be prevented by using condoms and avoiding unprotected sexual contact. Barrier protection will not, however, prevent the spread of wart-causing HPV to such uncovered areas as the pubis and upper thighs.

Vaccines to prevent the spread of human papillomavirus are available for use in women.

Resources

BOOKS

Buchman, Dian Dincin. *Herbal Medicine*. London: Tiger Books International, 1991.

Kenton, Leslie. *The Joy of Beauty*. London: Century Publishing,1993.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life Books, 1997.

Renner, John H. *The Home Remedies Handbook*. Publications International, Ltd., 1994.

Stupik, Ramona. *AMA Complete Guide to Women's Health*. New York: Random House, 1996.

PERIODICALS

Betancur Galvis, L. A., G. E. Morales, J. E. Forero, and J. Roldan. "Cytotoxic and Antiviral Activities of Colombian Medicinal Plant Extracts of the *Euphorbia* Genus." *Memorias do Instituto Oswaldo Cruz* 97 (June 2002): 541 546.

Brentjens, M. H., K. A. Yeung Yue, P. C. Lee, and S. K. Tyring. "Human Papillomavirus: A Review." *Dermatologic Clinics* 20 (April 2002): 315 331.

Centers for Disease Control and Prevention. "Sexually Transmitted Diseases Treatment Guidelines 2002." *MMWR Recommendations and Reports* 51 (RR 6) (May 10, 2002): 1 78.

Garland, S. M. "Human Papillomavirus Update with a Particular Focus on Cervical Disease." *Pathology* 34 (June 2002): 213 224.

Pollock, B., and A. S. Highet. "An Interesting Response to Diphencyprone (DPC) Sensitization on Facial Warts: Review of DPC Treatment for Viral Warts." *Journal of Dermatological Treatment* 13 (June 2002): 47 50.

Tuncel, A., M. Gorgu, M. Ayhan, et al. "Treatment of Anogenital Warts by Pulsed Dye Laser." *Dermatologic Surgery* 28 (April 2002): 350 352.

Vermani, K., and S. Garg. "Herbal Medicines for Sexually Transmitted Diseases and AIDS." *Journal of Ethnopharmacology* 80 (April 2002): 49 66.

ORGANIZATIONS

American Academy of Dermatology, P.O. Box 4014, 930 N. Meacham Rd., Schaumburg, IL 60168 5014. (847) 330 2300. Fax: (847)330 0050. http://www.aad.org.

American Academy of Family Physicians, 8880 Ward Parkway, Kansas City, MO 64114 (816) 333 9700. http://www.aafp.org/health.info.

American Podiatric Medical Association. 9312 Old Geor getown Rd, Bethesda, MD 20814 1698. (301) 571 9200. http://www.apma.org.
Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. http://www.cdc.gov.

OTHER

Medscape. http://www.medscape.com/micromedex/Care Notes/dermatology/ElectrocauteryWartRemoval.html.

Patricia Skinner
Rebecca J. Frey, PhD

Wasabi

Description

Wasabi (*Wasabia japonica*) is an edible plant member of the Cruciferae family, which includes cabbage, turnips, and mustard. Wasabi shares the anticancer benefits of this family. Native to Japan where it has been cultivated since the tenth century, it is still considered a staple condiment in that country. Traditional preparation involves using a sharkskin grater called an *oroshi*.

Wasabi's culinary popularity and chemical bioactivity make it valuable medicinally and industrially. Demand for wasabi has created a relatively short supply, higher prices, and new commercial opportunities. These new opportunities include research and development of cultivation technologies, particularly in Canada, and exportation from Japan of *seiyo wasabi*, or Western wasabi—imitations made of horseradish (*Cochlearia armoracia*). Western and Japanese wasabi are both highly prized.

Wasabi (*Wasabia japonica*) is a perennial, root-like rhizome that is cylindrical in shape. A brownish-green skin covers its pale green flesh. The plant grows to about 18 in (46 cm) in height and produces leaves on long stems from the crown of the plant. As the plant ages, the leaves fall off and a rhizome, or creeping underground stem, is formed, from which new buds arise as modified stems. The modified stem is the part of the plant that is used. The highest quality wasabi, whose translated name is mountain hollyhock (also known as *sawa wasabi*), thrives on cool water. It grows along the edges of cold mountain streams. When cultivated, rather than wild-crafted (harvested randomly from its natural growing places), it is grown on tree-shaded, terraced gravel beds covered by a thin layer of cool running mountain water or on artificially shaded gravel ridges formed in larger river beds. A lower quality wasabi (*oka wasabi*) is grown in fields. There are two varieties of wasabi, *Daruma*—considered to have a more attractive appearance—and *Mazuma*—considered to have more heat. Wasabi is described as being "hot and fiery without burning," which changes to a sweetness that lingers in the mouth.

Wasabi root. *(Photograph by Don Ryan. AP Photos. Reproduced by permission.)*

General use

Historically, wasabi has been consumed as a condiment, used similarly to horseradish or mustard. Its pungent flavor and aroma may add a piquant flavor to sushi, marinades or sauces, and rice, noodle, and fish dishes. In Japanese restaurants across North America, sashimi and sushi may be served with a small mound of grated wasabi or wasabi paste. Nontraditional uses include adding wasabi to mashed potatoes, tuna sandwiches, or blending it with soy sauce. One source

KEY TERMS

Crucifer—A type of vegetable that is now believed to guard against cancer, ulcers, and infections in the digestive tract. Examples of crucifers include wasabi, broccoli, cauliflower, mustard greens, and cabbage.

Rhizome—A subterranean plant stem that is distinguished from a true root by stem buds or nodes that develop into new shoots. A rhizome transports and stores water and nutrients. If a rhizome is cut, it does not die as would a root, but is capable of sprouting several new plants.

Sashimi—A traditional Japanese preparation of rice, fish, shell fish, mollusks, and other fish products, served with pickled vegetables.

Sushi—A traditional Japanese preparation of food wherein vinegared rice, vegetables, and fish or fish products, are wrapped in *nori* seaweed, cut, and served.

included it in a recipe for a unique Bloody Mary. Wasabi leaves marinated in sake, brine, or soy sauce, are eaten with a bowl of rice.

Aside from its unique flavor, wasabi has another benefit. Traditional Japanese cuisine includes raw fish, which is a potential source of parasites and bacteria. Wasabi's antiparasitic, antimicrobial, and antibiotic abilities may be preventive against **food poisoning**. One source points specifically to wasabi's effectiveness against the Anisakis parasite. Another study, comparing the antibacterial activity of different foods against *Escherichia coli* (*E. coli*) and Staphylococcus bacteria, found that cruciferous plants possess antibacterial activity, with the highest activity found in wasabi (rhizome).

Other studies found that wasabi may be effective against the tooth-adhering ability of the bacteria *Streptococcus mutans*, thus inhibiting dental plaque and decay. Of special note are the numerous studies demonstrating wasabi's effectiveness against stomach **cancer** cells. One study found the induction of stomach cancer in rats was suppressed when they were given wasabi. The risk of hormone-related malignancies, such as breast and **prostate cancer**, may also be lowered. Some researchers believe that the cruciferous vegetables help the body eliminate excess endogenous (produced from within) and exogenous (produced from without but ingested or absorbed) hormones, such as estrogen. This action may be a result of wasabi's ability to stimulate the liver and gallbladder, aiding in the digestion of fatty foods and the processing of food nutrients.

Other medicinal benefits attributed to wasabi include its effectiveness against **diarrhea**, **blood clots**, inflammation, and **asthma**. Its pungent aroma may help relieve sinusitis and **bronchitis**. Although the amounts absorbed from culinary use may be negligible, wasabi reportedly also contains **potassium**, **calcium**, and **vitamin C**.

Industrial applications of wasabi under investigation include its usefulness in the development of other antibiotics due to its own antibiotic qualities; its effectiveness as a fungicide against the blackleg fungus that threatens plants commercially valued for their oil, such as rapeseed and canola; and, its possible use as an effective alternative to chemically toxic wood preservatives.

Preparations

Wasabi is most commonly found in powder or paste form. However, due to the scarcity and price of high quality wasabi, many of these preparations—including imports from Japan for retail sale and those served in Japanese restaurants—are imitations made of horseradish, mustard, a starchy binder, and coloring. Wasabi paste may be made from a powdered wasabi by adding water, and letting it stand 10 minutes to allow the flavor and heat to develop. One source noted that the powder may be safely stored in a cupboard, but recommended refrigerating the paste. A salad dressing may be made by combining 3 tbsp of rice wine vinegar, 1 tbsp honey, 1 tsp wasabi paste, 1 tsp soy sauce, and 1/2 tsp **sesame oil**.

Traditional wasabi is freshly prepared for each use, as its volatile oils are quickly dissipated. It is recommended that individuals select a fresh, cool, and succulent rhizome with nice color. It should be rinsed under cool water with a vegetable brush, cutting a fresh surface below or above the leaf node (a distinctive ridge as on bamboo stems). While maintaining a 90-degree angle to the grating surface, the wasabi should be grated in a circular motion against a traditional sharkskin, ceramic, or stainless steel grater. (It is not necessary to peel the wasabi rhizome before grating it.) Then it is gathered into a ball and allowed to sit momentarily at room temperature. It is best used within 15 to 20 minutes.

One source notes that wasabi products are often found in large grocery stores that sell Asian food products and ethnic condiments; Asian markets; fish markets; gourmet shops; and other alternative marketplaces. Prices are similar to other specialty condiments of equal quality.

Precautions

Wasabi should not come into contact with the eyes or nasal passages.

Due to its anti-inflammatory, antibiotic, antibacterial, antiparasitic, anticoagulant, and anti-asthmatic effects, the use of wasabi may magnify the effects of certain pharmaceutical drugs used for similar purposes. People with ulcers, esophageal reflux, kidney disorders, gastrointestinal disease, or those using hormone replacement therapy, are advised to consult with a healthcare professional before using wasabi.

Side effects

Due to its liver and gallbladder stimulating effects, eating wasabi may cause gastrointestinal disturbances, including diarrhea and **nausea**.

Interactions

One source notes that wasabi has possible interactions with anti-inflammatory analgesics, anesthetics, thyroid medications, corticosteroids, diuretics, and high blood pressure medications. This may be due in part to confusion with horseradish species. No other *Wasabia japonica*-drug interaction references are noted.

Resources

BOOKS

Black, Jacquelyn G. *Microbiology, Principles and Explo rations,* 5th ed. Hoboken, NJ: John Wiley & Sons, 2002.

PERIODICALS

Cohen, S. "Wasabi May Make Sushi Safe." *Shape* (November 2002): 116.

Fuke, Y., Y. Haga, H. Ono, T. Nomura, and K. Ryoyama. "Anti carcinogenic Activity of 6 methylsulfinylhexyl Isothiocyanate, an Active Anti proliferative Principal of Wasabi (*Eutema wasabi maxim*)." *Cytotechnology* (1997): 197 203.

Fuke, Y., Y. Ohishi, K. Iwashita, H. Ono, and K. Shinohara. "Growth Suppression of MKN 28 Human Stomach Cancer Cells by Wasabi (*Eutrema wasabi maxim*)." *Journal of the Japanese Society of Food Science & Tech nology* (1994): 709 11.

Hill, M., and G. Barclay. "Dig Up Great Taste." *The Herb Companion* (December 2003): 28 37.

Hodge, W. H. "Wasabi: Native Condiment Plant of Japan." *Economic Botany* (January 1974): 118 29.

Knittel, L. "10 Foods for a Healthy, Beautiful Smile." *Natural Health* (December 2002): 45 7.

Ono, H., S. Tesaki, S. Tanabe, and M. Watanabe. "6 Methlsulfinylhexyl Isothiocyanate and its Homo logues as Food oriented Compounds with Antibacterial Activity Against Escherichia coli and Staphylococcus aureus." *Bioscience, Biotechnology, and Biochemistry* (February 1998): 363 5.

Tanida, N., A. Kawaura, A. Takahashi, K. Sawada, and T. Shimoyama. "Suppressive Effect of Wasabi (pun gent Japanese spice) on Gastric Carcinogenesis Induced by MNNG in Rats." *Nutrition and Cancer* (1991): 53 8.

OTHER

American Chemical Society. *Wasabi! Sushi condiment may prevent cavities*. December 2000. http://www.science daily.com/.

"Bamboo Select." Botanical Features: Rhizomes. [Cited May 22, 2004]. http://www.bambooselect.com/UK/ Botanical features.htm.

City Farmer, Canada's Office of Urban Agriculture. *Urban agricultural notes: Wasabia japonica*. http://www. cityfarmer.org/.

Lerche Davis, J. "Pull Out the Chop Sticks Wasabi May Prevent Tooth Decay." *WebMD Medical News Archives* [cited June 14, 2004]. http://www.mywedmd. com/.

Mccauley, D. "Wasabi." *Canadian House & Home* November 2000. [cited June 14, 2004]. http://www. findarticles.com/.

Lee Ann Paradise
Katherine E. Nelson, N.D.

Water therapy *see* **Hydrotherapy**

Watsu *see* **Shiatsu**

Waxberry *see* **Bayberry**

Western cedar *see* **Red cedar**

Western herbalism *see* **Herbalism, Western**

Wheat germ

Description

Wheat germ is the embryo of the wheat kernel. It is separated from wheat being milled for flour. Wheat germ is **sodium**-and **cholesterol**-free, and dense in nutrients. It is rich in **vitamin E**, **magnesium**, **pantothenic acid**, **phosphorus**, thiamin, and **zinc**. It is also a source of coenzyme Q10 (ubiquinone) and PABA (para-aminobenzoic acid). Two tablespoons of wheat germ contains 65 calories, 6 g protein, 2 g of unsaturated fat, and 2 g of fiber.

General use

Wheat germ is a food source, and is part of the breads and cereals food group. Its high vitamin and mineral content make it an extremely nutritious food. Wheat germ contains the following nutrients:

- Vitamin E. One cup of wheat germ contains 19.5 mg of vitamin E, and one tablespoon of wheat germ oil is packed with 26.2 mg of vitamin E. Vitamin E is an antioxidant which is thought to protect the immune system.
- Magnesium. Magnesium assists the body in producing and transferring energy, and helps to maintain heart, bone, muscle, and circulatory system health.
- Pantothenic acid. The panthothenic acid in wheat germ helps the body process and use energy from food, and metabolizes cholesterol and fatty acids. There is approximately 1.24 mg of pantothenic acid, also called vitamin B_5, in 0.5 cup wheat germ. The U. S. recommended daily allowance (RDA) of pantothenic acid is 5 mg/day.
- Phosphorus. A quarter cup serving of wheat germ contains 232 mg of phosphorus. Phosphorus helps build bones and teeth and assists in metabolism. Adults should consume approximately 700 mg of the mineral daily.
- Thiamine. Thiamine, one of the B complex vitamins, is essential to normal growth, and to building healthy skin, muscle, bones, and hair. It also promotes normal functioning of the nervous system, and helps the body to metabolize alcohol. One cup of wheat germ contains 1.08 mg of thiamin, and the RDAs for men and women are 1.2 mg and 1.1 mg, respectively.
- Zinc. Wheat germ contains some zinc, a trace mineral and antioxidant essential for proper growth, immune system function, and hormone production.
- Coenzyme Q10. Coenzyme Q10, or ubiquinone, is an antioxidant that assists cells in transferring energy and oxygen.
- Para-aminobenzoic acid (PABA). PABA helps to maintain the balance of intestinal flora, or bacteria.

Wheat germ is also high in fiber, and contains approximately 1 gram of fiber per tablespoon. A diet high in fiber can be useful in regulating bowel function (i.e., reducing **constipation**), and may be recommended for patients at risk for colon disease, **heart disease**, and diabetes.

Preparations

Wheat germ is used extensively in animal feeds, but for human consumption, wheat germ cereals and wheat germ oil are the two most popular preparations of the grain. Both are available in most grocery and health food stores.

A jar of vacuum-packed wheat germ can be safely stored up to one year unopened. Opened jars should be refrigerated, where they can be stored up to nine months if stored properly and tightly sealed.

To increase fiber and nutrients in bread and cereal recipes, wheat germ may be used to replace 0.5–1 cup of regular flour.

KEY TERMS

Antioxidant—A substance that inhibits oxidation, a process that damages cells in the body and may play a role in aging and cancer.

Metabolize—For food and nutritional components, to convert food into energy and then break it down into simpler substances for excretion.

Precautions

Because wheat germ contains fat, proper cold storage is necessary to prevent spoilage.

Side effects

There are no known side effects to wheat germ consumption at normal dietary levels.

Resources

BOOKS

Reavley, Nocola. *The New Encyclopedia of Vitamins, Min erals, Supplements, and Herbs*. New York: M. Evans & Company, 1998.

Paula Ford-Martin

Wheat grass therapy

Definition

Wheat grass, sometimes written as wheatgrass or wheat-grass, is a young green wheat plant (genus *Agropyron*) harvested before it develops grain kernels and turns the traditional yellow color associated with wheat stalks. Wheat grass is commonly prepared as a juice, and is consumed either alone or as a mixture with other juices.

Ears of triticale, a hybrid of wheat and rye grass. *(© Foods of the World / Alamy)*

Wheat grass is a source of many nutrients. Differences between samples of wheat grass due to variable growing conditions, quality of seed, and other factors including dose amounts and form will produce variable amounts of nutrients in any single dose of wheat grass. The following is a partial list.

- biotin
- choline
- lutein
- lycopene
- betacarotene
- thiamine
- riboflavin
- niacin
- pantothenic acid
- pyridoxine
- folic acid
- vitamin C
- vitamin E
- vitamin K
- calcium
- cobalt
- copper
- alanine
- arginine

Although wheat grass contains a wide range of **amino acids** and other nutrients, the concentrations are low. Relatively large quantities of wheat grass may be required in order to provide significant nutritional benefits.

KEY TERMS

Chlorophyll—Any of a group of green pigments found in plants and some types of bacteria.

Enzyme—Any of a large group of proteins produced by living organisms and functioning as biochemical catalysts.

Origins

There is no well documented history of consumption of wheat grass. Wheat is one of the oldest crops known, and was cultivated as long as 9,000 years ago in the Euphrates Valley of the Middle East. At least one company has claimed that ingestion of wheat grass dates from the Essenes, a Jewish sect of about the first century A.D.. Contemporary use seems to have originated with Ann Wigmore (1909–1994). Wigmore may be credited with many of the theories concerning enzymes, grasses, and living foods:

Benefits

Wheat grass, depending on the dose, is considered a dietary supplement, although the concentrations of some nutrients may be low. The sellers of wheat grass have made a large number of claims for the product. The following list is representative, but not complete:

- cure cancer
- cure chronic fatigue syndrome
- detoxify liver
- purify blood
- neutralize pollutants
- improve energy
- improve circulation
- slow aging

- increase immunity
- protect against biological warfare

Description

Wheat grass is usually grown indoors, either commercially or for personal use. The grass is harvested while still green, and before the wheat kernels have developed. The juice is extracted either with stone grinding, as with a mortar and pestle, or with a manual juicer. High-speed juicers are considered unsuitable, either because they will oxidize the chlorophyll or destroy the enzymes.

Wheat grass juice, according to Ann Wigmore, should be consumed within 30 minutes of juicing.

Wheat grass has a taste that has been described as pungent, however one manufacturer disputes these claims, and maintains that the product has a watermelon or **green tea** taste.

Preparations

Wheat grass may be purchased in a variety of ways. Kits are available, containing seed, soil, and pots, so that users may grow their own supplies. Alternately, the cut grass is available in packages of 8 or 16 ounces.

Powders and tablets made from dehydrated wheat grass are also marketed to the public.

Precautions

No special precautions are required. Because wheat grass juice does not contain gluten, the principle allergen in wheat, the juice may be expected to be safe even for people with wheat **allergies**.

Side effects

There are no established side effects of wheat grass.

Research and general acceptance

Wheat grass has not been accepted into conventional medicine at any level. The United States Food and Drug Administration (FDA) and the German Commission E have not reviewed the validity of wheat grass therapy claims. While some of the claims made for wheat grass are based on laboratory studies, there do not appear to be clinical studies or any form of confirmation from human studies of any form.

While wheat grass contains a large assortment of nutrients, the concentrations are low, and a large volume of juice or powder would be required in order to make a significant contribution to health. Arguments regarding the benefits or orally ingested enzymes have been generally rejected, because enzymes are destroyed during digestion.

Training and certification

There is no training required to prepare wheat grass, and no established rules for its use.

Resources

BOOKS

Blumenthal, M., et. al. *The Complete German Commission E Monographs Therapeutic Guide to Herbal Medicine*. Austin, TX: American Botanical Council, 1998.

Meyerowitz, S., et. al. *Wheatgrass Nature's Finest Medicine: The Complete Guide to Using Grass Foods & Juices to Revitalize Your Health, 6th edition*. Great Barrington, MA: Sproutman Publications, 1999.

Wigmore, A. *The Wheatgrass Book*. Avery Penguin Putnam

PERIODICALS

Bauman B. "The Benefits of Wheatgrass Fact or Fiction?" *Greater Baton Rouge Business Report*, August 29, 2000, p 36.

Bradley, R. "You can reduce stress lose weight detoxify stop smoking increase energy with liv ing foods." *Townsend Letter for Doctors and Patients* (April 2003): 86.

"11 Super Foods to Eat Right Now." *Vegetarian Times* (December 1998).

Gilbere, Gloria. "Nature's Immune Booster and pH Bal ancer." *Total Health* (August/September 2003): 40.

"Grass in a glass." *The University of California, Berkeley Wellness Letter* (November 1995): 4.

"Medicinal Antidotes from Dr. Chili: How to Protect Yourself Against the Effects of Chemical Weapons." *Earth First!* 21, p. 20

"Reports on the health aspects of wheat grass juice." *Envi ronmental Nutrition* (May 2000): 7.

"Wheatgrass Therapy." *NCAHF Newsletter* (September October 1994): 3.

Wigmore, A. "The wheatgrass way to super health and vitality: it's easy to grow your own!" *Health News & Review* (Spring 1992): B.

ORGANIZATIONS

American Botanical Council, 6200 Manor Rd, Austin, TX 78723.

Ann Wigmore Natural Health Institute, Inc. PO Box 429 Rincón, Puerto Rico 00677.

The National Council Against Health Fraud, 119 Foster Street Peabody, MA 01960.

Samuel Uretsky, Pharm.D.

Wheezing

Definition

Wheezing is a high-pitched whistling sound associated with labored breathing.

Description

Wheezing occurs when a person tries to breathe deeply through air passages (bronchia) that are narrowed because of muscle contractions or filled with mucus as a result of: allergy, infection, illness, or irritation. Wheezing is experienced by 10-15% of the population.

Wheezing most commonly occurs when a person is exhaling. It is sometimes accompanied by a mild sensation of tightness in the chest. **Anxiety** about not being able to breathe easily can cause muscle tension that makes the wheezing worse.

Causes and symptoms

Wheezing is the symptom most associated with **asthma**. It can be aggravated by dry air and high altitude. A 2001 study also found a connection between nighttime wheezing/asthma and gastroesophageal reflux, or the flow of stomach acid backward into the lower part of the esophagus. Wheezing can be caused by:

- exposure to allergens (food, pollen, and other substances, that cause a person to have an allergic reaction)
- fumes
- ice-cold drinks, or very cold air
- medication
- strenuous exercise
- weather changes
- foreign objects trapped in the airway
- cystic fibrosis and other genetic disorders
- respiratory illnesses like pneumonia, bronchitis, congestive heart failure, and emphysema

The symptoms of wheezing are: labored breathing, whistling sound upon breathing, shortness of breath, and a tight or heavy feeling in the chest.

Medical emergencies

Breathing problems can be life-threatening. Immediate medical attention is required whenever a person:

- Turns blue or gray and stops breathing.
- Becomes extremely short of breath, and is unable to speak.

KEY TERMS

Allergen—A substance that causes an allergic reaction in a person with a hypersensitive immune system.

Bronchia—Air passages in the lungs. Wheezing occurs when bronchia become constricted (narrowed).

- Coughs up bubbly pink or white phlegm.
- Seems to be suffocating.
- Develops a fever of 101°F (38.3°C) or higher.
- Wheezes most of the time, and coughs up gray or greenish phlegm.

Diagnosis

A family physician, allergist, or pulmonary specialist takes a medical history that includes questions about **allergies**, or unexplained symptoms that may be the result of allergic reactions. If the pattern of the patient's symptoms suggests the existence of allergy, skin and blood tests are performed to identify the precise nature of the problem.

A pulmonary function test may be ordered to measure the amount of air moving through the patient's breathing passages. X rays are sometimes indicated for patients whose wheezing seems to be caused by chronic **bronchitis** or **emphysema**.

Treatment

Patients whose wheezing is related to asthma, chronic bronchitis, emphysema, or a severe allergic reaction may benefit from alternative medicine but they must continue to have their condition monitored by a conventional physician.

Mild wheezing may be relieved by drinking plenty of juice, water, weak tea, and broth. This helps to replace fluids lost because of rapid breathing and loosen mucous in the air passages. Ice-cold drinks should be avoided. A vaporizer can help clear air passages. A steam tent, created by lowering the face toward a sink filled with hot water, placing a towel over the head and sink, and inhaling the steam, can have the same effect.

Herbal remedies

Several herbal remedies exist for the treatment of wheezing and asthma, and they include:

- Baical skullcap (*Scutellaria baicalensis*) decoction relieves wheezing.
- Coltsfoot tea may relieve wheezing.
- Cramp bark (*Viburnum opulus*) tincture eases breathing.
- Elecampane (*Inula helenium*) can help to clear mucous.
- Garlic (*Allium sativum*) can ease asthma symptoms.
- German chamomile (*Chamomilla recutita*) infusion can relieve wheezing.
- Ginkgo (*Ginkgo biloba*) eases asthma symptoms.
- Marsh mallow (*Althaea officinalis*) root eases asthma symptoms.
- Mullein (*Verbascum thapsus*) tea in a vaporizer relieves wheezing.
- Nettle (*Urtica dioca*) infusion relieves wheezing.
- Passionflower (*Passiflora incarnata*) relaxes muscle spasms leading to a reduction in wheezing.
- Thyme (*Thymus vulgaris*) infusion relieves wheezing.

Ayurvedic treatment

Wheezing can be alleviated by drinking **licorice** tea. The tea is prepared by steeping one teaspoon of licorice (*Yashti madbu*) root in one cup of water, adding 5-10 drops of mahanarayan oil just before drinking. The patient should take one sip every 5-10 minutes. A remedy for breathlessness is a mixture of onion juice (one quarter cup), black pepper (0.125 tsp), and honey (1 tsp).

Mustard seeds have bronchial system healing properties. Brown mustard oil may be massaged onto the chest. A mustard tea (one quarter teaspoon each ground mustard seed and pippali or black pepper) with honey may be drunk two or three times daily or sipped throughout the day. Another mustard remedy is taking brown mustard oil (1 tsp) with natural sugar (1 tsp) two or three times daily.

Homeopathy

Homeopathic remedies are chosen for each patient based on his or her pattern of symptoms. Arsenicum is indicated for patients who experience restlessness, fearfulness, wheezing, and shortness of breath between the hours of midnight and 3 A.M. Spongia is recommended for those who have dry wheezing, which may occur as the patient is falling asleep, a feeling of suffocation, and a dry **cough**. **Lobelia** is for patients with chest tightness and wheezing that is worsened in cold air. Sambucus is indicated for persons whose wheezing is worsened after midnight, but who don't experience the fear or restlessness experienced by an arsenicum patient. **Pulsatilla** is recommended for those who are affectionate, and feel stifled in warm rooms. **Ipecac** is for patients who have a lot of phlegm in the lungs (wheezing is accompanied by rattling sounds in the chest), coughing, and possibly **vomiting**. **Bryonia** is for patients with dry wheezing, who feel warm and thirsty, and whose symptoms are worsened by motion.

Other remedies

Other treatments for wheezing include:

- Aromatherapy. The essential oils of lavender, eucalyptus, and rosemary can relieve congestion. Adding German chamomile essential oil to a vaporizer can relieve wheezing.
- Diet. Eliminating red meat, wheat, and dairy products and following a macrobiotic diet of vegetarian foods may relieve asthma symptoms.
- Relaxation techniques. Anxiety can worsen an asthma attack and therefore wheezing. Meditation, biofeedback, deep breathing, or other stress- reduction methods may help promote relaxation.
- Supplements. Magnesium may help to prevent bronchial spasms. The frequency of asthma attacks may be reduced by taking vitamin C and the B complex vitamins.
- Yoga. Certain yoga positions (Bridge, Cobra, Pigeon, and Sphinx) may relieve wheezing by improving breathing control and reducing stress.

Allopathic treatment

Bronchodilators (medications that help widen narrowed airways) may be prescribed for patients whose wheezing is the result of asthma. Antibiotics are generally used to cure acute bronchitis and other respiratory **infections**. Expectorants (cough-producing medications) or bronchodilators are prescribed to remove excess mucus from the breathing passages. If wheezing is caused by an allergic reaction, antihistamines will probably be prescribed to neutralize body chemicals that react to the allergen.

A new type of drug was being tested in late 2001 that blocks immunoglobulin E (IgE), an antibody produced in excessive levels in patients with **hay fever**. The drug also appears to prevent asthma in patients with chronic hay **fever**. The drug, called omalizumab, is the first in a new line of drugs expected to appear in the next few years.

If wheezing and asthma symptoms worsen in the nighttime, diagnosis and treatment of possible acid reflux in the stomach might ease symptoms.

Expected results

Mild wheezing caused by infection or acute illness usually disappears when the underlying cause is eliminated.

Some doctors believe that childhood respiratory infections may activate parts of the immune system that prevent asthma from developing.

Prevention

Stopping **smoking** can eliminate wheezing. So can reducing or preventing exposure to allergens or conditions that cause wheezing.

A person prone to wheezing should wear a scarf or surgical mask over the nose and mouth during physical exertion outdoors during cold weather. Likewise, wearing a surgical mask outdoors during the allergy season is helpful for persons whose wheezing is triggered by allergies.

Licorice root tea may prevent asthma (wheezing) attacks. Ayurvedic herbal remedies to prevent asthma symptoms include:

- Cinnamon (1 tsp) and trikatu (0.25 tsp) tea with honey twice daily
- Licorice and ginger (0.25 tsp each) tea
- Bay leaf (0.5 tsp) and pippali (0.25 tsp) mixed in honey taken two or three times daily
- Sitopaladi (0.5 tsp), punarnova (0.5 tsp), pippali (pinch), and abrak bhasma (pinch) mixed with honey taken once daily
- Spinach juice (0.125 cup) and pippali (pinch) taken twice daily

Resources

BOOKS

Cummings, Stephen and Dana Ullman. *Everybody's Guide to Homeopathic Medicines: Safe and Effective Remedies for You and Your Family*. New York: Jeremy P. Tarcher/Putnam, 1997.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Therapies*. Alexandria, VA: Time Life Books, 1996.

Lad, Vasant D. *The Compete Book of Ayurvedic Home Remedies*. New York: Harmony Books, 1998.

PERIODICALS

Avidan, B., et al. "Temporal Associations Between Cough ing or Wheezing and Acid Reflux in Asthmatics."*Gut* (December 2001): 767.

Blanc, Paul D., et al. "Alternative Therapies Among Adults with a Reported Diagnosis of Asthma or Rhinosinusi tis: Data from a Population Based Survey." *Chest* (November 2001): 1461.

Lanctot, Denise. "Case of the Out Of Control Wheeze." *Prevention* 48 (April 1996): 124+.

Langer, Stephen and Patricia Andersen Parrado. "Stifling allergies." *Better Nutrition* 61(April 1999): 44+.

Plaut, Marshall. "Immune Based, Tageted Therapy for Allergic Diseases."*JAMA, The Journal of the American Medical Association*. (December 19, 2001): 3005.

ORGANIZATIONS

American Lung Association, 1740 Broadway, New York, NY 10019 4374, (800) 586 4872. http://www.lungusa.org.

Asthma and Allergy Foundation of America. (800) 7 ASTHMA.

OTHER

"Kids in Daycare Three Times as Likely to Have Wheezing Illnesses." http://www.lungusa.org/footer.html (16 May 1998).

"Wheezing." http://www.mcare2.org/healthtips/homecare/wheezing.htm (16 May 1998).

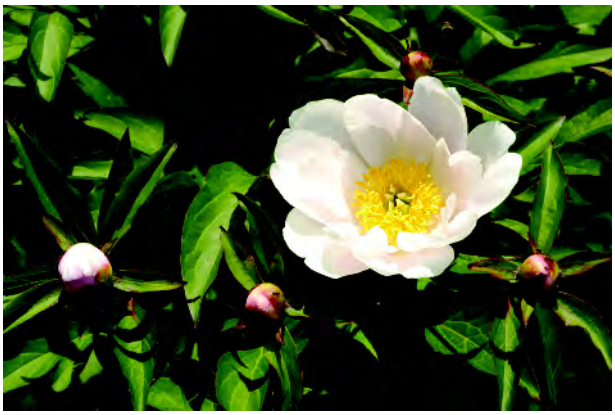
"Wheezing." http://www.onhealth.com/bu/cond/ailments/htm/wheezing/htm (17 May 1998).

Belinda Rowland
Teresa Norris

White peony root

Description

Peonies are members of the same botanical family as the buttercup, Ranunculaceae, and belong to the genus *Paeonia*. They originated in Asia, and have been



The root of the white peony flower is considered an herb with strong blood-toning characteristics, used to treat the imbalance of blood in the body, cooling and providing nourishment to the blood and activating circulation.
(© Organica / Alamy)

cultivated in both Japan and China for at least several centuries, perhaps even a millennium. Peonies are an early ground-breaker, producing reddish shoots as early as April in the Northern Hemisphere. They are a tall plant, ranging from 1–5 ft (30–150 cm) in height. Their branching stems produce glossy deep green leaves that taper to a point on each end, and grow up to 5 in (12.5 cm) in length. The peony root is brownish in color and tuberous.

The peony flowers are produced at the tips of the branching stems. Beginning as globular buds that produce a sweet, sticky exudate that attracts ants (that do no harm), these buds slowly open into large, showy flowers with diameters up to 10 in (20.5 cm) wide. The peony is an extremely long-lived plant, especially for a flowering one. It is not uncommon for peonies to live for a hundred years. They prefer moist, humus-rich loam and either full or partial sun. If peonies become overcrowded, the plants must be divided, and at the end of the growing season, it is best to cut off the stems at ground level and mulch for winter protection.

Though there are literally hundreds of hybrid varieties that have been developed over the centuries, most peonies share both a common origin and fairly similar characteristics. Many resemble a herbaceous shrub. Others that originated in western China have woody stems and are called tree peonies. Tree peonies do not die back completely in winter. In addition, tree peony root and red peony root are considered separate entities in **traditional Chinese medicine**.

Classification of these flowering plants is often based on when they bloom. The earliest produce blossoms in late April (in southern areas) or early May. Others flower in mid- or late May and into June. Another means of classifying peonies is based upon the shape of their flowers. Single peonies form a circle of five or more petals radiating symmetrically outward from a middle ring of yellow stamens, or male procreative structures. Japanese peonies have a similar appearance, but the stamens are both more narrow and more level and produce no pollen. Other varieties are either semi-double or double. Semi-double peonies have multiple rings of petals circling around visible stamens. Double peonies produce concentric rings of showy petals that hide the stamens.

Most of the varieties of peony admired in flower gardens today are hybrids of the two original species of this plant, *Paeonia officinalis* and *Paeonia lactiflora*, which differ slightly in appearance. *Paeonia officinalis* is the species most often seen in gardens and used as an ornamental flower. It reaches heights of 1.5-2 ft (45-60 cm) tall and its subspecies have a remarkable variation of colors. This species produces creeping roots that help to spread the plant.

Paeonia lactiflora, also called *Paeonia alba* or white peony, is the plant most often used in herbal medicine, particularly in Chinese herbal medicine. White peonies grow to 3 ft (1 m) tall, and are among the later-flowering peonies, coming into bloom in May and June in most climates. They have a sweeter scent than *Paeonia officinalis*. Despite the name of white peony, flowers can be several hues other than white depending upon the subspecies. There are rose-pink and scarlet varieties, as well as white peonies ornamented with other colors. White peonies can be either single, semi-double or fully double. *Paeonia rubra*, or red peony, is a separate herb.

KEY TERMS

Cold-deficiency diarrhea—In Chinese herbal medicine, this condition is described as cold settling in the abdomen when resistance is low, causing cramping, gas, and loose stools.

Emmenagogue—A medication or substance that induces menstruation.

General use

Under the name *bai shao*, white peony root is used in many diverse Chinese herbal formulas. It is considered an herb with strong blood-toning characteristics, used to treat the imbalance of blood in the body, cooling and providing nourishment to the blood, and activating circulation. More specifically, red peony root is used to treat heat rash, to correct poor circulation, and to stop hemorrhages.White peony root is used for irritability and muscle cramping, vaginal discharges, excessive menstrual bleeding, and excessive sweating. It is also given to treat a large variety of gynecological disorders and to avert miscarriage.

In the databases developed by the Agricultural Research Service of the United States Department of Agriculture, white peony root (from both *Paeonia albaflora* and subspecies *Paeonia albaflora trichocarpa*) has been shown to have chemical properties that restore the normal functioning of the digestive system; act as a laxative; relieve **pain**; reduce or stop spasms or seizures; lower blood pressure by dilating arteries; and improve the **nutrition** of blood. Peony root appears to have some positive effects in treating **anemia**, some types of **cancer**, convulsions, **gastritis**, **hypertension**, and some gynecological problems. It

can also be used as an emmenagogue, which means that it can bring on a woman's menstrual period.

Preparations

Powdered peony root is used in combination with other herbs used in Chinese herbal medicine, including apricot seeds, bupleurum, inula, **cyperus**, clematis, **corydalis**, ginseng, **licorice**, pueraria, rehmannia, dogwood, and **gardenia**. The classic Chinese blood tonic is a mixture of rehmannia, *dang bui*, cnidium, and white peony. A Western herbalist suggests combining white peony with nettles and **yellow dock** for treating mild anemia or blood deficiency.

Precautions

Chinese herbalists advise against using white peony root when cold-deficiency **diarrhea** is present.

Western readers should remember that Chinese herbal medicine is based upon individual prescriptions developed for each patient and his or her unique symptoms. Chinese herbs should not be taken, either individually or in formulas, unless a practitioner of Chinese herbal medicine is first consulted.

Resources

BOOKS

Molony, David, and Ming Ming Pan Molony. *The American Association of Oriental Medicine's Complete Guide to Chinese Herbal Medicine*. New York: Berkley Publish ing, 1999.

Phillips, Ellen, and C. Colston Burrell. *Rodale's Illustrated Encyclopedia of Perennials*. Emmaus, PA: Rodale Press, Inc., 1993.

Reid, Daniel. *A Handbook of Chinese Healing Herbs*. Boston: Shambhala Publications, Inc., 1995.

OTHER

Duke, James, MD. Dr.Duke's Phytochemical and Ethno botanical Databases. http://www.ars grin.gov/duke/ethnobot.htm.

Joan Schonbeck

White willow

Description

White willow (*Salix alba*) is a large tree that grows in Central and Southern Europe, Asia, and North America. Also known as European willow or baywillow, this tree prefers to root near streams and rivers and grows to a height of 35–75 ft (11–25 m). In the spring the slender branches first sprout tiny, yellow flowers and then long, thin green leaves.

White willow is the oldest recorded analgesic, or painkiller, in human history. *(© Arco Images / Alamy)*

White willow belongs to the Salicaceae family. There are over 300 species of willow, but only several species are used medicinally: white willow (*S. alba*), purple willow (*S. purpurea*), violet willow (*S. daphnoides*), and crack willow (*S. fragilis*).

General use

White willow is the oldest recorded analgesic, or painkiller, in human history. Chinese physicians have used white willow since 500 B.C. to relieve **pain** and lower fevers. White willow was also used in ancient Assyrian, Egyptian, and Greek medicine as well. The Greek physicians Dioscorides, Hippocrates, and Galen recommended white willow to remedy fevers and pain. Native American tribes, including the Cherokee, Blackfoot, Iroquois, and Eskimo peoples, created a tea from closely related species of the bark to relieve headaches,

KEY TERMS

Analgesic—A medication or preparation given to relieve pain. White willow extract has analgesic effects.

Decoction—An herbal tea created by boiling herbs in water. Roots, bark, and seeds are used in decoctions; boiling the herbs brings out their medicinal properties.

Nonsteroidal anti-inflammatory drugs (NSAIDs)—A group of analgesic medications that also have anti-inflammatory effects when used over a period of time.

Reye's syndrome—A rare but potentially fatal disorder that is most likely to occur in children following a viral disease and associated with giving aspirin. The symptoms of Reye's syndrome include vomiting, liver damage, and swelling of the brain.

Salicin—A bitter-tasting water-soluble chemical found in willow bark that has analgesic properties.

Tinnitus—A condition that causes ringing in the ears.

fever, sore muscles, **chills**, rheumatism, and general aches and pains. White willow was used in Europe to stop **vomiting**, remove **warts**, and suppress sexual desire as well as to treat fevers and pains.

In the mid-1700s, white willow was used in Britain as a remedy for **malaria** since the bark was similar to cinchona bark, a South American bark used to treat malaria. In 1828, European chemists extracted the constituent salicin from white willow bark and converted it to salacylic acid. At the end of the nineteenth century, acetylsalicylic acid was synthetically produced and aspirin was born. Due to the cheap and easy production of aspirin, white willow eventually lost its popularity as a pain and fever reliever.

In modern times, however, white willow is being recalled as nature's aspirin and gaining popularity around the world as an alternative treatment for fevers and inflammatory and painful conditions such as **bursitis**, **tendinitis**, headaches, **rheumatoid arthritis**, back pain, **osteoarthritis**, menstrual cramps, and muscle aches. White willow has been approved by the German Commission E for treating fevers, rheumatic ailments, and headaches. In France, white willow is used to remedy headaches, **toothache** pain, tendinitis, and muscle **sprains**. The British Herbal Compendium has administered white willow as a treatment for rheumatic and arthritic conditions, colds, and **influenza**.

How white willow works

The inner bark contains tannins, flavonoids, phenolic glycosides, and anti-inflammatory and fever-reducing salicylates. The high concentration of tannins may be responsible for relieving gastrointestinal disturbances and reducing tumors of the esophagus, stomach, colon, and rectum.

White willow's analgesic effect works to inhibit the production of prostaglandins, a hormone-like chemical that is produced by the body in response to injury and causes aches, pains, and inflammation. Thus, white willow is beneficial in treating acute and chronic pain and inflammation in conditions such as painful **menstruation**, arthritis, and **neuralgia**. White willow is best when used over long periods of time and can take days to improve conditions.

The active ingredient in white willow is salicin. Salicin is gradually converted along with other compounds in white willow into salicylic acid in the intestine and liver. Because of this conversion process, white willow generally takes longer to act than aspirin, but the effects may last for an extended period of time. As a result, white willow is mild on the stomach and usually does not cause bleeding or other gastrointestinal discomfort that often occurs with aspirin usage.

White willow vs. aspirin

Herbalists claim that white willow can sometimes be used to treat the same conditions as aspirin. One benefit to white willow use is that the natural salicylic acid present in white willow reportedly produces fewer side effects than the synthetically produced acetylsalicylic acid of aspirin.

Aspirin has been recommended as a treatment to reduce the risk of heart attacks and **stroke** by lessening the chance of internal **blood clots**. Preventative benefits of white willow in these cases have not been determined, primarily because the salicin content of the bark varies. Herbal experts believe that most willow bark samples contain enough salicin to have a similar effect.

Preparations

The bark of young tree branches (two or three years old) is harvested during the early spring. The grayish bark is separated from the tree, then either dried or used fresh. White willow is commercially available in tincture, tablet, capsule, powder, or tea forms. When choosing a commercial preparation, it is recommended to use a standard product that contains 200–250 mg of white willow per dose.

The recommended daily dosage is 100–250 mg of white willow every four hours. To relieve arthritic, back, and muscle aches and pains, the recommended dosage is 225 mg of white willow bark four times daily.

A decoction made from willow bark is used both internally and externally. To make a decoction, combine 1 tsp chopped or powdered white willow bark with 8–10 oz of water. Bring to a boil, then simmer for five minutes. Drink three or four times daily. This mixture can also be gargled to help inflamed gums and tonsils. Cooled and applied externally, the decoction helps aid healing of sores, **burns**, or **cuts**.

Tincture dosage: 2 ml three times daily.

Precautions

Persons with **tinnitus** should not take white willow.

Pregnant or breastfeeding women should consult their healthcare practitioner before taking white willow.

Persons who are sensitive to aspirin should use caution when taking white willow as it may irritate their stomachs.

Administration of aspirin to children under the age of 16 to relieve symptoms of cold, flu, or **chickenpox** may cause a rare condition called Reye's syndrome. Reye's syndrome is characterized by vomiting, swelling of the brain, and liver damage, and may be fatal. *Reye's syndrome is a medical emergency and requires immediate treatment by qualified medical professionals*. The toll-free hot line number of the National Reye's Syndrome Foundation is listed below.

While white willow is metabolized differently from aspirin, the two have similar effects and it is recommended that white willow not be given concurrent with aspirin use.

Persons with a bleeding disorder, ulcer, **colitis**, **Crohn's disease**, kidney or liver disease, or diabetes should not take this herb.

Children over 12 and persons over 65 should take white willow in low initial doses. Children under the age of 12 should not use white willow at all.

Side effects

Excessive doses of white willow may cause stomach upset, **diarrhea**, **nausea**, or ringing in the ears. If this occurs, stop taking white willow.

Interactions

In general, persons considering taking white willow preparations should first consult a physician or registered pharmacist, as white willow interacts with a number of nonprescription and prescription medications.

Persons who are allergic to aspirin should not use white willow.

White willow should not be taken in combination with aspirin or such nonsteroidal anti-inflammatory drugs (NSAIDs) as ibuprofen or naproxen, alcohol, or blood thinning medications.

White willow has been reported to have adverse interactions with bismuth subsalicylate (Pepto-Bismol), celecoxib (Celebrex), repaglinide (Prandin), and ticlopidine (Ticlid). It increases the action of metaclopramide (Reglan), but reduces the effectiveness of diclofenac (Voltaren, Cataflam), ketoprofen (Orudis), and nadolol (Corgard).

Resources

BOOKS

Pelletier, Kenneth R., MD. *The Best Alternative Medicine,* Chapter 6, "Western Herbal Medicine: Nature's Green Pharmacy." New York: Simon & Schuster, 2002.

Prevention. *The Complete Book of Natural and Medicinal Cures*. Emmaus, PA: Rodale Press Inc., 1994.

PERIODICALS

Appelboom, T. "Arthropathy in Art and the History of Pain Management Through the Centuries to Cyclooxyge nase 2 Inhibitors." *Rheumatology (Oxford)* 41 (April 2002): Supplement 1, 28 34.

Brune, K. "Next Generation of Everyday Analgesics." *American Journal of Therapeutics* 9 (May June 2002): 215 223.

Riddle, J. M. "History as a Tool in Identifying 'new' Old Drugs." *Advances in Experimental Medicine and Biol ogy* 505 (2002): 89 94.

ORGANIZATIONS

American Herbalists Guild. 1931 Gaddis Road, Canton, GA 30115. (770) 751 6021. http://www.americanherbalists guild.com.

National Reye's Syndrome Foundation. P. O. Box 829, Bryan, OH 43506. (800) 233 7393. http://www. reyessyndrome.org.

Jennifer Wurges
Rebecca J. Frey, PhD

Whooping cough

Definition

Whooping **cough**, also known as pertussis, is a highly contagious disease that causes classic spasms (paroxysms) of uncontrollable coughing, followed by a sharp, high-pitched intake of air which creates the characteristic whoop of the disease's name.

Wild cherry can be used as a remedy for whooping cough. *(© blickwinkel / Alamy)*

KEY TERMS

Catarrh—Inflammation of a mucous membrane, particularly in the respiratory system, that produces excessive secretions.

Cilia—Tiny hair-like projections from a cell. In the respiratory tract, cilia beat constantly in order to move mucus and debris up and out of the respiratory tree to protect the lung from foreign bodies.

Encephalopathy—Swelling and degeneration of the brain.

Paroxysm—A severe attack or a sudden increase in intensity of a disease.

Prophylaxis—The prevention of disease by protective measures.

Description

Whooping cough is caused by a bacterium called *Bordetella pertussis*. *B. pertussis* causes its most severe symptoms by attaching itself to those cells in the respiratory tract which have cilia. Cilia are small, hair-like projections that beat continuously, and serve to constantly sweep the respiratory tract clean of such debris as mucus, bacteria, viruses, and dead cells. When *B. pertussis* interferes with this normal, janitorial function, mucus and cellular debris accumulate and cause constant irritation to the respiratory tract, triggering coughing and increasing further mucus production.

Whooping cough is a disease that exists throughout the world. While persons of any age can contract whooping cough, children under the age of two are at the highest risk for both the disease and for serious complications including death. Apparently, exposure to *B. pertussis* bacteria earlier in life gives a person some, but not complete, immunity against infection with it later on. Subsequent **infections** resemble the **common cold**.

It is estimated that as many as 120,000 persons in the United States get whooping cough each year. The number of cases has been increasing, with the largest increases found in older children and adults. Between 1993 and 1996, the number of cases increased by 40% in five to nine year old children, 106% in 10–19 year olds, and 93% for persons aged 20 years and older.

Causes and symptoms

Whooping cough has four stages that partially overlap: incubation, catarrhal stage, paroxysmal stage, and convalescent stage.

A person usually acquires *B. pertussis* by inhaling droplets carrying the bacteria that were coughed into the air by someone already suffering with the infection. Incubation is the symptomless period of seven to 14 days after breathing in the *B. pertussis* bacteria, and during which the bacteria multiply and penetrate the lining tissues of the entire respiratory tract.

The catarrhal stage is often mistaken for an exceedingly heavy cold. The patient has teary eyes, **sneezing**, **fatigue**, poor appetite, and an extremely runny nose (rhinorrhea). This stage lasts about 10–14 days.

The paroxysmal stage, lasting two to four weeks, begins with the development of the characteristic whooping cough. Spasms of uncontrollable coughing, the whooping sound of the sharp inspiration of air, and **vomiting** are all hallmarks of this stage. The whoop is believed to occur due to inflammation and mucus that narrow the breathing tubes, causing the patient to struggle to get air into his/her lungs; the effort results in intense exhaustion. The paroxysms (spasms) can be induced by over activity, feeding, crying, or even overhearing someone else cough.

The mucus that is produced during the paroxysmal stage is thicker and more difficult to clear than the more watery mucus of the catarrhal stage, and the patient becomes increasingly exhausted attempting to clear the respiratory tract through coughing. Severely ill children may have great difficulty maintaining the normal level of oxygen in their systems and may appear somewhat blue after a paroxysm of coughing due to the low oxygen content of their blood. Such children may also suffer from swelling and degeneration of the brain

(encephalopathy), which is believed to be caused both by lack of oxygen to the brain during paroxysms and by bleeding into the brain caused by increased pressure during coughing. Seizures may result from decreased oxygen to the brain. Some children have such greatly increased abdominal pressure during coughing that hernias result (hernias are the abnormal protrusion of a loop of intestine through a weak area of muscle). Another complicating factor during this phase is the development of **pneumonia** from infection with another bacterial agent which takes hold due to the patient's weakened condition.

If the patient survives the paroxysmal stage, recovery occurs gradually during the convalescent stage, usually taking about three to four weeks. However, spasms of coughing may continue to occur over a period of months, especially when a patient contracts a cold, or other respiratory infection.

Diagnosis

Diagnosis based only on the patient's symptoms is not particularly accurate, as the catarrhal stage may appear to be a heavy cold, a case of the flu, or a simple **bronchitis**. Other viruses and **tuberculosis** infections can cause symptoms similar to those found during the paroxysmal stage. The presence of a pertussis-like cough along with an increase of certain specific white blood cells (lymphocytes) is suggestive of pertussis (whooping cough). However, cough can occur from pertussis-like viruses. The most accurate method of diagnosis is to culture (grow in the laboratory) the organisms obtained from swabbing mucus out of the nasopharynx (the breathing tube continuous with the nose). *B. pertussis* can then be identified by examining the culture under a microscope.

Researchers believe that as many as 90% of the cases are not diagnosed, mainly because of the nonspecific symptoms displayed by adults. An adult who has been coughing for months may have whooping cough.

Recent advances in the accuracy of diagnostic tests based on polymerase chain reactions (PCR) are now being applied to whooping cough. Researchers in Seattle are presently working on a PCR-based test for *Bordetella pertussis* that will improve the speed as well as the accuracy of diagnosing whooping cough.

Treatment

Whooping cough should always be treated with antibiotics and never with only alternative therapies. The following complementary therapies may reduce symptoms and speed recovery. Supportive treatment involves careful monitoring of fluids to prevent dehydration, rest in a quiet, dark room to decrease paroxysms, and suctioning of mucus. Sitting up during coughing attacks may help.

Herbals

The following herbal remedies may help to support antibiotic treatment of whooping cough:

- Bryonia (*Bryonia alba*) tea: spasmodic coughing.
- Butterbur (*Pinguicula vulgaris*) infusion: infection and spasms.
- Evening primrose (*Oenothera biennis*) oil.
- Jamaican dogwood (*Piscidia erythrina*) root or bark: spasms.
- Lobelia (*Lobelia inflata*) tea or tincture: spasmodic coughing.
- Pansy (*Viola tricolor*) tea or tincture: spasms.
- Red clover (*Trifolium pratense*) tea.
- Santonica (*Artemisia cina*) powder, tablets, or lozenges.
- Sea holly (*Eryngium planum*) infusion: infection and spasms.
- Skunk cabbage (*Symplocarpus foetidus*) powder, extract, or tincture.
- Sundew (*Drosera rotundifolia*) infusion: infection and spasms.
- Thyme (*Thymus vulgaris*) infusion: infection and spasms.
- Wild cherry (*Prunus serotina*) bark infusion or syrup: infection and spasmodic coughing.

Homeopathy

Homeopathic remedies are chosen based upon the family of symptoms displayed by each patient. Remedies for symptom families include:

- Drosera: dry and tickly feeling in throat; violent coughing that induces vomiting; symptoms worse after midnight.
- Kali carbonicum: dry, hard, hacking cough at 3 A.M.; puffy eyelids; exhaustion; chilly feeling.
- Coccus: coughing worse when warm; drinking cold water brings relief; vomiting stringy, transparent mucous.
- Cuprum: coughing spasms cause breathlessness and exhaustion; blue lips; toe and finger cramping; drinking cold water brings relief.
- Kali bichromicum: coughing up yellow, stringy mucus.

- Belladonna: stomach pain before coughing; coughing worse at night; retching with coughing attacks; red face; puffy eye lids.
- Ipecac: sick feeling most of the time; paleness, rigidity, breathlessness, and then relaxation precede vomiting.

Chinese medicine

Traditional Chinese medicine (TCM) practitioners use a combination of herbals, **acupuncture**, and ear acupuncture to treat whooping cough during each stage. Yi Zhi Huang Hua (*Herba solidaginis*) decoction or a decoction of Bai Mao Gen (*Rhizoma imperatae*), Lu Gen (*Rhizoma phragmitis*), and Si Gua Gen (*Radix vascularis luffae*) may be taken for the early stage of whooping cough. Gasping cough can be treated with a mixture of Wu Gong (*Scolopendra*) and Gan Cao (*Radix glycyrrhizae*).

Other remedies

Some other remedies which may assist in the treatment of whooping cough are:

- Dietary supplements include vitamins A and C, beta carotene, acidophilus, lung glandulars, garlic, and zinc.
- Dietary changes include drinking plenty of fluids, eating fruits, vegetables, brown rice, whole grain toast, vegetable broth, and potatoes, and avoiding dairy products.
- Juice therapists recommend orange and lemon juice or carrot and watercress juice.
- Hydrotherapy treatment consists of wet cloths or other material applied to the head or chest to relieve congestion.
- Aromatherapy uses essential oils of tea tree, chamomile, basil, camphor, eucalyptus, lavender, peppermint, or thyme.
- Osteopathic manipulation can reduce cough severity and make the patient feel more comfortable.

Allopathic treatment

Treatment with the antibiotic erythromycin is clearly helpful only in the very early stages of whooping cough, during incubation and early in the catarrhal stage. In general, however, physicians have used this antibiotic both for treatment of whooping cough itself and to prevent its spread to others in the patient's community. This type of preventive measure is known as prophylaxis.

Unfortunately, the benefits of antibiotic prophylaxis and treatment for whooping cough are limited because erythromycin-resistant strains of *B. pertussis* have spread throughout the United States since the first case of erythromycin resistance was identified in Arizona in 1994. Although erythromycin is still used as of 2003 for both treatment and prophylaxis of whooping cough, the Centers for Disease Control (CDC) are monitoring the five resistant strains of *B. pertussis* that have been identified so far.

Expected results

Just under 1% of all cases of whooping cough cause death; in 2000, only two deaths from whooping cough were reported in the United States. Children who die of whooping cough usually have one or more of the following three conditions:

- Severe pneumonia, perhaps with accompanying encephalopathy.
- Extreme weight loss, weakness, and metabolic abnormalities due to persistent vomiting during paroxysms of coughing.
- Other preexisting conditions, so that the patient is already in a relatively weak, vulnerable state (such conditions may include low-birth-weight babies, poor nutrition, infection with the measles virus, presence of other respiratory or gastrointestinal infections or diseases).

Prevention

The mainstay of prevention lies in the immunization program. In the United States, inoculations begin at two months of age. The pertussis vaccine, most often given as one immunization together with diphtheria and **tetanus** (called DTP), has greatly reduced the incidence of whooping cough. With one shot backed with a 70% immunization rate, two shots increase it to 75–80% and three to only 85%, it is not a guarantee.

A new formulation of the pertussis vaccine is available. Unlike DTP, which is composed of dead bacterial cells, the newer acellular pertussis vaccine is made up of two to five chemical components of the *B. pertussis* bacteria. The acellular pertussis vaccine (called DTaP; when combined with diphtheria and tetanus vaccines) greatly reduces the risk of unpleasant reactions, including high **fever** and discomfort at the injection site.

Because adults are the primary source of infection for children, there has been some talk in the medical community about vaccinating or giving booster vaccinations to adults. A recent increase of pertussis cases among adults in France has led several French medical schools to recommend booster doses of vaccine for adults.

Resources

BOOKS

Fetrow, Charles W. *The Complete Guide to Herbal Medicines*. Springhouse, PA: Springhouse Corporation, 1999.

Finegold, Sydney M., et al., eds. *Pertussis in Adults: Epidemiology, Signs, Symptoms, and Implications for Vaccination*. Chicago: The University of Chicago Press, 1999.

Lockie, Andrew and Nicola Geddes. *The Women's Guide to Homeopathy*. New York: St. Martin's Press, 1994.

Ryan, Kenneth J., and Stanley Falkour. "Pertussis." In *Sherris Medical Microbiology: An Introduction to Infectious Diseases*. edited by Kenneth J. Ryan. Norwalk, CT: Appleton and Lange, 1994.

Stoffman, Phyllis. *The Family Guide to Preventing and Treating 100 Infectious Diseases*. New York: John Wiley and Sons, Inc., 1995.

Ying, Zhou Zhong and Jin Hui De. "Whooping Cough." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingstone, 1997.

PERIODICALS

Decker, Michael D. and Kathryn M. Edwards. "Acellular Pertussis Vaccines." *Pediatric Clinics of North America* 47 (April 2000): 309 335.

Gilberg, S., E. Njamkepo, I. P. Du Chatelet, et al. "Evidence of *Bordetella pertussis* Infection in Adults Presenting with Persistent Cough in a French Area with Very High Whole Cell Vaccine Coverage." *Journal of Infectious Diseases* 186 (August 2002): 415 418.

Henderson, C.W. "Disease Still Potentially Deadly." *World Disease Weekly* (11/29/99 12/6/99): 17+.

Jenkinson, Douglas. "Natural Course of 500 Consecutive Cases of Whooping Cough: A General Practice Population Study." *British Medical Journal* 310 (6975)(February 4, 1995): 299+.

Laliberte, Richard. "The Threat of Whooping Cough." *Parents* 74 (January 1999): 45+.

"Pertussis Deaths United States, 2000." *Morbidity and Mortality Weekly Report* 51 (July 19, 2002): 616 618.

Qin, X., D. K. Turgeon, B. P. Ingersoll, et al. "*Bordetella pertussis* PCR: Simultaneous Targeting of Signature Sequences." *Diagnostic Microbiology and Infectious Disease* 43 (August 2002): 269 275.

Wilson, K. E., P. K. Cassiday, T. Popovic, and G. N. Sanden. "*Bordetella pertussis* Isolates with a Heterogeneous Phenotype for Erythromycin Resistance." *Journal of Clinical Microbiology* 40 (August 2002): 2942 2944.

ORGANIZATIONS

American Academy of Pediatrics. 141 Northwest Point Boulevard, Elk Grove Village, IL 60007. (847)434 4000. http://www.aap.org.

Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. http://www.cdc.gov.

Food and Drug Administration (FDA), Center for Biologics Evaluation and Research (CBER), 1401 Rockville Pike, Suite 200 N, Rockville, MD 20852. http://www.fda.gov/cber.

Belinda Rowland
Rebecca J. Frey, PhD

Wigmore diet

Definition

The Wigmore diet is named for its creator, Ann Wigmore, who devised a nutritional system called the Living Foods Program, based on a combination of wheat grass juice, live sprouts, and fresh raw foods. It is thought that this dietary regimen, which is sometimes called raw **nutrition**, detoxifies and rebuilds the body. Persons following the Wigmore diet also avoid using denatured processed commercial foods or anything containing chemicals, especially pesticides. Although the Wigmore diet is essentially a vegetarian diet, its distinctive feature is its emphasis on eating foods in their uncooked state.

Origins

The Wigmore diet was developed during the 1960s by Ann Wigmore (1909–1993), who was born in Eastern Europe in 1909 and emigrated to the United States after World War I. Wigmore credited her grandmother with teaching her natural healing methods. She did not, however, use this folk wisdom immediately but returned to it after years of ill health that included **colitis**, headaches, and arthritis. When she finally learned that she had **cancer**, she returned to her grandmother's healing methods in order to regain her health.

After testing the results of a diet based on sprouts and wheat grass juice in her own life, she wanted others to benefit from what she had learned. Wigmore founded the Hippocrates Health Institute in Boston in 1963, which continued into the late 2000s to teach her methods of self-healing through a live-foods diet. Wigmore died in a fire in 1993, and her diet still attracts new followers. Subsequently, the Hippocrates Institute opened branches in southern California and Florida.

Benefits

The Wigmore diet is based on the assumption that the high levels of living enzymes in fresh raw foods, particularly wheat grass juice and fresh sprouts, provide the body with substances needed to detoxify and

regenerate. In addition to increased vitality and a strengthened immune system, the Wigmore regimen is thought to help individuals overcome some serious diseases, including arthritis, digestive tract problems, **allergies** and even cancer.

Description

In her 1996 book, *The Blending Book: Maximizing Nature's Nutrients: How to Blend Fruits and Vegetables for Better Health*, Wigmore explained her views:

"Live foods nutrition is super nutrition because it recognizes and appreciates the differences between raw and cooked foods and between natural and synthetic nutrients. In the conventional nutrition-school curriculum there is little room for a discussion of either the value of enzymes and life forces in foods, or the merits of live (raw) versus cooked foods. Yet the difference, when translated into health terms, is the difference between being vitally healthy and alive, and just breathing."

The Wigmore diet classifies foods into four major categories: living foods, which include sprout mixtures, sunflower and buckwheat baby greens, living sauerkraut, and the fresh juices of wheat grass and barley; raw foods, which include fresh organic vegetables and ripe fruit, spices, herbs, and raw nuts; whole cooked foods, which include steamed or boiled vegetables, cooked whole grains, and baked root vegetables; and processed fast foods, which include all forms of junk foods. People following the Wigmore diet believe that most human diseases are caused when a person's diet contains mostly foods in the last two groups.

Practitioners of the Wigmore diet encourage people to think of enzyme and oxygen levels as bank accounts. The more oxygen and enzymes that can be stored in the cells, the healthier one feels. It has been shown that eating certain foods will maintain enzymes and oxygen at optimal preferred levels.

Other notable features of the Wigmore diet are its emphasis on wheat grass as a "living food medicine" and food combining as a key to good digestion. Wheat grass has been credited with more healings than any other factor in the program because it is supposed to be rich in over 90 enzymes and minerals that are needed to build up the blood and immune system. People following the Wigmore diet are encouraged to drink at least two 2-ounce servings of wheat grass juice every day. In addition, wheat grass enemas of 4–8 ounces can be taken "as often as possible" for best results during the **detoxification** process.

Food combining in the Wigmore diet is based on the assumption that certain food combinations cause stomach cramps, **indigestion**, bad breath, intestinal **gas**, or lowered energy levels. Foods are divided into nine groups: proteins (poultry, fish, dairy products, miso, and yeast); pre-digested proteins (nuts and seeds); starches; vegetables; acid fruits (citrus fruits and sour fruits); sub-acid fruits (apples, apricots, most berries, peaches); sweet fruits (bananas, dates, and all dried fruits); melons; and neutral foods (avocados and lemons). Melons are to be eaten alone. While meals made up of foods from any one category provide a good combination, for example, fruit and starch are a bad combination.

Another important point in the Wigmore diet is drinking water. Tap water is considered unsuitable, and some form of filter should be used. Distilled water or spring water are preferred.

Preparations

Preparations for the Wigmore diet include a gradual departure from less healthy foods; cleansing the digestive tract with **aloe** vera or similar products; and encouraging good digestion by eating food at room temperature as often as possible and eating raw or living foods before any cooked foods. It is thought that the cooked foods hold up the digestion of raw and living foods, causing intestinal gas. Ann Wigmore's *The Sprouting Book* discusses the proper preparation of the sprouts that play such a prominent role in her diet.

Precautions

Like all natural therapies, the Wigmore diet is more effective if environmental as well as nutritional pollution of all types is avoided and if a generally healthy lifestyle is followed. Such spiritual practices as **meditation**, visualization, and joining or starting a Living Foods support group are considered important features of a healthy lifestyle.

Side effects

Practitioners of the Wigmore diet warn people to expect certain side effects from detoxification, which is considered a key principle in the Living Foods lifestyle. The diet is believed to clear toxins from the body that have accumulated over years of poor nutritional habits. These toxins are released into the bloodstream and lymphatic system for eventual excretion. During the detoxification process, dieters may feel less energetic and uncomfortable in their body. The program recommends daily non-strenuous **exercise**, high fiber intake to cleanse the colon, daily dry skin brushing over the entire body, and the use of **spirulina** (blue-

KEY TERMS

Detoxification—The process of purifying the body of poisons accumulated during years of poor eating habits.

Homocysteine—An amino acid that in high levels can damage the arteries.

Raw nutrition—A synonym for the Wigmore diet's emphasis on uncooked and living foods.

Spirulina—A genus of blue-green algae that is sometimes added to food to increase its nutrient value.

Wheat grass—Young green wheat sprouts, grown organically for juicing; a central element of the Wigmore diet.

green algae) products to ease the side effects of the detoxification process.

As the Wigmore diet is a purely organic regimen and avoids the use of medications and all chemicals, the risk of other side effects is minimal. Nevertheless, some individuals will be unable to tolerate this diet, and others may be allergic to the foods that are prescribed.

Research and general acceptance

As with many holistic therapies, the Wigmore diet is met with skepticism from allopathic physicians. However, there are many clinical cases and testimonials consistent with Wigmore's predicted benefits.

Training and certification

Anyone can follow the Wigmore regimen, as no special training or certification is required. Many holistic practitioners are familiar with Wigmore's works and can advise on the regimen.

A German study reported in 2006 that following a strict raw foods diet can increase the risk of **heart disease**. The study found that people who ate only vegetables, fruits, nuts, and beans, had 26% higher levels of homocysteine, an amino acid that can damage arteries in much the same way as can high **cholesterol** and high triglyceride levels in the blood. The percentage was measured against a study group that also added meat and dairy products to their diet. The study's scientists said that the high homocysteine levels were likely due to a deficiency in vitamin B12, found primarily in animal foods. The study did not look at whether a raw foods diet that includes vitamin B12 supplementation would keep homocysteine at a normal level.

Resources

BOOKS

Rose, Natalia. *Raw Food Life Force Energy: Enter a Totally New Stratosphere of Weight Loss, Beauty, and Health*. New York: Collins, 2007.

Rudell, Wendy. *The Raw Transformation: Energizing Your Life with Living Foods*. Berkeley, CA: North Atlantic Books, 2006.

PERIODICALS

Berkoff, Nancy. "Feeding in the Raw: Raw Food Vegan by Definition Takes the No Meat Menu to New Heights. Are You Prepared to Make the Climb?" *Food Service Director* (December 15, 2005): 34.

Drapkin, Jennifer. "The Raw Rage." *Psychology Today* (July/August 2005): 20.

Mangels, Reed. "Raw Food Diets Also Have Positives and Negatives." *Vegetarian Journal* (May/June 2006): 12.

Walker, Vrinda. "Attitudes, Practices, and Beliefs of Indi viduals Consuming a Raw Foods Diet." *Vegetarian Journal* (July/August 2006): 27(3).

ORGANIZATIONS

Ann Wigmore Foundation, PO Box 399, San Fidel, NM, 87049 0399, (505) 552 0595, http://www.wigmore.org.

Ann Wigmore Natural Health Institute, PO Box 429, Rin cón, Puerto Rico, 00677, (787) 868 6307, http://www.annwigmore.org.

Vegan Society U.K., Donald Watson House, 21 Hylton St., HockleyBirmingham, B18 6HJ, U.K., (0121) 523 1730, http://www.vegansociety.com.

Patricia Skinner
Ken R. Wells

Wild endive *see* **Dandelion**

Wild oat

Description

Wild oat (*Avena sativa*) is a member of the grass family native to Scotland. There are approximately 25 varieties of the oat plants, and oat is now grown throughout the world. *Avena sativa* is the species that is used in herbal remedies. The mature seed of the oat plant is used as a cereal grain, however, much of the plant is used to maintain good health and to remedy disease conditions.

Before maturity, oat seeds are in a liquid phase and they are collected for use in tonics that treat nervous conditions. Wild oat is usually in this stage for two weeks during August.

Wild oats. *(© Agripicture Images / Alamy)*

KEY TERMS

Aphrodisiac—A substance that stimulates or is thought to stimulate sexual desire.

Beta-glucans—Complex carbohydrates contained in oats and other cereal grains. They are thought to be useful in managing diabetes as well as lowering blood cholesterol levels.

Functional food—A food or food ingredient that is thought to confer health benefits in addition to the nutrients it contains.

Gluten—A grayish sticky compound found in oat flour and other grain flours, composed of two proteins, glutenin and gliadin.

Nervine—A type of medication or herbal preparation given to calm the nerves.

Nutraceutical—Another term for functional food.

Tincture—A method of preserving herbs with alcohol. Powdered herb is added to a 50 percent alcohol solution. The tincture steeps for two weeks and is shaken daily. It is strained and bottled.

The seeds mature in the late summer and early fall. If harvested then, the seeds are rolled or ground into oatmeal. If the seeds aren't harvested at that time, they are referred to as groats.

Once the seeds are harvested, the straw from the plant can be cut up and brewed as oatstraw tea. The husks surrounding the seeds are used as oat bran.

The only part of this grain that not used in alternative medicine is the root.

Wild oat is also known as oat, groats, oatstraw, and straw.

General use

Avena sativa is Latin for wild oat, a name that does not provide the complete picture of this grain's use in alternative and conventional medicine. The old saying "sowing your wild oats" is based on the observation that stallions given wild oat experienced greater sex drives. Wild oat was thought to have the same effect on men, although that claim has never been scientifically proven. Nevertheless, dietary supplements containing wild oats are still advertised and sold as boosting the male sex drive.

Wild oat may not be an aphrodisiac or a means of promoting fertility, but the grain has numerous other health benefits.

In the past, people recovering from illnesses ate oatmeal because it was easily digested. Doctors advised overworked people to drink a beverage consisting of wine and oats. The drink was said to restore nervous energy. Oatmeal also served as a treatment for skin conditions.

In contemporary times, oatmeal is acknowledged as a rich source of bran and fiber. The grain is associated with treating high cholesterol . Whole oat products with at least 0.02 oz (0.75 g) of soluble fiber in each serving can reduce the risk of heart disease. The U.S. Food and Drug Administration allowed manufacturers to make that statement, and add that the fiber product must be part of a diet that is low in **cholesterol** and saturated fat. A study published in the summer of 2002 reported that oat cereal is superior to wheat cereal in lowering LDL cholesterol levels in adult males.

A new use for the beta-glucans (complex carbohydrates) contained in oats is in the manufacture of

functional foods for the management of type 2 (adult-onset) diabetes. Functional foods are a relatively recent category of foods. They are not currently defined as such by any government regulatory body, but are commonly understood to be any potentially healthful food or food ingredient that may provide health benefits beyond the traditional nutrients it contains. Functional foods are sometimes called nutraceuticals.

Oat fiber is also used as a substrate, or growing medium, for *Lactobacillus* and other bacteria that are introduced into the digestive tract of patients suffering from severe **infections** of the pancreas. The "good" bacteria in the intestines help the body to fight off infections elsewhere in the digestive system. The oat fiber provides the bacteria with nourishment without causing any side effects to the patient.

Furthermore, pregnant women can benefit from the calcium and other trace nutrients found in oat straw.

Wild oat is recognized as a natural antidepressant and a mild sedative. It acts like a tonic to the nervous system, providing both nourishment and balance. Oat tea or an oat Bach flower remedy is used as a nervine (preparation given to calm the nerves).

In these capacities, wild oat can be used to treat conditions including headaches, **depression**, tension, insomnia, **anxiety**, and feelings of sadness. Wild oat is also a remedy for nerve **pain** and chronic **fatigue**.

Oatstraw can be used to ease emotional anxieties and to treat skin conditions such as **rashes**, **psoriasis**, **burns**, **eczema**, warts, and insect **bites**.

An oatmeal pack may be used to treat skin conditions. The oatmeal facial is a popular treatment for promoting smoother skin because the textured oat sloughs off dead skin when used as a mask or scrub. An oatstraw bath can provide more relief for skin conditions and neuralgia.

Wild oat is also believed to help relieve symptoms of nicotine withdrawal, a remedy recommended by German doctors. The wild oat extract is said to be effective when used for this purpose, and oat cereal is also said to be helpful.

Preparations

Wild oat is available in various forms and is used in various alternative medicine traditions such as **homeopathy**. Commercial preparations include oatstraw tea, tincture, and the wild oat Bach flower remedy (a liquid concentrate called a stock). The packaged oatmeal sold in the grocery store can also be used for treatments.

Wild oat tea, which is also known as an infusion, is made by pouring 1 c (240 ml) of boiling water over 1–3 tsp (1.5–3 g) of the dried straw. The mixture is steeped for 10–15 minutes and then strained. Wild oat tea should be drunk three times a day.

When wild oat tincture is used, the dosage is 1 oz (1 mL) taken three times a day.

Wild oat can be combined with **skullcap** and **mugwort** to provide relief from depression and to improve sleep.

A flower remedy

Flower remedies are liquid concentrates made by soaking flowers in spring water. Also known as flower essences, 38 remedies were developed by homeopathic physician Edward Bach during the 1930s. Bach's wild oat remedy is taken to resolve conditions such as career anxiety and uneasiness about a lack of direction or commitment.

The daily dosage of the Bach wild oat flower remedy is 2–4 drops (1/8–1/4 ml) taken four times each day. The drops can be placed under the tongue or added to a glass of water. Another way to administer this remedy is to add some stock to the bath water.

Oat baths

An oatstraw bath can provide relief for irritated skin and neuralgia. A bath is prepared by boiling 1 lb (500 g) of shredded oatstraw in 2 qt (0.95 L) of water. After boiling for 20 minutes, this mixture is strained and used in the bath. Another option is to place cooked rolled oats in a bag and put the bag in the bath.

Precautions

Wild oat has not been associated with any health risks when taken in proper dosages, according to *Physician's Desk Reference for Herbal Medicines*, the 1998 book based on the findings of Germany's Commission E. The commission investigates herbal remedies for safety and effectiveness. The European group's findings about herbal remedies were published in a 1997 monograph.

However, people diagnosed with gluten sensitivity (celiac disease) should consult with a doctor or health practitioner to determine if they can safely take wild oat internally.

Side effects

There are no known side effects associated with designated dosages of wild oat.

Interactions

There are no known interactions associated with the use of wild oat and other medications or herbs.

Resources

BOOKS

Duke, James A. *The Green Pharmacy*. Emmaus, PA: Rodale Press, Inc., 1997.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear, and Lauren David Peden. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

Tyler, Varro, and Steven Foster. *Tyler's Honest Herbal*. Binghamton, NY: The Haworth Herbal Press, 1999.

PERIODICALS

Davy, B. M., K. P. Davy, R. C. Ho, et al. "High Fiber Oat Cereal Compared with Wheat Cereal Consumption Favorably Alters LDL Cholesterol Subclass and Par ticle Numbers in Middle Aged and Older Men." *American Journal of Clinical Nutrition* 76 (August 2002): 351 358.

Jenkins, A. L., D. J. Jenkins, U. Zdravkovic, et al. "Depression of the Glycemic Index by High Levels of Beta Glucan Fiber in Two Functional Foods Tested in Type 2 Diabetes." *European Journal of Clinical Nutri tion* 56 (July 2002): 622 628.

Olah, A., T. Belagyi, A. Issekutz, et al. "Randomized Clin ical Trial of Specific *Lactobacillus* and Fibre Supple ment to Early Enteral Nutrition in Patients with Acute Pancreatitis." *British Journal of Surgery* 89 (September 2002): 1103 1107.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin, TX 78720. (512) 331 8868.

American Dietetic Association. 216 West Jackson Blvd., Chicago, IL 60606. (312) 899 0040. http:// www.eatright.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http:// www.herbs.org.

OTHER

Ask Dr. Weil. 2000. http://www.askdrweil.com.

MotherNature.com Health Encyclopedia. 2000. http:// www. mothernature.com/ency.

Liz Swain
Rebecca J. Frey, PhD

Wild thyme *see* **Thyme**

Windflower *see* **Pulsatilla**

Wintergreen

Description

Though several different plants are called by this name, true wintergreen is *Gaultheria procumbens*, a low-growing species of shrub common in sandy coastal regions and woodlands of eastern North America from Georgia to New Foundland. It is a member of the heath, or Ericaceae, family. Other names by which wintergreen is known include aromatic wintergreen, boxberry, Canada tea, checkerberry, deerberry, ground berry, mountain tea, partidgeberry, spice berry, tea-berry, and wax cluster.

Wintergreen plants have creeping underground stems from which small reddish stalks grow, normally less than 6 in (15 cm) high. Wintergreen leaves are spoon-shaped and less than 0.5 in (1 cm) in length. They are bright green, shiny, and have a leathery appearance. They are attached in tufts near the tip of a rigid, slender stalk. In June or July, wintergreen plants produce tiny wax-like, urn-shaped flowers, which are either white or pink in color. These unusual flowers are often difficult to find because the plant's leaves and other ground covers on the forest floor hide them so well. The fruit of the wintergreen, a startlingly brilliant red berry, appears in late autumn through the winter and is much more visible than the wintergreen flower. Wintergreen is an evergreen plant, and even beneath deep snow it retains its shiny green leaves and scarlet berries.

Wintergreen leaves and berries are edible. In their natural state they have no particularly noticeable odor. The leaves have a tart, spicy, astringent taste, while the berries are sweet, with a unique, pleasant taste which is often used in flavorings. Wintergreen leaves were formerly carried in the *United States Pharmacopoeia*, but now only the oil distilled from them is listed. But in many countries the whole plant is still used. When wintergreen leaves are distilled, they impart an oil which is made up of 99% methyl salicylate, the chemical compound upon which all aspirin products are based. Before being distilled, wintergreen leaves have to be steeped in water for nearly a day before the oil will develop through fermentation. It is only after this fermentation and the chemical reaction of water and one component, gaultherin, that wintergreen emits its characteristic, pleasant aroma. Chemists have learned how to synthetically produce an oil with many of the same properties and a very similar product, also called oil of wintergreen is extracted from the sweet birch tree, *Betula lenta*.

The name wintergreen is also sometimes applied to two other members of the genus Gaultheria, as well as three other unrelated plants:

- *Gaultheria hispidula* is also called wintergreen. It is supposed to remove the predisposition to cancer from the body.
- *Gaultheria shallon*, sallol, is found in northwest America. Its berries are edible and quite tasty.
- *Pytola rotundiflora* is also known as false wintergreen or British wintergreen. It was formerly used as a vulnerary.
- *Chimophila umbellata* and *Maculata* are both called by a variety of names: bitter wintergreen, rheumatism weed, spotted wintergreen, or pipsissewa. North American natives used these two herbs for the treatment of indigestion, rheumatism, scrofula, and as a diuretic.
- *Trientalis europaea*, or chickweed wintergreen, is native to England. It was used in the past externally in a ointment used in healing wounds, and internally as a tea to treat blood-poisoning and eczema.

KEY TERMS

Eczema—General term for a group of acute or chronic inflammatory skin conditions characterized by redness, thickening, oozing, and the formation of papules, vesicles, and crusts.

Neuralgia—Severe pain caused by irritation of, or damage to, a nerve.

Papule—Superficial, solid elevation on the skin.

Rheumatism—A popular term for any disorder that causes pain and stiffness in muscles and joints and fibrous tissues, including minor aches and twinges, as well as disorders such as rheumatoid arthritis, osteoarthritis, and polymyalgia rheumatica.

Scrofula—Tuberculous inflammation of the lymph nodes of the neck in children, caused by bacteria in cattle; also called cervical adenitis.

Vesicle—Sac or hollow structure filled with fluid (i.e., a blister).

Vulnerary—An agent used for healing wounds.

General use

Wintergreen oil is used as flavoring for candies, chewing gum and medicines. With **eucalyptus** or menthol, it is often used to flavor toothpaste and other dental products. The berry, often called checkerberry, is used for flavoring candies. It is sometimes used as a tea by itself, or combined with tea as a flavoring. Hence, its name teaberry.

Medicinally, wintergreen leaves are taken internally as a decoction to treat nephritis and bladder problems. Wintergreen is used as a diuretic, for the treatment of **neuralgia**, as a systemic tonic, to stimulate menses, and to aid in bringing on lactation after childbirth. It has also been used to relieve children's headaches. Its leaves have also been used for headaches and other pains, and as a gargle for a **sore throat** and mouth.

Externally, oil of wintergreen is widely used in liniments for the relief of muscular-skeletal **pain**, both from sports injuries and arthritis. Because of its aromatic and pain-relieving qualities, the oil is used in a number of products in aroma therapy, including stress-reducing pulse point creams, foot scrubs and balms.

Preparations

Wintergreen leaves can be picked at any time of year, but summer is the most opportune time for gathering them. They must be dried in the shade to prevent loss of the volatile oil contained in the leaves, and should be stored in an airtight container in a dark, cool place. A decoction can be made by mixing 1 c (240 ml) of boiling water with 1 tsp (1.5 g) of the dried wintergreen leaves and allowing the mixture to steep for 15 minutes. This tea may be taken up to three times per day.

Oil of wintergreen, as noted previously, is made by first steeping wintergreen leaves in water for at least 24 hours, and then allowing this mixture to ferment and release its oil. Fermentation is known to have occurred when the characteristic wintergreen aroma is released. This oil is sometimes used externally in dilute solutions in combination with other products such as aloe and lanolin to produce ointments, but either the oil extracted from sweet birch or the synthetic version are more apt to be used.

Precautions

Oil of wintergreen should not be taken internally. In the past, it has been given in a capsule form to treat rheumatism, but excessive doses of it have actually caused death due to severe inflammation of the stomach and gastro-intestinal hemorrhage.

Side effects

True oil of wintergreen, distilled from wintergreen leaves, is very rapidly absorbed by the skin and often causes severe skin irritation and painful, hive-like skin eruptions.

Resources

BOOKS

Grieve, M., and C. F. Leyel. *A Modern Herbal: The Medical, Culinary, Cosmetic and Economic Properties, Cultiva tion and Folklore of Herbs, Grasses, Fungi, Shrubs and Trees With All of Their Modern Scientific Uses*. Barnes and Noble Publishing, 1992.

Hoffman, David, and Linda Quayle. *The Complete Illus trated Herbal: A Safe and Practical Guide to Making and Using Herbal Remedies*. Barnes and Noble Publishing, 1999.

Taber, Clarence Wilbur. *Taber's Cyclopedic Medical Dic tionary*. F.A. Davis Co., 1997.

Thayer, Henry. *Fluid and Solid Extracts*. Geo. C. Rand & Avery, 1866.

OTHER

Hobbs, Christopher. *Herbal Advisor*. http://www.AllHerb.com.

Joan Schonbeck

Witch hazel

Description

Witch hazel (*Hamamelis virginiana*) is a deciduous tree or shrub that is native to Atlantic North America, and it is now also cultivated in Europe and Asia. The shrub can reach a height of 15 ft (4.6 m). It flowers in the fall, producing vivid yellow flowers. Witch hazel is also known as hazel nut, snapping hazel, spotted alder, tobacco wood, winterbloom, and hamamelis water.

Native Americans used witch hazel leaves and bark as a poultice to reduce swelling and inflammation. Those are among the uses of this herb that has long been among the best known and widely used home remedies.

The word "witch" in the name of the herb is actually a derivative from the Anglo-Saxon word *wych* meaning flexible. The word described the flexibility of the branches that Native Americans used to make bows.

General use

Witch hazel is a very versatile remedy, with generally accepted uses ranging from facial care to soothing aching feet. It is also used for the treatment of **hemorrhoids**, inflammation of the mouth and throat, other conditions, such as **varicose veins**, **wounds**, and **burns**.

Witch hazel has so many applications that Andrew Weil, M.D., called the decoction or tincture of the bark the "all–around astringent." Weil, who practices natural and preventive medicine, recommended using witch hazel to ease the **pain** of **sunburn**, windburn, insect **bites**, poison ivy **blisters**, and sore and sprained muscles.

Witch hazel (Hammamelis). *(© Krys Bailey / Alamy)*

The medicinal element of witch hazel is the hamamelis water that is distilled, decocted, or tinctured from fresh and dried leaves, and fresh and dried bark and twigs. Tannins and volatile oils are the primary active ingredients of witch hazel that contribute to its astringent benefits. The tannin content of witch hazel leaves is 8%, and in witch hazel bark ranges from 1–3%, as the medicine derived from the bark will

KEY TERMS

Antioxidant—An enzyme or other organic substance that is able to counteract the damaging effects of oxidation in living tissue. The hamamelitannin in witch hazel is a strong antioxidant.

Astringent—A substance that contracts body tissue and checks capillary bleeding. Witch hazel's astringent action is caused by tannins.

Decoction—System for releasing the herbal essence of bark or root bark. Those elements are simmered in a non aluminum pan. Place 1 ounce of chopped bark or roots in 16 ounces or water. Bring to a boil, then simmer for 10 minutes. Strain, then squeeze out juices.

Pharynx—The cavity at the back of the throat that leads from the mouth and nasal passage to the larynx.

Poultice—A paste made of crushed herbs and a substance such an hot moist flour, corn meal, or bread and milk. The paste is placed on the skin.

Tannin—An astringent substance named for its uses in the tanning industry because it "fixes and preserves tissue," such as leather goods.

Tincture—A method of preserving herbs with alcohol. Powdered herb is added to a 50 percent alcohol solution. The tincture macerates for two weeks and is shaken daily. It is strained and bottled.

Topical—A type of medication that is applied to the external surface of the skin. Witch hazel is most commonly used in topical formulations.

yield a higher tannin concentration than that from leaves. Recent research done in Asia indicates that it is the tannin content of witch hazel that is chiefly responsible for its strong antioxidant activity.

As with other herbal astringents, witch hazel reduces the irritation on the tissue surface through a form of numbing. Surface inflammation is reduced, and the astringent creates a partial barrier against infection. That barrier aids in the treatment of wounds and burns. The astringency helps to stop bleeding, so witch hazel is useful in treating **bruises**, **cuts**, and other skin abrasions.

In addition, a cold compress of witch hazel is said to ease a **headache**. Cosmetically, witch hazel is used as a facial skin freshener and astringent to reduce pore size, make-up remover, and to reduce bags under eyes. Products for men that contain witch hazel include herbal shaving cream and aftershave.

The above are among the mainstream applications of the herb that Native Americans regarded as a general tonic. They also brewed witch hazel as a tea for conditions including cuts, colds, heavy **menstruation**, tumors, and eye inflammation. Witch hazel was taken internally to stop bleeding from hemorrhage.

Some of those applications remain part of folk medicine. Other folk remedy applications of witch hazel include applications for backache, and internal use for **diarrhea**, nervousness, nosebleed, **vaginitis**, and venereal disease.

As of 2008, there has been relatively limited research on the uses of witch hazel in the United States. There is agreement among alternative health practitioners that external use of this herb is safe.

Research conducted in Europe provides more information about applications of witch hazel. There, witch hazel products were approved for skin injuries, inflammation of skin and mucous membranes, and varicose veins. Witch hazel and leaves for the topical treatment of skin injuries, burns, varicose veins, and hemorrhoids. Recent studies carried out in Germany and the United Kingdom have established that witch hazel extract offers some protection against UV radiation prior to sun exposure and relieves the inflammation of sunburn.

In the United States, there is another controversy about the remedial benefit of witch hazel. Hamamelis water, when distilled, contains no tannin. Distilled witch hazel consists of a mixture of 14% of alcohol in water with a trace of volatile oil. The astringent effect of witch hazel is due to an alcohol content similar to that of red wine. But the unstudied volatile oils exert some effects similar to topical tannin, and are also antimicrobial.

Preparations

Witch hazel is available in various forms. Commercial preparations include witch hazel water and gels, although much commercial witch hazel is not true distilled witch hazel water. Witch hazel is also an ingredient in products, such as face and body pads and hemorrhoid pads, including Preparation H ointment.

As a topical astringent, witch hazel water is applied directly to burns, bruises, insect bites, and aching muscles. It can also be used to clean oily skin, remove make-up, or mixed with water for a relaxing footbath. Uses for the gel include treating cuts, **diaper rash**, and **bedsores**.

An infusion of fresh or dried leaves has been "cautiously used" in the treatment of internal hemorrhaging or for to reduce excessive menstrual flow.

Infusion is a process that preserves the astringent tannin in witch hazel, using the leaves. A decoction may be prepared by simmering, not boiling, the herb's bark. This is done by steeping 1 teaspoon of witch hazel powder or twigs in a cup of boiling water. The mixture is boiled and covered for 10 minutes, then strained. After it cools, it can be applied directly or mixed into an ointment base such as petroleum jelly.

Uses of witch hazel leaf include remedies for diarrhea and menstrual conditions. The bark is used for skin injuries, inflammation of the skin, locally inflamed swelling, hemorrhoids, and varicose veins.

Witch hazel dosages

Recommended dosages when using witch hazel are as follows:

- Witch hazel water (distillate) can be used as is or diluted at a 1:3 ratio with water.
- A poultice can be made by using 20–30% of witch hazel in semi-solid preparations.
- For an extract preparation, use a semi-solid and liquid preparation that corresponds to 5–10% of the drug.
- Decoctions of 5–10 grams of witch hazel extract per cup of water can be used for compresses and rinses.
- Ointment or gel is prepared by mixing 5 grams of witch hazel extract in 100 grams of an ointment base.
- The recommended dosage of suppositories is 0.1–1 gram of the drug. Suppositories in the rectum or vagina can be used from one to three times daily.

Applications

Witch hazel is a multi-faceted remedy that is administered in several ways. Applications of witch hazel include:

- Gargle with a decoction of 1 teaspoon of witch hazel bark that has been steeped 10 minutes in boiling water and then strained.
- For skin conditions, ointment or cream can be used twice a day or as needed.
- Tincture can be placed directly on affected areas.
- A poultice can be applied to wounds and sores.
- Witch hazel extracts can be applied in combination with warm, moist compresses in the morning or at bedtime.
- For bruises, a washcloth can be used for a witch hazel compress. An ice cube placed inside the cloth keeps the compress cold and diminishes swelling.

HEMORRHOID RELIEF. Witch hazel's applications include various methods for treating hemorrhoids:

- A hamamelis suppository can be inserted at bedtime to reduce inflammation of a swollen vein.
- For relief of hemorrhoids, Weil recommends moistening toilet paper with witch hazel. This compress is used to clean the anal area after bowel movements.

Combinations

Hemorrhoid treatment accounts for two remedies that combine witch hazel with another herb, such as pilewort. Pilewort is also known as celandine. Another hemorrhoid remedy combines witch hazel with **horse chestnut**.

Furthermore, witch hazel is combined with **aloe** vera in commercial products such as skin care treatments. Home recipes for facial cleanser and mask include witch hazel, **essential oils**, and other ingredients.

Precautions

When witch hazel is administered in designated therapeutic dosages, no health risks have been recorded. However, when witch hazel is taken internally, its tannin content can lead to digestive complaints. Furthermore, in rare cases, liver damage is conceivable following long term administration.

Witch hazel water is intended for external use and most sources cite recommended dosages are for adults. The amount should be adjusted for older people and the chronically ill. Individuals should check with their doctors about use of witch hazel.

External use of witch hazel may result in minor skin irritation for some people. When this occurs, the amount of witch hazel should be diluted.

While it is safe to use witch hazel for gargling, caution should be taken when using it internally. Witch hazel contains small amounts of safrole, a compound that the U. S. Food and Drug Administration (FDA) banned for use in food during the 1960s. That ban came after laboratory animals that ingested large amounts of the compound developed **cancer**. Witch hazel has not yet come under fire for safrole content. However, as of March 2000, there was little research information available. Additional study was needed on the safe use of this home remedy that was a staple for Native Americans.

Side effects

Opinion varies about the side effects caused when witch hazel is taken internally. The tannin content can cause stomach irritation or cramping. A dose of 1 gram of witch hazel will cause **nausea**, **vomiting**, or **constipation**.

The FDA has approved witch hazel distillate as safe for external use. Sources had reported no known side effects as of 2008. However, future studies may provide more information about the safety or side effects of witch hazel.

Interactions

The 1998 Commission E monograph reported no contraindications or interactions related to the use of witch hazel. However, there are well known interactions between many drugs and high tannin herbs that are too numerous to list. Those on blood thinners for circulatory trouble should take internal witch hazel preparations with caution if at all. In addition, witch hazel should not be taken internally with medications containing alkaloids, as it interferes with their absorption. Alkaloid drugs include atropine and codeine.

Resources

BOOKS

Albright, Peter. *The Complete Book of Complementary Therapies*. Allentown, PA: People's Medical Society, 1997.

Castleman, Michael. *The Healing Herbs*. Emmaus, PA: Rodale Press, Inc., 1991.

Keville, Kathi. *Herbs for Health and Healing*. Emmaus, PA: Rodale Press, Inc., 1996.

Lockie, Andrew and Nicola Geddes. *The Complete Guide to Homeopathy*. New York: DK Publishing, 1995.

Medical Economics Company. *PDR for Herbal Medicines*. Montvale, N.J.: Medical Economics Co., 1998.

Ritchason, Jack. *The Little Herb Encyclopedia*. Pleasant Grove, UT: Woodland Health Books, 1995.

Squier, Thomas Broken Bear with Peden, Lauren David. *Herbal Folk Medicine*. New York: Henry Holt and Company, 1997.

Tyler, Varro and Steven Foster. *Tyler's Honest Herbal*. Binghampton, NY: The Haworth Herbal Press, 1999.

PERIODICALS

Choi, H. R., J. Choi, Y. N. Han, et al. "Peroxynitrite Scav enging Activity of Herb Extracts." *Phytotherapy Research* 16 (June 2002): 364 367.

Habtemariam, S. "Hamamelitannin from *Hamamelis vir giniana* Inhibits the Tumour Necrosis Factor Alpha (TNF) Induced Endothelial Cell Death in Vitro." *Toxicon* 40 (January 2002): 83 88.

Hughes Formella, B. J., A. Filbry, J. Gassmüller, and F. Rippke. "Anti inflammatory Efficacy of Topical Preparations with 10% Hamamelis Distillate in a UV Erythema Test." *Skin Pharmacology and Applied Skin Physiology* 15 (March April 2002): 125 132.

ORGANIZATIONS

American Botanical Council. P.O. Box 201660, Austin TX, 78720. (512) 331 8868. http://www.herbalgram.org.

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org.

OTHER

Ask Dr. Weil. http://www.askdrweil.com.

Holistic OnLine. http://www.holisticonline.com.

Liz Swain

Rebecca J. Frey, PhD

Worms

Definition

Worms are parasitic, soft-bodied organisms that can infect humans and animals. Parasitic worms fall into several different classes and include flukes, roundworm, and tapeworm.

Description

Worms are parasites that live within a host organism (human or animal) for the purpose of obtaining food. This relationship causes harm to the host, and, with severe cases of infection, can be fatal. The term worms commonly refers to intestinal worms, although worms can infect other organs and the blood stream. Intestinal worms are helminths and fall into three classes: cestodes (tapeworms), nematodes (roundworms), and trematodes (flukes).

Cestodes

Tapeworms have a ribbon-like body composed of a scolex, which attaches the worm to the intestinal wall, and a long chain of progressively developing proglotids. Proglottids at the tail end of the worm contain eggs. Tapeworms can have 3–4,000 proglotids and be several meters long. Tapeworms that infect humans include *Taenia saginata*, *Taenia solium*, *Hymenolepsis nana*, and *Diphyllobothrium latum*. Tapeworms live in the small intestine and absorb food from the intestinal contents.

The complex life cycles of cestodes differ with each genus and involve two or three different hosts. In general, one host (the intermediate host) ingests

eggs that develop into a larval stage. A second host (the definitive host) ingests the larva which develop into adult worms in the intestine. Humans can become infected with tapeworm by eating raw or inadequately cooked, contaminated fish, pork, or beef. Humans can serve as both intermediate and definitive hosts for certain cestodes. Although humans can experience severe disease when serving as an intermediate host, they may show few signs of disease when harboring adult tapeworms.

Nematodes

Intestinal nematodes, or roundworms, are the most worm-like of all the helminths and resemble the earthworm. Nematodes have a mouth with either three lips or teeth (hookworms), a complete digestive tract, and separate sexes. Nematodes can range from a few millimeters to over one meter long. Roundworms that can infect humans include *Trichuris trichiura* (whipworm), *Enterobius vermicularis* (pinworm), *Capillaria philippinensis*, *Trichostrongylus* species, *Ascaris lumbricoides*, *Ancylostoma duodenale* (hookworm), *Necator americanus* (hookworm), and *Strongyloides stercoralis*. Infection occurs following contact (ingestion or skin) with contaminated soil. Pinworms are not uncommon in children and are easily spread to other family members.

There are five stages (four larval and one adult) in the life cycle of the roundworm. Each genus has a unique life cycle that can be classified into one of three patterns. A person becomes infected by ingesting eggs or larva or through skin penetration by larva. Once ingested, depending upon the genus, eggs may either develop into adult worms in the intestines, or a larval stage may gain access to the bloodstream, enter the lungs, be swallowed, and then develop into adult worms in the intestines. For certain genera, larva penetrate the skin, arrive at the lungs via the bloodstream, are swallowed, and become mature worms in the intestines. Eggs are passed out in the stool, or with pinworms, the female lays eggs on the skin surrounding the anal opening.

Trematodes

Trematodes, or flukes, are flat, leaf-shaped, and range in length from a few millimeters to 75 millimeters. Intestinal flukes are primarily found in the Asian continent. Intestinal flukes that can infect humans are *Fasciolopsis buski*, *Heterophyes heterophyes*, *Metagonimus yokogawai*, *Echinostoma* species, and *Nanophyetus salmincola*).

KEY TERMS

Atopy—An inherited type of allergic hypersensitivity associated with IgE antibodies. Studies of the effects of worm infestation on the human immune system are providing new clues to the prevention of atopy.

Cestodes—Tapeworms, which are long, flat, segmented parasitic intestinal worms.

Definitive host—The host organism for the final (adult) stage in the life cycle of a parasite.

Helminth—A general term for a parasitic worm.

Intermediate host—The host organism for an intermediate (larval) stage in the life cycle of a parasite.

Nematodes—Roundworms, which are parasitic intestinal worms resembling earthworms.

Parasite—An organism that lives on or within a host organism for the purpose of obtaining food.

Trematodes—Flukes, which are flat, leaf-shaped parasitic worms.

Trichinellosis—A parasitic disease caused by tissue-dwelling roundworms of the species *Trichinella spiralis*, usually acquired by eating infected meat.

The life cycles of all flukes involve freshwater snails as an intermediate host. Flukes are contracted by ingestion of eggs or encysted (encased) larva from contaminated water, raw water plants (water chestnuts, water bamboo shoots, etc.), or raw or inadequately cooked fish or snails. The eggs or larva mature into adult worms in the intestines.

Causes and symptoms

Infection by worms is caused by the ingestion of or skin contact with helminth eggs or larva, as described above.

Symptoms of helminth **infections** vary depending upon the genera and number of worms involved. Infection with adult tapeworms often causes no symptoms, however, some patients may experience **diarrhea**, abdominal **pain**, **anemia**, and/or **vitamin B_{12}** deficiency. Roundworm infection often causes no symptoms but some patients may experience abdominal pain, diarrhea, growth retardation, anemia, and bloody, mucousy stools. Pinworms cause irritated, itchy skin surrounding the anal opening. **Itching** may be more severe at night and interfere with sleep. Mild infection with flukes may cause no symptoms, but

heavy infections can cause diarrhea, abdominal pain, and profuse stools containing undigested food.

One side effect of worm infestation that is presently being studied for potential applications in treating atopy (a type of inherited allergic response) is the release of certain anti-inflammatory chemicals in the body. These chemicals, called cytokines, may prove to be useful in preventing atopy.

Diagnosis

The patient will be questioned about travel and ingestion of high-risk foods. Worms are diagnosed by microscopic examination of stool samples to identify eggs and adult worms. Three samples may be taken: two from normal bowel movements and one following the use of a laxative. Pinworms are diagnosed using the "Scotch tape" method in which a piece of tape is applied to the skin surrounding the anal opening. Pinworm eggs, and occasionally an adult worm, adhere to the tape and are identified by microscopic examination.

Treatment

Although alternative remedies may help treat worms, the patient should consult a physician to obtain an accurate diagnosis and appropriate antihelmintic medication.

Dietary modifications help to rid a person of worm infection. Processed foods and foods that contain sugar, white flour, and milk products should be avoided. The diet should be comprised of 25% fat, 25% protein, and 50% complex carbohydrates. At least two tablespoons of unprocessed sesame, safflower, canola, or flax oil should be taken daily.

Herbals

Herbals that may kill and expel worms include:

- aloe (*Aloe vera*)
- ash (*Fraxinus americana*) bark ashes
- bayberry (*Myrica cerifera*) bark tea
- black walnut bark
- *Brassica oleracea* decoction
- butternut root bark
- citrin (*Garcinia cambogia*) extract
- clove (*Eugenia caryophyllus*)
- cranberry powder
- erba ruggine (*Ceterach officinarum*)
- fennel (*Foeniculum officinale*)
- garlic (*Allium sativum*)
- *Chenopodium ambrosioides*
- ginger (*Zingiber officinale*)
- goldenseal (*Hydrastis canadensis*)
- lemon (*Citrus limon*)
- male fern
- orange (*Citrus sinensis*) peel
- onion (*Allium cepa*)
- palmarosa (*Cymbopogon martinii*)
- pinkroot (*Spigelia*)
- pumpkin (*Cucurbita pepo*) seeds
- *Punica granatum* bark infusion
- sage (*Salvia officinalis*)
- tansy
- wood betony (*Stachys officinalis*) tea
- wormwood (*Artemisia absinthium*) tincture

Chinese herbal medicines

Roundworms are treated with the herbs Chuan Lian Gen Pi (*Cortex meliae radicis*) and Bing Lang (*Semen arecae*) and the patent medicines Wu Mei Wan (Mume Pill) and Qu Hui Wan (Dispel Roundworms Pill). Pinworms are treated with the herbs Ku Lian Gen Pi (*Cortex meliae radicis*) and Shi Jun Zi (*Fructus quisqualis*). Flukes are treated with the herbs Bing Lang (*Semen arecae*) and a mixture of Bing Lang (*Semen arecae*), Da Huang (*Radix et rhizoma rhei*), and Qian Niu Zi (*Semen pharbitidis*). Hookworm is treated with the herbs Lei Wan (*Sclerotium omphaliae*) and a combination of Guan Zhong (*Rhizoma dryopteris crassirhizomae*), Ku Lian Gen Pi (*Cortex meliae radicis*), Tu Jing Jie (*Herba chenopodii ambrosioidis*), and Zi Su Ye (*Folium perillae*).

Other alternative remedies

Other remedies for intestinal worms include:

- Acupuncture. Acupuncture may be used as an adjunct to other treatments to relieve pain and regulate the spleen and stomach.
- Ayurveda. Ayurvedic remedies for pinworms include eating one-quarter teaspoon twice daily with water of the herbal mixture: vidanga (5 parts), shardunika (2 parts), and trikatu (one eight part). Also, the patient may take one half teaspoon triphala in warm water each night.
- Homeopathy. The most common remedy for pinworms is wormseed (*Cina*). Pinworms associated with other conditions are treated with stinging nettle (*Urtica urens*) for hives, Mexican grass (*Sabadilla*) for hay fever, cat thyme (*Teucrium*) for polyps, pinkroot (*Spigelia*) for heart palpitations or facial pain, and krameria (*Ratanhia*) for rectal fissures.

Allopathic treatment

Intestinal worm infection is treated with medications, many of which are effective with one oral dose. Helminth infections are treated with albendazole (Albenza), levamisole (Ergamisol), mebendazole (Vermox), praziquantel (Biltricide), pyrantel (Antiminth, Ascarel, Pin-X), or thiabendazole (Mintezol).

In treating tapeworm infestations, it is important to completely eliminate the head and neck regions of the tapeworm, as the entire worm can regenerate from these parts.

Expected results

Medications are very effective in eliminating helminth infections; however, reinfection is always a possibility. Some types of worms appear to trigger changes in the human immune system that make reifection easier. Patients should be retested following treatment to ensure that the infection has been eliminated. Complications of severe untreated infections include anemia, growth retardation, malnourishment, intestinal blockage, rectal prolapse (when the rectum extrudes out of the anal opening), and death.

Prevention

Most intestinal worm infections may be prevented by properly washing the hands after using the bathroom, washing skin after contact with soil, wearing shoes outside, and eating thoroughly cooked fish, meats (including meat from wild game), and freshwater plants. A number of cases of worm infections caused by eating raw salmon and crayfish were reported in North America in 2003; in addition, there was an outbreak of trichinellosis in Saskatchewan in 2000 that was traced to infected bear meat.

Skin penetration by larva may be reduced by eating foods rich in **vitamin A** including squash, carrots, sweet potatoes, yams, and greens.

People who live on farms, or have dogs or cats as house pets, should have their animals checked by a veterinarian on a regular basis and have them dewormed if necessary.

The Centers for Disease Control and Prevention (CDC) recommends that people traveling abroad should wash their hands with soap and water before handling food; should wash and peel all raw vegetables and fruits before eating; and should drink only bottled or boiled water, or carbonated drinks in cans or bottles.

As of late 2003, researchers in developing countries are working on a vaccine for pigs to help control worms transmitted by pigs to humans; however, the vaccine is not likely to be available for several years.

Resources

BOOKS

"Cestodes (Tapeworms)." Section 13, Chapter 161 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Garcia, Lynne S. and David A. Bruckner. *Diagnostic Medical Parasitology*. Washington, DC: American Society for Microbiology, 1997.

Markell, Edward K., David T. John, and Wojciech A. Krotoski. *Markell and Voge's Medical Parasitology*. 8th edition. Philadelphia: W.B. Saunders Company, 1999.

"Nematode (Roundworm) Infections." Section 13, Chapter 161 in *The Merck Manual of Diagnosis and Therapy*, edited by Mark H. Beers, MD, and Robert Berkow, MD. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

Pearson, Richard D. *Parasitic Diseases: Helminths*. Textbook of Gastroenterology, 3rd edition. Edited by Tadataka Yamada et al. Philadelphia: Lippincott Williams & Wilkins, 1999.

Ying, Zhou Zhong and Jin Hui De. "Common Parasitoses." In *Clinical Manual of Chinese Herbal Medicine and Acupuncture*. New York: Churchill Livingston, 1997.

PERIODICALS

Albonico, Marco, D.W.T. Crompton, and L. Savioli. "Control Strategies for Human Intestinal Nematode Infections." *Advances in Parasitology* (1999): 277 341.

Castilla, E. A., R. Jessen, D. N. Sheck, and G. W. Procop. "Cavitary Mass Lesion and Recurrent Pneumothoraces Due to *Paragonimus kellicotti* Infection: North American Paragonimiasis" *American Journal of Surgical Pathology* 27 (August 2003): 1157 1160.

Couture, C., L. Measures, J. Gagnon, and C. Desbiens. "Human Intestinal Anisakiosis Due to Consumption of Raw Salmon." *American Journal of Surgical Pathology* 27 (August 2003): 1167 1172.

Ferreira, M. B., S. L. da Silva, and A. G. Carlos. "Atopy and Helminths." *Allergy and Immunology (Paris)* 34 (January 2002): 10 12.

Gittleman, Ann Louise. "Parasites." *Total Health* (May/June 1997): 47+.

Guarrera, Paolo Maria. "Traditional Antihelmintic, Antiparasitic and Repellent Uses of Plants in Central Italy." *Journal of Ethnopharmacology* (1999): 183 192.

Jenson, J. S., R. OConnor, J. Osborne, and E. Devaney. "Infection with Brugia Microfilariae Induces Apoptosis of CD4(+) T Lymphocytes: A Mechanism of Immune Unresponsiveness in Filariasis." *European Journal of Immunology* 32 (March 2002): 858 867.

Kumaran, A. M., P. D'Souza, A. Agarwal, et al. "Geraniol, the Putative Anthelmintic Principle of *Cymbopogon martinii*." *Phytotherapy Research* 17 (September 2003): 957.

Roy, S. L., A. S. Lopez, and P. M. Schantz. "Trichinellosis Surveillance United States, 1997 2001." *Morbidity and Mortality Weekly Report Surveillance Summaries* 52 (July 25, 2003): 1 8.

Schellenberg, R. S., B. J. Tan, J. D. Irvine, et al. "An Out break of Trichinellosis Due to Consumption of Bear Meat Infected with *Trichinella nativa*, in 2 Northern Saskatchewan Communities." *Journal of Infectious Diseases* 188 (September 15, 2003): 835 843.

ORGANIZATIONS

American Veterinary Medical Association (AVMA). 1931 North Meacham Road, Suite 100, Schaumburg, IL 60173 4360. http://www.avma.org.

Centers for Disease Control and Prevention. 1600 Clifton Rd., NE, Atlanta, GA 30333. (800) 311 3435, (404) 639 3311. http://www.cdc.gov

Belinda Rowland
Rebecca J. Frey, PhD

Wormwood

Description

Wormwood (*Artemisia absinthium*) is a perennial that is native to Europe and parts of Africa and Asia but now grows wild in the United States. It is extensively cultivated. Also called shrub wormwood, *Artemisia absinthium* is a member of the daisy or Asteraceae family. The species name, *absinthium*, means "without sweetness." Many species of the genus *Artemisia* have medicinal properties.

Wormwood grows alongside roads or paths. This shrubby plant is 1-3 ft (0.3-0.9 m) tall and has gray-green or white stems covered with fine hairs. The yellowish-green leaves are hairy and silky and have glands that contain resinous particles where the natural insecticide is stored. Wormwood releases an aromatic odor and has a spicy, bitter taste.

Constituents and bioactivities

Wormwood contains a wide variety of biologically active compounds that contribute to its medicinal value. The constituents of wormwood include:

- acetylenes (trans-dehydromatricaria ester, C13 and C14 trans-spiroketalenol ethers and others)
- ascorbic acid (vitamin C)
- azulenes (chamazulene, dihydrochamazulenes, bisabolene, camphene, cadinene, sabinene, trans-sabinylacetate, phellandrene, pinene, and others)
- carotenoids
- flavonoids (quercitin 3-glucoside, quercitin 3-rhamnoglucoside, spinacetin 3-glucoside, spinacetin 3-rhamnoglucoside, and others)
- lignins (diayangambin and epiyangambin)
- phenolic acids (p-hydroxyphenylacetic, p-coumaric, chlorogenic, protocatechuic, vanillic, syringic, and others)
- tannins
- thujone and isothujone
- sesquiterpene lactones (absinthin, artabsin, anabsinthin, artemetin, artemisinin, arabsin, artabin, artabsinolides, artemolin, matricin, isoabsinthin, and others)

Wormwood is a strong bitter that affects the bitter-sensing taste buds on the tongue that send signals to the brain to stimulate the entire digestive system (salivation, stomach acid production, intestinal tract movement, etc.). This bitter taste also stimulates the production of bile by the liver and storage of bile in the gall bladder. The azulenes in wormwood have anti-inflammatory activity. The sesquiterpene lactones are insecticidal and have anti-tumor activity. The toxin thujone is a brain stimulant. Wormwood also has anti-inflammatory, antidepressant, carminative (relieves intestinal **gas**), tonic (restores tone to tissues), antibacterial, antifungal, anti-amoebic, antifertility, hepatoprotective (prevents and cures liver damage), febrifugal (reduces **fever**), and vermifugal (expels intestinal **worms**) activities.

General use

Wormwood has been used in European traditional medicine as a restorative of impaired cognitive functions (thinking, remembering, and perception).

Wormwood is often used as a digestive stimulant. It is helpful in treating **indigestion**, **heartburn**, **irritable bowel syndrome**, stomach **pain**, gas, and bloating. By increasing the production of stomach acids and bile, wormwood can be useful to persons with poor digestion. It helps persons recover after a long illness and improves the uptake of nutrients.

As the name suggests, wormwood is used to eliminate intestinal worms, especially pinworms and roundworms. It is also used as an insect repellent and insecticide.

More recently, one of the sesquiterpene lactones, artemisinin, has shown promise as a treatment for **breast cancer**. Artemisinin was extracted from wormwood by the Chinese thousands of years ago to cure **malaria**, and is presently used in Asia and parts of Africa for that purpose. Recent experiments have shown that

KEY TERMS

Artemisinin—A compound derived from wormwood that is presently used to treat malaria and shows promise as an anti-cancer treatment.

Bitter—Any herb whose bitter taste stimulates the digestive system. Bitters are used to treat stomach ailments.

Carminative—A preparation that helps to expel gas from the stomach and bowel.

Emmenagogue—A herb or medication that brings on a woman's menstrual period.

Febrifuge—A medication or agent that serves to reduce or dispel fever. Wormwood has febrifugal properties.

Perennial—A plant that regrows from its roots each year.

Thujone—A toxic compound found in wormwood oil that causes hallucinations, tremors, convulsions, sleeplessness, paralysis, stomach problems, and brain damage.

Vermifuge—A medicine that serves to expel worms or other animal parasites from the intestines. Wormwood has vermifugal properties.

artemisinin is effective against the malaria parasite because it reacts with the high levels of **iron** in the parasite to produce free radicals. The free radicals then destroy the cell walls of the malaria parasite. **Cancer** researchers applied the same principle to target cancer cells, which have a higher concentration of iron than normal cells. The researchers tested samples of breast cancer cells and normal breast cells that had first been treated to maximize their iron content and then treated with a water-soluble form of artemisinin. The normal cells showed litle change, but within 16 hours, almost all of the cancer cells were dead.

Wormwood is also helpful in treating gall bladder inflammation, **hepatitis**, **jaundice**, fever, **infections**, and mild **depression**. Wormwood may also protect the liver from harmful chemicals. It may stimulate **menstruation** or miscarriage. It has been used to treat the pains associated with **childbirth**, cancers, muscle aches, arthritic joints, **sprains**, dislocated joints, and broken bones.

Absinthe is a clear green alcoholic beverage that contains essential oil of wormwood and other plant extracts, is highly toxic, and is presently banned in many countries. A favorite liqueur in nineteenth-century France, absinthe was addictive and associated with a collection of serious side effects known as absinthism (irreversible damage to the central nervous system). The toxic component of wormwood that causes absinthism is thujone. Wormwood may contain as much as 0.6% thujone. On the other hand, wormwood soaked in white wine is used to produce the liqueur called vermouth (derived from the German word for wormwood, *Wermuth*), which contains very little thujone.

Preparations

Wormwood is harvested immediately prior to or during flowering in the late summer. All the aerial portions (stem, leaves, and flowers) have medicinal uses. Wormwood is used either fresh or dried.

Wormwood may be taken as an infusion (a tea), as a tincture (an alcohol solution), or in pill form. Wormwood should be taken only under the supervision of a professional. It should be taken in small doses as directed, and for no longer than four to five weeks at a time.

The infusion is prepared by steeping 0.5-2 tsp of wormwood in 1 cup of boiling-hot water for 10-15 minutes. The usual dosage is 3 cups daily, for a period not to exceed four weeks.

Wormwood tincture can be prepared by adding 1.5 cups of fresh, finely chopped wormwood or 8 tbsp of powdered wormwood to 2 cups of whiskey. The herb and alcohol mixture is shaken daily and allowed to steep for 11 days. The solids are strained out and the tincture is stored in a tightly capped bottle in a cool place. This tincture may be used externally (to relieve pain) or internally. Ten to 20 drops of tincture are added to water, which is taken 10–15 minutes before each meal. As with the infusion, wormwood tincture should not be taken for longer than four weeks.

Wormwood preparations are usually sipped because the strong bitter taste is an important component of its therapeutic effect on stomach ailments. The bitter taste of wormwood infusion or tincture may be masked with honey or molasses when the bitter action is not necessary, as in the treatment of worms, fever, or liver ailments.

Powdered wormwood is available in a pill form that can be used in the treatment of intestinal worms. An essential oil of wormwood is available for use in **aromatherapy**; it is toxic if used excessively.

Insect repellent can be made from wormwood by mixing thoroughly crushed fresh wormwood leaves with **apple cider vinegar**. This mixture is put into a small piece of gauze or cheesecloth. The ends are folded up and tied to make a little bag, and the bag is

rubbed over the skin of humans or pets to repel mosquitoes, gnats, and horseflies.

Precautions

Excessive use of wormwood leads to toxic levels of thujone in the body. The long-term use of wormwood oil containing thujone, or alcoholic drinks containing thujone oil (e.g., absinthe) can be addictive and cause seizures, brain damage, temporary kidney failure, and possibly death. Using wormwood for longer than four weeks or at higher than recommended doses may lead to **nausea**, **vomiting**, restlessness, **insomnia**, vertigo, tremors, and seizures. Women who are pregnant or lactating (breast feeding) should not use wormwood.

Side effects

Significant side effects are not encountered when wormwood is taken in small doses for only two to four weeks. One report stated, however, that using as much as 1 mL of wormwood tincture three times a day for up to nine months caused no side effects.

The U. S. Food and Drug Administration (FDA) states that wormwood may cause neurological symptoms, including delirium, paralysis, loss of intellect, and numbness of the legs and arms. The side effects associated with absinthism include auditory (hearing) and visual (seeing) hallucinations; tremors and convulsions; sleeplessness; paralysis; stomach problems; brain damage; and an increased risk of psychological disorders and suicide.

Interactions

As of 2008, there are no identified interactions between wormwood and any other drug or herbal medicine.

Resources

BOOKS

Chevallier, Andrew. *The Encyclopedia of Medicinal Plants*. New York: DK Publishing, 1996.

Heinerman, John. *Heinerman's Encyclopedia of Healing Herbs and Spices*. Englewood Cliffs, NJ: Parker Pub lishing Company, 1996.

PERIODICALS

"Ancient Chinese Folk Remedy May Hold Key to Nontoxic Cancer Treatment." *Health & Medicine Week* (Decem ber 17, 2001): 6.

Belinda Rowland
Rebecca J. Frey, PhD

Wounds

Definition

A wound occurs when the integrity of any tissue is compromised, for example, when skin breaks, muscle tears, **burns**, or bone **fractures**. A wound may be caused by an act, such as a gunshot, fall, or surgical procedure; by an infectious disease; or by an underlying condition.

Description

Types and causes of wounds are wide ranging, and health care professionals have several different ways of classifying them. They may be chronic, such as the skin ulcers caused by **diabetes mellitus**, or acute, such as a gunshot wound or animal bite. Wounds may also be referred to as open, in which the skin has been compromised and underlying tissues are exposed, or closed, in which the skin has not been compromised, but trauma to underlying structures has occurred, such as a bruised rib or cerebral contusion. Emergency personnel and first-aid workers generally place acute wounds in one of eight categories:

- Abrasions. Also called scrapes, they occur when the skin is rubbed away by friction against another rough surface (e.g. rope burns and skinned knees).
- Avulsions. These occur when an entire structure or part of it is forcibly pulled away, such as the loss of a permanent tooth or an ear lobe. Explosions, gunshots, and animal bites may cause avulsions.
- Contusions. Also called bruises, these result from forceful trauma that injures an internal structure without breaking the skin. Blows to the chest, abdomen, or head with a blunt instrument (e.g. a football or a fist) can cause contusions.

Ulcerated wound on a limb stump. *(Custom Medical Stock Photo. Reproduced by permission.)*

- Crush wounds occur when a heavy object falls onto a person, splitting the skin and shattering or tearing underlying structures.
- Cuts are slicing wounds made with a sharp instrument, leaving even edges. They may be as minimal as a paper cut or as significant as a surgical incision.
- Lacerations. Also called tears, these are separating wounds that produce ragged edges. They are produced by a tremendous force against the body, either from an internal source as in childbirth, or from an external source like a punch.
- Missile wounds. Also called velocity wounds, they are caused by an object entering the body at a high speed, typically a bullet.
- Punctures are deep, narrow wounds produced by sharp objects such as nails, knives, and broken glass.

Causes and symptoms

Acute wounds have a wide range of causes. Often, they are the unintentional results of motor vehicle accidents, falls, mishandling of sharp objects, or sports-related injury. Wounds may also be the intentional result of violence involving assault with weapons, including fists, knives, or guns.

The general symptoms of a wound are localized **pain** and bleeding. Specific symptoms include:

- An abrasion usually appears as lines of scraped skin with tiny spots of bleeding.
- An avulsion has heavy, rapid bleeding and a noticeable absence of tissue.
- A contusion may appear as a bruise beneath the skin or may appear only on imaging tests; an internal wound may also generate symptoms such as weakness, perspiration, and pain.
- A crush wound may have irregular margins like a laceration; however, the wound will be deeper and trauma to muscle and bone may be apparent.
- A cut may have little or profuse bleeding depending on its depth and length; its even edges readily line up.
- A laceration too may have little or profuse bleeding; the tissue damage is generally greater and the wound's ragged edges do not readily line up.
- A missile entry wound may be accompanied by an exit wound, and bleeding may be profuse, depending on the nature of the injury.
- A puncture wound will be greater than its length, therefore there is usually little bleeding around the outside of the wound and more bleeding inside, causing discoloration.

KEY TERMS

Abrasion—Also called a scrape. The rubbing away of the skin surface by friction against another rough surface.

Avulsion—The forcible separation of a piece from the entire structure.

Butterfly bandage—A narrow strip of adhesive with wider flaring ends (shaped like butterfly wings) used to hold the edges of a wound together while it heals.

Cut—Separation of skin or other tissue made by a sharp edge, producing regular edges.

Laceration—Also called a tear. Separation of skin or other tissue by a tremendous force, producing irregular edges.

Plasma—The straw-colored fluid component of blood, without the other blood cells.

Puncture—An injury caused by a sharp, narrow object deeply penetrating the skin.

Tourniquet—A device used to control bleeding, consisting of a constricting band applied tightly around a limb above the wound. It should only be used if the bleeding in life-threatening and cannot be controlled by other means.

Traumatic shock—A condition of depressed body functions as a reaction to injury with loss of body fluids or lack of oxygen. Signs of traumatic shock include weak and rapid pulse, shallow and rapid breathing, and pale, cool, clammy skin.

Whole blood—Blood that contains red blood cells, white blood cells, and platelets in plasma.

Diagnosis

A diagnosis is made by visual examination and may be confirmed by a report of the causal events. Medical personnel will also assess the extent of the wound and what effect it has had on the patient's well being (e.g. profound blood loss, damage to the nervous system or skeletal system). In cases of severe injury, or when a physician suspects possible internal injury, tests might be made to determine the extent of a wound. In late 2001, a new ultrasound (imaging inside the body via sound waves)technique was introduced that might help doctors diagnose internal bleeding, a serious complication of some injuries. The technique could help prevent invasive surgery for diagnosis.

Treatment

Treatment of wounds involves stopping any bleeding, then cleaning and dressing the wound to prevent infection. Additional medical attention may be required if the effects of the wound have compromised the body's ability to function effectively.

Stopping the bleeding

Most bleeding may be stopped by direct pressure. Direct pressure is applied by placing a clean cloth or dressing over the wound and pressing the palm of the hand over the entire area. This limits local bleeding without disrupting a significant portion of the circulation. The cloth absorbs blood and allows clot formation; the clot should not be disturbed, so if blood soaks through the cloth, another cloth should be placed directly on top rather than replacing the original cloth.

If the wound is on an arm or leg that does not appear to have a broken bone, the wound should be elevated to a height above the person's heart while direct pressure is applied. Elevating the wound allows gravity to slow down the flow of blood to that area.

If severe bleeding cannot be stopped by direct pressure or with elevation, the next step is to apply pressure to the major artery supplying blood to the area of the wound. In the arm, pressure would be applied to the brachial artery by pressing the inside of the upper arm against the bone. In the leg, pressure would be applied to the femoral artery by pressing on the inner crease of the groin against the pelvic bone.

If the bleeding from an arm or leg is so extreme as to be life-threatening and if it cannot be stopped by any other means, a tourniquet—a device used to check or prevent bleeding or blood flow—may be required. However, in the process of limiting further blood loss, the tourniquet also drastically deprives the limb tissues of oxygen. As a result, the patient may live but the limb may die.

Dressing the wound

Once the bleeding has been stopped, cleaning and dressing the wound is important for preventing infection. Although the flowing blood flushes debris from the wound, running water should also be used to rinse away dirt. Embedded particles such as wood slivers and glass splinters, if not too deep, may be removed with a needle or pair of tweezers that has been sterilized in rubbing alcohol or in the heat of a flame. Once the wound has been cleared of foreign material and washed, it should be gently blotted dry, with care not to disturb the blood clot. An antibiotic ointment may be applied. The wound should then be covered with a clean dressing and bandaged to hold the dressing in place.

Homeopathic remedies

In addition to the conventional treatments described above, there are alternative therapies that may help support the injured person. **Homeopathy** can be very effective in acute wound situations. **Ledum** (*Ledum palustre*) is recommended for puncture wounds (taken internally). **Calendula** (*Calendula officinalis*) is the primary homeopathic remedy for wounds.

Other effective treatments

An antiseptic, it is used topically as a succus (juice), tea, or salve. Another naturally occurring antiseptic is **tea tree oil** (*Melaleuca* spp.), which can be mixed with water for cleaning wounds. **Aloe** (*Aloe barbadensis*) can be applied topically to soothe skin during healing. When wounds affect the nerves, especially in the arms and legs, **St. John's wort** (*Hypericum perforatum*) can be helpful when taken internally or applied topically. Also, an important Chinese herb preparation called Yunnan Bai Yao, which includes the main herbal ingredient san chi, is used very effectively to stop bleeding, and promote healing for all sorts of wounds. Other hearbal remedies include Hypericum for nerve pain, and **arnica** for soft tissue damage. **Acupuncture** can help support the healing process by restoring the energy flow in the meridians that have been affected by the wound. In some cases, **vitamin E** taken orally or applied topically can speed healing and lessen scarring.

Allopathic treatment

A person who has become impaled on a fixed object, such as a fence post or a stake in the ground, should only be moved by emergency medical personnel. Foreign objects embedded in the eye should only be removed by a doctor. Larger penetrating objects, such as a fishhook or an arrow, should only be removed by a doctor to prevent further damage as they exit.

Additional medical attention is necessary in several instances. Wounds that penetrate the muscle beneath the skin should be cleaned and treated by a doctor. Such a wound may require stitches to keep it closed during healing. Some deep wounds which do not extend to the underlying muscle may only require butterfly bandages to keep them closed during healing. Wounds to the face and neck, even small ones, should always be examined and treated by a doctor to preserve sensory function and minimize scarring. Deep

wounds to the hands and wrists should be examined for nerve and tendon damage. Puncture wounds may require a **tetanus** shot to prevent serious infection. Animal **bites** should always be examined and the possibility of **rabies** infection determined.

Infection

Wounds that develop signs of infection should also be brought to a doctor's attention. Signs of infection are swelling, redness, tenderness, throbbing pain, localized warmth, **fever**, swollen lymph glands, the presence of pus either in the wound or draining from it, and red streaks spreading away from the wound.

Emergency treatment

With even as little as one quart of blood lost, a person may lose consciousness and go into traumatic shock. Because this is life-threatening, emergency medical assistance should be called immediately. If the person stops breathing, artificial respiration (also called mouth-to-mouth resuscitation or rescue breathing) should be administered. In the absence of a pulse, cardiopulmonary resuscitation (CPR) must be performed. Once the person is breathing unassisted, the bleeding may be attended to.

In cases of severe blood loss, medical treatment may include the intravenous replacement of body fluids. This may be infusion with saline or plasma, or a transfusion of whole blood.

Expected results

Without the complication of infection, most wounds heal well with time. Depending on the depth and size of the wound, it may or may not leave a visible scar.

Prevention

Most actions that result in wounds are preventable. Injuries from motor vehicle accidents may be reduced by wearing seat belts and placing children in size-appropriate car seats in the back seat. Sharp, jagged, or pointed objects or machinery parts should be used according to the manufacturer's instructions and only for their intended purpose. It is important to educate children on the proper way to hold and handle sharp objects, or keep them out of the reach of children. Firearms and explosives should be used only by adults with explicit training; they should also be kept locked and away from children. Persons engaging in sports, games, and recreational activities should wear all proper protective equipment and follow safety rules.

Resources

BOOKS

American Red Cross Staff. *Standard First Aid*. St. Louis: Mosby Yearbook, 1992.

The Editors of Time Life Books. *The Medical Advisor: The Complete Guide to Alternative and Conventional Treatments*. Alexandria, VA: Time Life Books, 1996.

PERIODICALS

"Sound Waves Beat the Knife." *The Economist* (December 8, 2001).

ORGANIZATIONS

American Red Cross. P.O. Box 37243, Washington, D.C. 20013. http://www.redcross.org.

Kathleen Wright
Teresa Norris

Writing therapy *see* **Journal therapy**

Wu bing shao *see* **Pinellia**

Wu wei zi *see* **Schisandra**

XYZ

Xin yi hua *see* **Magnolia**

Yarrow

Description

Yarrow (*Achillea millefolium*) is an aromatic member of the Asteraceae (Compositae) family. This perennial European native with lovely, fern-like foliage is also named millefoil, or thousand leaves, because of its finely-divided leaves. There are many species and subspecies of yarrow, including a similar native American variety known as *A. Millefolium var. lanulosa*. Yarrow is naturalized throughout North America and can be found growing wild in meadows, fields, and along roadsides. Introduced to North America by early colonists, yarrow soon became a valued remedy used by many tribes of indigenous people. American Shakers gathered yarrow for use in numerous medicinal preparations. The plant was listed in the official *U.S. Pharmacopoeia* from the mid- to late nineteenth century.

Yarrow's hardy rhizome, or underground stem, develops from underground runners as the extensive root system spreads. The lacy, finely-divided leaves are multi-pinnate, and grow alternately, clasping at the base along the simple, erect and angular stem. The feather-like leaves may reach 6 in (15.2 cm) in length. They mound near the ground in early growth; then the slightly hairy stems reach upwards to 3 ft (0.91 m) in height during flowering. The tiny blossoms may be rose or lilac colored, or a creamy white; they flower from June until October. Yarrow blossoms grow in flat-topped composite clusters at the top of the stems.

Human relationships with this healing plant reach back to ancient times. The fossilized pollen of yarrow has been found in Neanderthal burial caves from as far back as 60,000 years. Yarrow has long been associated with magic and divination, and is considered by some folk herbalists as a sacred plant with special spiritual powers to offer protection. Yarrow stalks are traditionally used to cast the *I Ching*, the Chinese book of prophecy. The herb was also believed to be useful in love charms and in conjuring. One folk name for yarrow is devil's **nettle**. Other names include bloodwort, carpenter's weed, sanguinary, staunchweed, dog daisy, old man's pepper, field **hops**, nosebleed, knight's milfoil, soldier's woundwort, and military herb. Yarrow accompanied soldiers into battle and was relied upon for its hemostatic action to treat **wounds**. This use may have been the source of yarrow's generic name, taken from the legend of Achilles. The Greek hero is said to have used yarrow in the Trojan War to staunch the blood flowing from the wounds of fallen comrades. Yarrow was used in battlefield first aid as recently as World War I (1914–1918).

General use

Scientists have identified over one hundred active chemical compounds in yarrow, including the intensely blue-colored azulene derivatives found in the essential oil of yarrow and at least two species of **chamomile** (*Chamaemelum nobile (L.)* and *Matricaria recutita*). Other chemical constituents in yarrow include lactones, flavonoids, tannins, coumarins, saponins, sterols, sugars, a bitter glyco-alkaloid, and **amino acids**. The aerial parts of yarrow, particularly the wild white-flowered variety, are most often used in medicinal remedies.

External uses

Yarrow is well known for its wound healing capabilities, particularly in staunching the flow of blood. The herb is considered a vulnerary and hemostatic with antiseptic and antibacterial properties. The astringent action of the leaf, when inserted into a nostril, may stop a nosebleed. An infusion of the leaf, stems, and flowers will speed the healing of **rashes**, **hemorrhoids**, and skin ulcers. Dried and powdered yarrow sprinkled on **cuts** and abrasions may also facilitate healing. Native Americans used yarrow in poultice form to treat skin

Yarrow. This perennial European native with fern-like foliage is also named millefoil, or thousand leaves, because of its finely-divided leaves. *(© Arco Images / Alamy)*

problems. Infusions of yarrow have been used as a hair rinse in attempts to prevent baldness.

Internal uses

In folk medicine, freshly gathered yarrow root mashed in whiskey was used as a primitive anesthetic. Yarrow has also been used to stop internal bleeding, and as a bitter digestive tonic. Its emmenagogic action promotes the flow of bile. Yarrow tea taken warm acts as a diaphoretic, or medication given to induce sweating. It is particularly beneficial in the treatment of **fever**, colds, and **influenza**, as well as the early stages of **measles** and **chickenpox**. The essential oil, extracted by steam distillation of the flowers, is dark blue in color and has anti-inflammatory, anti-allergenic, and anti-spasmodic properties. Fresh yarrow leaf chewed slowly is said to relieve **toothache**. The herb has also been used to induce nosebleed in an attempt to relieve **migraine headache**. Yarrow appears to be beneficial in reducing high blood pressure. Flavonoids in the herb act to dilate the peripheral arteries and help to clear **blood clots**.

KEY TERMS

Astringent—A substance that causes soft tissue to contract or constrict. Yarrow has some astringent properties.

Diaphoretic—A substance or medication given to induce or promote sweating.

Hemostatic—A substance used to stop bleeding or hemorrhaging. Yarrow has hemostatic properties.

Infusion—The most potent type of extraction of a herb into water. Infusions are steeped for a longer period of time than teas.

Pinnate—Having leaflets arranged on each side of a common stalk. Yarrow has a multi-pinnate leaf.

Tincture—The extraction of a herb into an alcohol solution for either internal or external use.

Vulnerary—A substance or medication used to speed the healing of external wounds. Yarrow was traditionally used as a vulnerary.

Preparations

Yarrow should be harvested while the herb is in flower, on a dry day after the morning dew has evaporated. The leaves, stems, and blossoms are all used medicinally. The leaves should be cut from the stems and spread out on a paper-lined tray to dry in a bright, airy room, out of direct sunlight. Blossoms may be left on the stems and hung in small bunches upside-down in a very warm room. Dried flowers should be stored separately, and dry stems cut into small segments before storage in an airtight, dark glass container, clearly labeled to indicate the contents and the date and place of harvest.

Leaf infusion: Place 2 oz of fresh yarrow leaf, less if dried, in a warmed glass container. Bring 2.5 cups of fresh, nonchlorinated water to the boiling point and add it to the yarrow. Cover. Steep the tea for 10 to 15 minutes, then strain. Drink warm or cold throughout the day, up to three cups per day. The prepared tea can be stored for about two days in the refrigerator.

Tincture: Combine 4 oz of fresh yarrow leaf and stalks cut fine (or 2 oz dry powdered herb) with 1 pint of brandy, gin, or vodka in a glass container. The alcohol should be enough to cover the plant parts and have a 50/50 ratio of alcohol to water. Cover and store the mixture away from the light for about two weeks,

shaking several times each day. Strain and store in a tightly capped, clearly labeled dark glass bottle. A standard dose is 10 to 15 drops of the tincture in water, up to three times a day.

Precautions

Yarrow may have a cumulative medicinal effect on the system. Patients should avoid the frequent use of yarrow in large doses for long periods of time. Yarrow is a uterine stimulant; pregnant or lactating women should therefore not use the herb internally.

Side effects

People with **allergies** to ragweed, another member of the Asteraceae family of plants, may also want to avoid taking yarrow internally. In some cases yarrow may cause skin rashes or photosensitivity after ingestion.

Interactions

No interactions between yarrow and standard pharmaceutical preparations have been reported.

Resources

BOOKS

Coon, Nelson. *An American Herbal: Using Plants For Healing*. Emmaus, PA: Rodale Press, 1979.

Foster, Steven, and James A. Duke. *Peterson Field Guide to Eastern/Central Medicinal Plants*. New York: Houghton Mifflin Company, 1990.

Hutchens, Alma R. *A Handbook of Native American Herbs*. Boston: Shambhala, 1992.

McIntyre, Anne. *The Medicinal Garden*. New York: Henry Holt and Company, 1997.

Ody, Penelope. *The Complete Medicinal Herbal*. New York: Dorling Kindersley, 1993.

PDR for Herbal Medicines. Montvale, NJ: Medical Eco nomics Company, 1998.

Tyler, Varro E., Ph.D. *The Honest Herbal*. New York: Pharmaceutical Products Press, 1993.

OTHER

Alternative Herbal Index. http://www.onhealth.com.

Clare Hanrahan

Yeast infection

Definition

Yeast infection is most often caused by a species of the yeast *Candida*, most commonly *Candida albicans*, thus it is often referred to as candidiasis.

Oral candidiasis, also known as thrush, on an infant's tongue. *(Photo Researchers, Inc. Reproduced by permission.)*

Candida is a common cause of vaginal **infections** in women, and *Candida* may cause mouth infections in people with reduced immune function, or in patients taking certain antibiotics. *Candida* can be found in virtually all normal people, but causes problems in only a fraction. In recent years, however, several serious categories of candidiasis have become more common, due to the increased use of antibiotics, the rise of **AIDS**, the increase in the number of organ transplantations, and the use of invasive devices (catheters, artificial joints and valves)—all of which increase a patient's susceptibility to infection.

Description

Vaginal candidiasis

More than one million women in the United States develop vaginal yeast infections each year. It is not life-threatening, but it can be uncomfortable and frustrating.

Oral candidiasis

This disorder, also known as thrush, causes white, curd-like patches in the mouth or throat.

Deep organ candidiasis

Also known as invasive candidiasis, deep organ candidiasis is a serious systemic infection that can affect the esophagus, heart, blood, liver, spleen, kidneys, eyes, and skin. Like vaginal and oral candidiasis, it is an opportunistic disease that strikes when a person's resistance is lowered, often due to another illness. There are many diagnostic categories of deep organ candidiasis, depending on the tissues involved.

KEY TERMS

Biopsy—The removal and examination of tissue from a live body.

Colonize—To become established in a host.

Granulocytopenia—A condition characterized by a deficiency of white blood cells.

Nasogastric—Tube inserted through the nasal passages into the stomach.

Opportunistic—Infection caused by microorganisms that are usually harmless, but which can cause disease when a host's resistance is lowered.

Systemic—Afflicting an entire body system or the body in general.

Causes and symptoms

Vaginal candidiasis

Most women with vaginal candidiasis experience severe vaginal **itching**. They also have a discharge that often looks like cottage cheese and has a sweet or bread-like odor. The vulva and vagina can be red, swollen, and painful. Sexual intercourse may also be painful.

Oral candidiasis

Whitish patches can appear on the tongue, inside of the cheeks, or the palate. Oral candidiasis typically occurs in people with abnormal immune systems. These can include people undergoing chemotherapy for cancer, people taking immunosuppressive drugs to protect transplanted organs, or people with HIV infection.

Deep organ candidiasis

Anything that weakens the body's natural barrier against colonizing organisms, including stomach surgery, **burns**, nasogastric tubes, and catheters, can predispose a person for deep organ candidiasis. Rising numbers of AIDS patients, organ transplant recipients, and other individuals whose immune systems are compromised help account for the dramatic increase in deep organ candidiasis in recent years. Patients with granulocytopenia (deficiency of white blood cells) are particularly at risk for deep organ candidiasis.

Diagnosis

Often clinical appearance gives a strong suggestion about the diagnosis. Generally, a clinician will take a sample of the vaginal discharge or swab an area of oral plaque, and then inspect this material under a microscope. Under the microscope, it is possible to see characteristic forms of yeasts at various stages in the life cycle.

Fungal blood cultures should be taken for patients suspected of having deep organ candidiasis. Tissue biopsy may be required for a definitive diagnosis.

Treatment

Home remedies for vaginal candidiasis include vinegar douches or insertion of a paste made from *Lactobacillus acidophilus* powder into the vagina. In theory, these remedies will make the vagina more acidic, and therefore, less hospitable to the growth of *Candida*. Also effective for treatment is the dietary additions of berberis, **thyme**, grapefruit seed extract, and tea tree. Fresh **garlic** (*Allium sativum*) is believed to have antifungal action, so incorporating it into the diet or inserting a peeled garlic clove wrapped in gauze into the vagina may be helpful. The insert should be changed twice daily. Some women report success with these remedies; they should try a conventional treatment if an alternative remedy is not effective, or seek the advice from a licensed naturopathic physician.

Some prescription drugs, particularly antibiotics, may disrupt the bacteria normally present in the intestine and vagina, causing the unpleasant symptoms of **constipation**, diarrhea, or **vaginitis**. Because *Lactobacillus acidophilus* is one such regular inhabitant that can prevent bacterial or yeast overgrowth, consumption of yogurt or *L. bacillus* capsules or tablets has been found to be effective in decreasing the incidence of candidiasis.

Allopathic treatment

Vaginal candidiasis

In most cases, vaginal candidiasis can be treated successfully with a variety of over-the-counter antifungal creams or suppositories. These include Monistat, Gyne-Lotrimin, and Mycelex. However, infections often recur. If a women has frequent recurrences, she should consult her doctor about prescription drugs such as Vagistat-1, Diflucan, and others.

Oral candidiasis

This is usually treated with prescription lozenges or mouth washes. Some of the commonly used prescriptions are nystatin mouthwashes (Nilstat or Nitrostat) and clotrimazole lozenges.

Deep organ candidiasis

The recent increase in deep organ candidiasis has led to the creation of treatment guidelines. Patients who have been diagnosed with deep organ candidiasis should have catheters removed, and antifungal chemotherapy should be started to prevent the spread of the disease. Drugs should be prescribed based on a patient's specific history and defense status.

Expected results

Vaginal candidiasis

Although most cases of vaginal candidiasis are cured reliably, these infections can recur. To limit recurrences, women may need to take a prescription antifungal drug such as terconazole (sold as Terazol), or take other antifungal drugs on a preventive basis.

Oral candidiasis

These infections can also recur, sometimes because the infecting Candida develops resistance to one drug. Therefore, a physician may need to prescribe a different drug.

Deep organ candidiasis

The prognosis depends on the category of disease, as well as the condition of the patient when the infection strikes. Patients who are already suffering from a serious underlying disease are more susceptible to deep organ candidiasis that spreads throughout the body.

Prevention

Because *Candida* is part of the normal group of microorganisms that co-exist with all people, it is impossible to avoid contact with it. Good vaginal hygiene and good oral hygiene might reduce problems, but they are not guarantees against candidiasis. Other risk factors include low protein or vegetarian **diets**, a diet high in sugar, and use of antibiotics. There are also a number of ways vaginal candidiasis may be avoided:

- Frequent douching and use of feminine sprays and bath products should be avoided, as these products may disturb the normal vaginal pH balance.
- Drying the outside vaginal area thoroughly, and avoiding prolonged wear of a wet bathing suit, or damp undergarments.
- Wiping from the front to the rear, away from the vagina, after a bowel movement or urination.
- Avoiding sexual intercourse during treatment.
- Using unscented sanitary pads during menstruation.
- The use of cotton underpants, and the avoidance of tight fitting clothing.

Because hospital-acquired (nosocomial) deep organ candidiasis is on the rise, people need to be made aware of it. Patients should be sure that catheters are properly maintained and used for the shortest possible time. The frequency, length, and scope of courses of antibiotic treatment should also be cut back.

Resources

BOOKS

Carlson, K.J., S.A. Eisenstat, and T. Ziporyn. *The Harvard Guide to Women's Health*. Harvard University Press, 1996.

PERIODICALS

Greenspan, Deborah, and John S. Greenspan. "HIV related oral disease." *The Lancet* 348 (September 14, 1996):729 734.

Tobin, Marla J. "Vulvovaginal candidiasis: topical vs. oral therapy." *American Family Physician* 51 (May 15, 1995):1715 1723.

OTHER

Monistat.com: Yeast Infection Resource Center. http://www.monistat.com.

Kathleen D. Wright

Yellow dock

Description

Yellow dock (*Rumex crispus*) is a small, leafy plant that grows wild throughout the world. It belongs to the buckwheat or Polygonaceae family. It has yellowish-brown roots, which accounts for its common name. The roots are 8-12 in (20-30 cm) long, about 0.5 in (1.27 cm) thick, fleshy, and usually not forked. The stem is 1-3 ft (0.3-0.9 m) high and branched. Yellow dock is also known as curly or curled dock because of its long lance shaped leaves that are slightly ruffled along its edges. The leaves are 6-10 in (15-25 cm) long. Its leaves are used for food while both roots and leaves are used as herbal remedies. Yellow dock is closely related to rhubarb and sorrel.

In terms of chemical analysis, yellow dock contains anthraquinone glycosides, tannins, rumicin, and oxalates, including **potassium** oxalate.

Yellow dock is primarily used in the treatment of digestive problems, liver diseases, and skin disorders. It has been described as an alterative, astringent, cholagogue, hepatic, laxative, and nutritive. *(© blickwinkel / Alamy)*

KEY TERMS

Alterative—A herb that changes one's physical condition, especially a blood cleanser.

Astringent—A substance that constricts or binds skin cells.

Cholagogue—A substance that stimulates the flow of bile.

Hepatic—A herb that acts as a liver tonic.

Infusion—The most potent form of extraction of a herb into water. Infusions are steeped for a longer period of time than teas.

Oxalic acid—A white crystalline water-soluble acid, found in yellow dock, sorrel, and spinach. In its pure form it is used as a cleanser and bleaching agent.

General use

Yellow dock is primarily used in the treatment of digestive problems, liver diseases, and skin disorders. It has been described as an alterative, astringent, cholagogue, hepatic, laxative, and nutritive.

Yellow dock contains relatively small amounts of anthraquinone glycosides, which are strong laxatives in larger doses. Since yellow dock contains only small amounts of these chemicals, however, it is used as a mild laxative. Yellow dock is also used to help support and restore liver function, which is why it is called a hepatic.

Applied externally as an antiseptic and an astringent, yellow dock has been used to treat skin **cuts**, swelling, **rashes**, **boils**, **burns**, bleeding **hemorrhoids**, dog and insect **bites**, and **wounds**. An ancient British charm that was chanted when dock is applied to skin irritations caused by stinging **nettle** illustrates the use of yellow dock as a skin treatment: "Nettle out, dock in, dock remove the nettle sting."

Yellow dock is also taken internally as a treatment for such skin conditions as **psoriasis**, **eczema**, **acne**, poison ivy, and other rashes, often in combination with such other herbs as **red clover** (*Trifolium pratense*), **dandelion** root (*Taraxacum officinalis*), cleavers (*Galium aparine*), and burdock (*Arctium lappa*).

Yellow dock also has been used in the treatment of liver and gallbladder disorders. It is called a cholagogue because it is thought to stimulate the production of bile and digestive fluids.

Yellow dock is nutritious, as it contains **vitamin C**, **iron**, **calcium**, and **phosphorus**. It even contains enough tannin to use in tanning leather.

Other uses of yellow dock by traditional herbalists have included the treatment of:

- vaginitis
- fibroids
- anemia
- swollen glands

Preparations

Both the roots and leaves of yellow dock are used in remedies. Due to the mild and general nature of its actions, yellow dock is rarely used alone, but in combination with other herbal remedies. The roots are dug in late summer and autumn between the months of August and October. They are cleaned well and split lengthwise before drying. The roots are ground or

crushed and then are used in preparing ointments, tinctures, decoctions, or teas. The ground root is kept cool and dry but not frozen.

Tea is prepared by boiling 1-2 tsp (5-10 g) of yellow dock root in 500 mL (2 cups) water for 10 minutes. Syrup is made by boiling 0.5 lb of crushed root in a pint of syrup. Dried extracts of yellow dock are also prepared as pills or capsules, and are available commercially. These commercial preparations are often a mixture of several different types of herbs. The directions on the label of the commercial product should be followed for recommended dosages.

For external applications, both roots and leaves are used. The root may be pounded and applied as a poultice. Fresh or boiled leaves and stems are directly placed on skin irritations. An ointment is made by boiling the root in vinegar until the fiber is softened. The pulp is then mixed with a solid grease such as petroleum jelly, animal fat, or vegetable shortening.

The young leaves of yellow dock may be eaten cooked as greens, but should not be eaten raw. If the plant is too bitter, it may be parboiled, washed, added to clear water, and cooked until tender. Since the leaves contain oxalic acid (similar to spinach), they should not be eaten frequently in large amounts as the oxalic acid can prevent the absorption of calcium. The seeds of yellow dock have been ground and used as flour.

Precautions

Since no safe dosage has been established, pregnant or breastfeeding women and infants and children under the age of six should avoid the use of yellow dock. Persons with any chronic diseases of the gastrointestinal tract, such as duodenal ulcers, esophageal reflux, spastic **colitis**, diverticulosis, or **diverticulitis**, should not take yellow dock.

A person with a history of **kidney stones** should not use yellow dock, since the oxalates and tannins present in yellow dock may aggravate that condition.

When used as a laxative, yellow dock should not be used for more than a week, unless a doctor has ordered otherwise. Overuse of a laxative may lead to dependence. Any sudden changes in bowel habits or function that last longer than two weeks should be checked by a doctor before using a laxative. Children up to six years of age should not take a laxative unless prescribed by a doctor.

Side effects

The side effects, especially if larger doses of yellow dock are taken, include **diarrhea**, skin eruptions, **nausea**, and **vomiting**. Kidney damage, characterized by blood in urine, decreased urine flow, and swelling of hands and feet may also occur.

Interactions

To enhance the activity of yellow dock, use it in combination with such other herbs as red clover (*Trifolium pratense*), dandelion root (*Taraxacum officinalis*), cleavers (*Galium aparine*), and burdock (*Arctium lappa*).

Resources

BOOKS

Heatherly, Ana Nez. *Healing Plants: A Medicinal Guide to Native North American Plants and Herbs*. New York: The Lyons Press, 1998.

Judith Sims

Yellow jasmine *see* **Gelsemium**

Yerba santa

Description

Yerba santa (*Eriodictyon glutinosum* and *Eriodictyon californicum*) is a short evergreen shrub that grows in dry, hilly areas of California and Northern Mexico. The plant, part of the Hydrophyllaceae family, grows in clusters and is approximately 3 ft (1 m) in height. The smooth stem and thick yellow leaves are covered with a resin, and the plant has blue flowers that cluster together in groups of six to 10. The leaves are 2–5 in (5–12 cm) long. The plant contains chrysocriol, eridonel, eriodictyol, formic acid, glucose, glycerides of fatty acids, homoeriodictyol, resin, tannic acids, tannins, volatile oil, and zanthoeridol. The leaves should be gathered in the spring and early summer.

General use

Yerba santa, which literally means sacred herb in Spanish, has been used for centuries for a variety of illnesses, such as bronchitis , colds, coughs, **diarrhea**, and **stomachaches**. The Spanish came to know of its medicinal value through Native Americans, who either smoked or made infusions of yerba santa. The herb, also known as bear's weed, consumptive's weed,

Yerba santa has been used for centuries for a variety of illnesses, such as bronchitis, colds, coughs, diarrhea, and stomachaches. *(© bildagentur-online.com / Alamy)*

gum bush, and mountain balm, is still primarily used for respiratory congestion, either from acute **asthma**, colds, or coughs. Yerba santa has also been found effective for a number of symptoms, including gastrointestinal disorders and **fatigue**. When used externally for bruises , mosquito **bites**, or **sprains**, yerba santa can be applied as a poultice. The herb also used as a tonic to cleanse the blood, tone the nervous system, stimulates the mind, and controls the appetite. It is also believed to enhance the action of other herbs when used in combination. It has a sweet, slightly bitter taste.

Respiratory conditions

Yerba santa is best known for its use in respiratory conditions, especially when there is a lot of mucous stuck in the body. It is considered one of the best decongestants, working as an expectorant by breaking up thick mucus and facilitating its expulsion from the body. For acute colds and coughs with upper respiratory and sinus congestion, yerba santa is extremely helpful. As a muscle relaxant, yerba santa works well for asthmatics as it dilates the bronchial tubes and allows air to flow more easily into the lungs. For asthma, yerba santa is often smoked in a pipe, for instance.

Acute illnesses

At the onset of a cold, especially when there is a cough or bronchial irritation, yerba santa can eradicate or at least alleviate the symptoms.

Digestive aid

As a sialagogue, a substance that promotes salivation, yerba santa helps digestion. The excess saliva production helps the digestive process and can alleviate digestive problems.

Fatigue

Because yerba santa is a stimulant, it reduces fatigue and curbs the appetite.

Skin conditions

A poultice of yerba santa should be applied to **bruises**, insect bites, sprains, and **wounds**.

KEY TERMS

Sialagogue—An agent that increases salivation.

Preparations

For a yerba santa infusion, take 1 tbsp of the fresh or dried leaves to 1 c of boiling water and let it steep for 10 minutes. If a tincture is taken, then one dose should be from 10–30 drops, taken four times a day. If dried leaves are used, then the tincture is best with an alcohol base.

Precautions

Yerba santa should not be taken by women who are pregnant or nursing. It is also an herb that should not be used by people who are suffering from chronic gastrointestinal disorders. As a stimulant, it should also be used sparingly by those who have **sleep disorders** or bouts of **insomnia**.

Side effects

As a stimulant, yerba santa may cause sleeplessness and contribute to a lack of appetite.

Interactions

When it is taken internally, as an infusion, tincture, or in capsule form, be aware that yerba santa can affect the how iron and other minerals are absorbed into the body. Those who tend to be **iron** deficient may want to supplement their **diets** with iron while taking yerba santa. It is best to consult with a physician or other health practitioner before attempting to self-medicate.

Resources

BOOKS

Ritchason, Jack. *The Little Herb Encyclopedia*. Woodland Health Books, 1995.

Tierra, Michael. *The Way of Herbs*. Pocket Books, 1980.

OTHER

Grieve, Mrs. M. *A Modern Herbal*. http://www.botanical.com.

Herbal Dave Homepage. http://www.herbaldave.com.

InfoStructure. http://www.mind.net.

Thrive Online. http://www.thriveonline.com.

Katherine Y. Kim

Yoga

Definition

The term *yoga* comes from a Sanskrit word that means yoke or union. Traditionally, yoga is a method joining the individual self with the Divine, Universal Spirit, or Cosmic Consciousness. Physical and mental exercises are designed to help achieve this goal, also called self-transcendence or enlightenment. On the physical level, yoga postures, called *asanas*, are designed to tone, strengthen, and align the body. These postures are performed to make the spine supple and healthy and to promote blood flow to all the organs, glands, and tissues, keeping all the bodily systems healthy. On the mental level, yoga uses breathing techniques (*pranayama*) and **meditation** (*dyana*) to quiet, clarify, and discipline the mind. However, experts are quick to point out that yoga is not a religion, but a way of living with health and peace of mind as its aims.

Origins

Yoga originated in ancient India and is one of the longest surviving philosophical systems in the world. Some scholars have estimated that yoga is as old as 5,000 years; artifacts detailing yoga postures have been found in India from over 3000 B.C. Yoga masters (*yogis*) claim that it is a highly developed science of healthy living that has been tested and perfected for all these years. Yoga was first brought to America in the late 1800s when Swami Vivekananda, an Indian teacher and yogi, presented a lecture on meditation in Chicago. Yoga slowly began gaining followers, and flourished during the 1960s when there was a surge of interest in Eastern philosophy. There has since been a vast exchange of yoga knowledge in America, with many students going to India to study and many Indian experts coming here to teach, resulting in the establishment of a wide variety schools. Today, yoga is thriving, and it has become easy to find teachers and practitioners throughout America. A recent Roper poll, commissioned by *Yoga Journal*, found that 11 million Americans do yoga at least occasionally and six million perform it regularly. Yoga stretches are used by physical therapists and professional sports teams, and the benefits of yoga are being touted by movie stars and Fortune 500 executives. Many prestigious schools of medicine have studied and introduced yoga techniques as proven therapies for illness and **stress**. Some medical schools, like UCLA, even offer yoga classes as part of their physician training program.

Benefits

Yoga has been used to alleviate problems associated with high blood pressure, high **cholesterol**, migraine headaches, **asthma**, shallow breathing, backaches, **constipation**, diabetes, **menopause**, **multiple sclerosis**, **varicose veins**, and many chronic illnesses. It also has been studied and approved for its ability to promote **relaxation** and reduce stress. On the other hand, some researchers are now questioning claims that yoga is beneficial for such conditions as **carpal tunnel syndrome**.

Yoga is increasingly recommended for **dysmenorrhea**, **premenstrual syndrome**, and other disorders in premenopausal women, in Europe as well as in the United States.

Yoga can also provide the same benefits as any well-designed **exercise** program, increasing general health and stamina, reducing stress, and improving those conditions brought about by sedentary lifestyles. Yoga has the added advantage of being a low-impact

Yoga positions

Name	Description
Abdominal massage	Kneel with arms folded. Bend torso toward ground and lower forehead to the floor. Slowly raise up, switch arms, and repeat.
Boat	Lying on back, raise head, torso, arms, and legs off the ground and stretch. Arms should be outstretched and pointing towards feet.
Bow	Lying on stomach, hold ankles from behind and slowly raise head, torso and thighs off floor.
Bridge	Lying on back with knees bent and feet flat on floor, raise pelvis off floor and arch back. Arms should be stretched out on floor with hands grasped.
C	On hands and knees, move head and buttocks as far left as possible, inhale as you return center and repeat on the right side.
Camel	While kneeling, arch back and bend head back toward feet. Hold heels with hands and exhale while in movement.
Cat	On hands and knees, arch back and exhale while in movement, rounding shoulders and back.
Child	Kneeling with arms to the side, roll torso on floor and rest forehead on the ground.
Cobra	Stretched out on floor with stomach down, place elbows parallel to shoulders and raise torso up. Arms should straighten with hands flat on floor.
Corpse	Lie on back with feet and arms outstretched. Breathe deeply.
Dog	On hands and knees, dip back and lift head and buttocks up. Exhale.
Downward-Facing Dog	On hands and knees form an inverted V by pushing pelvis up and pressing hands and heels to floor. Exhale while in movement.
Half Cobra	Stretched out on floor with stomach down, place elbows parallel to shoulders and raise torso up. Keep arms bent and only raise torso off the ground as far as the navel.
Half Locust	Lying on stomach with hands beneath the body, raise legs one at a time while tensing buttocks. Repeat with other leg.
Half Lotus	Sit with legs crossed (only one leg should be over the other) and knees touching the floor.
Half Moon	Standing with feet together, hold hands above the head with arms outstretched. Exhale and stretch to the left. Inhale and return to center. Repeat on other side.
Hand and thumb squeeze	Make a fist around thumb and squeeze. Release slowly and repeat on other hand.
Head to knee	Sitting with right leg outstretched and the left leg bent toward the body, with the left foot touching the right leg, stretch head to right knee. Repeat on pother side.
Hero	Kneel on the floor with thighs perpendicular to the floor, and touch inner knees together. Sit back and down between the feet, resting the buttocks on the floor. Rest hands on the thighs.
Knee down twist	Lying on back with arms outstretched, place right foot on left knee and swivel right knee to the left side of floor. While in movement, turn head to left side. Repeat on other side.

(Illustration by Corey Light. Cengage Learning, Gale)

Yoga positions (CONTINUED)

Name	Description
Locust	Lying on stomach with hands lying next to the body, fingers pointing toward the toes, squeeze buttocks and lift legs up and outward. Keep legs straight and press back of the arms up, palms facing the sky.
Lotus	Sit with legs crossed and knees touching the floor, with a foot resting on each knee.
Mountain	Standing with feet together, inhale while raising arms straight above the head and clasp hands together. Exhale while lowering arms, and clasp hands in front of the heart.
Pigeon	Kneeling slide the left leg straight out from behind and inhale, stretching torso up. Release and repeat on other side.
Plow	Lying on back, inhale and raise legs over head while keeping hands flat on floor for support.
Rag Doll	While standing, exhale and bend over toward toes, cupping elbows with hands. Breathe deeply.
Seated Angle	Sitting with legs outstretched in a V shape, stretch arms to toes and head to floor.
Seated Forward Bend	Sitting with legs outstretched and feet together, stretch head to toes.
Shoulder Crunch	With back straight, slowly lift shoulder to ear and lower. Repeat on other side.
Shoulder Stand	Lying on back, lift legs up and support back with hands. Slowly angle legs over head and then extend upward.
Sphinx	Lying on stomach with elbows parallel to shoulders and palm and forearms on the ground, push torso up and look upward.
Spider	Press fingertips together and move palms in and out.
Spinal Twist	Sit with right foot crossed over left leg and right leg held with left arm. Twist while supporting body with right hand on the floor. Repeat on other side.
Standing Angle	Inhale and step into V position, stretching arms out and then down toward floor.
Standing Yoga Mudra	Standing with arms at sides, inhale and raise arms in front. Exhale and swing arms to back.
Tree	While standing, place one foot on opposite thigh and outstretch arms above the head. Hold hands above with index fingers straight and the remaining fingers clasped.
Triangle	With arms parallel to floor and legs outstretched, turn one foot out and stretch to that side, keeping arms straight, putting the hand on the side being stretched toward on the floor and the other arm straight into the air. Turn head up toward stretched arm.
Upward Dog	Lying on stomach with hands down near the chest, lift torso off the floor while raising on toes. Hands should raise, but remain palms down. Arch back slightly.
Warrior I	Raise arms over head with palms together and lunge forward with one foot, keeping thigh parallel to the ground.
Warrior II	With arms straight out and parallel to the ground and legs in V, turn one foot out and lunge to the side, keeping hips straight.
Yoga Mudra	Sitting on heels, round torso to the ground with forehead to the floor while stretching arms overhead. Inhale while in movement and exhale while lowering arms.

(Illustration by Corey Light. Cengage Learning, Gale)

KEY TERMS

Asana—A position or stance in yoga.

Dyana—The yoga term for meditation.

Hatha yoga—Form of yoga using postures, breathing methods and meditation.

Meditation—Technique of concentration for relaxing the mind and body.

Pranayama—Yogic breathing techniques.

Yogi (feminine, yogini)—A trained yoga expert.

activity that uses only gravity as resistance, which makes it an excellent physical therapy routine; certain yoga postures can be safely used to strengthen and balance all parts of the body. A study published in late 2002 summarized recent findings about the benefits of yoga for the cardiovascular and musculoskeletal systems. The review noted that yoga is still viewed as a "trendy" form of exercise rather than one with documented medical benefits.

Meditation has been much studied and approved for its benefits in reducing stress-related conditions. The landmark book, *The Relaxation Response*, by Harvard cardiologist Herbert Benson, showed that meditation and breathing techniques for relaxation could have the opposite effect of stress, reducing blood pressure and other indicators. Since then, much research has reiterated the benefits of meditation for stress reduction and general health. Currently, the American Medical Association recommends meditation techniques as a first step before medication for borderline **hypertension** cases. Some 2002 studies indicate that yogic meditation by itself is effective in lowering serum cholesterol as well as blood pressure.

Modern psychological studies have shown that even slight facial expressions can cause changes in the involuntary nervous system; yoga utilizes the mind/body connection. That is, yoga practice contains the central ideas that physical posture and alignment can influence a person's mood and self-esteem, and also that the mind can be used to shape and heal the body. Yoga practitioners claim that the strengthening of mind/body awareness can bring eventual improvements in all facets of a person's life.

Description

Classical yoga is separated into eight limbs, each a part of the complete system for mental, physical, and spiritual well-being. Four of the limbs deal with mental and physical exercises designed to bring the mind in tune with the body. The other four deal with different stages of meditation. There are six major types of yoga, all with the same goals of health and harmony but with varying techniques: hatha, raja, karma, bhakti, jnana, and tantra yoga. **Hatha yoga** is the most commonly practiced branch of yoga in America, and it is a highly developed system of nearly 200 physical postures, movements, and breathing techniques designed to tune the body to its optimal health. The yoga philosophy believes the breath to be the most important facet of health, as the breath is the largest source of *prana*, or life force, and hatha yoga utilizes *pranayama*, which literally means the science or control of breathing. Hatha yoga was originally developed as a system to make the body strong and healthy enough to enable mental awareness and spiritual enlightenment.

There are several different schools of hatha yoga in America; the two most prevalent ones are Iyengar and ashtanga yoga. Iyengar yoga was founded by B.K.S. Iyengar, who is widely considered as one of the great living innovators of yoga. Iyengar yoga puts strict emphasis on form and alignment, and uses traditional hatha yoga techniques in new manners and sequences. Iyengar yoga can be good for physical therapy because it allows the use of props like straps and blocks to make it easier for some people to get into the yoga postures. Ashtanga yoga can be a more vigorous routine, using a flowing and dance-like sequence of hatha postures to generate body heat, which purifies the body through sweating and deep breathing.

The other types of yoga show some of the remaining ideas which permeate yoga. Raja yoga strives to bring about mental clarity and discipline through meditation, simplicity, and non-attachment to worldly things and desires. Karma yoga emphasizes charity, service to others, non-aggression and non-harming as means to awareness and peace. **Bhakti yoga** is the path of devotion and love of God, or Universal Spirit. Jnana yoga is the practice and development of knowledge and wisdom. Finally, tantra yoga is the path to self-awareness through religious rituals, including awareness of sexuality as sacred and vital.

A typical hatha yoga routine consists of a sequence of physical poses, or asanas, and the sequence is designed to work all parts of the body, with particular emphasis on making the spine supple and healthy and increasing circulation. Hatha yoga asanas utilize three basic movements: forward bends, backward bends, and twisting motions. Each asana is named for a common thing it resembles, like the sun salutation, cobra, locust, plough, bow, eagle, and tree, to name a few. Each pose has steps for entering and exiting it, and each posture

requires proper form and alignment. A pose is held for some time, depending on its level of difficulty and one's strength and stamina, and the practitioner is also usually aware of when to inhale and exhale at certain points in each posture, as breathing properly is another fundamental aspect of yoga. Breathing should be deep and through the nose. Mental concentration in each position is also very important, which improves awareness, poise, and posture. During a yoga routine there is often a position in which to perform meditation, if deep relaxation is one of the goals of the sequence.

Yoga routines can take anywhere from 20 minutes to two or more hours, with one hour being a good time investment to perform a sequence of postures and a meditation. Some yoga routines, depending on the teacher and school, can be as strenuous as the most difficult workout, and some routines merely stretch and align the body while the breath and heart rate are kept slow and steady. Yoga achieves its best results when it is practiced as a daily discipline, and yoga can be a life-long exercise routine, offering deeper and more challenging positions as a practitioner becomes more adept. The basic positions can increase a person's strength, flexibility, and sense of well-being almost immediately, but it can take years to perfect and deepen them, which is an appealing and stimulating aspect of yoga for many.

Yoga is usually best learned from a yoga teacher or physical therapist, but yoga is simple enough that one can learn the basics from good books on the subject, which are plentiful. Yoga classes are generally inexpensive, averaging around 10 dollars per class, and students can learn basic postures in just a few classes. Many YMCAs, colleges, and community health organizations offer beginning yoga classes as well, often for nominal fees. If yoga is part of a physical therapy program, its cost may be reimbursed by insurance.

Preparations

Yoga can be performed by those of any age and condition, although not all poses should be attempted by everyone. Yoga is also a very accessible form of exercise; all that is needed is a flat floor surface large enough to stretch out on, a mat or towel, and enough overhead space to fully raise the arms. It is a good activity for those who can not go to gyms, who do not like other forms of exercise, or have very busy schedules. Yoga should be done on an empty stomach, and teachers recommend waiting three or more hours after meals. Loose and comfortable clothing should be worn.

Precautions

People with injuries, medical conditions, or spinal problems should consult a doctor before beginning yoga. Those with medical conditions should find a yoga teacher who is familiar with their type of problem and who is willing to give them individual attention. Pregnant women can benefit from yoga, but should always be guided by an experienced teacher. Certain yoga positions should not be performed with a **fever**, or during **menstruation**.

Beginners should exercise care and concentration when performing yoga postures, and not try to stretch too much too quickly, as injury could result. Some advanced yoga postures, like the headstand and full lotus position, can be difficult and require strength, flexibility, and gradual preparation, so beginners should get the help of a teacher before attempting them.

Yoga is not a competitive sport; it does not matter how a person does in comparison with others, but how aware and disciplined one becomes with one's own body and limitations. Proper form and alignment should always be maintained during a stretch or posture, and the stretch or posture should be stopped when there is **pain**, **dizziness**, or **fatigue**. The mental component of yoga is just as important as the physical postures. Concentration and awareness of breath should not be neglected. Yoga should be done with an open, gentle, and non-critical mind; when one stretches into a yoga position, it can be thought of accepting and working on one's limits. Impatience, self-criticism, and comparing oneself to others will not help in this process of self-knowledge. While performing the yoga of breathing (pranayama) and meditation (dyana), it is best to have an experienced teacher, as these powerful techniques can cause dizziness and discomfort when done improperly.

Side effects

Some people have reported injuries by performing yoga postures without proper form or concentration, or by attempting difficult positions without working up to them gradually or having appropriate supervision. Beginners sometimes report muscle soreness and fatigue after performing yoga, but these side effects diminish with practice.

Research and general acceptance

Although yoga originated in a culture very different from modern America, it has been accepted and its practice has spread relatively quickly. Many yogis are amazed at how rapidly yoga's popularity has spread in

PATANJALI (2ND CENTURY B.C.)

There is little historical information available on Patanjali, who is credited with developing yoga, one of the six systems of Hindu philosophy. Several scholars suggest several persons may have developed yoga under the pseudonym of Patanjali. In any case, Patanjali existed around 150 B.C. in India. He developed yoga based on a loose set of doctrines and practices from the Upanishads, themselves a set of mystical writings. The Upanishads are part of the Aranyakas, philosophical concepts that are part of the Veda, the most ancient body of literature of Hinduism. Patanjali gave these combined philosophical and esoteric writings a common foundation in his *Yoga Sutra*, a set of 196 concise aphorisms (wise sayings) that form the principles of yoga. He also drew upon Samkhya, the oldest classic system of Hindu philosophy. Patanjali's yoga accepted Samkhya metaphysics and the concept of a supreme soul. He established an eight stage discipline of self control and meditation. The individual sutras (verses) lay out the entire tradition of meditation. They also describe the moral and physical disciplines needed for the soul to attain absolute freedom from the body and self.

the United States, considering the legend that it was passed down secretly by handfuls of followers for many centuries.

There can still be found some resistance to yoga, as active and busy Americans sometimes find it hard to believe that an exercise program that requires them to slow down, concentrate, and breathe deeply can be more effective than lifting weights or running. However, ongoing research in top medical schools is showing yoga's effectiveness for overall health and for specific problems, making it an increasingly acceptable health practice.

Training and certification

Many different schools of yoga have developed in America, and beginners should experiment with them to find the best-suited routine. Hatha yoga schools emphasize classical yoga postures, and raja yoga schools concentrate on mental discipline and meditation techniques. In America, there are no generally accepted standards for the certification of yoga teachers. Some schools certify teachers in a few intensive days and some require years of study before certifying teachers. Beginners should search for teachers who show respect and are careful in their teaching, and should beware of instructors who push them into poses before they are ready.

Resources

BOOKS

Ansari, Mark, and Liz Lark. *Yoga for Beginners*. New York: Harper, 1999.

Bodian, Stephan, and Georg Feuerstein. *Living Yoga*. New York: Putnam, 1993.

Carrico, Mara. *Yoga Journal's Yoga Basics*. New York: Henry Holt, 1997.

Iyengar, B.K.S. *Light on Yoga*. New York: Schocken, 1975.

Pelletier, Kenneth R., MD. *The Best Alternative Medicine*, Chapter 10, "Ayurvedic Medicine and Yoga: From Buddha to the Millennium." New York: Simon & Schuster, 2002.

PERIODICALS

Engebretson, J. "Culture and Complementary Therapies" *Complementary Therapies in Nursing and Midwifery* 8 (November 2002): 177 184.

Gerritsen, A. A., M. C. de Krom, M. A. Struijs, et al. "Conservative Treatment Options for Carpal Tunnel Syndrome: A Systematic Review of Randomized Con trolled Trials." *Journal of Neurology* 249 (March 2002): 272 280.

Kronenberg, F., and A. Fugh Berman. "Complementary and Alternative Medicine for Menopausal Symptoms: A Review of Randomized, Controlled Trials." *Annals of Internal Medicine* 137 (November 19, 2002): 805 813.

Manocha, R., G. B. Marks, P. Kenchington, et al. "Sahaja Yoga in the Management of Moderate to Severe Asthma: A Randomized Controlled Trial." *Thorax* 57 (February 2002): 110 115.

Raub, J. A. "Psychophysiologic Effects of Hatha Yoga on Musculoskeletal and Cardiopulmonary Function: A Literature Review." *Journal of Alternative and Com plementary Medicine* 8 (December 2002): 797 812.

Tonini, G. "Dysmenorrhea, Endometriosis and Premen strual Syndrome" [in Italian] *Minerva Pediatrica* 54 (December 2002): 525 538.

Vyas, R., and N. Dikshit. "Effect of Meditation on Respi ratory System, Cardiovascular System and Lipid Pro file." *Indian Journal of Physiology and Pharmacology* 46 (October 2002): 487 491.

Yoga International Magazine. R.R. 1 Box 407, Honesdale, PA 18431. http://www.yimag.com

Yoga Journal. P.O. Box 469088, Escondido, CA 92046. http://www.yogajournal.com

ORGANIZATIONS

American Yoga Association. *www.americanyogaassociation.org*.

International Association of Yoga Therapists (IAYT). 4150 Tivoli Ave., Los Angeles, CA 90066.

Yoga Research and Education Center (YREC). 2400A County Center Drive, Santa Rosa, CA 95403. (707) 566 0000. www.yrec.org.

OTHER

Yoga Directory. http://www.yogadirectory.com
Yoga Finder Online. http://www.yogafinder.com

Douglas Dupler
Rebecca J. Frey, PhD

Yohimbe

Description

Yohimbe (*Corynanthe yohimbe*) is an herb derived from the bark of the yohimbe tree found primarily in the West African nations of Cameroon, Gabon, and Zaire. The major active constituent of the bark is yohimbine. In prescription doses, the active ingredient is yohimbine hydrochloride.

General use

Yohimbe has been used for centuries in African folk medicine to treat fevers, leprosy, coughs, and as a local anesthetic. But its most popular use has been as an aphrodisiac and a mild hallucinogen. It has been widely used in Europe for about 75 years to treat male erectile dysfunction, or **impotence**. The U. S. Food and Drug Administration (FDA) approved yohimbe as a treatment for impotence in the late 1980s. It is sold as an over-the-counter dietary supplement and as a prescription drug under brand names such as Yocon, Aphrodyne, Erex, Yohimex, Testomar, Yohimbe, and Yovital.

There is no clear medical research that indicates exactly how or why yohimbe works in treating impotence. It is generally believed that yohimbe dilates blood vessels and stimulates blood flow to the penis, causing an erection. It also prevents blood from flowing out of the penis during an erection. It may also act on the central nervous system, specifically the lower spinal cord area where sexual signals are transmitted. Studies show it is effective in 30-40% of men with impotence. It is primarily effective in men with impotence caused by vascular, psychogenic, or diabetic problems. It usually does not work in men whose impotence is caused by organic nerve damage. In men without erectile dysfunction, yohimbe in some cases appears to increase sexual stamina and prolong erections.

Yohimbe is also used for weight loss, although not to the extent it is used for treating impotence. Some alternative health practitioners believe it is more effective and safer than the stimulant ephedra (also known as *ma huang*) in achieving weight loss. Yohimbe is often prescribed for weight loss by natural health practitioners at Bastyr University in Kenmore, Washington "It's my number one choice for weight loss," Lise Alschuler, medical director of the school's natural health clinic, said in a January 1998 article in *Vegetarian Times*. "I prescribe it in very small doses and slowly increase intake while monitoring patients' tolerance levels." Dosing starts at 1 mg of yohimbine three times a day.

Yohimbe has been used for centuries in African folk medicine to treat fevers, leprosy, coughs, and as a local anesthetic but its most popular use has been as an aphrodisiac and a mild hallucinogen. *(© TH Foto / Alamy)*

A 1994 study by the Eastern Virginia Medical School also found yohimbine may be effective in treating **narcolepsy**. While the study involved only eight people with the sleep disorder, seven of them given yohimbine were able to stay awake for an eight-hour work day. The researchers believe yohimbine works by counteracting the brain chemistry that causes narcolepsy, and remains effective even after a few weeks of regular use.

KEY TERMS

Aphrodisiac—Any substance, aroma, or image that arouses sexual desire.

Erectile dysfunction—The inability of a male to have or maintain an erection.

Glaucoma—A disease of the eye marked by increased pressure within the eyeball that can cause damage and lead to a gradual loss of vision.

Hypertension—Abnormally high arterial blood pressure, which if left untreated can lead to hear disease and stroke.

Leprosy—A chronic disease characterized by lesions on the body, especially the face, that enlarge and spread if left untreated, leading to paralysis, muscle wasting, and deformities.

Monoamine oxidase inhibitor—A class of antidepressant drugs.

Narcolepsy—A condition characterized by brief attacks of deep sleep outside of the normal sleep cycle.

Tyramine—A compound derived from tyrosine, an amino acid that is a precursor to various alkaloids, and found in various types of food.

Preparations

The usual dosage of yohimbine extract to treat erectile dysfunction is 5.4 milligrams (mg) three times a day. It may take three to six weeks for it to take effect. In the event of side effects, dosage is usually reduced to one-half a tablet three times a day, then gradually increased to one tablet three times a day. Prescription yohimbe containing yohimbine is standardized at 5.4 mg per tablet. The retail price for a name brand yohimbe is generally $18-36 for 30 tablets. A generic prescription for yohimbine is about $6-12 for 30 tablets. Most yohimbe sold over the counter is in tablet or capsule form and contains 500-1,000 mg of yohimbe bark, and contains only a small percentage of the active ingredient yohimbine. The strength of yohimbe bark extract sold over the counter varies greatly and may not be a reliable source of yohimbine. A 1995 study by the FDA looked at 26 over-the-counter yohimbe products and did not find any that had enough yohimbine to effectively treat erectile dysfunction. Yohimbe bark extract is also sold over the counter in combination with other herbs and dietary supplements. The best way to ensure that a patient is getting enough active ingredient to treat erectile dysfunction is to ask a physician for a prescription yohimbe product.

Precautions

Since yohimbe can cause confusion, dizziness, and disorientation, it should not be taken while operating machinery, driving, or performing hazardous activities. It should not be taken by people with chronic health problems, such as heart, liver, or kidney disease, diabetes, **glaucoma**, **hypertension** (high blood pressure), or mental illness. Children, women, or men with prostate problems should not use yohimbe. Persons should consult their physician or health care practitioner before they start taking yohimbe.

Side effects

There can be several serious side effects associated with yohimbe. An allergic reaction is possible with symptoms such as difficulty breathing, throat constriction, **hives**, and swelling of the face, lips, or tongue. It can also cause an irregular or rapid heartbeat, and disorientation. Minor side effects can include **dizziness**, anxiety, shaking, headaches, skin flushing, and irritability.

Yohimbe is also reported to have produce hallucinogenic properties in some people. The effects have been compared to the drug LSD and can last from two to four hours. These effects include audio and visual hallucinations, and feelings of euphoria. They usually occur when yohimbe is taken in higher than recommended doses.

Interactions

Yohimbe should not be used by people who are taking tranquilizers, antidepressants, sedatives, antihistamines, amphetamines or other stimulants, including **caffeine**. Since yohimbe is a short-term monoamine oxidase (MAO) inhibitor, it should not be taken with hypertension medication. It should not be taken with food or drink that contains high amounts of tyramine, such as wine, beer, cheese, cured meats, dried fish, bananas, red plumbs, oranges, dried fruit, avocado, tomato, eggplant, and soy sauce. Doing so can cause a rise in blood pressure. Yohimbe should not be used with other prescription erectile dysfunction drugs, such as Viagra.

Resources

BOOKS

Foster, Steven and Varro E. Tyler. *Tyler's Honest Herbal: A Sensible Guide to the Use of Herbs and Related Remedies*. Binghamton, NY: The Haworth Press, Inc. 1999.

Miller, Lucinda G. and Wallace J. Murray (Editors). *Herbal Medicinals: A Clinician's Guide*. Binghamton, NY: The Haworth Press, Inc. 1999.
Poche, Henry Z. *Medical Biology of Yohimbine & Its Easy Use in Male Sex Erectile Dysfunction*. Washington, DC: ABBE Publishers Association of Washington, DC. 1997.
Robbers, James E. and Varro E. Tyler. *Tyler's Herbs of Choice: The Therapeutic Use of Phytomedicinals*. Bing hamton, NY: The Haworth Press, Inc. 1998.
Tenny, Deanne. *Yohimbe (The Woodland Health Series.)* Pleasant Grove, UT: Woodland Publishing. 1997.

PERIODICALS

Berger, Laurie. "The Lowdown on natural Fat Fighters." *Vegetarian Times* (January 1998): 82 84.
Campbell, Adam. "Soft Science: The Exclusive World on Which Sex Supplements may Help and Which Won't." *Men's Health* (May 2002): 100.
Castleman, Michael. "Recipes for Lust." *Psychology Today* (July/August 1997): 50 58.
Millman, Christian. "Natural Disasters." *Men's Health* (April 1999): 90.
Puotinen, C. J. "Herbs for Virility: Natural Ways to Spruce Up Your Sex Appeal." *Vegetarian Times* (May 1997): 80 82.
"Yohimbe Tree Bark: Herbal Viagra Better Gotten by Rx." *Environmental Nutrition* (February 1999): 8.

ORGANIZATIONS

American Herbalist Guild. P.O. Box 70, Roosevelt, UT 84066. (435) 722 8434. http://www.healthy.net:80/pan/pa/herbalmedicine/ahg.htm.

OTHER

Natural Health Encyclopedia. "Yohimbe." Personal Health Zone. 2000. http://www.personalhealthzone.com/pg000251.html.
"Yohimbe (*Pausinystalia yohimbe*)." MotherNature.com. http://www.mothernature.com/ency/herb/yohimbe.asp.
"Yohimbine." drkoop.com. http://www.drkoop.com/hcr/drugstory/pharmacy/leaflets/english/d01386a1.asp.

Ken R. Wells
Teresa G. Odle

Yucca

Description

The yucca plant is native to the high deserts of the southwestern United States and Mexico. It is also found less commonly in parts of the eastern United States and West Indies. Extracts from the plant's root are used in alternative medicine as a soap and as an herbal dietary supplement. The yucca has at least 40 species, including *Yucca filamentosa*, the most common type, *Yucca brevifolia* (Joshua tree), *Yucca aloifolia* (Spanish bayonet), and *Yucca gloriosa* (Spanish dagger.) Two other species, *Yucca baccata* and *Yucca glauca*, are called soap plant because their roots are especially good for making soap.

Yucca plant in flower. *(© Cephas Picture Library / Alamy)*

Yucca plants are tree-like succulents of the lily family (Liliaceae) with stemless stiff, pointed leaves that end in a sharp needle. The Joshua tree, the namesake of Joshua Tree National Park near Palm Springs, California, is believed to have been named by Mormon settlers because the plant's angular branches resembled the outstretched arms of Joshua leading them out of the desert. The yucca flower is a series of white or purple blossoms on a long stalk.

General use

Native American tribes in the southwestern United States and Northern Mexico found numerous uses for the yucca, dating back hundreds of years. Several tribes, including the Western Apaches on the Fort Apache

Reservation in Arizona, use the plant today. The most common use seems to be for hygiene. Roots of the yucca baccata are pounded to remove extracts that are made into shampoo and soap. The Apaches also use yucca leaf fibers to make dental floss and rope. Historically, Western Apaches mixed ground juniper berries with yucca fruit to make a gravy. They also made a fermented drink from **juniper** berries and yucca fruit pounded to a pulp and soaked in water. Other Native American groups used yucca soap to treat dandruff and **hair loss**.

Native Americans also used yucca plants for a variety of other non-medical purposes, including making sandals, belts, cloth, baskets, cords, and mats. Such uses can still be found today among Hopi, Papago, and Ute Indians. The Zuni used a mixture of soap made from yucca sap and ground aster to wash newborn babies to stimulate hair growth. Navajos would tie a bunch of yucca fibers together and use it as a brush for cleaning metates.

The primary medical use of yucca is to treat arthritis and joint **pain** and inflammation. Native Americans used sap from the leaves in poultices or baths to treat skin lesions, **sprains**, inflammation, and bleeding. Teas made from yucca mixed together with other herbs are still brewed by folk healers in northern New Mexico to treat **asthma** and headaches. Constituents of the yucca are used today to treat people with **osteoarthritis** and rheumatoid arthritis. The plant's medical properties are found in saponins, precursors of cortisone, which prevent the release of toxins from the intestines that restrict normal cartilage formation. Saponins are produced naturally in the body by the adrenal glands. It is believed yucca works best for arthritis when taken over an extended period of time.

Yucca extract is used to treat a variety of other conditions, including migraine headaches, **colitis**, ulcers, **wounds**, **gout**, **bursitis**, hypertension (high blood pressure), and high LDL cholesterol (also called bad **cholesterol**). Liver, kidney, and gallbladder disorders are also treated with yucca extract. More recently, researchers have found that **resveratrol**, a compound found in yucca extract as well as in red wine, inhibits the aggregation or clumping of blood platelets. This finding suggests that yucca extract may be useful in preventing **blood clots**.

A number of commercial uses for yucca extract have been found, including adding it to root beer, alcoholic beer, and cocktail mixers as a foaming agent. The bittersweet dark brown extract is also used as an additive in ice cream and other foods.

The extract of the *Yucca schidigera* (Mojave or Mohave yucca) is also used as an additive in natural pet foods. It is reported to speed up bowel elimination, reduce fecal and urine odor, and improve digestion in dogs and cats. It can also be added to pet food as a spray or drops. Several studies also show that when added to animal feed, *Yucca schidigera* extract can reduce noxious ammonia gas in the waste products of poultry, pigs, cows, and horses. A decrease in ammonia levels can increase egg production in chickens and milk production in dairy cattle.

KEY TERMS

Adrenal glands— A pair of endocrine organs near the kidneys that produce steroids such as sex hormones, hormones associated with metabolic functions, and epinephrine.

Bursitis—An inflammation of a sac between a tendon and bone, usually in the shoulder or elbow.

Cholesterol— A fatty substance manufactured in the liver and carried throughout the body in the bloodstream.

Colitis—An inflammation of the colon.

Cortisone—A drug used in the treatment of rheumatoid arthritis.

LDL cholesterol—Low density lipid cholesterol, which causes fatty buildup in blood vessels and can lead to heart disease.

Metates—Stone slabs used by Native Americans to grind corn and other grains.

Poultice—Medicinal herbs or remedies held together by a piece of cloth tied together at its corners, heated, and applied to sores or lesions to promote healing.

Saponins—A group of glucosides that occur in plants and produce a soapy lather.

Preparations

The standard dosage of concentrated yucca saponins is two to four tablets or capsules a day. Yucca concentrate is also available as a tea, with the usual dosage being 3–5 cups a day. Capsules and tablets are commonly sold in doses of 500 milligrams. A bottle of 30, 60, 90, or 100 units costs $6–10 and can usually be found in health food stores.

Precautions

Since yucca has rarely been studied in a scientific setting, it is not known whether it is safe in children, pregnant or lactating women, or people with a history

of severe kidney or liver diseases, heart disease, or **cancer**. It appears to be nontoxic to other mammals, including such household pets as cats and dogs.

Side effects

Saponins extracted from yucca plants are generally considered safe when used in traditional doses and forms based on several hundred years of use by Native Americans, both as food and medicine. In recent years, the only reported minor problems are rare cases of diarrhea and **nausea**. Some people who are sensitive to plant allergens may develop a mild skin rash from contact with yucca sap.

Interactions

Long-term internal use of yucca extract may interfere with the absorption of such fat-soluble vitamins as A, D, E, and K. However, no interactions between yucca and standard prescription medications have been reported.

Resources

BOOKS

Foster, Steven and Varro E. Tyler. *Tyler's Honest Herbal: A Sensible Guide to the Use of Herbs and Related Reme dies.*Binghamton, NY: The Haworth Press, Inc. 1999.

Heinerman, John. *Aloe Vera, Jojoba, and Yucca*. Chicago, IL: Keats Publishing, 1990.

Kavasch, E. Barrie, and Karen Baar. *American Indian Healing Arts: Herbs, Rituals, and Remedies for Every Season of Life*. New York: Bantam Books, 1999.

Miller, Lucinda G., and Wallace J. Murray, eds. *Herbal Medicinals: A Clinician's Guide*. Binghamton, NY: The Haworth Press, Inc. 1999.

Null, Gary. *Secrets of the Sacred White Buffalo*. Paramus, NJ: Prentice Hall. 1998.

Robbers, James E. and Varro E. Tyler. *Tyler's Herbs of Choice: The Therapeutic Use of Phytomedicinals*. Bing hamton, NY:The Haworth Press, Inc. 1998.

PERIODICALS

Miyakoshi, M., et al. "Antiyeast Steroidal Saponins from *Yucca Schidigera* (Mohave Yucca), a New Anti Food Deteriorating Agent." *Journal of Natural Products* (March 2000): 332 338.

Nyerges, Christopher. "Naturally Clean: How to Find and Use Some of Nature's Most Common Soaps." *Mother Earth News* (August September 1997): 18 19.

Olas, B., B. Wachowicz, A. Stochmal, and W. Oleszek. "Anti Platelet Effects of Different Phenolic Com pounds from *Yucca schidigera Roezl*. Bark." *Platelets* 13 (May 2002): 167 173.

Vanderjagt, T. J., R. Ghattas, D. J. Vanderjagt, et al. "Comparison of the Total Antioxidant Content of 30 Widely Used Medicinal Plants of New Mexico." *Life Sciences* 70 (January 18, 2002): 1035 1040.

Wang, Y., et al. "Effect of Steroidal Saponin from *Yucca Schidigera* Extract on Ruminal Microbes." *Journal of Applied Microbiology* (May 2000): 887 896.

ORGANIZATIONS

American Association of Naturopathic Physicians (AANP). 3201 New Mexico Avenue, NW, Suite 350, Washing ton, DC 20016. (202) 895 1392. *www.naturopathic.org*.

Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. www.swsbm.com.

OTHER

"Yucca." MotherNature.com. www.mothernature.com/ ency/herb/yucca.asp.

Ken R. Wells
Rebecca J. Frey, PhD

Zhi zi *see* **Gardenia**

Zinc

Description

Zinc is a mineral that is essential for a healthy immune system, production of certain hormones, wound healing, bone formation, and clear skin. It is required in very small amounts, and is thus known as a trace mineral. Despite the low requirement, zinc is found in nearly every cell of the body and is a key to the proper function of more than 300 enzymes, including superoxide dismutase. Normal growth and development cannot occur without it.

General use

The U.S. Recommended Dietary Allowance (RDA) for zinc is 5 milligrams (mg) for children under one year of age, 10 mg for children aged one to 10 years old, 15 mg for males 11 years or older, 12 mg for females 11 years or older, 15 mg for women who are pregnant, and 16-19 mg for women who are lactating.

Zinc has become a popular remedy for the **common cold**. Evidence shows that it is unlikely to prevent upper respiratory **infections**, but beginning a supplement promptly when symptoms occur can significantly shorten the duration of the illness. The only form of zinc proven effective for this purpose is the zinc gluconate or zinc acetate lozenge. Formulations of 13-23 mg or more appear to be most effective, and need to be dissolved in the mouth in order to exert antiviral properties. Swallowing or sucking on oral

Recommended dietary allowance of zinc

Age	mg/day
Children 0-6 mos.	3
Children 7-12 mos.	3
Children 1-3 yrs.	3
Children 4-8 yrs.	5
Children 9-13 yrs.	8
Boys 14-18 yrs.	11
Girls 14-18 yrs.	9
Men ≥ 19 yrs.	11
Women ≥ 19 yrs.	8
Pregnant women	13
Breastfeeding women	14

Foods that contain zinc

	mg
Oysters, 6 med.	16
Beef shank, lean, 1 oz.	3
Beef chuck, lean, 1 oz.	2.7
Chickpeas, canned, 1 cup	2.6
Yogurt, plain, low fat, 1 cup	2.2
Milk, 1 cup	1.8
Beans, kidney, California red, 1 cup	1.6
Beef tenderloin, lean, 1 oz.	1.6
Cashews, dry roasted, no salt, 1 oz.	1.6
Peas, green, frozen, 1 cup	1.6
Pecans, dry roasted, no salt, 1 oz.	1.4
Pork shoulder, lean, 1 oz.	1.4
Beef, eye of round, lean, 1 oz.	1.3
Cheese, swiss, 1 oz.	1.1
Nuts, mixed, dry roasted, no salt, 1 oz.	1.1
Almonds, dry roasted, no salt, 1 oz.	1.0
Walnuts, black, dried, 1 oz.	1.0
Cheese, cheddar, 1 oz.	0.9
Cheese, mozzarella, part skim, 1 oz.	0.9
Chicken breast, meat only, 1 oz.	0.9
Chicken leg, meat only, 1 oz.	0.9
Oatmeal, instant, low salt, 1 packet	0.8
Pork tenderloin, lean, 1 oz.	0.8
Beans, baked, canned with pork, 1 oz.	0.6
Flounder, sole, 1 oz.	0.2

mg = milligram

(Illustration by GGS Information Services. Cengage Learning, Gale)

KEY TERMS

Acrodermatitis enteropathica—Hereditary metabolic problem characterized by dermatitis, diarrhea, and poor immune status. Oral treatment with zinc is curative.

Benign prostatic hypertrophy—Enlargement of the prostate gland, which surrounds the male urethra, causing frequent urination. This condition is very common in older men.

Hemochromatosis—A hereditary condition which results in excessive storage of iron in various tissues of the body.

Macular degeneration—Deterioration of part of the retina, causing progressive loss of vision. This is the most common cause of blindness in the elderly.

Sickle-cell anemia—A genetic malformation of red blood cells that can cause periodic crises in sufferers.

Tinnitus—Perceived ringing, buzzing, whistling, or other noise heard in one or both ears that has no external source. There are a number of conditions that may cause this.

zinc tablets will not work. The lozenges can be used every two hours for up to a week or two at most.

People who are deficient in zinc are prone to getting more frequent and longer lasting infections of various types. Zinc acts as an immune booster, in part due to stimulation of the thymus gland. This gland tends to shrink with age, and consequently produces less of the hormones that boost the production of infection-fighting white blood cells. Supplemental zinc, at one to two times RDA amounts, can reverse this tendency and improve immune function.

In another immune stimulant capacity, zinc can offer some relief from chronic infections with *Candida albicans*, or yeast. Most women will experience a vaginal **yeast infection** at some time, and are particularly prone to them during the childbearing years. Some individuals appear to be more susceptible than others. One study showed yeast- fighting benefits for zinc even for those who were not deficient in the mineral to begin with. Other supplements that will complement zinc in combating yeast problems are **vitamin A**, **vitamin C**, and **vitamin E**. Another measure that can help to limit problems with *Candida* is eating yogurt, which is an excellent source of *Lactobacillus*, a friendly bacteria that competes with yeast. Limiting sweets in the diet and eating **garlic** or odor-free garlic supplements may also prove helpful.

People who are going to have surgery are well advised to make sure they are getting the RDA of zinc, vitamin A, and vitamin C in order to optimize wound healing. A deficiency of any of these nutrients can significantly lengthen the time it takes to heal. Adequate levels of these vitamins and minerals for at

least a few weeks before and after surgery can speed healing. The same nutrients are important to minimize the healing time of **bedsores**, **burns**, and other skin lesions.

There are two male health problems that can potentially benefit from zinc supplementation. Testosterone is one of the hormones that requires zinc for production. Men with **infertility** as a result of low testosterone levels may experience improvement from taking a zinc supplement. Another common condition that zinc can be helpful for is benign prostatic hypertrophy, a common cause of abnormally frequent urination in older men. Taking an extra 50 mg a day for three to six months offers symptomatic relief for some men.

Teenagers are often low in zinc, and also tend to experience more **acne** than the general population. The doses used in studies have been in the high range, requiring medical supervision, but increasing dietary zinc or taking a modest supplement in order to get the RDA amount is low risk and may prove helpful for those suffering from acne. Consult a knowledgeable health care provider before taking large doses of any supplement.

There is some evidence that zinc supplementation may slightly relieve the symptoms of **rheumatoid arthritis**, but the studies are not yet conclusive. It's possible that those who initially had low zinc levels benefited the most.

In 2002, new research showed certain concentrations of zinc improved the effect of a therapy called interferon for some patients with chronic **hepatitis** C. Although the trial was preliminary, it showed promise for further research into zinc's effects in enhancing interferon therapy.

Zinc is sometimes promoted as an aid for memory. This may be true to the extent that vitamin B_6 and neurotransmitters are not properly utilized without it. However, in the case of people with **Alzheimer's disease**, zinc can cause more harm than good. Some experiments indicate that zinc actually decreases intellectual function of people with this disease. Under these circumstances, it is probably best to stick to the RDA of 15 mg as a maximum daily amount of zinc.

The frequency of sickle-cell crisis in patients with sickle-cell **anemia** may be decreased by zinc supplementation. The decrease was significant in one study, although the severity of the attacks that occurred was not affected. Use of zinc supplementation or other treatment for sickle- cell anemia, a serious condition, should not be undertaken without the supervision of a health care provider.

Both the retina of the eye, and the cochlea in the inner ear contain large amounts of zinc, which they appear to need in order to function properly. Dr. George E. Shambaugh, Jr., M.D., is a professor emeritus of otolaryngology and head and neck surgery at Northwestern University Medical School in Chicago. In *Prevention's Healing with Vitamins*, he "estimates that about 25% of the people he sees with severe **tinnitus** are zinc-deficient." He adds that they sometimes have other symptoms of zinc deficiency. Large doses may be used in order to provide relief for this problem. Medical supervision and monitoring are necessary to undertake this course of treatment.

Topical zinc can be useful for some conditions, including cold sores. It is also available in a combination formula with the antibiotic erythromycin for the treatment of acne. Zinc oxide is a commonly used ingredient in the strongest sun block preparations and some creams for the treatment of **diaper rash** and superficial skin injuries. Men can use topical zinc oxide to speed the healing of **genital herpes** lesions, but it is too drying for women to use in the vaginal area.

There is still not enough information on some of the claims that are made for zinc. A few that may have merit are the prevention or slowing of **macular degeneration**, and relieving **psoriasis**. Consult a health care provider for these uses.

Deficiency

It is not uncommon to have mild to moderately low levels of zinc, although serious deficiency is rare. Symptoms can include an increased susceptibility to infection, **rashes**, **hair loss**, poor growth in children, delayed healing of **wounds**, rashes, acne, male infertility, poor appetite, decreased sense of taste and smell, and possible swelling of the mouth, tongue, and eyelids.

A more serious, chronic deficiency can cause severe growth problems, including dwarfism and poor bone maturation. The spleen and liver may become enlarged. Testicular size and function both tend to decrease. **Cataracts** may form in the eyes, the optic nerve can become swollen, and color vision is sometimes affected by a profound lack of zinc. Hearing is sometimes affected as well.

Since meats are the best sources of zinc, strict vegetarians and vegans are among the groups more likely to be deficient. The absorption of zinc is inhibited by high fiber foods, so people who have **diets** that are very high in whole grain and fiber need to take supplements separately from the fiber. Zinc is needed in larger

amounts for women who are pregnant or breastfeeding. Deficiency during **pregnancy** may lower fetal birthweight, as well as increase maternal risk of toxemia. A good prenatal vitamin is likely to contain an adequate amount. People over age 50 don't absorb zinc as well, nor do they generally have adequate intake, and may require a supplement. Alcoholics generally have poor nutritional status to begin with, and alcohol also depletes stored zinc.

There is an increased need for most vitamins and minerals for people who are chronically under high **stress**. Those who have had surgery, severe burns, wasting illnesses, or poor **nutrition** may require larger amounts of zinc than average.

Some diseases increase the risk of zinc deficiency. Sickle-cell anemia, diabetes, and kidney disease can all affect zinc metabolism. People with **Crohn's disease**, sprue, chronic **diarrhea**, or babies with acrodermatitis enteropathica also have an increased need for zinc. Consult a health care provider for appropriate supplementation instructions.

Preparations

Natural sources

Oysters are tremendously high in zinc. Some sources, such as whole grains, beans, and nuts, have good zinc content but the fiber in these foods prevents it from being absorbed well. Foods with better utilized zinc include beef, chicken, turkey, milk, cheese, and yogurt. Pure maple syrup also is a good source of zinc.

Supplemental sources

Zinc supplements are available as oral tablets in various forms, as well as lozenges. Zinc gluconate is the type most commonly used in lozenge form to kill upper respiratory viruses. Select brands that do not use citric acid or tartaric acid for flavoring, as these appear to impair the effectiveness. The best-absorbed oral types of zinc may include zinc citrate, zinc acetate, or zinc picolinate. Zinc sulfate is the most likely to cause stomach irritation. Topical formulations are used for acne and skin injuries. Oral zinc should not be taken with foods that will reduce its absorption, such as coffee, bran, protein, phytates, **calcium**, or **phosphorus**. Supplements should be stored in a cool, dry location, away from direct light, and out of the reach of children.

Precautions

Toxicity can occur with excessively large doses of zinc supplements, and produce symptoms, including **fever**, **cough**, abdominal **pain**, **nausea**, **vomiting**, diarrhea, drowsiness, restlessness, and gait abnormalities. If doses greater than 100 mg per day are taken chronically, it can result in anemia, immune insufficiency, heart problems, and **copper** deficiency. High doses of zinc can also cause a decrease in high density lipoprotein (HDL), or good, **cholesterol**.

People who have hemochromatosis, are allergic to zinc, or are infected with HIV should not take supplemental zinc. Ulcers in the stomach or duodenum may be aggravated by supplements as well. Those with **glaucoma** should use caution if using eye drops containing zinc. Overuse of supplemental zinc during pregnancy can increase the risk of premature birth and stillbirth, particularly if the supplement is taken in the third trimester. This increase in adverse outcomes has been documented with zinc dosages of 100 mg taken three times daily.

Side effects

Zinc may cause irritation of the stomach, and is best taken with food in order to avoid nausea. The lozenge form used to treat colds has a strong taste, and can alter the sense of taste and smell for up to a few days.

Interactions

The absorption of vitamin A is improved by zinc supplements, but they may interfere with the absorption of other minerals taken at the same time, including calcium, **magnesium**, **iron**, and copper. Supplements of calcium, magnesium, and copper should be taken at different times than the zinc. Iron should only be taken if a known deficiency exists. Thiazide and loop diuretic medications, sometimes used for people with high blood pressure, congestive heart failure, or liver disease, increase the loss of zinc. Levels are also lowered by oral contraceptives. Zinc can decrease the absorption of tetracycline and quinolone class antibiotics, antacids, soy, or **manganese**, and should not be taken at the same time of day. Drinking coffee at the same time as taking zinc can reduce the absorption by as much as half. Even moderate amounts of alcohol impair zinc metabolism and increase its excretion. Chelation with EDTA can deplete zinc, so patients undergoing chelation need to supplement with zinc, according to the instructions of the health care provider.

Resources

BOOKS

Bratman, Steven and David Kroll. *Natural Health Bible*. California: Prima Publishing, 1999.

Feinstein, Alice. *Prevention's Healing with Vitamins*. Pennsylvania: Rodale Press, 1996.
Griffith, H. Winter. *Vitamins, Herbs, Minerals & supplements: the complete guide*. Arizona: Fisher Books, 1998.
Jellin, Jeff, Forrest Batz, and Kathy Hitchens. *Pharmacist's letter/Prescriber's Letter Natural Medicines Comprehensive Database*. California: Therapeutic Research Faculty, 1999.
Pressman, Alan H. and Sheila Buff. *The Complete Idiot's Guide to Vitamins and Minerals*. New York: alpha books, 1997.

PERIODICALS

Vernarec, Emil. "Zinc May Enhance the Efficacy of Interferon." *RN*(May 2002):28.

Judith Turner
Teresa G. Odle

The Zone diet

Definition

The Zone Diet program is a food management system that claims to promote optimal metabolic efficiency in the body by balancing the hormones insulin and glucagon. Insulin is responsible for converting, in the blood, incoming nutrients into cells. Glucagon regulates glucose in the liver. The Zone's food plan consists of a dietary intake of 40% carbohydrates, 30% protein, and 30% fat.

Origins

In 1995, Dr. Barry Sears, Ph.D., a former biotechnology researcher for the Massachusetts Institute of Technology, authored *The Zone*. Since that time, the book has sold more than one million copies. One of the more popular carbohydrate-restrictive **diets**, the Zone's success has recently spawned several Zone "knock-off" diets. The Zone Diet is based on a program Dr. Sears developed almost twenty years earlier to treat **heart disease** in Type II diabetics. One of his key inspirations for developing this program was his own genetic history, which demonstrated an inclination for premature **heart attack**.

In a web interview for WebMD Health, *Spending a Week in the Zone with Barry Sears, Ph.D.*, Dr. Sears explained that he believed that the primary cause of heart disease was not high **cholesterol** but high levels of insulin; and that the Zone Diet is designed to control insulin levels and thus promote better health. Dr. Sears continues to promote his diet through speeches and his web site, http://www.drsears.com/.

Benefits

The name of Dr. Sears' diet refers to an expression used by athletes to describe a euphoric state of optimal physical and mental efficiency. At its heart, the Zone Diet strives to control two metabolic hormones, insulin and glucagons, as well as properly balance eicosanoid metabolism. Eicosanoids, found in fatty acids, are important in the regulation of inflammatory, immunological and hemostatic (arresting hemorrhage) processes. Metabolism is the chemical process in living cells that provides the body with energy and new material to repair waste. In addition to permanent weight loss, this hormonal balance is said to increase longevity and blood flow, improve the immune system, and promote a sense of general well being. Furthermore, the Zone Diet is thought to assist in the prevention of chronic ailments such as diabetes, heart disease, and high blood pressure.

Description

The diet asserts that by controlling the glucagons-insulin ratio in the body, it promotes long-term weight loss as the body burns excess fat. In addition, it is claimed that balancing levels of eicosanoids further increases mental and physical performance and reduces inflammation and hunger. This state of hormonal balance, also referred to as "the Zone," is achieved, according to the diet, by maintaining a dietary ratio of 40% carbohydrates, 30% fat, and 30% protein. It is this dietary ratio that has led people to call the Zone a "40/30/30 diet."

The Zone diet requires eating five times a day—three full meals as well as a mid-afternoon and prebedtime snack. The dieter is told that he/she should eat at least once every five hours to maintain proper insulin levels. There are two distinct methods used when preparing a Zone meal: the Eyeball Method and the Block Method. Following either method should provide a daily caloric intake of roughly 1,200 calories for women and 1,500 calories for men.

With the Eyeball Method, the dieter's hand is used to judge portion sizes. For low fat proteins (chicken and fish), the portion should be approximately the size and thickness of the dieter's palm. This equals roughly three ounces of protein for women and four ounces for men. Then carbohydrates are added to the meal. For "favorable" carbohydrates, such as most fruits and vegetables, two loose, fist-sized portions may be added. For "unfavorable" carbohydrates, such as pasta and grains,

KEY TERMS

Carbohydrates—Neutral compounds of carbon, hydrogen, and oxygen found in sugar, starches, and cellulose.

Eicosanoids—Local, short lived fatty acid substances with hormone-like properties, derived from arachidonic acid, that have strong physiological effects, even in very low concentrations. They influence several vital functions, such as the regulation of inflammatory, immunological and hemostatic processes.

Glucagon—A hormone from the pancreas that is responsible for releasing glucose stored in the liver.

Insulin—The hormone responsible for conveying incoming blood nutrients into cells.

Ketogenic diet—A diet that results in energy produced through the metabolism of fatty acids, usually from stored fat. By eating a very high amount of fat (80 percent) and low amounts of carbohydrates and protein, the body burns stored fat. Close medical supervision is necessary because of serious possible side effects, including ketosis.

Ketosis—An abnormal accumulation of ketones in the body, usually found in people who have diabetes mellitus or who are fasting, pregnant, starving, or on a high fat diet. Ketosis can cause serious side effects, including dehydration, kidney stones, gall stones, inflammation of the pancreas, decreased bone density, vitamin deficiency, eye problems.

Orthostatic hypotension—A drop in systolic blood pressure, which can result in dizziness or loss of consciousness.

Triglycerides—A blood fat lipid that increases the risk for heart disease.

only one tight, fist-sized portion may be added. Finally, a "dash" of dietary fat is added, which can consist of a few nuts, olives, or guacamole.

The second, and more precise, method for the Zone diet is the Block Method. In this method, each "Zone Food Block" consists of three "mini-blocks," which each represent one portion each of low-fat protein, favorable carbohydrates, and dietary fat. These mini-blocks contain a precise measurement of these macronutrients, specifically seven grams of protein, nine grams of carbohydrates, and 1.5 grams of fat. Each of the three daily meals and snacks consists of a set number of blocks. Women should consume three blocks per meal and one block for each snack, totaling eleven blocks each day. Men should consume four blocks per meal and one block for each snack, totaling 14 blocks each day. These are considered the minimum daily nutritional requirements for an adult. Different factors, such as increased muscle mass and **pregnancy**, may increase the daily food block requirements.

The Zone diet is only one of four key elements in the entire nutritional program proposed by Dr. Sears. The other three elements are the use of monounsaturated fats, dietary supplementation of Omega-3 fish oils, and **exercise**. These other elements, it is asserted, will help control metabolic function, produce "good" eicosanoids, and lower insulin levels. These four elements combined should produce a positive hormonal balance and thus increased health and permanent weight loss.

Preparations

There are few preparations required for going on the Zone diet. However, as with going on any diet, it is wise to consult with a physician beforehand. A physical examination and blood work are suggested, particularly to determine levels of cholesterol, glucose, insulin, and triglycerides (fatty acids). Dieters should also prepare their kitchens by purchasing proper measuring tools and a food scale. In addition, they should empty their cupboards of all foods with high-density carbohydrates. Zone "quick start" kits are also available from various retailers and on-line stores.

Precautions

As every individual possesses a unique biochemistry, achieving "the Zone," the state of optimal mental and physical efficiency, can be very subjective. This subjectivity can lead to confusion and frustration as individuals attempt to find their perfect metabolic balance using the 40/30/30 diet plan. Some critics believe the Zone diet is too strict, making it too difficult to maintain over a long period of time.

Due to its high protein ration (30%), the Zone diet is not recommended for people with impaired liver or kidney function. Protein metabolizes in the liver and is then excreted by the kidneys. The added strain of a high protein diet can cause long-term damage to these organs, as well as cause **kidney stones** and bone loss. Some experts further believe that these high protein requirements also contra-indicate the Zone diet for people with or at risk of heart disease, due to the higher level of saturated fat and cholesterol in many high protein foods. Clinical studies have shown that high fat/high protein/low carbohydrate diets can also

increase the risk of serious diseases such as high blood pressure, **stroke**, and adult-onset diabetes.

Despite Dr. Sears' claims to the contrary, many scientific studies show that the Zone diet may actually impair physical performance rather than enhance it. **Fatigue** experienced by athletes during exercise may be due to the diet's low proportions of dietary intake of carbohydrates (as stated above) as well as inadequate caloric intake. Additionally, the suggested benefits of risk reduction and increased health may be overstated.

Side effects

Dr. Sears states there are few or no side effects associated with his diet. However, many nutritional experts disagree. The Zone diet requires an intake of carbohydrates below the minimum nutritional daily requirements (100–120 g) agreed upon by most health experts. This deficiency can lead to several health risks such as cardiac problems, ketosis, and orthostatic hypotension (temporarily lowered blood pressure, usually from standing up quickly, causing temporary blood flow reduction and lack of oxygen to the brain, then lightheadedness and sometimes loss of consciousness). Mineral and vitamin deficiencies caused by low carbohydrate consumption may increase the risk of numerous diseases. The diet's high protein intake places added stress on kidney functions, increasing the risk of **gout**, **osteoporosis**, kidney stones, and kidney damage. One researcher, Sachiko St. Jeor, and colleagues concluded that dieters following diets like the Zone are potentially at risk for vitamin and mineral deficiencies.

Research and general acceptance

Although the Zone diet is not as strongly criticized as most high protein/low carbohydrate diets, few health organizations and nutritionists endorse it. Indeed, organizations such as the American College of Sports Medicine and the American Dietetic Association have publicly disagreed with the 40/30/30 plan. Most experts note the Zone diet's lack of scientific credibility, either claiming that the majority of Dr. Sears' observations and findings are supported by poorly controlled studies, unproven theories, non-validated results, and half-truths, or that the majority of published scientific research points to the detrimental effects of the Zone rather than to its health benefits. The long-term effects of the Zone diet have not been fully researched; therefore, the diet's long-term health benefits and risks are still undefined.

Training and certification

There is no formal training or certification required for the Zone diet. As Dr. Sears stated, "All you need [to start on the diet] is one hand and one eye."

Resources

BOOKS

Sears, Barry. *The Zone*. New York: Harper Collins, 1995.
Sears, Barry. *Mastering the Zone*. New York: Regan Books, 1997.

PERIODICALS

Cheuvront, Samuel. "The Zone Diet and Athletic Perform ance." *Sports Medicine*(April 2000): 289 294.
Cheuvront, Samuel. "The Zone Diet Phenomenon: A Closer Look at the Science behind the Claims." *Journal of the American College of Nutrition* (February, 2003): 9 17.
Coleman, Ellen. "The BioZone Nutrition System: A Dietary Panacea?" *International Journal of Sports Nutrition* (March, 1996): 19 21.
Jarvis, Mark, Alan Seddon, Lars McNaughton, and Dylan Thompson. "The Acute 1 Week Effects of the Zone Diet on Body Composition, Blood Lipid Levels, and Performance in Recreational Endurance Athletes." *The Journal of Strength and Conditioning Research*. (Febru ary 2002):50 57.
Kendall, Pat. "Zoning in on the Zone." *Nutrition News* (September 1997).
St. Jeor, Sachiko, Barbara Howard, Elaine Prewitt, Vicki Bovee, Terry Bazzarre, and Robert Eckel. "Dietary Protein and Weight Reduction." *Circulation*(October 2001): 1869 1874.

OTHER

Babal, Ken. "The Zone: Sound Advice or Just Another Diet?" [cited June 13, 2004]. http://www.healthwell. com/hnbreakthroughs/feb98/thezonediet.cfm.
"Introduction to the Zone." Zone Perfect [cited June 13, 2004]. http://www.zoneperfect.com.
McDougall, John. "The Great Debate: High vs. Low Protein Diets" [cited June 13, 2004]. http://www.drmcdougall. com/debate.html.
Sears, Barry. "Zone Diet." DrSears.com [cited June 13, 2004]. http://www.drsears.com.
"Spending a Week in the Zone with Barry Sears, Ph.D." WebMD Health [cited June 13, 2004]. http:// my.webmd.com/content/article/1/1700_50101.
"The Zone Diet." Healthwell.com [cited June 13, 2004]. http:// www.healthwell.com/healthnotes.cfm?ContentID 1069001.
"The Zone Diet." Weight loss Institute [cited June 13, 2004]. http://www.weight loss institute.com/zone_diet.htm

Lee Ann Paradise

Zone therapy *see* **Reflexology**
Zoster *see* **Shingles**

ORGANIZATIONS

A

AIDS Treatment Data Network. The NETWORK, 611 Broadway, Suite 613, New York, NY 10012. (212) 260 8868; (800)734 7104. http://www.atdn.org/.

Academy of Dermatology. 930 N. Meacham Road, P.O. Box 4014, Schaumberg, IL 60168 4014. (708) 330 0230. http://www.aad.org/zoster.html

Academy of General Dentistry. 211 East Chicago Ave., Suite 900, Chicago, IL 60611 1999; (888) AGD DENT http://www.agd.org.

Academy of Laser Dentistry. PO Box 8667, Coral Springs, FL 33075; (954) 346 3776; (877) 527 3776 http://www.laserdentistry.org.

Academy of Psychosomatic Medicine. 5824 N. Magnolia, Chicago, IL 60660. (773) 784 2025. http://www.amp.org

Accreditation Commission for Acupuncture and Oriental Medicine (ACAOM). Maryland Trade Center #3, 7501 Greenway Center Dr., Suite 760, Greenbelt, MD 20770; (301) 313 0855; (866) 455 7999 http://www.acaom.org

Acupressure Institute. 1533 Shattuck Ave., Berkeley, CA 94709; (800) 442 2232 www.acupressure.com

Aerobic and Fitness Association of America. 15250 Ventura Blvd., Suite 200, Sherman Oaks, CA 91403. (877) 968 2639. http://www.afaa.com

Agency for Toxic Substances and Disease. 1825 Century Blvd., Atlanta, GA 30345; (800) 232 4636 http://www.atsdr.cdc.gov/

Agoraphobics Building Independent Lives. 1418 Lorraine Ave., Richmond, VA 23227.

Agoraphobics In Motion. 605 W. 11 Mile Rd., Royal Oak, MI 48067.

Al Anon, Alanon Family Group, Inc. P.O. Box 862, Mid town Station, New York, NY 10018 0862. (800) 356 9996. http://www.recovery.org/aa

Alcoholics Anonymous, AA World Services, Inc. PO Box 459. New York, NY 10163 (212) 870 3400 http://www.alcoholics anonymous.org/

Alexander Graham Bell Association for the Deaf. 3417 Volta Place NW, Washington, DC 20007 2778. (202) 337 5220. http:/ http://www.agbell.org

Alexander Technique International 1692 Massachusetts Ave., 3rd Floor, Cambridge, MA 02138, (888) 668 8996, 617 497 2615 www.ati net.com

Alliances, Inc. 2121 Eisenhower Avenue, Suite 603, Alexan dria, VA 22314. (800) 463 6482. http://www.med source.com

Aloha International/Hawaiian Huna Village. P.O. Box 426, Volcano, HI 96785. 808 985 8880. http://www.huna.org/

ALS Association. 21021 Ventura Blvd., Suite #321, Wood land Hills, CA 91364. (818) 340 7500.

Alternative Medicine Foundation, Inc., P.O. Box 60016, Potomac, MD 20859. (301) 340 1960 http://www.am foundation.org/tcm.htm

Alzheimer's Association. 225 N. Michigan Ave., 17th Floor, Chicago, IL 60601. (800) 272 3900. http://www.alz.org.

Alzheimer's Disease Education and Referral (ADEAR) Center; The National Institute of Aging (NIA).PO Box 8250, Silver Spring, MD 20907; (800) 438 4380 http://www.alzheimers.org.

American Academy of Allergy, Asthma and Immunology. 555 E. Wells St., Suite 1100. Milwaukee, WI 53202 3823 (414) 272 6071 http://www.aaaai.org

American Academy of Audiology. 11730 Plaza America Drive, Suite 300, Reston, VA 20190. (703) 790 8466. http://www.audiology.org

American Academy of Child and Adolescent Psychiatry. 3615 Wisconsin Ave. NW. Washington, DC 20016 3007 (202) 966 7300 http://www.aacap.org

American Academy of Clinical Sexologists. 1929 18th Street NW, Suite 1166, Washington, DC 20009. (202) 462 2122.

American Academy of Clinical Toxicology. 777 East Park Dr., PO Box 8820. Harrisburg, PA 17105. (717) 558 7750. http://www.clintox.org/.

American Academy of Dermatology. PO Box 4014, Schaumburg, IL 60618 4014; (847) 240 1280; (866) 503 7546 http://www.aad.org.

American Academy of Environmental Medicine. 6505 E. Central Ave., #296, Wichita, KS 67206; (316) 684 5500; (800) 232 4636 http://www.aaemonline.org

American Academy of Family Physicians. PO Box 11210. Shawnee Mission, KS 66207 (913) 906 6000 http://www.aafp.org

American Academy of Medical Acupuncture (AAMA). 4929 Wilshire Blvd., Suite 428, Los Angeles, CA 90010. (323) 937 5514. http://www.medicalacupuncture.org

American Academy of Neural Therapy. 410 East Denny Way, Suite 18, Seattle, WA, 98122. (206) 749 9967. http://www.Neuraltherapy.com

American Academy of Neurology. 1080 Montreal Ave., St. Paul, MN 55116. (612) 695 1940. http://www.aan.com/public/con.html

American Academy of Ophthalmology. P.O. Box 7424, San Francisco, CA 94120 7424. (415) 561 8500. http://www.eyenet.org

American Academy of Orthopaedic Surgeons (AAOS). 6300 North River Road, Rosemont, IL 60018. (847) 823 7186 or (800) 346 AAOS. http://www.aaos.org

American Academy of Otolaryngology, Head and Neck Surgery, Inc. One Prince Street, Alexandria, VA 22314 3357. (703) 836 4444.

American Academy of Pain Management. 13947 Mono Way #A, Sonora, CA 95370. (209) 533 9744. http://www.aapainmanage.org

American Academy of Pain Medicine. 4700 W. Lake, Glenview, IL 60025. (847) 375 4731. http://www.painmed.org

American Academy of Pediatrics (AAP). 141 Northwest Point Boulevard, Elk Grove Village, IL 60007 1098. 847 434 4000. kidsdocs@aap.org http://www.aap.org

American Academy of Sleep Medicine (AASM). One Westbrook Corporate Center, Suite 920, Westchester, IL 60154. (708) 492 0930. http://www.aasmnet.org

American Apitherapy Society 500 Arthur Street, Centerport, NY 11721, (631) 470 9446, http://www.apitherapy.org

American Art Therapy Association.1202 Allanson Rd., Mundelein, IL 60060 3808. 888 290 0878 or 847 949 6064. Fax: 847 566 4580. E mail: arttherapy@ntr.net http://www.arttherapy.org

American Association For Pediatric Ophthalmology and Strabismus. c/o Denise De Losada Wilson. P.O. Box 193832, San Francisco, CA 94119 3832. (415) 561 8505. aapos@aao.org. http://med aapos.bu.edu.

American Association for Marriage and Family Therapy. 1100 17th Street NW, 10th Floor, Washington, DC 20036 4601. (202) 452 0109.

American Association for Therapeutic Humor. 222 S. Mer amec, Suite 303. St. Louis, MO 63105. (314) 863 6232. http://www.aath.org

American Association of Acupuncture and Oriental Medi cine (AAAOM) P.O. Box 162340, Sacramento, CA 95816, (916) 443 4770, (866) 455 7999, (916) 443 4766 www.aaaomonline.org

American Association of Colleges of Osteopathic Medicine. 5550 Friendship Blvd., Suite 310, Chevy Chase, MD 20815 7231. (301) 968 4100. http://www.aacom.org

American Association of Naturopathic Physicians (AANP). 4435 Wisconsin Ave. NW, Suite 403, Washington, DC 20016; (866) 538 2267 http://www.naturopathic.org

American Association of Neurological Surgeons (AANS). 5550 Meadowbrook Drive, Rolling Meadows, IL 60008. (888) 566 AANS or (847) 378 0500. Fax: (847) 378 0600. http://www.aans.org

American Association of Nutritional Consultants. 810 S. Buffalo Street, Warsaw, IN 46580. (888) 828 2262.

American Association of Orthopedic Medicine. 600 Pem brook Drive, Woodland Park, CO 80863 (866)687 1920 Fax: 719 687 5184 (800) 992 2062. http://www.aaomed.org

American Association of Pastoral Counselors. 9504 A Lee Highway, Fairfax, VA 22031 2303. (703)385 6967. http://www.aapc.org.

American Association of Poison Control Centers. 3201 New Mexico Ave., Suite 310, Washington, DC 20016; (800) 222 1222 http://www.aapcc.org

American Association of Sex Educators, Counselors & Therapists. P.O. Box 238, Mt. Vernon, IA 52314. http://www.aasect.org

American Board of Hypnotherapy. 16842 Von Karman Avenue, Suite 476, Irvine, CA 92714. http://www.hypnosis.com/

American Botanical Council. P.O. Box 144345, Austin, TX 78714 4345. (512) 926 4900. http://www.herbalgram.org

American Cancer Society (National Headquarters). 1599 Clifton Road, N.E. Atlanta, GA 30329. (800) 227 2345. http://www.cancer.org

American Chiropractic Association. 1701 Clarendon Blvd.. Arlington, VA 22209. (703) 276 8800. http://www.amerchiro.org/.

American Chronic Pain Association. PO Box 850, Rocklin, CA 95677 0850; (800) 533 3231 http://www.theacpa.org.

American College for Advancement in Medicine (ACAM). 24411 Ridge Route, Suite 115. Laguna Hills, CA 92653 (949) 309 3520 http://www.acamnet.org/site/

American College of Acupuncture and Oriental Medicine. 9100 Park West Drive, Houston, TX 77063. (800) 729 4456. http://www.acaom.edu

American College of Allergy, Asthma, and Immunology. 85 West Algonquin Road, Suite 550, Arlington Heights, IL 60005. (847) 427 1200. http://www.acaai.org

American College of Chiropractic Consultants (ACCC). 28 E. Jackson Bldg., 10th Fl., Suite 1020 Chicago, IL 60604. http://www.accc chiro.com

American College of Gastroenterology. 4900 B South Thirty First Street, Arlington, VA 22206 1656. (703) 820 7400. http://www.acg.cgi.gi.org/acghome/html

American College of Hyperbaric Medicine. 9875 S. Franklin Dr., Suite 300. Franklin, WI 53132. (414) 858 2240. http://www.hyperbaricmedicine.org/.

American College of Obstetricians and Gynecologists (ACOG). 409 12th Street, SW, P.O. Box 96920, Washington, DC 20090 6920. http://www.acog.org

American College of Occupational and Environmental Medicine (ACOEM). 1114 North Arlington Heights Road, Arlington Heights, IL 60004. (847) 818 1800. http://www.acoem.org

American College of Rheumatology. 1800 Century Place, Suite 250, Atlanta, GA 30345. (404) 633 3777. acr@rheumatology.org. http://www.rheumatology.org

American College of Sports Medicine. PO Box 1440, Indi anapolis, IN 46206 1440 or 401 W. Michigan St., Indianapolis, IN 46202. (317) 637 9200. Fax: (317) 634 7817. http://www.acsm.org

American College of Traditional Chinese Medicine. 455 Arkansas Street, San Francisco, CA 94107. (415) 282 7600. http://www.actcm.edu

American Council for Headache Education. 19 Mantua Road, Mt. Royal, NJ 08061. (609) 423 0043 or (800) 255 2243. http://www.achenet.org

American Council on Exercise. 5820 Oberlin Dr., Suite 102, San Diego, CA 92121 0378. (858) 535 8227. http:// www.acefitness.org

American Dance Therapy Association. (410) 997 4040. info@adta.org. http://www.adta.org

American Dental Association. 211 E. Chicago Ave. Chi cago, IL 60611. (312) 440 2500. http://www.ada.org

American Dermatological Association. PO Box 551301. Davie, FL 33355 (954) 452 1113 http://www. amer derm assn.org

American Diabetes Association. 1701 N. Beauregard St., Alexandria, VA 22311. (512) 926 4900. (800)342 2383. http://www.diabetes.org.

American Dietetic Association (ADA). 120 South Riverside Plaza, Suite 2000, Chicago, IL 60606 6995. (800) 877 1600. http://www.eatright.org.

American Epilepsy Society. 342 N. Main St., Rm. 301. Hartford, CT 06105 4298. (860) 586 7505. http:// www.aesnet.org/.

American Foundation for AIDS Research. 120 Wall St., 13th Fl.. New York, NY 1005 3908. (212) 806 1600. http://www.amfar.org/cgi bin/iowa/fdoc.html? record 13.

American Foundation for Urologic Disease, Inc. 1000 Corporate Boulevard, Suite 410, Linthicum, MD 21090. (800) 828 7866. (410) 689 3990. memberservices @nafc.org. http://www.afud.org

American Foundation of Traditional Chinese Medicine. 505 Beach Street, San Francisco, CA 94133. (415) 776 0502.

American Gastroenterological Association (AGA). 4930 Del Ray Avenue, Bethesda, MD 20814. (310 654 2055. http://www.gastro.org/

American Gastroenterological Association.Bethesda, MD 20814 (301) 654 2089 http://www.gastro.org

American Geriatrics Society. Empire State Building, 350 Fifth Ave., Suite 801, New York, NY 10118. (212) 308 1414. (800) 272 3900. http://www.american geriatrics.org.

American Headache Society. 19 Mantua Road. Mount Royal, NJ 08061 (856) 423 0043 http://www. americanheadachesociety.org

American Heart Association, National Center. 7272 Greenville Avenue, Dallas, TX 75231. http://www. americanheart.org

American Heart Association. 7320 Greenville Ave., Dallas, TX 75231. (800) 242 8721. http://www.american heart.org

American Herbal Pharmacopoeia. PO Box 66809, Scotts Valley, CA 95067; (831) 461 6318; (800) 373 7105 www.herbal ahp.org

American Herbal Products Association. 8484 Georgia Ave., Suite 370, Silver Spring, MD 20910. (301) 588 1174. http://www.ahpa.org

American Herbalist Guild. P.O. Box 70, Roosevelt, UT 84066. (435) 722 8434. http://www.healthy.net:80/pan/ pa/herbalmedicine/ahg.htm

American Holistic Medical Association. One Eagle Valley Court, Suite 201, Broadview Heights, OH 44147; (440) 838 1010; (800) 222 1222 http://www.holistic medicine.org

American Indian Science and Engineering Society (AISES). 5661 Airport Blvd. Boulder, CO 80301 2339. (303) 939 0023. Fax: (303) 939 8150. aisehq@spot.colorado.edu. http://www.colorado.edu/aises

American Industrial Hygiene Association. 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031. (703) 849 8888. http://www.aiha.org

American Institute of Homeopathy. 801 N. Fairfax Street, Suite 306, Alexandria, VA 22314 (888) 445 9988. http:// homeopathyusa.org

The American Institute of Stress. 124 Park Avenue, Yonkers, NY 10703 (914) 963 1200. Fax: (914) 965 6267. http://www.stress.org.

American Institute of Vedic Studies. P.O. Box 8357, Santa Fe, NM 87504. (505) 983 9385. http://www.vedanet. com/

American Liver Foundation. 75 Maiden Lane, Suite 603, New York, NY 10038 4810; (800) GO LIVER (465 4837) http://www.liverfoundation.org

American Lung Association. 1740 Broadway, New York, NY 10019 4374. (800) 586 4872. http://www.lungusa.org

American Macular Degeneration Foundation. P.O. Box 515, Northampton, MA 01061 0515. 888 MACULAR. 413 268 7660. amdf@macular.org. http://www. macular.org

American Massage Therapy Association. 820 Davis St., Suite 100, Evanston, IL 60201 4444. 847 864 0123. http://www.amtamassage.org

American Medical Association. 515 N. State Street, Chicago, IL 60612. (312) 464 5000. http://www.ama assn.org

American Menopause Foundation, Inc. Empire State Bldg., 350 Fifth Ave., Ste. 2822. New York, NY 10118. (212) 714 2398. http://www.americanmenopause.org.

American Music Therapy Association, Inc. 8455 Colesville Road, Suite 1000 Silver Spring, ML 20910. (301) 589 3300. http://www.musictherapy.org

American Natural Hygiene Society. P.O. Box 30630, Tampa, FL 33630. (813) 855 6607. anhs@anhs.org. http://www.anhs.org/index.html

American Naturopathic Medical Association (ANMA). PO Box 96273. Las Vegas, NV 89193 (702) 897 7053 www.anma.com

American Obesity Association (AOA). 1250 24th Street NW, Suite 300, Washington, DC 20037. (202) 776 7711 or (800) 98 OBESE. http://www.obesity.org

American Optometric Association. 2420 North Lindburgh Boulevard, St. Louis, MO 63141. (800) 365 2219. http://www.aoanet.org/

American Organization for the Bodywork Therapies of Asia (AOBTA). Laurel Oak Corporate Center, Suite 408, 1010 Haddenfield Berlin Rd., Voorhees, NJ 08043; (856) 782 1616; (866) 455 7999 http://www.aobta.org/

American Osteopathic Association. 142 E. Ontario Chicago, IL 6061. (800) 621 1773. info@aoa net.org. http://www.aoa net.org

American Pain Society. 4700 W. Lake Ave.. Glenview, IL 60025. (847) 375 4715. http://www.ampainsoc.org.

American Parkinson Disease Association. 1250 Hylan Boulevard, Suite 4B, Staten Island, NY 10305 1946. (800) 223 2732. http://www.apdaparkinson.com/

American Physical Therapy Association (APTA). 1111 North Fairfax Street, Alexandria, VA 22314. (703)684 APTA or (800) 999 2782. http://www.apta.org

American Podiatric Medical Association. 9312 Old Geor getown Rd, Bethesda, MD 20814 1698. (301) 571 9200. http://www.apma.org

American Polarity Therapy Association. PO Box 19858, Boulder, CO 80308; (303) 545 2080; (800) 227 2345 http://www.polaritytherapy.org.

American Prostate Society. PO. Box 870, Hanover, MD 21076. (410) 850 0818. (888) 445 9988. http://www.americanprostatesociety.com.

American Psychiatric Association (APA). 1400 K Street, NW, Washington, DC 20005. (888) 357 7924. http://www.psych.org

American Psychological Association (APA). Office of Pub lic Affairs. 750 First St. NE, Washington, DC 20002 4242. (202) 336 5700. http://www.apa.org/

American Psychosomatic Society. 6728 Old McLean Village Drive, McLean, VA 22101. (703) 556 9222. http://www.psychosomatic.org

American Psychotherapy & Medical Hypnosis Association. 210 S. Sierra, Reno, NV 89501. http://members.xoom.com/Hypnosis/.

American Red Cross. P.O. Box 37243, Washington, D.C. 20013. http://www.redcross.org

American Rose Society. P. O. Box 30000, Shreveport, LA 71130. (318) 938 5402. http://www.ars.org

American Skin Association. 346 Park Ave. South, 4th floor, New York, NY 10010. (800) 499 SKIN. http://www.americanskin.org/frameset.htm.

American Sleep Apnea Association. Wake Up Call: The Wellness Letter for Snoring and Apnea. 1424 K Street NW, Suite 302, Washington, DC 20005. (202) 293 3650. http://www.sleepapnea.org

American Social Health Association. PO Box 13827. Research Triangle Park, NC 27709 (919) 361 8400 http://www.ashastd.org

American Society for Bariatric Surgery. 7328 West Univer sity Avenue, Suite F, Gainesville, FL 32607. (352) 331 4900. http://www.asbs.org

American Society for Clinical Nutrition. 9650 Rockville Pike, Bethesda, MD 20814. (301) 530 7110. http://www.faseb.org/ascn

American Society for Reproductive Medicine. 1209 Mont gomery Highway, Birmingham, AL 35216 2809. (205) 978 5000. (866) 455 7999 http://www.asrm.com.

American Society for the Alexander Technique P.O. Box 60008, Florence, MA 01062, (413) 584 2359, (800) 473 0620, 413 584 3097 www.alexandertech.org

American Society of Bariatric Physicians. 5453 East Evans Place, Denver, CO 80222 5234. (303) 770 2526. http://www.asbp.org

American Society of Clinical Hypnosis. 200 E. Devon Avenue, Des Plaines, IL 60018.

American Society of Exercise Physiologists. Department of Exercise Physiology, The College of St. Scholastica, 1200 Kenwood Ave., Duluth, MN 55811. (218) 723 6297. http://www.css.edu/asep

American Society of Hematology (ASH). 1900 M Street, NW, Suite 200, Washington, DC 20036. (202) 776 0544. http://www.hematology.org

American Thyroid Association. 6066 Leesburg Pike, Suite 550. Falls Church, VA 22041 (703) 998 8890 http://www.thyroid.org

American Tinnitus Association. P.O. Box 5, Portland, Ore gon 97207 0005. (800) 634 8978 or (503) 248 9985. http://www.ata.org

American Urologic Association. 1000 Corporate Blvd., Suite 410, Linthicum, MD 21090; (410) 859 7335; (866) 746 4282 http://www.auanet.org.

American Vegan Society (AVS). 56 Dinshah Lane, PO Box 369, Malaga, NJ 08328. (856) 694 2887. (800) 877 1600. http://www.americanvegan.org/index.htm.

American Veterinary Medical Association (AVMA). 1931 North Meacham Road, Suite 100, Schaumburg, IL 60173 4360. http://www.avma.org

American Yoga Association (AYA) P.O. Box 19986,. Sar asota, FL 34276. (941) 927 4977. Fax: (941) 921 9844. http://www.americanyogaassociation.org

Ann Wigmore Foundation. PO Box 399. San Fidel, NM 87049 0399. (505) 552 0595. http://www.wigmore.org.

Anthroposophic Press (Steiner Books) P.O. Box 749. Great Barrington, MA 01230 (413) 528 8233. www.steiner books.org

Anxiety Disorders Association of America. 11900 Parklawn Dr., Ste. 100, Rockville, MD 20852. (301) 231 9350.

Arthritis Foundation. 1330 W. Peachtree St. Atlanta, GA 30309. http://www.arthritis.org

Association for Applied Psychophysiology and Biofeedback (AAPB). 10200 W. 44th Avenue, Suite 304. Wheat Ridge, CO 80033. (303) 422 8436. http://www.aapb.org

Association for Holotropic Breathwork International. PO Box 400267. Cambridge, MA 02140. (617) 674 2474. http://www.breathwork.com.

Association for Past Life Research and Therapies, Inc., P.O. Box 20151 Riverside, CA 92516. http://www.pastlife healing.com/

Association for Psychosomatic Medicine. 4560 Delafield Ave., Bronx, NY 10471 3905. http://www.theamp.org

Association for Repetitive Motion Syndromes. PO Box 514. Santa Rosa, CA 95402. (707) 571 0397. http:// www.certifiedpst.com/arms/.

Association for Research and Enlightenment, Inc. 215 67th St., Virginia Beach, VA 23451. (757) 428 3588 or (800) 333 4499. are@edgarcayce.org. http://www.are cayce. com/index.htm

Association of Gastrointestinal Motility Disorders. 12 Roberts Dr.. Bedford, MA 01730. (781) 275 1300. http://www.agmd gimotility.org.

Association of Labor Assistants and Childbirth Educators (ALACE) (formerly Informed Birth & Parenting). PO. 390436, Cambridge, MA 02139; (888) 222 5223 http:// www.alace.org/.

Association of Oncology Social Work. 1211 Locust Street, Philadelphia, PA 19107. (215) 599 6093. http:// www.aosw.org

Association of Reflexologists. 5 Fore Street, Taunton Som erset, TA1 1HX. http://www.aor.org.uk.

Association of Women's Health, Obstetric, and Neonatal Nurses. 2000 L St. NW, Suite 740, Washington, DC 20036. (202) 261 2400. Toll free in Canada (800) 245 0231. http://www.awhonn.org.

Asthma and Allergy Foundation of America. 1125 Fifteenth St. NW, Suite 502. , Washington, DC 20005. (605) 780 0546. 800 7ASTHMA. http://www.aafa.org.

Aston Training Center. PO Box 3568. Incline Village, NV 89450. (775) 831 8228. http:// www.astonenterprises.com.

Atkins Nutritionals. 1050 Seventeenth St., Suite 100, Denver, CO 80265; (800) 6 ATKINS http://www.atkins.com

Attention Deficit Disorder Association. 15000 Commerce Parkway, Suite C. Mount Laurel, NJ 08054 (856) 439 9099 www.aad.org

Australian Association of Professional Hypnotherapists and NLP Practitioners, Inc. PO BOX 1526, Southport, Gold Coast, Queensland 4215, Australia. http:// www.members.tripod.com/~aaphan/index.html

Australian Homeopathic Association. 6 Cavan Ave., Renown Park, VA 5008, ; (61) 8 8346 3961. (888) 445 9988. http://www.homeopathyoz.org.

Australian Traditional Medicine Society. PO Box 1027, Meadowbank, VA NSW 2114; 61 2 9809 6800; (888) 445 9988 http://www.atms.com.au.

Ayurvedic and Naturopathic Medical Clinic. 2115 112th Ave NE, Bellevue, WA 98004. (425) 453 8022. http:// www.ayurvedicscience.com/

B

Barbara Brennan School of Healing. P.O. Box 2005. East Hampton, NY 11937. (516) 329 0951. Fax: (516) 324 9745. e mail: bbshoffice@barbarabrennan.com.

Bastyr University. 14500 Juanita Dr. NE, Seattle, WA 98103. (206) 834 4100. http://www.bastyr.edu/

Benson Henry Institute for Mind Body Medicine. 824 Boy lston Street. . Chestnut Hill, MA 02467. (617) 732 9130. http://www.mbmi.org/home.

Better Hearing Institute. 515 King Street, Suite 420, Alex andria, VA 22314. (703) 684 3391.

Bonnie Prudden Myotherapy. P.O. Box 65240. Tucson, AZ 85728. (800)221 4634. http://www.bonnieprudden.com

Breema Center. 6076 Claremont Ave.. Oakland, CA 94618. (510) 428 0937. http://www.breema.com.

British Association for Cancer Research. Institute of Cancer Research, McElwain Laboratories, Cotswold Road, Sutton , GA SM2 5NG ; (44) 020 8722 4208. (800)227 2345. http://www.bacr.org.uk.

British Institute of Homeopathy Canada. 1445 St. Joseph Blvd., Gloucester, ON K1C 7K9 Canada. (613) 830 4759. http://www.homeopathy.com.

British Massage Therapy Council. 17 Rymers Lane, Oxford OX4 3JU. 01865 774123. http://www.bmtc.co.uk

British Society of Dowsers. Sycamore Cottage, Tamley Lane, Hastingleigh, Ashford, Kent TN26 5HW, United Kingdom.

Buddhist Association of the United States (BAUS). 1384 Broadway, 19th Floor, New York, NY 10018. (212) 398 8886. http://www.baus.org

C

California Association of Acupuncture and Oriental Medi cine http://www.CAAOM.ORG/medicine/ overview.htm

California Colon Hygienist Society. 333 Miller Ave., Suite 1, Mill Valley, CA 94941. (415) 383 7224.

Cambridge Institute for Better Vision. 65 Wenham Rd., Topsfield, MA 01983.

Canadian Association of Naturopathic Doctors. 1255 Sheppard Ave. East, Toronto, VA M2K 1E3; 61 2 9809 6800; (800) 551 4381 http://www.cand.ca.

Canadian Cancer Society. 10 Alcorn Ave., Suite 200, Can ada., VA M4V 3B1 ; (416) 961 7223. (800) 877 1600. http://www.cancer.ca.

Canadian Celiac Association. 5170 Dixie Rd., Suite 204, Mississauga, L4W 1E3 (800) 363 7296. http:// www.celiac.ca.

Canadian Coordinating Office for Health Technology Assessment. 600 865 Carling Ave.. Ottawa, DC K1S5S8 (613) 226 2553. http://www.ccohta.ca/pubs/ english/sleep/treatment.

Canadian Dental Association. 1815 Alta Vista Dr.. Canada., ON K1G 3Y6, (613) 523 1770. http://www.cda adc.ca.

Canadian Naturopathic Association/Association canadi enne de naturopathie. 1255 Sheppard Avenue East at Leslie, North York, ON M2K 1E2. (800) 551 4381 or (416) 496 8633. http://www.naturopathicassoc.ca

Canadian Neuro Optic Research Institute. P.O. Box 29053. 4324 Dewdney Ave. Regina, Saskatchewan S4T 7X3.

Canada. (306) 359 7694. Fax: (306) 525 2659. cnricontacts@cnri.edu. http://www.cnri.edu/

Canadian Pain Society. 701 Rossland Road East, Suite 373, Whitby, IL L1N 9K3; (905) 668 9545; (800) 533 3231 http://www.canadianpainsociety.ca.

Canadian Taijiquan Federation. P.O. Box 421, Milton, Ontario L9T 4Z1. http://www.canadiantaijiquanfederation.ca

Canadian Urological Association. 1155 University, Suite 1155, Montreal, MD H3B 3A7; (514) 395 0376. (888) 445 9988. http://www.cua.org.

Cancer Prevention Coalition. c/o University of Illinois at Chicago School of Public Health, MC 922, 2121 West Taylor Street,. Chicago, IL 60612 (312) 996 2297. http:\\www.preventcancer.com.

Cancer Research Institute (National Headquarters). 681 Fifth Avenue, New York, NY 10022. (800) 992 2623. http://www.cancerresearch.org

Celiac Disease Foundation. 13251 Ventura Blvd., Suite 1, Studio City, CA 91604 1838. (818) 990 2354. (800) 363 7296. http://www.celiac.org.

Celiac Sprue Association. P.O. Box 3170. Omaha, NE 68131 0700. (877) 272 4272 www.csaceliacs.org

Center for Biologics Evaluation and Research (CBER), U. S. Food and Drug Administration (FDA). 1401 Rockville Pike, Rockville, MD 20852 1448. (800) 835 4709 or (301) 827 1800. http://www.fda.gov/cber

Center for Cell and Gene Therapy. Baylor College of Medicine. One Baylor Place N1002. Houston, TX 77030 (713) 798 1246 http://www.bcm.edu/genetherapy.

Center for Complementary and Alternative Medicine Research in Asthma, Allergy, and Immunology. University of California at Davis. 3150B Meyer Hall., Davis, CA 95616. (916) 752 6575. 800 7ASTHMA. http://www camra.ucdavis.edu.

Center for Food Safety and Applied Nutrition, U.S Department of Health and Human Services. 5100 Paint Branch Parkway, College Park, MD 20740 (888) SAFEFOOD. http://www.cfsan.fda.gov

Center for Journal Therapy. 12477 W. Cedar Drive, #102. Lakewood, CO 80228. http://www.journaltherapy.com

Center for Mind Body Medicine. 5225 Connecticut Ave, NW, Suite 414 Washington, DC 20015. (202) 966 7338. http://www.cmbm.org/

Center for Mindfulness in Medicine, Health Care and Society. Stress Reduction Clinic. University of Massachusetts Memorial Health Care. 55 Lake Avenue North, Worcester, MA 01655. (508) 856 2656. Fax (508) 856 1977. jon.kabat zinn@banyan@ummed.edu http://www.umassmed.edu/cfm

Center for Occupational and Environmental Medicine. 7510 Northforest Dr., North Charleston, SC 29420. (843) 572 1600. http:\\ http://www.coem.com

Center for Science in the Public Interest. 1875 Connecticut Ave. NW, Suite 300. . Washington, DC 20009. (202) 332 9110. http://www.cspinet.org.

Centers for Disease Control and Prevention (CDC). 1600 Clifton Road, Atlanta, GA 30333. (404) 639 3311. http://www.cdc.gov

Centre for Economic Botany, Royal Botanic Gardens, Kew; Richmond, Surrey; TW9 3AE, United Kingdom. Fax: +44 (0)20 8332 5768. http://www.rbgkew.org.uk

Centre for International Ethnomedicinal Education and Research (CIEER). P.O. Box 60016. Potomac, MD 20859 (301) 340 1960 http://www.cieer.org

Chinese Association of Urine Therapy. 72 Wu Kon Lio Road, Wuku Industrial Park, Taipei Hsien, Taiwan, Republic of China. 886 2 22988446. http://www.everlifepharm.com/urine/

Chronic Fatigue and Immune Dysfunction Syndrome Association of America (CFIDS). PO Box 220398, Chapel Hill, NC 20222 0398 http://www.cfids.org.

Chuang Yen Monastery. 2020, Route 301, Carmel, NY 10512. (845) 225 1819 or (845) 228 4288.

Church of Christ, Scientist. http://www.Christian Science.org

Civil Aerospace Medical Institute. P. O. Box 20582, Oklahoma City, OK 73125. (202) 366 4000. http://www.cami.jccbi.gov

Clinic: University of Maryland Medical Center. 22 S. Greene Street (N5W40), Baltimore, MD 21201. (410) 328 6749; (800) 492 5538 www.celiaccenter.org/

College of Syntomic Optometry. (717) 387 0900. http://www.syntonicphototherapy.com

Colon Cancer Alliance. 5411 North University Dr., Suite 202, Coral Gables, FL 33067. (877) 422 2030. (800)227 2345. http://www.ccalliance.org.

Cosmetic Ingredient Review (CIR). 1101 17th Street NW, Suite 310, Washington, DC 20036. (202) 331 0651. Fax: (202) 331 0088. http://www.cir safety.org

Council for Homeopathic Certification. PMB 187, 16915 SE 272nd St., Suite 100, Covington, WA 98042. (866) 242 3399. (888) 445 9988. http://www.homeopathic directory.com.

Crohn's & Colitis Foundation of America. 386 Park Ave. S., 17th Floor, New York, NY 10016 8804; (800) 932 2423 http://www.ccfa.org/

Cultural Survival. 96 Mount Auburn St. Cambridge, MA 02138. (617) 441 5400. Fax (617) 441 5417. csinc@cs.org. http://www.cs.org

Cymatherapy International.(866) 909 0099 http://cymatherapy.com

D

DHA/EPA Omega 3 Institute. 150 Research Lane, Rm. 100, University of Guelph Research Park, Guelph, DC N1G 4T2; (866) 538 2267 http://www.dhaomega3.org/

Delta Society. http://www.deltasociety.org/

Depression and Bipolar Support Alliance. 730 N. Franklin St., Suite 501. Chicago, IL 60610. (312) 642 0049. http://www.ndmda.org/.

Dieticians of Canada. 480 University Ave., Suite 604, Canada., VA M5G 1V2 ; (416) 596 0857. (800) 877 1600. http://www.dieticians.ca.

Dieticians of Canada. 480 University Ave., Suite 604, Tor onto, VA M5G 1V2; (416) 596 0857; (888) 445 9988 http://www.dieticians.ca

Digestive Disease National Coalition (DDNC). 711 Second Street NE, Suite 200, Washington, DC 20002. (202) 544 7497. http://www.ddnc.org

Digestive Health Initiative. 7910 Woodmont Avenue, #914, Bethesda, MD 20814. (800) 668 5237. http://www.gastro.org./dhi.html

Division of Aging and Seniors, Health Canada. 200 Eglan tine Driveway, Ottawa, NY K1A 1B4 ; (613) 952 7606. (800) 272 3900. http://www.publichealth.gc.ca.

Dr. Edward Bach Centre. Mount Vernon, Bakers Lane, Brightwell cum Sotwell, VA OX10 0PZ ; (44) 01491 834678. (888) 445 9988. http://www.bachcentre.com.

E

Eating Disorders Awareness and Prevention. 603 Stewart St., Suite 803, Seattle, WA 98101. (800) 931 2237. http://www.edap.org

Endocrine Society. 8401 Connecticut Ave., Suite 900. Chevy Chase, MD 20815 (301) 941 0200 http://www.endo society.org/

Endometriosis Association, International Headquarters. 8585 North Seventy Sixth Place. Milwaukee, WI 53223 (414) 355 2200 http://EndometriosisAssn.org

Environmental Health Center, a Division of the National Safety Council. 1025 Connecticut Avenue, NW, Suite 1200, Washington, DC 20036. (202) 293 2270. http://www.nsc.org

Environmental Protection Agency. Ten regional offices with region specific addresses and phone numbers. http://www.epa.gov

Epilepsy Foundation. 8301 Professional Place, Landover, MD 20785. (860) 586 7505. (800) 332 1000. http://www.epilepsyfoundation.org/.

European Institute of Women's Health. 33 Pearse St., Dublin, VA 2; 353 1 671 5691; (888) 445 9988 http://www.eurohealth.ie.

F

FDA Center for Food Safety and Applied Nutrition (FDA/CFSAN). http://www.fda.gov/medwatch/safety/2002/kava.htm.

Fasting Center International. 32 West Anapurna St., #360, Santa Barbara, CA 93101. http://www.fasting.com

Federation of Feminist Women's Health Centers. 14220 Interurban Ave South #140. Seattle, WA 98168 (212) 714 2398. http://www.fwhc.org/menopause.

Feldenkrais Guild of North America. 3611 S.W. Hood Avenue, Suite 100, Portland, OR 97201. (800) 775 2118 or (503) 221 6612. Fax: (503) 221 6616. http://www.feldenkrais.com

Feminist Women's Health Center. 106 East E St.. Yakima, WA 98901. (509) 575 6473 x112. http://www.fwhc.org.

Florida Institute of Psychophysical Integration: Quantum Balance. 5837 Mariner Drive. Tampa, FL 33609 3411. (813) 186 2273. Fax: (813) 287 2870. Dr.Joy@Johnson Mail.com.

Flower Essence Society. PO Box 459, Nevada City, CA 95959 (44) 01491 834678. (800) 736 9222. http://www.flowersociety.org.

Food and Agricultural Organization of the United Nations. 120 South Riverside Plaza, Suite 2000, Chicago, IL 60606 6995. (301) 340 1960. (800) 877 1600. http://www. fao.org.

Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857. (888) 463 6332. http://www.fda.gov

Food and Nutrition Information Center, National Agricul tural Library, United States Department of Agricul ture. 10301 Baltimore Ave., Room 105, Beltsville, MD 20705; (301) 504 5414; (800) 877 1600 http:fnic.nal.usda.gov

Foundation Fighting Blindness. Executive Plaza I, Suite 800, 11350 McCormick Rd., Hunt Valley, MD 21031 1014. (888) 394 3937. http://www.blindness.org

Foundation for Homeopathic Education and Research. 21 Kittredge St., Berkeley, CA 94704. (510) 649 8930.

Freedom From Fear. 308 Seaview Ave., Staten Island, NY 10305. (718) 351 1717. http://www.freedomfromfear.com

G

Gastro Intestinal Research Foundation. 70 East Lake Street, Suite 1015. Chicago, IL 60601 5907 (312) 332 1350 http://www.girf.org

Gay Men's Health Crisis. 119 W. 24th St. New York, NY 10011 0022 (212) 367 1000 http://www.gmhc.org/donate.html.

Geomancy, the Feng Shui Education Association. 2939 Ulloa Street, San Francisco, CA 94116. (415) 753 6408. http://www.geofengshui.com

Gerson Institute. 1572 Second Avenue, San Diego, CA 92101. (425) 967 0737. (800) 838 2256. http://www.gerson.org.

Glaucoma Foundation. 80 Maiden Lane, Suite 1206. New York, NY 10038 (212) 285 0080 http://www.glaucomafoundation.org

Global Alliance Against Chronic Respiratory Diseases (GARD), World Health Organization, Department of Chronic Diseases and Health Promotion. 20, Avenue Appia, Geneva, GA CH 1211 27; (404) 498 1515; (800) 311 3435 http://www.who.int/respiratory/gard/en/.

Gluten Intolerance Group. 31214 124th Avenue SE. Auburn, WA 98092 3667. (253) 883 6655 www.gluten.net

Gluten Free Living. 31214 124th Avenue SE. Auburn, WA 98092 3667. (253) 883 6655 www.glutenfreeliving.com

Grand Forks Human Nutrition Research Center. 2420 Sec ond Ave. N.. Grand Forks, ND 58202 (317) 637 9200 http://www.gfhnrc.ars.usda.gov

Guild for Structural Integration. 209 Canyon Blvd. P.O. Box 1868. Boulder, CO 80306 1868. (303) 449 5903. (800) 530 8875. http://www.rolfguild.org.

H

Hawaiian Lomilomi Association. PO Box 2356 , Kealakekua, HI 96750 2356. http://www.hawaiilomilomi.com.

Healing Light Center Church. 261 E. Alegria Ave. #12. Sierra Madre, CA 91024. (626) 306 2170. Fax: (626) 355 0996.

Health and Rejuvenation Research Center A division of the Association for Research and Enlightenment, Inc. 215 67th Street Virginia Beach, VA 23451 2061. (757) 428 3588 ext. 7340. hrrc@are cayce.com.

Heart Association of Australia. 80 William St., Level 3, Sydney, VA NSW 2011, ; (11) 61 2 300 36 2787. (800) 242 8721. http://www.heartfoundation.org.au

Heart and Stroke Foundation of Canada. 222 Queen St., Suite 1402, Ottawa, VA K1P 5V9 ; (613) 569 4361. (800) 242 8721. http://www.heartandstroke.ca

Hellerwork. 406 Berry St. Mt. Shasta, CA 96067. (530) 926 2500. http://www.hellerwork.com

Hepatitis Foundation International. 504 Blick Dr., Silver Spring, MD 20904; (800) 891 0707 http://www.hepfi. org/

Herb Research Foundation. 1007 Pearl St., Suite 200, Boulder, CO 80302. (303) 449 2265. http://www.herbs.org

Herbal Advisor. http://www.AllHerb.com

Holistic Dental Association. PO Box 151444. San Diego, CA 92175. (619) 923 3120. http://www.holisticdental.org.

Homeopathic Medical Council of Canada. 3910 Bathurst St., Suite 202, Toronto, CA M3H 3N8, ; (416) 638 4622. (800) 736 9222. http://www.hmcc.ca.

Huna Research, Inc. 1760 Anna Street. Cape Girardeau, MO 63701 4504. (573) 334 3478. http://www.angelfire. com/mo/huna/

Hypoglycemia Support Foundation. PO Box 451778, Sun rise, FL 33345 http://www.hypoglycemia.org/

I

ITL Cancer Clinic (Bahamas) Ltd. P.O. Box F 42689, Freeport, Grand Bahama, Bahamas. (877) 290 2607. (242)352 7455. http://www.immunemedicine.com/

Indigenous Traditional Healing Council. P. O. Box 646, Tempe, AZ 85280. (602) 209 4759. http://www.azitlan. org/sweatlodge/council/htm.

Insight Meditation Society. 1230 Pleasant, St. Barre, MA 01005. (978) 355 4378. FAX: (978) 355 6398. http:// www.dharma.org

Institut Pasteur. 25 28, rue du Dr. Roux, 75015 Paris, France. +33 (0) 1 45 68 80 00. http://www.pasteur.fr/ haut_ext.html

Institute for Frontier Science. 6114 LaSalle Ave. Oakland, CA 94611. (510) 531 5767. E mail: brubik@compuserve.com. http://www.healthy.net/frontierscience/

Institute for Traditional Medicine. 2017 SE Hawthorne Blvd., Portland, OR 97214. (503) 233 4907. http:// www.itmonline.org.

Institute of Medicine of the National Academies. 500 Fifth St. NW. Washington, DC 20001. (202) 234 2352. http:// www.iom.edu.

The Interactive Guide to Learning Disabilities for Parents, Teachers, and Children. http://www.ldonline.org

International Academy of Biological Dentistry and Medi cine. 17222 Red Oak Dr., Ste. 101. Houston, TX 77090. (281) 651 1745. http://www.iabdm.org.

International Alliance of Healthcare Educators (IAHE). 11211 Prosperity Farms Road, D 325. Palm Beach Gardens, FL 34410. (561) 622 4334 www.iahe.com.

International Aromatherapy and Herb Association. 3541 West Acapulco Lane. Phoenix, AZ 85053 4625. (602) 938 4439. http://www.aztec.asu.edu./iaha/

International Association of Crystal Healing Therapists. P.O. Box 344, Manchester, M60 2EZ, United Kingdom. Telephone: (UK) 01200 426061. Fax: (UK) 01200 444776. info@iacht.co.uk. http://www. iacht.co.uk/

International Association of Enterstomal Therapy, 27241 La Paz Road, Suite 121, Laguna Niguel, CA 92656

International Association of Infant Massage. P.O. Box 1045. Oak View, CA 93022.

International Association of Reiki Professionals. P.O. Box 481, Winchester, MA 01890. http://www.iarp.org

International Association of Rubenfeld Synergists (INARS). 7 Kendall Rd., Kendall Park, NJ 08824. (877) RSM 2468. http://www.rubenfeldsynergy.com.

International Association of Yoga Therapists (IAYT). 4150 Tivoli Ave., Los Angeles, CA 90066. http://www.yoga site.com/yoga orgs.html

International Carotenoid Society. 10301 Baltimore Ave., Room 105. Beltsville, MD 20705 (301) 504 5414 http:// www.carotenoidsociety.org

International Center for Health & Humor. 2930 Hidden Valley Road, Edmond, OK 73013. (405) 341 8115. http://www.humorandhealth.com.

International Center for Infertility Information Dissemina tion. PO Box 6836 , Arlington, VA 22206. (703) 379.9178. (866) 455 7999 http://www.asrm.org.

International Childbirth Education Association (ICEA). PO Box 20048, Minneapolis, MN 55420; (952) 854 8660; (888) 222 5223 http://www.icea.org.

International College of Applied Kinesiology 6405 Metcalf Ave., Suite 503, Shawnee Mission, KS 66202, 913 _384 5336, http://www.icakusa.com and http:// www.icak.com

International Council for Medical and Clinical Therapists. 7361 McWhorter Place, Suite 300, Annandale, VA 22003 5469. http://www.ultradepth.com/ICMCT.htm

International Food Information Council. 1100 Connecticut Avenue, NW, Suite 430, Washington, DC, 20036. (202) 296 6540. http://www.ific.org

International Foundation for Homeopathy. P. O. Box 7, Edmonds, WA 98020. (206) 776 4147.

International Institute of Infant Massage. 605 Bledsoe Rd.NW. Albuquerque, NM 87107. (505) 341 9381. Fax: (505) 341 9386. http://www.infantmassage.com.

International Institute of Islamic Medicine & The Islamic Medical Association of North America. PO Box 160. Brandon, FL 33509. (813) 661 6161. http://www.iiim.org.

International Institute of Reflexology. 5650 First Avenue North, PO Box 12642. St. Petersburg, FL 33733 2642. (727) 343 4811. http://www.reflexology usa.net/.

International Iridology Research Association. PO Box 1442. Solano Beach, CA 92075 2208. (888) 682 2208. IIRA Office@aol.com. http://www.iridologyassn.org/

International Medical and Dental Hypnotherapy Association. 4110 Edgeland, Suite 800, Royal Oak, MI 48073 2285. http://www.infinityinst.com

International Society for Traumatic Stress Studies, 60 Revere Dr., Ste. 500, Northbrook, IL 60062. (847) 480 9028. http://www.istss.org

International Society for the Study of Subtle Energies and Energy Medicine (ISSSEEM). 356 Goldco Circle. Golden, CO 80401. (303) 278 2228. http://www.vitalenergy.com/ISSSEEM

International Tremor Foundation. 7046 West 105th Street, Overland Park, KS 66212. (913) 341 3880.

International Trepanation Advocacy Group (ITAG), Inc. P. O. Box 65, Wernersville, PA 19565. (610) 693 6869. Fax: (610) 693 3261. http://www.trepan.com

Intestinal Health Institute. 4427 East Fifth St., Tucson, AZ 85711. (520) 325 9686. info@sheilas.com. http://www.sheilas.com

Iodine Network. 180 Elgin St., Suite 1000. Ottawa, K2P 2K3 +1 (613) 782 6812 http://www.iodinenetwork.net/

Irritable Bowel Syndrome Association. 1440 Whalley Ave., Suite 145, New Haven, CT M3H 3N8,; (416) 638 4622. (888) 445 9988. http://www.ibsassociation.org.

J

Japan Society for Oriental Medicine. Kokusai Hamamatsucho Bldg. 6F, 1 9 18 Kaigan, Minato ku, Tokyo 105 0022, Japan. office@jsom.or.jp. http://www.jsom.or.jp/html/en/index.htm

Jin Shin Do Foundation for Bodymind Acupressure. PO Box 416, Idyllwild, CA 92549; (951) 659 5707; (877) 905 2700 http://www.jinshindo.org/

Juvenile Diabetes Research Foundation International. 120 Wall Street, New York, NY 10005 4001; (425) 967 0737; (800) 533 2873 http://www.jdrf.org.

K

KidsHealth/Nemours Foundation. 4600 Touchton Road East, Building 200, Suite 500, Jacksonville, FL 32246. http://www.kidshealth.org

Kneipp Corporation of America. 105 107 Stonehurst Court. Northvale, NJ 07647. (201) 750 0600 or (800) 937 4372. http://www.kniepp.com

Kristin Brooks Hope Center. 615 Seventh St. NE, Washington, DC 20002; (202) 536 3200; (800) 442 4673 http:www//hopeline.com.

Kushi Institute. PO Box 7, Becket, MA 01223; (413) 623 5741; (800) 227 2345 http://www.macrobiotics.org.

L

LaStone Therapy. 2919 E. Broadway Blvd., Suite 224. Tucson, AZ 85716. (520) 319 6414. http://www.lastonetherapy.com

Labyrinth Enterprises. 128 Slocum Avenue, St. Louis, MO 63119. (800) 873 9873 or (314) 968 5557. Fax: (314) 968 5539. http://www.labyrinth enterprises.com

Labyrinth Society (TLS). P. O. Box 144, New Canaan, CT 06840. (877) 446 4520. http://www.labyrinthsociety.org

LaLeche League. 1400 N. Meacham Rd., Schaumburg, IL 60173 4048. (847) 519 7730. http://www.lalecheleague.org

Learning Disabilities Association of America (LDA). 4156 Library Road, Pittsburgh, PA 15234 1349. (412) 341 1515. http://www.ldanatl.org

Leukemia and Lymphoma Society. 600 Third Avenue, New York, NY 10016. (800) 955 4572. http://www.leukemia.org

Lighthouse. 111 East Fifty ninth St., New York, NY 10022. (314) 991 4100. (800) 334 5497. http://www.lighthouse.org.

Linus Pauling Institute. Oregon State University 571 Weniger Hall, Corvalis, OR 97331 6512; (541) 737 5075; (800) 227 2345 http://lpi.oregonstate.edu/.

LungCancer.org: A Program of Cancer Care. 275 Seventh Avenue, New York, NY 10001. (212) 712 8400 ; (800) 813 4673. http://www.lungcancer.org.

Lupus Foundation of America, Inc. 1300 Piccard Dr., Suite 200, Rockville, MD 20850. (800) 558 0121. http://www.lupus.org

Lyme Disease Foundation, Inc. One Financial Plaza, Hartford, CT 06103. (800) 886 LYME. http://www.lyme.org

Lyme Disease Network of NJ. 43 Winton R., East Brunswick, NJ 08816. (404) 639 3311; (800) 886 LYME http://www.lymenet.org

Lymphedema and Wound Care Clinic of Austin. 5750 Balcones Dr., Ste. 110, Austin, TX 78731. (512) 453 1930. http://www.lymphedema.com

Lymphoma Research Foundation of America, Inc. 8800 Venice Boulevard, Suite 207, Los Angeles, CA 90034. (310) 204 7040. http://www.lymphoma.org

M

Macular Degeneration Foundation. P.O. Box 531313, Henderson, NV 89053. 888 633 3937. http://www.eyesight.org

Macular Degeneration Partnership. 8733 Beverly Boule vard, Suite 201, Los Angeles, CA 90048 1844. 888 430 9898. 310 423 6455. http://www.amd.org

March of Dimes Resource Center. 1275 Mamaroneck Ave nue, White Plains, NY 10605. (888) 663 4637. http://www.modimes.org

Mayo Clinic. 200 1st St. S.W., Rochester, Minnesota 55905 (507) 284 2511 http://www.mayoclinic.com

McDougall Wellness Center. P.O. Box 14039. Santa Rosa, CA 95402. (707) 576 1654. http://www.crmc dougall.com

Memorial Sloan Kettering Cancer Center. 1275 York Ave. 68th St., New York, NY 10021. (212) 639 2000. http://www.mskcc.org

Meningitis Foundation of America. 7155 Shadeland Sta tion, Suite 190, Indianapolis, IN 46256 3922. (800) 668 1129. http://www.musa.org/welcome.htm

Mental Health America. 2000 N. Beauregard St., 6th Floor, Alexandria, VA 22311; (703) 684 7722; (800) 969 6642 http://www.nmha.org

Meridian Institute 1853 Old Donation Parkway, Suite 1 Virginia Beach, VA 23454. (757) 496 6009. http://www.meridianinstitute.com

Metabolic Technologies, Inc. 2711 S. Loop Dr., Suite 4400, Ames, Iowa 50010 8656. www.http://hmb.org

Michael J. Fox Foundation for Parkinson's Research. Grand Central Station, PO Box 4777, New York, NY 10163. (800) 708 7644. http://www.michaeljfox.org.

Milne Institute Inc. P.O. Box 2716, Monterey, CA 93942 2716. (831) 649 1825. Fax: (831) 649 1826. http://www.milneinstitute.com

Mind Body Medical Institute. Beth Israel Deaconess Medi cal Center. One Deaconess Road, Boston, MA 02215. (617) 632 9525. http://www.mbmi.org

Mozart Center (Tomatis method). P.O. Box 76, Jenner, CA 95450. (707) 632 6976. http://www.mozartcenter.com

Multiple Sclerosis Association of America (MSAA). 706 Haddonfield Road. Cherry Hill, NJ 08002 2652. (800) LEARN MS(532 7667) Fax: (609) 661 9797. http://www.msaa.com

Multiple Sclerosis Foundation, Inc. (MSF). 6350 North Andrews Avenue. Fort Lauderdale, FL 33309. (800) 441 7055 Fax: (954) 938 8708.

Muscular Dystrophy Association. 3300 East Sunrise Drive, Tucson, AZ 85718. (520) 529 2000 or (800) 572 1717. http://www.mdausa.org.

Mushroom Council. 11875 Dublin Boulevard, Suite D 262, Dublin, CA 94568. (925) 556 5970. http://www.mushroomcouncil.com

Myopia International Research Foundation. 1265 Broad way, Room 608, New York, NY 10001. (212) 684 2777.

N

Narcolepsy Network. 10921 Reed Hartman Highway, Cincinnati, OH, 45242. (513) 891 3522. http://www.websciences.org/narnet/

National Aeronautics and Space Administration, Office of Biological and Physical Research. http://www.spaceresearch.nasa.gov

National Alliance for Research on Schizophrenia and Depression (NARSAD). 60 Cutter Mill Rd., Suite 404, Great Neck, NY, 11021. (703) 684 7722; (800) 829 8289 http://www.narsad.org

National Alliance for the Mentally Ill (NAMI). 200 North Glebe Road, Suite 1015, Arlington, VA 22203 3754. (202) 336 5700; (800) 950 6264. http://www.nami.org

National Alliance on Mental Illness (NAMI). Colonial Place Three, 2107 Wilson Blvd., Suite 300, Arlington, VA 22201 3042; (703) 524 7600; (800) 829 8289 http://www.nami.org

National Anxiety Foundation. 3135 Custer Dr., Lexington, KY 40517. (606) 272 7166. http://www.lexington on line.com/naf.html

National Association for Continence. 2650 East Main Street, Spartanburg, SC 29307. (800) 252 3337. http://www.nafc.org

National Association for Parents of the Visually Impaired, Inc. P.O. Box 317, Watertown, MA 02471. (800) 562 6265. Fax: (617) 972 7444. http://www.spedex.com/napvi

National Association of Anorexia Nervosa and Associated Disorders (ANAD) P.O. Box 7, Highland Park, IL 60035; (847) 831 3438; (800) 374 2721 http://www.anad.org

National Association of Certified Thermographers. 4248 Park Glen Rd., Minneapolis, MN 55407. (866) 417 3949. http://www.mynact.org

National Association of Cognitive Behavioral Therapists. PO Box 2195, Weirton, WV 26062. (800) 853 1135 http://www.nacbt.org/

National Association of Holistic Aromatherapy. 836 Hanley Industrial Court, St. Louis, MO 63144. (888) ASK NAHA. http://www.naha.org

National Association of Jewish Chaplains. 901 Route 10, Whippany, NJ 07981 1156. (973) 736 9193. http://www.najc.org

National Association of the Deaf. 814 Thayer Ave., Silver Spring, MD 20910 4500. (301) 587 1788. http://www.nad.org

National Board for Hypnotherapy and Hypnotic Anaes thesiology. 7841 West Ludlow Drive, Suite A, Peoria, AZ 85381. http://www.nbha medicine.com/index.html

National Cancer Institute (NCI). NCI Public Inquiries Office, Suite 3036 A, 6116 Executive Boulevard, MSC8322, Bethesda, MD, 20892.(800) 4 CANCER or (800) 332 8615 (TTY). http://www.nci.nih.gov

National Center for Environmental Health, Centers for Disease Control and Prevention. 1600 Clifton Rd., Atlanta, GA 30333; (800) 311 3435 http://www.cdc.gov/nceh/

National Center for Homeopathy. 801 N. Fairfax St., Suite 306, Alexandria, VA 22314. (703) 548 7790. http://www.homeopathic.org

National Center for Learning Disabilities (NCLD). 381 Park Avenue South, Suite 1401, New York, NY 10016. (410) 296 0232. http://www.ncld.org

National Center for the Preservation of Medicinal Herbs. 3350 Beech Grove Road, Rutland, Ohio 45775. (740)742 4401.

National Certification Commisision for Acupuncture and Oriental Medicine (NCCAOM) 76 South Laura St., Suite 1290, Jacksonville, FL 32202; (904) 598 1005 http://www.nccaom.org/

National CFIDS Foundation. 103 Aletha Rd. Needham, MA 02192. (781) 449 3535 http://www.ncf net.org

National Cholesterol Education Program. NHLBI Information Center, PO Box 30105. Bethesda, MD 20824 0105 (301) 592 8573 http://www.nhlbi.nih.gov

National Chronic Fatigue Syndrome and Fibromyalgia Association. PO Box 18426. Kansas City, MO 64133 (913) 321 2278 http://www.ncfsfa.org/

National Council of Strength & Fitness. P.O. Box 557486, Miami, FL 33255. (800) 772 6273. http://www.ncsf.org

National Depressive and Manic Depressive Association (NDMDA). 730 N. Franklin St., Suite 501, Chicago, IL 60610. (800) 826 3632. http://www.ndmda.org

National Diabetes Information Clearinghouse. 1 Information Way, Bethesda, MD 20892 3560; (425) 967 0737; (800) 860 8747 http://diabetes.niddk.nih.gov.

National Digestive Diseases Information Clearinghouse (NDDIC). 2 Information Way, Bethesda, MD 20892 3570; (425) 967 0737; (800) 891 5389 http://digestive.niddk.nih.gov

National Eating Disorders Association. 603 Stewart Street, Suite 803, Seattle, WA 98101. (800)931 2237. http://www.nationaleatingdisorders.org

National Eating Disorders Organization (NEDO). 6655 South Yale Ave., Tulsa, OK 74136. (918) 481 4044.

National Emphysema Foundation. 128 East Ave., Norwalk, CT 06851; (203) 866 5000; (800) 548 8252 http://www.emphysemafoundation.org

National Eye Institute. 31 Center Dr., MSC 2510. Bethesda, MD 20892 2510. (301) 496 5248 http://www.nei.nih.gov

National Fibromyalgia Association. 2121 S. Towne Centre Place, Suite 300, Anaheim, CA 92806. (714) 921 0150. http://www.fmaware.org.

National Guild of Hypnotists. PO Box 308, Merrimack, NH. http://www.ngh.net

National Headache Foundation. 820 N. Orleans, Suite 217, Chicago, IL 60610; (888) 653 5552 http://www.headaches.org

National Heartburn Alliance. 303 East Wacker Drive, Suite 440, Chicago, IL 60601. (877) 471 2081.nhbainformation@heartburnalliance.org. http://www.heartburnalliance.org/

National Heart, Lung, and Blood Institute Information Center. PO Box 30105, Bethesda, MD 20824 0105; (301) 592 8573; (800) 242 8721 http://www.nhlbi.nih.gov/

National Hepatitis C Coalition. PO Box 5058, Hemet, CA 92544; (951) 766 8238; (800) 891 0707 http://national hepatitis c.org/

National Information Center for Children and Youth with Disabilities. PO Box 1492, Washington, DC 20013 1492; (800) 695 0285 http://www.nichcy.org/

National Institute for Occupational Safety and Health, US Department of Health and Human Services. 4676 Columbia Parkway (Mail Drop R2), Cincinnati, OH 45226. http://www.cdc.gov/niosh/homepage.html

National Institute of Aging, Alzheimer's Education and Referral Center. PO Box 8250, Silver Spring, MD 20907; (800) 438 4380 http://www.nia.nih.gov/alzheimers

National Institute of Allergy and Infectious Diseases (NIAID). NIAID Office of Communications and Government Relations. 6610 Rockledge Drive, MSC 6612, Bethesda, MD 20892 6612. (866) 284 4107; (888) CDC FACTS (888 232 3228). http://www.niaid.nih.gov

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), National Institutes of Health. 1 AMS Circle, Bethesda, MD 20892 3675; (301) 495 4484; (877) 226 4267 http://www.niams.nih.gov

National Institute of Ayurvedic Medicine (Brewster). 584 Milltown Road, Brewster, NY 10509. (845) 278 8700. http://www.niam.com

National Institute of Ayurvedic Medicine (Manhattan). 375 Fifth Ave., 5th Floor, New York, NY 10016; (212) 685 8600 http://niam.com/

National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health. 1815 Alta Vista Dr.. Bethesda, MD 20892 2190. (301) 496 4261. http://www.nidr.nih.gov.

National Institute of Diabetes and Digestive and Kidney Diseases. Office of Communications and Public Liaison, Building 31, Room 9A06, 31 Center Dr., MSC 2560. Bethesda, MD 20892 2560. (301) 496 3583 http://www.niddk.nih.gov/

National Institute of Mental Health (NIMH) Science Writing, Press, and Dissemination Branch. 6001 Executive Boulevard, Room 8184, MSC 9663, Bethesda, MD 20892 9663. (301) 443 4513. (866) 615 6464. http://www.nimh.nih.gov.

National Institute of Neurological Disorders and Stroke. NIH Neurological Institute. PO Box 5801, Bethesda, MD 20824; (301) 496 5751; (800) 352 9424 http://www.ninds.nih.gov

National Institute on Aging. Building 31, Room 5C27, 31 Center Drive, MSC 2292, Bethesda, MD 20892. (301) 496 1752. http://www.nia.nih.gov

National Institute on Deafness and Other Communication Disorders (NIDCD), National Institutes of Health. 31 Center Drive, MSC 2320. Bethesda, MD 20892 2320. (301) 496 7243. Fax: (301) 402 0018. http://www.nidcd.nih.gov

National Institutes of Health, Office of Research on Women's Health. 6707 Democracy Blvd, Suite 400, Bethesda,

MD 20892 5484. (301)402 1770 Fax: (301)402 1798. http://orwh.od.nih.gov

National Institutes of Health. National Institute of Diabe tes, Digestive, and Kidney Diseases. Building 31, Room 9A06, 31 Center Drive, MSC 2560, Bethesda, MD 20892 2560; (301) 496 3583; (800) 860 8747 http://www2.niddk.nih.gov.

National Institutes of Mental Health (NIMH). Information Resources and Inquires Branch. 5600 Fishers Lane, Rm.7C 02, MSC 8030, Bethesda, MD20892. (301) 443 4513. http://www.nimh.nih.gov

National Kidney Foundation, Inc. 30 East 33rd Street, New York, NY 10016. (800)622 9010. http://www.kidney.org

National Kidney and Urologic Diseases Information Clearinghouse. 3 Information Way, Bethesda, MD 20892 3580; 800 891 5390 http://kidney.niddk.nih.gov/

National Lead Information Center, National Safety Coun cil. 1121 Spring Lake Dr., Itasca, IL 60143 3201; (630) 285 1121; (800) 311 3435 http://www.nsc.org/issues/lead/

National Lymphedema Network. Latham Square, 1611 Telegraph Avenue, Suite 1111, Oakland, CA 94612 2138. (800) 541 3259. http://www.lymphnet.org

National Mental Health Association. 2001 N. Beauregard St., 12th floor, Alexandria, VA 22311. (800) 969 NMHA. http://www.nmha.org

National Multiple Sclerosis Society (NMSS). 733 3rd Ave nue. New York, NY 10017 3288. (800) 344 4867 or (212) 986 3240. http://www.nmss.org.

National Organic Program. USDA AMS TM NOP, ROOM 4008 s. Bldg, Ag Stop 0268, 1400 Independence Avenue, S.W., Room 1180. Washington, DC 20250. (202)720 3252. http://www.ams.usda.gov/nop

National Organization of Rare Disorders. 55 Kenosia Ave nue PO Box 1968 Danbury, CT 06813 1968. (800) 999 6673. orphan@rarediseases.org. http://www.rare diseases.org

National Oriental Medicine Accreditation Agency (NOMAA). 3445 Pacific Coast Highway, Suite 300, Torrance, CA 90505. (213) 820 2045. http://www.nomaaa.org

National Osteoporosis Foundation. 1232 22nd Street N.W., Washington, DC 20037 1292. (202) 223 2226. http://www.nof.org

National Pancreas Foundation. 363 Boylston St., 4th Floor, Boston, MA 02116. (866) 726 2737; (800) 891 5390. http://www.pancreasfoundation.org.

National Parkinson Foundation. 1501 NW Ninth Avenue, Miami, FL 33136. (800) 327 4545. http://www.parkinson.org

National Pediculosis Association (NPA), Inc. 50 Kearney Road, Needham, MA 02494. (781) 449 NITS. npa@headlice.org. http://www.headlice.org

National Pressure Ulcer Advisory Panel, SUNY at Buffalo, Beck Hall, 3435 Main Street, Buffalo, NY 14214. http://www.npuap.org

National Psoriasis Foundation. 6600 SW Ninty second Ave., Suite 300, Portland, OR 97223 7195. (800)723 9166. http://www.psoriasis.org.

National Reye's Syndrome Foundation. P.O. Box 829, Bryan, OH 43506. (800) 233 7393. http://www.reyessyndrome.org

National Rosacea Society. 800 S. Northwest Highway, Suite 200, Barrington, IL 60010. (888) 662 5874. http://www.rosacea.org

National Scoliosis Foundation. 5 Cabot Place Stoughton, MA 02072. (800) 673 6922. NSF@scoliosis.org. http://www.scoliosis.org

National Sleep Foundation. 1522 K St. NW, Suite 500, Washington, DC 20005. (202) 347 3471. http://www.sleepfoundation.org.

National Stroke Association. 9707 E. Easter Lane, Cen tennial, CO 80112. (800)STROKES. http://www.stroke.org

National Toxicology Program (NTP) Liaison and Scientific Review Office. P. O. Box 12233, MD A3 01, Research Triangle Park, NC 27709. (919) 541 0530. http://ntpserver.niehs.nih.gov.

National Vaginitis Association. 117 South Cook Street, Suite 315, Barrington, IL 60010. (800) 909 8745. VagAssoc@aol.com. http://www.vaginal infection.com

National Women's Health Information Center. 8550 Arlington Blvd., Suite 300, Fairfax, VA 22031. (800) 994 9662. http://www.4woman.gov

National Women's Health Network. 514 10th Street NW, Suite 400, Washington, DC 20004. (202) 628 7814. http://www.nwhn.org.

Natural Woman Foundation. 8539 Sunset Blvd, No. 135, Los Angeles, CA 90069. (888) 489 6626. Chriscoprd @aol.com. http://www.naturalwoman.org

Naturopathic Physicians Licensing Examination Board (NPLEX). P. O. Box 69657, Portland, OR 97201. (503) 250 9141. http://www.nabne.org/html/index2.html

Nelson Bach USA, Ltd. 100 Research Drive, Wilmington, MA 01887. (800) 319 9151 or (978) 988 3833. Fax: (978) 988 0233. http://www.nelsonbach.com/usa.html

New York Botanical Garden. Bronx River Parkway at Fordham Road, Bronx, NY 10458. (718) 817 8700. http://www.nybg.org

New York Ginseng Association. P.O. Box 127, Roxbury, NY 12474. (607) 326 3005.

North American Association for the Study of Obesity. 8630 Fenton St., Suite 412, Silver Spring, MD, 20910. (301) 563 6526. http://www.naaso.org.

North American Menopause Society. P.O. Box 94527, Cleveland, OH 44101. (440) 442 7550. info@menopause.org. http://www.menopause.org

North American Riding for the Handicapped Association (NARHA). P. O. Box 33150, Denver, CO 80233. (303) 452 1212 or (800) 369 RIDE. http://www.narha.org

North American Vegetarian Society. PO Box 72, Dolgeville, NY 13329. (518) 568 7970. http://www.navs online.org/.

Novato Institute for Research & Training. 1516 W. Grant Avenue, Suite 212, Novato, California 94945. 415 897 0336. http://www.somatics.com/

Nurse Healers Professional Associates International (NH PAI), the Official Organization of Therapeutic Touch. 3760 S. Highland Drive, Salt Lake City, UT 84106. (801) 273 3399. nhpai@therapeutic touch.org. http://www.therapeutic touch.org.

O

Occupational Safety & Health Administration 200 Consti tution Avenue, N.W., Washington, D.C. 20210 http://www.osha.gov/

Office of Dietary Supplements (ODS), National Institutes of Health. 6100 Executive Boulevard, Room 3B01, MSC 7517, Bethesda, MD 20892. (301) 435 2920. http://www.ods.od.nih.gov

Office of Women's Health. U.S. Department of Health and Human Services. 200 Independence Ave. SW, Room 712E, Washington, DC 20201; (416) 638 4622; (800) 994 9662 http://www.womenshealth.gov.

Office of the Special Assistant for Gulf War Illnesses. Four Skyline Place, 51113 Leesburg Pike, Suite 901, Falls Church, VA 22041; (800) 497 6261. www.gulflink.osd.milc

Ohsawa Macrobiotics P.O. Box 3998, Chico, CA 95927 3998, (530) 566 9765, (800) 232 2372, (866) 464 3616 http://www.gomf.macrobiotic.net/Info.htm

Optometric Extension Program. 2912 South Daimler St., Santa Ana, CA 92705.

Optometric Glaucoma Society. 5553 Taft Ave., Oakland, CA 94618. (925) 557 4181 http://www.optometric glaucomasociety.org

Organic Trade Association. PO Box 547, Greenfield, MA 01302. (413) 774 7511; (413) 774 6432 http://www.ota.com

Osteoporosis Canada. 1090 Don Mills Rd., Suite 301, Toronto, DC M3C 3R6; (800) 463 6842 http://www.osteoporosis.ca.

Overeaters Anonymous. World Service Office, P.O. Box 44020, Rio Rancho, NM, 87174 4020. (505) 891 2664. http://www.oa.org

P

Parkinson Alliance. PO Box 308, Kingston, NJ 08528 0308. (800) 579 8440. http://www.parkinsonalliance.net.

Parkinson's Action Network. 1000 Vermont Ave. NW, Washington, DC 20005. (202) 842 4101; (800) 850 4725 http://parkinsonsaction.org.

Parkinson's Disease Foundation. 710 West 168th Street, New York, NY 10032 9982. (212) 923 4778; (800) 457 6676 http://www.parkinsons foundation.org.

Patience T'ai Chi Association. 2620 East 18th Street, Brooklyn, NY 11235. (718) 332 3477. http://www.patiencetaichi.com

People Against Cancer. 604 East Street, P.O. Box 10, Otho, IA 50569. (515) 972 4444. http://www.peopleagainst cancer.net/

PhysicalMind Institute. 1807 Second Street, Suite 15/16, Santa Fe, New Mexico 87505. (505) 988 1990 or (800) 505 1990. Fax: (505) 988 2837. themethod@trail.com. http://www.the method.com

Physicians Committee for Responsible Medicine. 5100 Wis consin Ave. NW, Suite 400, Washington, DC 20016; (202) 686 2210; (800) 6 ATKINS http://www.atkins dietalert.org

Phytopharm Plc. Corpus Christi House, 9 West St.,. God manchester, PE29 2HY, 44 (0) 1480 437697. http://www.phytopharm.co.uk/contacts/headoffice/.

Pilates Studio. 2121 Broadway, Suite 201, New York, New York, 10023 1786. (800)474 5283 or (888) 474 5283 or (212)875 0189. Fax: (212) 769 2368. http://www.pilates studio.com

Pittsburgh School of Pain Management. 1312 E. Carson Street, Pittsburgh, PA 15203. (412) 481 2553. http://www.painschool.com

Polycystic Ovarian Syndrome Association. P. O. Box 80517, Portland, OR 97280. (877) 775 PCOS. http://www.pcosupport.org

Postpartum Support International. PO Box 60931, Santa Barbara, CA 93160; (805) 967 7636; (800) 944 4773 http://www.postpartum.net.

Prevent Blindness America (Diabetes and Eyesight). 500 East Remington Rd., Schaumburg, IL 60173. (800) 331 2020. http://www.diabetes sight.org

Pritikin Longevity Center 19735 Turnberry Way , Aventura, FL 33180, (305) 935 7131, (800) 327 4914, (305) 935 7371 http://www.pritikin.com

Q

Qigong Human Life Research Foundation. PO Box 5327. Cleveland, OH 44101. (216) 475 4712.

Quit Smoking, Center for Disease Control and Prevention. 1600 Clifton Road NE, Atlanta, GA, 30333. (404) 498 1515; (800)311 3435 http://www.cdc.gov/tobacco/quit_smoking/

R

Radionics Association. Baerlein House, Goose Green, Deddington, Oxon. OX15 0SZ, United Kingdom. (01869) 338852. http://www.interlog.com/~radionic/#institute.

RESOLVE. 8405 Greensboro Drive, Suite 800, McLean, VA 22102 5120. (703) 556 7172. (866) 455 7999 http://www. resolve.org.

Radionics Institute. 411 (W) 75 Eastdale, Toronto, Canada, M4C 5N3. http://www.mystical www.co.uk/dowsing.html

Reflexology Association of America. 4012 Rainbow St. KPMB#585. . Las Vegas, NV 89103 2059. (401) 578 6661. http://www.reflexology usa.org/.

Restless Legs Syndrome Foundation. 1610 Fourteenth St NW, Suite 300. Rochester, MN 55901. (877) INFO RLS. http://www.rls.org.

Rocky Mountain Herbal Institute. P. O. Box 579, Hot Springs, MT 59845. (406) 741 3811. http://www.rmhiherbal.org

Rocky Mountain Institute of Yoga and Ayurveda. P.O. Box 1091, Boulder, CO 80306. (303) 499 2910. http://www.rmiya.org/index.php/

Rolf Institute of Structural Integration. 209 Canyon Blvd. P.O. Box 1868. Boulder, CO 80306 1868. (303) 449 5903. (800) 530 8875. http://www.rolf.org/

S

Scoliosis Association. PO Box 811705 Boca Raton, FL 33481 1705. (407) 368 8518. normlipin@aol.com. http://www.scoliosis assoc.org

Scoliosis Research Society. 611 East Wells Street Milwaukee, WI 53202. (414) 289 9107. Tjackson@execinc.com. http://www.srs.org

Self Help for Hard of Hearing People, Inc. 7910 Woodmont Avenue, Suite 1200, Bethesda, MD 20814. (301) 657 2248. http://www.shhh.org

Sensory Integration International/The Ayres Clinic, 1514 Cabrillo Avenue, Torrance, CA 90501 2817. http://www.sensoryint.com

Seventh Day Adventist Dietetic Association (SDADA). (SDADA is an official affiliate of the ADA.) 9355 Telfer Run, Orlando, FL 32817. (856) 694 2887. (800) 877 1600. http://www.sdada.org.

Shintaido of America. PO Box 1979, Novato, CA 94948 1979. http://www.shintaido.org.

Smokefree.gov, in affliliation with the National Cancer Institute, CDC, National Institutes of Health, Depart ment of Health and Human Services, and USA.gov. 1600 Clifton Road NE, Atlanta, GA, 30333. (404) 498 1515; TTY 1 800 332 8615 http://www.smokefree.gov/

Society for Clinical and Experimental Hypnosis. 6728 Old McLean Village Drive, McLean, VA 22101.

Society for Light Treatment and Biological Rhythms. 824 Howard Ave., New Haven, CT 06519. Fax (203) 764 4324. http://www.sltbr.org

Society for Ortho Bionomy International. 5875 North Lincoln Avenue, Suite 225. Chicago, IL 60659. (800) 743 4890. http://www.ortho bionomy.org

Society of Cosmetic Chemists (SCC). 120 Wall Street, Suite 2400, New York, NY 10005 4088. (212) 668 1500. Fax: (202) 668 1504. http://www.scconline.org

Sound Healers Association. PO Box 2240, Boulder, CO ; (800) 246 9764 http://www.soundhealers association.org

Southwest School of Botanical Medicine. P. O. Box 4565, Bisbee, AZ 85603. (520) 432 5855. http://www.sws bm.com

Soyfoods Association of North America. 1050 Seventeenth St. NW, Suite 600, Washington, DC 20036. (292) 659 3520. (800) 877 1600. http://www.soyfoods.org.

Spondylitis Association of America. PO Box 5872, Sherman Oaks, CA 91413; (301) 496 8190; (800) 777 8189 http://www.spondylitis.org/

Stanford Center for Narcolepsy. Stanford University School of Medicine, 701 B Welch Rd., Room 146, Palo Alto, CA 94304. (650) 725 6517. http://www med.stanford.edu/school/Psychiatry/narcolepsy.

StoneCircle Services. E mail: info@stonecircledesign.com. http://www.stonecircledesign.com

Stress and Anxiety Research Society (STAR). STAR is an international multidisciplinary organization of researchers that began in the Netherlands in 1980. http://www.star society.org.

Substance Abuse & Mental Health Services Administration. 1 Choke Cherry Road. Rockville, MD 20857 (212) 870 3400 http://www.samhsa.gov/

Supreme Master Ching Hai International Association. P. O. Box 730247, San Jose, CA 95173 0247. http://www.godsdirectcontact.org

T

Texas Heart Institute Heart Information Service. P.O. Box 20345, Houston, TX 77225 0345. 1 800 292 2221. http://www.tmc.edu/thi/his.html

Third Age, Inc. 25 Stillman St., Suite 102. San Francisco, CA 94107 1309. (212) 639 2000. www.thirdage.com.

Thyroid Foundation of America. One Longfellow Place, Suite 1518, Boston, MA 02114; (301) 941 0200; (800) 832 8321 http://www.tsh.org/

TMJ Association. PO Box 26770. Milwaukee, WI 53226 0770. (262) 432 0350. http://www.tmj.org.

Touch for Health Kinesiology Association. PO Box 392, New Carlisle, OH 45344 0392. (937) 845 3404. (800) 466 8342 http://www.tfhka.org.

Tourette Syndrome Association, Inc. 42 40 Bell Boulevard, Bayside, NY 11361 2820. (718) 224 2999. Fax: (718) 279 9596. ts@tsa usa.org. http://www.tsa usa.org

Trager Institute. 21 Locust Avenue. Mill Valley, CA 94941 2806. (415) 388 2688. Fax: (415) 399 2710. admin@trager.com. http://www.trager.com

TTEAM/Ttouch in Canada. Rochdell Road, Vernon, BC V1B 3E8. (250) 545 2336. http://www.tellingtontouch.com

U

U.S. Food and Drug Administration (FDA). 5600 Fishers Lane, Rockville, MD 20857 0001. (888) INFO FDA. http://www.fda.gov

U.S. Food and Drug Administration Office of In Vitro Diagnostic Device Evaluation and Safety. HFZ 440 2098 Gaither Road, Rockville, MD 20850. (301) 594 3084. http://www.fda.gov/cdrh/oivd

U.S. Fund for UNICEF. 125 Maiden Lane, New York, NY 10038; +1 (613) 782 6812; (800) 4UN ICEF http://www.unicefusa.org/

United Cerebral Palsy Association. 1660 L St. NW, Suite 700, Washington, DC 20036 5602; (800) USA 5 UCP http://www.ucpa.org

United Network for Organ Sharing. PO Box 2484, Richmond, VA 23218; (888) 894 6361 http://www.unos.org

United Plant Savers. P.O. Box 98, East Barre, VT 05649. (802) 496 7053. Fax: (802) 496 9988. http://www.plantsavers.org

United States Administration on Aging. 330 Independence Ave. SW. Washington, DC 20201. (202) 619 0724. http://www.aoa.gov.

United States Department of Agriculture (USDA), Agri cultural Research Service (ARS). 5601 Sunnyside Avenue, Beltsville, MD 20705. (301) 504 1651. http://www.ars.usda.gov

United States Department of Agriculture, Food and Nutri tion Information Center. 10301 Baltimore Ave., Department of Agriculture. Beltsville, MD 20705 2351. (301) 504 5719. http://www.nal. usda.gov/fnic/.

United States Department of Agriculture, Research Service. Jamie L. Whitten Building. 1400 Independence Ave. SW. Washington, DC 20250. (202) 234 2352. http://www.ars.usda.gov.

United States Department of Agriculture. Center for Nutrition Policy and Promotion. 1120 20th Street NW, Suite 200, North Lobby, Washington, D.C. 20036. (202) 418 2312. http://www.usda.gov/cnpp

United States Department of Agriculture. Washington, DC 20250. http://www.usda.gov

United States Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition. 5100 Paint Branch Parkway, College Park, MD 20740. (888) SAFEFOOD. http://www.cfsan.fda.gov

United States Pharmacopoeia (USP). 12601 Twinbrook Parkway, Rockville, MD 20852. (800) 822 8772. http://www.usp.org

University of Maryland Health Center. Health Library. . College Park, MD 20742. (301) 314 8180. http://www.umm.edu.

Upledger Institute. 11211 Prosperity Farms Road, Palm Beach Gardens, FL 33410. (800) 233 5880. Fax: (561) 622 4771. http://www.upledger.com

V

Valley Cedar Leaf Oil. RR #5, Eganville, Ontario, Canada K0J 1T0. (613) 628 2892. http://www.valleycedarleafoil. com

Vegan Outreach. 211 Indian Drive, Pittsburgh, PA 15238. (412) 968 0268. (800) 877 1600. http://www.veganou treach.org/.

Vegan Society U.K. Donald Watson House, 21 Hylton St.. Hockley, Puerto Rico B18 6HJ, (0121) 523 1730. http://www.vegansociety.com.

Vegetarian Nutrition Dietetic Practice Group, American Dietetic Association. 120 S. Riverside Plaza, Suite 2000, Chicago, IL 60606 6995. (518) 568 7970. (800) 877 1600. http://www.vegetariannutrition.net/.

Vegetarian Resources Group. PO Box 1463, Baltimore, MD 21203. (410) 366 8343. (800) 877 1600. http://www.vrg.org.

Vestibular Disorders Association (VEDA). PO Box 4467, Portland, OR 97208 4467. (800) 837 8428. http://www.vestibular.org

Veterinary Botanical Medicine Association (VBMA). c/o Susan G. Wynn, DVM, 334 Knollwood Lane, Wood stock, GA 30188. (303) 449 2265. (888) 644 6226. http://www.vbma.org.

Vitamin C Foundation. P. O. Box 73172, Houston, TX 77273; (281) 443 3634; (888) 443 3634 www.vitaminc foundation.org/found.htm

W

Women in Balance. P.O. Box 5517 , Washington, DC 20016. http://www.womeninbalance.

Women to Women. P.O. Box 306, Portland, ME 04112. (800)798 7902. http://www.womentowomen.com.

Women's Cancer Resource Center. 5741 Telegraph Ave., Oakland, CA 94609; (416) 961 7223; (888) 421 7900 http://www.wcrc.org.

World Headache Alliance. 41 Wellbeck St., London, IL W1G 8EA; (856) 423 0043; (888) 653 5552 http://www.w h a.org

World Health Organization (WHO). Avenue Appia 20, 1211, Geneva, NY 27; +41 22 791 2111; (800) 4UN ICEF http://www.who.int/en/

World Hypnosis Organization, Inc. 2521 W. Montrose Avenue, Chicago, IL 60618. http://www.worldhypnosis.org/about.html

Y

Yoga Alliance. 122 West Lancaster Avenue, Suite 204,. Reading, PA 19607 1874. (610) 777 7793. Fax:(610) 777 0556 http://www.yogaalliance.org

Yoga Research and Education Center (YREC). 2400A County Center Drive, Santa Rosa, CA 95403. (707) 566 0000. http://www.yrec.org.

GLOSSARY

A

A1C. A test that measures a diabetic's average blood sugar (glucose) levels over two to three months.

AIDS DEMENTIA COMPLEX. A type of brain dysfunction caused by HIV infection that causes difficulty thinking, confusion, and loss of muscular coordination.

ABLATION. The removal of abnormal tissue growths by surgery.

ABORTIFACIENT. A drug or preparation given to induce abortion.

ABRASION. Also called a scrape. The rubbing away of the skin surface by friction against another rough surface.

ABSCESS. A localized collection of pus in the skin or other body tissue caused by infection.

ABSORPTION SPECTROMETRY. A scientific procedure to determine the chemical composition of an unknown substance.

ABSTINENCE. Choosing not to engage in a certain action, such as sex.

ACANTHOSIS NIGRICANS. A localized darkening of the skin that is associated with insulin resistance. This is not seen in all cases, and is considered a rare disorder.

ACCOMMODATION. The ability of the lens to change its focus from distant to near objects and vice versa. It is achieved through the action of the ciliary muscles that change the shape of the lens.

ACETALDEHYDE. An intermediate product in the breakdown pathway of ethanol; believed to cause hangover.

ACETYLCHOLINESTERASE. An enzyme that interferes with the function of acetylcholine.

ACETYLCHOLINE. A major neurotransmitter that balances the effects of dopamine in the brain and transmits nerve impulses.

ACHENE. Any small, dry, hard one-seeded case or fruit that does not split open at maturity to discharge the seed. Dandelion seeds are held inside achenes.

ACONITINE. A toxic alkaloid contained in aconite. As little as 2 mg taken internally may be fatal.

ACOUSTIC NEUROMA. A benign tumor that grows on the nerve leading from the inner ear to the brain. As the tumor grows, it exerts pressure on the inner ear and causes severe vertigo.

ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS). A disease in which the immune response is impaired. The disease is caused by the human immunodeficiency virus (HIV), which is spread by direct contact with body fluids such as blood and semen.

ACRODERMATITIS ENTEROPATHICA. A Hereditary metabolic problem characterized by dermatitis, diarrhea, and poor immune status.

ACTIN. A protein that functions in muscular contraction by combining with myosin.

ACUPOINT. A pressure point stimulated in acupressure.

ACUPRESSURE. An ancient form of Asian healing massage that involves applying pressure (without needles) to special points or areas on the body in order to maintain good health, cure disease, and restore vitality.

ACUPUNCTURE. An ancient Chinese method of relieving pain or treating illness by piercing specific areas of the body with fine needles.

ACUTE PRESCRIBING. Homeopathic treatment for self-limiting illnesses with abrupt onset.

ACUTE RETROVIRAL SYNDROME. A group of symptoms resembling mononucleosis that often are the first sign of HIV infection.

ACUTE. Refers to a disease or symptom that has a sudden onset and lasts a relatively short period of time.

ACYCLOVIR. An antiviral drug that is available under the trade name Zovirax, in oral, intravenous, and topical forms. The drug prevents the varicella zoster virus from replicating.

ADAMS TEST. A screening test in which a child being examined for scoliosis is asked to bend forward with the feet together and the knees straight.

ADAPTOGEN. A substance (plant or drug) with biologically active components that increase the adaptive ability of an organism stressed by internal and external factors; helps to counter and prevent damage from adverse physical, chemical, or biological stressors.

ADDICTION. The state of being both physically and psychologically dependent on a substance.

ADENOCARCINOMA. A cancerous tumor derived from epithelial (surface) cells or a gland-like tumor.

ADENOID. A collection of lymph tissue located in the nasopharynx.

ADENOVIRUS. A virus that affects the upper respiratory tract.

ADHESION. The joining or sticking together of parts of an organ that are not normally joined together.

ADHESIVE CAPSULITIS. Adhesions and inflammation in the shoulder capsule that restrict movement.

ADIPOSE. Fat tissue, which can act as an endocrine organ by converting androgens to estrogen via the enzyme aromatase.

ADJUNCTIVE. Refers to a form of treatment that is not strictly necessary to a therapy regimen but is helpful.

ADJUSTMENT DISORDER. A psychiatric disorder marked by inappropriate or inadequate responses to a change in life circumstances.

ADJUSTMENT. A specific type of manipulation of the spine designed to return it to proper structural and functional form.

ADJUVANT THERAPY. Treatment involving radiation, chemotherapy (drug treatment), hormone therapy, biotherapeutics, or a combination of any of these given after the primary treatment in order to rid the body of residual microscopic cancer.

ADJUVANT. A substance or medication used together with a vaccine or other drug to assist the effect of the main ingredient.

ADRENAL GLANDS. A pair of endocrine organs, the adrenal glands sit above both kidneys. The adrenal cortex produces several hormones including cortisol, DHEA, estrogen and progesterone, and aldosterone.

ADRENAL HORMONE. The adrenocortical hormones are cortisol and cortisone. They are anti-inflammatory substances that aid in the function of a number of body systems, including the central nervous system, the cardiovascular system, the musculoskeletal system, and the gastro intestinal system.

ADRENALINE. Also known as the "emergency hormone," adrenaline is produced by the body during times of stress. Excess adrenaline levels can increase blood pressure and heart rate, leading to heart disease.

ADSORPTION. A process in which an extremely thin layer of one substance (liquid, gas, or solid) forms on the surface of another substance.

ADULTERANT. A substance that makes something impure or inferior.

AEROBIC. Any cardiovascular exercise that increases heart rate and breathing, such as jogging, bicycling, and swimming.

AESCINATE. A chemical found in horse chestnut that is effective in relieving the tissue swelling associated with varicose veins.

AFFECTIVE DISORDER. An emotional disorder involving abnormal highs and/or lows in mood. Now termed mood disorder.

AFFECT. The expression of emotion displayed to others through facial expressions, hand gestures, tone of voice. Types of affect include: flat (inanimate, no expression), blunted (minimally responsive), and inappropriate.

AFFERENT. Sensory signals that travel from the sensory cells at the periphery of the body back to the brain and spinal cord.

AGE-RELATED MACULAR DEGENERATION (ARMD). A chronic, painless eye disease occurring in people over age 50 that damages the macula, or central part of the retina, causing irreversible loss of central vision.

AGGRAVATION. In homeopathy, a temporary worsening or intensification of the patient's symptoms prior to improvement and healing.

AGNI. Ayurvedic term for strength of digestion.

AGNUSIDE. The active ingredient in chasteberry.

AGONIST. A medication that has an affinity for and stimulates the activity of cell receptors that are normally stimulated by naturally occurring substances, such as melatonin.

AGORAPHOBIA. Abnormal anxiety regarding public places or situations from which the person may wish to flee or in which he or she would be helpless in the event of a panic attack.

AGRANULOCYTOSIS. A blood disorder characterized by a reduction in the number of circulating white blood cells (granulocytes). White blood cells defend the body against infections. Agranulocytosis is a potential side effect of some newer antipsychotic medications.

AIKIDO. A Japanese martial art developed during the early twentieth century by Morihei Ueshiba. Literally translated, aikido means "the way of harmony with universal energy" or "the way of a loving spirit."

AKATHISIA. Agitated or restless movement, usually affecting the legs and accompanied by a sense of discomfort; a common side effect of neuroleptic medications.

AKA. In Huna, the shadow body of the low self. The aka forms threads or cords between the low self and other persons, objects, or the High Self. These aka threads serve as energy channels.

AKINESIA. Inability to move.

ALBUMINURIA. The presence of high levels of the protein albumin in the urine.

ALDOSTERONE. A hormone produced by the adrenal gland, instrumental in the regulation of sodium and potassium resorption by the kidney.

ALENDRONATE. A non-hormonal drug used to treat osteoporosis in postmenopausal women.

ALEXANDER TECHNIQUE. A movement therapy that identifies and changes poor physical habits that may cause fatigue. The body is put into a state of relaxation and balance through the use of simple movements.

ALGAE. A mainly waterborne organism that produces energy from light and chlorophyll.

ALKALOID. Any of a large class of bitter-tasting alkaline ring compounds that contain nitrogen and are common in plants. Periwinkle, nicotine, caffeine, morphine, and quinine belong to this class of compounds, and are generally toxic.

ALLERGEN. A foreign substance, such as mites in house dust or animal dander that, when inhaled, causes the airways to narrow and produces symptoms of asthma.

ALLERGIC REACTION. An inappropriate or exaggerated genetically determined reaction to a chemical that occurs only on the second or subsequent exposures to the offending agent, after the first contact has sensitized the body.

ALLERGIC RHINITIS. Inflammation of the mucous membranes of the nose and eyes in response to an allergen.

ALLOPATHIC. Conventional medical treatment of disease symptoms that uses substances or techniques to oppose or suppress the symptoms.

ALLOPATHY. A method of treating disease by using substances that are opposite to the symptoms presented by a patient.

ALLOPURINOL. A drug that corrects hyperuricemia by inhibiting urate production.

ALOE CONCENTRATE. Aloe gel from which the water has been removed.

ALOE GEL. Thick, undiluted substance from the central portion of the aloe leaf.

ALOE JUICE. A product for oral use, which is composed of at least 50% aloe gel.

ALOE LATEX. Bitter yellow sap from the middle leaf layer.

ALPHA-2 AGONIST. A class of drugs that bind to and stimulate alpha-2 adrenergic receptors, causing responses similar to those of adrenaline and noradrenaline, by inhibiting aqueous humor production.

ALPHA-FETOPROTEIN. A substance produced by a fetus's liver that can be found in the amniotic fluid and in the mother's blood. Abnormally high levels of this substance suggest there may be defects in the fetal neural tube.

ALPHA-TOCOPHEROL. An antioxidant derivative of vitamin E that stabilizes cell membranes.

ALTERATIVE. A substance that cleanses and purifies the blood.

ALTERNATIVE MEDICINE. A system of healing that rejects conventional, pharmaceutical-based medicine and accepts the use of dietary supplements and therapies such as herbs, vitamins, minerals, massage, and cleansing diets.

ALVEOLI. Small, thin-walled sacs located at the end of the smallest airways in the lungs where the exchange of oxygen and carbon dioxide takes place.

ALZHEIMER'S DISEASE. A degenerative brain disease caused by physiological changes inside the brain. As a result, the patient experiences impaired memory and thought processes.

AMARGOGENTIN. An extremely bitter substance found in gentian that makes it an effective digestive stimulant.

AMBIENT. Of the surrounding area or environment.

AMEBIASIS. An infection or disease caused by amoebas.

AMENORRHEA. The absence of menses in women of childbearing age in the absence of pregnancy.

AMINO ACID DECARBOXYLATE (AADC) INHIBITORS. Drugs, such as carbidopa and benserazide, that block the enzyme AADC, which breaks down levodopa in the blood.

AMINO ACIDS. A group of organic compounds that are vital to living cells, and serve as the building blocks of protein.

AMPHETAMINES. A group of drugs that stimulate the central nervous system. They are used medically to counteract depression, but are often used illegally as stimulants.

AMPULLA OF VATER. The widened portion of the duct through which the bile and pancreatic juices enter the intestine. *Ampulla* is a Latin word describing a bottle with a narrow neck that opens into a wide body.

AMPUTATION. The surgical removal of a part of the body.

AMSLER GRID. A checkerboard pattern with a dot in the center that is used to diagnose macular degeneration.

AMYLOID PLAQUES. Protein fragments produced normally in the body that accumulate and form hard, insoluble plaques between the nerve cells in the brain and interfere with neural activity.

AN MO. A form of Chinese massage that treats the whole body and emphasizes balancing yin and yang techniques in the treatment. Its name means "press and stroke" in Chinese.

ANABOLIC STEROIDS. A group of mostly synthetic hormones sometimes taken by athletes to temporarily increase muscle size.

ANAEROBE. A type of bacterium that does not require oxygen to live. The tetanus bacterium is an anaerobe.

ANALGESIC. A medication or preparation given for pain relief.

ANAPHRODISIAC. A substance or medication that suppresses sexual desire.

ANAPHYLACTIC SHOCK. A severe allergic reaction that causes blood pressure drop, racing heart, swelling of the airway, rash, and possibly convulsions.

ANAPHYLAXIS. A possibly life-threatening allergic reaction causing increased sensitivity to an allergen. It can result in a sharp drop in blood pressure and difficulty breathing.

ANDROGENS. Male sex hormones that are predominant in males, and linked with the development of acne.

ANDROPAUSE. Midlife hormonal changes in men.

ANECDOTAL EVIDENCE. A category of medical or dietary evidence based on or consisting of individual reports, usually written by observers who are not doctors or scientists.

ANEMIA. Condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume. Common symptoms include paleness, fatigue, and shortness of breath.

ANESTHESIA. Method of controlling pain during surgery.

ANESTHETICS. Drugs that cause a loss of feeling, especially of pain. Some anesthetics also cause a loss of consciousness.

ANEURYSM. A sac or weak spot formed by the stretching of the wall of an artery.

ANGINA. Chest pain that happens when diseased blood vessels restrict the flow of blood to the heart. Angina is often the first symptom of coronary artery disease.

ANGIOEDEMA. Severe non-inflammatory swelling of the skin, organs, and brain that can also be accompanied by fever and muscle pain.

ANGIOGENESIS. The development of new blood vessels, specifically those that supply tumors with blood and nutrients for growth.

ANGIOGRAPHY. X-ray imaging of the arteries in a particular part of the body. Angiography is often performed in order to determine the location of internal bleeding.

ANGIOPLASTY. Surgery to dilate the narrowed or blocked part of a blood vessel.

ANHEDONIA. Loss of the capacity to experience pleasure. One of the so-called negative symptoms of schizophrenia, anhedonia is also a symptom of major depression.

ANISOMETROPIA. An eye condition in which the eyes have unequal refractive power.

ANKYLOSING SPONDYLITIS. A type of arthritis that causes gradual loss of flexibility in the spinal column. It occurs most commonly in males between the ages of 16 and 35 and may be initiated by a food allergy component, such as an allergy to wheat.

ANKYLOSING. A process by which joint bones fuse, stiffen, and/or become rigid.

ANNUAL. A plant that completes its life cycle of growing leaves, blooming, and producing seeds in a single year or growing season.

ANNULUS FIBROSIS. The outer portion of the intervertebral disk made primarily of fibrocartilage rings.

ANODYNE. A medicinal herb that relieves distress or soothes pain.

ANORECTIC. A drug that reduces the appetite.

ANOREXIA NERVOSA. A serious, sometimes fatal eating disorder characterized by intense fear of being fat and severe weight loss. It primarily affects teenage and young adult females. Sufferers see themselves as fat even when they are not.

ANOSOGNOSIA. Lack of awareness of the nature of one's illness. The term is usually applied to stroke patients, but is sometimes used to refer to lack of insight on the part of patients with schizophrenia. Anosognosia appears to be caused by the illness itself.

ANOVULATION. The absence of ovulation in the menstrual cycle.

ANTACID. Common medication that neutralizes stomach acid for the short-term treatment of heartburn.

ANTHELMINTHIC. A medication that destroys or expels parasitic worms from the digestive tract.

ANTHOCYANOSIDES. Flavonoid antioxidants from plant pigments that are particularly active in the eye.

ANTHRAQUINONES. A group of plant substances known to produce an irritant laxative effect.

ANTHRAX. A highly toxic strain of bacteria.

ANTHROPOLOGY. The study of the origin and physical, social, and cultural development and behavior of groups of people.

ANTHROPOSOPHICAL MEDICINE. A form of alternative medicine dating back to the 1920s. The focus is on ensuring that individuals possess within themselves an environment conducive to health.

ANTI-ANDROGEN DRUGS. Drugs that block the activity of the male hormone.

ANTI-FUNGAL. A medication prescribed to treat infections caused by fungi.

ANTI-INFLAMMATORY. A medication or substance that reduces the symptoms of fever and inflammation.

ANTI-MOTILITY MEDICATIONS. Medications such as loperamide (Imodium), diphenoxylate (Lomotil), or medications containing codeine or narcotics that decrease the ability of the intestine to contract. These can worsen the condition of a patient with dysentery or colitis.

ANTIANDROGEN. A substance that blocks the action of androgens, the hormones responsible for male characteristics.

ANTIBIOTIC. An agent able to kill or interfere with the development of bacteria and other micro-organisms.

ANTIBODY. Any of numerous protein molecules produced by the immune system as a primary immune defense to destroy or neutralize foreign objects. Each antibody recognizes a specific target, referred to as the antigen.

ANTICHOLINERGIC. A medication or other substance that blocks certain parasympathetic nerve impulses.

ANTICOAGULANT. Any substance that reduces or prevents the blood's tendency to clot in order to prevent blockages in the arteries.

ANTICONVULSANT MEDICATION. A drug used to prevent convulsions or seizures; often prescribed in the treatment of epilepsy.

ANTIDEPRESSANT. A type of medication that is used to treat depression; sometimes used to treat other disorders, such as autism.

ANTIDIURETIC. A substance that diminishes the formation of urine.

ANTIDOTE. Any substance that slows or stops the effects of a homeopathic remedy. Coffee and camphor are considered to be particularly powerful antidotes. Also a remedy to counteract a poison.

ANTIEMETIC. Prevents or alleviates nausea or vomiting.

ANTIGEN. Part of an invading microorganism, which causes tissue damage and which also stimulates the body's immune system to produce antibodies.

ANTIHISTAMINE. A drug that blocks the action of histamine (a substance that produces an allergic reaction) and is used to control allergies.

ANTIHYPERTENSIVE. A medication given to lower blood pressure.

ANTIMALARIAL. Any substance that reduces the effects of the tropical disease malaria.

ANTIMICROBIAL. A plant substance that acts to inhibit the growth of harmful microorganisms or acts to destroy them.

ANTIOXIDANT. A substance that prevents oxidative damage, such as cellular damage caused by free radicals.

ANTIPRURITIC. A type of medication applied to the skin to stop itching.

ANTIPSORIC. A homeopathic remedy that is an effective constitutional treatment for the psoric miasm. *Calcarea carbonica* is one of three major antipsoric remedies.

ANTIPSYCHOTIC MEDICATION. A drug used to treat psychotic symptoms, such as delusions or hallucinations, in which patients are unable to distinguish fantasy from reality.

ANTIPYRETIC. A substance or medication that combats fever with cooling properties.

ANTISCORBUTIC. An agent that is effective against scurvy, like vitamin C.

ANTISEPTIC. A substance that works to inhibit the growth and reproduction of bacteria and viruses.

ANTISPASMODIC. A substance that relieves spasm or uncontrolled contraction, usually of the smooth or involuntary muscle of the arteries, intestines, or the airways.

ANTITOXIN. A vaccine used to stimulate immunity against a specific disease.

ANTITUMOR. A property of plant chemistry that acts to prevent or inhibit the formation or growth of tumors.

ANTITUSSIVE. A drug that is used to control coughing.

ANTIVENIN. Antibodies taken from the serum of horses that can be used to neutralize the venom of snakes and insects.

ANUS. The opening at the lower end of the rectum. The anus and rectum are both part of the large intestine.

ANXIETY DISORDER. The experience of prolonged, excessive worry about circumstances in one's life.

ANXIOGENIC. Tending to produce anxiety.

ANXIOLYTIC. A medication that alleviates anxiety.

APANA. Life sustaining energy centered in the larger intestine; the fifth of the five airs of Ayurvedic philosophy; the life force governing expulsion activity.

APHRODISIAC. A substance or food thought to stimulate erotic desire and enhance sexual performance. Aphrodisiacs are named for Aphrodite, the ancient Greek goddess of love.

APIGENIN. A bioflavonoid contained in chamomile that appears to inhibit *H. pylori*.

APITHERAPY. A form of alternative therapy based on the use of honey and other bee products.

APLASTIC. Exhibiting incomplete or faulty development.

APNEA. The temporary absence of breathing.

APOCRINE. A type of glandular secretion in which the top portion of the secreting cells is released along with the secreted substances.

APOPTOSIS. Structural changes within cells of a multi-cell organism leading to controlled and regulated cell death, also called programmed cell death (PCD); a natural means to eliminate unnecessary and unhealthy cells.

APPETITE SUPPRESSANT. A drug that decreases feelings of hunger. Most work by increasing levels of serotonin or catecholamine, chemicals in the brain that control appetite.

AQUEOUS HUMOR. A clear fluid in the posterior and anterior chambers of the eye that moves from back to front and exits the eye through a small canal into the venous system.

AREA POSTREMA. A structure of the brain stem that triggers vomiting in response to toxins in the bloodstream and cerebrospinal fluid.

AROMATHERAPY. The therapeutic use of plant-derived, aromatic essential oils to promote physical and psychological well-being.

ARRHYTHMIA. An abnormal rate or rhythm of the heartbeat.

ART THERAPY. The use of art media to assess and treat an individual's development, abilities, personality, interests, concerns, or conflicts.

ARTEMISININ. An antimalarial agent derived from an ancient Chinese herbal remedy. Two of the most popular varieties are artemether and artesunate, used mainly in Southeast Asia in combination with mefloquine.

ARTERIES. Blood vessels that carry oxygenated blood to organs and other tissues of the body.

ARTERIOLE. The tiny extensions of arteries that lead into the capillaries.

ARTERIOSCLEROSIS. A disease characterized by build-up on the artery walls that can lead to the obstruction of blood flow.

ARTHRALGIA. Joint pain.

ARTHRITIS. An inflammatory condition affecting joints.

ARTHROGRAPHY. An imaging technique that is sometimes used to evaluate a joint associated with internal derangement.

ARTICULAR BONES. Two or more bones connected to each other via a joint.

ASANAS. Physical postures associated with the practice of hatha yoga.

ASCENDING INFECTION. Infection which begins in the urinary bladder and travels through the ureters up to the kidneys.

ASCOMYCETE. Any class of higher fungi with septate hyphae and spores formed in the asci.

ASCORBIC ACID. Another name for vitamin C, derived from its ability to prevent scurvy.

ASCOSPORES. Any spores contained in the ascus, which is the oval or tubular spore case of an ascomycete.

ASPERGER SYNDROME. A condition in which individuals have autistic behavior but normal language skills.

ASPIRATION. An action during which solids or liquids that should be swallowed into the stomach are instead breathed into the respiratory system.

ASTHMA. A lung condition in which the airways become narrow due to smooth muscle contraction, causing wheezing, coughing, and shortness of breath.

ASTIGMATISM. An eye condition that causes a person to see distorted images due to an abnormality in the curvature of the eye's lens.

ASTRAL. Of or from the stars.

ASTRINGENT. Any substance or medication that causes soft tissue to contract or constrict.

ATAXIA. A condition in which balance and coordination are impaired.

ATHEROSCLEROSIS. Disease of the arterial wall in which the inner layer thickens, causing narrowing of the channel and thus impairing blood flow.

ATHETOID. The type of CP that is marked by slow, writhing, involuntary muscle movements.

ATHLETE'S FOOT. A fungal infection between the toes, officially known as tinea pedis.

ATOPIC DERMATITIS. Infection of the skin as a result of exposure to airborne or food allergens.

ATOPY. A group of diseases, including eczema, that develop in people with an inherited tendency to develop immediate antibodies to common environmental allergens.

ATRIOVENTRICULAR BLOCK. A dysfunctional electrical function of cardiac muscle.

ATROPHIC VAGINITIS. An inflammation of the vagina that develops when the estrogen levels in the body drop. It is usually associated with normal menopause or with surgical removal of the ovaries, but can occur with breast-feeding or premature menopause.

ATROPHY. A progressive wasting and loss of function of any part of the body.

ATTENTION DEFICIT DISORDER (ADD). A learning disability characterized by an inability to pay attention or concentrate on a specific activity. It is characterized by daydreaming.

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER. A behavioral disorder marked by inattentiveness, hyperactivity, and impulsivity.

ATTUNEMENT. Life energy teaching given by a Reiki master to a student.

ATYPICAL ANTIPSYCHOTICS. A group of medications for the treatment of psychotic symptoms introduced in the 1990s. The atypical antipsychotics include clozapine, risperidone, quetiapine, ziprasidone, and olanzapine. They are sometimes called serotonin dopamine antagonists.

AUDIOLOGIST. A health care professional who performs diagnostic testing of impaired hearing.

AUGMENTATIVE COMMUNICATION DEVICES. Computers, picture boards, and other devices that increase the ability to communicate, either with or without speech.

AURA. An energy field that is thought to emanate from the human body and to be visible to people with special psychic or spiritual powers.

AURICULAR ACUPUNCTURE. Acupuncture using only points found on the ears.

AUTHENTIC MOVEMENT. A type of movement that is influenced heavily by Jungian analysis, and works by analyzing the internal images of the patient. Patients are also urged to dance only when they feel the "impulse" to move.

AUTISM. A developmental disability that appears early in life, in which normal brain development is disrupted and social and communication skills are retarded, sometimes severely.

AUTODIGESTION. A process in which pancreatic enzymes are activated prematurely and begin to digest the pancreas itself.

AUTOGENIC TRAINING. A form of self-hypnosis developed in Germany that appears to be beneficial to migraine sufferers.

AUTOGENOUS VACCINE. A vaccine made of dead bacteria from a patient's own body.

AUTOHEMOTHERAPY. A form of ozone therapy in which a small quantity of the patient's blood is withdrawn, treated with a mixture of ozone and oxygen, and reinfused into the patient.

AUTOIMMUNE DISEASE. Condition in which a person's immune system attacks the body's own cells, causing tissue destruction.

AUTOIMMUNITY. A condition in which the body's immune system produces antibodies in response to its own tissues or blood components instead of to foreign particles or microorganisms.

AUTOINTOXICATION. Self-poisoning by toxic products formed within the body during intestinal digestion. This term was coined around 1885 as part of a theory that regarded intestinal function as a central aspect of health.

AUTONOMIC NERVOUS SYSTEM. The part of the nervous system that controls so-called involuntary functions such as heart rate, salivary gland secretion, respiratory function, and pupil dilation.

AVALOKITESVARA. The Sanskrit name of Quan yin.

AVULSION. The forcible separation of a piece from the entire structure.

AXONS. The conducting fiber of a nerve cell. Axons vary from a fraction of an inch to several feet in length.

AYURVEDIC MEDICINE. A 5,000-year old system of holistic medicine developed in India. Ayurvedic medicine is based on the idea that illness results from a personal imbalance or lack of physical, spiritual, social, or mental harmony.

AZOLE. Any member of a group of chemical compounds with five-membered rings containing one or more nitrogen atoms. Several azoles are used as antifungal medications.

B

BABESIOSIS. A disease caused by protozoa of the genus *Babesia* characterized by a malaria-like fever, anemia, vomiting, muscle pain, and enlargement of the spleen. Babesiosis, like Lyme disease, is carried by a tick.

BACILLUS CALMETTE-GUÉRIN (BCG). A vaccine made from a damaged bacillus similar to the tubercle bacillus, which may help prevent serious pulmonary tuberculosis and its complications.

BACOSIDES. The name of two chemicals found in brahmi that are believed to aid memory by improving the efficiency of nerve impulse transmission.

BACTEREMIA. The presence of bacteria in the bloodstream.

BACTERICIDAL. An agent that destroys bacteria (e.g., *Staphylococci aureus, Streptococci pneumoniae, Escherichia coli, Salmonella enteritidis*).

BACTERICIDE. A substance that kills bacteria.

BACTERIURIA. The presence of bacteria in the urine.

BAICALEIN. A compound found in skullcap that appears to be a cancer chemopreventive.

BARBITURATE. A group of drugs that have sedative properties. Barbiturates depress the body's respiratory rate, blood pressure, temperature, and central nervous system.

BARIATRICS. The branch of medicine that deals with the prevention and treatment of obesity and related disorders.

BARRETT'S ESOPHAGUS OR BARRETT'S SYNDROME. Changes in the type of cells lining the esophagus. Sometimes associated with the development of esophageal cancer.

BASAL GANGLIA (SINGULAR, GANGLION). Masses of gray matter in the cerebral hemispheres of the brain that are involved in the regulation of voluntary movements. Tourette syndrome has been linked to these areas of the brain.

BEHAVIOR MODIFICATION. Therapy aimed at changing behavior by substituting problem behaviors with more useful activities.

BEHAVIORAL MEDICINE. The branch of medicine that studies mind/body relationships.

BEHAVIORAL THERAPY. A collection of techniques for treating mental disorders based upon changing abnormal behavior rather than attempting to analyze its fundamental basis. It is particularly used in phobic or obsessional disorders, and seeks to eliminate symptoms.

BELL'S PALSY. Facial paralysis or weakness with a sudden onset, caused by swelling or inflammation of the seventh cranial nerve, which controls the facial muscles. Disseminated Lyme disease sometimes causes Bell's palsy.

BELLERGAL. A potent combination of ergotamine tartrate (a blood vessel constricting substance often used for migraines), belladona alkaloids (a potentially poisonous substance with sedative and anti-spasmodic effects), and phenobarbitol (a hypnotic sedative).

BENIGN PROSTATIC HYPERPLASIA (BPH). A noncancerous condition of the prostate that causes growth of the prostate tissue, thus enlarging the prostate and obstructing urination.

BENIGN. Not malignant, noncancerous.

BENTONITE CLAY. A green clay of aluminum silicate containing magnesium and trace minerals. The clay can draw out agents of infection.

BENZODIAZEPINES. A class of drugs that have a hypnotic and sedative action, used mainly as tranquilizers to control symptoms of anxiety or panic.

BERBERINE. A white or yellow water-soluble alkaloid with antibacterial properties. Coptis, goldenseal, and barberry are all plants that contain berberine.

BERIBERI. A condition caused by a thiamine deficiency, with peripheral neurologic (nerve), cerebral (brain), and cardiovascular (heart and blood vessel) symptoms.

BEST-CASE SERIES. A preliminary study that relies on assumptions about patient outcomes without a specific treatment, compared with similar patients receiving the best available conventional treatments. There are no control cases.

BETA AGONIST. Class of substances that relieve bronchoconstriction, among other effects.

BETA-AMYRIN PALMITATE. A compound found in lobelia that has antidepressant properties.

BETA-BLOCKER. A class of drugs that bind beta-adrenergic receptors and thereby decrease the ability of the body's own natural epinephrine to bind to those receptors, leading to the reduction of aqueous humor secretion.

BETA-GLUCANS. Complex carbohydrates contained in oats and other cereal grains. They are thought to be useful in managing diabetes as well as lowering blood cholesterol levels.

BETA-SITOSTEROL. A plant lipid with considerable biological activity; even in very amounts it is found to be anti-inflammatory and to have positive effects in treating BPH.

BIENNIAL. A plant that takes two years or two distinct growing seasons to complete its life cycle. In the first year it grows leaves only; in the second it flowers and produces seeds.

BILE. A bitter, greenish liquid secreted by the liver that aids in the digestion and absorption of fats.

BILIARY DUCT DISEASE. Disease of the anatomic duct from the liver, which joins the duct from the gall bladder to form the common bile duct before entering the small intestine.

BILIARY SYSTEM/BILE DUCTS. The gall bladder and the system of tubes that carry bile from the liver into the intestines.

BILIRUBIN. A yellow pigment that is the end result of hemoglobin degradation. Bilirubin is cleared from the blood by action of liver enzymes and excreted from the body.

BINGE EATING. A pattern of eating marked by episodes of rapid consumption of large amounts of food, usually food that is high in calories.

BIOACCUMULATION. The buildup of a toxin or other substance within a food chain, as larger predators retain the substance from the bodies of prey they eat.

BIOAVAILABILITY. The rate and extent to which a drug or other substance enters the general circulation.

BIOCIDE. Any chemical that works to kill microorganisms and other forms of life by poisoning. Hospital disinfectants are examples of biocides.

BIODEGRADABLE. Capable of being broken down by the actions of living organisms. Inulin from chicory roots can be used to produce biodegradable substances used in industry.

BIODIVERSITY. The presence of many different species of plants and animals within a limited geographical region.

BIOENERGETICS. A system of therapy that combines breathing and body exercises, psychological therapy, and the free expression of emotions to release blocked physical and psychic energy.

BIOFEEDBACK. The use of monitoring devices that display information about body functions, such as heart rate or blood pressure, to help patients learn to consciously control the functions.

BIOFIELD THERAPIES. A subgroup of energy therapies that make use of energy fields (biofields) thought to exist within or emanate from the human body. Biofield therapies include such approaches as aura therapy, Reiki, therapeutic touch, qigong, and polarity balancing.

BIOFLAVONOID. A large group of phytochemicals with antioxidant and immune-boosting properties.

BIOIDENTICAL. Molecules that are identical in chemical formulae and similar or identical in chemical structures, actions, and effects to naturally occurring biological molecules.

BIOPSY. The surgical removal and microscopic examination of living tissue for diagnostic purposes.

BIOSYNTHESIS. A process that produces chemical compounds from simpler components.

BIOTERRORISM. The intentional use of disease-causing microbes or other biologic agents to intimidate or terrorize a civilian population for political or military reasons. Type A influenza virus could be used as an agent of bioterrorism.

BIOTIN. The B complex vitamin found naturally in yeast, liver, and egg yolks.

BIPHOSPHONATES. Compounds (such as alendronate) that slow bone loss and increase bone density.

BISMUTH. A metallic element used to make medications that soothe the stomach lining. Bismuth appears to have some antimicrobial effectiveness against *Helicobacter pylori*.

BITTER. Any herb whose bitter taste stimulates the digestive system. Bitters are used to treat stomach ailments.

BLACKHEAD. A plug of fatty cells capped with a blackened mass.

BLADDER NECK. The place where the urethra and bladder join.

BLADDER SPHINCTER. The outlet that releases urine into the urethra.

BLASTOCYST. A cluster of cells representing multiple cell divisions that have occurred in the fallopian tube after successful fertilization of an ovum by a sperm. This is the developmental form that must enter the uterus and implant to achieve pregnancy.

BLEPHARITIS. A condition where the eyelids become red, irritated, and scaly. The eyes are painful, red, and inflamed.

BLOCKING PROTEIN FACTOR (BPF). A serum component that may prevent the immune system from recognizing cancer cells.

BLOOD CHEMISTRY PANEL. A general set of tests measuring substances in the blood that may indicate common diseases.

BLOOD CULTURE. A test used to find and identify infectious organisms in the blood. Blood drawn from the patient is placed in a culture medium and the sample is observed for the growth of bacteria. If bacteria grow, they are analyzed for identification.

BLOOD PRESSURE. The force applied to the walls of the arteries as the heart pumps blood through the body.

BLOOD-BRAIN BARRIER. A membrane that lines the blood vessels in the brain and prevents many damaging substances from reaching the brain. Certain small molecules are able to cross the barrier, including water, oxygen, carbon dioxide, and alcohol.

BLOOD. In TCM, it is the fluid that transports physical and emotional nourishment.

BLUNTED AFFECT. A term that refers to the loss of emotional expressiveness sometimes found in patients with schizophrenia. It is sometimes called flattened affect.

BODHISATTVA. A Buddhist holy person who has attained enlightenment, but postpones nirvana in order to help others become enlightened.

BODY MASS INDEX (BMI). A measurement of fatness that compares height to weight.

BODY DYSMORPHIC DISORDER. A psychiatric disorder marked by preoccupation with an imagined physical defect.

BODYWORK. A term that covers a variety of therapies that include massage, realignment of the body, and similar techniques to treat deeply ingrained stresses and traumas carried in the tissues of the body.

BONE MARROW SUPPRESSION. Decrease in production of blood components, including red blood cells, white blood cells, and platelets. This can result in anemia, increased susceptibility to infections, and excessive bleeding.

BONE MARROW. A spongy tissue located in the hollow centers of certain bones, such as the skull and hip bones. Bone marrow is the site of blood cell generation.

BONE MARROW TRANSPLANTATION. A medical procedure in which normal bone marrow is transferred from a healthy donor to an ailing recipient. An illness that prevents production of normal blood cells—such as sickle cell anemia—may be treated with a bone marrow transplant.

BONE SCAN. A diagnostic procedure in which radioactive tracer is injected and images are taken of specific areas or the entire skeleton.

BOUCHARD'S NODES. Swelling of the middle joint of the finger.

BOWEL ASTRINGENT. A substance that causes bowel tissue to dry and shrink by reducing its ability to absorb water.

BOWEL OBSTRUCTION. A blockage in the intestine that prevents the normal flow of waste down the length of the intestine.

BRADYKINESIA. Slow movement.

BRAHMI. A herb used in Ayurvedic and Japanese medicine that is believed to improve a person's ability to remember new information. Brahmi is also called bacopa.

BRAXTON HICKS CONTRACTIONS. Short, fairly painless uterine contractions during pregnancy that may be mistaken for labor pains. They allow the uterus to grow and help circulate blood through the uterine blood vessels.

BROMELAIN. One or more enzymes found in pineapples and sometimes added to supplements to boost their effectiveness.

BROMHIDROSIS. A medical condition in which a person's sweat always smells unpleasant.

BRONCHIAL TUBES. The major airways from the back of the throat to the lungs and their main branches.

BRONCHIA. Air passages in the lungs. Wheezing occurs when bronchia become constricted (narrowed).

BRONCHIOLES. Small tubes in the lungs leading to the alveoli, where gas exchange occurs.

BRONCHITIS. An infection in the lungs.

BRONCHODILATOR. A medicine that relaxes the bronchial muscles and opens up the air passages to the lungs.

BRONCHOSCOPE. A thin, flexible, lighted tube that is used to view the air passages in the lungs.

BRONCHOSCOPY. A procedure in which a thin, flexible, lighted tube that is threaded through the airways to view the air passages in the lungs.

BRUXISM. Habitual clenching and grinding of the teeth, especially during sleep.

BUDDHISM. A philosophy founded in India in the sixth century B.C. and based on the teachings of the historical Buddha, born Siddartha Gautama.

BULBAR MUSCLES. Muscles of the mouth and throat responsible for speech and swallowing.

BULIMIA NERVOSA. An eating disorder characterized by episodic binge eating followed by self-induced vomiting or laxative abuse.

BUPLEURUM. An Asian plant used in traditional Chinese and Japanese medicines to treat infected or inflamed skin.

BURNOUT. An emotional condition, marked by tiredness, loss of interest, or frustration, that interferes with job performance. Burnout is usually regarded as the result of prolonged stress.

BURSA. A sac that contains synovial fluid and cushions the joints. Pl.: Bursae

BURSITIS. An inflammation of the tissue sac, called a bursa, which surrounds and helps lubricate the joints.

BUTTERFLY BANDAGE. A narrow strip of adhesive with wider flaring ends (shaped like butterfly wings) used to hold the edges of a wound together while it heals.

C

C-REACTIVE PROTEIN (CRP). A protein present in blood serum in various abnormal states, like inflammation.

CD4. A type of protein molecule in human blood. The HIV virus infects cells with CD4 surface proteins and, as a result, depletes the number of T cells, B cells, natural killer cells, and monocytes in the patient's blood.

CT (COMPUTER TOMOGRAPHY) SCAN. The diagnostic technique in which the combined use of a computer and x rays passed through the body at different angles produces clear, cross-sectional images *(slices)* of the tissue being examined.

CACHEXIA. General physical wasting and malnutrition, usually associated with such chronic diseases as cancer and AIDS.

CADMIUM. A heavy metal.

CADUCEUS. The ancient and universal symbol of medicine consisting of the winged staff of Mercury and two intertwining serpents.

CALCITONIN. A naturally occurring hormone made by the thyroid gland that can be used as a drug to treat osteoporosis and Paget's disease of the bone.

CALCIUM. A mineral necessary for strong bones and proper functioning of organs and muscles.

CALCIUM CARBONATE. A salt that is used in many antacids.

CALCIUM CHANNEL BLOCKER. A drug that blocks the entry of calcium into the muscle cells of small blood vessels (arterioles) and keeps them from narrowing.

CALCIUM CITRATE. A chemical compound made from calcium and citric acid.

CALCULI (SINGULAR, CALCULUS). Mineral deposits that can form a blockage in the urinary system.

CALORIC TESTING. Flushing warm and cold water into the ear stimulates the labyrinth and causes vertigo and nystagmus (involuntary movement of the eyes in a horizontal direction) if all the nerve pathways are intact.

CAMELLIA SINENSIS. Tea plant or tea tree from which black, oolong, green, and white tea are made.

CAMPYLOBACTER. A bacterium that can invade the lining of the intestine.

CANCER. A disease caused by uncontrolled abnormal cell growth.

CANDIDIASIS. Overgrowth of candida yeast in the body which may cause a variety of symptoms.

CANTHARIDIN. The irritating poison produced by Spanish fly that serves as the active ingredient in cantharis. Because of cantharidin, high doses of cantharis are highly toxic.

CAPACITOR PLATES. An apparatus that can carry electricity and stores an electrical charge.

CAPSAICIN. A crystalline, bitter compound found in peppers. It may be helpful in treating some forms of gastritis.

CARBOHYDRATES. Neutral compounds of carbon, hydrogen, and oxygen found in sugar, starches, and cellulose.

CARBUNCLE. A Staphylococcal skin infection that affects the hair follicles. The term may also be used to refer to a group of boils.

CARCINOGENESIS. Production of cancer.

CARCINOGENS. Chemical substances that cause cell mutations and, ultimately, cancer.

CARDIAC ARRYTHMIA. The irregular beating of the heart.

CARDIAC CATHETERIZATION. A treatment using a narrow tube to clear out a blocked blood vessel.

CARDIAC GLYCOSIDE. A chemical compound, often derived from a plant, consisting of a sugar joined to another chemical group, with biological effects on the heart; drugs that block the enzyme that regulates the electrical activity of the heart.

CARDIAC TONIC. Any of a diverse group of remedies intended to relieve heart symptoms. Most tonics contain herbal extracts, vitamins, and minerals.

CARDIOMYOPATHY. A condition of damaged, diseased, thickened, or stretched heart muscle, resulting in weakness of the heart. Cardiomyopathy often occurs following heart attacks due to scarring, but may also have an infectious or nutritional origin.

CARDIOVASCULAR. Refers to the heart and blood vessels as a unified system.

CARIES. Cavities in the teeth.

CARMINATIVE. A substance or medication that causes gas to be expelled from the stomach and intestines.

CARNOSOL. An antioxidant compound found in rosemary that appears to have anticancer properties.

CAROTENOIDS. Any of a group of more than 600 orange or red substances that are found primarily in vegetables, many of which are vitamin A precursors.

CAROTENOSIS (CAROTENODERMIA, CAROTENEMIA). A yellowish pigmentation of the skin caused by high levels of carotene in the blood.

CARPAL TUNNEL SYNDROME. A condition caused by compression of the median nerve (from overuse) in the carpal tunnel of the hand, characterized by pain.

CARRIER OIL. An oil used to dilute essential oils for use in massage and other skin care applications.

CARTILAGE. A firm, whitish elastic connective tissue found in humans and other animals.

CARVONE. The chemical compound that gives spearmint its characteristic flavor. Carvone is a pale yellow or colorless liquid when extracted from the plant.

CATACHIN. A flavonoid found in fo ti that has antioxidant and tumor-inhibiting qualities.

CATALYST. A substance that increases the rate of a chemical reaction without undergoing change itself.

CATAPLEXY. A symptom of narcolepsy in which there is a sudden episode of muscle weakness triggered by emotions. The muscle weakness may cause the person's knees to buckle or the head to drop. In severe cases, the patient may become paralyzed for a few seconds

CATARACTS. Eye condition in which the lenses harden and lose their clarity.

CATARRH. Inflammation of a mucous membrane, particularly in the respiratory system, that produces excessive secretions.

CATATONIA. Disturbance of motor behavior with either extreme stupor or random, purposeless activity.

CATECHIN. A yellow, slightly bitter antioxidant found in evening primrose oil. Catechin appears to slow tumor growth and to protect against heart disease.

CATECHOL-O-METHYLTRANSFERASE (COMT) INHIBITORS. Drugs, such as entacapone and tolcapone, that block COMT, an enzyme that breaks down levodopa in the blood.

CATHARSIS. Therapeutic discharge of emotional tension by recalling past events.

CATHARTIC. Capable of reducing or relieving constipation.

CATHETER. A rubber or plastic tube placed through the urethra into the bladder to remove excess urine when the flow of urine is cut off or to prevent urinary infection.

CATHETERIZE. A procedure whereby a thin tube, called a catheter, is inserted into the urethra to collect urine, which drains into an external collection bag.

CAUDA EQUINA. The nerve roots in the final portion of the spine, controlling movement and sensation in the legs. These nerve roots resemble a horse's tail.

CAULOSAPONIN. The chemical compound found in blue cohosh that is used to stimulate uterine contractions during labor. It can have toxic side effects in humans.

CAUSTIC. Corrosive; capable of destroying by chemical action.

CAUTERIZATION. Sealing tissue or blood vessels by burning with a heat source or electrical current.

CAUTERIZE. To damage with heat or cold so that tissues shrink; used as a method to stop bleeding.

CAUTERY INSTRUMENT. A device that applies heat to the tissues to destroy damaged or diseased areas.

CAVITY. A hole or weak spot in the tooth surface caused by decay.

CELIAC DISEASE. An intestinal disorder characterized by intolerance of gluten, a protein present in the grains of wheat, rye, oats, and barley.

CELLULOSE. A material derived from the cell walls of certain plants. It is used in the production of many vegetable fibers and is a major raw material component in the production of manufactured fibers including acetate, rayon, and triacetate.

CENTRAL NERVOUS SYSTEM. Consisting of the brain and spinal cord, with their nerves and end organs that control voluntary acts; includes sensory and motor nerve fibers controlling skeletal muscles.

CENTRIFUGE. A machine that rotates rapidly and uses centrifugal force to separate substances of different densities.

CEPHAELINE. A chemical compound found in ipecac that irritates the stomach lining and triggers the vomiting reflex.

CEPHALALGIA. The medical term for headache.

CEREBROSPINAL FLUID. Clear fluid found around the brain and spinal cord and in the ventricles of the brain.

CERVICAL. Relating to the top part of the spine that is composed of the seven vertebrae of the neck and the disks that separate them.

CERVIX. The opening from the vagina leading into the uterus.

CESTODES. Tapeworms, which are long, flat, segmented parasitic intestinal worms.

CHAKRAS. The energy centers located at points along the body, usually identified as seven in number in yoga and other Eastern healing therapies. Stone massage works to open the chakras, as well as relax the physical body.

CHALAZION. A small cyst on the eyelid that develops because the Meibomian gland becomes plugged.

CHANCRE. The initial skin ulcer of primary syphilis, consisting of an open sore with a firm or hard base.

CHARANTIN. A compound with hypoglycemic effects that can be extracted from bitter melon with alcohol.

CHARCOT-MARIE-TOOTH SYNDROME (CMT). The most common form of inherited peripheral neuropathy.

CHELATE. A chemical compound in which a metal is bonded to one or more organic groups.

CHELATION. The use of a medication or herbal substances to inactivate toxic substances in the body. Chelation is used to treat iron overload in some patients.

CHELATION THERAPY. Treatment with chemicals that bind to a poisonous metal and help the body pass it in urine at a faster rate.

CHEMOPREVENTATIVE. A chemical or drug that is thought to prevent a disease.

CHEMOTHERAPEUTIC AGENT. A medication used to treat disease, usually cancer.

CHEMOTHERAPY. Chemical (drug) treatment of disease; in cancer treatment, the use of synthetic drugs to destroy a tumor either by inhibiting the growth of the cancerous cells or by killing the cancer cells.

CHI (QI OR KI). The universal life-force or energy. The quality, quantity, and balance of a person's chi determines his or her state of health and longevity.

CHILBLAIN. Redness and swelling of the skin often accompanied by burning, itching, and blisters. A condition caused by excessive exposure to the cold.

CHIROPRACTIC. A method of treatment based on the interactions of the spine and the nervous system. Chiropractors adjust or manipulate segments of the patient's spinal column in order to relieve pain and increase the healthy flow of nerve energy.

CHITIN. A transparent horny substance found in the outer coverings of shellfish. Chitin is used to make commercial preparations of glucosamine.

CHLAMYDIA. The most common bacterial sexually transmitted disease in the United States.

CHLOASMA. A skin discoloration common during pregnancy, also known as the mask of pregnancy or melasma, with which blotches of pale brown skin appear on the face. The blotches may appear in the forehead, cheeks, and nose, and may merge into one dark mask.

CHLOROPHYLL. A green plant pigment found in plants, algae, and some bacteria. Chlorophyll is responsible for capturing the light energy needed for photosynthesis.

CHLOROQUINE. An antimalarial drug that was first used in the 1940s, until the first evidence of quinine resistance appeared in the 1960s. It is now ineffective against falciparum malaria almost everywhere.

CHOLAGOGUE. Stimulates the flow of bile from the liver to the intestines.

CHOLECYSTECTOMY. Surgical removal of the gallbladder.

CHOLESTEROL. A steroid fat found in food derived from animals that is also produced in the body for several important functions. Excess cholesterol intake is linked to many diseases.

CHOLESTEROL ABSORPTION INHIBITOR. A substance that decreases the absorption of cholesterol in the intestines.

CHOLINE. Choline is a nutrient required by the body. It does not meet the classic definition of a

vitamin because the body makes some choline but not enough to support health. The remainder must be acquired through diet.

CHONDROITIN. A complex carbohydrate found in human and animal cartilage that is used to treat several physical disorders, most importantly arthritis.

CHOREA. A nervous system disorder that causes involuntary jerking or spasms. Also known as St. Vitus dance.

CHOROIDAL NEOVASCULARIZATION (CNV). The proliferation of new, fragile blood vessels in the choroid layer. Leakage from these vessels causes wet AMD.

CHOROID. The middle vascular layer of the eyeball, behind the retina.

CHRONIC DISEASE. An illness or medical condition that lasts over a long period of time and sometimes causes a long-term change in the body.

CHVOSTEK'S SIGN. A facial spasm caused when a doctor taps lightly on a patient's facial nerve. A positive Chvostek's sign may indicate that the patient has hypomagnesemia.

CIALIS. Trade name for tadalafil, an oral medication for the treatment of impotence.

CILIA. Tiny, hair-like projections from a cell. Within the respiratory tract, the cilia act to move mucus along, in an effort to continually flush out and clean the respiratory tract.

CIRCADIAN RHYTHM. The approximately 24-hour period, also known as the body's time clock, that regulates waking and sleeping periods.

CIRRHOSIS. The end result of many forms of liver disease, the condition of the liver when its cells have been damaged or destroyed and are replaced by scar tissue.

CITRAL. A pale yellow liquid drived from lemongrass used in making perfumes and to flavor food.

CLAIRVOYANT. A person who has the power to see within their mind a future event or an event or thing out of their visual range.

CLEFT PALATE. A birth defect characterized by a deep split in the roof of the mouth, associated with folic acid deficiency.

CLINDAMYCIN. An antibiotic that can be used instead of penicillin.

CLINICAL NUTRITION. The use of diet and nutritional supplements as a way to enhance health and prevent disease.

CLOSE WORK. Tasks which cause the eyes to focus on something close at hand, such as reading, writing, computer work, and sewing.

CLOSTRIDIUM DIFFICILE. A species of bacteria of the genus *Clostridium* that causes diarrhea associated with antibiotic use.

CLOSTRIDIUM. A genus of deadly bacteria that are responsible for tetanus and other serious diseases, including botulism and gangrene from war wounds. It thrives without oxygen.

COBB ANGLE. A measure of the curvature of scoliosis, determined by measurements made on x rays.

COCHLEA. The hearing part of the inner ear. This snail-shaped structure contains fluid and thousands of microscopic hair cells tuned to various frequencies, in addition to the organ of Corti (the receptor for hearing).

COENZYME Q_{10}. A substance used by cells in the human body to produce energy for cell maintenance and growth. It is being studied as a possible preventive for migraine headaches.

COENZYME. A substance needed by enzymes to produce many of the reactions in energy and protein metabolism in the body.

COGNITIVE RESTRUCTURING. A technique used in cognitive-behavioral therapy. The process of replacing maladaptive thought patterns with constructive thoughts and beliefs.

COGNITIVE-BEHAVIOR THERAPY. A form of psychotherapy that seeks to modify behavior by manipulating the environment to change the patient's response.

COLCHICINE. A drug used to treat painful flare-ups of gout.

COLD-DEFICIENCY DIARRHEA. In Chinese herbal medicine, this condition is described as cold settling in the abdomen when resistance is low, causing cramping, gas, and loose stools.

COLD. In Chinese pathology, the term defines a condition that has insufficient warmth, either objective (hypothermia) or subjective (feeling cold).

COLITIS. An inflammation of the colon.

COLLAGEN. A white, fibrous protein that is found in skin, bones, ligaments, tendons, cartilage, and all other connective tissue.

COLLARETTE. The slightly raised area of scaly skin that forms at the borders of the herald patch and later lesions of pityriasis rosea.

COLLATERAL SUPERFICIAL VEINS. Veins that are readily visible and stick up from the skin surface.

COLONIZE. To become established in a host.

COLON. Large intestine; the lower part of the digestive system that is primarily responsible for conserving water by absorbing it from the bowel contents.

COLONOSCOPY. Examination of an area of the gastrointestinal tract by putting a lighted scope, usually bearing a fiber-optic camera, into the rectum and passing it through the intestine.

COLOSTOMY. A procedure performed when a large quantity of intestine is removed. The end piece of the intestine leading to the rectum is closed.

COLTSFOOT. A common weed, *Russilago farfara*, used to treat chest complaints.

COMEDO. A hard plug composed of sebum and dead skin cells.

COMMENSAL BACTERIA. Bacteria that live in or on the human body and are in an often beneficial relationship with the human host. For example, some bacteria in the digestive tract produce needed B vitamins.

COMMISSION E. A committee formed in Germany in 1978 to evaluate the efficacy and safety of herbs used in traditional medical practice.

COMMON BILE DUCT. The passage through which bile travels from the cystic duct to the small intestine.

COMMON COLD. An illness caused by an upper respiratory viruses. Usual symptoms include nasal congestion, coughing, sneezing, throat irritation, and a low-grade fever.

COMPENSATED CIRRHOSIS. Asymptomatic cirrhosis of the liver.

COMPLEMENT. A large group of serum proteins that are involved in the immune response.

COMPLEMENTARY MEDICINE. Various treatments used in alternative medicine that are used specifically to supplement conventional drug and therapy treatments, rather than to replace conventional medicine.

COMPLEMENTARY THERAPY. Includes many of the same treatments used in alternative medicine, such as herbal medicine, massage, and focused imaging, but uses them to supplement conventional drug and therapy treatments, rather than to replace conventional medicine.

COMPLETE COLECTOMY. The surgical removal of all four parts of the colon.

COMPLETE PROTEIN. A protein food that has all the essential amino acids the body requires to digest it.

COMPLEX CARBOHYDRATES. Complex carbohydrates are broken down by the body into simple sugars for energy, are found in grains, fruits and vegetables. They are generally recommended in the diet over refined sugar and honey, because they are a more steady source of energy.

COMPLEX SUGARS. A category of carbohydrate compounds within plants, found to have antiviral and anti-inflammatory effects; they have a more complex structure than the sweet, simple dietary sugars.

COMPOUNDING PHARMACY. A pharmacy that uses bulk materials to fill prescriptions according to a physician's formulation; a formulating pharmacy.

COMPRESS. A cloth used to apply heat, cold, or medications to the skin.

COMPULSION. A rigid behavior that is repeated over and over each day.

COMPUTED TOMOGRAPHY (CT) SCAN. An imaging technique in which cross-sectional x rays of the body are compiled to create a three-dimensional image of the body's internal structures.

CONDITIONING. In psychology, the process of acquiring, developing, or establishing new associations and responses in a person or animal.

CONDUCT DISORDER. A behavioral and emotional disorder of childhood and adolescence. Children with a conduct disorder act inappropriately, infringe on the rights of others, and violate societal norms.

CONDUCTIVE HEARING LOSS. Hearing loss caused by loss of function in the external or middle ear.

CONDYLOMA ACUMINATA (PLURAL, CONDYLOMATA). The medical term for warts in the genital region or anus.

CONDYLOMATA LATA. Highly infectious patches of weepy pink or gray skin that appear in the moist areas of the body during secondary syphilis.

CONES. Receptor cells, located in the retina of the eye, that allow the perception of colors.

CONGENITAL. Existing at or before birth; a condition that developed while the fetus was in utero or as a consequence of the birth process.

CONGESTIVE HEART FAILURE. A condition in which the heart is too weak to maintain an adequate supply of blood to the tissues of the body.

CONIFER. Any of several families of trees and shrubs, mostly evergreen, belonging to the order Coniferales, distinguished by bearing seeds and pollen in the form of dry scales arranged in a cone.

CONIZATION. Surgical removal of a cone–shaped piece of tissue from the cervix.

CONJUNCTIVITIS. Inflammation of the conjunctiva, the mucous membrane surrounding the eye. Also known as pinkeye.

CONNECTIVE TISSUE. Tissue that supports and binds other body tissue and parts.

CONSOLIDATION. A condition in which lung tissue becomes firm and solid rather than elastic and air-filled because it has accumulated fluids and tissue debris.

CONSTIPATION. Difficulty passing stools, infrequent stools, or insufficient stools.

CONSTITUTIONAL. Involving the whole body. A constitutional symptom, for example, is one that is not focused entirely in the diseased organ system, but affects the whole system (such as fever).

CONSTITUTIONAL PRESCRIBING. Homeopathic treatment based on a total assessment of the person's life history, heredity, lifestyle, and present environment, as distinct from prescribing based on immediate acute symptoms.

CONTACT DERMATITIS. Inflammation, redness, and irritation of the skin caused by an irritating substance.

CONTAMINATED. Unclean or infected by contact with or the addition of something.

CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP). A ventilation device that blows a gentle stream of air into the nose during sleep to keep the airway open.

CONTRACT. To squeeze down, become smaller.

CONTRACTURE. Shortening of a muscle caused by an imbalance of force between opposing muscles.

COPROLALIA. The involuntary use of vulgar or obscene language.

CORM. A small, underground bulb or stem that holds food for the development of a young plants.

CORNEA. The clear, bowl-shaped structure at the front of the eye located in front of the colored part of the eye. The cornea lets light into the eye and partially focuses it.

CORONARY ARTERIES. The main arteries that provide blood to the heart. The coronary arteries surround the heart like a crown, coming out of the aorta, arching down over the top of the heart, and dividing into two branches.

CORONARY ARTERY DISEASE. A narrowing or blockage, due to atherosclerosis, of the arteries that provide oxygen and nutrients to the heart. When blood flow is cut off, the result is a heart attack.

CORONAVIRUS. One of a family of RNA-containing viruses known to cause severe respiratory illnesses. In March 2003, a previously unknown coronavirus was identified as the causative agent of severe acute respiratory syndrome (SARS).

CORPUS CAVERNOSUM (PLURAL, CORPORA CAVERNOSA). One of two rods of spongy tissue in the penis that become engorged with blood in order to produce an erection.

CORPUS STRIATUM. Regions on each side of the brain that transmit signals for movement in response to dopamine from the substantia nigra.

CORTICAL. Regarding the cortex, or the outer layer of the brain, as distinguished from the inner portion.

CORTICOSTEROID. A group of synthetic hormones that are used to prevent or reduce inflammation. Toxic effects may result from rapid withdrawal after prolonged use or from continued use of large doses.

CORTISOL. Also known as the "stress hormone," cortisol is produced by the body during stress. Excess levels of cortisol can lead to a variety of health-related issues.

CORTISONE. A drug used in the treatment of rheumatoid arthritis.

CORYDALINE. An alkaloid derived from corydalis that has some effectiveness as a pain reliever.

COSMIC RADIATION. Radiation of high penetrating power originating in outer space. It consists partly of high-energy atomic nuclei.

COTYLEDON. A seed leaf, from the embryo of a seed plant.

COUMARINS. These blood-thinning plant chemicals break down red blood cells. Coumarins are

responsible for the fresh- mown lawn aroma that some herbs exude.

CRABS. An informal term for pubic lice.

CREATININE. One of the waste substances normally excreted by the kidneys into the urine. When urine flow is slowed, creatinine may collect in the blood and cause toxic effects.

CREEPING ERUPTION. Itchy irregular, wandering red lines on the skin made by burrowing larvae of the hookworm family and some roundworms. Also called cutaneous larva migrans.

CRETINISM. Severe hypothyroidism that is present at birth.

CRIGLER-NAJJAR SYNDROME. A moderate to severe form of hereditary jaundice.

CROCETIN. A reddish-yellow plant pigment found in saffron that has been studied for its anticancer effectiveness.

CROHN'S DISEASE. An inflammatory small intestine disease named after the gastroenterologist, Burrill B. Crohn, characterized by symptoms of cramping, especially after meals, and chronic diarrhea of loose, liquid, frequent stools.

CROSS LATERALIZATION. A term used to describe what was believed to be a difference in the way the mind works in persons with and without dyslexia.

CROWN. The part of a tooth that is covered by enamel.

CRUCIFER. A type of vegetable that is now believed to guard against cancer, ulcers, and infections in the digestive tract. Examples of crucifers include wasabi, broccoli, cauliflower, mustard greens, and cabbage.

CRYOGENICS. A science examining the freezing of living tissue for preservation and use at a later time.

CRYOTHERAPY. A technique of removing warts by freezing with liquid nitrogen.

CUCURMIN (SOMETIMES SPELLED CURCUMIN). A yellow material that gives turmeric root its characteristic color.

CULTURE. A laboratory test in which colonies of microorganisms are grown from tissue samples of an infected individual in order to identify the pathogen.

CULTURE TEST. A laboratory test to grow samples of an infecting organism from discharge or samples of affected tissue.

CULTURING. Growing cells in a special substance, or media, in the laboratory.

CUMULATIVE. Increasing in effects or quantity by successive additions.

CUPPING. A type of percussion stroke in which the massage therapist strikes or thumps the muscles with cupped hands.

CURETTAGE. The removal of tissue or growths by scraping with a curette.

CUSHING'S SYNDROME. A disorder in which too much of the adrenal hormone, cortisol, is produced; caused perhaps by a pituitary or adrenal gland tumor.

CUT. Separation of skin or other tissue made by a sharp edge, producing regular edges.

CYANOSIS. A bluish tinge to the skin that can occur when the blood oxygen level drops too low.

CYCLOSPORIN. A drug that suppresses the immune system and has been used to treat severe psoriasis. Some research indicates that cyclosporin may increase the risk of skin cancer for psoriasis patients.

CYME. A flower cluster whose main branch ends in a flower that blooms before the others at its side or base.

CYSTIC FIBROSIS. A genetic disease that causes multiple digestive, excretory, and respiratory complications. Among the effects, the pancreas fails to provide secretions needed for the digestion of food.

CYSTINURIA. Excess cystine, lysine, arginine, and ornithine in urine due to defective transport system of these acids in kidney and intestines.

CYSTITIS. Painful inflammation of the urinary bladder caused by infection, irritation, allergy, or other causes.

CYSTOSCOPE. An instrument used to view and introduce treatments into the urinary tract.

CYSTOSCOPY. A procedure for examination of the interior of the bladder using an instrument introduced through the urethra into the bladder.

CYTOCHROME. A substance that contains iron and acts as a hydrogen carrier for the eventual release of energy in aerobic respiration.

CYTOKINES. Chemicals made by the cells that act on other cells to stimulate or inhibit their function. Cytokines that stimulate growth are called growth factors.

CYTOSTATIC. Suppressing the growth and multiplication of cells.

CYTOTOXIC. An agent that destroys the cells of a specific organ. Anticancer agents are cytotoxic.

D

DNA. Deoxyribonucleic acid. The chemical of chromosomes and hence the vehicle of heredity.

DSM-IV. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). This reference book, published by the American Psychiatric Association, is the diagnostic standard for most mental health professionals in the United States.

DTP. Diphtheria, tetanus, and whole-cell pertussis vaccine; no longer used in the United States.

DTAP. Diphtheria and tetanus toxoids and acellular Pertussis combination vaccine.

DAIDZEIN. An isoflavone contained in kudzu that appears to be useful in treating alcoholism.

DAILY VALUE (DV). The percentage of the RDA of a nutrient that is present in a food or supplement.

DAOISM. Also called Taoism, Dao means "the way." Daoism is a holistic spiritual philosophy of the universe that is based on the idea that all elements in the universe are interactive and interdependent with each other.

DARKFIELD. A technique of microscopic examination in which light is directed at an oblique angle through the slide so that organisms look bright against a dark background.

DAWN SIMULATION. A form of light therapy in which the patient is exposed while asleep to gradually brightening white light over a period of an hour and a half.

DE-BLOCKING PROTEIN FACTOR (DPF). A serum component used in IAT that is claimed to inactivate or remove BPF.

DE-GAS. To release and vent gases. New building materials often give off gases and odors and the air should be well circulated to remove them.

DEBRIDE. To surgically remove dead tissue. Noun: Debridement

DECIBEL. A unit of the intensity of sound, a measure of loudness.

DECIDUOUS. A tree or bush that sheds its leaves seasonally.

DECILITER. A fluid measurement that is equal to one-tenth of a liter, or 100 cubic centimeters (27 fluid drams or teaspoonfuls).

DECOCTION. A herbal extract produced by mixing an herb with cold water, bringing the mixture to a boil, and letting it simmer to evaporate the excess water. Decoctions are usually chosen over infusion when the botanical or herb in question is a root, seed, or berry.

DECONGESTANT. A drug that relieves nasal congestion.

DEFECATION. Passage of feces through the anus.

DEFINITIVE HOST. The host organism for the final (adult) stage in the life cycle of a parasite.

DEGENERATIVE DISEASES. A group of diseases characterized by progressive degenerative changes in tissue, including arteriosclerosis, diabetes mellitus, and osteoarthritis.

DEHYDRATION. A condition in which the body lacks the normal level of fluids, potentially impairing normal body functions.

DEHYDROEPIANDROSTERONE (DHEA). A hormone produced by the adrenal glands that is important in the synthesis of other hormones, especially estrogen and testosterone.

DELIRIUM TREMENS. A potentially fatal withdrawal syndrome in persons who have become physically dependent on alcohol or other drugs, characterized by shaking, sweating, hallucinations, nausea, and agitation.

DELUSION. A false belief that is resistant to reason or contrary to actual fact. Common delusions in schizophrenia include delusions of persecution, or delusions about one's importance (sometimes called delusions of grandeur).

DEMENTIA PRAECOX. A late nineteenth-century term for schizophrenia.

DEMENTIA. Irreversible mental deterioration.

DEMINERALIZATION. A loss or decrease of minerals in the bones.

DEMULCENT. A substance or agent used to soothe irritated mucous membranes.

DENATURED. Food that has been processed and is no longer of benefit to the body.

DENDRITES. Branching projections that grow out of a nerve cell.

DENTAL CARIES. A disease of the teeth in which microorganisms convert sugar in the mouth to acid, which then erodes the tooth.

DENTINE. The hard major portion of a tooth below the enamel.

DEPENDENCE. A state in which a person requires a steady concentration of a particular substance in order to avoid experiencing withdrawal symptoms.

DEPRESSION. A psychological condition that is characterized by feelings of sadness, sleep disturbance, fatigue, and inability to concentrate.

DERMATITIS. A condition where the skin is red and inflamed, often accompanied by pain and itching.

DERMATITIS HERPETIFORMIS. A chronic, very itchy skin disease with groups of red lesions that leave spots behind when they heal. It is sometimes associated with cancer of an internal organ.

DERMATOLOGIST. A physician specializing in the branch of medicine concerned with skin.

DERMATOPHYTE. A type of fungus that is parasitic on skin and causes a skin disease.

DERMOID TUMOR. A skin-like benign growth that may appear on the ovary and resemble a cyst.

DERVISH. A member of the Sufi order. Their practice of meditation involves whirling ecstatic dance.

DESENSITIZATION. A treatment for phobias which involves exposing the phobic person to the feared situation. It is often used in conjunction with relaxation techniques. Also used to describe a technique of pain reduction in which the painful area is stimulated.

DETOXIFICATION. The process of eliminating or neutralizing toxins in the body, thereby enabling the body to heal itself and restore health.

DEVIATED SEPTUM. A hole or perforation in the septum, the wall that divides the two nasal cavities.

DIABETES MELLITUS. A degenerative disease characterized by inadequate production or absorption of insulin, excessive urine production, and excessive amounts of sugar in the blood and urine.

DIABETES. A disease in which the body either cannot produce adequate amounts of insulin (type 1) or properly metabolize the hormone (type 2).

DIABETIC COMA. A life-threatening, reduced level of consciousness that occurs in persons with uncontrolled diabetes mellitus.

DIABETIC KETOACIDOSIS. A potentially serious condition in which ketones become present in the blood stream because of the metabolism of fats *burned* in lieu of carbohydrates that would normally be used, which occurs due to insufficient insulin.

DIABETIC PERIPHERAL NEUROPATHY. Dulled sensitivity of nerves to pain, temperature, and pressure particularly in the legs and feet.

DIABETIC RETINOPATHY. The tiny blood vessels to the retina, the tissues that sense light at the back of the eye, are damaged, leading to blurred vision, sudden blindness, or black spots, lines, or flashing light in the field of vision.

DIAGENESIS. Changes that occur in sediment or a sedimentary rock after deposition.

DIAGNOSIS. Means of determining health problems and general condition in a patient.

DIAN XUE. The Chinese name for acupressure. This form of massage can be done at home as well as by a trained therapist.

DIAPHORETIC. A substance or medication given to induce or promote sweating.

DIAPHRAGM BREATHING. Method of deep breathing using the entire lungs.

DIASTOLIC BLOOD PRESSURE. Blood pressure when the heart is resting between beats.

DIAZINON. A member of the organophosphate family of pesticides. This chemical causes nerve and reproductive damage.

DIETARY SUPPLEMENT. A product, such as a vitamin, mineral, herb, amino acid, or enzyme, that is intended to be consumed in addition to an individual's diet with the expectation that it will improve health.

DIETITIAN. A health care professional who specializes in individual or group nutritional planning, public education in nutrition, or research in food science.

DIGESTION. The body's process of breaking down food, extracting energy and nutrients, and eliminating unusable components.

DIGESTIVE ENZYMES. Proteins that catalyze the breakdown of large molecules (usually food) into smaller molecules.

DIGESTIVE TRACT. The long tubular structure that handles all digestion and the structures that connect to it, including the mouth, esophagus, stomach, and intestines.

DIGITALIS. A naturally occurring compound used in the preparation of the medication digoxin, prescribed to increase the heart rate and strengthen the force of the heart's contractions.

DIHYDROTESTOSTERONE (DHT). A testosterone metabolite implicated in the increase in size and number of prostatic cells.

DILATE. To expand in diameter and size.

DIMERCAPROL (BAL). A chemical agent used to remove excess lead from the body.

DIMMER. A molecule consisting of two identical simpler molecules.

DIOPTER (D). A unit of measure for describing the refractive power of a lens.

DIOSGENIN. A compound found in wild yam that has been used to make synthetic progesterone.

DIOXIN. A toxic chemical produced in the manufacture of some pesticides and herbicides.

DIOXYGENASE ENZYMES. Substances that accelerate the chemical reaction of oxygen molecules with an organic substrate.

DIPLEGIA. Paralysis of corresponding parts on both sides of the body.

DIRECT FLUORESCENT ANTIBODY TEST. A test in which a fluorescent dye is linked to an antibody for diagnostic purposes.

DIRECTION. Bringing about the free balance of the head on the spine and the resulting release of the erector muscles of the back and legs which establish improved coordination.

DIRTY BOMB. A bomb made with conventional explosives that also contains radioactive isotopes. When the bomb explodes, the radioactive material spreads contamination over a wide area.

DISACCHARIDE. A type of sugar that consists of two simpler (monosaccharide) sugars.

DISK. Dense tissue between the vertebrae that acts as a shock absorber and prevents damage to nerves and blood vessels along the spine.

DISSEMINATED. Scattered or distributed throughout the body.

DISSOCIATION. A reaction to trauma in which the mind splits off certain aspects of the traumatic event from conscious awareness. Dissociation can affect the patient's memory, sense of reality, and sense of identity.

DISSOCIATIVE AMNESIA. A disorder characterized by loss of memory for a period or periods of time in the patient's life.

DISTILLATE. The material obtained through the process of distilling (vaporized and condensed to separate out different compounds).

DISULFIRAM-LIKE POISON. Disulfiram is a chemical compound that causes a severe physiological reaction to alcohol. This poison behaves like disulfiram.

DISUSE ATROPHY. Condition of muscles that have lost size, strength, and function due to lack of mobility.

DITERPENE. An organic compound that contains only carbon and hydrogen arranged in a characteristic molecular structure; found commonly in plants and trees.

DIURETIC. A group of medications that increase the amount of urine produced and relieve excess fluid buildup in body tissues. Diuretics may be used in treating high blood pressure, lung disease, premenstrual syndrome, and other conditions.

DIURNAL. Events that happen in the daytime, daily; associated with circadian rhythms.

DIVINING. The act of locating an object using a special sense or instinct.

DOJO. A martial arts school.

DONEPEZIL. A drug commonly prescribed for Alzheimer's disease that provides temporary improvement in cognitive functions for some patients with mild-to-moderate forms of the disease.

DOPAMINE. A neurotransmitter that acts within certain brain cells to regulate movement and emotions.

DOPAMINE AGONIST (DA). A drug that binds to dopamine receptors on cell surfaces and mimics the effects of dopamine.

DOPAMINE RECEPTOR ANTAGONISTS (DAS). The older class of antipsychotic medications, also called neuroleptics. These primarily block the site on nerve cells that normally receives the brain chemical dopamine.

DORSAL RHIZOTOMY. A surgical procedure that cuts nerve roots to reduce spasticity in affected muscles.

DORSAL ROOT ENTRY ZONE (DREZ). A type of nerve surgery for postherpetic neuralgia that is occasionally used when the patient can get no other pain relief. The surgery destroys the area where damaged nerves join the central nervous system, thereby interfering with inappropriate pain mes

DOSHA. One of the three physical constitution types (vata, pitta, and kapha) in Ayurvedic medicine.

DOUBLE-BLIND PLACEBO CONTROLLED STUDY. A study in which neither the patient nor the drug administrator knows who is receiving the trial drug and who the placebo.

DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL. A study that uses two groups of subjects. One group (experimental group) receives the treatment being tested, while the other group (control group) receives a placebo. Neither the subjects nor the researchers know which subjects are in which group.

DOULA. A woman who assists an expectant mother with physical and emotional support during labor.

DOWN SYNDROME. A genetic disorder caused by an extra human chromosome 21 (trisomy 21), characterized by mental retardation, muscular weakness, and folds over the patient's eyelids.

DRUSEN. Yellowish-white fatty deposits on the retina, including the macula.

DUODENUM. The first of the three segments of the small intestine that connects the stomach and the jejunum. Most peptic ulcers are in the duodenum.

DYANA. The yoga term for meditation.

DYSBIOSIS. The condition that results when the natural flora of the gut are thrown out of balance, such as when antibiotics are taken.

DYSGLYCEMIA. Disrupted glucose regulation resulting in periods of hypoglycemia, hyperglycemia, elevated insulin and insulin resistance.

DYSKINESIA. An abnormal involuntary movement or tic.

DYSLEXIA. A term applied to a kind of learning disability particularly noted for reversals and spatial shifts, making reading, writing, spelling and math very difficult.

DYSMENORRHEA. Painful menstruation.

DYSMOTILITY. Abnormally slow or fast rhythmic movement of the stomach or intestine.

DYSPEPSIA. Recurrent or persistent pain in the upper abdomen.

DYSSOMNIA. A primary sleep disorder in which the patient suffers from changes in the quantity, quality, or timing of sleep.

DYSTHEMIA. A state of chronic, mild depression.

DYSTONIA. Painful involuntary muscle cramps or spasms; one of the extrapyramidal side effects associated with antipsychotic medications.

DYSTONIC. Describes the condition dystonia, in which fine motor control is confused.

DYSURIA. Painful or difficult urination.

E

ECCHYMOSIS (PLURAL, ECCHYMOSES). The medical term for a bruise, or skin discoloration caused by blood seeping from broken capillaries under the skin.

ECCRINE. A type of gland that produces a clear watery secretion without releasing cells or cell contents into the secretion.

ECHINACEA. A popular herbal remedy used to treat colds, the flu, and urinary tract infections.

ECLECTICS. Nineteenth-century herbal scientists in the United States who founded the Reformed Medical School. Their outlook was based on herbal medicines of practitioners in Europe and Asia and uses by Native Indians.

ECTOPIC PREGNANCY. A pregnancy that occurs outside the uterus, often in the fallopian tubes. The fetus will not survive, and in some cases, the pregnancy can result in the death of the mother.

ECZEMA. General term for a group of acute or chronic inflammatory skin conditions characterized by redness, thickening, oozing, and the formation of papules, vesicles, and crusts.

EDEMA. Water retention in the body that often causes swelling of the hands and feet.

EDETATE CALCIUM DISODIUM (EDTA CALCIUM). A chemical agent used to remove excess lead from the body.

EFFERENT. Motor signals that go from brain and spinal cord out to the muscles of the body.

EFFICACY. The power to bring about intended results.

EFFLEURAGE. A massage technique that involves light stroking with the palms or thumbs.

EFFUSION. A collection of fluid that has leaked out into some body cavity or tissue.

EICOSANOIDS. Hormone-like compounds thought to protect against cardiovascular disease.

EICOSAPENIAENOIC ACID. A type of acid derived from gamma-linoleic acid.

EJACULATORY INCOMPETENCE. Inability to ejaculate inside the vagina.

ELASTIN. A yellow fibrous protein that is the basic component of elastic connective tissue.

ELECAMPANE. A perennial herb with large yellow flowers used primarily as a digestive stimulant.

ELECTRICAL IMPEDANCE. This technique uses a small electrical current passing through the body. Fat impedes or slows down electrical current. The faster the current runs through the body, the less fat there is.

ELECTROCARDIOGRAPHY. A procedure for measuring heart activity.

ELECTROCAUTERY. A procedure in which heat from an electric current is used to perform surgical procedures.

ELECTRODESICCATION. To make dry, dull, or lifeless with the use of electrical current.

ELECTROLYTE. An ion, or weakly charged element, that conducts reactions and signals in the body. Examples of electrolytes are sodium and potassium ions.

ELECTROMAGNETIC ENERGY. Energy created by electromagnetism, the forces of electricity and magnetism.

ELECTROMYOGRAPHIC BIOFEEDBACK. A method for relieving jaw tightness by monitoring the patient's attempts to relax the muscle while the patient watches a gauge. The patient gradually learns to control the degree of muscle relaxation.

ELECTROMYOGRAPHY (EMG). A test in which a nerve's function is examined by stimulating the nerve with electricity and then measuring the speed and strength of the corresponding muscle's response.

ELECTRONYSTAGMOGRAPHY. A method for measuring the electricity generated by eye movements. Electrodes are placed on the skin around the eye and the individual is subjected to a variety of stimuli so that the quality of eye movements can be assessed.

ELECTRORETINOGRAM. An instrument for measuring electrical signals from a point in the macula.

ELEUTHEROSIDE. Active chemical found in Siberian ginseng.

ELIXIR. Similar to a liquid extract, sweetened, and with added aromatic principals, said to be one of the most common forms of liquid herbal medicines for oral consumption.

ELLAGIC ACID. A yellow crystalline compound derived from tannins and used to prevent bleeding. It is found in raspberries and is thought to help prevent cancer.

EMBOLI, EMBOLUS. Emboli is the plural form of embolus. Embolus refers to any mass of air, blood clot, or foreign body that travels through the bloodstream and is capable of lodging in smaller blood vessels where it can obstruct the blood flow to that vessel.

EMBOLISM. Obstruction or blockage in a blood vessel caused by an embolus.

EMBOLIZATION. A technique that shrinks fibroids by cutting off their blood supply.

EMBOLUS. A clot that forms in one place in the body and then travels and lodges elsewhere. Emboli is the plural of embolus.

EMBRYO. The result of fertilization of an egg by a sperm during the first eight weeks of development following conception. For the rest of pregnancy, the embryo is called a fetus.

EMESIS. An act or episode of vomiting.

EMETIC. A medication given to induce vomiting.

EMMENAGOGUE. An herb or medication that brings on a woman's menstrual period.

EMOLLIENT. A substance that softens and smoothes the skin.

EMPHYSEMA. An incurable, smoking-related disease, in which the air sacs at the end of the lung's bronchi become weak and inefficient. People with emphysema often first notice shortness of breath, repeated wheezing and coughing that brings up phlegm (mucus).

EMPYEMA. An infection that causes pus to accumulate in the pleural space which may cause a tear in the pleural membrane and allow the infection to spread to other areas in the body.

EMULSIFICATION. The process by which two immiscible liquids are dispersed into each other.

ENAMEL. The hard outermost surface of a tooth.

ENCEPHALITIS. Inflammation of the brain, usually caused by a virus. The inflammation may interfere with normal brain function and may cause seizures, sleepiness, confusion, personality changes, weakness in one or more parts of the body, and even coma.

ENCEPHALOPATHY. Swelling and degeneration of the brain.

ENDARTERECTOMY. A procedure in which the diseased inner portions of an artery, including any deposits, are removed.

ENDEMIC. Belonging or native to a particular locality or people.

ENDOCARDITIS. Inflammation of the lining of the heart, and/or the heart valves, caused by infection.

ENDOCRINE GLAND. A ductless gland, such as the pituitary, thyroid, or adrenal gland, that secretes its products directly into the blood or lymph.

ENDOCRINE SYSTEM. The network of glands that produces hormones and releases them into the bloodstream. The thyroid gland is part of the endocrine system.

ENDOCRINE. Refers to glands that secrete hormones circulated in the bloodstream or lymphatic system.

ENDOCRINOLOGIST. A physician who specializes in the diagnosis and treatment of endocrine system conditions, including thyroid dysfunction.

ENDODONTIST. A dentist who specializes in diagnosing and treating diseases of the pulp and other inner parts of the tooth.

ENDOGENOUS OPIOIDS. Natural pain relievers produced by the body that are also associated with the sensation of itching.

ENDOGENOUS. Produced or originating from the body.

ENDOMETRIAL IMPLANTS. Growths of endometrial tissue that attach to organs, primarily in the pelvic cavity.

ENDOMETRIAL. Pertaining to the endometrium, a mucous membrane lining the uterus.

ENDOMETRIOSIS. A condition in which the tissue that normally lines the uterus (endometrium) grows in other areas of the body, causing pain, irregular bleeding, and frequently, infertility.

ENDOMETRIUM. The tissue lining the uterus that grows and sheds each month during a woman's menstrual cycle.

ENDORPHINS. A group of chemicals resembling opiates that are released in the body in response to trauma or stress. Endorphins react with opiate receptors in the brain to reduce pain sensations.

ENDOSCOPE. A medical instrument that can be passed into an area of the body (e.g., the bladder or intestine) to allow examination of that area. The endoscope usually has a fiber-optic camera, which allows a greatly magnified image to be shown on a television screen.

ENDOSCOPY. A diagnostic procedure in which a tube is inserted through the mouth, into the esophagus and stomach. It is used to visualize various digestive disorders, including hiatal hernias.

ENDOTHELIUM. A thin layer of smooth tissue that lines the inside of blood vessels, the heart and abdomen, and other body cavities.

ENDURANCE. The ability to sustain an activity over a period of time.

ENERGY. Includes nonmaterial (such as Qi) as well as material (such as blood) vital forces that create and sustain life.

ENGRAM. A permanent trace left in nerve tissue by a stimulus; in psychology, a latent memory picture or lasting trace left in the psyche by any experience.

ENHANCED EXTERNAL COUNTERPULSATION (EECP). A noninvasive angina treatment that increases blood flow to the heart.

ENTERITIS. Inflammation of the bowels.

ENTEROPATHY. A disease of the intestinal tract.

ENTRAINMENT. The patterning of body processes and movements to the rhythm of music.

ENZYME. Any of a group of complex proteins that originate in living cells and help to break down organic compounds into simpler molecules.

ENZYME THERAPY. An alternative approach to the treatment of digestive disorders and other illnesses related to nutritional problems. Enzyme therapy emphasizes the use of animal- or plant-derived digestive enzymes as dietary supplements.

EOSINOPHILIA MYALGIA SYNDROME (EMS). A chronic, painful disease of the immune system that causes joint pain, fatigue, shortness of breath, and swelling of the arms and legs. EMS can be fatal.

EOSINOPHIL. A type of white blood cell that increases in number in response to certain medical conditions, such as allergy or parasitic infection.

EPICONDYLE. A projection on the surface of a bone; often an area for muscle and tendon attachment.

EPICONDYLITIS. A painful and sometimes disabling inflammation of the muscle and surrounding tissues of the elbow caused by repeated stress and strain on the forearm near the lateral epicondyle of the humerous (arm bone).

EPIDEMIC PAROTITIS. The medical name for mumps.

EPIDEMIC. A widespread regional disease outbreak.

EPIDEMIOLOGICAL STUDY. A study which analyzes health events and trends in particular patient populations.

EPIDERMIS. The outermost layer of skin cells.

EPIDURAL SPACE. The space immediately surrounding the outer most membrane of the spinal cord.

EPIGLOTTITIS. A serious bacterial infection that can develop rapidly and lead to airway obstruction.

EPILEPSY. A neurological disorder characterized by the sudden onset of seizures.

EPILEPTOLOGIST. A physician who specializes in the treatment of epilepsy.

EPINEPHRINE. Also called adrenalin, a secretion of the adrenal glands (along with norepinephrine) that helps the liver release glucose and limits the release of insulin. Norepinephrine is both a hormone and a neurotransmitter, a substance that transmits nerve signals.

EPISIOTOMY. A surgical incision of the vaginal opening made during childbirth to avoid tearing during delivery.

EPITHELIAL. Tissues that line cavities and body surfaces, such as the skin.

EPITHELIUM. The layer of tissue that covers body surfaces and lines the inner surfaces of body cavities and hollow organs.

EPSOM SALTS. A preparation of magnesium sulfate, used internally as a laxative or externally in compresses or warm baths to reduce swelling, inflammation, and itching from minor skin problems.

EPSTEIN-BARR VIRUS. A common herpes virus that is responsible for causing infectious mononucleosis. This virus is problematic in people who have a compromised immune system.

EQUINE-FACILITATED THERAPY. Another term for therapeutic riding.

EQUINOVARUS. A condition in which the foot is typically pulled inward.

EQUINUS. A common postural deformity, in which the foot is extended by the strong pull of the rear calf muscles, causing the toes to point.

ERECTILE DYSFUNCTION. Difficulty achieving or maintaining an erect penis.

ERGONOMICS. A branch of applied science that coordinates the physical design and arrangement of furniture, machines, and other features of a living or working environment with the needs and requirements of the individuals in that environment.

ERGOT PREPARATIONS. A classification of drugs made from a fungus, used primarily for the treatment of migraines.

ERUPTION. Emergence of teeth through the gums.

ERYTHEMA MIGRANS (EM). A red skin rash that is one of the first signs of Lyme disease in about 75% of patients.

ERYTHEMA. A diffuse red and inflamed area of the skin.

ERYTHROBLASTOSIS FETALIS. A disorder of newborn infants marked by a high level of immature red blood cells (erythroblasts) in the infant's blood.

ERYTHROCYTE SEDIMENTATION RATE (ESR). The rate at which red blood cells settle out in a tube of unclotted blood, expressed in millimeters per hour; elevated sedimentation rates indicate the presence of inflammation.

ERYTHROCYTES. Known as red blood cells, the ones that carry oxygen to every part of the body.

ERYTHROGENIC TOXIN. A toxin or agent produced by the scarlet fever-causing bacteria that causes the skin to turn red.

ERYTHROMYCIN. An antibiotic that can be used instead of penicillin.

ESCHAROTIC. A corrosive or caustic substance.

ESOPHAGITIS. Inflammation of the esophagus.

ESOPHAGUS. Muscular tube, about 10 in (25 cm) long, connecting the throat to the stomach.

ESSENCE. The constituent of a plant that determines its characteristics.

ESSENTIAL AMINO ACIDS. Amino acids that cannot be produced by the human body and that must, therefore, be included in daily diet.

ESSENTIAL FATTY ACID (EFA). A fatty acid that the body requires but cannot make. It must be obtained from the diet. EFAs include omega-6 fatty acids found in primrose and safflower oils, and omega-3 fatty acids oils found in fatty fish and flaxseed, canola, soybean, and walnuts.

ESSENTIAL OIL. A term describing a wide variety of concentrated plant-derived oils. They are often used to make soaps and perfumes, as well as being used extensively in natural medical remedies.

ESSENTIAL TREMOR. An uncontrollable (involuntary) shaking of the hands, head, and face. Also called familial tremor because it is sometimes inherited.

ESTRADIOL. A steroid hormone produced in the ovary, a highly potent form of estrogen.

ESTRIOL. A steroid hormone thought to be the metabolic byproduct of estrone and estradiol. It is produced in higher concentrations during pregnancy.

ESTROGENIC. A substance that promotes estrus, the state in which a woman is capable of conceiving.

ESTROGEN. A class of steroid hormones that are predominant in females. The term often refers to the three major estrogens: estriol, estradiol, and estrone.

ESTRONE. A steroid hormone that is metabolically weaker than estradiol but more potent thatn estriol.

ETHANOL. The chemical that causes the effects and aftereffects of drinking alcoholic beverages.

ETHEREAL. Something that is of or from the heavens, usually used in a metaphysical sense.

ETHNOBOTANY. The study of the plant lore and agricultural practices of a people or culture.

ETHNOMEDICINE. Medicine pertaining to a particular ethnic group.

EUSTACHIAN TUBE. A thin tube between the middle ear and the pharynx. Its purpose is to equalize pressure on either side of the ear drum.

EXACERBATIONS. Increase in severity of a disease or condition.

EXANTHEM (PLURAL, EXANTHEMS OR EXANTHEMATA). A skin eruption regarded as a characteristic sign of such diseases as measles, German measles, and scarlet fever.

EXCISION. The process of excising, removing, or amputating.

EXFOLIATE. To shed skin; in skin care, the process of removing dead skin cells.

EXOCRINE. Refers to a system of organs that produces chemicals that go through a duct (or tube) to reach other organs or body surfaces whose functioning they affect.

EXPECTORANT. A substance or medication given to bring up phlegm or mucus from the respiratory tract.

EXTENSOR MUSCLES. A group of muscles in the forearm that serve to lift or extend the wrist and hand. Tennis elbow results from overuse and inflammation of the tendons that attach these muscles to the outside of the elbow.

EXTRAPYRAMIDAL SYMPTOMS (EPS). A group of side effects associated with antipsychotic medications. EPS include parkinsonism, akathisia, dystonia, and tardive dyskinesia.

EXUVIUM. A cast-off shell of an insect or crustacean. Cicada in traditional Chinese medicine is made from the molted shell of a cicada.

F

FALLOPIAN TUBE. The tube leading from the ovary into the uterus.

FALSE-NEGATIVE. A laboratory result that does not detect the presence of a disease that is actually present.

FAMCICLOVIR. An oral antiviral drug that is available under the trade name Famvir. The drug prevents the varicella zoster virus from replicating.

FARSIGHTEDNESS. Being able to see more clearly those objects far away as opposed to those that are near. Also called hyperopic.

FASCIA. The sheet of connective tissue that covers the body under the skin and envelops every muscle, bone, nerve, gland, organ, and blood vessel. Fascia helps the body to retain its basic shape.

FASCICULATION. Small involuntary muscle contractions visible under the skin.

FASTING. Avoiding food for a period of time.

FATS. Long chains of fatty acids that are stored in animal tissue.

FATTY ACID. A long-chain carboxylic acid found in fats, oils, and other lipids.

FEBRIFUGE. A substance or medication that lowers or dispels fevers.

FEBRILE SEIZURE. Convulsions brought on by fever.

FEBRILE. Characteristic of fever.

FECES. Undigested food and other waste that is eliminated through the anus. Feces are also called fecal matter or stools.

FEEDBACK RESPONSE. A response to information carried back to the brain, or to other areas or glands from target tissues that generates a follow up response.

FELDENKRAIS. An educational method dedicated to improved movement and enhanced functioning originated by Moshe Feldenkrais (1904–1984), an engineer, physicist, and Judo expert.

FEMUR. The main bone in the human thigh and the strongest bone in the body.

FENFLURAMINE. An anorectic drug, withdrawn from the United States market in 1997 due to toxic effects.

FERRITIN. An iron storage protein found in the blood. High levels of serum ferritin may indicate iron overload.

FETUS. A developing unborn infant from the end of the eighth week after fertilization until birth.

FIBER. Nutrients in the diet that are not digested by the enzymes in the stomach and/or intestine.

FIBRINOGEN. A protein that is important in blood clotting.

FIBRINOLYSIS. The breakdown of fibrin, an insoluble protein that is the end product of blood clotting. Fibrinolysis results in the dissolution of small clots.

FIBROBLASTS. Found in connective tissue, these fat, oval cells help build fibrous tissue.

FIBROCARTILAGE. Cartilage that consists of dense fibers.

FIBROCYSTIC DISEASE. A common condition in middle-aged women, characterized by the growth of one or more cysts in the breasts. Cysts are small inclusions filled with fluid. These are harmless but may cause pain and tenderness.

FIBROIDS. Fibrous non-cancerous growths on the uterus or surrounding tissue.

FIBROMYALGIA. A chronic disease syndrome characterized by fatigue, widespread muscular soreness, and pain at specific points on the body.

FIBROSIS. The formation of fibrous, or scar, tissue which may follow inflammation and destruction of normal tissue.

FIGHT-OR-FLIGHT RESPONSE. The body's reaction to threats.

FIRE. An extremely high internal heat condition characterized by severe dehydration, red eyes, red face, constipation, insomnia, and agitation. Fire often affects Lungs, Liver, and Stomach.

FIRST-RANK SYMPTOMS. A list of symptoms that have been considered to be diagnostic of schizophrenia. These include delusions, somatic hallucinations, hearing voices commenting on one's behavior, and thought insertion or withdrawal.

FISTULA. An abnormal channel that creates an open passageway between two structures that do not normally connect.

FIVE ELEMENTS. The five basic substances (water, wood, fire, earth, and metal) that symbolize the fundamental qualities of the universe. In Chinese food cures, the five elements are correlated with the internal organs of the body and with the five basic food tastes.

FLAKE. A small, thin skin mass.

FLAVONE. A colorless crystalline compound found in skullcap and other plants that is the parent substance of a group of yellow plant pigments.

FLAVONOID. A food chemical that helps to limit oxidative damage to the body's cells and protects against heart disease and cancer.

FLUID EXTRACT. Made by simmering a plant and reducing the water until the mixture is thickened. This resulting liquid has a concentrated form of the active constituents of a plant. Alcohol, glycerin, or tincture of Benzoin may be added as a preservative.

FLUORESCEIN ANGIOGRAPHY. A method that uses a fluorescent dye for photographing blood vessels of the retina.

FLUORIDE. A mineral compound, taken orally or topically, used to strengthen teeth.

FLUOROQUINOLONES. A group of newer antibiotics that are used to treat penicillin-resistant staphylococcal infections.

FLUOROURACIL. An anticancer drug.

FLUOUROQUINOLONES. A group of medications used to treat bacterial infections in many different parts of the body. They are often used to treat bacteria

that have become resistant to penicillin and other antibiotics.

FOLATE. A vitamin used to treat a number of medical conditions.

FOLLICLE-STIMULATING HORMONE (FSH). A hormone that stimulates the development of egg follicles in the ovaries, egg maturation, and the production of estrogen.

FOLLICLE. The small sac at the base of a hair shaft. The follicle lies below the skin surface.

FOMITE. An inanimate object that can transmit infectious organisms.

FONTANELLE. A membrane-covered soft spot in an infant's skull where the bone has not yet completely formed.

FOOD ADDITIVE. A chemical added to food to enhance its flavor, color, appearance, shelf life, or some other quality. Food additives are regulated by the U.S. Food and Drug Administration (FDA).

FORENSIC. Pertaining to courtroom procedure or evidence used in courts of law.

FORMALDEHYDE. A chemical preservative used in many building materials such as adhesives, furnishings, and manufactured woods (plywood and particle board). It can cause eye, nose, and throat irritation and it has been listed as a cancer-causing agent.

FORSKOLIN. Chemical compound extracted from coleus root that appears to be effective in treating asthma, eczema, colic, and other conditions.

FRAGILE X SYNDROME. A genetic condition related to the X chromosome that affects mental, physical, and sensory development.

FREE OXYGEN RADICALS. Also called free radicals, these are by-products of oxygen that cause oxidative damage to the body's cells.

FREE RADICAL. A molecule with an unpaired electron that has a strong tendency to react with other molecules in DNA (genetic material), proteins, and lipids (fats), resulting in damage to cells. Free radicals are neutralized by antioxidants.

FREUDIAN ANALYSIS. A type of psychological treatment where the therapist seeks to help the patient resolve conflicts and traumas buried in the subconscious.

FRIEDREICH'S ATAXIA. An inherited disease that usually manifests in childhood or adolescence, characterized by loss of muscular coordination (ataxia), curvature of the spine, impaired speech, and cardiomyopathy.

FRUCTOSE. A type of natural sugar found in many fruits, vegetables, and in honey.

FUNCTIONAL CYST. A benign cyst that forms on the ovary and resolves on its own without treatment.

FUNCTIONAL FOOD. A food or food ingredient that is thought to confer health benefits in addition to the nutrients it contains.

FUNDOPLICATION. Surgical procedure that increases pressure on the LES (lower esophageal sphincter), reducing reflux.

FUNGICIDE. A substance that kills fungi.

FUNGUS. A plant that lacks both leaves and flowers, and lives on decaying matter. The fungi may be single-celled or grow quite large. The group of fungi includes molds, yeasts, smuts, and mushrooms.

FURANOSESQUITERPENES. A sub-class of compounds known as terpenes in the oils of plants and foods that do not contain an alcohol portion. These compounds tend to be found in volatile oils, and are related to the aroma of volatile and essential oils.

FUROCOUMARINS. A type of compound found in certain foods and plants including celery, limes, and angelica root, known to effect the skin and the immune system; may increase the risk of skin cancer.

FURUNCLE. The medical name for a boil.

G

GALACTOGOGUE. A substance that stimulates the production of breast milk in nursing mothers.

GAMMA LINOLENIC ACID (GLA). An essential fatty acid that is found in borage seed oil.

GAMMA RADIATION. High energy electromagnetic waves emitted in some nuclear reactions.

GANGRENE. A serious condition characterized by decay or death of an organ, tissue, or bone caused by a lack of oxygen and nutrients and by bacterial infections.

GASTRIC ACID. Also, stomach acid; helps break up fats and proteins for further digestion, aids in the absorption of nutrients through the walls of the intestines into the blood, and helps protect the gastrointestinal tract from harmful bacteria.

GASTRITIS. Inflammation of the stomach, particularly of its mucous membrane.

GASTROESOPHAGEAL REFLUX DISEASE (GERD). A disorder of the lower end of the esophagus, caused by stomach acid flowing backward into the esophagus and irritating the tissues.

GASTROINTESTINAL TRACT. The entire length of the digestive system, including the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus.

GASTROINTESTINAL. Pertaining to the stomach and intestine.

GAUCHER'S DISEASE. A rare genetic disease caused by a deficiency of enzymes needed for the processing of fatty acids.

GEL ELECTROPHORESIS. A laboratory test that separates molecules based on their size, shape, or electrical charge.

GENE THERAPY. A method of treating a disorder by replacing damaged or abnormal genes with normal ones.

GENERAL PARESIS. A form of neurosyphilis in which patients' personality, as well as their control of movement, is affected. Patients may develop convulsions or partial paralysis.

GENIOPLASTY. An operation performed to reshape the chin. Genioplasties are often done to treat OSA because the procedure changes the structure of the patient's upper airway.

GENISTEIN. A plant isoflavone, found as genistin in soy, that is used to produce ipriflavone.

GENOTYPE. The genetic makeup of an organism or group of organisms with respect to a biological trait or set of traits.

GENU VALGUS. Deformity in which the legs are curved inward so that the knees are close together, nearly or actually knocking as a person walks with ankles widely apart.

GENUS. With regard to botany, genus refers to a plant's classification. Plants within the same genus have one or more common characteristics.

GEOPATHIC STRESS. Any variation in normal energy patterns that some believe can cause illness.

GERMAN COMMISSION E. The world standard for regulatation of herbal products.

GERMANDER. A plant, *Teucrium chamaedrys*, that belongs to the mint family and may have been used to adulterate skullcap products reported to cause liver damage.

GERMICIDAL. Known to kill germs.

GESTALT THERAPY. A form of therapy that focuses on helping patients reconnect with their bodies and their feelings directly, as contrasted with verbal intellectual analysis.

GESTATION. Time of development in the uterus.

GHEE. Butter heated to removed the fat, used in Ayurvedic foods and remedies.

GHRELIN. A recently discovered peptide hormone secreted by cells in the lining of the stomach. Ghrelin is important in appetite regulation and maintaining the body's energy balance.

GILBERT'S SYNDROME. A mild hereditary form of jaundice.

GINGIVITIS. Inflamed and bleeding gums caused by poor dental hygiene, respiratory diseases, and other disease processes.

GINGKO BILOBA. A shade tree native to China that has fan-shaped leaves and fleshy seeds.

GINKGO EXTRACT. Made from the leaves of the *Ginkgo biloba* tree, this extract, used in other countries to treat circulatory problems, may also reduce the symptoms of patients with dementia.

GINSENG INTOXICATION. Possible side effects of taking *Panax ginseng* products.

GINSENOCIDES. Active chemicals found in American ginseng.

GLANDS. Collections of tissue that produce chemicals needed for chemical reactions elsewhere in the body.

GLAUCOMA. An eye disorder caused by damage to the optic nerve resulting in vision loss. Glaucoma is usually accompanied by inflammation and increased pressure in the eye (intraocular pressure). There are several types that may develop suddenly or gradually.

GLOBIN. One of the component protein molecules found in hemoglobin. Normal adult hemoglobin has a pair each of alpha-globin and beta-globin molecules.

GLOBUS PALLIDUS. Areas on each side of the brain that transmit signals controlling movement.

GLOMERULONEPHRITIS. A serious inflammation of the kidneys that can be caused by streptococcal

bacteria; a potential complication of untreated scarlet fever.

GLOSSOPHARYNGEAL NEURALGIA. Sharp recurrent pain deep in the throat that extends to the area around the tonsils and possibly the ear. It is triggered by swallowing or chewing.

GLOTTIS. The opening between the vocal cords at the upper part of the larynx.

GLUCAGON. A hormone produced in the pancreas that raises the level of glucose in the blood. An injectable form of glucagon, which can be bought in a drug store, is sometimes used to treat insulin shock.

GLUCAN. A complex sugar molecule consisting of smaller units of glucose.

GLUCOCORTICOIDS. A general class of adrenal cortical hormones that are mainly active in protecting against stress and in protein and carbohydrate metabolism. They are widely used in medicine as anti-inflammatories and immunosuppresives.

GLUCOSAMINE. A complex carbohydrate composed of glucose and an amino acid called glutamine. It is an important building block of cartilage and is often taken together with chondroitin as a treatment for osteoarthritis.

GLUCOSE 6 PHOSPHATE DEHYDROGENASE (G6PD) DEFICIENCY. A hereditary disorder that can lead to episodes of hemolytic anemia in combination with certain medications.

GLUCOSE. Simple sugar that serves as the main energy source for cells.

GLUTATHIONE PEROXIDASE. An enzyme that functions as an antioxidant, in the activation of other enzymes, and in the transport of minerals and amino acids. Human glutathione is dependent on selenium.

GLUTATHIONE. Formed from three amino acids (protein building blocks), glutathione is an antioxidant involved in cellular respiration, protection of red blood cells, and the detoxification by the liver of foreign substances.

GLUTEN. A protein found in wheat, rye, barley, and oats.

GLYCEMIC INDEX (GI). A numeric scale for measuring the level and speed of blood glucose increase that carbohydrate-containing food creates upon consumption.

GLYCEMIC. The presence of glucose in the blood.

GLYCOPROTEINS. Complex proteins that protect immune factors and growth factors from being broken down by stomach acids. Glycoproteins are also called protease inhibitors.

GLYCOSAMINOGLYCANS. Any of a group of polysaccharides with high molecular weight that contain amino sugars and often form complexes with proteins.

GLYCOSIDE. An herbal carbohydrate that exerts powerful effect on hormone-producing tissues. The glycoside breaks down into a sugar and a non-sugar component.

GLYCYRRHIZIN. A sweet-tasting compound in licorice root that has a number of beneficial effects on the cardiovascular and digestive systems.

GNRH ANTAGONISTS. A group of medications that affect the reproductive hormones. These medications are used to treat fibroids, endometriosis, and infertility.

GOBO. A variety of burdock that can be used as a vegetable for soups and salads. It is sometimes known as Japanese burdock.

GOITER. Swelling of the thyroid gland caused by under or over production of thyroxine.

GONADS. Organs that produce sex cells—the ovaries and testes.

GONIOSCOPE. An instrument that consists of a magnifier and a lens equipped with mirrors and sits on the patient's cornea.

GONOCOCCUS. The bacterium *Neisseria gonorrheae* , which causes gonorrhea, a sexually transmitted infection of the genitals and urinary tract that may occasionally affect the eye, causing blindness if not treated.

GOSSYPOL. A chemical found in cotton seed oil that is thought to immobilize sperm.

GOUT. A disease causing inflammation of the joints, especially the knees, toes, and fingers due to the deposit of crystallized uric acid in the joints.

GRAM POSITIVE BACTERIA. Bacteria that turn purple in the Gram staining process. They lack a secondary outer membrane that allows dye to enter and stain the bacterial cell.

GRAM-POSITIVE/NEGATIVE. A classification system that differentiates bacteria into two classes based upon staining characteristics determined by the composition of the cell wall. Usnea are effective against gram-positive bacteria.

GRANULATION TISSUE. Small, red, bumpy, velvety-looking tissue produced during the healing of wounds.

GRANULES. Small packets of reactive chemicals stored within cells.

GRANULOCYTOPENIA. A condition characterized by a deficiency of white blood cells.

GRAVE'S DISEASE. A condition produced by excessive production of thyroid hormones, characterized by and enlarged thyroid gland and protruding eyeballs.

GUIDED IMAGERY. Use of relaxation and mental visualization to improve mood and/or physical wellbeing.

GUILLAIN-BARRÉ SYNDROME. Also called acute idiopathic polyneuritis, a neurologic syndrome that can cause numbness in the limbs and muscle weakness following certain viral infections.

GUMMA. A symptom that is sometimes seen in tertiary syphilis, characterized by a rubbery swelling or tumor that heals slowly and leaves a scar.

GUT FLORA. A term used to describe all of the microorganisms living in the digestive system.

H

H_2 ANTAGONIST. A type of drug that relieves indigestion by reducing the production of stomach acid.

HDL CHOLESTEROL. High-density lipoprotein cholesterol is a component of cholesterol that helps protect against heart disease. HDL is nicknamed "good cholesterol."

HLA-B27. An antigen or protein marker on cells that may indicate the possibility of ankylosing spondylitis.

HMG-COA REDUCTASE. Hepetic hydroxy-methyl-glutaryl coenzyme A is an enzyme created in the liver that promotes the production of cholesterol.

HABIT. Referring to the particular set of physical and mental tensions present in any individual.

HACHIMIJIOGAN. A Chinese herbal formula that is thought to protect the eyes against cataracts by increasing the glutathione content of the lens.

HAIR FOLLICLES. Tiny organs in the skin, each one of which grows a single hair.

HAIRY LEUKOPLAKIA OF THE TONGUE. A white area of diseased tissue on the tongue that may be flat or slightly raised. Caused by the Epstein-Barr virus, it is an important diagnostic sign of AIDS.

HALLUCINATION. False sensory perceptions. A person experiencing a hallucination may hear sounds or see people or objects that are not really present. Hallucinations can also affect the senses of smell, touch, and taste.

HALLUCINOGEN. A substance that causes the perception of a stimulus or object when it is not really present.

HASHIMOTO'S DISEASE. A condition in which the body makes antibodies to destroy the thyroid; tendency toward this disease is thought to be inherited.

HATHA YOGA. Form of yoga using postures, breathing methods and meditation.

HEALING CRISIS. A temporary worsening of the patient's symptoms during successive stages of homeopathic treatment.

HEARTBURN. A popular term for an uncomfortable burning sensation in the stomach and lower esophagus, sometimes caused by the reflux of small amounts of stomach acid.

HEAT CONDITION. A disease whose symptoms include fever, rashes, redness, dehydration, and inflammation.

HEAT. In traditional Chinese medicine (TCM), a disease condition characterized by intolerance for cold, deficient fluids, and irritability, among other things.

HEAVY METAL POISON. A metal with a specific gravity greater than about 5.0, that is poisonous, such as lead or mercury.

HEAVY METALS. Chemical elements that have a specific gravity (a measure of density) at least four times that of water, generally with harmful effects on the human body.

HEBEPHRENIC SCHIZOPHRENIA. An older term for what was later known as the disorganized subtype of schizophrenia.

HEBERDEN'S NODES. Swelling or deformation of the finger joints closest to the fingertips.

HELICOBACTER PYLORI. A gram-negative rod-shaped bacterium that lives in the tissues of the stomach and causes inflammation of the stomach lining.

HELMINTH. A general term for a parasitic worm.

HEMATOLOGIST. A physician who specializes in the study of blood and diseases of the blood.

HEMATURIA. A condition in which red blood cells are present in the urine. Blood in the urine may be readily visible or small amounts may give the urine a smoky appearance.

HEME. The iron-containing molecule in hemoglobin that serves as the site for oxygen binding.

HEMIPLEGIA. Paralysis of one side of the body.

HEMOCHROMATOSIS. Also known as iron overload; a genetic condition in which excess iron is stored in the tissues and organs by the body where it can build up to toxic amounts.

HEMODIALYSIS. The blood processing procedure used when kidney function is lost. Blood is removed from a vein, processed through a dialysis machine (artificial kidney), and put back into a vein.

HEMOGLOBIN. An iron-containing pigment of red blood cells composed of four amino acid chains (alpha, beta, delta, gamma) that delivers oxygen from the lungs to the tissues of the body.

HEMOGLOBIN A. Normal adult hemoglobin which contains a heme molecule, two alpha-globin molecules, and two beta-globin molecules.

HEMOGLOBIN S. Hemoglobin that is produced in association with the sickle cell trait; the beta-globin molecules of hemoglobin S are defective.

HEMOLYSIS. The destruction or breakdown of red blood cells.

HEMOLYTIC ANEMIA. A blood disorder characterized by destruction of red blood cells.

HEMOLYTIC. Referring to the destruction of the cell membranes of red blood cells, resulting in the release of hemoglobin from the damaged cell.

HEMOPHILIA. A blood-clotting disorder that can lead to serious hemorrhage from minor cuts and injuries.

HEMORRHAGE. Rapid high-volume loss of blood.

HEMORRHOID. A varicose vein in the area around the anus. Hemorrhoids sometimes cause pain and bleeding.

HEMOSTATIC. A substance used to stop bleeding or hemorrhaging. Yarrow has hemostatic properties.

HEPATIC ENCEPHALOPATHY. Brain and nervous system damage that occurs as a complication of liver disorders.

HEPATIC. An herb that acts as a liver tonic.

HEPATITIS. A viral infection of the liver.

HEPATOTOXIC. Poisonous to the liver.

HERALD PATCH. The initial skin eruption of pityriasis rosea, usually on the back or chest, that occurs a week or two before the main outbreak. It is sometimes called the mother patch.

HERB. In naturopathy, a plant or plant derivative or extract prescribed for health or healing.

HERNIATED. Characterized by an abnormal protrusion of a body part. In a herniated disk, the disk protrudes into the spinal canal between the vertebrae.

HERPES SIMPLEX VIRUS. A virus that can cause fever and blistering on the skin, mucous membranes, or genitalia.

HERPES ZOSTER VIRUS. Acute inflammatory virus attacking the nerve cells on the root of each spinal nerve with skin eruptions along a sensory nerve ending.

HIATAL HERNIA. Protrusion of part of the stomach through the diaphragm to a position next to the esophagus.

HIATUS. Opening in the diaphragm through which the stomach connects to the esophagus.

HIGH SELF. The Huna term for the level of the personality that functions as a guardian spirit and forms the person's connection with God.

HIGH SPOT. An area of a tooth or restoration that feels abnormal or uncomfortable because it hits its opposing tooth before other teeth meet.

HIPPOCAMPUS. A horseshoe-shaped ridge in the brain that is part of the limbic system. The hippocampus is associated with the formation of short-term memory and with the sense of spatial orientation.

HIRSUITISM. The growth of excess hair on the bodies of women, usually due to a hormone imbalance.

HISTAMINE RECEPTOR 2 (H2) BLOCKER. Heartburn medication that reduces the production of stomach acid.

HISTAMINE. A substance released from cells that causes some of the symptoms of an allergic reaction.

HODGKIN'S DISEASE. A type of cancer characterized by slowly enlarging lymph tissue; symptoms include generalized itching.

HOLISTIC. A practice of medicine that focuses on the whole patient, and addresses the social, emotional, and spiritual needs of a patient as well as their physical treatment.

HOMEOPATHY. The principal known as like cures like, the use of minute quantities of remedies that if used in large doses would produce the effects of the disease being treated.

HOMEOSTASIS. The statch the body has reached its optimal level of internal balance and stability.

HOMOCYSTEINE. An amino acid produced from the metabolism of other amino acids. High levels are an independent risk factor for heart disease.

HONOKIOL. A compound derived from magnolia that is used in some Japanese herbal preparations as a mild tranquilizer. Honokiol may also be useful in treating lung cancer.

HOOK-UP. A state of effortless connection with a life-enhancing force.

HORDEOLUM. The medical term for stye; an infection or small abscess formation in the hair follicle glands of the eyelids.

HORMONE. A chemical messenger secreted by a gland and released into the blood, where it travels to distant cells to exert an effect.

HORMONE REPLACEMENT THERAPY (HRT). The use of estrogen and progesterone to replace hormones that the ovary no longer supplies. HRT is no longer used as long-term therapy for postmenopausal women.

HORMONE THERAPY. Treatment that inhibits the production of hormones such as testosterone and estrogen.

HOT FLASH. A temporary sensation of warmth that starts in the chest and radiates into the neck and face, usually associated with the menopause in women. It is sometimes called a hot flush.

HUBBARD TANK. A large water tank or tub used for underwater exercises.

HUMAN CHORIONIC GONADOTROPIN (HCG). A hormone produced by the placenta during pregnancy.

HUMAN IMMUNODEFICIENCY VIRUS (HIV). A transmissible retrovirus that causes AIDS in humans. Two forms of HIV are recognized: HIV-1, which causes most cases of AIDS in Europe, North and South America, and most parts of Africa; and HIV-2, which is chiefly found in West African patients.

HUMAN PAPILLOMAVIRUS. 120 types of viruses, about 30 of which are sexually transmitted and cause genital warts and cervical cell changes.

HUNTINGTON'S CHOREA. A hereditary disease that typically appears in midlife, marked by gradual loss of brain function and voluntary movement. Some of its symptoms resemble those of schizophrenia.

HUNTINGTON'S DISEASE. A fatal inherited disorder characterized by progressive neurologic symptoms including loss of motor and cognitive function.

HYDRODISTENTION. Filling the bladder with fluid for the purpose of examining the internal bladder with a cystoscope.

HYDROGEN PEROXIDE. A colorless, unstable compound of hydrogen and oxygen (H_2O_2). An aqueous solution of hydrogen peroxide is used as an antiseptic and bleaching agent.

HYDROGENATED FAT. Unsaturated fat, commonly vegetable oil, that is processed with high heat and hydrogen to make it solid at room temperature. Margarine is a common hydrogenated fat.

HYDROTHERAPY. The use of water (hot, cold, steam, or ice) to relieve discomfort and promote physical well-being. Also called water therapy.

HYPERALIMENTATION. A method of refeeding anorexics by infusing liquid nutrients and electrolytes directly into central veins through a catheter.

HYPERAROUSAL. A state or condition of muscular and emotional tension produced by hormones released during the fight-or-flight reaction.

HYPERBARIC OXYGEN THERAPY (HBO). A form of oxygen therapy in which the patient breathes oxygen in a pressurized chamber.

HYPEREMESIS. Severe vomiting during pregnancy. Hyperemesis appears to increase a woman's risk of postpartum depression.

HYPERGLYCEMIA. A condition of having too much glucose or sugar in the blood.

HYPERHIDROSIS. A condition in which a person produces excessive amounts of perspiration.

HYPERKALIMIA. Excessive amount of potassium in the blood that serves as an indicator of the possible serious complications in bodily functions.

HYPERLIPIDEMIA. A condition characterized by abnormally high levels of lipids in blood plasma.

HYPERMAGNESEMIA. A condition in which the levels of magnesium in body fluids are too high, almost always caused by a combination of low calcium levels and taking too much magnesium as a dietary supplement.

HYPERMETABOLIC. Conditions that increase the rate of metabolism, such as fever and hyperthyroidism.

HYPERPLASIA. A condition in which cells, such as those making up the prostate gland, divide abnormally rapidly and cause the organ to become enlarged.

HYPERPLASTIC OBESITY. Excessive weight gain in childhood, characterized by an increase in the number of new fat cells.

HYPERREFLEXIA. Reflexes that are abnormally brisk.

HYPERSENSITIVITY. A condition in which very small amounts of allergen can cause the airways to constrict and bring on an asthmatic attack.

HYPERSOMNIA. Excessive sleeping (can be from 9–20 hours, or more); a symptom of dysthymic and major depressive disorder.

HYPERTENSION. Abnormally high arterial blood pressure, which if left untreated can lead to hear disease and stroke.

HYPERTHYROIDISM. Excess functioning of the thyroid gland, resulting in overproduction of the thyroid hormones.

HYPERTROPHIC OBESITY. Excessive weight gain in adulthood, characterized by expansion of already existing fat cells.

HYPERTROPHY. A term for enlargement, as in BPH (benign prostatic hypertrophy).

HYPERURICEMIA. High levels of uric acid in the bloodstream.

HYPNOGOGIC HALLUCINATIONS. Dream-like auditory or visual hallucinations that occur while falling asleep.

HYPNOSIS. A sleeplike condition that can be artificially induced in people, in which they are susceptible to suggestions from the hypnotist.

HYPNOTIC. Capable of inducing sleep.

HYPOCALCEMIA. Calcium deficiency in the blood.

HYPOCRETINS. Chemicals secreted in the hypothalamus that regulate the sleep/wake cycle.

HYPOGLYCEMIA. A condition characterized by abnormally low levels of glucose in the blood.

HYPOKALEMIA. A condition in which the levels of potassium in the bloodstream are too low.

HYPOMAGNESEMIA. A condition of magnesium deficiency, the symptoms of which include heart arrhythmias, muscle tremors or twitches, seizures, hyperactive reflexes, and psychiatric symptoms.

HYPOMANIA. A milder form of mania that is characteristic of bipolar II disorder.

HYPONATREMIA. Abnormally low levels of sodium in the blood, often related to dehydration.

HYPOPNEA. Shallow or excessively slow breathing usually caused by partial closure of the upper airway during sleep.

HYPOTHALAMUS. A gland in the forebrain that controls heartbeat, body temperature, thirst, hunger, body temperature and pressure, blood sugar levels, and other functions.

HYPOTHALAMUS. The part of the brain that controls the endocrine system.

HYPOTHYROIDISM. A condition that is characterized by decreased activity of the thyroid gland (a hormone-producing gland at the front of the neck) that often results in weight gain, tiredness, dry skin, and other symptoms.

HYPOTONIC. Describes the condition hypotonia, in which fine motor control is floppy, without tone.

HYSTERECTOMY. Removal of the uterus by surgery either to remove tumors, treat cancer or precancerous conditions. Surgery is performed through the abdominal wall or through the vagina.

I

ICTERUS. Another name for jaundice.

IDEAL WEIGHT. Weight corresponding to the lowest death rate for individuals of a specific height, gender, and age.

IDIOPATHIC. Of unknown cause. Primary Raynaud's is an idiopathic disorder.

ILEOSTOMY. The removal of a pouch at the end of the small intestine.

ILLITE. A family of hydrous potassium aluminosilicate clays, characterized by a three-layer structure and a gray, light green, or yellow-brown color.

IMMUNE FUNCTION. The body's defense system against bacteria, viruses and fungi, and any malfunction of the organism.

IMMUNE RESPONSE. The protective reaction by the immune system against foreign antigens (substances that the body perceives as potentially dangerous). The

immune system combats disease by neutralizing or destroying antigens.

IMMUNE SUPPRESSING. Any substance or event that reduces the activity of the immune system.

IMMUNE SYSTEM. The system of specialized organs, lymph nodes, and blood cells throughout the body that work together to prevent foreign organisms (bacteria, viruses, fungi, etc.) from invading the body.

IMMUNOCOMPROMISED. Having a damaged immune system.

IMMUNODEFICIENT. A condition in which the body's immune response is damaged, weakened, or is not functioning properly.

IMMUNOFLUORESCENT ASSAY. A laboratory technique using a fluorescent dye and a special microscope to identify the cause of an infection.

IMMUNOGLOBULIN G (IGG). Immunoglobulin type gamma, the most common type found in the blood and tissue fluids.

IMMUNOGLOBULINS. A group of globulin proteins that function as antibodies.

IMMUNOSUPPRESSIVE. Anything that acts to suppress or weaken the body's immune system, thus making it more susceptible to disease.

IMMUNOTHERAPY. Treatment of cancer by stimulating the body's immune defense system.

IMPETIGO. A bacterial infection of the skin characterized by skin blistering.

IMPOTENCE. Refers to a condition where the penis is unable to get erect or stay erect.

IMPACTED TOOTH. A tooth that is growing against another tooth, bone, or soft tissue.

IN VITRO TESTING. A test performed in a lab setting rather than in a human or animal organism. The test may involve living tissue or cells, but takes place out of the body.

IN VITRO. A Latin phrase that literally means "in the glass." It refers to an entity or process developed in a laboratory or similar controlled nonliving environment.

IN VIVO TESTING. A test performed on a living organism, such as a controlled clinical study involving human test subjects. In vivo is Latin for "in the living body."

IN VIVO. Literally, "in life," referring to laboratory experiments that make use of living organisms.

INCONTINENCE. Inability to control bladder or bowel movements.

INCONTINENTIA PIGMENTI SYNDROME (IPS). An inherited skin disorder characterized by blistered lesions in infancy, which heal but leave uneven pigmentation of the skin.

INCUBATION PERIOD. The time it takes for a person to become sick after being exposed to a disease.

INDEX CASE. The first case of a contagious disease in a group or population that serves to call attention to the presence of the disease.

INDIVIDUALIZED EDUCATIONAL PLAN (IEP). A plan that guides the delivery of services to a child with special education needs.

INDOCYANIN GREEN ANGIOGRAPHY. A sensitive method for examining retinal blood vessels.

INFERTILITY. Inability to have children.

INFEST. To be parasitic in a host.

INFLAMMATION. A localized reaction to tissue injury or damage, usually characterized by pain, swelling, and redness.

INFLUENZA. A virus that affects the respiratory system, causing fever, congestion, muscle aches, and headaches.

INFUSION. An herbal preparation made by adding herbs to boiling water and then steeping the mixture to allow the medicinal herb to infuse into the water.

INHIBITION. Referring to the moment in an Alexander lesson when the student refrains from beginning a movement in order to avoid tensing of the muscles.

INK BAG. The part of a cuttlefish that contains their dye, also known as sepia.

INNERVATE. To supply a part of the body with nerves. For example, the vagus nerve supplies nerve function to the eardrum; therefore, we say that the eardrum is innervated by the vagus nerve.

INSECTICIDES. Any substance used to kill insects.

INSOMNIA. A prolonged and usually abnormal inability to obtain adequate sleep.

INSULIN RESISTANCE. Also called metabolic syndrome, a condition in which the body fails to properly respond to the insulin it produces.

INSULIN. A hormone produced by the pancreas that helps to regulate blood sugar levels.

INTEGRATIVE MEDICINE. A medical approach that brings together and uses aspects of conventional and alternative medicines.

INTENTION TREMOR. A rhythmic purposeless shaking of the muscles that begins with purposeful (voluntary) movement. This tremor does not affect muscles that are resting.

INTERFERON. An immune protein produced by cells in the body to fight viral infections.

INTERMEDIATE HOST. The host organism for an intermediate (larval) stage in the life cycle of a parasite.

INTERMITTENT CLAUDICATION. Calf pain that occurs while walking and is relieved at rest, and related to restricted blood flow to the legs.

INTERNAL DERANGEMENT. A condition in which the cartilage disc in the temporomandibular joint lies in front of its proper position.

INTERNATIONAL UNIT (IU). A widely accepted definition that is used to quantify a given substance.

INTERSTITIAL CYSTITIS. An inflammatory, and sometimes scarring, condition of the bladder that affects many women.

INTERSTITIAL SPACES. Areas of the body occurring outside the vessels or organs, between the cells.

INTESTINAL DYSBIOSIS. An imbalance among the various microorganisms that live in the digestive tract.

INTESTINAL FLORA. The beneficial bacteria that live in the digestive tract and aid digestion of food.

INTESTINAL MICROFLORA. The bacteria and other microorganisms that live in the human gastrointestinal tract.

INTESTINES. Also called the bowels and divided into the large and small intestine. They extend from the stomach to the anus, where waste products exit the body. The small intestine is about 20 ft (6.1 m) long and the large intestine, about 5 ft (1.5 m) long.

INTRACELLULAR. Inside a cell.

INTRAVENOUS (IV) THERAPY. Administration of fluids through the veins.

INTRAVENOUS FLUIDS. In cases of immediate need for hydration, nourishment, or medicine, a needle with tubing is inserted directly into the vein.

INTRAVENOUS. Within a vein.

INTUBATION. Surgical procedure whereby a tube is inserted into the windpipe of a seriously ill patient to facilitate breathing.

INULIN. A carbohydrate belonging to a class of compounds known as fructans. Inulin fiber is resistant to digestion in the upper gastrointestional tract, so it reaches the large intestine essentially intact.

IODINE. A trace mineral used by the body to produce thyroid hormones.

IQ. Intelligence quotient; a measure of intellectual functioning determined by performance on standardized intelligence tests.

IRIS. The colored ring of muscle that controls the amount of light allowed to reach the retina.

IRRADIATION. The act of exposing something to ultraviolet rays or x rays.

IRRITABLE BOWEL SYNDROME (IBS). A functional disturbance of the lower intestine that can cause bloating, cramping, abdominal pain, diarrhea, constipation, and painful bowel movements.

ISCHEMA. Local anemia due to mechanical obstruction, mainly arterial narrowing, of the blood supply.

ISCHEMIC. Insufficient blood supply to a specific organ or tissue.

ISLES OF LANGERHANS. Cellular masses of tissue in a space within the pancreas that secrete insulin.

ISOFLAVONES. Compounds, including plant estrogens, with two phenolic rings, that are found in significant quantities in soybeans and soy foods. Isoflavones belong to the larger category of flavonoids, plant compounds that are often a source of the plant fruit.

ISOMER. Two compounds that have the same molecular formulas but different chemical structures.

ISOQUINOLINE ALKALOID. Natural compound found in plants that may be toxic to humans and animals, but also possesses therapeutic qualities.

ISOTOPE. An unstable form of an element that gives off radiation to become stable. An isotope of an element has the same number of protons as the element, but a different number of neutrons, and therefore, a different mass number than that of the element.

ISOTRETINOIN. A drug that decreases sebum production and dries up acne pimples.

ITAI-ITAI DISEASE. The first reported cases of cadmium poisoning in the world, seen in Japan in about 1950. The name means "ouch-ouch" and represents the sufferers' screams of pain.

J

JACUZZI. A trademark name for a whirlpool bath.

JARISCH-HERXHEIMER REACTION. A temporary reaction to penicillin treatment for syphilis that includes fever, chills, and worsening of the skin rash or chancre.

JAUNDICE. A condition characterized by higher-than-normal levels of bilirubin in the bloodstream and an accompanying yellowing of the skin and eyes.

JOINT. Structures holding two or more bones together.

JUNGIAN ANALYSIS. A method of psychological treatment where the patient strives to understand the internal, often mythic images in his or her thoughts and dreams.

K

KAHUNA. A traditional Hawaiian village leader responsible for physical and spiritual healing; some specialize in herbs, others in massage.

KAMPO. Traditional Japanese system of herbal medicine.

KAPOSI'S SARCOMA. A cancer of the connective tissue that produces painless purplish red (in people with light skin) or brown (in people with dark skin) blotches on the skin. It is a major diagnostic marker of AIDS.

KARATE. A native Okinawan fighting style brought to Japan in the early twentieth century.

KAVALACTONES. Medically active compounds in kava root that act as local anesthetics in the mouth and as minor tranquilizers.

KELOIDS. An excessive overgrowth of collagen scar tissue, often found in young women and African Americans.

KERATOCONUS. A progressive condition in which the cornea takes on a cone shape, causing major changes in the eye's refractive power.

KESHAN DISEASE. A form of heart disease in children, first discovered in the Keshan region of China. It may represent a selenium deficiency syndrome.

KETOACIDOSIS. A condition due to starvation or uncontrolled type 1 diabetes. Ketones are acid compounds that form in the blood when the body breaks down fats and proteins. Symptoms include abdominal pain, vomiting, rapid breathing, extreme tiredness, and drowsiness.

KETOCONAZOLE. An antifungal medication.

KETOGENIC DIET. A diet that results in energy produced through the metabolism of fatty acids, usually from stored fat. By eating a very high amount of fat (80%) and low amounts of carbohydrates and protein, the body burns stored fat. Close medical supervision required.

KETONES. The potentially toxic by-products of partially burned fatty acids that the body uses as an alternative fuel source when carbohydrates are not available.

KETOSIS. An abnormal accumulation of ketones in the body, usually found in people who have diabetes mellitus or who are fasting, pregnant, starving, or on a high fat diet. Ketosis can cause serious side effects including dehydration, kidney stones, or gall stones.

KIDNEY DIALYSIS. A process by which blood is filtered through a dialysis machine to remove waste products that would normally be removed by the kidneys. The filtered blood is then circulated back into the patient; also called renal dialysis.

KIDNEY STONES. Hard lumpy masses of mineral wastes that are formed in the kidneys and may cause blockages.

KINESIOLOGY. The study of the anatomy and physiology of body movement, particularly in relation to therapy.

KNEE AND ANKLE JERK REFLEXES. Normal reflexes elicited usually by testing with a reflex hammer and demonstrating, by being present, a healthy and intact nervous system.

KOOSH BALL. A lightweight, "furry" ball of rubber band material used in Davis technique exercises for retraining neuropathways in the brain of a person with dyslexia.

KOPLIK'S SPOTS. Tiny spots occurring inside the mouth, especially on the inside of the cheek. These spots consist of minuscule white dots (like grains of

salt or sand) set onto a reddened bump. Unique to measles.

KUNDALINI. In yoga, energy that resides at the base of the spine and can be channeled upward for spiritual awakening.

KUNDALINI YOGA. A type of yoga that focuses on the body's innate psychospiritual energy (*kundalini shakti* or "serpent power" in Sanskrit) through breathing exercises, meditation, yoga postures, and chanting.

KUNG FU. Another name for qigong; today it more commonly means a Chinese martial arts practice.

L

LACERATION. Also called a tear. Separation of skin or other tissue by a tremendous force, producing irregular edges.

LACTIC ACID BACTERIA (LAB). Bacteria that convert carbohydrates to lactic acid as a major metabolic product.

LACTIC ACID. A by-product of muscular work out; slow clearance of lactic acid from tissues is associated with muscular fatigue.

LACTO-OVO VEGETARIAN. People who do not eat meat, but do consume dairy products and eggs.

LACTOBACILLUS ACIDOPHILUS. A bacteria found in yogurt that changes the balance of the bacteria in the intestine in a beneficial way.

LACTOFERRIN. A protein found in colostrum that carries iron to red blood cells and appears to have anticancer activity.

LACTOSE. A sugar found in milk and milk products. Some people are lactose intolerant, meaning they have trouble digesting lactose. Lactose intolerance can produce symptoms resembling those of IBS.

LACTOSE INTOLERANCE. An inability to properly digest milk and dairy products.

LAETRILE. The chemical amygdalin, obtained from apricots, peaches, and bitter almonds.

LAMINITIS. A veterinary term for inflammation in the foot of a horse.

LANCEOLATE. Narrow, leaf shape that is longer than it is wide and pointed at the end.

LANUGO. A soft, downy body hair that develops on the chest and arms of anorexic women.

LAPACHOL. The name given to the active ingredient in pau d'arco, which appears to have some anticancer properties.

LAPAROSCOPE. An instrument that allows a surgeon to look into the abdominal cavity through a small incision and perform surgery on a small area.

LAPAROSCOPY. An examination of the interior of the abdomen with a lighted tube called a laparoscope.

LAPAROTOMY. Surgical operation performed to open the abdomen for inspection of the internal organs, or as a preliminary step to additional surgery.

LARYNX. A part of the respiratory tract between the pharynx and the trachea, having walls of cartilage and muscle, and containing the vocal cords.

LASER-ASSISTED IN-SITU KERATOMILEUSIS (LASIK). A procedure that uses a cutting tool and a laser to modify the cornea and correct moderate to high levels of myopia (nearsightedness).

LATCHING. A term used to describe a baby's mouth hold on his or her mother's nipple.

LATENT PERIOD. Also called incubation period, the time between infection with a disease-causing agent and the development of disease.

LATENT. A nonactive virus in a dormant state within a cell. Herpes virus is latent in the nervous system.

LATERAL NAIL FOLD. The fold of skin along the side of the nail.

LAW OF SIMILARS. The basic principle of homeopathic medicine that governs the selection of a specific remedy. It holds that a substance of natural origin that produces certain symptoms in a healthy person will cure those same symptoms in a sick person.

LAWS OF CURE. A set of three rules used by homeopaths to assess the progress of a patient's recovery.

LAXATIVE. Promotes evacuation of the bowels.

LAZY BOWEL SYNDROME. An inability to have a bowel movement without the aid of chemical laxatives.

LDL CHOLESTEROL. Low-density lipoprotein cholesterol is the primary cholesterol molecule. High levels of LDL increase the risk of coronary heart disease. LDL is nicknamed "bad cholesterol."

LEAKY GUT. Intestinal permeability caused by damage to the intestinal mucosa, which leads to increase in the toxic load placed on the liver.

LECITHIN. A fatty substance found in plant and animal material, particularly egg yolk.

LEFT BRAIN. The left cerebral hemisphere, which controls activity on the right side of the body in humans. The left brain is thought to be specialized for language use and mathematical calculation; it is also associated with logical analysis and fact-based decisions.

LEGUME. A family of plants used for food that includes beans, peas, and lentils. Legumes are high in protein, fiber, and other nutrients.

LEIOMYOMA. The medical term for a benign mass in muscle tissue. Uterine fibroids are one type of leiomyoma.

LEISHMANIASIS. A disease of the tropics transmitted by sandflies.

LEMON BALM. An herb with antiviral properties that is also used to alleviate anxiety or insomnia. The botanical name for lemon balm is *Melissa officinalis*.

LENS. The transparent, elastic, curved structure behind the iris (colored part of the eye) that helps focus light on the retina. Also refers to any device that bends light waves.

LENTINAN. A compound found in shiitake mushrooms that helps to boost the immune system.

LEPROSY. A chronic disease characterized by lesions on the body, especially the face, that enlarge and spread if left untreated, leading to paralysis, muscle wasting, and deformities.

LEPTIN. A protein hormone that affects feeding behavior and hunger in humans. At present it is thought that obesity in humans may result in part from insensitivity to leptin.

LESION. An area of skin that has been infected or diseased.

LEUCINE. An amino acid produced by the hydrolysis of proteins by pancreatic enzymes during digestion and by putrefaction of nitrogenous organic matter.

LEUKOCYTES. Also called white blood cells, the ones that fight infection and boost the immune system.

LEUKORRHEA. Also known as yeast infection, a fungal infection of the vagina producing a thick white discharge.

LEUKOTRIENES. Substances that are produced by white blood cells in response to antigens and contribute to inflammatory and asthmatic reactions.

LEVODOPA. A naturally occurring amino acid that is converted to dopamine in the brain; the primary treatment for Parkinson's disease.

LICHEN PLANUS. A noncancerous, chronic, itchy skin disease that causes small, flat purple plaques on wrists, forearm, and ankles.

LICHEN. An organism consisting of algal and fungal partners living together in a mutually beneficial relationship.

LICORICE ROOT. An herb believed to be helpful in treating ulcers, respiratory problems, and a variety of other conditions.

LIGAMENT. A fibrous band of tissue connecting cartilage or bones that serves to strengthen and support joints.

LIGASE CHAIN REACTION. A laboratory technique for detecting sexually transmitted disease organisms in urine by rapidly copying and recopying the organism's DNA, thus making the presence of infection easier to detect.

LIGATION. Tying off a blood vessels or other tube with wire or suture, usually during surgery.

LIMBIC SYSTEM. A group of structures in the brain that includes the hypothalamus, amygdala, and hippocampus. The limbic system plays an important part in regulation of human moods and emotions.

LINDANE. An organic chloride, neurotoxic insecticide that kills lice.

LINOLEIC ACID. An essential fatty acid that is found in sesame oil.

LIPASE. An enzyme that is used by the body to break down dietary fats (lipids), especially triglycerides, into a form that can be absorbed in the intestines.

LIPID. Any of a variety of substances that, along with proteins and carbohydrates, make up the main structural components of living cells.

LIPOPOLYSACCHARIDE. A complex carbohydrate with lipids (organic fats and waxes) attached to its molecule.

LIPOPROTEIN(A). A type of bad cholesterol that increases the risk of heart attack or stroke.

LIPOSUCTION. The surgical removal of fatty tissue underneath the skin through a small incision in the skin.

LIPOTROPIC. Substances that help prevent or correct excessive fat deposits in liver.

LITHONTRIPIC. Phytochemical effect that acts to prevent the formation of kidney or gall stones and facilitates dissolution and removal when formed.

LITHOTRIPSY. A nonsurgical technique for removing gallstones by breaking them apart with high-frequency sound waves.

LIVER ENCEPHALOPATHY. A condition in which the brain is affected by a buildup of toxic substances that would normally be removed by the liver. The condition occurs when the liver is too severely damaged to cleanse the blood effectively.

LOBECTOMY. Surgical removal of an entire lobe of the lung.

LOBELINE. An alkaloid compound found in lobelia that resembles nicotine in its pharmacological effects. It has been studied by researchers in the field of tobacco addiction and drug abuse.

LOCKJAW. Refers to a common name given to the disease taken from its most pervasive symptom.

LODESTONE. A variety of magnetite that possesses magnetic polarity.

LOTUS SUTRA. One of the most sacred texts of Buddhism, regarded as a summary of the supreme Buddhist teaching that leads one directly to enlightenment.

LOW SELF. The Huna term for the subconscious mind. The word "low" does not mean inferior in value, but refers only to what is below the level of consciousness.

LOW-DENSITY LIPOPROTEIN. LDL, the so-called bad cholesterol.

LOWER BURNER. A TCM term for the kidneys.

LOWER ESOPHAGEAL SPHINCTER (LES). Muscle at the base of the esophagus that opens to allow food to enter the stomach and closes to prevent reflux back into the esophagus.

LOZENGE. A medicated candy intended to be dissolved slowly in the mouth to soothe irritated tissues of the throat.

LUES MALIGNA. A skin disorder of secondary syphilis in which areas of ulcerated and dying tissue are formed. It occurs most frequently in HIV-positive patients.

LUMBOSACRAL. Referring to the lower part of the backbone or spine.

LUMPECTOMY. A surgical procedure in which only the cancerous tumor in the breast is removed, together with a rim of normal tissue.

LUNGS. In TCM, the parts of the body associated with breathing, such as the lungs and the skin. It also regulates the movement of water and qi through the body channels.

LUMBAGO. Lower back pain caused by rheumatoid arthritis, muscle strain, osteoarthritis, or a ruptured spinal disk.

LUMBAR PUNCTURE (LP). A medical test in which a very narrow needle is inserted into a specific space between the vertebrae of the lower back in order to draw a sample of CSF for further examination. Also referred to as a spinal tap.

LUMBAR SPINE. The segment of the human spine above the pelvis that is involved in low back pain. There are five vertebrae, or bones, in the lumbar spine.

LUMBAR VERTEBRAE. Five bones in the lower spine.

LUPUS ERYTHEMATOSUS. An autoimmune disease that can damage skin, joints, kidneys, and other organs.

LUPUS NEPHRITIS. Kidney damage associated with systemic lupus erythematosis, an autoimmune disease. The kidney damage is gradual, but leads to complete kidney failure.

LUPUS. Either of two inflammatory diseases affecting connective tissue, one largely confined to the skin, the other affecting the joints and internal organs.

LUTEIN. An antioxidant carotenoid found in large quantities in dark-green, leafy vegetables such as spinach and kale. Lutein is deposited on the lens and macula of the eye where it protects cells from damage caused by ultraviolet and blue light.

LUX. The International System unit for measuring illumination, equal to one lumen per square meter.

LYME BORRELIOSIS. Another name for Lyme disease.

LYME DISEASE. A chronic, recurrent inflammatory disease carried by deer ticks and caused by a spirochete.

LYMPH NODES. Small bean-shaped structures that are scattered along the lymphatic vessels. These nodes serve as filters and retain any bacteria or cancer cells that are traveling through the system.

LYMPHATIC SYSTEM. The vessels, nodes, and organs that carry the clear lymph fluid, containing lymphocytes and other white blood cells throughout the body, and that filter the blood to remove dead cells and other debris.

LYMPHOCYTE. A type of white blood cell that is important in the formation of antibodies and that can be used to monitor the health of AIDS patients.

LYMPHOMA. Cancer of the lymph nodes.

LYMPH. An alkaline fluid found in the lymphatic vessels that is usually clear, transparent fluid, unless it is draining from the intestines when it then appears milky.

M

MACROBIOTICS. A diet emphasizing grains, certain vegetables, legumes, and fish.

MACROCYTIC ANEMIA. A condition caused by cobalamin deficiency, which is characterized by red blood cells that are too few, too fragile, and abnormally large.

MACROPHAGE. Specialized cells present throughout the lymphoid tissues of the body that circulate in the bloodstream. Macrophages have a surface marker that stimulates other cells to react to an antigen.

MACULAR DEGENERATION. Deterioration of part of the retina, causing progressive loss of vision. This is the most common cause of blindness in the elderly.

MACULA. An area of 0.1–0.2 in (3–5 mm) at the center of the retina that is responsible for sharp, central vision.

MAGNETIC RESONANCE IMAGING (MRI). An imaging technique that uses a large circular magnet and radio waves to generate signals from atoms in the body. These signals are used to construct detailed images of internal body structures and organs, including the brain.

MAGNETISM. A discredited theory put forth by Viennese physician Franz Anton Mesmer stating that all persons possess magnetic forces that can be used to influence magnetic fluid in other people and therefore effect healing.

MAJOR MINERAL. One of three important inorganic elements in human nutrition, distinguished from trace elements (minor minerals) and electrolytes. Magnesium is a major mineral, along with calcium and phosphorus.

MALABSORPTION PROBLEMS. A condition in which the intestinal tract is not able to absorb adequate nutrients from the food that passes through it (e.g., celiac disease, inflammatory bowel disease).

MALABSORPTION. The inability of the digestive tract to absorb all the nutrients from food due to some malfunction or disability.

MALADAPTIVE. Unsuitable; maladaptive behavior is behavior that is inappropriate to a given situation.

MALATHION. An organic phosphate, neurotoxic insecticide that kills lice.

MALIGNANT HYPERTHERMIA. A rare, inherited condition in which a person develops a very high fever when given certain anesthetics or muscle relaxants in preparation for surgery.

MALIGNANT MELANOMA. The most deadly of the three types of skin cancer.

MALIGNANT. Meaning cancerous and tending to spread to surrounding tissues.

MALNUTRITION. Any disorder of nutrition caused by insufficient or unbalanced diet that can result in impaired absorption or use of foods.

MALOCCLUSION. The misalignment of opposing teeth in the upper and lower jaws.

MAMMOGRAPHY. X-ray imaging of the breast that can often detect lesions in the tissue too small or too deep to be felt.

MANA. The Hawaiian word for life energy. According to Huna, mana can be transferred from the conscious mind into parts of the body needing healing or into talismans or crystals to charge them with energy.

MANDALA. A design, usually circular, that appears in religion and art. In Buddhism and Hinduism, the mandala has religious ritual purposes and serves as a yantra (a geometric emblem or instrument of contemplation).

MANDIBLE. The medical name for the lower jaw.

MANIA. Hyperelevated, or excessively excited mood.

MANOMETRY. Procedure that measures pressure. In esophageal manometry, a thin, flexible catheter is placed down the esophagus to measure pressure at various points.

MANTRA. A sacred word or formula that is repeated as an incantation to focus the mind and spirit, or to induce a mystical state.

MARTIAL ARTS. Group of diverse activities originating from the ancient fighting techniques of the Orient.

MASSAGE. A rubbing or kneading with hands or other parts of the body to stimulate circulation, make joints more supple, and relieve tension.

MAST CELLS. A type of immune system cell that is found in the lining of the nasal passages and eyelids and participates in the allergic response by releasing histamine.

MASTITIS. Inflammation of the breast.

MASTOID PROCESS. The rounded protrusion of bone that can be felt just behind the ear.

MATERIA MEDICA. In homeopathy, reference books compiled from the findings/effects of the various natural remedies, drugs and herbs.

MATURATION. The process by which stem cells transform from immature cells without a specific function into a particular type of blood cell with defined functions.

MAZE. A network of paths or passages intended to confuse, with numerous choices at different points. Unlike a labyrinth, a maze often has high walls intended to block the visitor's line of sight.

MCCUNE-ALBRIGHT SYNDROME (MCAS). A genetic syndrome characterized in girls by the development of ovarian cysts and puberty before the age of 8, together with abnormalities of bone structure and skin pigmentation.

MEDIAN NERVE. A nerve that runs through the wrist and into the hand. It provides sensation and some movement to the hand, the thumb, the index finger, the middle finger, and half of the ring finger.

MEDICINE BUNDLE. A leather bag or animal skin in which a Native American healer carries herbs, stones, and various ritual objects as a sign of his or her healing powers.

MEDITATION. A practice of concentrated focus upon a sound, object, visualization, the breath, movement, or attention itself in order to increase awareness of the present moment, reduce stress, promote relaxation, and enhance personal and spiritual growth.

MEDITERRANEAN DIET. A low-cholesterol diet that emphasizes vegetables and fish, and limits consumption of red meat and eggs.

MEFLOQUINE. An antimalarial drug that was developed by the United States Army in the early 1980s. Today, malaria resistance to this drug has become a problem in some parts of Asia (especially Thailand and Cambodia).

MEGA-DOSES. Very high doses of vitamins intended to treat a variety of ailments, as recommended by orthomolecular practitioners.

MEGALOBLASTIC ANEMIA. A condition caused by cobalamin deficiency, which is characterized by red blood cells which are too few, too fragile, and abnormally large. Also known as macrocytic anemia.

MEGALOBLAST. A large erythroblast (a red marrow cell that synthesizes hemoglobin).

MELANIN. A biological pigment that gives color to skin, hair, and the iris of the eye.

MELANOCYTE. The pigment-producing cell in the epidermis that produces malanin and determines skin color.

MELANOMA. A highly malignant form of skin cancer associated with overexposure to ultraviolet radiation from sunlight.

MELATONIN. A naturally occurring hormone involved in regulating the body's internal clock.

MENARCHE. The first menstrual period or the establishment of the menstrual function.

MENIERE'S DISEASE. The combination of vertigo and decreased hearing caused by abnormalities in the inner ear.

MENINGES. The three-layer membranous covering of the brain and spinal cord, composed of the dura, arachnoid, and pia. It provides protection for the brain and spinal cord, as well as housing many blood vessels and participating in the appropriate flow of CSF.

MENINGITIS. An infection or inflammation of membranes of the brain and spinal cord.

MENISCOCYTOSIS. Another word for sickle cell disease.

MENISCUS. Crescent-shaped disks of cartilage located on the head of the tibia that serve as shock absorbers.

MENOPAUSE. The permanent cessation of menstruation; also called the change of life or climacteric.

MENORRHAGIA. Excessive bleeding at the time of a menstrual period, either in amount of blood or number of days, of both.

MENSTRUATION. A monthly occurrence of blood and uterine material discharge from a woman's vagina while she is in her reproductive years.

MENTASTICS. The active phase of Trager therapy. Mentastics are a form of movement reeducation in which clients learn to reexperience movement as pleasurable and positive.

MERCURY. A metallic element appearing as a silver-colored liquid at ordinary temperatures.

MERIDIAN. In traditional Chinese medicine, meridians are the invisible channels that run beneath the skin and through which the body's energy (chi) flows.

MESOTHELIOMA. A tumor consisting of spindle cells or fibrous tissue, usually in the lining of the lung.

META-ANALYSIS. An analysis of previous medical studies.

METABOLIC. Pertaining to metabolism, or the chemical processes that take place in the body, which result in growth, energy, elimination of waste, and other body functions.

METABOLISM. Biochemical processes related to the breakdown of food and its conversion into energy.

METABOLITE. A by-product of the physical and chemical change process known as metabolism.

METABOLIZE. For food and nutritional components, to convert food into energy and then break it down into simpler substances for excretion.

METASTASIZE. The spread of cancer to an area away from its original site.

METATES. Stone slabs used by Native Americans to grind corn and other grains.

METFORMIN. An anti-diabetic drug of the biguanide class. This drug increases the sensitivity of cells to insulin, but is capable of causing very severe adverse reactions, including lactic acidosis and anemia.

METHAMPHETAMINE. A form of amphetamine that is a potent stimulant of the central nervous system and is highly addictive.

METHANOL. A liquid alcohol, used as a solvent or denaturant for ethanol.

METHIONINE. An amino acid that provides benefits for the liver, as well as for conditions such as osteoarthritis, depression, fibromyalgia, and a host of other medical issues.

METHYLATION. The process by which a methyl group ($-CH_3$) is added to some compound, ion, or other chemical species.

METRONIDAZOLE. An anti-infective agent regarded as the best available drug for treating trichomoniasis. It is sold under the trade names Flagyl and MetroGel.

MIASM. In homeopathy, a hereditary weakness of the constitution and a corresponding predisposition to chronic disease.

MICROANGIOPATHIC. Pertaining to disorders of the small blood vessels.

MICROFLORA. Beneficial bacteria in the intestines. Microflora reinforce the barrier function of the intestinal mucosa to help prevent the attachment of pathogenic microorganisms and the entry of allergens.

MICRONIZED. A crystal that is ground to a very fine powder.

MICRONUTRIENT. An element essential to health that is required only in very small amounts. Micronutrients are sometimes called trace elements.

MIDDLE EAR. The inner portion of the ear made up of an air-filled chamber, which is separated from the outer ear by the tympanic membrane.

MIDDLE SELF. The Huna term for the conscious mind, including the ability to reason. The middle self is what others recognize as an individual's personality.

MIGRAINE. A severe headache, often accompanied by nausea and vomiting. It is usually experienced on one side of the head, and may be preceded by visual symptoms.

MILIARY TUBERCULOSIS. A form of TB in which the bacillus spreads through all body tissues and organs, producing many thousands of tiny tubercular lesions. Miliary TB is often fatal unless promptly treated.

MILK ALKALI SYNDROME. A disorder of the kidneys caused by long-term treatment of ulcers with antacids, particularly alkaline compounds such as sodium bicarbonate, and large amounts of calcium.

MIND'S EYE. A term referring to an imaginary point from which the mind views what the eyes look at or what the imagination presents.

MINERALS. Chemical elements that are found in plants and animals and are essential for life. There are two types of minerals: major minerals, which the body requires in large amounts, and trace elements, which the body needs only in minute amounts.

MINI-MENTAL STATUS EXAMINATION (MMSE). A brief test of memory and cognitive function that is used to evaluate the presence and extent of memory loss and to monitor the effects of treatment for memory loss.

MIOTIC. A drug that causes pupils to contract.

MISCARRIAGE. Case when a fetus is prematurely ejected from the uterus during pregnancy.

MISO. A fermented paste made from soybeans, salt, and rice or barley, used to flavor soups and sauces in Asian cooking.

MITE. An insect parasite belonging to the order Acarina. The organism that causes scabies is a mite.

MITTELSCHMERZ. A German word for the pain that some women experience at ovulation.

MIXED MANIA/MIXED STATE. A mental state in which symptoms of both depression and mania occur simultaneously.

MODALITY. A factor or circumstance that makes a patient's symptoms better or worse. Modalities include such factors as time of day, room temperature, external stimuli, the patient's level of activity, sleep patterns, etc.

MOHS SURGERY. A type of micrographic surgery for removal of a visible tumor. Mohs surgery has a high cure rate (up to 99% for certain types of new lesions and 95% for recurrent cancers), with minimal removal of healthy surrounding tissue.

MONACOLIN. An HMG-CoA reductase inhibitor, which assists in the lowering of cholesterol levels.

MONOAMINE OXIDASE (MAO-B) INHIBITORS. Drugs such as selegiline that inhibit the enzyme MAO-B that breaks down dopamine in the brain.

MONOAMINE OXIDASE INHIBITOR (MAOI). An antidepressant drug that prevents the breakdown of monoamine neurotransmitters (such as serotonin) in the gaps between nerve cells. Nardil and Parnate are common MAOI brands.

MONOCLONAL ANTIBODY. A protein substance that is produced in the laboratory from a single clone of a B-cell, the type of cell of the immune system that makes antibodies. Monoclonal antibodies are used in cancer treatment.

MONOCYTE. A large white blood cell that is formed in the bone marrow and spleen.

MONOMER. A molecule that can combine with others to form a dimmer or a polymer.

MONONUCLEOSIS. A flu-like illness caused by the Epstein-Barr virus.

MOOD DISORDER. A group of mental disorders involving a disturbance of mood, along with either a full or partial excessively happy (manic) or extremely sad (depressive) syndrome not caused by any other physical or mental disorder. Mood refers to a prolonged emotion.

MORBIDITY. The unhealthiness or disease characteristics associated with a mental disorder.

MOTHER TINCTURE. The first stage in the preparation of a homeopathic remedy, made by soaking a plant, animal, or mineral product in a solution of alcohol.

MOTILITY. The movement or capacity for movement of an organism or body organ. Indigestion is sometimes caused by abnormal patterns in the motility of the stomach.

MOTOR NEURON. A nerve cell that specifically controls and stimulates voluntary muscles.

MOXIBUSTION. A technique of treatment in which the practitioner warms the skin over vital qi points by holding a burning herbal wick above the skin.

MRI (MAGNETIC RESONANCE IMAGING). The diagnostic technique which provides high quality cross-sectional images of organs or structures within the body through the use of a high-speed magnetic imaging device.

MUCILAGE. A gummy or gel-like substance present in plants.

MUCILAGINOUS. Having a moist, soft, and sticky quality. The inner rind of slippery elm bark is an example of a mucilaginous plant product.

MUCOPOLYSACCHARIDE. An older term for a class of large sugar molecules that are found in cartilage and other forms of connective tissue. Mucopolysaccharides are called glycosaminoglycans.

MUCOUS MEMBRANES. Thin sheets of tissue that cover and protect body passages that open to the outside. These membranes secrete mucus and absorb water and various salts.

MUCUS. The slippery secretion of the mucous membranes of the respiratory tract.

MUGWORT-SPICE SYNDROME. A type of food allergy that occurs in people who are sensitized to mugwort, celery, carrots, and other spices. It often takes the form of a skin rash.

MULLEIN. A plant related to the figwort, used by Native Americans to treat inflammations. It is still recommended by naturopaths to reduce the discomfort of swimmer's ear.

MULTIPLE CHEMICAL SENSITIVITY. A condition characterized by severe and crippling allergic reactions to commonly used substances, particularly chemicals. Also called environmental illness.

MULTIPLE ENDOCRINE NEOPLASIA. Tumor formation characterized by a progressive, abnormal multiplication of cells that are not necessarily malignant in any of the glands that secrete chemicals directly into the blood stream, such as the thyroid gland, adrenal glands, or ovaries.

MULTIPLE SCLEROSIS (MS). A progressive, autoimmune disease of the central nervous system characterized by damage to the myelin sheath that covers nerves. In most types, the disease, which causes progressive paralysis, is marked by periods of exacerbation and remission.

MUSCLE BALANCE AND FUNCTION DEVELOPMENT (MBF). A movement therapy that strives to realign body posture through a series of exercises.

MUTATION. A change in a gene's DNA. Whether a mutation is harmful is determined by the effect on the product for which the gene codes.

MYALGIA. Muscle pain.

MYASTHENIA GRAVIS. A muscle weakness that occurs because the body makes antibodies to the natural chemical that facilitates transmission of impulses between the nerve and the muscle.

MYCELIUM. Fine thread-like tendrils that are capable of invading body organs and are sent out by a fungus to seek nutrition.

MYCOBACTERIA. A group of bacteria that includes *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis, and other forms that cause related illnesses.

MYCOBACTERIUM AVIUM (MAC) INFECTION. A type of opportunistic infection that occurs in about 40% of AIDS patients and is regarded as an AIDS-defining disease.

MYELIN. A whitish fatty substance that acts like an electrical insulator around certain nerves in the peripheral nervous system.

MYELOGRAPHY. A medical test in which a special dye is injected into a nerve to make it visible on an x ray.

MYOCARDIAL INFARCTION. A blockage of a coronary artery that cuts off the blood supply to part of the heart. In most cases, the blockage is caused by fatty deposits.

MYOCARDIUM. The thick middle layer of the heart that forms the bulk of the heart wall and contracts as the organ beats.

MYOPATHY. Any abnormal condition or disease of muscle tissue, characterized by muscle weakness and wasting.

MYOSIN. A protein found in muscle tissue that interacts with another protein called actin during muscle contraction.

MYOSITIS. Inflammation of the muscle.

MYOTHERAPY. A form of trigger point therapy that relies on deep massage of the trigger points rather than injections to relieve pain.

MYOTONIA. The inability to normally relax a muscle after contracting or tightening it.

MYRCENE. A compound found in the essential oil of lemongrass that has pain-relieving properties.

MYRINGOTOMY. A surgical procedure performed to drain an infected middle ear. A newer type of myringotomy uses a laser instead of a scalpel.

MYXEDEMA. A condition that can result from a thyroid gland that produces too little of its hormone.

N

N-ACETYLCYSTEINE (NAC). A compound amino acid and antioxidant that protects the liver, supports the immune system, and helps break up mucous.

NAIL PLATE. The plate covering the tips of the fingers and toes. Commonly called the nail.

NARCOLEPSY. A lifelong sleep disorder marked by four symptoms: sudden brief sleep attacks, cataplexy, temporary paralysis, and hallucinations.

NARCOTIC. Capable of inducing deep sleep or unconsciousness.

NASOGASTRIC INTUBATION. Insertion of a tube through the nose and mouth for delivery of food and oxygen.

NASOPHARYNX. The part of the airway leading into the nose.

NATURAL KILLER (NK) CELL. A lymphocyte that acts as a primary immune defense against infection.

NATURALIZED. Plants that are introduced in the wild.

NATUROPATHIC MEDICINE. An alternative system of healing that uses homeopathy, herbal medicine, and hydrotherapy, and rejects most conventional drugs as toxic.

N.D. OR DOCTOR OF NATUROPATHIC MEDICINE. In some states, Naturopathic doctors, medically trained in diagnostics and natural and alternative therapies, are licensed as Naturopathic physicians. In other states, they may be licensed or registered as Naturopathic doctors.

NEARSIGHTEDNESS. Being able to see more clearly those objects that are near as opposed to those in the distance. Also called myopia.

NEBULIZER. A device that delivers medicine into the airways in the form of a mist.

NECROSIS. Localized tissue death due to disease or injury, such as a lack of oxygen supply to the tissues.

NEGATIVE AIR IONIZATION. A procedure by which air molecules are ionized to produce an environment similar to summer air, in which negative ions are more common than they are in winter air.

NEGATIVE SYMPTOMS. Symptoms of schizophrenia that represent a loss or reduction of normal functioning.

NEMATODES. Roundworms, which are parasitic intestinal worms resembling earthworms.

NEOPLASIA. The development of new, abnormal tissue.

NEPHRECTOMY. Surgical removal of a kidney.

NEPHRITIS. An inflammation or irritation of the kidney.

NERVE. Fibers that carry sensory information, movement stimuli, or both from the brain and spinal cord to other parts of the body and back again. Some nerves, including the vagus nerve, innervate distantly separated parts of the body.

NERVINE. A medication or preparation given to calm the nervous system.

NERVOUS TIC. A repetitive, involuntary action, such as the twitching of a muscle or repeated blinking.

NEURAL TUBE DEFECT. Incomplete development of the brain, spinal cord, or vertebrae of a fetus, which is sometimes caused by a folic acid deficiency.

NEURALGIA. Severe pain caused by irritation of, or damage to, a nerve.

NEURALLY MEDIATED HYPOTENSION. A rapid fall in blood pressure that causes dizziness, blurred vision, and fainting, and is often followed by prolonged fatigue.

NEURASTHENIA. Nervous exhaustion. A disorder with symptoms of irritability and weakness, commonly diagnosed in the late 1800s.

NEURODERMATITIS. An itchy skin disease (also called lichen simplex chronicus) found in nervous, anxious people.

NEUROFIBRILLARY TANGLES. Abnormal structures, composed of twisted masses of protein fibers within nerve cells, found in the brains of persons with Alzheimer's disease.

NEUROIMAGING. The use of x ray studies and magnetic resonance imaging (MRIs) to detect abnormalities or trace pathways of nerve activity in the central nervous system.

NEUROLEPTIC. Another name for the older type of antipsychotic medications given to schizophrenic patients.

NEUROLOGICAL SYSTEM. The system that initiates and transmits nerve impulses including the brain, spinal cord, and nerves.

NEUROMUSCULAR. The body system of nerves and muscles as they function together.

NEURON. A nerve cell that receives, processes, saves, and sends messages. It consists of an axon, a body, and dendrites.

NEUROPATHY. Abnormality of the nerves that may be manifested as numbness, tingling, or weakness of the affected area.

NEUROSIS. A term commonly used to describe a range of relatively mild psychiatric disorders in which the sufferer remains in touch with reality.

NEUROTOXIN. A chemical compound that is toxic to the central nervous system.

NEUROTRANSMISSION. When a neurotransmitter, or chemical agent released by a particular brain cell, travels across the synapse to act on the target cell to either inhibit or excite it.

NEUROTRANSMITTER. A chemical in the brain that transmits messages between neurons, or nerve cells.

NICOTINE. The addictive ingredient of tobacco; it acts on the nervous system and is stimulating and calming.

NICOTINE REPLACEMENT THERAPY (NRT). A method of weaning a smoker from both nicotine and the oral

fixation that accompanies a smoking habit by giving the smoker smaller and smaller doses of nicotine in the form of a patch or gum.

NIGHT GUARD. A removable custom-fitted plastic appliance that fits between the upper and lower teeth to prevent them from grinding against each other.

NIRVANA. In Buddhism, release from the cycle of reincarnation through conquering one's hatreds, passions, and delusions.

NIT. The egg sac laid by adult female lice.

NOCICEPTOR. A nerve cell that is capable of sensing pain and transmitting a pain signal.

NOCTURIA. Excessive need to urinate at night. Nocturia is a symptom of OSA and often increases the patient's daytime sleepiness.

NOCTURNAL MYOCLONUS. A disorder in which the patient is awakened repeatedly during the night by cramps or twitches in the calf muscles; also called periodic limb movement disorder (PLMD).

NODULOCYSTIC ACNE. A disorder of the sebaceous (oil-secreting) glands in which deep, and sometimes painful, cysts and pustules are formed.

NOH THEATER. A Japanese theatrical form developed in the fourteenth century, featuring masks, extravagant costumes, bare stages, and restrained movements.

NON-ESSENTIAL AMINO ACIDS. Amino acids that are produced in the human body.

NON-HEME IRON. Dietary or supplemental iron that is less efficiently absorbed by the body than heme iron (ferrous iron).

NON-SMALL CELL LUNG CANCER. A group of lung cancers: squamous cell carcinoma, adenocarcinoma, and large cell carcinoma.

NONCOMEDOGENIC. A substance that contains nothing that would cause blackheads or pimples to form on the skin. Jojoba oil is noncomedogenic.

NONGONOCOCCAL URETHRITIS (NGU). A sexually transmitted urethral infection that is not gonorrhea.

NONPATHOGENIC. Incapable of causing disease; harmless.

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS). A group of pain-relieving medications that also reduce inflammation when used over a period of time. NSAIDs are often given to patients with osteoarthritis.

NOSOCOMIAL. Contracted in a hospital. Staph infections are the most common type of nosocomial infections.

NOSODE. A homeopathic medicine made from disease material. Nosodes are given in order to prevent infectious diseases.

NOURISH YIN. In TCM, to cool the body and replenish its fluids.

NSAIDS. Nonsteroidal anti–inflammatory drugs such as ibuprofen and naproxen.

NUCLEIC ACID. A type of chemical that is used as a component for building DNA. The nucleic acids found in DNA are adenine, thymine, guanine, and cytosine.

NUCLEOSIDES. Any of various compounds consisting of a sugar and a purine or pyrimidine base, especially a compound obtained by hydrolysis of a nucleic acid.

NUCLEUS PULPOSUS. The center portion of the intervertebral disk that is made up of a gelatinous substance.

NUMMULAR DERMATITIS. A skin infection in which the areas of irritated skin are coin-shaped.

NUTRACEUTICAL. Any food or food ingredient that is thought to provide health benefits, including the prevention and treatment of disease. Flaxseed is considered a nutraceutical.

NYSTAGMUS. An involuntary, rapid movement of the eyeball, usually from side to side.

O

OBSESSION. A recurring, distressing idea, thought, or impulse that feels foreign or alien to the individual.

OBSESSIVE-COMPULSIVE DISORDER (OCD). A disorder characterized by the tendency to perform repetitive acts or rituals in order to relieve anxiety.

OBSTRUCTION. A blockage.

OBSTRUCTIVE SLEEP APNEA (OSA). A potentially life-threatening condition characterized by episodes of breathing cessation during sleep alternating with snoring or disordered breathing. Low levels of oxygen in the blood of patients with OSA may eventually cause heart problems or stroke.

OCCIPITAL NEURALGIA. Pain on one side of the back of the head caused by entrapment or pinching of an occipital nerve.

OCCLUSION. The way upper and lower teeth fit together during biting and chewing.

OCCLUSIVE. Closing off. One of the newest treatments for stress urinary incontinence in women is an external occlusive single-use cap that covers the urethral opening.

OFFAL. Waste parts of an animal that are usually discarded.

OFFICINALIS. Denoting that the substance is available without prescription.

OLEIC ACID. Oily acid found in most vegetable and animal oils and fats. Used to make ointments.

OLIGOMENORRHEA. Irregular, infrequent menses.

OLIGOMERIC PROANTHOCYANIDINS (OPCS). Part of a large group of phytochemicals called bioflavonoids.

OLIGOSACCHARIDE. A carbohydrate consisting of from three to six units of simple sugars (monosaccharides). A large number of oligosaccharides have been prepared by partially breaking down more complex carbohydrates (polysaccharides).

OLIGURIA. A condition in which the kidneys produce small amounts of urine.

OMEGA-3 FATTY ACIDS. Fatty acids from fish and vegetable oils that appear to protect against blood clots.

OMEGA-6 FATTY ACID. A fatty acid with its first double bond at the sixth carbon in its carbon chain.

ONCOLOGIST. Conventional medical doctor who has specialized training in cancer.

ONYCHOCRYPTOSIS. The medical term for ingrown nail.

OPHTHALMOLOGIST. A physician who specializes in the anatomy and physiology of the eyes and in the diagnosis and treatment of eye diseases and disorders.

OPHTHALMOSCOPE. An instrument, with special lighting, designed to view structures in the eye.

OPPORTUNISTIC INFECTION. A type of infection caused only under certain circumstances, as when a person's immune system is impaired.

OPHTHALMIC. Relating to the eye.

OPTIC NERVE. A bundle of nerve fibers that carries visual messages from the retina in the form of electrical signals to the brain.

OPTICAL COHERENCE TOMOGRAPHY (OCT). A diagnostic method for imaging eye tissue.

OPTIMUM DAILY INTAKE (ODI). The amount of a supplement that provides the greatest value to a person.

OPTOKINETIC. A reflex that causes a person's eyes to move when their field of vision moves.

OPTOMETRIST. A professional who evaluates and tests sight for correction like glasses or contact lens.

ORCHITIS. Inflammation of one or both testes, accompanied by swelling, pain, fever, and a sensation of heaviness in the affected area.

OREXIN. Another name for hypocretin, a chemical secreted in the hypothalamus that regulates the sleep/wake cycle. Narcolepsy is sometimes described as an orexin deficiency syndrome.

ORGAN OF CORTI. A spiral structure inside the cochlea that converts vibration to signals that are passed to the brain.

ORGANIC FOOD. Food grown without the use of synthetic pesticides and fertilizers.

ORGANIC ILLNESS. A physically, biologically based illness.

ORGASMIC DISORDER. Impairment of the ability to reach sexual climax.

ORTHOKERATOLOGY. A method of reshaping the cornea using a contact lens. It is not considered a permanent method to reduce myopia.

ORTHOPEDICS. A medical specialty concerned with treating diseases, injuries, and malformations of the bones and supporting structures, such as tendons, ligaments, and muscles.

ORTHOPEDIST. A specialist who is concerned with the bones, muscles, and joints and their points of interaction.

ORTHOSTATIC HYPOTENSION. A drop in systolic blood pressure, which can result in dizziness or loss of consciousness.

ORTHOSTATIC. Related to or caused by an upright position.

ORTHOTIC. A device or brace used to control, correct, or compensate for a bone deformity.

OSSICLES. A group of tiny bones in the middle ear that conduct sound through vibration. The bones are the malleus (or anvil), incus (or hammer), and stapes (or stirrup).

OSTEOARTHRITIS. A type of arthritis marked by chronic degeneration of the cartilage of the joints, leading to pain and sometimes loss of function.

OSTEOBLASTS. Cells in the body that build new bone tissue.

OSTEOMALACIA. Softening, weakening, and removal of the minerals from bone in adults caused by vitamin D deficiency.

OSTEOPATHIC MANIPULATIVE TREATMENT (OMT). A collective term that refers to the variety of hands-on manipulative techniques practiced by osteopaths to diagnose and prevent disorders as well as to treat them.

OSTEOPATHY. System of medicine that believes that the human body can make its own remedies to heal infection; emphasizes the musculoskeletal system. It originally used manipulative techniques but also added surgical, hygienic, and medicinal methods when needed.

OSTEOPENIA. Mild thinning of the bone mass, but not as severe as osteoporosis. Osteopenia results when the formation of bone is not enough to offset normal bone loss. Osteopenia is generally considered the first step to osteoporosis.

OSTEOPOROSIS. A condition found in older individuals in which bones decrease in density and become fragile and more likely to break. It can be caused by lack of vitamin D and/or calcium in the diet.

OTITIS EXTERNA. Inflammation of the outer ear. Otitis externa is the medical term for swimmer's ear.

OTOSCLEROSIS. A disease that scars and limits the motion of the small conducting bones in the middle ear.

OTOSCOPE. A lighted medical instrument that can be used to visualize the ear canal and the tympanic membrane.

OTOTOXIC. Damaging to the nerves controlling the senses of hearing and balance.

OVARY. One of the two almond-shaped glands in the female reproductive system responsible for producing eggs and the hormones estrogen and progesterone.

OVER-THE-COUNTER (OTC). A medication that does not require a doctor's prescription.

OVULATION. The monthly process (part of a normal menstrual cycle) by which an ovarian follicle ruptures, releasing a mature egg cell.

OVUM. The reproductive cell of the female that contains genetic information and participates in the act of fertilization; also popularly called the egg.

OXALIC ACID. A poisonous white crystalline acid, used for bleaching, as a cleanser, and as a laboratory reagent.

OXIDATION. Combining with oxygen. In fatty acids, is the process is accomplished with the breakdown of the carbon chain in two-carbon segments.

OXIDIZED METABOLITE. The result of a process in which one molecule or substance is utilized by the body by first adding oxygen.

OXIDIZE. When oxygen reacts with a substance, it causes a decomposition of its living elements.

OZONE. A form of oxygen with three atoms in its molecule (O_3), produced by an electric spark or ultraviolet light passing through air or oxygen. Ozone is used therapeutically as a disinfectant and oxidative agent.

P

PSA. Prostatic Specific Antigen, elevated levels of which are a precondition to the development of cancer of the prostate gland.

PSA TEST. A blood test to determine prostate-specific antigen levels in men, which can help determine the risk for prostate cancer.

PACEMAKER. Device that is surgically implanted in those suffering from heart disease or disorders, that regulates the beating of the heart.

PACLITAXEL. A drug derived from the common yew tree (*Taxus baccata*) that is the mainstay of chemotherapy for ovarian cancer.

PAGET'S DISEASE. A common disease of the bone of unknown cause usually affecting middle-aged and elderly people, characterized by excessive bone destruction and unorganized bone repair.

PALLIDOTOMY. Surgery that destroys a small amount of tissue in the globus pallidus, which is overstimulated by the corpus striatum in PD. The surgery can improve tremors, rigidity, and bradykinesia.

PALMATE. A type of leaf that has lobes or leaflets radiating from a central point.

PALPATION. A diagnostic technique in which the examiner gently presses, or palpates, a specific area of the patient's body. Palpation is used in the diagnosis of varicose veins.

PALPITATION. A feeling of irregular or rapid heartbeat.

PANAX GINSENG. A popular longevity herb cultivated in Asia, Russia, and the United States. Described by some herbalists as an adaptogen, it is purported to strengthen the immune system and have a number of other beneficial effects.

PANCARDITIS. Inflammation the lining of the heart, the sac around the heart, and the muscle of the heart.

PANCHAKARMA. Intensive Ayurvedic cleansing and detoxification program.

PANCREAS. A large elongated glandular organ near the stomach. It secretes juices into the small intestine, and the hormones insulin, glucagon, and somatostatin into the bloodstream.

PANCREATITIS. Inflammation of the pancreas.

PANDEMIC. Worldwide outbreak of an infection, afflicting millions of people.

PANTETHEINE. A growth factor substance essential in humans and a constituent of coenzyme A.

PAPANICOLAOU (PAP) SMEAR. A diagnostic test using a sampling of tissue from the cervix.

PAPILLOMA. A benign growth on the skin or mucous membrane.

PAPULE. A small solid raised area of skin, no more than 1 cm in diameter.

PARADIGM SHIFT. A philosophical or spiritual change in the pattern or model by which one lives and views the world.

PARADIGM. A pattern or model.

PARAMYXOVIRUS. A genus of viruses that includes the causative agent of mumps.

PARASITE. An organism that lives on or within a host organism for the purpose of obtaining food.

PARASITICIDAL. Known to kill or eliminate parasites.

PARASITICIDE. A substance destructive to parasites.

PARASOMNIA. A primary sleep disorder in which the person's physiology or behaviors are affected by sleep, the sleep stage, or the transition from sleeping to waking.

PARASYMPATHETIC NERVOUS SYSTEM. A part of the autonomic nervous system that is concerned with conserving and restoring energy. It is the part of the nervous system that predominates in a state of relaxation.

PARASYMPATHETIC RESPONSE. A state of deep relaxation and the mechanism by which the body naturally regenerates itself and maintains chemical and metabolic balance.

PARENCHYMA. The supportive tissue surrounding a particular structure. An example is that tissue that surrounds and supports the actually functional lung tissue.

PARESTHESIA. The sensation of pins and needles or tingling that is often the result of nerve compression.

PARKINSON'S DISEASE. A slowly progressive disease that destroys nerve cells. Parkinson's is characterized by shaking in resting muscles, a stooping posture, slurred speech, muscular stiffness, and weakness.

PARKINSONISM. A set of symptoms originally associated with Parkinson's disease that can occur as side effects of neuroleptic medications. The symptoms include trembling of the fingers or hands, a shuffling gait, and tight or rigid muscles.

PAROTITIS. Inflammation and swelling of one or both of the parotid salivary glands.

PAROXYSM. A severe attack or a sudden increase in intensity of a disease.

PARTHENOLIDE. A sesquiterpene lactone isolated from feverfew that is thought to be responsible for most of its medical effectiveness.

PARTURITION. Childbirth.

PASSIVE DIFFUSION. A process whereby a liquid migrates from a solution of lower concentration to a solution of higher concentration, making the latter more dilute.

PASSIVE SMOKING. A person's having to breathe in smoke from someone else's cigarette or pipe. Other terms for passive smoking are exposure to secondhand smoke or exposure to environmental tobacco smoke (ETS).

PASTE. Water-based products that are thick when applied and have a tendency to dry out and build up.

PASTIA'S LINES. Red lines in the folds of the skin, especially in the armpit and groin, that are characteristic of scarlet fever.

PATCH TEST. A skin test that is done to identify allergens. A suspected substance is applied to the skin. After 24 to 48 hours, if the area is red and swollen, the test is positive for that substance.

PATENT FORMULAS. Chinese herbal formulas that were patented centuries ago and are believed to be proven over centuries of use and study.

PATHOGENIC BACTERIA. Bacteria that produce illness.

PATHOGENS. Micro-organisms capable of causing disease.

PATHOLOGICAL, OR, NON-PATHOLOGICAL. Terms indicating whether a condition is considered a disease state.

PATHOLOGIST. A doctor who specializes in the diagnosis of disease by studying cells and tissues under a microscope.

PEAK EXPIRATORY FLOW (PEF). A test used to measure how fast air can be exhaled from the lungs to measure the openness of the airways.

PEDICULICIDE. Any substance that kills lice.

PEDICULOSIS (PLURAL, PEDICULOSES). A lice infestation.

PELLAGRA. A condition caused by a dietary deficiency of niacin, one of the B vitamins. Symptoms include dementia, diarrhea, and dermatitis.

PELVIC INFLAMMATORY DISEASE (PID). An infection of the uterus, fallopian tubes, and/or ovaries.

PELVIC LYMPHADENECTOMY. Surgical removal of the lymph nodes and passageways within the pelvis.

PEMPHIGUS VULGARIS. An autoimmune skin disorder that causes blistering of the skin and mucous membrane.

PENICILLAMINE. A drug used to treat medical problems (such as excess copper in the body and rheumatoid arthritis) and to prevent kidney stones. It is also sometimes prescribed to remove excess lead from the body.

PENICILLIN. An antibiotic that is used to treat bacterial infections.

PENILE IMPLANT. An artificial device inserted by surgery in the penis to produce an erection. Implantation of rigid or semi-rigid bars produces a permanent erection; use of an inflatable device allows the man to produce an erection at will.

PEPTIC ULCER DISEASE (PUD). A stomach disorder marked by corrosion of the stomach lining due to the acid in the digestive juices.

PERCUTANEOUS ABSORPTION. The process by which certain strong medications, such as selenium compounds, can enter the body through the skin.

PERENNIAL. A plant that grows every year without reseeding.

PERFORATION. A hole that develops in a body tissue. In otitis media, the eardrum sometimes perforates because of the pressure of fluid behind it.

PERIMENOPAUSE. The time span just before a woman reaches menopause. It usually begins when a woman is in her 40s and may produce many of the symptoms associated with menopause.

PERINATAL ASPHYXIA. Lack of oxygen that occurs before, during, or around the time of birth.

PERINEAL AREA. The genital area between the vulva and anus in a woman, and between the scrotum and anus in a man.

PERINEOMETER. A device for measuring PC-muscle contraction.

PERIODIC LIMB MOVEMENTS IN SLEEP (PLMS). Random movements of the arms or legs that occur at regular intervals during sleep.

PERIODONTAL DISEASE. Disease of the gums and teeth. Symptoms include bleeding and receding gums, gingivitis, abscesses, and loose teeth.

PERIODONTITIS. A gum disease that destroys the structures supporting the teeth, including bone.

PERIOSTEUM. The specialized layer of connective tissue that covers all bones in the body.

PERIOSTITIS. Inflammation of the tissue covering the bone.

PERIPHERAL NEUROPATHY. A nerve disease associated with diabetes that causes numbness, tingling, pain, or burning in the feet, legs, and toes.

PERIPHERAL VISION. The ability to see objects that are not located directly in front of the eye. Peripheral vision allows people to see objects located on the side or edge of their field of vision.

PERISTALSIS. A wave-like action of rhythmic contractions throughout the smooth muscles of the digestive tract, from esophagus to rectum.

PERMETHRIN. A synthetic pyrethroid for killing lice.

PERNICIOUS ANEMIA. A type of anemia that occurs when the stomach does not secrete enough intrinsic factor, which is necessary for the absorption of vitamin B_{12}.

PERSISTENT GENERALIZED LYMPHADENOPATHY (PGL). A condition in which HIV continues to produce chronic painless swellings in the lymph nodes during the latency period.

PERSONALITY DISORDER. A group of conditions characterized by a general failure to learn from experience or adapt appropriately to changes, resulting in personal distress and impairment of social functioning.

PESTICIDES. Chemicals used to kill insects.

PETIT MAL SEIZURES. A less severe form of epileptic seizure.

PETRISSAGE. A massage technique in which the therapist kneads or squeezes the muscles with both hands.

PETROLEUM JELLY OR OINTMENT. Petrolatum, a gelatinous substance obtained from oil that is used as a protective dressing.

PEYOTE. The dried top of the mescal cactus, used by shamans in some Southwestern cultures to induce a trance state. Peyote contains a chemical called mescaline that produces hallucinations.

PEYRONIE'S DISEASE. A disease resulting from scarring of the corpus cavernosa, which causes painful erections.

PH. A comparative measure of the acidity or alkalinity of a solution.

PHARMACODYNAMICS. The study of the relationships and interactions of herbs.

PHARMACOGNOSIST. A person involved in pharmacognosy, the science concerned with the medical products of plants in their natural state.

PHARMACOPOEIA. A book describing drugs, chemicals, and medicinal preparations, especially one recognized as an authority and serving as a standard.

PHARYNX. The cavity at the back of the throat that leads from the mouth and nasal passage to the larynx.

PHENACETIN. A compound formerly used to ease pain or fever, but withdrawn because of its serious side effects.

PHENOTHIAZINES. A parent compound for the synthesis of some antipsychotic compounds.

PHENYLALANINE. An essential amino acid that cannot be consumed by people with a metabolic disease known as phenylketonuria (PKU).

PHENYLKETONURIA (PKU). An enzyme deficiency present at birth that disrupts metabolism and causes brain damage; this rare inherited defect may be linked to the development of autism.

PHEOCHROMOCYTOMA. A tumor of the sympathoadrenal system that produces hypertension resulting in excessive headaches, sweating, and palpitation, apprehension, flushing of the face, nausea, and vomiting.

PHEROMONE HORMONES. Substances secreted in order to bring out a response from other members of the same species, particularly in regard to sexual arousal.

PHLEBITIS. Inflammation of a vein, often accompanied by swelling and the formation of blood clots.

PHLEGM. A thick secretion of mucus that may clog the airway passages; it is produced in response to irritation.

PHOBIA. In psychoanalytic theory, a psychological defense against anxiety in which the patient displaces anxious feelings onto an external object, activity, or situation.

PHONICS. A system to teach reading by teaching the speech sounds associated with single letters, letter combinations, and syllables.

PHOSPHOROUS. Referring to a chemical element occurring in all living cells.

PHOTODYNAMIC THERAPY (PDT). A therapy that uses light-activated drugs to destroy rapidly-dividing cells or new blood vessels in the eye.

PHOTORECEPTORS. Specialized nerve cells (rods and cones) in the retina that are responsible for vision.

PHOTOREFRACTIVE KERATECTOMY (PRK). A procedure that uses an excimer laser to reshape the cornea and permanently correct nearsightedness (myopia).

PHOTOSENSITIVITY. An abnormal reaction to light exposure caused by a disorder or resulting from the use of certain drugs.

PHOTOTOXIC. Causes a harmful skin reaction when exposed to sunlight.

PHYCOCYANIN. A protein found in spirulina that gives the alga its blue color. Phycocyanin has anti-inflammatory effects.

PHYLLOQUINONE. An alternate name for vitamin K_1.

PHYSICAL MANIPULATION. The use of deep massage, spinal alignment, and joint manipulation to stimulate tissues.

PHYSIOLOGIC. Refers to physiology, particularly normal, healthy, physical functioning.

PHYTO. A prefix meaning, or pertaining to, a plant or plants (such as as in phytochemical, phytomedicinal, and phytotherapy).

PHYTOALEXIN. A compound made by some plants to fight various microbes, such as bacteria, viruses, and fungi, or as a response to environmental stress.

PHYTOESTROGEN. Any of several compounds found in plants that possess estrogen-like activity.

PHYTOHORMONES. Steroid hormones found in plants, including phytoestrogens and phytoandrogens.

PHYTOMEDICINALS. Medicinal substances derived from plants.

PHYTONADIONE. Another name for vitamin K_1. It is the form of vitamin K most often used to treat patients on anticoagulant therapy.

PHYTOPLANKTON. Very small free-floating aquatic plants found in plankton.

PHYTOSTEROLS. Plant-based oils that appear to have a cholesterol-lowering effect.

PHYTOTHERAPY. A form of treatment that uses plants or plant extracts either externally or internally.

PHYTOCHEMICALS. Beneficial chemical substances found in plants and fruits and thought to work synergistically in whole foods to provide disease protection and promote health.

PICA. An abnormal appetite or craving for non-food items; often such substances as chalk, clay, dirt, laundry starch, or charcoal.

PIGMENTED RETINAL EPITHELIUM. The dark-colored cell layer that supports the retina. It may thin or become detached with macular degeneration.

PINEAL GLAND. A gland about the size of a pea at the base of the brain that is part of the endocrine system.

PINNATE. Having leaflets arranged on each side of a common stalk.

PIOGLITAZONE. An anti-diabetic drug of the thiazolidinedione class. This drug increases the sensitivity of the cells to insulin, but is capable of causing severe adverse reactions, including congestive heart failure.

PIPERONYL BUTOXIDE. A liquid organic compound that enhances the activity of insecticides.

PIRIFORMIS. A muscle in the pelvic girdle, or hip bones, that is closely associated with the sciatic nerve.

PITTING EDEMA. Swelling caused by excess water that can be detected when the skin is pressed with a finger and an indentation remains after the finger is withdrawn.

PITUITARY GLAND. A small oval endocrine gland attached to the hypothalamus. The pituitary gland releases TSH, the hormone that activates the thyroid gland.

PLACEBO EFFECT. The ability of substances possessing no medicinal value to nonetheless achieve health benefits through the patient's belief and consequent optimism.

PLACEBO. A pharmacologically inactive substance given to placate a patient who supposes it to be a medicine.

PLACENTA. The organ that develops in the uterus during pregnancy that links the blood supplies of the mother and fetus.

PLANKTON. A mass of tiny animals and plants floating in the sea or in lakes, usually near the surface.

PLANTAR FASCIA. A tough fibrous band of tissue surrounding the muscles of the sole of the foot.

PLANTAR FASCITIS. Inflammation of the plantar fascia.

PLANTAR WARTS. Warts located on the sole of the foot.

PLAQUE. A buildup of fats, cholesterol, calcium, and fibrous tissue in the blood that tends to attach to and weaken artery walls.

PLASMA. A clear yellowish fluid that is a component of blood.

PLATELET AGGREGATION. The clumping together of blood cells, possibly forming a clot.

PLATELET. The smallest kind of blood cell, usually found in large quantities, that plays an important part in blood clotting. Also called thrombocytes.

PLEURISY. Inflammation of the pleura (lining of the chest cavity) usually caused by a lung infection.

PLEXOPATHY. Compression of a nerve where it is part of a bundle of nerves called a plexus.

PNEUMOCYSTIS CARINII PNEUMONIA (PCP). An opportunistic infection caused by a fungus that is a major cause of death in patients with late-stage AIDS.

PNEUMONECTOMY. Surgical removal of an entire lung.

PNEUMONIA. A condition caused by bacterial or viral infection that is characterized by inflammation of the lungs and fluid within the air passages.

PNEUMONITIS. Inflammation of lung tissue.

PNEUMOTHORAX. Air inside the chest cavity, which may cause the lung to collapse. Pneumothorax is both a complication of pulmonary tuberculosis and a means of treatment designed to allow an infected lung to rest and heal.

PODIATRY. A medical specialty concerned with treating diseases, injuries, and malformations of the feet.

POINT OF VIEW. In a person with dyslexia, this term is used to describe the angle from which their mind's eye views an object. This point of view may be unanchored and moving about, as if several different people were telling what they see all at the same time.

POLLEN COUNT. The amount of pollen in the air; often broadcast on the daily news during allergy season. It tends to be lower after a heavy rain that washes the pollen out of the air and higher on warm, dry, windy days.

POLYCHREST. A homeopathic remedy that can be given for a wide variety of diseases and conditions.

POLYCYSTIC OVARIAN SYNDROME (PCOS). A condition in which the eggs are not released from the ovaries and instead form multiple cysts.

POLYGENIC. A trait or disorder that is determined by a group of genes acting together. Most human characteristics, including height, weight, and general body build, are polygenic.

POLYPHENOLS. Phytochemicals that act as an antioxidant, protecting cells against damaging free radicals.

POLYPHENOL. Acid compound in plants.

POLYP. A benign, tumor-like outgrowth.

POLYSACCHARIDE. A complex carbohydrate that characterizes most forms of carbohydrates.

POLYSOMNOGRAPHY. A technique for diagnosing sleep disorders with the use of a machine that records the pulse, breathing rate and other variables while the patient sleeps.

POLYUNSATURATED FATS. Non-animal oils or fatty acids rich in unsaturated chemical bonds not associated with the formation of cholesterol in the blood.

PORTAL HYPERTENSION. A type of hypertension that can be life threatening; veins enlarge in the stomach and esophagus, and the enlarged veins, called varices, can rupture and bleed massively.

POSITIVE IONS. Ionic particles having a positive electrical charge.

POSITIVE SYMPTOMS. Symptoms of schizophrenia that represent excesses or distortions of normal mental functions.

POSTPARTUM. Following childbirth.

POST-HERPETIC NEURALGIA (PHN). Persistent pain that occurs as a complication of a herpes zoster infection. Although the pain can be treated, the response is variable.

POSTPRANDIAL. After eating or after a meal.

POTENCY. The number of times that a homeopathic remedy has been diluted and succussed (shaken). In centesimal potencies, one part of the medicinal substance has been diluted with 99 parts of water or alcohol; in decimal potencies, the ratio is 1:9.

POTENTIATE. To intensify the effects of another herb or prescription medication.

POTENTIATION. A type of drug interaction in which one drug or herbal preparation intensifies or increases the effects of another.

POTENTIZATION. The process of increasing the power of homeopathic preparations by successive dilutions and succussions of a mother tincture.

POTENTIZE. To trigger effectiveness of a substance.

POUCHITIS. An acute infection in part of the intestines of patients who have undergone an ileostomy and a complete colectomy.

POULTICE. A soft cloth filled with a warm moist mass of grains, herbs, or other medications applied to sores or injured parts of the body.

PRAKRITI. An individual's unique dosha pattern.

PRANAYAMA. The yogic discipline of controlling the breath. It is sometimes used to refer to a form of yoga that emphasizes breathing exercises.

PRANA. Basic life energy, found in food, air, and water, as defined in the East Indian Ayurveda and yoga philosophies.

PREBIOTICS. Non-digestible food ingredients that pass through the stomach into the intestines, where they selectively stimulate the growth and/or activity of healthy colonic bacteria.

PREDNISONE. A steroid, immune suppressing, anti-inflammatory medication used to treat the symptoms of rheumatoid arthritis, auto-immune, and many inflammatory conditions.

PREECLAMPSIA. A serious disorder of late pregnancy, in which the blood pressure rises, there is a large amount of retained fluids, and the kidneys become less effective and excrete proteins directly into the urine.

PREGNENOLONE. A steroid ketone formed by the oxidation of other steroids, such as cholesterol, a precursor to the hormone progesterone.

PREMATURE EJACULATION. Rapid ejaculation before the person wishes it, usually in less than one to two minutes after beginning intercourse.

PREMENSTRUAL SYNDROME (PMS). A group of symptoms, including nervous tension, irritability, tender breasts, and headache, experienced by some women in the days before menstruation, caused by changes in hormone levels.

PRESSURE POINTS. Specific locations on the feet and hands that correspond to nerve endings. Pressure on these locations are used to connect to and affect the organs and glands of the human body via the spinal cord.

PRIMARY ENERGY PATTERN. A spiral motion that radiates from the umbilicus; the energy pattern associated with a child in the womb.

PRIMARY HEADACHE. A headache that is not caused by another disease or medical condition.

PROANTHOCYANIDINS. Bioflavenoids found in cranberries, responsible for the fruit's effectiveness in preventing urinary tract infections.

PROBIOTICS. Beneficial bacteria in the gastrointestinal tract essential to healthy digestion. Probiotics produce certain essential vitamins and provide protection from bacteria, parasites, viruses, yeasts, and fungi while promoting the breakdown of waste and toxins.

PROCAINE PENICILLIN. An injectable form of penicillin that contains an anesthetic to reduce the pain of the injection.

PRODROMAL. Referring to warning symptoms that occur before the onset of a disease or disorder.

PRODROME. Symptoms that warn of the beginning of disease. The herpes prodrome consists of pain, burning, tingling, or itching at a site before blisters are visible.

PROGESTERONE. The hormone produced by the ovary after ovulation that prepares the uterine lining for a fertilized egg.

PROGNOSIS. Referring to the expected outcome of a disease and its treatment.

PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY (PML). A disease caused by a virus that destroys white matter in localized areas of the brain. It is regarded as an AIDS-defining illness.

PROKINETIC. A drug that works to speed up the emptying of the stomach and the motility of the intestines.

PROLACTIN. A hormone secreted after delivery which stimulates the production of milk.

PROLAPSED. Referring to an organ fallen down from its normal body position.

PROLINE-RICH POLYPEPTIDE (PRP). A hormone found in colostrum that regulates the thymus gland and the immune system. It helps to make colostrum an effective treatment for autoimmune disorders and possibly heart disease. Proline is an amino acid.

PRONATION. The lowering or descending of the inner edge of the foot while walking.

PROPHYLACTIC. A preventative treatment.

PROPHYLAXIS. The prevention of disease by protective measures.

PROPOLIS. A sticky resin made by honeybees to seal the holes in their hives.

PROPRIOCEPTIVE. Pertaining to proprioception, or the awareness of posture, movement, and changes in equilibrium and the knowledge of position, weight, and resistance of objects as they relate to the body.

PROSTAGLANDIN. An unsaturated fatty acid in humans that helps to control smooth muscle contraction, blood pressure, inflammation, and body temperature.

PROSTASIN. A blood protein that appears to be a reliable early indicator of ovarian cancer.

PROSTATECTOMY. Surgical removal of the prostate gland.

PROSTATE. A gland in males that secretes a fluid into the semen that improves the movement and viability of sperm.

PROSTATIC SECRETIONS. Normal secretions of the prostate gland intended to nourish and protect sperm, improving fertility.

PROSTATITIS. An inflammation or irritation of the prostate.

PROTEASE ENZYME. Any of a group of enzymes that help to break down proteins into smaller amino acid compounds. Bromelain belongs to this enzyme group.

PROTEIN. A complex molecule that contains carbon, hydrogen, oxygen, nitrogen, and usually sulfur, which forms an amino acid chain. Proteins are essential for tissue growth and repair.

PROTHROMBIN. One protein component of the cascade reaction which results in clot formation.

PROTOZOA. Single-celled microorganisms belonging to the subkingdom Protozoa that are more complex than bacteria. About 30 protozoa cause diseases in humans.

PROTON PUMP INHIBITOR (PPI). Medication that inhibits stomach acid production in severe heartburn.

PROVING. Case study of the effect of a homeopathic medicine.

PROVITAMIN A. A carotenoid, such as beta carotene, that can be converted into vitamin A in the liver.

PRURITUS. The medical term for itching.

PSEUDOCYST. A fluid-filled space that may arise in the setting of pancreatitis.

PSEUDOMEMBRANOUS COLITIS. A potentially life-threatening inflammation of the colon, caused by a toxin released by the Clostridium difficile bacterium that multiplies rapidly following antibiotic treatment.

PSORA. According to Hahnemann, the oldest and most universal miasm, responsible for human vulnerability to the majority of non-venereal chronic diseases.

PSORIASIS. A common chronic skin disorder that causes red patches anywhere on the body.

PSYCHOANALYSIS. A psychological theory and therapeutic method based on the idea that the mind works on conscious and unconscious levels and that childhood events have a psychological influence on people throughout their lives.

PSYCHODYAMIC. The scientific study of mental or conditional forces developing especially in early childhood and their effect on behavior and mental states.

PSYCHODYNAMIC THERAPY. A therapeutic approach that assumes improper or unwanted behavior is caused by unconscious, internal conflicts and focuses on gaining insight into these motivations.

PSYCHOMOTOR AGITATION. Disturbed physical and mental processes (e.g., fidgeting, wringing of hands, racing thoughts); a symptom of major depressive disorder.

PSYCHOMOTOR RETARDATION. Slowed mental and physical processes characteristic of a bipolar depressive episode.

PSYCHONEUROIMMUNOLOGY. The study of the relationships among mind, nervous system, and immune response.

PSYCHOSIS. A severe mental disorder characterized by delusions, hallucinations, and other evidence of loss of contact with reality. Some psychiatrists regard shamanic experiences as evidence of psychosis.

PSYCHOSOCIAL. Relating to both the psychological and the social aspects of a person.

PSYCHOSOMATIC ILLNESS. A condition in which unresolved emotional distress manifests as physical symptoms of illness.

PSYCHOTHERAPY. A medical treatment that seeks to resolve psychological traumas and conflicts, often by discussing them and emotionally reliving difficult events in the past.

PTYALISM. Excess salivation.

PUBERTY. The period of life in which boys' and girls' sexual organs begin to reach maturity and the ability to reproduce begins.

PUBOCOCCYGEAL (PC) MUSCLES. The muscles of the lower pelvic girdle, or pelvic floor, which support the bladder, urethra, and urethral sphincter; the muscle group at the neck of the bladder that acts as a spigot for controlling urine flow into the urethra, vagina, uterus, and rectum.

PULEGONE. The toxic chemical found in pennyroyal oil.

PULMONARY FUNCTION TESTS. Tests that measure the amount and rate of air breathed in over a period of time. PFTs also measure how well the lungs move oxygen into the blood.

PULP. The soft innermost part of a tooth, containing blood vessels and nerves.

PULPITIS. Inflammation of the pulp of a tooth that involves the blood vessels and nerves.

PUMICE STONE. A volcanic rock that can be used to remove overgrowths and smooth the skin.

PUNCTURE. An injury caused by a sharp, narrow object deeply penetrating the skin.

PUPILLARY REACTION. The normal change in the size of the pupil due to the amount of ambient light. Under normal circumstances, both pupils respond simultaneously and equally.

PUPIL. The black hole in the center of the iris through which light enters on the way to the lens and retina.

PURGATIVE. Having a tendency to stimulate movement of the bowels.

PURGE. To rid the body of food and calories, commonly by vomiting or using laxatives.

PURIFIED PROTEIN DERIVATIVE (PPD). An extract of tubercle bacilli that is injected into the skin to find out whether a person presently has or has ever had tuberculosis.

PURINE. A substance found in foods that is broken down into urate and may contribute to hyperuricemia and gout.

PURPURA. A group of disorders characterized by purple, red, or brown areas of discoloration visible through the skin.

PUS. A thick yellowish or greenish fluid containing inflammatory cells. Usually caused by bacterial infection.

PUSTULAR. Resembling a blister and usually containing pus.

PUSTULE. A small raised pimple or blister-like swelling of the skin that contains pus.

PYELONEPHRITIS. Infection and inflammation of the kidney.

PYOGENIC. Capable of generating pus. Streptococci, staphylococci, and bowel bacteria are the primary pyogenic organisms.

PYRETHRIN. Naturally-occurring insecticide extracted from chrysanthemum flowers. It paralyzes lice so that they cannot feed.

PYRIDOXINE. Another name for vitamin B_6.

PYROGEN. A chemical circulating in the blood that causes a rise in body temperature.

Q

QIGONG. A Chinese exercise system (similar to t'ai chi) where people learn how to control the flow and distribution of qi (life energy); thought to improve health and harmony of mind and body.

QI. A Chinese medical term (also seen as Chi), pronounced *chee,* denoting active physiological energy; or a term more generally used in TCM for the life force.

QUADRIPLEGIA. Paralysis of all four limbs.

QUANTUM VACUUM (QV). A theory coined by physicists, which defines the interactions of energy that combine to form reality.

QUERCETIN. A flavonoid (chemical compound/biological response modifier) found in onions and garlic that may be a useful dietary supplement for asthma patients.

QUININE. One of the first treatments for malaria, quinine is a natural product made from the bark of the Cinchona tree. It was popular until being superseded by the development of chloroquine in the 1940s.

QUINOLONES. A group of antibiotics, often used to treat bacterial infections, that sometimes cause tendinitis.

QUINSY. Acute inflammation of the tonsils and throat area that often results in abscesses.

R

RADICULOPATHY. Compression of a nerve root at the point where it exits the spinal cord.

RADIAL KERATOTOMY (RK). A surgical procedure involving the use of a diamond-tipped blade to make several spoke-like slits in the peripheral (non-viewing) portion of the cornea to improve the focus of the eye and correct myopia by flattening the cornea.

RADIATION THERAPY. Also called radiotherapy, the treatment for a disease involving carefully measured exposure to radiation.

RADICULAR. Pain that is caused by compression or impingement at the root of a nerve.

RADIODERMATITIS. Red, irritated, and inflamed skin caused by x rays, radiation treatment, or other radiation exposure.

RADIOISOTOPE. A form of a chemical element that emits radiation in the form of energy or small particles.

RANSON'S SIGNS. A set of 11 signs used to evaluate the severity of a case of pancreatitis.

RAPID EYE MOVEMENT SLEEP. A stage of sleep during which dreams occur. This stage usually alternates with a heavier, more restful stage of sleep.

RASH. A spotted, pink or red skin eruption that may be accompanied by itching and is caused by disease, contact with an allergen, food ingestion, or drug reaction.

RATES. The subtle emanations of energy which may be detected with radionic equipment.

RAW NUTRITION. A synonym for the Wigmore diet's emphasis on uncooked and living foods.

RAYNAUD'S SYNDROME. A vascular, or circulatory system, disorder that is characterized by abnormally cold hands and feet. This chilling effect is caused by constriction of the blood vessels in the extremities, and occurs when the hands and feet are exposed to cold weather.

REALITY TESTING. A phrase that refers to a person's ability to distinguish between subjective feelings and objective reality.

RECEPTOR. A cell-surface molecule that binds a specific hormone to produce a specific biological effect.

RECOMMENDED DIETARY ALLOWANCE (RDA). Also called Recommended Daily Allowance, the average daily dietary intake of a nutrient that is sufficient to meet the nutritional requirements of 97–98% of healthy individuals of a given age and gender.

RECTAL PROLAPSE. A condition where the lining of the rectum, the last part of the large intestine, protrudes through the anus.

RECTUM. The last 5 to 6 in (13-16 cm) of the intestine that leads to the anus. Waste is stored here until it is eliminated from the body through the anus.

RECURRENCE. The return of an active infection following a period of latency.

RED BLOOD CELL. Hemoglobin-containing blood cells that transport oxygen from the lungs to tissues. In the tissues, the red blood cells exchange their oxygen for carbon dioxide, which is brought back to the lungs to be exhaled.

REFERENTIAL. A type of delusion in which the person misinterprets items, minor occurrences, or other people's behavior as referring to them. Misinterpretations that are not as resistant to reality as a delusion are sometimes called ideas of reference.

REFERRED PAIN. Pain that is experienced in one part of the body but originates in another organ or area. The pain is referred because the nerves that supply the damaged organ enter the spine in the same segment as the nerves that supply the area where the pain is felt.

REFLEXOLOGY. Belief that reflex areas in the feet correspond to every part of the body, including organs and glands, and that stimulating the correct reflex area can affect the body part.

REFLUX. The backward flow of a body fluid or secretion. Indigestion is sometimes caused by the reflux of stomach acid into the esophagus.

REFRACTION. The turning or bending of light waves as the light passes from one medium or layer to another. In the eye it means the ability of the eye to bend light so that an image is focused onto the retina. Also, method of determining the optical status of eyes.

REFRACTIVE (EYE) SURGERY. Eye surgery to correct a defect in the eye's ability to focus accurately on an image.

REFRACTIVE POWER. The degree of refraction of an eye.

REGRESSION THERAPY. Traveling back and reliving emotions experience through prior lives while meditating.

REIKI. Form of therapeutic bodywork that strives to heal the body's energy field.

REISHI MUSHROOM. Another name for ganoderma.

RELAPSE. A return to a disease state, after recovery appeared to be occurring. In alcoholism, relapse refers to a patient beginning to drink alcohol again after a period of avoiding alcohol.

RELAXATION RESPONSE. The body's response to relaxation techniques, during which metabolism and stress levels decrease and immune response increases.

REMEDY ANTIDOTE. Certain foods, beverages, prescription medications, aromatic compounds, and other environmental elements that counteract the efficacy of homeopathic remedies.

REMISSION. Disappearance of a disease as a result of treatment. Complete remission means that all disease is gone. Partial remission means that the disease is significantly improved by treatment, but residual traces of the disease are still present.

RENAL ARTERY STENOSIS. Disorder in which the arteries that supply blood to the kidneys constrict.

RENAL FAILURE. A state when the kidneys are so extensively damaged that they can no longer function.

REPERFUSION. The reintroduction of blood flow to organs or tissues after blood flow has been stopped for surgical procedures.

REPERTORY. Homeopathic reference book consisting of descriptions of symptoms. The process of selecting a homeopathic remedy from the patient's symptom profile is called repertorizing.

REPETITIVE STRAIN INJURY. Injury resulting from a repeated movement such as typing or throwing a ball. Also called Repetitive stress injury.

RESIDUAL VOLUME. The amount of air trapped inside the lungs as a result of incompletely exhaling.

RESIN. A sticky substance used for medicinal purposes and in the manufacture of varnishes, obtained from the bark of certain trees.

RESORPTION. The breakdown or dissolving of bone tissue by biochemical processes in the body.

RESTLESS LEGS SYNDROME (RLS). A disorder in which the patient experiences crawling, aching, or other disagreeable sensations in the calves that can be relieved by movement.

RETINOID. Any of the group of substances which comprise active vitamin A, including retinaldehyde, retinol, and retinoic acid. It includes synthetic vitamin A derivative used in the treatment of a variety of skin disorders.

RETROGRADE EJACULATION. A condition in which the semen spurts backward into the bladder.

RETROVIRUS. A virus that contains a unique enzyme called reverse transcriptase that allows it to replicate within new host cells.

RESVERATROL. A polyphenolic compound found in 72 varieties of plants, including wine grapes (especially the skins), berries, and peanuts.

RETCHING. The coordinated contraction of muscles as for vomiting but without the discharge of stomach contents.

RETINA. The inner, light-sensitive layer of the eye containing rods and cones. It is the nervous tissue membrane at the back of the eye, opposite the lens, that receives visual images and sends them to the brain via the optic nerve.

RETINITIS PIGMENTOSA. A group of inherited degenerative eye disorders characterized by deterioration of the retina, causing vision impairment and ultimately blindness, usually by the time the individual reaches middle age.

RETINOL EQUIVALENT (RE). 1 µg of all-*trans* retinol (vitamin A), 6 µg of all-*trans* beta carotene.

RETROGRADE MENSTRUATION. Menstrual flow that travels into the body cavity rather than out through the vagina.

RETT SYNDROME. An X-linked disorder of the nervous system found almost exclusively in girls. Children with Rett's syndrome often develop bruxism, for reasons as yet unknown.

REYE'S SYNDROME. Acute, often fatal childhood syndrome marked by encephalopathy (brain disease), hepatitis (inflammation of the liver), and fatty accumulations in the viscera (many of the soft parts and internal organs). Often associated with taking aspirin.

RHABDOMYOLYSIS. The necrosis or disintegration of skeletal muscle.

RHABDOVIRUS. A type of virus named for its rod- or bullet-like shape.

RHEUMATIC FEVER. A heart disease that is a complication of a strep infection.

RHEUMATIC. Refers to any of a variety of disorders marked by inflammation, deterioration, or metabolic damage of the body's connective tissues, especially the joints.

RHEUMATISM. A popular term for any disorder that causes pain and stiffness in muscles and joints and fibrous tissues, including minor aches and twinges, as well as disorders such as rheumatoid arthritis, osteoarthritis, and polymyalgia rheumatica.

RHEUMATOID ARTHRITIS. A painful autoimmune condition, with inflammation and swelling in the joints, sometimes accompanied by spasms in nearby muscles, and frequently resulting in loss of joint function. Rheumatoid arthritis occurs two to three more times in women than men.

RHEUMATOID FACTOR. Antibody found in approximately 80% of patients with adult onset rheumatoid arthritis. When RF is identified in children with juvenile rheumatoid arthritis, there is increased risk of joint damage. The child may require more aggressive treatment.

RHEUMATOLOGY. The study of disorders characterized by inflammation, degeneration of connective tissue, and related structures of the body. These disorders are sometimes collectively referred to as rheumatism.

RHINOPHYMA. Long-term swelling and overgrowth in skin tissue of the nose that leaves it with a knobby, bulb-like look.

RHINOVIRUS. A virus that infects the upper respiratory system and causes the common cold.

RHIZOME. A fleshy plant stem that grows horizontally under or along the ground. It is distinguished from a true root by stem buds or nodes that develop into new shoots. Roots are sent out below this stem and leaves or shoots are sent out above it.

RHODOPSIN. The light-sensitive photopigment contained in rods discriminates between different levels of light intensity.

RHOMBOHEDRAL. A parallelepiped whose edges are all of equal length.

RHYTHM METHOD. The oldest method of contraception with a very high failure rate, in which partners refrain from having sex during ovulation. Ovulation is predicted on the basis of a woman's previous menstrual cycle.

RICIN. An extremely poisonous protein derived from castor beans.

RICKETS. A condition caused by the deficiency of vitamin D, calcium, and usually phosphorus, seen primarily in infancy and childhood, and characterized by abnormal bone formation.

RIGHT BRAIN. The right cerebral hemisphere, which controls activity on the left side of the body in humans. It is associated with spatial and nonverbal concepts, intuition, emotions, and creativity. Labyrinth walking is thought to stimulate the right brain.

RINGWORM. A fungal skin infection that predominantly affects children. The condition is characterized by reddish, scaly rings on the skin.

RODS. Photoreceptors, located in the retina of the eye, that are highly sensitive to low levels of light.

ROLFING. Developed by Dr. Ida Rolf, rolfing uses deep tissue massage and movement to bring the body into correct alignment. It is based on the belief that proper alignment of various parts of the body is necessary for physical and mental health.

ROTAVIRUS. The primary infectious cause of diarrhea in infants and children.

ROUGHAGE. Another name for dietary fiber.

ROYAL JELLY. Special substance secreted by bees to feed the young queen bees.

RUBELLA. Also known as German measles. When a woman contracts rubella during pregnancy, her developing fetus may be damaged. One of the problems that may result is autism.

RUMINANT. Any of various hoofed, even-toed, usually horned mammals of the suborder Ruminantia, such as cattle, sheep, goats, deer, and giraffes.

RUSSELL'S SIGN. Scraped or raw areas on the patient's knuckles, caused by self-induced vomiting.

RUTIN. A bright greenish-yellow flavonoid (plant pigment) found in ruta that has been credited with antioxidant properties.

S

SACRAL NERVES. The five pairs of nerves that arise from the lowermost segments of the spinal cord and control bladder, bowel, and pelvic functions. Stimulation of the sacral nerves by an implanted device is a newer treatment for urinary incontinence.

SACRO-ILIAC. The joint at which the upper hip bone joins the backbone to the pelvis.

SAIKOSAPONINS. Chemical compounds found in bupleurum that have anti-inflammatory effects.

SALICIN. A bitter-tasting water-soluble chemical found in willow bark that has analgesic properties.

SALICYLIC ACID. An agent prescribed in the treatment of hyperkeratotic skin conditions and fungal infections. It is a crystalline substance that is the active ingredient in aspirin.

SALIVARY DUCT. Tube through which saliva is carried from the salivary gland to the mouth.

SALIVARY GLAND. Gland in which saliva is formed.

SALVE. A substance that is applied to wounds or sores; A topical ointment or paste sometimes made by

blending a substance with olive oil, then mixing it with melted beeswax.

SAMANA. Life sustaining energy of the smaller intestine; the fourth of the five airs of Ayurvedic philosophy; the life force governing side-to-side motion.

SAME. An active compound made from methionine and adenosine triphosphate (ATP), an enzyme found in muscle tissue.

SANSKRIT. The classical literary language of India. It is considered the oldest living language of the Indo-Aryan family.

SAPONIN. A glucoside compound found in parsley, soapwort, and other plants, that forms a stable foam when added to water. Saponin is used commercially in beverages. Pl.: Saponins

SARCOIDOSIS. A disease of unknown etiology, which causes widespread lesions that may affect any organ or tissue of the body.

SARCOMA. A malignant growth in the connective tissue, bone, cartilage or muscle; usually the most lethal form of cancer.

SASHIMI. A traditional Japanese preparation of rice, fish, shell fish, mollusks, and other fish products, served with pickled vegetables.

SATURATED FAT. Fat that is usually solid at room temperature, found mainly in meat and dairy products but also in such vegetable sources as nuts, some seeds, and avocados.

SCABIES. A contagious rash caused by the *Sarcoptes scabiei* mite, which burrows into the upper layer of the skin in order to lay eggs. Scabies is characterized by intense itching.

SCALE. Any thin, flaky, plate-like piece of dry skin.

SCHEMAS. Fundamental core beliefs or assumptions that are part of the perceptual filter through which people view the world. Cognitive-behavioral therapy seeks to change maladaptive schemas.

SCHISTOSOMIASIS. Also called bilharziasis, this is a disease caused by bodily infestation of blood flukes.

SCHIZOPHRENIA. Schizophrenia is a psychotic disorder that causes distortions in perception (delusions and hallucinations), inappropriate moods and behaviors, and disorganized or incoherent speech and behavior.

SCHNEIDERIAN SYMPTOMS. Another name for first-rank symptoms of schizophrenia.

SCIATICA. Pain along the course of the sciatic nerve, running from pelvis down the back of leg to the foot caused by a compression or irritation of the fifth lumbar spinal root.

SCLERA. A dense white fibrous membrane that, together with the cornea, forms the outer covering of the eyeball.

SCLERODERMA. Immune system disorder where collagen (a protein found in connective tissue, bone, skin, etc.) forms in an abnormally rigid manner. Can affect many body organs and tissues such as the heart, lungs, gastrointestinal tract, joints, kidneys, and skin.

SCOLIOMETER. A tool for measuring trunk asymmetry; it includes a bubble level and angle measure.

SCOLIOSIS. A lateral curvature of the spine.

SCROFULA. Tuberculous inflammation of the lymph nodes of the neck in children, caused by bacteria in cattle; also called cervical adenitis.

SCROFULODERMA. Abscesses on the skin associated with tuberculosis and caused by mycobacteria.

SCRUPULOSITY. A spiritual disorder characterized by perfectionism and obsessive fears of God's punishment. Some patients with OCD also develop religious scrupulosity.

SCURVY. A disease characterized by loose teeth, and bleeding gums and mouth, caused by a lack of ascorbic acid (vitamin C) in the diet.

SEASONAL AFFECTIVE DISORDER (SAD). A mood disorder caused by decreased daylight during winter, SAD is characterized by depression, weight gain, and sleepiness during the winter months. An estimated 4–6% of the population of Canada and the northern United States suffers from SAD.

SEBACEOUS GLANDS. The oil- or grease-producing glands of the body.

SEBORRHEIC DERMATITIS. An inflammatory condition of the skin of the scalp, with yellowish greasy scaling of the skin and itching. Other areas of the body may also be affected. Mild seborrheic condition is called dandruff.

SEBUM. An oily skin moisturizer produced by sebaceous glands.

SECONDARY HEADACHE. A headache that is caused by another disease or disorder.

SECONDARY INFECTION. An infection by a microbe that occurs during an infection by a different kind of microbe.

SEDATIVE. A drug, herb, or preparation that has a calming and relaxing effect. Sedatives are used to aid sleep and ease pain and are often given as mild tranquilizers.

SEDIMENTARY. Formed by deposits of sediment, or material that settles on the bottom in a body of water.

SELECTIVE ESTROGEN RECEPTOR MODULATOR. A hormonal preparation that offers the beneficial effects of hormone replacement therapy (HRT) without the increased risk of breast and uterine cancer associated with HRT.

SELECTIVE SEROTONIN REUPTAKE INHIBITOR (SSRI). A class of antidepressant drugs that block the reabsorption of serotonin by nerve cells in the brain, thus raising the levels of serotonin. SSRIs include fluoxetine (Prozac), sertraline (Zoloft), and paroxetine (Paxil).

SELENIUM. A mineral supplement with antioxidant properties that may be useful for reducing breast pain and tenderness associated with fibrocystic breast disease. The recommended daily allowance of selenium is 70 mcg for men and 55 mcg for women.

SELF-BREEMA. A personalized form of Breema bodywork that the individual performs on his or her own body, without an instructor as partner. It is intended to supplement Breema bodywork treatment sessions with an instructor.

SEMEN. A whitish, opaque fluid containing sperm released by a male at ejaculation.

SEMINAL VESICLES. The pouches above the prostate that store semen.

SENESCENCE. Aging.

SENILE PLAQUES. Abnormal structures, composed of parts of nerve cells surrounding protein deposits, found in the brains of persons with Alzheimer's disease.

SENSITIZATION. The process by which the immune system becomes sensitive or hypersensitive to a specific chemical and reaction to it when re-exposed.

SENSORINEURAL HEARING LOSS. Hearing loss caused by damage to the nerves or parts of the inner ear that control the sense of hearing.

SENSORY AWARENESS. Bringing attention to the sensations of tension and/or release in the muscles.

SENSORY ROOT GANGLION. A bundle of nerves that help conduct physical sensations.

SEPSIS. Bacterial poisoning causing destruction of body tissues; blood poisoning by pus-forming microorganisms or toxins.

SEQUELA. An abnormal condition resulting from a previous disease or disorder. Pl.: Sequelae.

SERIAL CASTING. A series of casts designed to gradually move a limb into a more functional position, as opposed to doing it all at once with one cast, as would be done in setting a broken bone.

SEROTONIN DOPAMINE ANTAGONISTS (SDAS). A second generation of antipsychotic drugs, also called atypical antipsychotics. SDAs include clozapine (Clozaril), risperidone (Risperdal), and olanzapine (Zyprexa).

SEROTONIN SYNDROME. A potentially life-threatening reaction to increased levels of the neurotransmitter serotonin in the central nervous system, most often as a result of drug interactions. It is characterized by agitation, confusion, delirium and perspiration.

SEROTONIN. A chemical compound that acts as a neurotransmitter, conveying information within the nervous system and regulating mood, emotion, sleep and appetite. Too much serotonin may be responsible for migraines or nausea.

SERUM. Clear, fluid part of the blood.

SESSILE. A botanical term to describe a leaf that emerges from the plant stem without a stalk.

SET POINT. In medicine, a term that refers to body temperature, body weight, or other measurements that a human or other organism tries to keep at a particular value. The Shangri-la diet is said to work by lowering the dieter's set point for body weight.

SEXUAL AROUSAL DISORDER. The inhibition of the general arousal aspect of sexual response.

SEXUALLY TRANSMITTED DISEASES (STDS). A group of diseases that are transmitted by sexual contact. In addition to gonorrhea, this group generally includes chlamydia, HIV (AIDS), genital herpes, genital warts, and syphilis.

SHAMAN. In certain indigenous tribes or groups, a person who acts as an intermediary between the natural and supernatural worlds. Shamans are regarded as having the power or ability to cure illnesses.

SHANGRI-LA. A utopia; a mythical place in the Himalayas where life approaches perfection, depicted in a 1933 novel by James Hilton.

SHEEP BLOOD AGAR PLATE. A petri dish filled with a nutrient gel containing red blood cells that is used to

detect the presence of streptococcal bacteria in a throat culture. Streptococcal bacteria will break down the red blood cells.

SHEN NONG. A legendary emperor, he was called the "Divine Farmer" of China. Shen Nong made many discoveries concerning herbal medicine and cataloged 365 species of medicinal plants. An early herbal text, written around 400 A.D.

SHEN. One of the five body energies. It influences mental, spiritual, and creative energy. Shen tonics address deficiencies in this type of energy.

SHIATSU. Japanese form of acupressure massage.

SHINGLES. An disease caused by an infection with the *Herpes zoster* virus, the same virus that causes chickenpox. Symptoms of shingles include pain and blisters along one nerve, usually on the face, chest, stomach, or back.

SHOCK WAVE THERAPY. A method of treating tennis elbow and other musculoskeletal injuries that involves directing bursts of high-pressure sound waves at the affected area.

SHOCK. A condition in which the amount of blood circulating in the body is inadequate to meet the body's needs. Shock can be caused by certain diseases, serious injury, or blood loss. Symptoms include rapid pulse, pale skin and bluish lips and fingernails.

SHORT-CHAIN FATTY ACIDS. End products of bacterial fermentation derived from the breakdown of complex carbohydrates by anaerobic micro-organisms in the large intestine.

SIALAGOGUE. An agent that increases salivation.

SICK BUILDING SYNDROME. An illness related to multiple chemical sensitivity in which a person develops symptoms in response to chronic exposure to airborne environmental chemicals found in a tightly sealed building.

SICKLE-CELL ANEMIA. A genetic malformation of red blood cells that can cause periodic crises in sufferers.

SIDESTREAM SMOKE. The smoke that is emitted from the burning end of a cigarette or cigar or that comes from the end of a pipe. Along with exhaled smoke, it is a constituent of secondhand smoke.

SIGMOID COLON. The final portion of the large intestine which empties into the rectum.

SILICOSIS. A serious lung disease caused by prolonged inhaling of dust from stone or sand that contains silicon dioxide; also called grinder's disease or potter's rot.

SIMPLE. A type of leaf that is not divided into parts.

SINUSITIS. An infection of the sinus cavities characterized by pain in the eyes and cheeks, fever, and difficulty breathing through the nose.

SINUS TRACT. A channel connecting a body part with the skin outside.

SITZ BATH. From the German word for "sit," a bathtub shaped like a chair allowing a person to bathe while sitting so only the hips and buttocks are immersed; or, A warm water bath, sometimes including medications or herbs, to bathe the pelvic area.

SJÖGREN'S SYNDROME. An autoimmune disorder in which the body's white cells attack the glands that produce saliva and tears. Dry mouth is a core symptom of Sjögren's syndrome, which effects mostly older women.

SKIN GRAFT. Surgery used to cover burned or injured areas of the body with new skin.

SKIN LESION BIOPSY. A procedure in which a sliver of tissue from the skin is removed in order to examine it and establish a diagnosis.

SLEEP APNEA. A condition in which a person stops breathing while asleep. These periods can last up to a minute or more and can occur many times each hour. In order to start breathing again, the person must become semi-awake.

SLEEP DISORDER. Any condition that interferes with sleep. As of 2008, at least 84 have been identified, according to the American Sleep Disorders Association.

SLEEP LATENCY. The amount of time that it takes a person to fall asleep.

SLEEP PARALYSIS. An abnormal episode of sleep in which the patient cannot move for a few minutes, usually occurring on falling asleep or waking up. Often found in patients with narcolepsy.

SLIT LAMP. A special viewing device used by eye specialists to examine the eye for cataracts.

SODIUM POTASSIUM PUMP. A system responsible for the diffusion of sodium ions and potassium ions across cell membranes.

SOFT PALATE. The structure at the roof of the mouth that separates the mouth and the pharynx.

SOYBEAN. The seed of the plant *Glycine max*.

SPASMOLYTIC. A substance or medication that relieves cramping.

SPASM. Involuntary contraction of a muscle.

SPASTIC. Describes a condition in which the muscles are rigid, posture may be abnormal, and fine motor control is impaired.

SPAWN. Grain, often rye or millet, that has been inoculated with mushroom spores and is used to grow mushrooms commercially.

SPECIFIC PHOBIA. An intense but irrational fear of a specific place, object, or animal. Common specific phobias include fear of spiders, snakes, or dogs; fear of flying or highway driving; fear of blood; and fear of elevators and other closed spaces.

SPERMATOGENESIS. The process by which sperm develop to become mature sperm, capable of fertilizing an ovum.

SPERMATORRHEA. Involuntary discharge of semen without an orgasm occurring; sperm leakage.

SPERM. The reproductive cell of the male that contains genetic information and participates in the act of fertilization of an ovum.

SPHYGMOMANOMETER. An instrument used to measure blood pressure. It consists of an inflatable cuff and a manometer, the part that measures pressure.

SPINAL STENOSIS. Usually the result of arthritis of the spine, causing narrowing of the spinal canal in the lumbar vertebrae. The narrowing puts pressure on the roots of the sciatic nerve. It may cause sciatica.

SPINES. These sharp needle-like protrusions serve the plant in three important ways. They conduct water, reduce water loss, and protect the plant from herbivores.

SPIROCHETE. A type of bacterium with a long, slender, spiral shape. The bacteria that cause Lyme disease and syphilis, for example, are spirochetes.

SPIRULINA. A genus of blue-green algae that is sometimes added to food to increase its nutrient value. It is rich in vitamins, minerals, essential fatty acids, and antioxidants.

SPLEEN. A large lymphatic organ, located just under the left rib cage, that filters the blood. In TCM, Spleen refers to all organs considered necessary for extracting and using nutrients including the pancreas, large muscles, lips, eyelids, lymph system, spleen.

SPLENECTOMY. Surgical removal of the spleen.

SPONDYLITIS. An inflammation of the spine.

SPONDYLOSIS. Arthritis of the spine.

SPORE. The asexual reproductive body produced by simple organisms such as fungi, ferns, or other nonflowering plants.

SPRUE. A disorder in which the absorption of nutrients from the diet by the small intestine (malabsorption) is impaired, resulting in malnutrition. Two forms of sprue exist: tropical sprue and celiac sprue.

SPUTUM. Material produced within the alveoli in response to an infectious or inflammatory process and coughed up from the passageways of the lungs, including saliva, mucus, or phlegm.

SQUAMOUS EPITHELIAL CELLS. The flat cells that make up the surface layer of skin and mucous membranes.

STAGE. A term used to describe the size and extent of cancer.

STAGING. Using various methods of diagnosis to determine the extent of disease present in an individual. Staging is important as a way of determining the appropriate type of treatment for a particular disease.

STAMEN. The male fertilizing organ of flowering plants, bearing pollen.

STANDARDIZED HERBAL EXTRACT. An herbal product created by using water or alcohol to dissolve and concentrate the active ingredients, which are then quantified for medicinal pharmacological effect.

STANDARDIZED. To cause to conform to a standard. In medicine and pharmacy, this means that a given weight of an herb will contain a standardized percentage or weight of the active principle.

STAPHYLOCOCCUS. Any of several species of spherical bacteria that occur in groups of four or in irregular clusters. They can infect various parts of the body, especially the skin and mucous membranes.

STARCH. Complex carbohydrates.

STASIS. Stagnation in the flow of blood or any body fluid.

STATIN. An HMG-CoA reductase inhibitor, this class of drugs is used primarily, but not exclusively, to assist in the lowering of cholesterol levels.

STEAM DISTILLATION. A process of extracting essential oils from plant products through a heating and evaporation process.

STEROID. A family of compounds that share a similar chemical structure. This family includes estrogen and testosterone, vitamin D, cholesterol, and the drugs cortisone and prednisone.

STIGMASTEROL. A plant steroid that is extracted from soybeans and used to produce natural human hormones.

STIGMA. The thread-like filament found in the center of a flower where pollen collects.

STIMULANT LAXATIVES. Powerful laxatives that increase the frequency of bowel movements by stimulating muscle contractions that accelerate the passage of stool.

STIMULUS. Anything capable of eliciting a response in an organism or a part of that organism.

STOMACHIC. A medication or herbal preparation given to improve the functioning of the digestive system. It can tonify the stomach, sharpen or improve the appetite, or stimulate digestion.

STRABISMUS. Failure of the two eyes to direct their gaze at the same object simultaneously due to muscle imbalance.

STRAWBERRY TONGUE. A sign of scarlet fever in which the tongue appears to have a red coating with large raised bumps.

STREET DRUG. A substance purchased from a drug dealer. It may be a legal substance, sold illicitly (without a prescription, and not for medical use), or it may be a substance that is illegal to possess.

STREPTOCOCCUS PYOGENES. A common bacterium that causes strep throat and can also cause tonsillitis.

STREPTOCOCCUS. A genus of sphere-shaped bacteria that can cause a wide variety of infections.

STRESS HARDINESS. A personality characteristic that enables persons to stay healthy in stressful circumstances. It includes belief in one's ability to influence the situation; being committed to or fully engaged in one's activities; and having a positive view.

STRESS MANAGEMENT. A category of popularized programs and techniques intended to help people deal more effectively with stress.

STRESSOR. A stimulus or event that provokes a stress response in an organism. Stressors can be categorized as acute or chronic, and as external or internal to the organism.

STRESS URINARY INCONTINENCE (SUI). Urine leakage upon straining, coughing, laughing, or sneezing.

STRIATUM. A part of the basal ganglia, a deep structure in the cerebral hemisphere of the brain. Abnormally high levels of dopamine in the striatum are thought to be related to the delusions and hallucinations of schizophrenia.

STRIDOR. A noisy wheezing sound during breathing that may indicate an airway obstruction.

STROKE. A hemorrhage into the brain, formation of a clot in an artery, or rupture of an artery that causes sudden loss of consciousness. It may cause paralysis, coma, speech problems, and dementia.

STRUCTURAL INTEGRATION. The term used to describe the method and philosophy of life associated with Rolfing. Its fundamental concept is the vertical line.

STRYCHNINE. A colorless, crystalline poison obtained from the seeds of *Nux vomica*.

SUBCHONDRAL CYSTS. Fluid-filled sacs that form inside the marrow at the ends of bones as part of the development of OA.

SUBCUTANEOUS. Under the skin.

SUBDURAL HEMATOMA. Bleeding into the space between the outermost and middle membranes covering the brain.

SUBLINGUAL. Taken underneath the tongue.

SUBLUXATION. A partial or incomplete dislocation of the bones that form a joint, or misalignment between vertebrae that structurally and functionally impairs nerve function.

SUBSTANTIA NIGRA. Movement control centers of the brain containing dopamine-producing cells.

SUCCIMER (CHEMET) OR DMSA. A drug used to remove excess lead from the body.

SUCCULENT. Any type of drought-tolerant plant that stores water in its fleshy parts, such as stems and leaves.

SUCCUSSION. A process integral to the creation of a homeopathic remedy in which a homeopathic solution is struck against a firm surface. This is performed to thoroughly mix the substance and magnify its healing properties, a process called potentization.

SUET. Refers to the hard fat found around cattle and sheep kidneys and loins; it is used in cooking.

SULCUS. A v-shaped crevice where the gum line meets the teeth. A healthy sulcus measurement is 3 mm. As gum tissues become diseased, this crevice can

measure 6 mm and above, allowing bacteria to develop.

SULFADOXONE/PYRIMETHAMINE (FANSIDAR). An antimalarial drug developed in the 1960s. It is the first drug tried in some parts of the world where chloroquine resistance is widespread. It has been associated with severe allergic reactions due to its sulfa component.

SUNSCREEN. Products that block the damaging rays of the sun. Good sunscreens contain either para-aminobenzoic acid (PABA) or benzophenone, or both. Sunscreen protection factors range from 2-70.

SUPERANTIGEN. A type of bacterial toxin that triggers abnormal activation of T-cells, which regulate the body's response to infected or malignant cells. *S. aureus* is responsible for the production of a number of different superantigens.

SUPERFICIAL TUMOR. A tumor that has not penetrated deep into the body organ.

SUPERIOR HERB. The highest of three categories of herbal plants in traditional Chinese medicine. A superior herb is a non-toxic tonic that acts safely over time to assist the body in self-healing by eliminating toxins and nourishing, strengthening, and supporting cells,

SUPERIOR MESENTERIC ARTERY SYNDROME. A condition in which a person vomits after meals due to blockage of the blood supply to the intestine.

SUPPORTIVE. An approach to psychotherapy that seeks to encourage the patient or offer emotional support to him or her, as distinct from insight-oriented or educational approaches to treatment.

SUPPOSITORY. Any treatment prepared to be inserted into the vagina or the rectum.

SUSHI. A traditional Japanese preparation of food wherein vinegared rice, vegetables, and fish or fish products, are wrapped in *nori* seaweed, cut, and served.

SWIMMER'S EAR. An inflammation or infection of the ear canal due to overexposure to water.

SWIMMER'S ITCH. An allergic skin inflammation caused by a sensitivity to flatworms that die under the skin, causing an itchy rash.

SYMBIOTIC. The living relationship of two separate organisms. Symbiotic relationships can be mutually beneficial, beneficial to one partner and not harmful to the other partner, or beneficial to one partner and harmful to the other partner.

SYMPTOM. In homeopathy, a positive sign of the body's self-defense and self-healing that assists the practitioner to choose the correct remedy. Symptoms include the patient's emotional state, physical symptoms and psychological characteristics.

SYNCOPE. Dizziness or brief loss of consciousness resulting from an inadequate flow of oxygenated blood to the brain.

SYNDROME. Common features of a disease or features that appear together often enough to suggest they may represent a single, as yet unknown, disease entity.

SYNERGISTIC EFFECT. A compounding effect greater than the effect otherwise expected from adding the involved components.

SYNERGISTIC. Describes an association which improves the effectiveness of members of the association.

SYNERGY. A condition in which the action of a sum of parts is greater than the individual actions of those parts added together, something like "one plus one is greater than two."

SYNOVIAL FLUID. Fluid surrounding the joints which acts as a lubricant, reducing the friction between the joints.

SYNOVIAL JOINT. A type of joint that allows articular bones to move.

SYNOVIAL MEMBRANE. A layer of connective tissue that lines the insides of joints, tendon sheaths, and bursae. The synovial membrane produces synovial fluid, which has a lubricating function.

SYNOVIA. A clear, somewhat sticky lubricating fluid secreted by membranes that surround the joints.

SYRUP. An herbal preparation that is made generally by boiling the herb with water, adding sugar as a preservative, and boiling until it thickens. The syrup may be stored.

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE). A chronic, inflammatory, autoimmune disorder in which the individual's immune system attacks, injures, and destroys the body's own organs and tissues. It may affect many organ systems, including the skin, joints, lungs, heart, and kidneys.

SYSTEMIC. Afflicting an entire body system or the body in general; the opposite of localized.

SYSTOLIC BLOOD PRESSURE. Blood pressure when the heart contracts (beats).

T

TABES DORSALIS. A progressive deterioration of the spinal cord and spinal nerves associated with tertiary syphilis.

TABLEWORK. The passive phase of Trager therapy, in which the practitioner uses gentle and noninvasive movements to allow the client to relax deeply and experience physical movement as free and effortless.

TACRINE. A drug commonly prescribed for Alzheimer's disease that provides temporary improvement in cognitive functions for some patients with mild-to-moderate forms of the disease.

TACTILE SENSE. Receiving information about the body and the environment via contact with the skin. When this is lost through illness, a person may receive injuries without being aware of it.

TACTILE. The perception of touch.

T'AI CHI. An ancient Chinese martial art consisting of slow, rhythmic movements to relieve stress, anxiety, and depression, and provide cardiovascular, respiratory, and pain relief benefits. Qigong is a form of T'ai chi.

TAMOXIFEN. A drug used to treat cancer.

TANNER'S STAGES. Stages of physical development in childhood, adolescence and adulthood. They were first described by Drs. Marshall and Tanner in 1969, and are also referred to as pubertal stages 1 through 5.

TANNIN. An acidic substance that occurs naturally in plants. Tannins are phenolic compounds that help form proteins, alkaloids and glucosides from a solution. They are used to tan leather, color fabrics and ink and are found in tea and coffee.

TAOISM. A philosophy of life based on the writings of Chinese philosopher Lao-tse who lived about 500 B.C. Taoism considers humans in relation to the whole universe, advocates simplicity, and influenced traditional Chinese medicine.

TAPOTEMENT. A group of massage techniques in which the therapist strikes the soft tissues with the sides of the hands or with loose fists. It is intended to invigorate and tone the body.

TARDIVE DYSKINESIA (TD). A condition that involves involuntary movements of the tongue, jaw, mouth, or face or other groups of skeletal muscles that usually occurs either late in antipsychotic therapy or even after the therapy is discontinued. It may be irreversible.

TARGET TISSUES. Tissues specifically receptive to a given hormone.

T CELL. White blood cells that stimulate cells to create and release antibodies. They are a type of lymphocyte that develops in the thymus gland, circulates in the blood and lymph, and regulates the body's immune response to infected or malignant cells.

TD. The abbreviation for tetanus and diptheria vaccine.

TELANGIECTASIA. Small blood veins visible at the surface of the skin of the nose and cheeks.

TELLINGTON TOUCH (TTOUCH). A form of energy therapy that combines aspects of the Feldenkrais method of bodywork with aura therapy.

TEMPEH. A dense, high-fiber fermented cake of soybeans and other grains; it is a staple food in Indonesia.

TEMPORAL BONES. The compound bones that form the left and right sides of the skull.

TEMPOROMANDIBULAR JOINT DISORDER. Inflammation, irritation, and pain of the jaw caused by improper opening and closing of the temporomandibular joint. Other symptoms include clicking of the jaw and a limited range of motion.

TEMPOROMANDIBULAR JOINT (TMJ). The jaw joint formed by the mandible (lower jaw bone) moving against the temporal bone of the skull.

TENDINITIS. Inflammation of tissues that connect muscles to bones. Tendinitis is usually caused by strain or an injury. Also called tendonitis.

TENDON. A band or cord of thick white fibrous tissue that connects a muscle to bone.

TENOTOMY. Surgical procedure that cuts the tendon of a contractured muscle to allow lengthening.

TERPENES. Hydrocarbons found especially in essential oil.

TEST ANXIETY. A name for the stress and anxiousness that commonly occur in students before they take exams.

TESTICLE. One of the two male sex glands, located in the scrotum, where sperm and hormones are produced.

TESTOSTERONE. Male hormone produced by the testes and (in small amounts) in the ovaries. Testosterone is responsible for some masculine secondary sex

characteristics such as growth of body hair and deepening voice.

TETANUS. A potentially fatal infection of the central nervous system, found in wounds.

TETANY. A disorder of the nervous system characterized by muscle cramps, spasms of the arms and legs, and numbness of the extremities. It is a symptom of an abnormality in calcium metabolism or very low calcium levels in the body.

THALAMUS. An important relay center for sensory signals in the cerebral cortex of the brain.

THALAMOTOMY. Surgery that destroys a small amount of tissue in the thalamus to control Parkinson's Disease tremors.

THALASSEMIA. A group of several genetic blood diseases characterized by absent or decreased production of normal hemoglobin. Individuals who have thalassemia have to undergo frequent blood transfusions and are at risk for iron overload.

THEOBROMINE. A stimulant that occurs naturally in chocolate as well as in kola nut. Foods and drinks containing theobromine are poisonous to domestic pets.

THERAPEUTIC INDEX. The ratio of the benefits to be obtained from a drug compared to the risks of using that drug.

THERAPEUTIC TOUCH (TT). An American form of energy therapy based on the ancient tradition of the laying-on of hands. TT is thought to work by removing energy blockages or disturbances from the patient's aura.

THERMAL BURN. Tissue injury caused by extreme heat.

THERMOGENESIS. The production of heat, especially within the body.

THERMOGRAM. The image created by thermography.

THERMOLOGIST. A professional trained in reading thermograms.

THIAZOLADINEDIONES. A class of drugs typically used to treat diabetes and insulin resistance.

THIRD EYE. A term used to refer to the inner eye or eye of the mind. Opening the third eye refers to admission to a new level of consciousness.

THROMBOPHLEBITIS. Inflammation of a vein together with clot formation.

THORACIC OUTLET SYNDROME. Spasticity of the muscles of the upper back, neck, and/or shoulders.

THROMBOCYTE. Also called a platelet. Thrombocytes help the blood to clot so that wounds can heal.

THROMBOTIC. Pertaining to a blood clot formed within an intact blood vessel as opposed to a clot formed to seal the wall of a blood vessel after an injury.

THROMBUS. A blood clot that forms in the heart or blood vessel and remains there.

THRUSH. A yeast infection of the mouth characterized by white patches on the inside of the mouth and cheeks.

THUJONE. A natural compound found in the essential oils of cedar, wormwood, sage, mugwort, and clary. It is banned as a flavoring agent in the United States because of its neurotoxicity. Thujone is classified as a monoterpene ketone.

THYROIDECTOMY. Removal of the thyroid gland.

THYRODITIS. Inflammation of the thyroid.

THYROID-STIMULATING HORMONE (TSH). A hormone secreted by the pituitary gland that controls the release of T_4 by the thyroid gland.

THYROID. A small gland, located in the middle of the lower neck. A properly functioning thyroid maintains a balance of thyroid hormones to sufficiently regulate the body's metabolism.

THYROTOXICOSIS. An excess of thyroid hormone levels, thyroxine (T4), triiodothyronine (T3), or both, in the blood. Symptoms include rapid heart beat, sweating, anxiety, and tremor.

THYROXINE (T_4). A thyroid hormone that regulates many essential body processes.

TIA (TRANSIENT ISCHEMIC ATTACK). Occlusion of smaller blood vessels to the brain that can produce stroke-like symptoms from a few minutes to 24 hours, but leaves no permanent damage.

TIBB-NABAWI. Prophetic medicine (another name for unani-tibbi).

TIBIA. One of the long bone of the lower leg.

TIC. An involuntary, sudden, spasmodic muscle contraction.

TINCTURE. A solution of a medicinal substance in alcohol prepared by steeping the roots, leaves, or other parts of an herb or ingredient in an alcohol and water mixture. Tinctures can also be prepared using vinegar or glycerin instead of alcohol.

TINEA CRURIS. The medical term for jock itch.

TINEA. Any of several fungal infections of the skin, especially ringworm.

TINNITUS. Perceived ringing, buzzing, whistling, or other noise heard in one or both ears that has no external source. There are a number of conditions that may cause this.

TISANE. A decoction of herbs, usually drunk for medicinal purposes.

TITRATION. Gradually adjusting dosage of a supplement until the desired result is obtained, but no unwanted side effects appear.

TMJ SYNDROME. Tightness and pain in the jaw and neck muscles.

TOFU. A high-protein curd made from soybeans, used in meat and dairy replacement products.

TOLERANCE. A phenomenon whereby a drug user becomes physically accustomed to a particular dose of a substance, and requires ever-increasing dosages in order to obtain the same effects.

TONIC PUPIL. A pupil that is slow to change.

TONIC. A medication or herbal preparation that is given to restore or increase muscle tone, or to generally promote the vital functions of the body; or, An agent that restores normal tone to tissues.

TONIFICATION. Acupuncture technique for strengthening the body.

TONSILS. Oval-shaped masses of glandular tissue located on both sides at the back of the throat. Tonsils act like filters to trap bacteria and viruses.

TOPHUS (PLURAL, TOPHI). A chalky deposit of a uric acid compound found in gout. Tophi occur most frequently around joints and in the external ear.

TOPICAL. Referring to a medication or other preparation applied to the skin or the outside of the body.

TORSION. The accidental twisting of tissues in the body that may decrease the blood and oxygen supply to the affected area.

TOTAL PELVIC EXENTERATION. Surgical procedure involving removal of the rectum, lower portion of the large intestine, the urinary bladder, the pelvic reproductive organs, lymph nodes, pelvic muscles, and perineum. Both urinary and fecal diversions are required for this surgery.

TOURNIQUET. A device used to control bleeding, consisting of a constricting band applied tightly around a limb above the wound. It should only be used if the bleeding in life-threatening and cannot be controlled by other means.

TOXEMIA. Poisoning of the blood.

TOXICOLOGY. The branch of medical pharmacology dealing with the detection, effects, and antidotes of poisons.

TOXIC SHOCK SYNDROME (TSS). A potentially serious bacterial infection associated with the use of tampons to absorb menstrual flow.

TOXIFICATION. When the body is unable to eliminate poisonous substances, they remain clogged in the system and eventually cause a breakdown of normal function.

TOXIN. A general term for something that harms or poisons the body.

TRACE ELEMENT. An element that is required in only minute quantities for the maintenance of good health. Trace elements are also called micronutrients.

TRACHEA. A cartilage tube in the area of the throat that carries air to the lungs.

TRACHEOTOMY. A surgical procedure in which a small hole is cut into the trachea, or windpipe, below the level of the vocal cords.

TRADITIONAL CHINESE MEDICINE (TCM). An ancient system of medicine based on maintaining a balance in vital energy or qi that controls emotions and both spiritual and physical wellbeing. TCM utilizes herbal remedies, acupuncture, cupping, and other treatment modalities.

TRANS-FATTY ACID. A toxic type of fat created by hydrogenating oils and by deep frying foods.

TRANS-RECTAL ULTRASOUND. A procedure in which a probe is placed in the rectum. High-frequency sound waves that cannot be heard by humans are sent out from the probe and reflected by the prostate.

TRANSCENDENTAL MEDITATION (TM). A meditation technique based on Hindu practices that involves the repetition of a mantra.

TRANSCRANIAL MAGNETIC STIMULATION. A procedure used to treat patients with depression.

TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS). A technique used to control chronic pain. Electrodes placed over the painful area deliver a mild electrical impulse to nearby nerve pathways, thereby blocking transmission of pain signals to the brain.

TRANSENDENTAL MEDITATION. A focusing of the mind based in part on Hindu meditation techniques in which each person is given a word or phrase to meditate upon.

TRANSIENT. Of short duration.

TRANSVAGINAL ULTRASOUND. A technique for imaging the ovaries using sound waves generated by a probe inserted into the vagina. This diagnostic imaging procedure serves as the baseline for a hysterosonographic examination.

TRAUMATIC SHOCK. A condition of depressed body functions as a reaction to injury with loss of body fluids or lack of oxygen. Signs of traumatic shock include weak and rapid pulse, shallow and rapid breathing, and pale, cool, clammy skin.

TRAVELER'S DIARRHEA. Diarrhea caused by ingesting local bacteria to which one's digestive system has not yet adapted.

TREMATODES. Flukes, which are flat, leaf-shaped parasitic worms.

TREMBLING. A shaking of a body part.

TREPHINE. A saw- or drill-like instrument used to remove a circular piece of bone from the skull. It is also called a trepan.

TRICHINELLOSIS. A parasitic disease caused by tissue-dwelling roundworms of the species *Trichinella spiralis*, usually acquired by eating infected meat.

TRICYCLIC ANTIDEPRESSANT (TCA). A group of antidepressant drugs that all have three rings in their chemical structure. Their mechanism of action is not fully understood, but they appear to extend the duration of action of some neurohormones, including serotonin and norepinephrine.

TRICYCLICS. A type of antidepressant; Elavil, for example.

TRIDOSHA. The combination of three basic principles of energy, or biological humor, that comprise life, according to Ayurvedic philosophy.

TRIGEMINAL NEURALGIA OR TIC DOULOUREUX. An affliction of the trigeminal or fifth cranial nerve. The condition is characterized by attacks of shooting, stabbing pain on one side of the face. These episodes are triggered by touching the affected area.

TRIGGER POINT. An area of intense irritability within soft tissue structures, characterized by local soreness and sometimes referred pain.

TRIGLYCERIDE. Total amount of fat in the blood; or, a blood fat lipid that comes from food or is made from other energy sources in the body. Elevated triglyceride levels contribute to the development of atherosclerosis, or heart disease.

TRIGONELLINE. An alkaloid compound found in fenugreek.

TRIIODOTHYRONINE (T_3). A thyroid hormone similar to thyroxine but more powerful. Preparations of triiodothyronine are used in treating hypothyroidism.

TRIMESTER. One-third or 13 weeks of pregnancy.

TRIMETHYLAMINE. A product of decomposition associated with a fishy odor. Its build-up can result from excessive choline.

TRIMYRISTIN. A chemical found in nutmeg that causes anxiety.

TRIPLE BURNER. The pathways and relationships between the Spleen, the Lungs and the Kidney.

TRITURATION. A method of preparing a homeopathic remedy from an insoluble substance by grinding or pounding it into a fine powder. *Calcarea carbonica* is prepared from shells by trituration.

TROPICAL SPRUE. A condition of unknown cause whereby abnormalities in the lining of the small intestine prevent the body from absorbing food normally. This disease is not associated with gluten enteropathy. It has been associated with travel in tropical areas.

TUBAL PREGNANCY. A fertilized egg that implants in the fallopian tube instead of inside the uterus, which often occurs as a result of sexually transmitted infections such as Chlamydia; also known as ectopic pregnancy.

TUBERCLES. Small, pea-sized tubers that grow on *Dioscorea* plants in the angles between the leaves and the stem. They are used in the cultivation of Chinese yam.

TUBEROUS SCLEROSIS. A genetic disease that causes skin problems, seizures, and mental retardation; it may be confused with autism.

TUBER. A thick, fleshy underground stem that produces buds that can give rise to new plants.

TUI NA. A form of Chinese massage in which the therapist vigorously pushes and kneads the soft tissues of the patient's body. Its name means "push and grasp."

TUMOR ANTIBODY FACTOR (TAF). A component of IAT sera, possibly tumor necrosis factor (TNF), that may induce antibodies that destroy tumors.

TUMOR COMPLEMENT FACTOR (TCF). A component of IAT sera that stimulates antibody production.

TUMOR INDUCING FACTOR (TIF). A blood component that can initiate tumor growth.

TUMOR NECROSIS FACTOR (TNF) ANTAGONIST. A substance that blocks the action of TNF, a naturally occurring protein in the body that helps cause inflammation.

TUMOR. An abnormal growth resulting from a cell that loses its normal growth control restraints and multiplies uncontrollably.

TYRAMINE. A compound derived from tyrosine, an amino acid that is a precursor to various alkaloids, and found in various types of food.

TZANCK PREPARATION. A procedure in which skin cells from a blister are stained and examined under the microscope. The presence of large skin cells with many cell centers or nuclei points to a diagnosis of herpes zoster when combined with results from a physical examination.

TZANCK TEST. A laboratory test using a microscope to examine tissue samples that have been stained with certain dyes.

U

UDANA. Life-sustaining energy of the diaphragm, the third of the five airs of Ayurvedic philosophy, the life force governing upward motion.

ULCERATION. A pitted area or break in the continuity of a surface, such as the skin or mucous membrane.

ULCERATIVE COLITIS. An inflammation of the walls of the bowel accompanied by the formation of ulcers. The condition can result in permanent bowel damage.

ULCER. A site of damage to the skin or mucous membranes characterized by the formation of pus and the death of tissue. It is frequently accompanied by inflammation.

ULTRASOUND. This medical device uses sound waves bouncing off body organs or tissues, which are reflected back as images on the screen. Ultrasound can show shape, size, and certain characteristics of the tissues.

ULTRAVIOLET RADIATION (UV). Electromagnetic radiation that is shorter than visible light rays but longer than x rays. UV is thought to be responsible for sunburns, skin cancers, and cataract formation.

UNAPPROVED DRUG. The FDA is responsible for ensuring that biological products are safe and effective and in compliance with the law and FDA regulations. Biological products are licensed under the provisions of Section 351 of the Public Health Service Act (42USC)(PHS Act).

UNICURSAL. A curve or series of curves that forms one path, without branching or splitting. A true labyrinth is unicursal in design.

UNSATURATED FAT. Fat found in plant foods that is typically liquid (oil) at room temperature. They can be monounsaturated or polyunsaturated, depending on their chemical structure. Unsaturated fats are the most highly recommended dietary fats.

UREA. A colorless compound that is the primary component of urine in mammals and that results from the oxidation of proteins.

URETER. A tube that carries urine from the kidney to the bladder.

URETHRAL SPHINCTER. Circular muscle that controls the movement of urine from the bladder to the urethra.

URETHRA. The small tube that drains urine from the bladder and in men serves as a conduit for semen during ejaculation.

URETHRITIS. An inflammation or irritation of the urethra, the tube that drains the bladder.

URIC ACID. A compound that can form deposits in joints and tissues. This disease is known as gout or hyperuricemia.

URINARY RETENTION. The result of progressive obstruction of the urethra by an enlarging prostate, causing urine to remain in the bladder even after urination.

UROLOGIST. A physician who specializes in treating problems of the urinary tract.

URTICARIA. Itchy pustules that may be caused by a hypersensitivity to food, drugs, or other substances.

USP. The *U.S. Pharmacopoeia* contains nationally and internationally recognized drug standards published by the United States Pharmacopeia Convention and used as a standard by FDA and other federal regulatory agencies.

UTERUS. The female reproductive organ that contains and nourishes a fetus from implantation until birth. Also known as the womb.

UVEITIS. Inflammation of the uvea, which is a continuous layer of tissue consisting of the iris, the ciliary body, and the choroid. The uvea lies between the retina and sclera.

UVULOPALATOPHARYNGOPLASTY (UPPP). An operation to remove excess tissue at the back of the throat to prevent it from closing off the airway during sleep.

V

VACCINE. A substance prepared from a weakened or killed virus which, when injected, helps the body to form antibodies that attack an invading virus and may prevent infection altogether.

VAGINAL CONE. A weighted cone held in the vagina for Kegel excercising.

VAGINISMUS. A condition in which muscles around the outer third of the vagina have involuntary spasms in response to attempts at vaginal penetration, thus making penetration impossible or difficult.

VAGINITIS. An inflammation of the mucous membrane that lines the interior of the vagina. It often results from a *Candida* or other fungal infection, and is accompanied by pain, itching, and discharge.

VAGINOSIS. Bacterial infection of the vagina, caused by an overgrowth of bacteria that normally live in the vagina.

VALACYCLOVIR. An oral antiviral drug that is available under the trade name Valtrex. The drug prevents the varicella zoster virus from replicating.

VARICELLA-ZOSTER IMMUNE GLOBULIN (VZIG). A substance that can reduce the severity of chickenpox symptoms.

VARICELLA-ZOSTER VIRUS. The virus that causes chicken pox and shingles.

VARICOSE VEINS. Swollen and distended veins in the superficial skin layer of the legs.

VARIVAX. A vaccine for the prevention of chicken pox.

VAS DEFERENS. The duct that stores sperm and carries it from the testicles to the urethra.

VASODILATATION. A widening of the blood vessels.

VASODILATORY. Causing the veins in the body to dilate, or enlarge.

VASODILATOR. A drug or nerve that causes blood vessels to widen.

VATA. One of the three main constitutional types found under Ayurvedic principles. Keeping one's particular constitution in balance is considered important in maintaining health.

VECTOR. An animal or insect carrier that transfers an infectious organism from one host to another.

VEGAN. A person who does not eat any animal products, including dairy and eggs; or, food products made without any animal products such as meat, milk, or eggs. A vegan diet is a nutrition regimen that excludes all animal products.

VEGAN DIET. A vegetarian diet that excludes meat and dairy products.

VEGETARIANISM. The theory or practice of living only on vegetables and fruits.

VENOUS THROMBOEMBOLISM. A blood clot in a vein rather than an artery, which, if it breaks free, can travel to a lung.

VENTRICLE. One of the two lower chambers of the heart.

VENTRICULAR. Pertaining to the two lower chambers of the heart.

VERMIFUGE. A medication or preparation given to expel worms and other intestinal parasites.

VERRUCA (PLURAL, VERRUCAE). The medical term for warts.

VERTEBRAE. The component bones of the spine.

VERTIGINOUS ATTACKS. Attacks of vertigo or dizziness.

VERTIGO. A feeling of dizziness together with a sensation of movement and a feeling of rotating in space.

VESICLE. Sac or hollow structure filled with fluid (i.e., a blister).

VESTIBULAR SYSTEM. The brain and parts of the inner ear that work together to detect movement and position. Also maintains balance.

VESTIBULAR. Pertaining to the vestibule; regarding the vestibular nerve of the ear which is linked to the ability to hear sounds.

VIGILANCE. Attentiveness or alertness.

VILLI. The tiny, finger-like projections on the surface of the small intestine that help absorb nutrients.

VIPASSANA. A Buddhist meditative practice that emphasizes deep attentiveness to the present moment.

VIREMIA. The measurable presence of virus in the bloodstream that is a characteristic of acute retroviral syndrome.

VIRILIZATION. Male sexual characteristics such as deepening voice, male-pattern hair growth and balding in women.

VIRUS. A tiny particle that can cause infections by duplicating itself inside a cell using the cell's own machinery.

VISUAL ACUITY. Visual sharpness and resolving ability, usually measured by the ability to read numbers and letters.

VISUALIZATION TECHNIQUES. A form of meditation, contemplation, and imagination that seeks to alter physical processes and directions of behavior or outcomes by focused mental awareness on specific images.

VITAL FORCE. Innate wisdom and energy of the body.

VITAMIN. Any of various organic carbon-containing substances that are essential in minute amounts for normal growth and activity of the body, and are obtained naturally from plant and animal foods.

VITAMIN A (RETINOL). An essential nutrient for vision that is obtained from animal products or made in the liver from carotenoids such as beta carotene. Also found in orange and yellow vegetables, milk, and eggs. It is critical for proper growth and development.

VITAMIN K. A fat-soluble vitamin responsible for blood clotting, bone metabolism, and proper kidney function.

VITILIGO. A skin pigmentation disorder in which the melanocytes are destroyed leaving irregular patches of unpigmented skin, appearing most commonly on hands, feet, face and lips.

VOLATILE ORGANIC COMPOUNDS. Compounds from common sources such as cleaning materials and furnishings that vaporize, or become a gas, at room temperature.

VOLATILE. Evaporating readily at room temperature. The essential oils of a plant are sometimes called volatile oils for this reason.

VOLUNTARY MUSCLE. A muscle under conscious control; contrasted with smooth muscle and heart muscle.

VOMITUS. The medical term for the contents of the stomach expelled during vomiting.

VULNERARY. A medication or preparation used to heal wounds, bruises, sprains, and ulcers.

VULVAR VESTIBULITIS. Inflammation of the vestibule of the vulva or vagina.

VULVA. The external genital organs of a woman, including the outer and inner lips, clitoris, and opening of the vagina.

VULVOVAGINAL CANDIDIASIS. A yeast-like fungal infection of the vulva and vagina, which can be related to regular consumption of cranberry.

VYANA. Life sustaining energy of the heart and lungs; the second of the five airs of Ayurvedic philosophy; the life force governing circular motion.

W

WARFARIN. A blood-thinning drug, known by the brand name Coumadin.

WART. A small, fleshy skin growth caused by a virus.

WASTING SYNDROME. A progressive loss of weight and muscle tissue caused by the AIDS virus.

WATER-SOLUBLE VITAMINS. Vitamins that are not stored in the body and are easily excreted. These vitamins must be consumed regularly as foods or supplements to maintain health.

WEDGE RESECTION. Removal of only a small portion of a cancerous lung.

WERNECKE-KORSAKOFF SYNDROME. A condition caused by thiamine deficiency and usually related to alcoholism. Symptoms occur alternately in the central nervous system (brain and spinal cord) and peripheral nervous system (nerves in the remaining parts of the body).

WHEAL. A smooth, slightly elevated area on the body surface, which is redder or paler than the surrounding skin.

WHEAT GRASS. Young green wheat sprouts, grown organically for juicing; a central element of the Wigmore diet.

WHOLE BLOOD. Blood that contains red blood cells, white blood cells, and platelets in plasma.

WILDCRAFTING. The art of gathering or harvesting herbs or other plants from their native wild environment for human use.

WILSON'S DISEASE. A rare hereditary disease marked by high levels of copper deposits in the brain and liver. It can cause psychiatric symptoms resembling schizophrenia.

WINDOW. A perspective adopted to assess the property of a given plant.

WITHDRAWAL. The side effects experienced by a person who has become physically dependent on a substance, upon decreasing the substance's dosage, or discontinuing its use.

WOLFF PARKINSON WHITE (WPW) SYNDROME. A condition caused by abnormal electrical function in the heart

X

XEROSTOMIA. The medical term for dry mouth.

Y

YIN AND YANG. A Taoist concept that the universe is split into two separate but complementary aspects. Balance is sought between the passive force of yin (female) and the active force of yang (male).

YOGA. An Indian philosophical and health movement that strives to achieve balance through relaxation, meditation, breathing exercises, and body movements.

YOGI (FEMININE, YOGINI). A trained yoga expert.

YTTRIUM ALUMINUM GARNET (YAG). A type of laser used to perform surgery on secondary cataracts.

Z

ZEAXANTHIN. An antioxidant carotenoid that is the mirror image of lutein.

ZEN. A form of meditation that emphasizes direct experience.

ZOLLINGER-ELLISON SYNDROME. A disorder characterized by the presence of tumors (gastrinomas) that secrete a hormone (gastrin), which stimulates the production of digestive juices.

ZONE THERAPY. Also called zone analgesia, a method of relieving pain by applying pressure to specific points on the body. It was developed in the early 20th century by William Fitzgerald.

ZOONOSIS (PLURAL, ZOONOSES). Any disease of animals that can be transmitted to humans. Rabies is an example of a zoonosis.

ZYGOTE. The result of the sperm successfully fertilizing the ovum. The zygote is a single cell that contains the genetic material of both the mother and the father.

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